Appendix G Water Supply Assessment

WATER SUPPLY ASSESSMENT

FOR

CITY OF RANCHO SANTA MARGARITA GENERAL PLAN UPDATE

PREPARED FOR:

SANTA MARGARITA WATER DISTRICT

Prepared by:

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November 7, 2018

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E. Water Purchase and Sale Agreement entered into as of July 31, 2012 between Cadiz, Inc. et al and Santa Margarita Water District.

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SECTION 1 - INTRODUCTION

1.1 Purpose

In October of 2001, Senate Bill 610 (SB 610) was signed into California state law with an effective date of January 1, 2002. SB 610 amended existing legal requirements for confirmation of water supply sufficiency as a condition of approval for development projects. The confirmation of water supply sufficiency is achieved through an analysis of the water purveyor's existing and future water sources and existing and projected water demand in relation to a "project" as defined by SB 610, resulting in the production of a project-specific Water Supply Assessment ("WSA" or "Assessment"). The WSA also requires additional analysis if any portion of the water purveyor's current or future water supplies that may serve the Project include groundwater.

The SB 610 Assessment is triggered for projects that are subject to the California Environmental Quality Act (CEQA) and that meet the definition of "project" as defined in Water Code Section 10912.

This WSA has been prepared for the City of Rancho Santa Margarita ("City") General Plan Update ("Project") by Santa Margarita Water District (SMWD), which is the water supplier to the City for this Project. SMWD has determined that SB 610 applies to the Project pursuant to Water Code Section 10912(a)(7), which states: "*A project that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project.*"

Section 1 of this Assessment describes the proposed Project's relation to the water supplier's most recent (2015) Urban Water Management Plan (UWMP) and provides a review of statewide conservation requirements and Assessment methodology. Section 2 provides the water demand analysis of both the Project and the SMWD service area; Section 3 reviews the projected water supplies for the Project and the SMWD service area; Section 4 contains the required discussion of SMWD groundwater supplies; and Section 5 concludes the Assessment by answering the primary question at hand.

Law

Water Code Section 10910: (*a) Any city or county that determines that a project, as defined in Section 10912, is subject to the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) under Section 21080 of the Public Resources Code shall comply with this part.*

Water Code Section 10912: *For the purpose of this part, the following terms have the following meanings:*

(a) "Project" means any of the following:

(1) A proposed residential development of more than 500 dwelling units.

(2) A proposed shopping center or business establishment employing more than 1,000 persons or having more than 500,000 square feet of floor space.

(3) A proposed commercial office building employing more than 1,000 persons or having more than 250,000 square feet of floor space.

(4) A proposed hotel or motel, or both, having more than 500 rooms.

(5) A proposed industrial, manufacturing, or processing plant, or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,000 square feet of floor area.

(6) A mixed-use project that includes one or more of the projects specified in this subdivision.

(7) A project that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project.

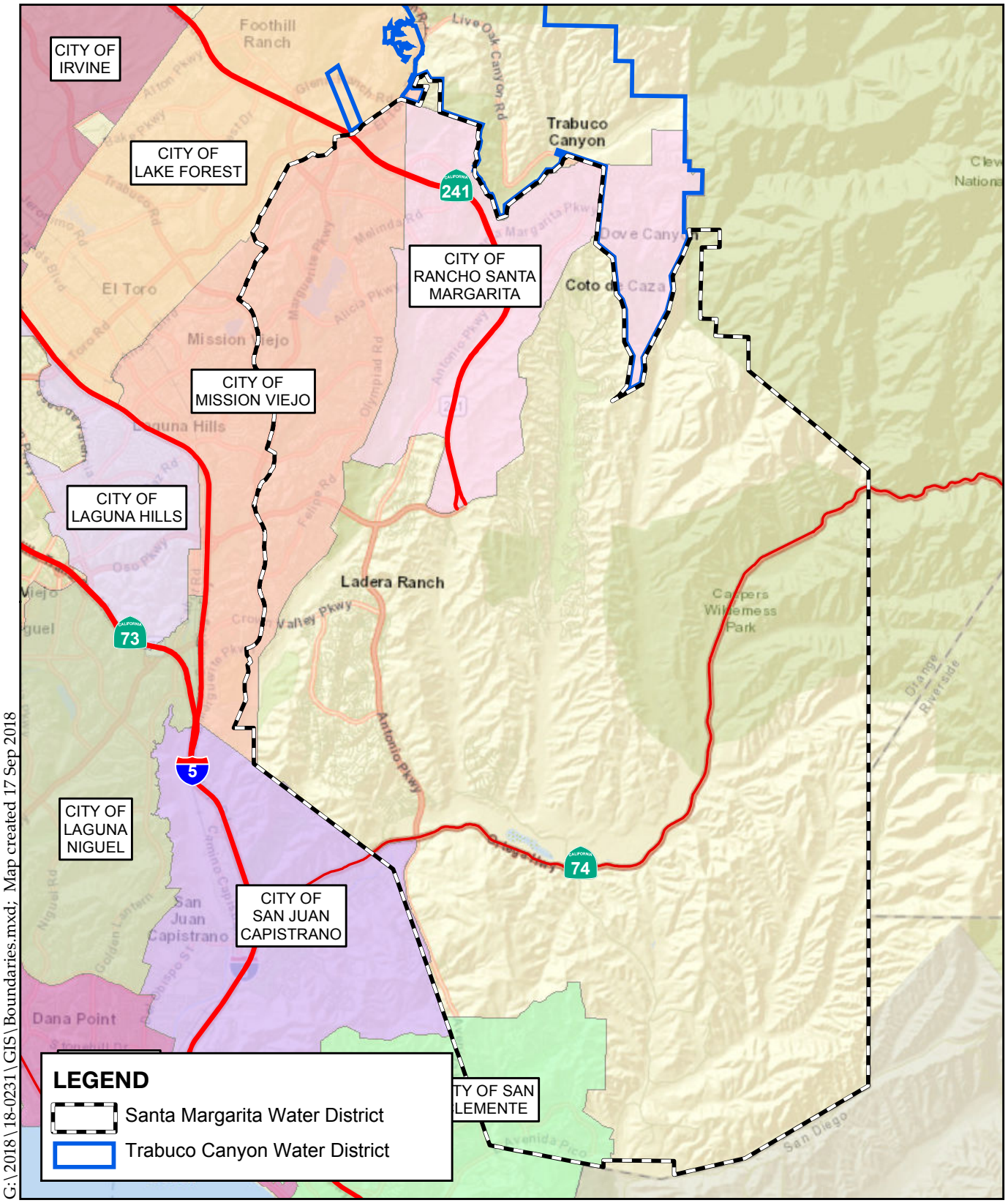
1.2 Proposed Project

On July 26, 2018 the City requested this WSA be prepared in accordance with SB 610 for the City's General Plan Update (Project) draft Environmental Impact Report (EIR).[1]

[1] State Clearinghouse No. 2018041075

The City is the Lead Agency and therefore responsible for preparation of the EIR pursuant to CEQA. Although the City is served by two water agencies (Trabuco Canyon Water District and SMWD), the City has indicated that the Project will be located within SMWD's service area because it encompasses all of the City's Business Park and Commercial General-designated land, as well as a majority of the City's residential areas. (City Letter, 2018) (See **Figure 1 – City and Water District Boundaries**.)

The City's General Plan Update will address an approximately 20-year planning period spanning from 2019 to 2040. This WSA will assume development of the proposed Project will be completed by 2025. The City estimates that the proposed Project would add an additional 528 dwelling units and 3,085,014 additional square feet of non-residential uses over the current General Plan land use plan projections. The City indicates the Project will not change existing land use designations but assumes the projected growth will occur through reuse and revitalization, including potential intensification of shopping centers and business park areas. Accordingly, there are no specific development projects that accompany the General Plan Update, or targeted areas in which the projected growth is assumed by the City to occur. The City has also indicated future development of areas within the City's Sphere of Influence would require annexation and adoption of a Specific Plan which would also require an assessment of available water supply, separate from this study. (City Letter, 2018) (See **Figure 2 – City of Rancho Santa Margarita Proposed General Plan Update.**)



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Sources: SMWD, 2018; ESRI.

0 2 4 Miles

Figure 1 - City and Water District Boundaries

Santa Margarita Water District

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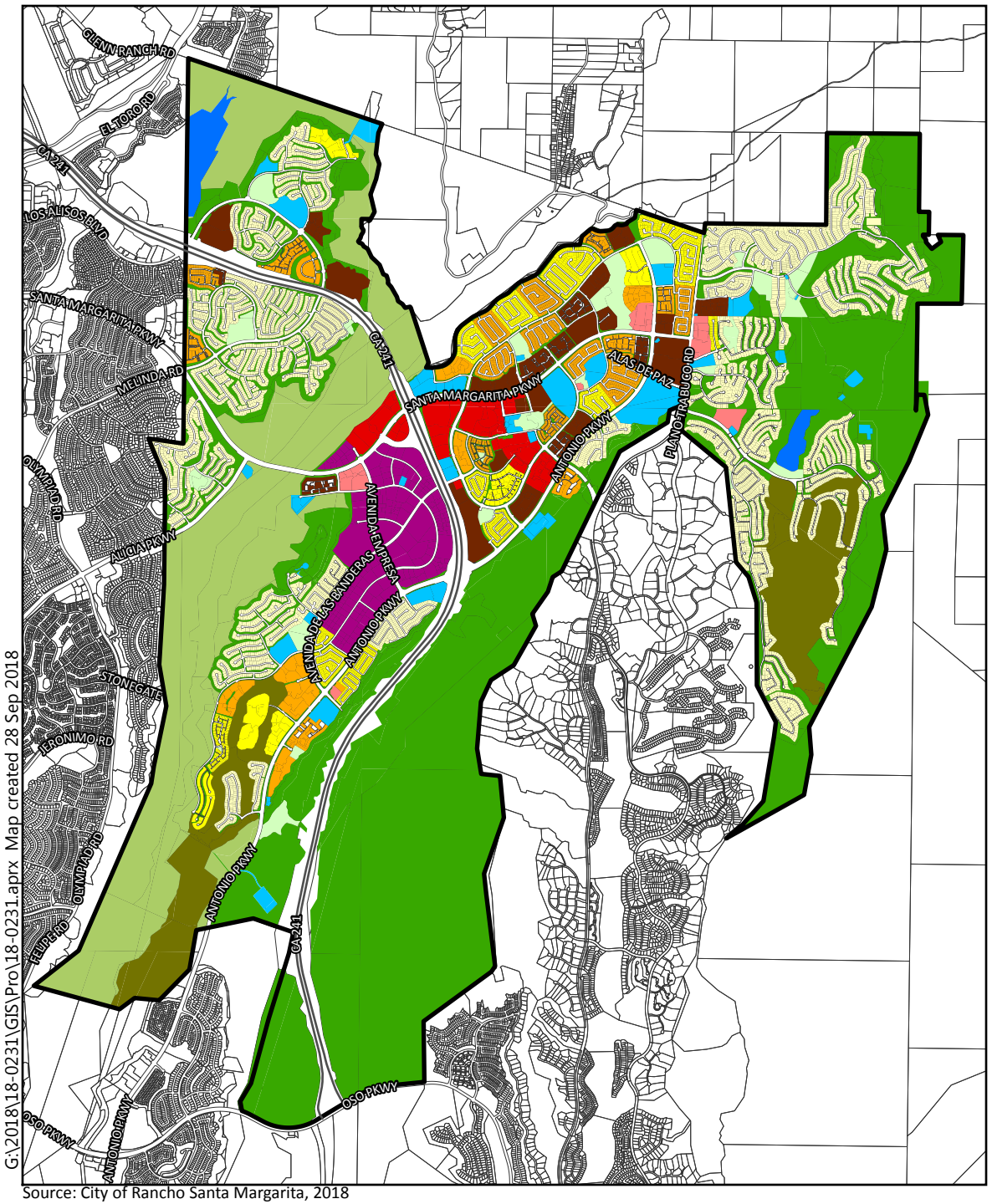

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Source: City of Rancho Santa Margarita, 2018

Legend

- City Boundary
- LOW DENSITY RESIDENTIAL
- LOW-MEDIUM DENSITY RESIDENTIAL
- MEDIUM DENSITY RESIDENTIAL
- HIGH DENSITY RESIDENTIAL
- COMMERCIAL GENERAL
- NEIGHBORHOOD COMMERCIAL
- BUSINESS PARK
- COMMUNITY FACILITY
- PARK
- OPEN SPACE
- OPEN SPACE GOLF
- REGIONAL OPEN SPACE
- WATER

Figure 2 – City of Rancho Santa Margarita Proposed General Plan Update

Water Supply Assessment

0 1 Miles

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The City's existing conditions, proposed build out capacity, and net change as a result of the proposed Project are shown in **Table 1-1 – Land Use Plan Development Capacity Summary.**

Table 1-1 – City Land Use Plan Development Capacity Summary

Land Use	Existing Dwelling Units (DU)	Existing Non-Residential (SF)	Maximum		Assumed		Acres	Estimated Total Dwelling Units (DU)	Estimated Total Non-Residential (SF)	Net Gain
			DU/acre	FAR	DU/acre	FAR				
Residential										
Low Density	6,032	--	7	--	7	--	895.5	6,268	--	**236**
Low-Medium Density	2,259	--	11	--	10	--	228.2	2,282	--	**23**
Medium Density	4,080	--	18	--	16	--	263.3	4,213	--	**133**
High Density	5,395	--	25	--	22	--	251.4	5,531	--	**136**
Commercial and Business										
General Commercial	--	961,906	--	1.0	--	0.25	129.4	--	1,408,732	**446,826**
Neighborhood Commercial	--	363,454	--	0.6	--	0.20	43.5	--	378,961	**15,507**
Business Park	--	3,457,374	--	1.0	--	0.45	271.3	--	5,318,273	**1,860,899**
Public/Quasi-Public										
Community Facility	--	1,184,862	--	0.6	--	0.15	219.4	--	1,433,721	**248,859**
Open Space										
Parks	--	3,616	--	0.5	--	0.001	154.0	--	6,706	**3,089**
Open Space	--	10,000	--	--	--	--	3,162.6	--	10,000	**--**
Open Space Golf	--	67,026	--	0.4	--	0.0035	457.1	--	69,694	**2,668**
Regional Open Space	--	--	--	0.4	--	0.01	1,164.3	--	507,166	**507,166**
Other										
Water	--	--	--	--	--	--	71.2	--	--	--
Total	**17,766**	**6,048,238**					**7,311.0**	**18,294**	**9,133,252**	
							Net Gain	**528**	**3,085,014**	

Note: From *City of Rancho Santa Margarita General Plan, Public Review Draft, Land Use Element,* April 2018, pp. LU-29-LU-30.
SF: square feet
DU: dwelling unit
FAR: floor to area ratio, represents the ratio between the total gross floor area of all buildings on a lot and the total area of that lot.

The Project will be supplied by a public water system operated by SMWD, who commissioned this Assessment from Albert A. Webb Associates on August 28, 2018 for the purpose of answering the following key question per SB 610: whether the projected supply for the next 20 years, based on normal, single dry and multiple dry years, will meet the demands projected for the Project plus existing and planned future uses, including agricultural and manufacturing uses.

Recycled Water

Recycled water and "non-domestic" (non-potable) water will be considered in this Assessment. SMWD is currently planning an extension of their recycled water system into the City, and pertinent information from that preliminary plan is provided herein. This Assessment will assume that the extension of a recycled water system into the City will replace existing potable water use with recycled water by using SMWD's existing supply of recycled water. SMWD currently operates a recycled water/non-domestic water production and distribution system that is supplied from the following sources:

1. Two District-owned water reclamation plants (WRPs), namely Chiquita WRP and Oso WRP;

2. One jointly-owned WRP (3A Plant);

3. Urban return flow[2] collection from multi-purpose basins (i.e., Oso Barrier, Cañada Gobernadora, Dove Canyon, Trabuco, and Horno);

4. Untreated groundwater from the Rancho Mission Viejo Mutual Water Company through an existing agreement;

[2] "Urban return flow" represents non-stormwater runoff. Non-stormwater runoff typically consists of overspray from irrigation, pool draining, leaks and/or illicit connections from sources that should be draining to a treatment plant.

5. The ability to purchase recycled water from Irvine Ranch Water District's Los Alisos WRP through an existing agreement during dry year conditions; and

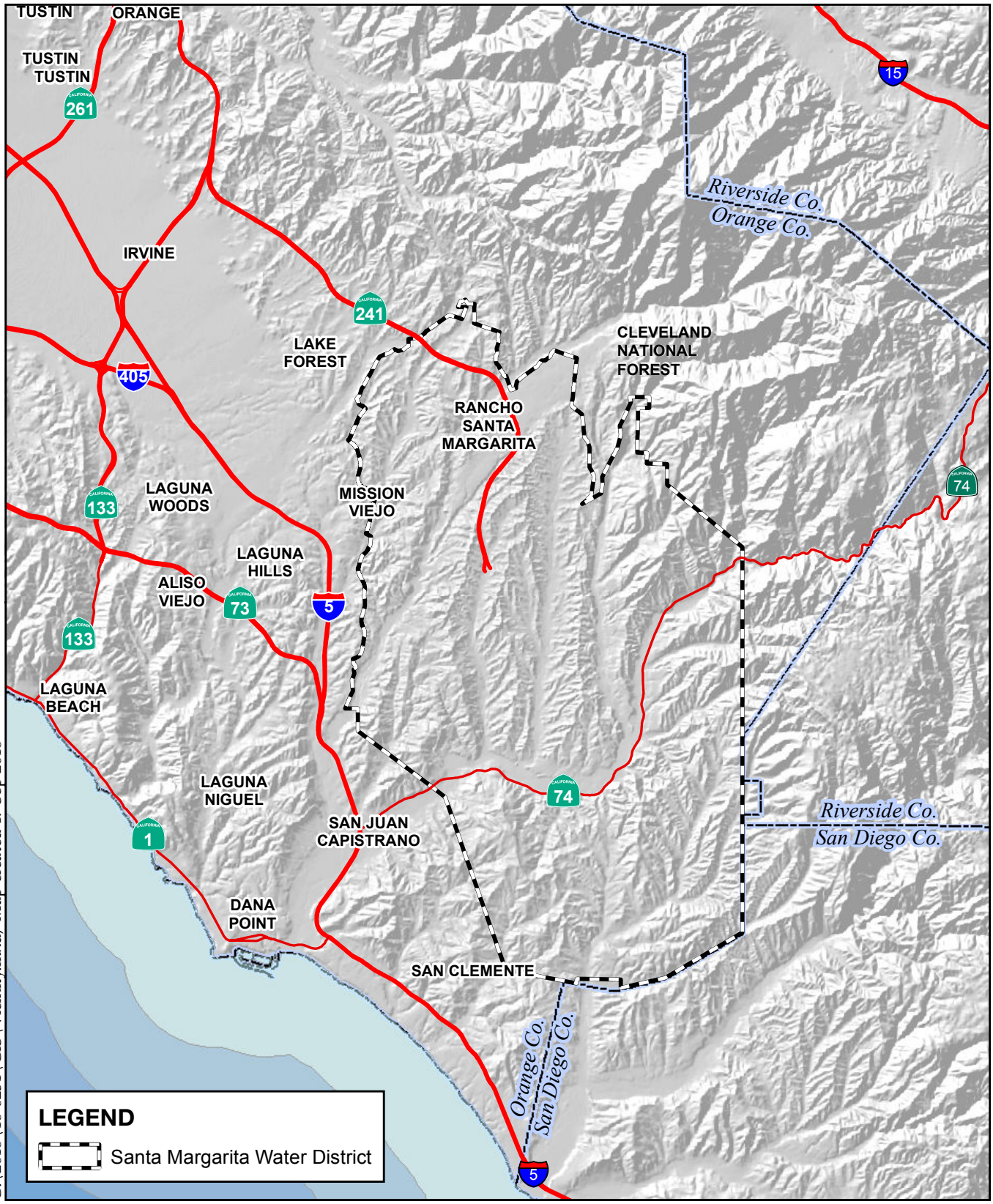
6. The ability to purchase recycled water from the City of San Clemente's WRP through an existing interim agreement.

SMWD provides wastewater collection, conveyance and treatment services to a portion of the City, with Trabuco Canyon Water District collecting and treating the remainder. Wastewater flows from the City are treated at the Chiquita WRP, which is expected to be the main source of recycled water supply to the City (UWMP, p. 6-2).

Project Location

The City of Rancho Santa Margarita is located in eastern Orange County, about 10 miles northeast of the Pacific Ocean, in the foothills of the Santa Ana Mountains (**Figure 3 – Vicinity Map** and **Figure 4 – USGS Topographic Map**). The General Plan study area is comprised of 8,607 acres (13 square miles), of which 8,280 acres are located within the City's incorporated limits and the remaining 327 acres are located within the City's Sphere of Influence. The community is bisected by State Route 241, and the cities of Mission Viejo and Lake Forest are located to the west, Cleveland National Forest is located to the east, and unincorporated areas are located to the north and south of the City. (NOP, p. 3)

The City's current General Plan was adopted in 2002 and was anticipated to result in the development of 17,608 dwelling units and 13.6 million square feet of non-residential development, resulting in a population of 51,178 persons at buildout (NOP, p. 6). As shown in **Table 1-1**, the City currently has 17,766 dwelling units (158 more than planned for in the 2002 General Plan), approximately 6 million square feet of non-residential land uses, and 48,516 residents. The proposed Project's 528 residential dwelling units will be in addition to the existing 17,766 dwelling units (**Table 1-1**). Because of the time that has elapsed since adoption of the 2002 General Plan, outdated information and projections warrant the proposed update. (NOP, pp. 6-11)



G:\2018\18-0231\GIS\Vicinity.mxd; Map created 17 Sep 2018

Sources: OC Survey website, 2018; ESRI.

0 2 4 6 Miles

Figure 3 - Vicinity Map

Santa Margarita Water District

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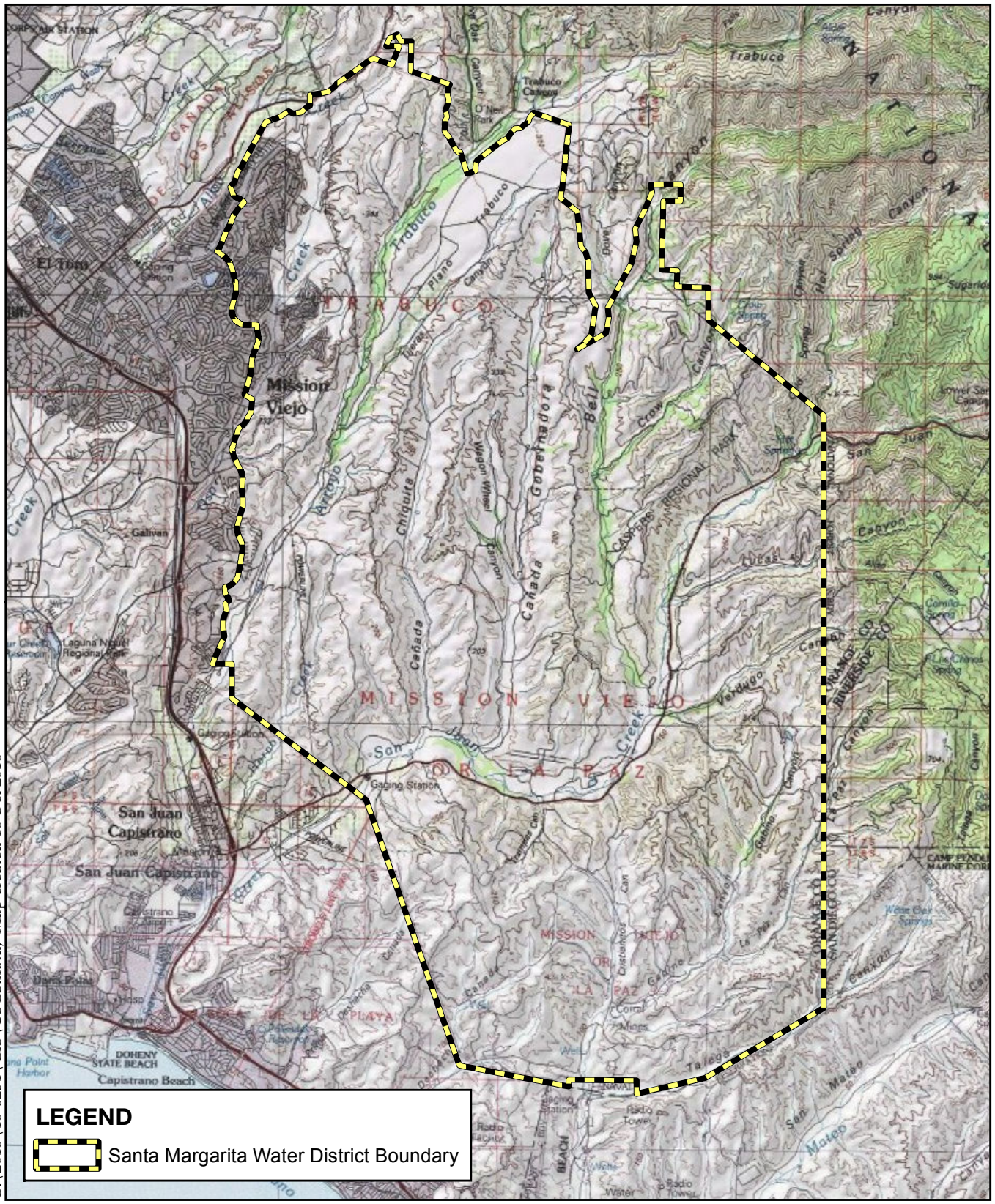

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Sources: OC Survey website, 2018; ESRI.

Figure 4 - USGS Topographic Map

Santa Margarita Water District

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1.3 Project Relation to Urban Water Management Plan

Law

Water Code Section 10910. *(c) (1) The city or county, at the time it makes the determination required under Section 21080.1 of the Public Resources Code* [CEQA]*, shall request each public water system identified pursuant to subdivision (b) to determine whether the projected water demand associated with a proposed project was included as part of the most recently adopted urban water management plan adopted pursuant to Part 2.6 (commencing with Section 10610).*

(2) If the projected water demand associated with the proposed project was accounted for in the most recently adopted urban water management plan, the public water system may incorporate the requested information from the urban water management plan in preparing the elements of the assessment required to comply with subdivisions (d), (e), (f), and (g).

(3) If the projected water demand associated with the proposed project was not accounted for in the most recently adopted urban water management plan, or the public water system has no urban water management plan, the water supply assessment for the project shall include a discussion with regard to whether the public water system's total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses, including agricultural and manufacturing uses.

(4) If the city or county is required to comply with this part pursuant to subdivision (b), the water supply assessment for the project shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during normal, single dry, and multiple dry

> *water years during a 20-year projection, will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses.*

SMWD is the water supplier for the Project and has prepared a 2015 Urban Water Management Plan (UWMP) that was adopted by SMWD Board of Directors on June 1, 2016 and submitted to the state Department of Water Resources (refer to **Appendix A** for 2015 UWMP). The 2015 UWMP was based on the current City General Plan and thus the supply and demand projections in the 2015 UWMP do not include the additional development proposed in the General Plan Update. In addition, SMWD has recently updated its 2015 water demand and water supply projections with more detailed and current information in a 2018 Water Supply Verification (WSV) for *The Ranch Plan: Planning Area Nos. 5 and 8* (WSV), included as **Appendix B**. This document sources data from calendar year (CY) and fiscal year (FY) 2017. Therefore, this Assessment will utilize the 2018 WSV for SMWD's current water demand and water supply projections.

SMWD has historically relied on treated imported water purchased from The Metropolitan Water District of Southern California (Metropolitan) through the Municipal Water District of Orange County (MWDOC) for the majority of domestic (potable) water supply. MWDOC prepared a 2015 UWMP that accounts for SMWD's then-current water demand and supply projections (**Appendix C**). MWD also prepared a 2015 UWMP that accounts for MWDOC projections for water demand and supply (**Appendix D**).

1.4 Statewide Mandatory Water Conservation Requirements

On January 17, 2014, Governor Jerry Brown proclaimed a statewide State of Emergency due to ongoing drought conditions. Since then, the Governor has issued at least six Executive Orders and other Proclamations in response to impacts from extended statewide drought conditions. Executive Order B-37-16 issued on May 9, 2016, established a new water use efficiency framework for California. The order established longer-term water conservation measures that include permanent monthly water use

reporting, new urban water use targets, reducing system leaks and eliminating wasteful practices, strengthening urban drought contingency plans and improving agricultural water management and drought plans.

In response, SMWD's Board of Directors adopted the Comprehensive Water Conservation Program Ordinance No. 2014-10-03 in October 2014, which established a staged water conservation program to encourage reduced water consumption within SMWD through conservation; enable effective water supply planning; assure reasonable and beneficial use of water; prevent waste of water; and maximize the efficient use of water within SMWD.

The City of Rancho Santa Margarita began a *Water Awareness Initiative* in January 2009 to highlight the issue of water supply, reliability, and quality. Beginning on February 1, 2016, and consistent with the Governor's Executive Order No. B-29-15,[3] the City codified *Landscape water efficiency* requirements in Municipal Code Section 9.05.120.

On April 7, 2017 the Governor issued Executive Order B-40-17 that ended the drought state of emergency in all California counties except Fresno, Kings, Tulare, and Tuolumne. The Executive Order maintains the mandatory water reporting requirements and prohibitions on wasteful practices contained in Executive Order B-37-16, as described previously.[4] In a related action, state agencies released a plan to implement Executive Order B-37-16 titled, *Making Water Conservation a California Way of Life* which includes requirements for drought contingency planning and annual reporting of validated water loss audits.[5]

Since 2014, SMWD's domestic water use has decreased with the implementation of water conservation ordinances and measures. Specifically, District water demands have

[3] Superseded by Executive Order No. B-37-16.
[4] State of California, Executive Order B-40-17 can be found at https://www.gov.ca.gov/docs/4.7.17_Exec_Order_B-40-17.pdf.
[5] April 2017 Final Report, available at http://www.water.ca.gov/wateruseefficiency/conservation/docs/20170407_EO_B-37-16_Final_Report.pdf.

decreased relative to CY 2014 by approximately 19 percent in CY 2015, 20 percent in CY 2016, and 18 percent in CY 2017 (WSV, p. 3-3). SMWD customers utilize water conservation methods including; conversion to recycled water for irrigation, turf removal, conversion to drought resistance landscapes, conversion to more efficient irrigation systems and evapotranspiration (ET)-based irrigation controllers, retrofits to high efficiency clothes washers and toilets, and implementation of weather-based irrigation controllers.

1.5 Methodologies of Analysis

This Assessment follows the report outline suggested by the California Department of Water Resources' *Guidebook for Implementation of Senate Bill 610 and Senate Bill 221 of 2001*. The projected domestic and non-domestic water demands published in SMWD's 2015 UWMP and 2018 WSV were determined based upon population growth projections, unit water use demand factors, water loss percentages, and actual water data.

SECTION 2 - WATER DEMAND ANALYSIS

The purpose of this section is to evaluate whether the proposed Project was considered in the water supplier's planning for customer water demand. This section will: 1) identify the categories of water use, 2) identify water demand by those categories over the next 20 years, and 3) compare the City of Rancho Santa Margarita's proposed General Plan Update ("Project") estimated water demand to the water demand for the Project site that was included in the Santa Margarita Water District (SMWD) 2015 Urban Water Management Plan (UWMP, **Appendix A**).

Law

> Water Code Section 10910: *(c) (2) (2) If the projected water demand associated with the proposed project was accounted for in the most recently adopted urban water management plan, the public water system may incorporate the requested information from the urban water management plan in preparing the elements of the assessment required to comply with subdivisions (d), (e), (f), and (g).*
>
> *(3) If the projected water demand associated with the proposed project was not accounted for in the most recently adopted urban water management plan, or the public water system has no urban water management plan, the water supply assessment for the project shall include a discussion with regard to whether the public water system's total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses, including agricultural and manufacturing uses.*

2.1 Service Area Demographic Factors

A variety of demographic factors may affect water use. The Urban Water Management Planning Act lists several demographic factors to be detailed including climate, current

and projected population, density, and the mix of customer types (or sectors).[1] As suggested by the Department of Water Resources' *Guidebook for Implementation of Senate Bill 610 and Senate Bill 221 of 2001*, these data provided herein are taken generally from SMWD's 2015 UWMP, with updates as noted.

The service area of SMWD, which includes a majority of the City of Rancho Santa Margarita is located on the west (or windward) side of the Santa Ana Mountains just inland from the Pacific Ocean (**Figure 3**). The topography of the service area is generally hilly with a substantial change in elevation from the most westerly point of the service area to the easterly areas in the mountain foothills (**Figure 4**). The local climate is characterized by warm summers, mild winters and light rainfall (UWMP, p. 2-1). Based on recorded data from the last 12 months (Sept. 2017 to Aug. 2018), the service area received approximately 7 inches of rainfall, most of which took place between November and March. Evapotranspiration in the area was approximately 56 inches over the same period. The average maximum and minimum temperatures were approximately 78°F and 52°F for the last 12 months.[2]

The SMWD service area population was estimated at 156,949 persons in 2015 (UWMP, p. 2-3). Currently, the population is estimated at 161,000 persons and projected to increase 24 percent to 200,026 persons by 2040 (WSV, p. 3-4). This is consistent with the population projections in the 2015 UWMP (p. 2-3). Most of the anticipated growth in the SMWD service area will occur through continued development of the Rancho Mission Viejo community located in the southwest portion of the service area in unincorporated Orange County ([**Figure 1**] UWMP, p. 2-2). On the other hand, the City of Rancho Santa Margarita is almost fully developed, with future land use opportunities limited to "reuse" and "revitalization." The City's draft General Plan defines these terms as, "Reuse will occur through the change-out of one business for another, and revitalization will occur through modernization of buildings and uses. Additionally,

[1] California Water Code Sections 10631 (e)(1) and (2).
[2] California Irrigation Management Information System (CIMIS), Monthly Report for *Coto de Caza - South Coast Valleys – Station 245*, Sept. 2017 – Aug. 2018, from https://cimis.water.ca.gov, accessed Sept. 11, 2018.

property owners may seek to expand or intensify their existing use, consistent with a parcel's land use designation" (LU Element, p. 27). The City recognizes that many parcels are not developed to their maximum density (for residential uses) or intensity (for non-residential uses). Specifically, the City expects revitalization of existing shopping centers and business parks with a higher average floor-to-area ratio (FAR) than was built under the prior General Plan (ibid, pp. 27-28).

The City's proposed General Plan Update also acknowledges potential future locations of development (i.e., within Sphere of Influence, Chiquita Ridge, and Mixed-Use); however these would require General Plan amendments at such time a project is proposed since they would require a land use change (ibid, p. 27), possibly an annexation into the City, and then a separate water supply availability study would be required. This Assessment does not include these potential developments.

2.2 Santa Margarita Water District Current and Future Water Demands

SMWD categorizes its water demand into six categories: single family, multi-family, commercial (including schools, fire stations, government offices, and light industrial), landscape, other (Lago Santa Margarita and Lake Mission Viejo), and water losses. SMWD currently provides domestic water through approximately 57,000 metered connections, up from approximately 55,000 connections shown in the 2015 UWMP (WSV, p. 3-2). The majority of the SMWD demands are residential (72 percent in FY 2017), water losses totaled 3.3 percent with the remaining potable demands being that of commercial/industrial, landscape and other users. The water loss is calculated from the Water Loss Audit Report to be 3.3 percent; however, conservatively and to remain consistent with historical use and losses, a water loss factor of 4 percent will be applied to future demand projections for domestic water and 8 percent for non-domestic water. SMWD does not currently provide any sales to agriculture or to other water agencies. SMWD does not currently provide potable water for saline water intrusion barriers, groundwater recharge, or participate in conjunctive use (ibid, p. 3-2).

SMWD's actual domestic and non-domestic water use in 2017 was 22,241 AF and 7,993 AF, respectively (WSV, p. 3-4). The current and future total water demands without the Project are provided in **Table 2-1 – Current and Future Water Demand (AFY)**.

Table 2-1 – Current and Future Water Demand (AFY)

	2015[a]	2017[b]	2020	2025	2030	2035	2040
	Actual		Projected[b]				
Domestic Water Demand (AFY)	26,910	22,241	23,384	24,266	25,044	25,262	25,262
Non-Domestic Water Demand (AFY)	7,495	7,993	8,787	10,090	11,269	13,899	13,929
Total Current Demand (AFY)	34,405	30,234	32,171	34,356	36,313	39,161	39,191

Notes: All values in units of AFY (acre-feet per year) and does not include the proposed Project.
[a] From SMWD 2015 UWMP, p. 2-8.
[b] From 2018 WSV, p. 3-4. Includes projected growth in Rancho Mission Viejo and loss factors.

Without the Project, SMWD currently expects total water demand to increase approximately 30 percent between 2017 and 2040; this includes a domestic water increase of 14 percent and a non-domestic water increase of 74 percent. Again, these projections are from a Board- adopted 2018 WSV, which is the most current source of information, beyond the 2015 UWMP. The domestic and non-domestic demand projections shown in **Table 2-1** are less than the demand projections made in the 2015 UWMP up until 2035. Beginning in 2035, SMWD projects more water demand (both domestic and non-domestic) than was projected in the 2015 UWMP (p. 2-8). The difference in water demands between the UWMP and the WSV is an indication of the successful implementation of the water conservation measures implemented by SMWD customers beginning in 2015 that have had permanent impacts going forward.

2.3 Project Water Demand

Water service to most of the City and in particular those areas of expected reuse and revitalization envisioned by the Project will be provided by the SMWD. The City's proposed General Plan Update Land Use Plan is shown in **Figure 2.** The City proposes

a net growth of 528 residential dwelling units and 3,085,014 square feet of non-residential uses in addition to the City's existing growth at build out, as shown in **Table 2-2 – City of Rancho Santa Margarita Proposed Project Net Growth**.

Table 2-2 – City of Rancho Santa Margarita Proposed Project Net Growth

Land Use	Estimated Dwelling Units (DU)[(a)]	Estimated Non-Residential Square Feet (SF)[(a)]	Max. Density (DU/acre) or Max. Intensity (FAR)[(b)]
Residential Uses			
Low Density Residential	236	--	7.0 DU/acre
Low-Medium Density Residential	23	--	11.0 DU/acre
Medium Density Residential	133	--	18.0 DU/acre
High Density Residential	136	--	25.0 DU/acre
Commercial, Business and Tourist Uses			
General Commercial	--	446,826	1.0:1 FAR
Neighborhood Commercial	--	15,507	0.6:1 FAR
Business Park	--	1,860,899	1.0:1 FAR
Public/Quasi-Public Uses			
Community Facility	--	248,859	0.6:1 FAR
Open Space Uses			
Parks	--	3,089	0.5:1 FAR
Open Space	--	--	n/a
Open Space Golf	--	2,668	0.4:1 FAR
Regional Open Space	--	507,166	0.4:1 FAR
Other Uses			
Water	--	--	--
Total	**528**	**3,085,014**	--

Notes:

[(a)] From City of Rancho Santa Margarita *Draft General Plan, Land Use Element (April 2018)*, Table LU-4.

[(b)] From City of Rancho Santa Margarita *Draft General Plan, Land Use Element (April 2018)*, Table LU-2.

DU: dwelling unit

SF: square feet

FAR: Floor area ratio, represents the ratio between the total gross floor area of all buildings on a lot and the total area of that lot.

In order to calculate the expected water consumption associated with the Project's net growth (increase over existing conditions), SMWD's current standard domestic water demand factors shown in **Table 2-3 – Domestic Water Demand Factors** were used.

Table 2-3 – Domestic Water Demand Factors

Land Use	Units	Demand Factor (gpd/Unit)
Conventional Single-Family Detached Homes	DU	450
High-Density Single-Family Detached	DU	450
Multi-Family Homes	DU	175
Age Qualified Homes	DU	300
Affordable Housing	DU	175
Parkland	AC	200
School	Student	12.5
Urban Activity Center	KSF	225
Neighborhood Center	KSF	225
Business Park	KSF	225

Note: From *Water Supply Verification for The Ranch Plan, Planning Areas 5 and 8,* Table 2.2, p. 2-5.
DU: dwelling unit
AC: acre
KSF: thousand square feet
gpd: gallons per day

The estimated domestic water demand of the City's proposed net growth from the proposed Project are shown in **Table 2-4 – Estimated Project Water Demand.**

Table 2-4 – Estimated Project Water Demand

Land Use	Estimated Dwelling Units (DU)[a]	Estimated Non-Residential Square Feet (SF)[a]	Water Demand Factor (gpd/unit)[b]	Water Demand (AFY)[c]
Low Density Residential	236	--	450 gpd/du	124
Low-Medium Density Residential	23	--		12
Medium Density Residential	133	--		70
High Density Residential	136	--		71
			Subtotal Residential Uses	**277**
General Commercial	--	446,826	225 gpd/KSF	117
Neighborhood Commercial	--	15,507		4
Business Park	--	1,860,899		488
			Subtotal Commercial/Business Uses	**609**
Community Facility	--	248,859	225 gpd/KSF	65
			Subtotal Community Facility Uses	**65**
Parks	--	3,089	200 gpd/acre	0.02
Open Space	--	--		--
Open Space Golf	--	2,668		0.01
Regional Open Space	--	507,166	Zero water consumption is assumed.	--
			Subtotal Open Space Uses	**0.03**
Water	--	--	--	--
Total	**528**	**3,085,014**	**--**	**951**

Notes: All totals rounded to whole numbers

[a] From City of Rancho Santa Margarita *Draft General Plan, Land Use Element (April 2018)*, Table LU-4.

[b] From SMWD 2018 WSV for *The Ranch Plan, Planning Areas 5 and 8*, Table 2.2.

[c] Includes 4% loss rate.

KSF: thousand square feet

AFY: acre-feet per year

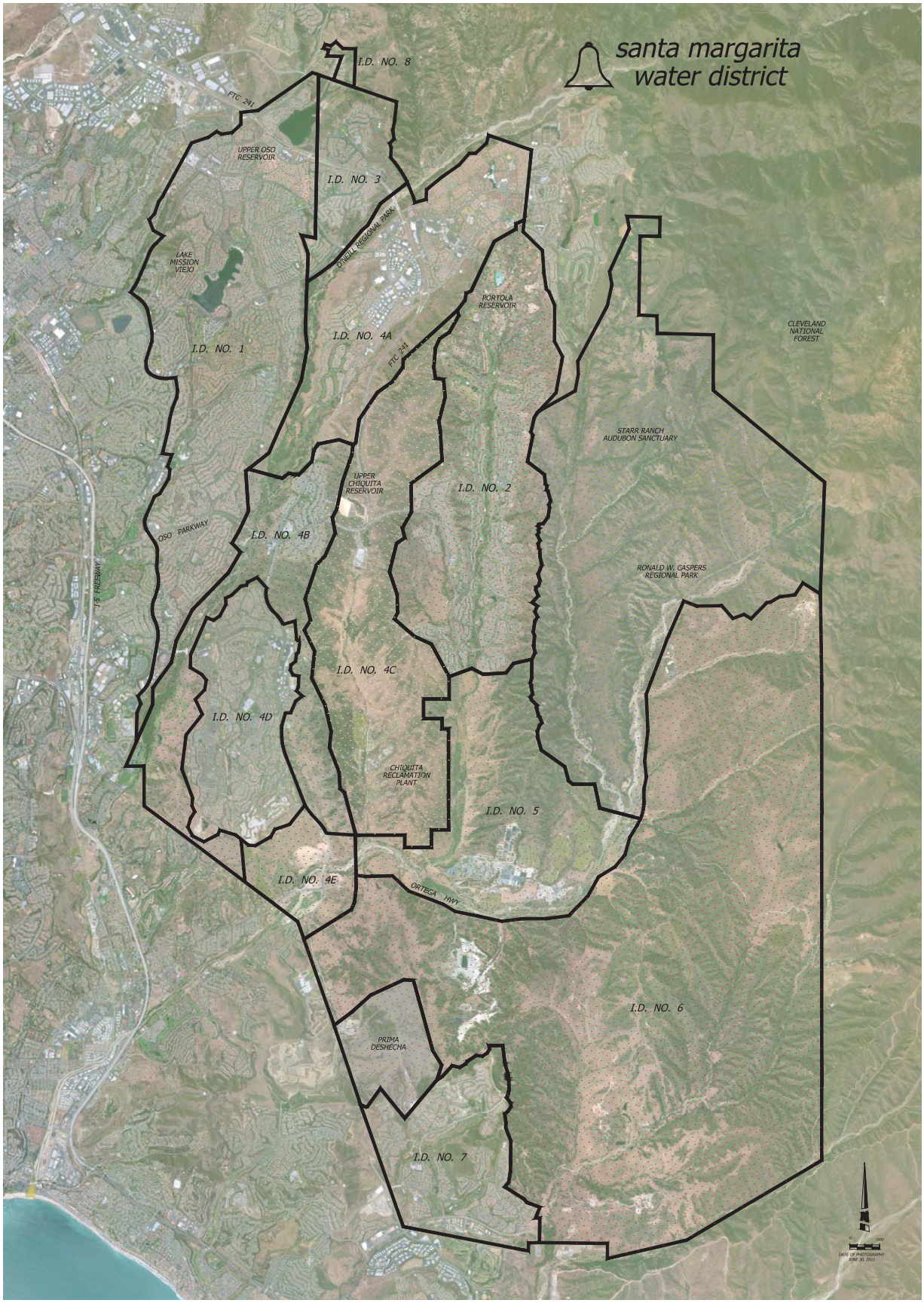
DU: dwelling unit

SF: square feet

gpd: gallons per day

The Project's domestic water demand has been estimated to be 951 AFY based on the most current information and guidance described herein which was provided by the City and SMWD. This annual demand rate should be interpreted as the anticipated additional demand over the existing need at build out of the City based on the proposed General Plan update. The proportion of each land use in **Table 2-4** that may be irrigated with recycled water is unknown. SMWD estimates that the proposed Project's additional growth would be constructed no earlier than 2020, and be completed by 2025.

Concurrent with preparation of this WSA is the preparation of a Recycled Water Master Plan for the City of Rancho Santa Margarita, specifically located in SMWD's Improvement District No. 4A (I.D. 4A) and is shown in **Figure 5 – Improvement District Map**. With the forthcoming I.D. 4A Recycled Water Master Plan, SMWD desires to convert the majority of the demand relative to irrigation meters within I.D. 4A from potable to recycled water supply. Currently, 1,000 AFY of existing recycled water supply is estimated for this purpose.



G:\2018\18-0231\GIS\Pro\18-0231.aprx Map created 26 Sep 2018

Source: SMWD 2015 UWMP, p. 2-11

Figure 5 – Improvement District Boundaries

Water Supply Assessment

The Recycled Water Master Plan for I.D. 4A conversion of potable water to recycled water will be represented in this Assessment as an additional demand for recycled water and an equal decrease in the potable water demand, beginning in 2025, as shown in **Table 2-5 –Water Demand with Project.**

Table 2-5 – Water Demand with Project (AFY)

Water Demand Type	2017[b]	2020	2025	2030	2035	2040
	Actual	Projected[b]				
Domestic Water						
Project (Net Growth)	0	0	951	951	951	951
Other District Service Area[a]	22,241	23,384	24,266	25,044	25,262	25,262
Domestic Water Demand To Be Met With Recycled Water[b]	0	0	(1,000)	(1,000)	(1,000)	(1,000)
Domestic Water Subtotal (AFY)	22,241	23,384	24,217	24,995	25,213	25,213
Non-Domestic Water						
Project (Net Growth)[c]	0	0	0	0	0	0
Recycled Water Master Plan for I.D. 4A	0	0	1,000	1,000	1,000	1,000
Other District Service Area[a]	7,993	8,787	10,090	11,269	13,899	13,929
Non-Domestic Water Subtotal (AFY)	7,993	8,787	11,090	12,269	14,899	14,929
Total Water Demand with Project (AFY)	30,234	32,171	35,307	37,264	40,112	40,142

Notes:

[a] From Tables 2-1 and 2-4 herein. Assumes proposed Project will be complete in 2025.

[b] With implementation of the proposed Recycled Water Master Plan for I.D. 4A within the City of Rancho Santa Margarita, a conversion will take place to replace 1,000 AFY of existing potable water demand with 1,000 AFY of recycled water.

[c] Non-domestic water use by Project assumed to be zero for this Assessment.

The Project's additional water demand increases SMWD's previous demand forecast made in the 2018 WSV beginning in 2025. Likewise, the Project's additional water demand increases the total demand projected in **Table 2-5** of the 2015 UWMP (see Table 2-7 in **Appendix A**) beginning in 2035. The following two sections of the Assessment describe the supplies projected to be available to SMWD from present to 2040, consistent with the 2018 WSV and 2015 UWMP according to all identified District water supply entitlements, rights and service contracts.

SECTION 3 - WATER SUPPLY ANALYSIS

This section identifies the sources of water that are available to and utilized by the Santa Margarita Water District (SMWD). The purpose of this section is to evaluate the water supplies that could be utilized by the proposed net growth from the City of Rancho Santa Margarita (City) General Plan Update (Project) during normal, single-dry and multiple-dry years during a 20-year projection (2020 to 2040). Section 4 – *Groundwater Analysis* contains additional required information regarding SMWD groundwater supplies.

Law

Water Code Section 10910 (d)(1)*: The assessment required by this section shall include an identification of any existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project, and a description of the quantities of water received in prior years by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), under the existing water supply entitlements, water rights, or water service contracts.*

(2) An identification of existing water supply entitlements, water rights, or water service contracts held by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), shall be demonstrated by providing information related to all of the following:

(A) Written contracts or other proof of entitlement to an identified water supply.

(B) Copies of a capital outlay program for financing the delivery of a water supply that has been adopted by the public water system.

(C) Federal, state, and local permits for construction of necessary infrastructure associated with delivering the water supply.

(D) Any necessary regulatory approvals that are required in order to be able to convey or deliver the water supply.

3.1. Documenting Wholesale Water Supplies

Many retail water suppliers in California, including SMWD, receive supplies from one or more water wholesalers. SB 610 requires this Assessment to document wholesale supplies received by:

i. Describing the quantities of water received from each wholesaler in prior years;
ii. Identifying existing entitlements, water rights, and/or water service contracts held by SMWD for the wholesale supply;
iii. Provide proof of entitlements, water rights, service contracts, relevant capital outlay programs, and construction permits for necessary infrastructure to deliver wholesale supplies, if any; and
iv. Regulatory approvals required to convey or deliver the wholesale supply.

Wholesale Supplies Received

SMWD is a member agency of the Municipal Water District of Orange County (MWDOC), a wholesale water supplier. MWDOC is a member agency of and receives wholesale water imported from The Metropolitan Water District of Southern California (Metropolitan), and as such is entitled to receive water from available Metropolitan sources. SMWD's domestic water supply has been entirely dependent on imported water purchased from Metropolitan through MWDOC, which consists of a blend of water from the Colorado River Aqueduct (CRA) and the State Water Project (SWP) in Northern California. SMWD owns capacity rights to various infrastructure described herein to import this water to its service area. Capacity rights are not equivalent to supply. Supply is subject to availability.

Imported water supplies to southern California can be highly variable; in January 2014 for example, the allocation of SWP water was reduced to 0 percent due to persistent

drought conditions. In response to the variability of supplies from the CRA and SWP, Metropolitan developed a *Water Supply Allocation Plan* to allocate wholesale imported water supplies among its member agencies. MWDOC, a Metropolitan member agency, in turn has developed its own *Water Supply Allocation Plan* (WSAP) to allocate imported supplies at the retail level.[1] Based on MWDOC's 2016 WSAP, SMWD is allocated 29,202 AFY of potable imported water from MWDOC assuming no water shortage is occurring. Due to ongoing drought conditions at the time, MWDOC's 2016 WSAP included a *Shortage Allocation Model* to allocate water to its member agencies during a water shortage. Metropolitan declared a WSAP Regional Shortage Level 3 ("Stage 3") effective July 1, 2015 through June 30, 2016. In response, MWDOC reduced the allocation to SMWD to 26,277 AFY for the duration of the water shortage condition. In May 2016, Metropolitan rescinded the mandatory water restrictions that were part of the Stage 3 condition and declared a "Condition 2 – Water Supply Alert" calling for continued conservation by all member agencies. The statewide drought emergency officially ended in April 2017.

The amount of imported water purchased by MWDOC from Metropolitan is equal to the amount of water needed to meet MWDOC's service area demands. In 2015, MWDOC obtained 225,508 AF from Metropolitan (MWDOC 2015 UWMP, p. 3-25). The imported water historically allocated by MWDOC for SMWD is shown in **Table 3-1 – Historic Imported Water Supply (AFY).**

[1] A copy of MWDOC's 2016 WSAP is located in Appendix D to the MWDOC 2015 UWMP, which is provided in Appendix C, herein.

Table 3-1 – Historic Imported Water Supply (AFY)

Fiscal Year	Allocation Available
Historic	
2000	27,923
2005	30,268
2010	28,077
2015	26,910
2016[(a)]	29,202 / 26,277
2017	29,202
Current	
2018	29,202

Note: From 2018 WSV, Tables 4.1, and 4.6.
(a) Allocation for non-shortage / shortage conditions.

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 in 2020 through 2040 during normal years, single dry year, and multiple dry years (MWDOC 2015 UWMP, p. 3-41). SMWD is therefore capable of meeting the water demands of its customers in normal, single dry, and multiple dry years from present to 2040.

Imported water makes up the majority of SMWD's water supply portfolio. The sources of the supply, CRA and SWP, are discussed below.

Colorado River Aqueduct

Colorado River water is imported through the CRA to its terminus at Lake Mathews in western 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. Metropolitan has a basic entitlement of 550,000 AFY of Colorado River water, plus surplus water up to an additional 662,000 AFY when certain conditions exist. However, surplus water has not be available for a number of years. Due

to long term drought conditions in the Colorado River Basin, the Colorado River faces an uncertain future water supply.

State Water Project

SWP water is imported from northern California and available as stipulated by the California Department of Water Resources (DWR) in response to hydraulic conditions in the Sacramento/San Joaquin delta, environmental regulations and the local hydrology.[2]

DWR estimates that deliveries of SWP water will be 8 percent of maximum contractual allocation[3] under the single dry-year condition (equivalent to 154,000 acre-feet for Metropolitan) and 62 percent under the long-term average condition, which is equivalent to 1,185,000 AF for Metropolitan. In dry, below-normal rainfall conditions, Metropolitan has increased the supplies received from the California Aqueduct by developing flexible Central Valley/SWP storage and transfer programs. (2018 WSV, pp. 4-6 to 4-7)

Existing Entitlements to Wholesale Supplies

As a member agency, SMWD's entitlement to wholesale supply from MWDOC is currently 29,202 AFY. This allocation is set until MWDOC establishes a new allocation of supply as needed in the future based on District growth. Adjustments to the allocation will take into account a MWDOC-determined growth factor for SMWD (i.e., growth adjustment), as well as any significant changes in supply from other sources to SMWD (other than Metropolitan or MWDOC) relative to the base period.

SMWD forecasts the FY 2016 "non-shortage" imported water supply allocation of 29,202 AFY will be available from MWDOC to SMWD through 2040, which is a conservative estimate because as previously stated the supply allocation from MWDOC would increase consistent with adjustments for growth due to population increases within the

[2] Department of Water Resources (DWR), *State Water Project Delivery Capability Report*, published every 2 years as well as "Notice to State Water Project Contractors" issued as often as needed. The current Delivery Capability Report adopted by DWR is dated March 2018.
[3] Refers to "Table A" water deliveries to SWP Contractors. The Table A amount is the contractual amount of allocated SWP supply, set by percentage amount annually by DWR; it is scheduled and uninterruptible.

SMWD service area. The development of any new sources identified and discussed herein would reduce the imported supply by an amount equivalent to that new source (WSV, p. 4-18).

Existing Entitlements for Imported Water Infrastructure

CRA and SWP water to which SMWD is entitled, is supplied to SMWD through a series of facilities, in which SMWD has capacity rights as described below, and shown in **Figure 6 – Imported Water Facilities**. Copies of said rights are provided in the appendices herein.

Diemer Water Treatment Plant and Allen-McColloch Pipeline

CRA water and SWP water are both treated at Metropolitan's Diemer Water Treatment Plant (WTP) in Yorba Linda and delivered to south Orange County water agencies through the Allen-McColloch Pipeline (AMP). The AMP is SMWD's primary source of domestic water, in which SMWD owns specific capacity rights for the delivery of water. SMWD receives its allocated supply from the AMP via a connection to the South County Pipeline (SCP) in north Mission Viejo. The SCP is jointly owned on the basis of capacity allocation, by SMWD and Metropolitan. SMWD's capacity right in the AMP is 139.19 cubic feet per second (cfs).

The Agreement for Sale and Purchase of the AMP (Metropolitan Agreement No. 4623) among Metropolitan, MWDOC, MWDOC Water Facilities Corporation and certain other identified participants, including SMWD, dated July 1, 1994 (the AMP Sale Agreement) requires Metropolitan, among other things, to meet SMWD's requests for water deliveries (subject to the availability of water from Metropolitan). The AMP Sale Agreement further requires Metropolitan to augment/increase capacity necessary to meet SMWD's projected ultimate service area water demands, which includes The Ranch Plan and other undeveloped lands within SMWD.

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Source: South Orange County Integrated Regional Watershed Management Program, May 2018

Figure 6 – Imported Water Facilities

Water Supply Assessment

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East Orange County Feeder No. 2

In addition to the AMP, SMWD also has a connection to the East Orange County Feeder No. 2 (EOCF #2), which is jointly owned by several local agencies and Metropolitan. Like the AMP, the EOCF #2 also conveys domestic water from the Diemer WTP to south Orange County. SMWD has capacity rights in the EOCF #2 of 14 cfs per the agreement entitled "1970 Agreement Municipal Water District of Orange County and SMWD," dated December 4, 1970. Domestic water is delivered via the EOCF #2 to the Aufdenkamp Transmission Main and then to SMWD's Plaza Pump Station through the CM-12 turnout.

The EOCF #2 is considered a back-up system to the AMP and is currently used by SMWD intermittently for facilities maintenance purposes. SMWD's capacity rights in the EOCF #2, and connecting local facilities, enable SMWD to receive water from sources including agencies located within the Orange County Water District (OCWD) service area. The delivery and method of delivery (i.e., direct delivery or exchange) of such water is likely to occur under dry year(s) conditions or emergencies and will be subject to agreements or understandings involving MWDOC, OCWD and its member agencies, and Irvine Ranch Water District (IRWD).

Aufdenkamp Transmission Main

SMWD maintains joint ownership of the Aufdenkamp Transmission Main through a joint powers agreement with the Laguna Beach County Water District (operator) and several local agencies. This pipeline conveys treated imported water from the EOCF #2 to SMWD's distribution system.

Baker Pipeline and Baker Water Treatment Plant

SMWD also owns capacity in the Baker Pipeline, which conveys untreated (raw) water from a connection to Metropolitan's raw water feeder system to the Baker WTP located in Lake Forest. SMWD owns capacity in the pipeline pursuant to Santiago Aqueduct Commission Joint Powers Authority Agreement dated September 1961. The capacity is established by the Baker WTP.

The Baker WTP is a domestic water treatment plant that was completed in 2016 in the City of Lake Forest. The plant, which has a treatment capacity of 28.1 million gallons per day (mgd), is a joint regional project, operated by IRWD, on behalf of SMWD and several local agencies. The Baker WTP treats the raw, imported water from the Baker Pipeline purchased from Metropolitan, and may treat local surface water from Irvine Lake. Metropolitan water from the CRA and SWP, and local water from Irvine Lake, can be treated independently or as a blend at the Baker WTP. SMWD has a treatment capacity right of 8.4 mgd (9,400 AFY, or approximately 30 percent of the plant), which is combined with the treated imported water supply from MWDOC via the Diemer WTP and is not in addition to the amount of imported water SMWD can receive through MWDOC.

The SMWD capacity rights to imported water facilities are summarized in **Table 3-2 – Capacity Rights to Imported Water Supply Facilities.** Copies of the agreements are available at SMWD.

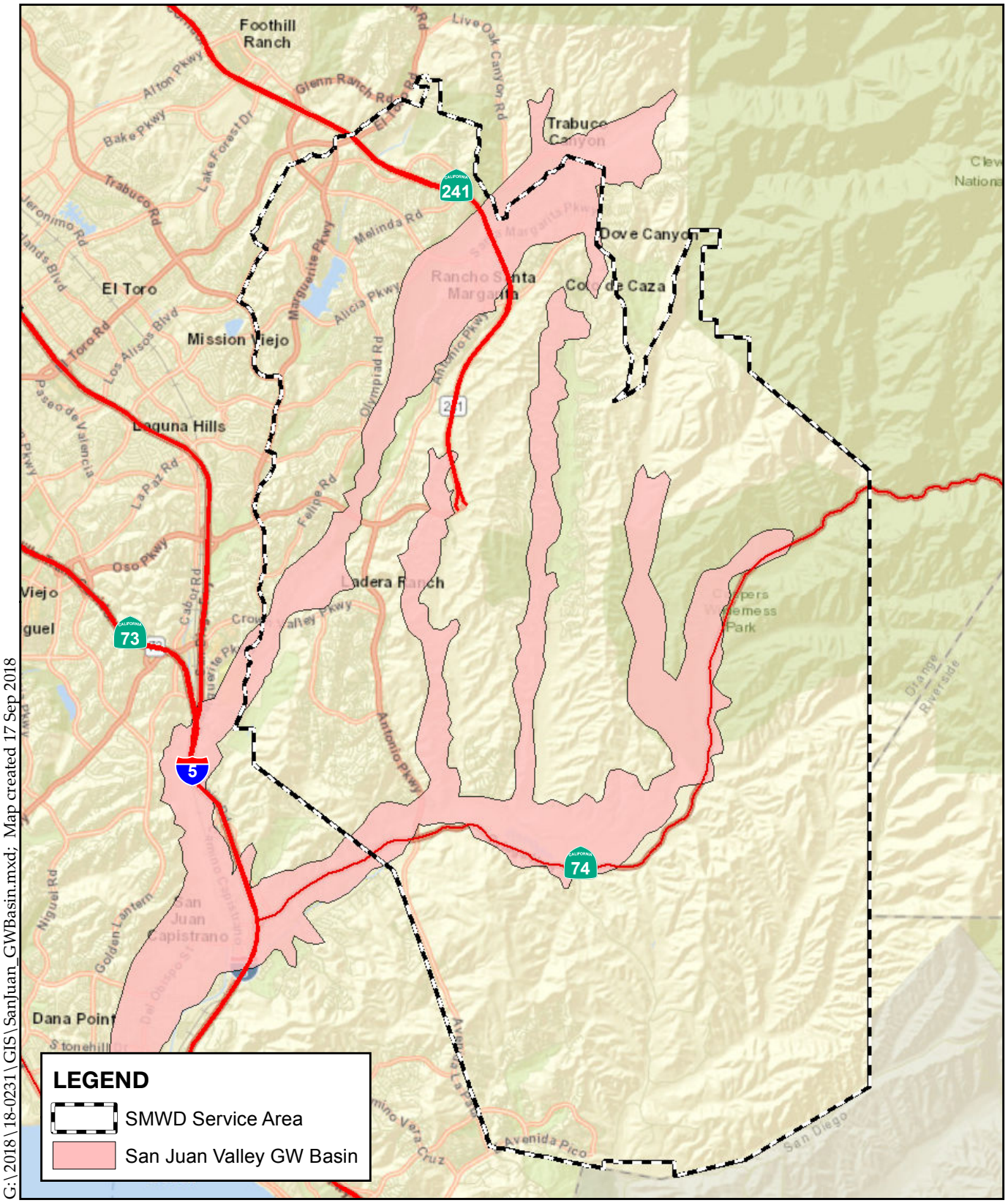
Table 3-2 – Capacity Rights for Imported Water Supply Facilities

Facility	Capacity Right	Agreement Date	Flow From / To	Notes	Ever Used?
Allen-McColloch Pipeline	139.19 cfs	July 1, 1994	Diemer WTP / El Toro Reservoir	Primary source of imported supply for SMWD	Yes
East Orange County Feeder #2	14 cfs	December 9, 1970	Diemer WTP / Newport Beach	Back-up system for AMP	Yes
Aufdenkamp Transmission Main	14 cfs	August 5, 1969	EOCF #2 / Laguna Beach	Joint ownership through JPA	Yes
Baker Pipeline	13 cfs	September 1961	Santiago Lateral and Irvine Lake / Baker WTP	Joint ownership through JPA	Yes
Baker Water Treatment Plant	8.4 mgd	December 16, 2013	Santiago Lateral and Irvine Lake / South County Pipeline	Treats raw CRA and SWP water with local sources. Joint ownership.	Yes

Note:
cfs: cubic feet per second
mgd: million gallons per day
WTP: water treatment plant
EOCF #2: East Orange County Feeder #2
CRA: Colorado River Aqueduct
SWP: State Water Project
JPA: Joint Powers Authority
AMP: Allen-McColloch Pipeline

3.2. Documenting All Water Supplies and Water Supply Projects

As described previously in Section 3.1, the majority of SMWD's water supply comes from purchased imported water. To meet future demands, ensure supply reliability, and to develop a more diverse water supply, SMWD is expanding its recycled water system to offset existing potable water demand in the City of Rancho Santa Margarita (City), expanding non-potable groundwater supplies from Rancho Mission Viejo Mutual Water Company (RMV MWC), and constructing seasonal storage for the non-potable water system (i.e., Trampas Canyon Reservoir). In addition, SMWD is developing new supply sources (i.e., potable groundwater from Cadiz, Inc.), new local groundwater basin recharge opportunities with the San Juan Basin Authority (SJBA), developing Indirect Potable Reuse (IPR) projects within the San Juan Basin, and partnering with South Coast Water District (SCWD) for development of the Doheny Desalination project. The boundary of the local San Juan Groundwater Basin is shown in **Figure 7 – San Juan Valley Groundwater Basin**.



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Sources: CA Dept. Water Res., 2016; SMWD, 2018; ESRI.

0 2 4 Miles

Figure 7 - San Juan Valley Groundwater Basin

Santa Margarita Water District

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A summary of the current and projected domestic and non-domestic water supplies available to SMWD in a normal year are listed in **Table 3-3 – Summary of Current and Projected Water Supplies (AFY).** A description of each supply source follows the table.

Table 3-3 – Summary of Current and Projected Water Supplies (AFY)

Water Supply	2015	2017	2020	2025	2030	2035	2040	Form of Right	Ever Used?
Domestic Water Baseline Supply									
Imported Water from MWDOC	26,910	22,795	29,202	29,202	29,202	29,202	29,202	Contract	Yes
Doheny Desalination	-	-	-	1,000	1,000	1,000	1,000	Agreement	No
Cadiz Groundwater	-	-	5,000	5,000	5,000	5,000	5,000	Contract	No
San Juan Watershed IPR Project	-	-	-	4,565	6,560	6,560	6,560	Right	No
Subtotal (AFY)	26,910	22,795	34,202	39,767	41,762	41,762	41,762	-	-
***Domestic Supplemental Supply*[(a)]**									
CVWD Exchange	-	-	*4,250*	*4,250*	*4,250*	*0*	*0*	*Contract*	*No*
GSWC Purchase[(b)]	-	-	*1,613.4*					*Contract*	*No*
Non-Domestic Water Baseline Supply[(c)]									
Recycled Water	7,495	8,833	8,598	10,110	11,075	11,774	11,774	Capacity ownership	Yes
Urban Return Flow Diversions		1,715	1,715	1,715	1,715	1,715	1,715	Right	Yes
RMV MWC Lease	0	400	816	1,321	1,605	1,957	2,500	Contract	Yes
San Clemente WRP	0	0	605	605	605	605	605	Agreement	No
Subtotal (AFY)	7,495	10,948	11,734	13,751	15,000	16,051	16,594	-	-
***Non-Domestic Supplemental Supply*[(a)]**									
Los Alisos WRP	*0*	*0*	*1,500*	*1,500*	*1,500*	*0*	*0*	*Agreement*	*Yes*
Total Baseline Supply (AFY)	**34,405**	**33,743**	**45,936**	**53,518**	**56,762**	**57,813**	**58,356**	**-**	**-**

Note: 2015 data from SMWD 2015 UWMP, p. 3-11. Other data from 2018 WSV, Table 4.6. All values in units of AFY.

(a) *Supplemental supply sources are shown in italics and not included in total.* Total Available Baseline Supply is the sum of baseline domestic water and baseline non-domestic water supplies.

(b) Original amount was 2,000 AF, current amount available for purchase in the event Metropolitan supply is unavailable is 1,613.4 AF.

(c) Detailed projections for each source of non-domestic supply are provided below in **Table 3-4**.

CVWD: Cucamonga Valley Water District
GSWC: Golden State Water Company
RMV MWC: Rancho Mission Viejo Mutual Water Company
WRP: water reclamation plant
AFY: acre-feet per year

Domestic Water Supply Sources

Imported Water

As discussed previously, the primary source of water supply for SMWD has been treated imported water purchased from MWDOC via Metropolitan. Imported water is expected to make up a majority of SMWD's future supply. Details on the past, current, and projected imported water supply allocated to SMWD are shown in **Tables 3-1 and 3-3**. In FY 2017, SMWD's water supply was comprised of approximately 72 percent imported water and 28 percent non-potable water (WSV, p. 4-1).

As described previously, SMWD has entitlements to receive imported water from Metropolitan through MWDOC via connection to Metropolitan's regional distribution system, which are shown in **Table 3-2**. Although pipeline and connection capacity rights do not guarantee the availability of water, per se, they do guarantee the ability to convey water when it is available from the Metropolitan distribution system (2015 UWMP, p. 3-15).

MWDOC has adopted a shortage allocation plan and accompanying allocation model that estimates firm demands on MWDOC. Assuming MWDOC would not be imposing mandatory restrictions if Metropolitan is not, the estimate of firm demands in MWDOC's latest allocation model has been used to estimate the minimum imported supplies available to each of MWDOC's retail agencies for 2015-2018. Thus, the estimate of the minimum imported supplies available to SMWD is 29,202 AFY. (SMWD 2015 UWMP, p. 5-6)

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 (MWDOC 2015 UWMP, p. 3-41). SMWD is therefore capable of meeting the water demands of its customers in normal, single dry, and multiple dry years from present to 2040.

SMWD currently has no plans for increasing imported water supplies from MWDOC or projects to expand existing imported water facilities.

Future Domestic Supply – Cadiz Water Purchase and Sale Agreement

SMWD has secured first priority rights to 5,000 AFY of domestic water supply from the *Cadiz Valley Water Conservation, Recovery and Storage Project,* along with an option to purchase an additional 10,000 AFY. SMWD also has carryover rights of 15,000 AF to store groundwater on Cadiz property in eastern San Bernardino County (contract included in **Appendix E**). This project is currently pending regulatory hurdles and an agreement with Metropolitan to wheel the Cadiz water into the CRA for treatment at the Baker WTP or the Diemer WTP. Cadiz, Inc. will provide all conveyance facilities to the CRA. SMWD estimates that this supply source will come online by 2020.

Future Domestic Supply - San Juan Watershed IPR Project

The San Juan Groundwater Basin is managed by the San Juan Basin Authority (SJBA), which was formed in 1963 by four agencies: City of San Juan Capistrano, South Coast Water District (SCWD), SMWD, and Moulton Niguel Water District (MNWD). As a member of the SJBA, SMWD is pursuing plans to increase recharge of the San Juan Basin with a combination of stormflows, urban runoff, and recycled water. In the past, groundwater produced by SMWD was minimal and for non-domestic uses, as discussed in Section 4 – *Groundwater Analysis*. But for the future, SMWD is in the preliminary planning stages of the San Juan Watershed (SJW) Project born out of Alternative 6 (*Adaptive Production Management, Creation of a Seawater Barrier, In-Stream Recharge, and Recycled Water Recharge)* from the *San Juan Basin Groundwater and Facilities Management Plan* (2013). The first phase of the SJW Project is expected to include installation of rubber dams to slow runoff and promote additional infiltration into the San Juan Basin. The Project is divided into three phases with Phase I estimated to produce additional supply for SMWD of approximately 700 AFY of water by 2020, Phase II projected to produce a total of 3,980 AFY by 2023, and the ultimate production of a total of 6,240 AFY by 2027 following the implementation of Phase III. Phase I will be treated

using the existing City of San Juan Capistrano's Ground Water Recovery Plant (GWRP) for use as a potable water supply. Phase II and III will involve introducing recycled water into both San Juan Creek and Arroyo Trabuco Creek to increase the amount of water that is put into the aquifer. Additional dams and expanded treatment capacity similar to the GWRP will be required to be constructed as a part of both Phases II and III. The Trampas Canyon Reservoir, which is in construction and expected to be ready by 2019, will store a portion of the recycled water for groundwater recharge purposes.

Future Domestic Supply – Doheny Ocean Desalination Project

SMWD is partnering with SCWD to develop the Doheny Ocean Desalination Project, which will provide a new local, baseline, potable water supply. If an initial 5 mgd facility is constructed, then approximately 1,000 AFY is assumed to be available for purchase. This supply source is anticipated to become available, at the earliest, in 2021. No agreements are in place at this time with SMWD and no distribution facilities have yet been constructed to distribute the supply to SMWD.

Domestic Supplemental Water Supply Sources

Cucamonga Valley Water District Agreement

SMWD entered into an agreement with the Cucamonga Valley Water District (CVWD) in 2006 (**Appendix F**) for at least 25 years beginning in 2006 for the purchase and delivery of 4,250 AF of water each year over the term of the contract.

In addition to its extensive groundwater rights in the Chino Groundwater Basin, CVWD obtains imported water from Metropolitan through the local wholesaler, Inland Empire Utilities Agency. Per the agreement, SMWD has a first priority option each year to purchase and receive up to 4,250 AF of domestic water from CVWD only if SMWD's available Tier I and Tier II imported water supplies/deliveries are insufficient to accommodate the water demands of *The Ranch Plan*. SMWD would exchange CVWD's portion of imported water for treated Metropolitan water in their delivery system. No

actual groundwater from within the Chino Groundwater Basin is physically moved to SMWD. This supply option has not been utilized yet and would not be available or utilized in the future unless the Metropolitan imported water supply to SMWD was reduced due to a drought, Metropolitan facilities outage, or other emergency condition. Accordingly, this supply source is considered a supplementary supply as opposed to a normal supply for SMWD.

Golden State Water Company Agreement

On December 28, 2001, SMWD and Southern California Water Company (predecessor to Golden State Water Company) entered into a water sale and purchase agreement providing for the purchase of 2,000 AF of water by SMWD (**Appendix G**). The water is currently stored in the Chino Groundwater Basin and is currently subject to a 0.7 percent per annum storage fee. This water was acquired in contemplation of augmenting imported water supplies for *The Ranch Plan.* The water may be called if necessary to supplement the CVWD supply discussed previously and is included for this purpose in the WSA. The storage account currently has 1,613.4 AF available to SMWD. This supply can only be used when Metropolitan declares a water shortage condition.

Non-Domestic Water Supply Sources

Local Groundwater

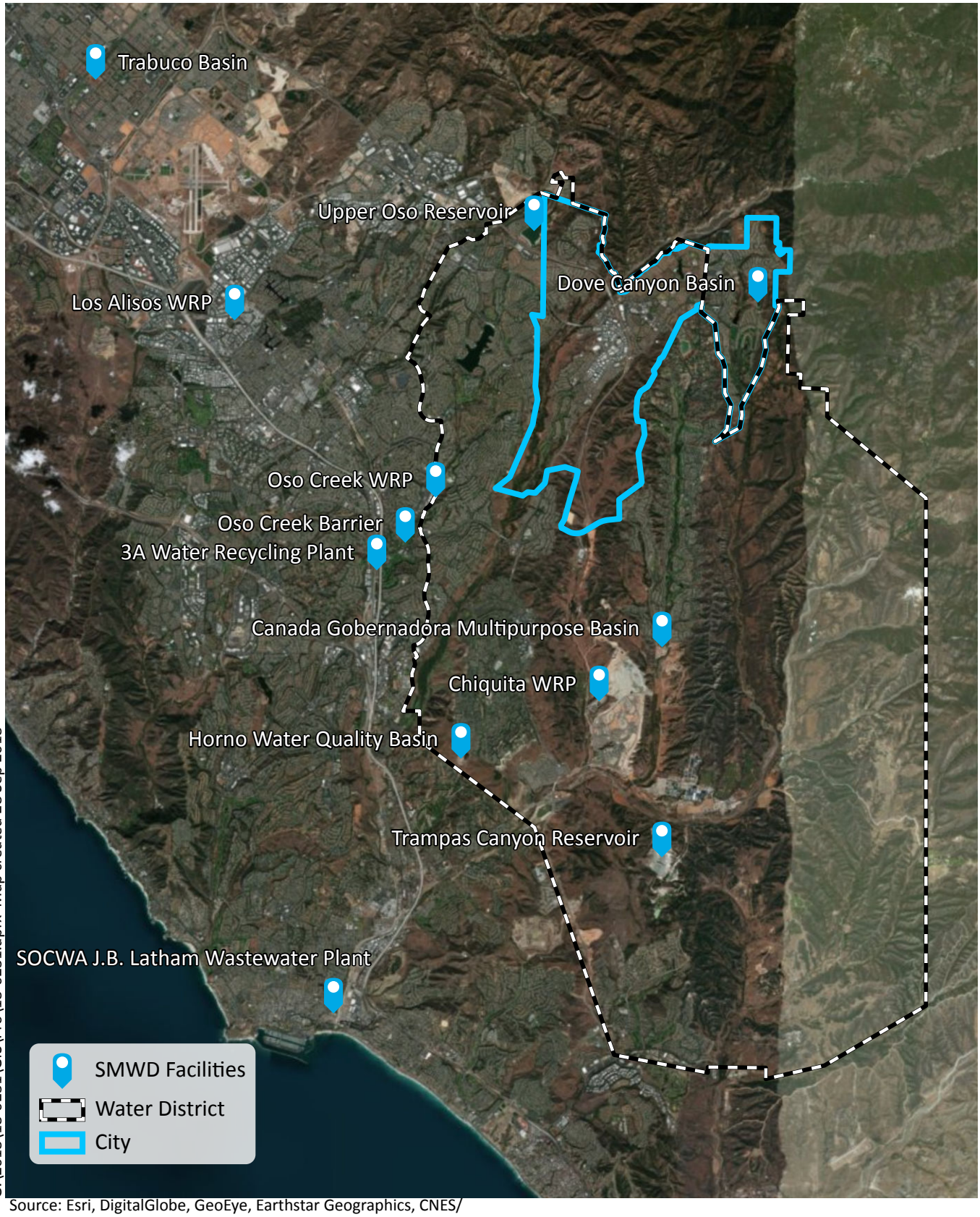
Historically, SMWD has operated one groundwater well (Well 6) located in the southeast corner of the SMWD Service Area to provide non-domestic service on a contract basis to the Quest Diagnostics Nichols Institute (2010 SMWD UWMP, p. 3-10). This well has subsequently been abandoned and SMWD currently has no operating wells. This Assessment includes a local groundwater discussion based on future projects, such as the San Juan Watershed IPR Project, that will recharge the basin and extract local groundwater for potable use.

As discussed herein, SMWD holds water rights permits in Oso Creek, Trampas Canyon, and Cañada Gobernadora Canyon (**Appendices H, I, and J**). SMWD is also required by

the San Diego Regional Water Quality Control Board (Order No. 97-52) to capture additional flows at the Oso Creek Barrier to ensure effluent from Oso WRP would not degrade the San Juan Basin. SMWD is currently pursuing a permanent water rights permit for 800 AFY in Gobernadora Creek.

Recycled Water

SMWD operates a recycled water production and distribution system that is supplied from the Chiquita WRP, Oso Creek WRP, and 3A WRP (**Figure 8 – District Facilities)**. SMWD also purchases recycled water on an as-needed and as-available basis from IRWD's Los Alisos WRP. SMWD is also developing an agreement with the City of San Clemente to receive recycled water from wastewater generated within the SMWD service area that is treated at the San Clemente WRP. There is future potential to purchase additional recycled water from the City of San Clemente.



G:\2018\18-0231\GIS\Pro\18-0231.aprx Map created 28 Sep 2018

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/ Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 1 2 3 4 5 Miles

Figure 8 – District Facilities

Water Supply Assessment

ALBERT A. WEBB ASSOCIATES

One other facility is located within the SMWD service area that also produces recycled water, the Nichols Institute WRP (privately owned), is an isolated system. Because this facility will not be used by the Project, it is not discussed further herein.

SMWD's recycled water/non-domestic water demand is expected to increase significantly by 2025, and then gradually increase through 2040 primarily in alignment with the development of planning areas in *The Ranch Plan,* as shown in **Table 3-3**. SMWD will accommodate the increase in recycled water demand with an expansion of the Chiquita WRP, increase the production of recycled water from wastewater flows collected in the Oso Creek watershed, construction of Trampas Reservoir, partnering with the City of San Clemente, and expansions of supplementary non-domestic water supplies.

Recycled water within SMWD's service area is used primarily for irrigation and construction purposes. The recycled water is delivered to parks, medians, slopes, golf courses, and schools throughout the City of Mission Viejo, Ladera Ranch, the Villages of Sendero and Esencia (PA-1 and PA-2, respectively, in the Ranch Plan), Coto de Caza, and the Talega community within the City of San Clemente. Recycled water also is the source water for the Lake Mission Viejo Advanced Purified Water Treatment Plant which produces lake fill water for Lake Mission Viejo. Recycled water will be provided to all planning areas in *The Ranch Plan*. Wastewater flows from the City of Rancho Santa Margarita (and other areas) are treated at the Chiquita WRP and SMWD plans to expand recycled water service into the City of Rancho Santa Margarita, as discussed herein. Recycled water production and urban return flow projections are detailed in **Table 3-4 – Current and Projected Non-Potable Water Supply by Source (AFY).**

Table 3-4 – Current and Projected Non-Potable Water Supply by Source (AFY)

	2017	2020	2025	2030	2035	2040
Oso Creek WRP						
Influent [a]	1,924	1,924	1,924	1,924	1,924	1,924
Plant Water Use/Losses (11.7%)[b]	(225)	(225)	(225)	(225)	(225)	(225)
Tertiary Capacity[c]	2,016	2,016	2,016	2,016	2,016	2,016
Recycled Water Supply (AFY)	1,699	1,699	1,699	1,699	1,699	1,699
Chiquita WRP						
Influent [d]	6,819	7,662	8,321	9,342	11,393	11,393
Plant Water Use/Losses (5.5%)[b]	(370)	(370)	(458)	(514)	(554)	(554)
Tertiary Capacity[e]	6721	6721	10,081	10,081	10,081	10,081
Recycled Water Supply (AFY) [f]	6,449	6,351	7,863	8,828	9,527	9,527
3A WRP						
Influent [g]	319	2,117	2,117	2,117	2,117	2,117
Plant Water Use/Losses (5.5%)[b]	(18)	(116)	(116)	(116)	(116)	(116)
Tertiary Capacity	2,688	2,688	2,688	2,688	2,688	2,688
Recycled Water Supply (AFY) [h]	301	548	548	548	548	548
WRP Recycled Water Subtotal (AFY)	**8,449**	**8,598**	**10,110**	**11,075**	**11,774**	**11,774**
Urban Return Flow Diversions (AFY)						
Oso Creek Barrier	900	900	900	900	900	900
Dove Canyon	115	115	115	115	115	115
Gobernadora Basin	250	250	250	250	250	250
Horno Basin	170	170	170	170	170	170
Trabuco Basin	280	280	280	280	280	280
Total Urban Return Flow (AFY) [i]	1,715	1,715	1,715	1,715	1,715	1,715
RMV MWC Groundwater (AFY) [j]	400	816	1,321	1,605	1,947	2,500
Total Non-Domestic Water Supply (AFY) [k]	**10,564**	**11,129**	**13,146**	**14,395**	**15,436**	**15,989**

Note: From 2018 WSV, Table 4.4. All values in units of AFY.

(a) 2017 metered plant influent flow from Mission Viejo
(b) Losses calculated as percentage of tertiary flow, estimated by SMWD staff. OCWRP higher loss factor due to solids handling 2017.
(c) Based on treatment capacity of 1.8 mgd.
(d) 2017 metered influent flow baseline plus estimated flows from future Ranch Plan Planning Areas 3, 4, 5, and 8.
(e) Based on tertiary capacity of 6.0 mgd (6,720 AFY); to be expanded to 9.0 mgd (10,081 AFY) in FY 2020.
(f) Tertiary capacity or influent wastewater flows, whichever is less, minus plant water use and losses.
(g) 2016 metered influent from Mission Viejo. Projections based on diverting 1.8 mgd of SMWD flows from JB Latham Plant to 3A WRP.
(h) Based on net supply capacity of 0.5 mgd, with no expansion in future.
(i) Based on 2015 and 2016 production records.
(j) From RMV MWC lease agreement (April 2012) and build-out timing as of July 2017.
(k) Does not include supplementary supply from Los Alisos WRP, which can be purchased up to 1,500 AFY through 2030, with additional as-available for purchase from IRWD. Does not include supply produced by Nichols Institute. Does not include City of San Clemente WRP project (in progress).

The following are descriptions of each part of SMWD's recycled water system.

1. Oso Creek WRP and Upper Oso Reservoir

SMWD owns and operates the Oso Creek WRP, which was constructed in 1978 and subsequently upgraded in 1989, 2004, and 2007. It has 3 mgd of tertiary treatment capacity.[4] In conjunction, there is a pressurized recycled water distribution system, and a 1.3 billion-gallon Upper Oso Reservoir that holds a blend of recycled water and urban return flows. Recycled water production from Oso Creek WRP is projected to remain constant at 1,699 AFY through 2040 (**Table 3-4**).

Recycled water effluent from the Oso Creek WRP, and urban return flows collected from Oso Creek at the Oso Creek Barrier diversion (discussed below) are pumped to the Upper Oso Reservoir, which has been operational since 1979 and is located near the 241 Toll Road in the cities of Mission Viejo and Rancho Santa Margarita.

The Upper Oso Reservoir is an uncovered, seasonal non-potable storage reservoir with an earthen dam designed to receive and store water during low season demands and to supplement supplies during high demand scenarios. The reservoir has 4,000 AF of storage capacity with 3,600 AF operational. SMWD owns 3,000 AF of capacity in the reservoir and MNWD owns the remaining 1,000 AF. The recycled water and urban return flows stored in the reservoir are used for landscape irrigation uses such as golf courses, major slopes, parks, and school grounds in the surrounding communities.

2. Chiquita WRP and Future Expansion of Recycled Water Production

The Chiquita WRP is owned and operated by SMWD with the most recent expansion of the plant completed in 2005. Wastewater flows from the City of Rancho Santa Margarita, Coto de Caza, Talega, Ladera Ranch, Sendero, Esencia, parts of IRWD and Trabuco Canyon Water District, and other areas within the SMWD service area are treated at the Chiquita WRP. The plant has a secondary treatment capacity of 9.0 mgd and a tertiary treatment capacity of 6 mgd. Tertiary treatment is suitable for non-potable water use. The existing recycled water distribution system includes a non-domestic transmission

[4] Tertiary treatment of wastewater produces recycled water that is suitable for non-potable water uses.

main serving the Talega development. The other system includes a non-domestic transmission main extending westerly to an operational storage reservoir in Covenant Hills. The Chiquita WRP would provide recycled water from existing supply to SMWD's expansion of the recycled water system into Improvement District No. 4A located in the City of Rancho Santa Margarita (**Figure 6 – Improvement District Boundaries**).

SMWD is planning to expand the Chiquita WRP tertiary capacity from 6.0 mgd to 9.0 mgd by FY 2021. The expansion will primarily serve recycled water to areas within *The Ranch Plan*. SMWD estimates that Chiquita WRP has the capacity to produce a recycled water supply of 6,449 AF and forecasts the same production in 2020, with a large increase by 2025 to 10,081 AFY through 2040 (**Table 3-4**) based on plant expansion and adequate wastewater flows.

3. 3A WRP

The 3A WRP is jointly owned by SMWD and MNWD and has been operated by SMWD since July 1, 2015. The majority of the wastewater collected from the MNWD sewer system and wastewater diverted from the SMWD Oso Trunk Sewer is treated at the 3A WRP to a tertiary level. Flows not treated to tertiary level are treated to secondary levels and discharged to the ocean through the effluent transmission main

Flows not diverted to the 3A WRP flow to the J.B. Latham Treatment Plant.[5] Solids are treated onsite. The 3A plant has secondary treatment capacity of 6.0 mgd and tertiary treatment capacity of 2.4 mgd. SMWD owns 28.125 percent of the secondary treatment capacity, with MNWD owning the balance of secondary capacity and all of the tertiary capacity. Currently, MNWD uses approximately 1.8 mgd of its tertiary treatment capacity and allows SMWD to use the remaining unused capacity (0.6 mgd). Recycled water production in 2017 was 301 AFY, less than capacity due to recycled water

[5] J.B. Latham Treatment Plant is a 13 mgd wastewater treatment plant that is owned and operated by Southern Orange County Wastewater Authority (SOCWA) that treats wastewater to secondary effluent standards prior to discharge through the San Juan Creek Ocean Outfall. SMWD has 2.25 mgd of capacity in the plant. J.B. Latham does not produce tertiary treated (recycled) water. Oso Creek WRP, 3A WRP, and J.B. Latham provide wastewater treatment for a majority of the City of Mission Viejo.

conveyance limitations. With future planned improvements it is projected to increase to full capacity at 548 AFY by 2020 (**Table 3-4**).

Future Recycled Water Supply – San Clemente WRP

SMWD is in the process of finalizing an agreement with the City of San Clemente that will allow SMWD-generated wastewater to flow to the San Clemente WRP for treatment and return of recycled water for use within the SMWD service area. Approximately 0.6 mgd would be sent and treated at the San Clemente WRP. There is future potential for San Clemente to sell SMWD additional amounts of recycled water. Interim facilities to convey the SMWD wastewater to the WRP, and to convey recycled water back to SMWD are in-place. Additional infrastructure is planned to be completed by the summer of 2019 for the ultimate condition, including Talega Lift Station upgrades and construction of the Pico Booster Pump Station. This would be a normal supply of recycled water to the SMWD recycled water distribution system.

Future Recycled Water Reservoir and Water Rights– Trampas Canyon

SMWD is reconstructing and expanding the Trampas Canyon Reservoir, which is located in *The Ranch Plan* Planning Area 5, just south of Ortega Highway. The reservoir was constructed between 1973 and 1975 and was used until recently as a tailing retention facility for a quarry. Upon completion, the reservoir will provide seasonal storage in SMWD's non-domestic water system by FY 2019. The Trampas Reservoir will store non-potable water during the low-demand winter months, so it can be used to supply peak irrigation demands during the high-demand summer months. The reservoir will primarily store recycled water from Chiquita WRP but will also store recycled water from the Oso Creek WRP, the 3A WRP, and possibly the City of San Clemente WRP via interconnections with the Chiquita recycled water distribution system. A pump station is also being constructed to pump water from this proposed reservoir into the transmission/distribution systems. The reservoir is also planned to store recycled water for recharge of the San Juan Basin.

In 2017, SMWD became the primary owner of a license for the diversion and use of water within Trampas Canyon by the State Water Resources Control Board (SWRCB) Division of Water Rights (**Appendix H)**. As stated in the license, no more than 575 AF per year between September 1 and April 30 may be diverted from the canyon to storage and beneficial use. Diversion is expected to begin following the completion of the project by SMWD.

Supplemental Recycled Water Supply

Los Alisos WRP

IRWD owns and operates the Los Alisos WRP, as well as a non-domestic water distribution system. SMWD entered into an agreement with IRWD to interconnect their non-domestic water systems and purchase supplementary recycled water from the Los Alisos WRP, which can be pumped to the Upper Oso Reservoir for seasonal storage through an interconnection in Mission Viejo. SMWD can purchase up to 1,500 AFY from IRWD and the supply is expected to be available through 2030. Additional recycled water can be purchased on an as-available basis. This is considered a supplementary recycled water supply for SMWD, as opposed to a normal supply.

Urban Return Flow Diversion Supply

SMWD also collects and utilizes non-domestic water from urban return flow diversions at five basins (i.e. Oso Barrier, Cañada Gobernadora, Dove Canyon, Trabuco, and Horno). The total supply from urban return flow diversions is projected to stay constant at 1,715 AFY from 2020 to 2040 (**Table 3-4**).

Oso Creek Barrier

Since 1979, SMWD has operated the Oso Creek Barrier in Mission Viejo (the Barrier). The Barrier was constructed pursuant to San Diego Regional Water Quality Control

Board (Regional Board) Order 77-11.[6] The Regional Board required operation of the Barrier to mitigate potential degradation of the lower San Juan Creek Basin that may be caused by the use of recycled water produced and distributed from SMWD's Oso Creek WRP (discussed previously). The Barrier is operated during non-storm periods and produces approximately 900 AFY on a reliable basis. Water diverted from the Oso Creek Barrier is pumped to the Upper Oso Reservoir. SMWD projects the Barrier will continue producing 900 AFY of urban return flow over the 20-year planning horizon, as shown in **Table 3-4.**

SMWD also maintains Permit 17489 issued by the SWRCB Division of Water Rights on December 19, 1978 for the diversion and use of no more than 611 AF per year from Oso Creek collected from November 1 to April 30 (**Appendix I**). As stated in the permit, the purpose of this diversion is for irrigation within a net area of 1,777 acres within the SMWD service area. The flows captured at the Oso Creek Barrier as a result of the Regional Board Order are in addition to the water rights diversion.

Cañada Gobernadora Multipurpose Basin

SMWD's Cañada Gobernadora Multipurpose Basin (Gobernadora Basin) is located within an unincorporated portion of southeastern Orange County, just south of the community of Coto de Caza. Located along the 8.5-mile Gobernadora Creek, a major tributary to San Juan Creek, the Gobernadora Basin intercepts a significant portion of the Gobernadora Creek flow for storm detention and treatment of urban return flows. The Gobernadora Basin reduces downstream erosion and sedimentation of Gobernadora Creek and improves water quality.

The Gobernadora Basin captures and naturally treats urban return flows and uses this source to help meet irrigation demands in the nearby community. The Gobernadora Basin consists of a storm detention basin and a natural treatment system, a system to capture and divert flows to the wetlands, a pump station, and a pipeline to deliver flows

[6] Region 9 Order No. 77-11, *Waste Discharge Requirements for Santa Margarita Water District Pilot Reclamation near Mission Viejo, California.*

to the Portola Reservoir, a 550-AF recycled water storage reservoir located in Coto de Caza. SMWD has also connected the Gobernadora transmission system to the Chiquita WRP to deliver recycled water from that plant to Portola Reservoir. Current non-domestic water supply from Gobernadora Basin is 250 AFY, which is projected to continue over the 20-year planning horizon (**Table 3-4**).

SMWD submitted an application (No. A032195) dated September 9, 2013 to the SWRCB Division of Water Rights for appropriative water rights to a maximum of 800 AFY in Gobernadora Creek (**Appendix J**). This application is pending issuance of a permit by the state

Horno Water Quality Basin

The Horno Water Quality Basin Urban Return Flows Recovery Project is built on the southern side of the Ladera Ranch community on Horno Creek. The basin is designed to provide two functions: first, to attenuate storm flows to pre-development rates with a retention basin, to avoid adverse impacts to the City of San Juan Capistrano, and second, to divert low flows through constructed wetlands for natural treatment prior to recovering the urban return flows and pumping into SMWD's recycled water system for beneficial reuse. In 2017, the Horno Basin recovered flows equivalent to its design rate of 170 AFY, and SMWD projects that to continue through 2040 (**Table 3-4).**

Dove Canyon Basin and Trabuco Basin

The Dove Canyon Conservation and Water Recovery Project, and Trabuco Creek (aka Arroyo Trabuco) Basin also collect and supply urban return flows for use in SMWD's non-domestic water system. The annual estimated supply rates of the basins are 115 AFY and 280 AFY, respectively (**Table 3-4**).

Lease Agreement with Rancho Mission Viejo Mutual Water Company

Rancho Mission Viejo holds riparian water rights in the San Juan Creek watershed for its ranching, agriculture, and tenants' uses. RMV MWC and SMWD have entered into a

lease agreement **(Appendix K)** wherein RMV MWC will provide non-domestic groundwater from its well supply system to SMWD to supplement SMWD's recycled water and other non-domestic water supplies to planning areas in *The Ranch Plan.* SMWD received 400 AF of supply in FY 2017 and is scheduled to receive approximately 800 AF in FY 2018. SMWD can purchase up to 2,500 AFY, as prorated for development of *The Ranch Plan* Planning Areas, as shown below (Appendix K, p. 15):

- Planning Area 1 – 400 AFY;
- Planning Area 2 – 416 AFY;
- Planning Areas 3 and 4 – 1,131 AFY; and
- Planning Areas 5 – 553 AFY.

SMWD is pursuing a future project that would change the intent of the leased groundwater supply from non-domestic to domestic uses. Treatment would be required for human consumption of this supply source. The amount of domestic water available would be approximately 2,500 AFY by 2030 and prorated as *The Ranch Plan* develops, as outlined above. Because the project is in the early planning phases, this conversion from non-domestic to domestic water supply is not reflected in **Table 3-3.**

3.3. Water Supplies Never Before Used

Water Code Section 10910(e) requires the following information for any of SMWD's water supply entitlements, rights or contracts under which no water has been received in prior years, which may be a source of water supply for the proposed Project. Specifically, the Assessment must identify other public water systems or water service contractors that receive a water supply, have existing entitlements, water rights, or water service contracts to the same source of water. This situation applies to SMWD's contract entitlement to potable water from Cadiz Inc., one-time purchase agreement of potable

water with GSWC, and current negotiations with the City of San Clemente to finalize an agreement for the purchase of recycled water.[7]

Cadiz Water Purchase and Sale Agreement (Domestic Water)

The following entities have also secured entitlements to water supply deliveries from the *Cadiz Valley Water Conservation, Recovery, and Storage Project*, which is still undergoing regulatory review and pending agreements with Metropolitan before it can commence. The project is estimated to produce an annual average of approximately 50,000 AF of water for a 50-year term. The agreement between the participants listed below stipulates that the project includes the right to carry-over from one year to a subsequent year up to 150,000 AF but does not include the imported water storage component as described in the project EIR (**Appendix E**).

Project Participant	Project Allotment (AFY)
Santa Margarita Water District	15,000
Three Valleys Municipal Water District	5,000
Golden State Water Company	5,000
Suburban Water Systems	5,000
Jurupa Community Services District	5,000
Arizona & California Railroad	100
California Water Service Company	5,000
Total Project Allotment Subscribed	**40,100**
Project Allotment Available	**9,900**
Total Annual Project Allotment	**50,000**

Note: From Exhibit A in Agreement located in Appendix E, herein. Cadiz, Inc. has reserved 20 percent of project supplies for use by any San Bernardino County-based water agency.

SMWD has first priority rights to a firm water supply of 5,000 AFY from this source, with the option to purchase an additional 10,000 AFY.

[7] The CVWD Agreement would not be applicable here. Although no water has yet been received from the CVWD Agreement, the source of that supply of water would come from Metropolitan, from which SMWD already receives supplies.

Golden State Water Company Agreement (Domestic Water)

The one-time purchase agreement between GSWC and SMWD would supply SMWD with groundwater from the Chino Groundwater Basin (Chino Basin). Although the original agreement was for 2,000 AF, the amount decreases by a couple percent each year and is currently estimated at 1,613.4 AF. The Chino Basin is an adjudicated basin with court-appointed oversight by the Chino Basin Watermaster. In addition to GSWC, well over 1,000 entities including individuals, overlying industries, cities, and other water suppliers have water rights in the Chino Basin. The reader is referred to the Chino Basin Watermaster[8] for a list of current subscribers. A copy of this agreement is provided in **Appendix G**.

San Clemente WRP Agreement (Recycled Water)

SMWD will be entering into an agreement with the City of San Clemente to transmit SMWD-generated wastewater to the San Clemente WRP where it will be treated and returned to SMWD as recycled water and used in SMWD's recycled water system. Approximately 0.6 mgd of SMWD wastewater will be treated and an equivalent amount (minus an estimated loss of 10 percent) will be returned as recycled water (approximately 605 AFY). The San Clemente WRP is capable of producing approximately 5.0 mgd of recycled water. Currently, this recycled water is supplied to two golf courses in the City of San Clemente, and also to approximately 46 other sites consisting of city parks and medians, homeowner's associations, schools, and other reclaimed water users. No other subscribers to this source of recycled water, outside of the City of San Clemente, are known at this time.

3.4 Water Supply Reliability for Normal, Single-Dry, and Multiple-Dry Years

Pursuant to Water Code section 10910(c), this Assessment will compare current and projected water supply and water demand for normal, single dry, and multiple dry years.

[8] Chino Basin Watermaster, 9641 San Bernardino Rd., Rancho Cucamonga, CA 91730.(909) 484-3888. www.cbwm.org

The current (FY 2017) water supply and demands for SMWD with and without the proposed Project are calculated in **Table 3-5 – Comparison of Current Supply and Demand Scenarios (AFY)**.

Table 3-5 – Comparison of Current Supply and Demand Scenarios (AFY)

Current Supply & Demand	Normal	Single Dry	Multiple Dry Year 1	Multiple Dry Year 2	Multiple Dry Year 3
Supply Total [(a)]	33,743	35,110	35,110	35,110	35,110
Demand Total [(b)]	30,234	31,443	30,389	31,443	32,955
Difference (AFY)	**3,509**	**3,667**	**4,271**	**3,667**	**2,155**
Demand including Project [(c)]	31,185	32,394	31,790	32,394	33,906
Difference (AFY) (including Project)	**2,558**	**2,716**	**3,320**	**2,716**	**1,204**

Note: All values in units of AFY.

(a) Includes potable and non-potable supplies. Normal supply from Table 3-3, herein. Single and Multiple Dry Year supply is the sum of 26,277 AFY (from MWDOC FY 2016 Stage 3 shortage supply) plus FY 2017 actual non-potable supply of 8,833 AFY (Table 3-3). Holding this supply constant is consistent with 2015 UWMP methodology.

(b) Includes potable and non-potable demands. Normal demand from Table 2-5, herein. Per the assumptions in the 2015 UWMP, demands increase as follows: Single Dry 4%, Multiple Dry Year-1 2%, Year-2 4%, and Year-3 9%.

(c) Project demand is estimated at 951 AFY, from Table 2-4, herein.

As shown in **Table 3-5**, a surplus of SMWD's current supplies (including current non-domestic supply) would be expected during a range of drought years, with and without the proposed Project's estimated domestic water demand of 951 AFY. Notably, a surplus would also be expected if the additional demand from the forthcoming I.D. No. 4A Recycled Water Master Plan were included in **Table 3-5**.

Normal Year Supply and Demand Comparison

This Assessment is required to compare SMWD's total projected water supply and water demand for normal, single dry, and multiple dry years. According to DWR, a "normal" or "average" year can be determined by a water supplier as a single year or averaged range of years that most closely represents the average water supply available to the agency (2015 UWMP Guidance, p. 7-4). SMWD has selected a range of years between 1995 through 2015 to represent the normal year condition (SMWD 2015 UWMP, p. 3-16).

The net normal year condition for SMWD domestic and non-domestic water supplies and demands is projected for the 2020 to 2040 planning period in **Table 3-6 – Projected Normal Year Supply and Demand (AFY).** The estimated recycled water demand from the proposed Recycled Water Master Plan for I.D. No. 4A is currently 1,000 AFY

Table 3-6 – Projected Normal Year Supply and Demand (AFY)

Source	2020	2025	2030	2035	2040
Water Supply [a]					
Domestic Supply					
Imported Water [c]	29,202	29,202	29,202	29,202	29,202
Cadiz Water	5,000	5,000	5,000	5,000	5,000
San Juan Watershed IPR Project	700	3,980	6,240	6,240	6,240
Doheny Desalination Project	0	1,000	1,000	1,000	1,000
Domestic Water Supply Subtotal	**34,902**	**39,182**	**41,442**	**41,442**	**41,442**
Non-Domestic Supply					
Recycled Water	8,598	10,110	11,075	11,774	11,774
Urban Return Flows	1,715	1,715	1,715	1,715	1,715
RMV MWC Groundwater	816	1,321	1,605	1,957	2,500
San Clemente WRP Recycled Water	605	605	605	605	605
Non-Domestic Water Supply Subtotal	**11,734**	**13,751**	**15,000**	**16,051**	**16,594**
Water Supply Subtotal (AFY)	**46,636**	**52,933**	**56,442**	**57,493**	**58,036**
Water Demand [b]					
Domestic Water Demand					
Other District Service Area	23,384	24,266	25,044	25,262	25,262
Proposed Project	0	951	951	951	951
Conversion of Domestic to Recycled Water (Decrease of Domestic Demand)[d]	0	(1,000)	(1,000)	(1,000)	(1,000)
Domestic Water Demand Subtotal (AFY)	**23,384**	**24,217**	**24,995**	**25,213**	**25,213**
Non-Domestic Water Demand					
Other District Service Area	8,787	10,090	11,269	13,899	13,929
Recycled Water Master Plan for I.D. No. 4 (Increase of Non-Domestic Demand)	0	1,000	1,000	1,000	1,000
Non-Domestic Water Demand Subtotal (AFY)	**8,787**	**11,090**	**12,269**	**14,899**	**14,929**
Water Demand Subtotal (AFY)	**32,171**	**35,307**	**37,264**	**40,112**	**40,142**
Supply Surplus or (Deficiency) (AFY)	**14,465**	**17,626**	**19,178**	**17,381**	**17,894**

Note: All values in units of AFY (acre-feet per year)
(a) From Table 3-3, herein. Does not include supplemental supplies.
(b) From Table 2-5, herein.
(c) Correlates to the current supply allocated to District by MWDOC.
(d) Recycled Water Master Plan for I.D. No. 4 project.

As shown in **Table 3-6**, a supply surplus of domestic and non-domestic supply for the existing SMWD service area is forecasted through the planning horizon

under normal year rainfall conditions. In addition, a surplus of supply is also forecasted when the estimated water demands from the proposed City Project and proposed City Recycled Water Master Plan are included under normal rainfall conditions.

Single Dry Year Supply and Demand Comparison

A "single dry year" is defined by DWR as, "the year that represents the lowest water supply available to the agency" (2015 UWMP Guidance, p. 7-4). Although SMWD used 2002 as the basis for a single dry-year supply in their 2015 UWMP, SMWD has since revised their single dry year supply to the imported water shortage allocation from MWDOC of 26,277 AFY. MWDOC determined a Stage 3 shortage in FY 2016, which has been reached only once before. Consistent with the methodology in the 2015 UWMP, SMWD also assumes a 4 percent increase in all demands (domestic and non-domestic) during a single dry year, as shown in **Table 3-7 – Single Dry Year Supply and Demand (AFY)**.

Table 3-7 – Projected Single Dry Year Supply and Demand (AFY)

Source	2020	2025	2030	2035	2040
Water Supply [a]					
Domestic Water Supply					
Imported Water [c]	26,277	26,277	26,277	26,277	26,277
Cadiz Water	5,000	5,000	5,000	5,000	5,000
San Juan Watershed IPR Project	700	3,980	6,240	6,240	6,240
Doheny Desalination Project	0	1,000	1,000	1,000	1,000
Domestic Water Supply Subtotal (AFY)	**31,977**	**36,257**	**38,517**	**38,517**	**38,517**
Non-Domestic Water Supply					
Recycled Water	8,598	10,110	11,075	11,774	11,774
Urban Return Flows	1,715	1,715	1,715	1,715	1,715
RMV MWC Groundwater	816	1,321	1,605	1,957	2,500
San Clemente WRP Recycled Water	605	605	605	605	605
Non-Domestic Water Supply Subtotal (AFY)	**11,734**	**13,751**	**15,000**	**16,051**	**16,594**
Water Supply Subtotal (AFY)	**43,711**	**50,008**	**53,517**	**54,568**	**55,111**
Water Demand [b]					
Domestic Water Demand					
Other District Service Area	24,319	25,237	26,046	26,272	26,272
Proposed Project	-	989	989	989	989
Conversion of Domestic to Recycled Water (Decrease of Domestic Demand)[d]	0	(1,040)	(1,040)	(1,040)	(1,040)
Domestic Water Demand Subtotal (AFY)	**24,319**	**25,186**	**25,995**	**26,222**	**26,222**
Non-Domestic Water Demand					
Other District Service Area (Non-Domestic)	9,138	10,494	11,720	14,455	14,486
Recycled Water Master Plan for I.D. No. 4 (Increase of Non-Domestic Demand)	-	1,040	1,040	1,040	1,040
Non-Domestic Water Demand Subtotal (AFY)	**9,138**	**11,534**	**12,760**	**15,495**	**15,526**
Water Demand Subtotal (AFY)	**33,458**	**36,719**	**38,755**	**41,716**	**41,748**
Supply Surplus or (Deficiency) (AFY)	**10,253**	**13,289**	**14,762**	**12,852**	**13,363**

Note: All values in units of AFY (acre-feet per year).
(a) From Table 3-3, herein. Does not include IPR Project or supplemental agreements.
(b) From Table 2-5, herein. A 4% increase in all water demands is assumed.
(c) Correlates to Metropolitan's Stage 3 water shortage declaration and MWDOC's resulting allocation to SMWD in FY 2016.
(d) Recycled Water Master Plan for I.D. No. 4 project.

As shown in **Table 3-7**, a water supply surplus is forecasted for SMWD with and without the proposed City Project and City Recycled Water Master Plan under single-dry year conditions. Consistent with their 2015 UWMP, SMWD includes a 4 percent increase in each water demand category. The expected reduction in domestic water supply from a single-dry year rainfall condition is represented by a 10 percent reduction in SMWD's current allocation from MWDOC (i.e., 29,202 AFY to 26,277 AFY). No other supply

sources are reduced. Notably, a water supply surplus is still expected through the planning horizon under single dry year rainfall conditions if the domestic supply from the Cadiz Project does not come online, or if both non-domestic water supplies from Urban Return Flows and the RMV MWC Groundwater go to zero.

Multiple Dry Year Supply and Demand Comparison

A "multiple dry year" sequence is defined by DWR as, "the period that represents the lowest average water supply availability to the agency for a consecutive multiple year period (three years or more)" (2015 UWMP Guidance, p. 7-5). SMWD determined in their 2015 UWMP that the three-year period from 2012 through 2014 was the driest three-year period for SMWD's service area and represents the multiple dry year supply condition. For the same reason described for the single dry year condition, SMWD will use the MWDOC water shortage allocation of 26,277 AFY to represent multiple dry year supply, as shown in **Table 3-8 – Projected Multiple Dry Year Supply and Demand (AFY)**.

Table 3-8 – Projected Multiple Dry Year Supply and Demand (AFY)

	Supply/Demand	2020	2025	2030	2035	2040
Year 1	Total Supply[(a)]	43,711	50,008	53,517	54,568	55,111
	Total Demand with Project [(b)]	32,814	36,013	38,009	40,914	40,945
	District Surplus or (Deficiency)	**10,897**	**13,995**	**15,508**	**13,654**	**14,166**
Year 2	Total Supply[(a)]	43,711	50,008	53,517	54,568	55,111
	Total Demand with Project [(b)]	33,458	36,719	38,755	41,716	41,748
	District Surplus or (Deficiency)	**10,253**	**13,289**	**14,762**	**12,852**	**13,363**
Year 3	Total Supply[(a)]	43,711	50,008	53,517	54,568	55,111
	Total Demand with Project [(b)]	35,066	38,485	40,618	43,722	43,755
	District Surplus or (Deficiency)	**8,645**	**11,523**	**12,899**	**10,846**	**11,356**

Note: All values in units of AFY (acre-feet per year).

(a) From Table 3-3, herein. Does not include IPR Project or supplemental agreements.

(b) From Table 2-5, herein. A 2% increase in Year 1, 4% increase in Year 2, and 9% increase in Year 3 for all water demands are assumed.

(c) Includes Recycled Water Master Plan for I.D. 4A project.

As shown in **Table 3-8**, a water supply surplus for SMWD is projected in a multiple dry year rainfall period through the planning horizon. Consistent with SMWD's 2015 UWMP, each water demand category increased by two percent in Year 1, four percent in Year 2, and nine percent in Year 3, each relative to the normal year demands. Like the single dry year condition in **Table 3-7**, the imported water supply was decreased to the FY 2016 water shortage allocation from MWDOC of 26,277 AFY. No other supply sources are reduced in the multiple dry year condition.

SECTION 4 - GROUNDWATER ANALYSIS

SB 610 requires specific groundwater information to be included in this Assessment if groundwater will be a source of water for the proposed project. Because of future planned projects, groundwater may become a source of water supply to Santa Margarita Water District (SMWD) and hence to some part of the City of Rancho Santa Margarita's proposed General Plan Update ("Project").

Groundwater has not been a significant source of supply for SMWD, which has groundwater rights in the San Juan Basin (**Figure 7**). Although SMWD has not produced any water from the San Juan Basin recently, an increase in production is anticipated from a forthcoming indirect potable reuse (IPR) Project within the San Juan Basin ("San Juan Watershed Project"). SMWD *also* has an agreement with the Rancho Mission Viejo Mutual Water Company (RMV MWC) to use groundwater from their well system within the San Juan Basin for non-domestic purposes as The Ranch Plan develops. For the future, SMWD is also invested in securing additional domestic supply from groundwater owned by the Cadiz Inc. project located in the Fenner Valley Aquifer System, located in eastern San Bernardino County.

Law

Water Code Section 10910 (f): *If a water supply for a proposed project includes groundwater, the following additional information shall be included in the water supply assessment:*

(1) A review of any information contained in the urban water management plan relevant to the identified water supply for the proposed project.

(2) A description of any groundwater basin or basins from which the proposed project will be supplied. For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree

adopted by the court or the board and a description of the amount of groundwater the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), has the legal right to pump under the order or decree. For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as over drafted or has projected that the basin will become over drafted if present management conditions continue, in the most current bulletin of the department that characterizes the condition of the groundwater basin, and a detailed description by the public water system or the city or county if either is required to comply with this part pursuant to subdivision (b), of the efforts being undertaken in the basin or basins to eliminate the long-term overdraft condition.

(3) A detailed description and analysis of the amount and location of groundwater pumped by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), for the past five years from any groundwater basin from which the proposed project will be supplied. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), from any basin from which the proposed project will be supplied. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(5) An analysis of the sufficiency of the groundwater from the basin or basins from which the proposed project will be supplied to meet the projected water demand associated with the proposed project. A water supply assessment shall not be required to include the information required by this paragraph if the public water system determines, as part of the review required by paragraph (1), that the

sufficiency of groundwater necessary to meet the initial and projected water demand associated with the project was addressed in the description and analysis required by paragraph (4) of subdivision (b) of Section 10631.

4.1 Review of Urban Water Management Plan (CWC Section 10910 (f)(1))

SMWD's *2015 Urban Water Management Plan* (UWMP), prepared by Arcadis U.S., Inc. on behalf of the SMWD was adopted by the SMWD Board of Directors on June 1, 2016 (**Appendix A**). SMWD has since determined that the 2015 UWMP demand and supply projections for groundwater supplies required updating based on recent information. Therefore, the 2015 UWMP is sourced herein for general background information on pertinent groundwater basins.

This Assessment utilizes the *2018 Water Supply Verification for The Ranch Plan: Planning Areas Nos. 5 and 8* (WSV) prepared by Psomas on behalf of SMWD and adopted by the SMWD Board of Directors on May 18, 2018 (Resolution No. 2018-05-05). The 2018 WSV is sourced by this document for the most current information regarding: groundwater production and projections, and future groundwater supply projects (**Appendix B**).

4.2 Groundwater Basin Descriptions (CWC Section 10910 (f)(2))

San Juan Basin

SMWD in the past, has had limited use of local groundwater supply; however, it plans to integrate more local groundwater supply primarily through the use of the San Juan Basin for an IPR Project. The San Juan 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 (aka Trabuco Creek). The San Juan Creek Watershed is bounded by the Santa Ana Mountains to the north, sedimentary rock formations to the sides of the Upper Basin and Arroyo Trabuco, and the Pacific Ocean to the south (**Figure 7**). The four principal basins consist of approximately six 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 Basin consist of a heterogeneous mixture of sand, silts, and gravel. Groundwater in the San Juan Basin is typically high in chlorides, total dissolved solids, iron, and manganese and needs treatment to be used for domestic water purposes. (UWMP, p. 3-8)

The San Juan 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; and
- Flow from fractures and springs.

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

- Groundwater production;
- Rising groundwater;
- Evapotranspiration; and
- Outflow to the Pacific Ocean

Currently, five agencies including SMWD, have water rights to the Basin and use this water for either municipal purposes or for irrigation. The agencies with water rights to the San Juan Basin, their current maximum diversions and permit numbers are listed below:

- Santa Margarita Water District:
    - Gobernadora Creek - 800 AFY (Application No. A032195)
    - Cañada Gobernadora Canyon – 32 AFY, Nov. 1 to Apr. 30 (Permit No. 017692)

  - Oso Creek – 611 AFY, Nov. 1 to Apr. 30 (Permit No. 017489)[1]
  - Trampas Canyon – 575 AFY, Sept. 1 to Apr. 30 (License No. 12220)
- South Coast Water District: 1,300 AFY (Permit No. 21138)
- San Juan Basin Authority: 8,026 AFY (Permit No. 21074)
- San Juan Hills Golf Course: 450 AFY (Permit No. 21142)
- City of San Juan Capistrano: 3,325 AFY (By Agreement)

The permitted rights listed above total 14,319 AFY. The San Juan Basin, which is not adjudicated, is governed by San Juan Basin Authority (SJBA) which is a Joint Power Agency comprised of representatives from four local jurisdictions, SMWD, MNWD, the City of San Juan Capistrano, and South Coast Water District (SCWD). The SJBA in its role as the Basin Manager, will set an Annual Safe Yield based on groundwater in storage in the spring of each year and the spring assessment of seawater intrusion. This is due in part to the characterization of the San Juan Basin by the State Water Resources Control Board (SWRCB) as "flow of an underground stream," which means that they consider the groundwater in the basin a surface water, and because the storage in the groundwater basin is small relative to recharge and production (Wildermuth 2013, p. ES-12 and p. 3-23).

SJBA has adopted an adaptive management approach, on behalf of its member agencies, to managing the San Juan Basin. Pumping limitations are set annually by SJBA for several reasons, including, the storage capacity of the San Juan Basin is small; streambed recharge of stormwater runoff, which is the largest source of recharge to the basin, is highly variable dependent on climate conditions; and seawater intrusion and stressed riparian habitats have been identified when pumping rates were higher (in 2014, for example). In summary, given such a small storage volume relative to planned groundwater pumping, storage and water levels can be rapidly depleted in dry periods if pumping rates are not adaptively managed to match climate and storage conditions. (WEI 2016, pp. 2-3.)

[1] Does not include additional diversion in Oso Creek required by San Diego Regional Water Quality Control Board.

Fenner Valley Aquifer System

SMWD has secured first priority rights to domestic water supplies from the *Cadiz Valley Water Conservation, Recovery and Storage Project,* sourced from groundwater on Cadiz property in eastern San Bernardino County (contract included in **Appendix E**). This project is currently pending regulatory approvals and an agreement with Metropolitan to wheel the Cadiz water into the Colorado River Aqueduct (CRA) for treatment at the Baker WTP or the Diemer WTP. SMWD estimates that this supply source will come online by 2020.

The Fenner Valley Aquifer System is located at the base of the Fenner Valley and Orange Blossom Wash watersheds in the Mojave Desert at Cadiz, California, approximately 80 miles east of Barstow. An estimated 20 million AF of water is stored in the alluvium beneath the project area, with even more believed to be stored further underground in carbonate rock layers. Naturally, the groundwater flows to a terminus at highly saline dry lake beds. The Cadiz project will intercept the groundwater and put it to beneficial use for domestic, municipal purposes before it reaches the dry lake beds. The Cadiz project has applied for a 50-year term, with an annual average production rate of approximately 50,000 AFY. The Cadiz company states the water meets all state and federal drinking water standards without treatment, but when it goes online, treatment will occur at the Diemer WTP or Baker WTP prior to delivery to SMWD. (Cadiz Web Site, 09/27/18).

4.3. Historic Use of Groundwater (CWC Section 10910 (f)(3))

San Juan Basin

Although SMWD currently does not operate any groundwater wells, prior groundwater production occurred at SMWD's Well 6 (SMWD 2010 UWMP). The annual groundwater production rate from the San Juan Basin since 2000 is listed below in **Table 4-1 – Historical Annual Groundwater Production (AFY)**. This supply has only been used for non-potable purposes.

Table 4-1: Historic Annual Groundwater Production (AFY)

Fiscal Year	Groundwater Produced (AFY)
2000	154
2005	90
2006	71
2007	78
2008	65
2009	73
2010	65
2015	0
2017	0
2018	0

Notes: Data from 2005-2010 obtained from SMWD's 2010 UWMP, Table 3-6. Remaining data from SMWD 2018 WSV, Table 4.1 (Appendix B). Data could not be obtained for missing years.

Fenner Valley Aquifer System

For more than 25 years, the Cadiz Company has operated an organic farm at its Cadiz Valley property using the underlying groundwater to irrigate a variety of crops. Historic pumping in the Cadiz project area within the Fenner Valley Aquifer System is limited to supplying water for the Cadiz farm. Presently, 2,100 acres are farmed of the 9,600 acres zoned for agriculture. The existing wells have an annual production capacity of 13,000 AF of water. (Cadiz Web Site)

4.4. Projected Use of Groundwater (CWC Section 10910 (f)(4))

San Juan Basin

The SJBA adopted the *San Juan Basin Groundwater and Facilities Plan Update* (2013) which, among other things, identifies the potential to recharge the San Juan Basin with a combination of stormflows, urban return flows, and recycled water to maximize the

potable water supply through indirect potable reuse (IPR).[2] The first phase of the IPR Project is envisioned to include installation of rubber dams that will slow runoff to promote infiltration and recharge of the San Juan Basin. SMWD is preparing the California Environmental Quality Act (CEQA) documentation for the first phase of this project and has plans to be one of several participants to increase domestic water supply reliability.

The IPR Project is currently estimated to produce poor quality groundwater that is then treated with existing and future desalters for use as a potable/domestic water supply.[3] SMWD is limited to extracting the amount of water that was put into the basin by this project. Approximately 700 AFY of water by 2020 is estimated for the first phase of the IPR Project. If this initial phase is successful, the recharge program will use recycled water for recharge of the San Juan Basin and approximately 6,240 AFY would be extracted by SMWD by 2027. The Trampas Canyon Reservoir will store the recycled water for recharge.

Fenner Valley Aquifer System

Cadiz, Inc. is the owner of approximately 45,000 acres of land in eastern San Bernardino County, most of which overlies the Fenner Valley Aquifer System. Cadiz has formed the Fenner Valley Mutual Water Company, a nonprofit entity that will operate and manage the *Cadiz Valley Water Conservation, Recovery and Storage Project*. By contract agreement (included in **Appendix E**), SMWD is participating in this project that will appropriate groundwater from wells on the property overlying the Fenner Valley Aquifer System and deliver that groundwater for reasonable and beneficial uses via the CRA and other facilities as necessary. SMWD has primary responsibilities for the project and was

[2] Indirect potable reuse is the planned placement of recycled water into an environmental buffer, such as a groundwater system or surface water reservoir, before the blended water is used as a source of drinking water by a public water system (from *A Proposed Framework for Regulating Direct Potable Reuse in California*, State Water Resources Control Board, April 2018. Available at https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/direct_potable_reuse/dprframewk.pdf

[3] A desalter is a treatment process to treat raw water for potable purposes. It can include reverse osmosis or ion exchange methods.

the lead agency for the project Environmental Impact Report (EIR). The project would manage the Fenner Valley Aquifer and use water that would otherwise be evaporated from local dry lakes. A future phase of the project could include the ability to store water during wet years from the CRA in the Cadiz Aquifer to be used during dry years. The project is designed to provide 50,000 AFY of potable water on average to participating agencies.

Cadiz will develop, construct and finance all project facilities necessary for the production and delivery of project water and will transfer a possessory interest in the project facilities to the Fenner Valley Water Authority (FVWA). SMWD is the managing entity for the FVWA. Project Facilities include a wellfield located on the property, manifold, 43-mile conveyance pipeline between the wellfield and CRA, and interconnection between the conveyance pipeline and the CRA. In addition to construction and financing, Cadiz is also responsible for obtaining all permits and approvals required for the project in coordination with FVWA and SMWD. (WSV 2018, p. 4-9)

The project underwent an extensive environmental review for two years and will need additional regulatory approvals from certain public agencies to proceed with design and construction. SMWD served as the lead agency for CEQA review to evaluate the potential environmental impacts associated with construction and operation of the project. If alternatives are identified and mitigation measures determined necessary, they must be considered and incorporated prior to approval of the project. The EIR was performed by independent environmental and engineering consultants to conduct studies, obtain public input, and determine the feasibility of the project. The Final EIR was approved on July 31, 2012. (WSV 2018, p. 4-9)

SMWD has first priority rights to 5,000 AFY of water supply from the project, along with an option to purchase an additional 10,000 AFY. SMWD also has 15,000 AF of carry-over rights. The water will be produced and conveyed via Cadiz project facilities or alternate facilities to the CRA; and then wheeled through Metropolitan's CRA and other

transmission pipelines to the Baker WTP or the Diemer WTP for treatment. (WSV 2018, p. 4-9)

4.5. Sufficiency of Groundwater Basin (CWC Section 10910 (f)(5))

The majority of SMWD's future water demands, including the proposed City Project, will be met with imported water supplies and not with groundwater. Based on what is known about the San Juan Basin, the supply is limited and the volume in storage subject to seasonal changes depending on the amount of rainfall and creek flows. As such, local groundwater supplies will not be sufficient to meet all of SMWD's future demands. SMWD continues to develop efforts to increase local infiltration of stormwater and non-stormwater runoff as well as a future IPR Project that will put in non-domestic supplies to the San Juan Basin that are later pumped out for treatment and use as a minor portion of SMWD's domestic supply.

San Juan Basin

Facilities located within the San Juan Basin, which are not owned by SMWD, include 13 active groundwater wells and a desalter plant. Ongoing oversight of the basin by the SJBA includes annual water level and water quality monitoring, including joint groundwater monitoring with SMWD. An annual report is released by SJBA with the results of surface water, groundwater, biotic and climate data analyses. (SJBA Web Site)

The amount of water that SMWD expects to be available from the San Juan Basin is subject to the amount of water SMWD can recharge into the basin. Presently, the SJBA is implementing the *SJBA Groundwater and Desalination Optimization Program Foundational Actions Fund Program* (March 2016). This program evaluates the feasibility of expanding groundwater production facilities for sustainable, long-term use of this impaired watershed, including project implementation phasing and cost estimates (SJBA, p. vi). The sufficiency of groundwater to supply the SJBA's planned projects will be refined as the components of the optimization program are implemented: groundwater modeling studies for a seawater extraction barrier, hydraulic investigations

to increase stormwater and recycled water recharge, and adaptive production management (ibid, pp. 6-7).

Fenner Valley Aquifer System

The future supply of domestic water produced from the Cadiz groundwater project and allocated to SMWD will not be sufficient to meet all of SMWD's future domestic water demands. SMWD estimates just 5,000 AFY would be delivered, but it is expected to be a consistent delivery in both wet and dry years (Cadiz Web Site). An annual average total production rate of 50,000 AFY is planned. Approximately 20 million AF of water is estimated to be stored in the alluvium, and the natural recharge rate is estimated at 32,000 AFY. Under the project's conservation strategy, only 3 to 6 percent of groundwater in storage will be accessed. Further, the project's groundwater management plan, to be enforced by the County of San Bernardino, limits any drawdown to 80 feet below the current water table. (Wells throughout the area demonstrate that the water table extends at least 1,000 feet below ground surface.) (Cadiz Web Site) The sufficiency of groundwater that Cadiz expects to be available from the Fenner Valley Aquifer System is based on many years of research that is documented in their project CEQA documents, court challenges, and subsequent studies available on the SMWD and Cadiz Web sites. However, as shown in Section 3 – *Water Supply Analysis*, even without the Cadiz supply source SMWD is expected to have a surplus supply of water.

Conclusion

California Water Code Section 10631(j) provides that urban water suppliers, such as the SMWD, that rely upon a wholesale agency for a source of water may rely upon water supply information provided by the wholesale agency in fulfilling UWMP informational requirements. This Assessment has relied upon information from both MWDOC and Metropolitan UWMPs.

MWDOC's independent analysis of regional water conditions in conjunction with DWR's most recent Delivery Capability Report, provide additional and reliable assurances

concerning the sufficiency of imported water supplies that comprise a majority of SMWD supply sufficiency. Local and imported groundwater supplies are not planned to comprise a majority of SMWD's supply portfolio.

SMWD's pursuit of reducing reliance on imported water supplies by capturing and reusing more recycled water supplies and urban return flows as described in Section 3 – *Water Supply Analysis*, as well as interconnections and agreements with neighboring agencies, along with future storage and recovery projects will help to continue meeting SMWD's water demands during imported water shortages. These efforts are consistent with the goals of all member agencies of MWDOC and Metropolitan.

SECTION 5 - PRIMARY ISSUE FOR ASSESSMENT

As cited below, the lead agency, "…shall determine, based on the entire record, whether projected water supplies will be sufficient to satisfy demands of the project, in addition to existing and planned future uses." The lead agency is expected to approve or disapprove the project based on a number of factors, including but not limited to the Water Supply Assessment.

Law

> Water Code Section 10910(g)(1): *Subject to paragraph (2), the governing body of each public water system shall submit the assessment to the city or county not later than 90 days from the date on which the request was received. The governing body of each public water system, or the city or county if either is required to comply with this act pursuant to subdivision (b), shall approve the assessment prepared pursuant to this section at a regular or special meeting.*
>
> Water Code Section 10911(b): *The city or county shall include the water assessment provided pursuant to Section 10910, and any information provided pursuant to subdivision 9a), in any environmental document prepared for the project pursuant to Division 13 (commencing with Section 21000) of the Public Resources Code.*
>
> *(c) The city or county may include in any environmental document an evaluation of any information included in that environmental document provided pursuant to subdivision (b). The city or county shall determine, based on the entire record, whether projected water supplies will be sufficient to satisfy the demands of the project, in addition to existing and planned future uses. If the city or county determines that water supplies will not be sufficient, the city or county shall include that determination in its findings for the project.*

The lead agency is expected to review the Assessment and decide whether additional water supply information is needed for its consideration of the proposed project.

5.1 Findings

Whereas:

1. The Santa Margarita Water District (SMWD) has been identified as the water supplier for the portion of the City of Rancho Santa Margarita (City) that is expected to have the future net increases in residential and non-residential developments proposed by the forthcoming City General Plan Update ("Project"). The City is nearly built-out and increased future demand from the Project would result mostly from redevelopment of existing built land uses within the SMWD service area.
2. SMWD is pursuing an extension of recycled water service into the City to convert approximately 1,000 AFY of domestic water use to recycled water with existing recycled water supplies.
3. The estimated total domestic water demand for the Project is 951 acre-feet per year (AFY). District-wide domestic and non-domestic water demands are currently 22,241 AFY and 7,993 AFY, respectively. These are expected to increase by 2040, with the Project and the recycled water conversion project in the City, to 25,213 AFY (13 percent increase) and 14,929 AFY (87 percent increase), respectively.
4. SMWD has updated the District-wide water demand projections from the *2015 Urban Water Management Plan* dated June 2016 (**Appendix A**), to those contained within the *Water Supply Verification for The Ranch Plan: Planning Area Nos. 5 and 8* dated May 2018 (**Appendix B**), which was adopted by the SMWD Board of Directors by Resolution 2018-05-05 on May 18, 2018.
5. SMWD has been allocated 29,202 acre-feet per year of domestic water supply since 2016 by the local imported water wholesaler, the Municipal Water District of Orange County (MWDOC). The SMWD was able to continue meeting customer domestic water demand when the allocation from MWDOC was reduced 10 percent to 26,277 AF in 2016, in response to water shortage conditions. The

future domestic water allocation to SMWD from MWDOC is estimated to remain at 29,202 AFY.

6. SMWD is anticipating a firm domestic water supply of 5,000 AFY beginning in 2020 from the Cadiz groundwater project. Supplemental domestic water can also be obtained depending on existing agreements with other agencies (i.e. Cucamonga Valley Water District and Golden State Water Company).

7. SMWD is pursuing a future Indirect Potable Reuse (IPR) Project that would provide some domestic water supplies, albeit dependent on the amount of recycled/non-domestic water available to recharge the San Juan Basin. This domestic water supply source is expected by 2020 for the initial production of 700 AFY. Another new domestic water supply source will include the Doheny Ocean Desalination Project that is anticipated to come online in 2025 for approximately 1,000 AFY.

8. SMWD maintains ownership in three water reclamation plants that produced approximately 10,836 AF of recycled water in 2017. SMWD also purchases recycled water from Irvine Ranch Water District on an as-needed and as-available basis. Non-domestic water supplies are projected to increase to 16,594 AFY by 2040. SMWD is in the process of finalizing an agreement with the City of San Clemente for additional recycled water sourced from SMWD-wastewater beginning in 2019.

9. SMWD also captures non-stormwater urban return flows for groundwater recharge, riparian habitat, and reuse. Approximately 1,715 AF of this non-domestic water was utilized in 2017. SMWD also meets the non-domestic demands of the ongoing development of the Rancho Mission Viejo community ([RMV] i.e., *The Ranch Plan*) in unincorporated Orange County with local groundwater leased from the RMV Mutual Water Company, of approximately 800 AF in 2018. SMWD may pursue providing treatment in the future of this groundwater to convert it to a domestic water supply source. Non-domestic

groundwater leased from the RMV Mutual Water Company are projected to increase to 2,500 AFY by 2040.

10. SMWD currently maintains 31 potable tank reservoirs, two emergency storage potable water reservoirs, seven recycled water tank reservoirs, and two open-air recycled water reservoirs. A third open-air recycled water reservoir with 5,000 AF capacity is currently being constructed (Trampas Canyon Reservoir).

Considering the aforementioned facts, the total projected water supplies available to SMWD during normal, single dry, and multiple dry years (**Tables 3-6, 3-7,** and **3-8**) during a 20-year projection are found to be sufficient to meet the projected water demand associated with the proposed Project, in addition to SMWD's existing and planned future uses, including agricultural and manufacturing uses.

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Appendix A

Santa Margarita Water District 2015 Urban Water Management Plan Final

Santa Margarita Water District

ARCADIS Design & Consultancy for natural and built assets

2015

URBAN WATER MANAGEMENT PLAN

FINAL

JUNE 2016

2015 URBAN WATER MANAGEMENT PLAN

Santa Margarita Water District

FINAL

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27704002.0000

Date:

June 2016

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ACRONYMS AND ABBREVIATIONS

20x2020	20% Water Use Reduction in GPCD by Year 2020
3A	3A Water Reclamation Plant
Act	Urban Water Management Planning Act
AF	Acre-Feet
AFY	Acre-Feet per Year
AMI	Automated Meter Reading
AMP	Allen McColloch Pipeline
AMR	Automatic Meter Reading
APW	Advanced Purified Water
AWWA	American Water Works Association
Biops	Biological Opinions
BMP	Best Management Practice
CCC	California Coastal Commission
CCF	Hundred Cubic Feet
CDR	Center for Demographic Research
CEQA	California Environmental Quality Act
CII	Commercial/Industrial/Institutional
CIMIS	California Integrated Management Information System
County	County of Orange
CRA	Colorado River Aqueduct
CVP	Central Valley Project
CWVD	Cucamonga Valley Water District
CWRP	Chiquita Water Reclamation Plant
CY	Calendar Year
Delta	Sacramento-San Joaquin River Delta
DDW	Department of Drinking Water
District	Santa Margarita Water District
DMM	Demand Management Measure
DOF	Department of Finance
DU	Dwelling Unit
DVL	Diamond Valley Lake
DWR	Department of Water Resources
EIR	Environmental Impact Report
EOCF #2	East Orange County Feeder No. 2
ETo	Evapotranspiration
ETWD	El Toro Water District
FY	Fiscal Year
GCM	General Circulation Model
GPCD	Gallons per Capita per Day

GRF	Groundwater Recovery Facility
GSWC	Golden State Water Company
HECW	High Efficiency Clothes Washer
HET	High Efficiency Toilet
I.D.	Improvement Districts
IEUA	Inland Empire Utilities Agency
IRP	Integrated Water Resource Plan
IRWD	Irvine Ranch Water District
IWA	International Water Association
LBCWD	Laguna Beach County Water District
LRP	Local Resources Program
LTFP	Long-Term Facilities Plan
MAF	Million Acre-Feet
Metropolitan	Metropolitan Water District of Southern California
MNWD	Moulton Niguel Water District
MGD	Million Gallons per Day
MHI	Median Household Income
MWDOC	Municipal Water District of Orange County
NDMA	N-nitrosodimethylamine
OCWD	Orange County Water District
OCWRP	Oso Creek Water Reclamation Plant
PPCP	Pharmaceuticals and Personal Care Products
Poseidon	Poseidon Resources LLC
RHNA	Regional Housing Needs Assessment
RMV	Rancho Mission Viejo
SBx7-7	Senate Bill 7 as part of the Seventh Extraordinary Session
SCAB	South Coast Air Basin
SCAG	Southern California Association of Governments
SCWD	South Coast Water District
SCP	South County Pipeline
SDCWA	San Diego County Water Authority
SDP	Seawater Desalination Program
SJBA	San Juan Basin 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
TCWD	Trabuco Canyon Water District
TDS	Total Dissolved Solids
UV	Ultraviolet

UWMP	Urban Water Management Plan
WBIC	Weather Based Irrigation Controller
WEROC	Water Emergency Response Organization of Orange County
WRP	Water Reclamation Plant
WSAP	Water Supply Allocation Plan
WSDM	Water Surplus and Drought Management
WSO	Water Systems Optimization

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 Santa Margarita Water District's (District) service area and assesses the District's 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. The District'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 component of the Delta Action Plan which aims to sustainably manage the Bay Delta and reduce conflicts between environmental conservation and water supply; it is detailed in Section 3.2.2. 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 (if necessary)

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).

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 the District's conveyance system. The UWMP Checklist has been completed, which identifies the location of Act requirements in this Plan and is included in Appendix A. This is an individual UWMP for a retail 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**
☑	**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: Plan Identification

Agency Identification	
Type of Agency	
☐	Agency is a wholesaler
☑	Agency is a retailer
Fiscal or Calendar Year	
☐	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)	
07/01	
Units of Measure Used in UWMP	
Unit	AF
NOTES:	

1.2 Agency Overview

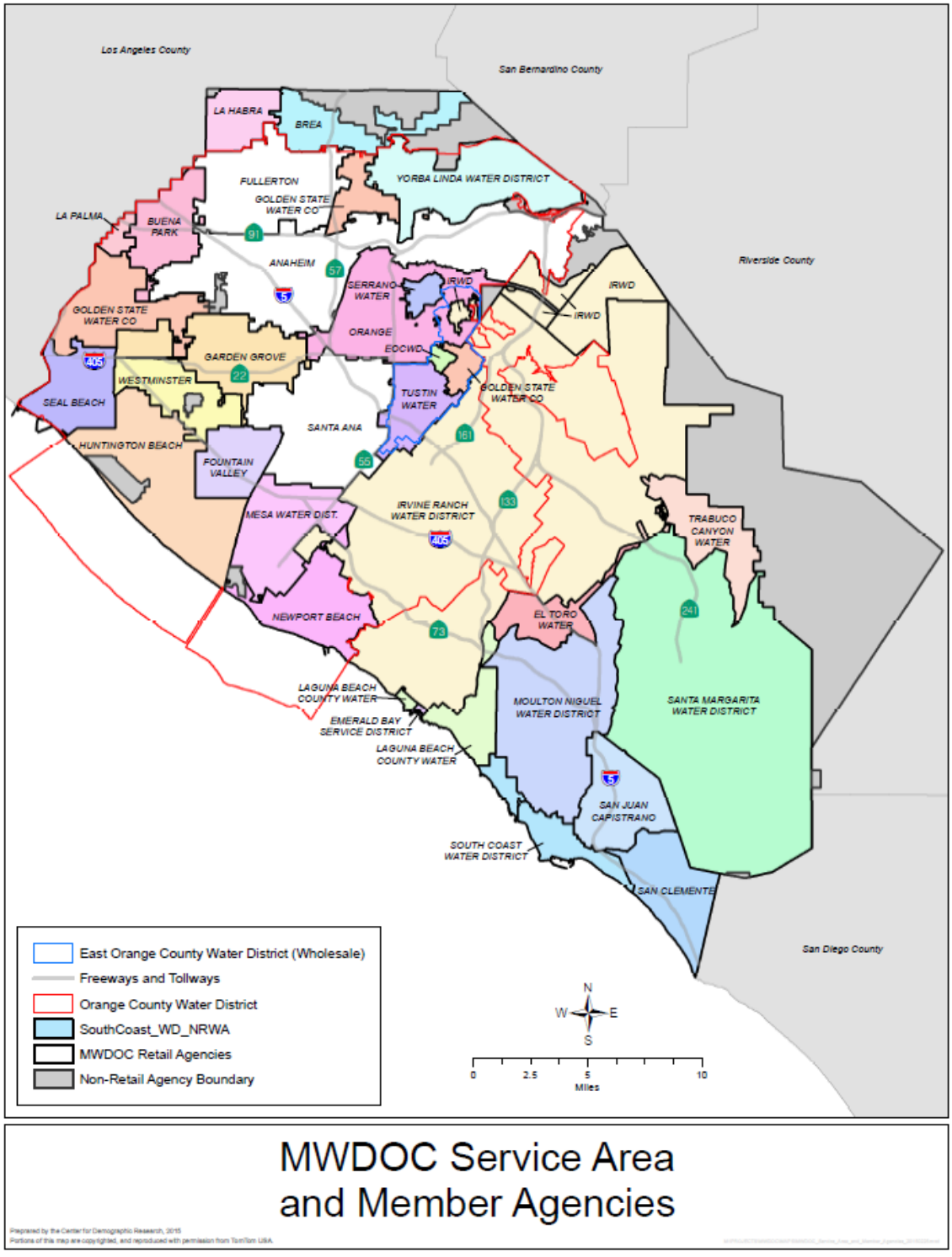
The District, established in December 1964 under provisions of the California Water District Law, includes 62,674 acres in the southeastern corner of Orange County. The governing body of the District (and all improvement districts therein) is a five-member Board of Directors, publicly elected at large for staggered four-year terms. The District's responsibilities are:

- Distribution of potable water for consumption and fire protection.
- Collection and treatment of wastewater.
- Distribution of recycled water along with the collection and distribution of urban return flows for irrigation purposes.

The current members of the District's Board of Directors are:

- Charley Wilson, President
- Charles T. Gibson, Vice-President
- Justin McCusker, Director and Engineering and Operations Committee Chair
- Saundra F. Jacobs, Director and Water Policy and Innovation Committee Chair
- Betty H. Olson, Ph.D., Director and Finance and Administration Committee Chair

The District receives its water from three main sources: imported drinking water from the Municipal Water District of Orange County (MWDOC), non-domestic urban return flows, and treated wastewater. MWDOC is Orange County's wholesale supplier and is a member agency of the Metropolitan Water District of Southern California (Metropolitan). The District also receives irrigation water from Rancho Mission Viejo and neighboring agencies. The regional location of the District is shown on Figure 1-1.



MWDOC Service Area and Member Agencies

Figure 1-1: Regional Location of Santa Margarita Water District

1.3 Service Area and Facilities

1.3.1 Santa Margarita Water District Service Area

The District provides water and wastewater treatment services to approximately 160,000 people within an area of 62,674 acres. The District is bounded on the north by El Toro Water District (ETWD), Irvine Ranch Water District (IRWD), and Trabuco Canyon Water District (TCWD), on the east by the Cleveland National Forest, on the south by the City of San Clemente and the United States Marine Corps' Camp Pendleton, and on the west by the City of San Juan Capistrano and Moulton Niguel Water District (MNWD). The District is responsible for inter-agency coordination and long range planning to meet future water supply and wastewater treatment needs for its service area as shown on Figure 1-2.

The District is divided into eight basic Improvement Districts (I.D.). These districts were formed to meet the needs of specific portions of the district based upon such factors as land use, topography, land ownership boundaries, and the timing and characteristics of water supply and wastewater treatment needs. The Cities of Mission Viejo, Rancho Santa Margarita and the unincorporated communities of Coto de Caza, Las Flores and Ladera Ranch as well as the remaining undeveloped portion of the Rancho Mission Viejo (RMV) are within the District's service boundary.

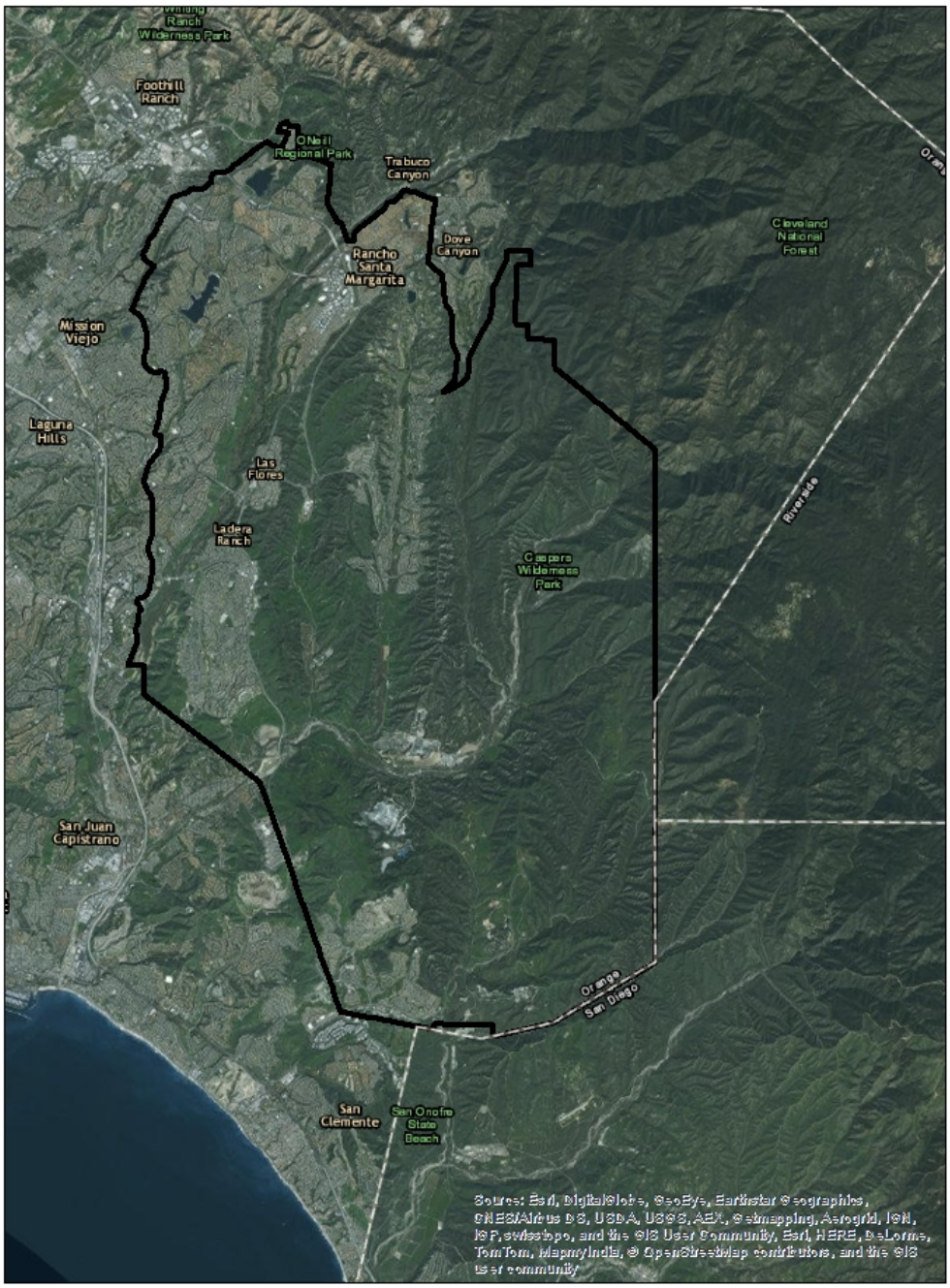


Figure 1-2: Santa Margarita Water District Service Area

1.3.2 Santa Margarita Water District Water Facilities

The District's system consists of approximately 1,525 miles of water (potable and recycled) and sewer lines, 31 potable water tank reservoirs, 2 emergency storage potable water reservoirs, 7 recycled water tank reservoirs, and 2 open-air recycled water reservoirs as shown in Appendix I. Nearly all of the District's water supply is purchased from Metropolitan, which delivers water to the region from Northern California via the State Water Project (SWP) and from the Colorado River via the Colorado River Aqueduct (CRA). Water from both sources is treated at either the Diemer Filtration Plant in Yorba Linda or the Baker Treatment Plant in Irvine (scheduled to open 10/16) prior to delivery to the District. The system connections and water volume supplied are summarized in Table 1-3, and the wholesalers informed of this water use as required are displayed in Table 1-4.

Table 1-3: Public Water Systems

Retail Only: Public Water Systems			
Public Water System Number	Public Water System Name	Number of Municipal Connections 2015	Total Volume of Water Supplied 2015 (AF)
CA3010101	Santa Margarita Water District	54,907	34,405
	TOTAL	54,907	34,405
NOTES: Customer Relations records retrieved March 2016			

Table 1-4: Water Supplier Information Exchange

Retail: Water Supplier Information Exchange
The retail supplier has informed the following wholesale supplier(s) of projected water use in accordance with CWC 10631.
MWDOC
NOTES:

2 DEMANDS

2.1 Overview

Since the last UWMP update, southern California's urban water demand has been largely shaped by the efforts to comply with SBx7-7. This law requires all California retail urban water suppliers serving more than 3,000 acre-feet per year (AFY) or 3,000 service connections to achieve a 20 percent water demand reduction (from a historical baseline) by 2020. The District has been actively engaged in efforts to reduce water use in its service area to meet the 2015 interim 10 percent reduction and the 2020 final water use target. Meeting this target is critical to ensure the District's eligibility to receive future state water grants and loans.

In April 2015, Governor Brown issued an Emergency Drought Mandate as a result of one of the most severe droughts in California's history, requiring a collective reduction in statewide urban potable 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, the District is carrying out more aggressive conservation efforts. It is also implementing higher (more restrictive) stages of its water conservation ordinance in order to achieve its State-mandated demand reduction target of 23 percent (reduced from 24 percent in March 2016) set for the District itself.

In addition to local water conservation ordinances, the District has partnered with MWDOC on educational programs, indoor/outdoor retrofit rebates, and training. These efforts have been made to achieve the statewide water conservation ordinances that require limited landscape watering, serving water in restaurants and bars only when requested, and reducing the amount of laundry cleaned by hotels. Further discussion on the District's water conservation ordinance is covered in Section 5 Water Shortage Contingency Plan.

This section analyzes the District's current water demands by customer type, factors that influence those demands, and projections of future water demands for the next 20 years. In addition, to satisfy SBx7-7 requirements, this section provides details of the District's SBx7-7 compliance method selection, baseline water use calculation, and 2015 and 2020 water use targets.

2.2 Factors Affecting Demand

Water demands within the District's service area are dependent on many factors such as local climate conditions and the evolving hydrology of the region, demographics, land use characteristics, and economics. In addition to local factors, the areas that serve as southern California's imported water sources are also experiencing drought conditions that impact availability of current and future water supplies.

2.2.1 Climate Characteristics

The District is located within the South Coast Air Basin (SCAB) that encompasses all of Orange County, and 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 light rainfall. On a global scale average temperatures are rising; the result is increased water usage required for irrigation and outdoor landscape to offset the evapotranspiration (ETo) from local soil and vegetation. ETo is the loss of water from a vegetative surface from a combination of plant transpiration (loss of water as vapor through plant leaves) and soil evaporation, movement of water from soil to air. Table 2-1 details the growing total ETo losses over a 12-month period in 2010 and 2015 for the same area. The difference in ETo over this five year period is 0.59 inches for the region surrounding the Irvine station. A higher ETo indicates that more water is being pulled from soil and vegetation to the atmosphere, thus increasing the amount needed to maintain existing irrigation patterns and uses.

Table 2-1: Climate Characteristics

	2010 Standard Monthly Average ETo (inches) [1]	2015 Standard Monthly Average ETo (inches) [1]
Jan	2.18	2.38
Feb	2.49	2.58
Mar	3.67	3.79
Apr	4.71	4.78
May	5.18	5.32
Jun	5.87	5.75
Jul	6.29	6.34
Aug	6.17	6.17
Sep	4.57	4.76
Oct	3.66	3.60
Nov	2.59	2.63
Dec	2.25	2.12
Annual	**49.63**	**50.22**

[1] CIMIS Station #75, Irvine, California from October 1987 to Present

The low volume of local rainfall has had a limited impact on reducing demand for the District. Water that infiltrates into the soil may enter groundwater supplies depending on the local geology. However, due to the large extent of impervious cover in southern California, most rainfall runoff quickly flows to a system of manmade storm drains and channels that lead to the San Juan Creek and then to the ocean.

Metropolitan's water supplies come from the SWP and the CRA, influenced by climate conditions in northern California and the Colorado River Basin, respectively. Both regions have been suffering from multi-year drought conditions with record low precipitation which directly impact water supplies to southern California.

2.2.2 Demographics

The Center for Demographic Research (CDR) estimates that the District had a December 2015 population of 156,949. The District has seen moderate growth within the service area, and its population is projected to increase 27 percent by 2035. Anticipated growth comes from continued development of Rancho Mission Viejo in the southeast portion of the service area.

The projected growth forecasted in the 2010 UWMP was not experienced due to the economic downturn that occurred in 2008-09. Table 2-2 shows the population projections in five-year increments out to 2040 within the District's service area.

Table 2-2: Population – Current and Projected

Retail: Population - Current and Projected						
Population Served	2015	2020	2025	2030	2035	2040
	156,949	169,628	187,826	194,951	199,028	200,026
NOTES: Source: Center for Demographic Research						

2.2.3 Land Use

The District is made up of primarily residential communities with common area landscaping. Residential is comprised of single and multi-family dwellings. Retail is concentrated in central community areas and the minor amount of manufacturing that occurs is within the Rancho Santa Margarita Business Park and the Talega Business Park.

The District was notified by the County of Orange (County) on February 26, 2003, in accordance with Water Code Section 10910 of its Notice of Preparation of a draft Environmental Impact Report (EIR) #589 for a development known as the Ranch Plan. Located within the District's current service territory in Improvement Districts 4C, 4E, 5, and 6, the Ranch Plan was scheduled to begin development in 2013 and included a mix of residential and commercial development in six planning areas. The planning areas represent 5,879 of the 22,815 acres of land owned by Rancho Mission Viejo. The remaining land between and surrounding the development will remain as open space. The proposed residential developments will consist of 14,000 units with 6,000 of the units being age-restricted units which have a lower water demand due to typical usage patterns, and 1,329 units of affordable housing. The proposed commercial development is estimated to be 5.2 million square feet. There is projected to be 130 acres of urban activity center uses, 258 acres of business park uses, 39 acres of neighborhood retail development, and up to two golf courses. The first planning area, the Village of Sendero, is currently being completed and the other five planning areas will be developed over the next 20 years (Hall & Foreman, 2012).

2.3 Potable Water Use by Customer Type

An agency's potable water consumption can be projected by understanding the type of use and customer type creating the demand. Developing local water use profiles helps to identify quantity of water used, and by whom within the agency's service area. A comprehensive profile of the agency's service area enables the impacts of water conservation efforts to be assessed and to project the future benefit of water conservation programs. Recycled water is discussed in Section 6.

The following sections of this UWMP provide an overview of the District's potable water consumption by customer account type as follows:

- Single-family Residential
- Multi-family Residential
- Commercial
- Irrigation
- Other (Construction/District Usage/Lakefill)

Other water uses including sales to other agencies and non-revenue water are also discussed in this section.

2.3.1 Overview

There are currently 54,907 active and inactive customer service connections in the District's potable water distribution system with all existing connections metered. Approximately 69 percent of the District's potable water demand is residential and about 21 percent of the total potable water demand is dedicated landscape. Table 2-3 contains a summary of the District's total potable water demand in the fiscal year (FY) of 2014-15 for potable water volumes.

Table 2-3: Demands for Potable Water - Actual (AF)

Retail: Demands for Potable Water - Actual			
Use Type	2015 Actual		
	Additional Description	Level of Treatment When Delivered	Volume
Single Family		Drinking Water	15,904
Multi-Family		Drinking Water	2,598
Commercial		Drinking Water	1,012
Landscape		Drinking Water	5,650
Other	Alternative Sourced	Drinking Water	633
Losses		Drinking Water	1,114
		TOTAL	26,910
NOTES: Volumes are pulled from the District's billing database. Losses are calculated as 4 percent of the imported volume (See Section 2.3.5).			

2.3.2 Non-Residential

Non-residential use includes commercial and dedicated landscape demands. Commercial potable water use accounts for 4 percent of total water demands and dedicated landscape accounts for 21 percent of total water demand. The District has a mix of commercial uses (markets, restaurants, etc.), public entities (schools, fire stations and government offices), office complexes, and light industrial.

2.3.3 Other Uses

The District's service area contains two manmade, recreational lakes that have historically used potable water to maintain their water levels. Lago Santa Margarita, located in Rancho Santa Margarita, has a five year average consumption of 35 AFY based on 2010-15 data to maintain the water level. The District projects that this volume is required to maintain the water level into the foreseeable future. Lake Mission Viejo, located in Mission Viejo, has a five year average consumption of 210 AFY based on 2010-15 data to maintain the water level. This District is currently planning a project to convert Lake Mission Viejo lakefill from potable water use to recycled water use.

2.3.4 Sales to Other Agencies

The District occasionally sells imported water to neighboring agencies. In FY 2014-15, the District sold 218 AF of potable water to Trabuco Canyon Water District.

2.3.5 Non-Revenue Water

Non-revenue water is defined by the International Water Association (IWA) as the difference between distribution systems input volume (i.e. production) and billed authorized consumption. Non-revenue water consists of three components: unbilled authorized consumption (e.g. hydrant flushing, firefighting, and blow-off water from well start-ups), real losses (e.g. leakage in mains and service lines), and apparent losses (unauthorized consumption and metering inaccuracies).

In 2015, the District contracted with Water Systems Optimization (WSO) to conduct a water loss audit per AWWA methodology for the District to understand the relation between water loss and revenue losses. This audit was developed by the IWA Water Loss Task Force as a universal methodology that could be applied to any water distribution system. This audit meets the requirements of SB 1420 that was signed into law in September 2014. Understanding and controlling water loss from a distribution system is an effective way for the District to achieve regulatory standards and manage their existing resources

Table 2-4 below is a result of the AWWA Water Audit completed for the District and the 2015 UWMP. The water loss summary was calculated over a one-year period (7/1/13 – 6/30/14) from available data and the methodology explained above. The volume of water loss calculated for this period represents 4.7 percent of the District's annual water supplied. Given the low volume of losses, the District will be focused on developing a water loss control program in order to continue to run an efficient system.

Table 2-4: Water Loss Audit Summary (AF)

Retail: 12 Month Water Loss Audit Reporting	
Reporting Period Start Date (mm/yyyy)	Volume of Water Loss
07/2013	1,265
NOTES:	

2.4 Demand Projections

Demand projections were developed for the District as part of the Santa Margarita Water District Water Demand Forecast that forecasted average demand for each major customer class based on an econometric model for 2015 to 2035 (Santa Margarita Water District Water Demand Forecast, M.Cubed, January 2016). Average demand was developed from the baseline average demand for each customer class (weather-normalized 2014 demand), projected growth of residential units from the District's FY 2015-16 CIP, and non-residential use from its historically linear relationship with residential. The average demand forecast was then adjusted to show the effects on demand from efficiency standards, expansion of District conservation programs, and changes in water and sewer rates. The adjustments for the effects of efficiency standards and District conservation programs are estimated with the Alliance for Water Efficiency's Water Conservation Tracking Tool. The average water use projections are combined with forecasts of residential and non-residential service connections to produce a forecast of total customer demand.

2.4.1 Demand Projection Methodology

The water demand projections were the outcome of the District's Water Demand Forecast for District's service area for 2015 to 2035. Baseline average demand by customer class was expressed as hundred cubic feet per dwelling unit (CCF/DU) for residential use and CCF/meter for commercial and greenbelt uses. The projection of service area population was developed by applying estimates of average household density for single family and multi-family residences to the corresponding dwelling unit projections. The estimates of average household density (person/DU) were developed using data from the 2000 Census for each of the 32 Census Tracts that overlap with the District service area. The resulting estimates were 3.22 persons per single family household and 2.28 persons per multi-family household. The number of service connections for single family and multi-family residential with either a single or shared water meter was computed. The number of service connections for commercial facilities was developed based on a linear correlation with residential service connections. This correlation was found to be valid for the entire 20 year planning horizon. The number of dedicated landscape (greenbelts and parks) service connections was also determined to have a linear relationship with residential service connections and was estimated in a similar manner (Santa Margarita Water District Water Demand Forecast, M.Cubed, January 2016).

From the gathered data, projections for service connections and population were produced from the demand model. Baseline water demand for each customer class was generated from 2014 actual demands that were normalized for weather impacts. Normalization removes large variations in the data caused by variable rainfall and yearly climate conditions. The average demand was then multiplied by the

DUs and number of service connections to calculate total demand projections per customer class. Adjustments were made to demonstrate impacts from increased efficiency of household appliances from the California Plumbing Code, general conservation programs within the District, and future increased water and sewer rates. Additional detail on the demand projection model can be found in the District's Water Demand Forecast that was developed by M.Cubed in January 2016.

2.4.2 Agency Refinement

Demand projections were developed for the District as part of the Santa Margarita Water District Water Demand Forecast. The future demand projections were reviewed and accepted by the District to be used as the basis for the 2015 UWMP.

2.4.3 25 Year Projections

A key component of the 2015 UWMP is to provide insight into the District's future water demand outlook. The District's FY 2015 domestic water demand was 26,910 AFY, met through purchased imported water from MWDOC and non-domestic water sources. Table 2-5 is a projection of the District's water demand for the next 25 years.

Table 2-5: Demands for Potable Water - Projected (AF)

Retail: Demands for Potable Water - Projected					
Use Type	Projected Water Use *Report To the Extent that Records are Available*				
	2020	2025	2030	2035	2040
Single Family	15,596	15,710	15,358	14,595	14,595
Multi-Family	2,547	2,566	2,509	2,384	2,384
Commercial	992	999	977	928	928
Landscape	5,540	5,581	5,456	5,185	5,185
Other	620	625	611	581	581
Losses	1,092	1,100	1,076	1,022	1,022
TOTAL	26,388	26,581	25,986	24,695	24,695
NOTES: SMWD Demand Forecast, M.Cubed, January 2016. Losses are calculated as 4 percent of imported water volume. Data for 2040 extrapolated.					

The above demand values were developed for the District from historical data and a developed model (Santa Margarita Water District Water Demand Forecast, M.Cubed, January 2016). The District is actively decreasing its reliance on imported water by pursuing a variety of water conservation strategies and increasing recycled water use, per capita water use is developed in Section 2.5 below.

Table 2-6: Inclusion in Water Use Projections

Retail Only: Inclusion in Water Use Projections	
Are Future Water Savings Included in Projections?	Yes
If "Yes" to above, state the section or page number, in the cell to the right, where citations of the codes, ordinances, etc… utilized in demand projections are found.	Section 4.1
Are Lower Income Residential Demands Included In Projections?	Yes
NOTES:	

The demand data presented in this section accounts for passive and active savings in the future. Passive savings are water savings as a result of codes, standards, ordinances and public outreach on water conservation and higher efficiency fixtures. Passive savings are anticipated to continue for the next 25 years and will result in continued water saving and reduced consumption levels.

2.4.4 Total Water Demand Projections

Based on the information provided above, the total demand for potable water is listed below in Table 2-7. The District plans to expand availability and use of recycled water in its service area.

Table 2-7: Total Water Demands (AF)

Retail: Total Water Demands						
	2015	2020	2025	2030	2035	2040
Potable Water	26,910	26,388	26,581	25,986	24,695	24,695
Recycled Water Demand	7,495	10,885	11,411	11,830	11,665	11,515
TOTAL WATER DEMAND	34,405	37,273	37,992	37,816	36,360	36,210
NOTES: 2015 volumes are pulled from SMWD billing database. Forecast provided from SMWD Demand Forecast, M. Cubed, January 2016.						

2.4.5 Water Use for Affordable Housing

Since 2010, the UWMP Act has required retail water suppliers to include water use projections for single-family and multi-family residential housing for affordable households. This will assist the District in complying with the requirement under Government Code Section 65589.7 granting priority for providing water service to affordable households. An affordable household is defined as a household earning below 80 percent of the median household income (MHI). The MHI is based on the mean income of the County with a 110 percent social equity adjustment applied.

DWR recommends retail suppliers rely on the housing elements of City or County general plans to quantify planned affordable housing with the district's service area (DWR, 2015 UWMP Guidebook, February 2016). The Regional Housing Needs Assessment (RHNA) assists jurisdictions in updating general plan's housing elements section. The RHNA identifies housing needs and assesses households by income level for the district through 2010 decennial Census and 2005-2009 American Community

Survey data. The fifth cycle of the RHNA covers the planning period of October 2013 to October 2021. The Southern California Association of Governments (SCAG) adopted the RHNA Allocation Plan for this cycle on October 4, 2012 requiring housing elements updates by October 15, 2013. The California Department of Housing and Community Development reviewed the housing elements data submitted by jurisdictions in the SCAG region and concluded the data meets statutory requirements for the assessment of current housing needs.

The projected water demand for affordable households in the District's service area was estimated by calculating the percentage of projected affordable households in the service area as a percentage of the total projected units in the RHNA. The plan breaks down affordable housing into three categories: extremely low (less than 30 percent MHI), very low (31 percent - 50 percent MHI), and lower income (51 percent - 80 percent MHI). Given that the District's service area covers portions of the Cities of Mission Viejo, Rancho Santa Margarita, and San Clemente, a weighted average of the RHNA percentage of affordable households for each City within the District was calculated. The weighted average is based on the percentage of developed land in the District each City accounts for, excluding areas like the Starr Ranch Audubon Sanctuary and Prima Deshecha Landfill. Unincorporated areas within the District are also included as part of the service area.

As summarized in Table 2-8, 46.36 percent of the District's residential service area lies within Rancho Santa Margarita. Based on the housing elements of the RHNA, the projected housing need for low-income households is 25.58 percent of total housing needs. Therefore, the area weighted projected demands for low-income households for the City of Rancho Santa Margarita is 11.86 percent (46.36 percent times 25.58 percent). The same procedure is repeated for all Cities within the District's service area, which results in an overall projected housing need for low-income households of 27.29 percent as a percentage of total housing units (SCAG, RHNA Allocation Plan, November 2013).

Table 2-8: Household Distribution Based on Median Household Income

City	% Area Served	% Low-income Households by City (RHNA)	Weighted % Low-income Households
Mission Viejo	28.40%	29.55%	8.39%
Rancho Santa Margarita	46.36%	25.58%	11.86%
San Clemente	5.24%	36.65%	1.92%
Unincorporated	20.00%	25.58%	5.11%
Total	100%	**Weighted Average**	**27.29%**

Table 2-9 provides a breakdown of the projected water needs for single family and multifamily affordable households. The projected water demands shown here represent 27.29 percent of the projected water demand for the single-family and multifamily categories provided in Table 2-5 above. For example, the total single family affordable household residential demand is projected to be 4,256 AFY in 2020 and 3,983 AFY in 2040.

Table 2-9: Projected Water Demands for Housing Needed for Affordable Households (AF)

Affordable Household Water Use					
Water Use Sector	Fiscal Year Ending				
	2020	2025	2030	2035	2040
Total Residential Demand	18,144	18,276	17,866	16,979	16,979
SF Residential Demand-Affordable Households	4,256	4,287	4,191	3,983	3,983
MF Residential Demand-Affordable Households	695	700	685	651	651
Total Affordable Households Demand	***4,951***	***4,988***	***4,876***	***4,634***	***4,634***

Figure 2-1 shows a breakdown of IDs within the District's service area. ID1 consists of the City of Mission Viejo, while the City of Rancho Santa Margarita includes IDs 3, 4A, and a portion of 4C. ID7 along with small uninhabited portions of ID6 and Prima D consists of the City of San Clemente. Unincorporated areas are spread throughout the service area of the District.

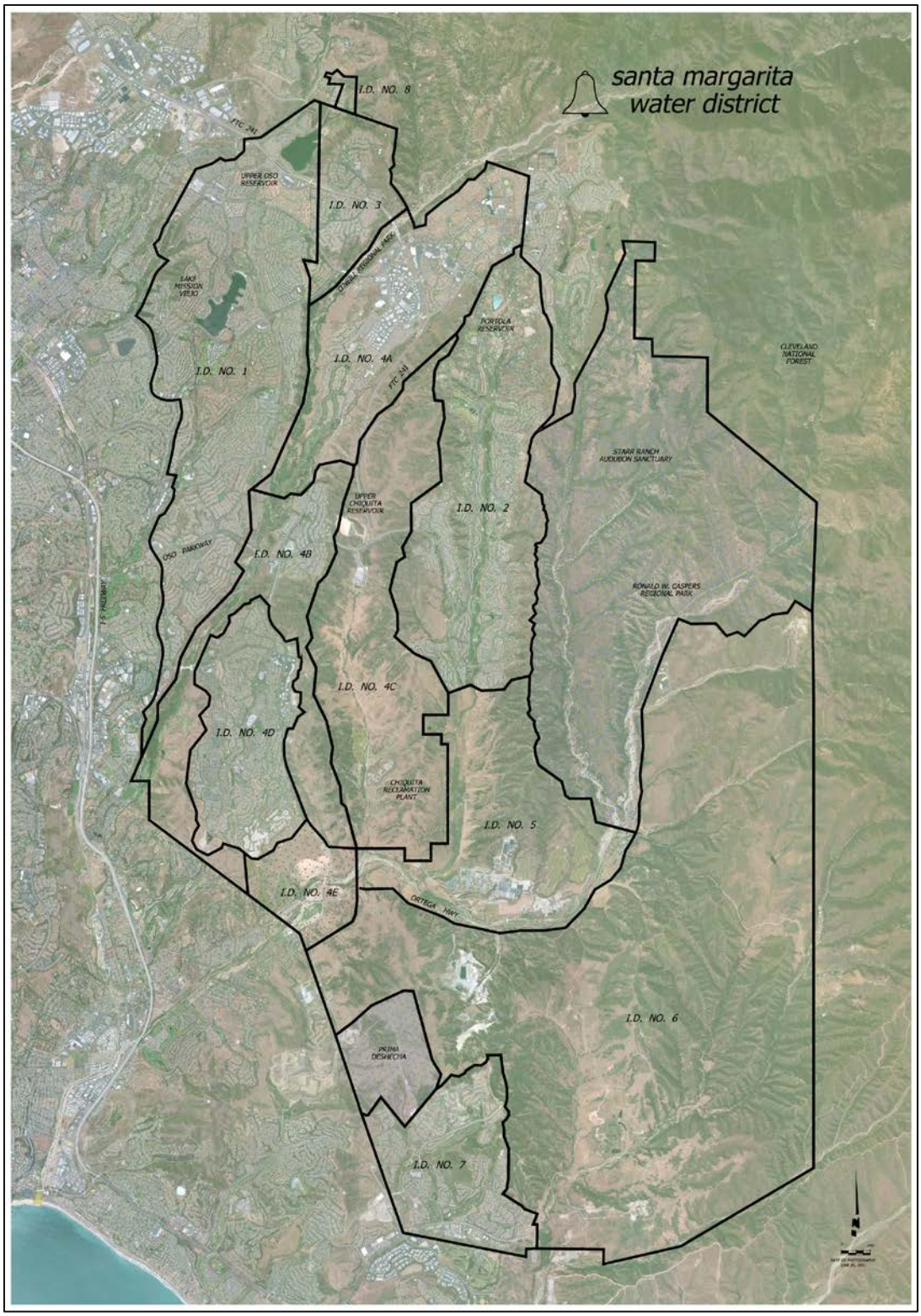


Figure 2-1: Santa Margarita Water District ID Boundaries

2.5 SBx7-7 Requirements

The Water Conservation Act of 2009, 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. The District must determine baseline water use during their baseline period and water use targets for the years 2015 and 2020 to meet the state's water reduction goal. The District may choose to comply with SBx7-7 individually or as a region in collaboration with other retail water suppliers in Orange County. Under the regional compliance option, the District is still required to report its individual water use targets. The District is required to be in compliance with SBx7-7 either individually or as part of the alliance, 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.

For the 2015 UWMP, the District must demonstrate compliance with its 2015 water use target to indicate whether or not they are on track to meeting the 2020 water use target. The District also revised their baseline per capita water use calculations using 2010 U.S. Census data. Changes in the baseline calculations also result in updated per capita water use targets.

DWR also requires agencies to submit SBx7-7 Verification Forms, a set of standardized tables to demonstrate compliance with the Water Conservation Act in this 2015 UWMP.

2.5.1 Baseline Water Use

The baseline water use is the District's gross water use divided by its service area population, reported in gallons per capita per day (GPCD). Gross water use is a measure of water that enters the distribution system of the supplier over a 12-month period with certain allowable exclusions. These exclusions are:

- Recycled water delivered within the service area
- Indirect recycled water
- Water placed in long term storage
- Water conveyed to another urban supplier
- Water delivered for agricultural use
- Process water

Water suppliers must report baseline water use for two baseline periods, the 10- to 15-year baseline (baseline GPCD) and the five-year baseline (target confirmation) as described below.

2.5.1.1 Ten to 15-Year Baseline Period (Baseline GPCD)

The first step to calculating the District's water use targets is to determine its base daily per capita water use (baseline water use). This baseline water use is essentially the District's gross water use divided by its service area population, reported in GPCD, which is calculated in the District's SBx7-7 verification form. The baseline water use is calculated as a continuous (rolling) 10-year average during a period, which ends no earlier than December 31, 2004 and no later than December 31, 2010. Water suppliers whose recycled water made up 10 percent or more of their 2008 retail water delivery can use up to a 15-

year average for the calculation. Recycled water use was 11 percent of the District's retail delivery in 2008; therefore, a 15-year baseline period is used.

The District's baseline water use is 210 GPCD, obtained from the 10-year period July 1, 1990 to June 30, 2005.

2.5.1.2 Five-Year Baseline Period (Target Confirmation)

Water suppliers are required to calculate water use, in GPCD, for a five-year baseline period. This number is used to confirm that the selected 2020 target meets the minimum water use reduction requirements. Regardless of the compliance option adopted by the District, it will need to meet a minimum water use target of 5 percent reduction from the five-year baseline water use. This five-year baseline water use is calculated as a continuous five-year average during a period, which ends no earlier than December 31, 2007 and no later than December 31, 2010. The District's five-year baseline water use is 202 GPCD, obtained from the five-year period July 1, 2003 to June 30, 2008.

2.5.1.3 Service Area Population

The District's service area boundaries correspond with the boundaries for a city or census designated place. This allows the District to use service area population estimates prepared by the Department of Finance (DOF). CDR is the entity which compiles population data for Orange County based on DOF data. The calculation of the District's baseline water use and water use targets in the 2010 UWMP was based on the 2000 U.S. Census population numbers obtained from CDR. The baseline water use and water use targets in this 2015 UWMP have been revised based on the 2010 U.S. Census population obtained from CDR in 2012.

2.5.2 SBx7-7 Water Use Targets

In the 2015 UWMP, the District may update its 2020 water use target by selecting a different target method than what was used in 2010. The target methods and determination of the 2015 and 2020 targets are described below.

2.5.2.1 SBx7-7 Target Methods

DWR has established four target calculation methods for urban retail water suppliers to choose from. The District is required to adopt one of the four options to comply with SBx7-7 requirements. The four options include:

- *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 GPCD
    - Landscape water use commensurate with the Model Landscape Ordinance
    - 10 percent reduction in baseline commercial/industrial/institutional (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.

The District selected to comply with Option 1 consistent with the option selected in 2010.

2.5.2.2 2015 and 2020 Targets

Under Compliance Option 1, the simple 20 percent reduction from the baseline, the District's 2015 target is 189 GPCD and the 2020 target is 169 GPCD as summarized in Table 2-10. The 2015 target is the midway value between the 10-year baseline and the confirmed 2020 target. In addition, the confirmed 2020 target needs to meet a minimum of 5 percent reduction from the five-year baseline water use. There were no adjustments made per Water Code 10608.24 and UWMP Guideline Section 5.8.2.

Table 2-10: Baselines and Targets Summary

Baselines and Targets Summary *Retail Agency*					
Baseline Period	Start Year	End Year	Average Baseline GPCD*	2015 Interim Target *	Confirmed 2020 Target*
10-15 year	*1991*	*2005*	*210*	*189*	*169*
5 Year	*2004*	*2008*	*202*		
*All values are in Gallons per Capita per Day (GPCD)					
NOTES:					

Table 2-11 compares the District's 2015 domestic water use target to its actual 2015 consumption. Based on this comparison, the District is in compliance with its 2015 interim target and is on track to meeting the 2020 water use target.

Table 2-11: 2015 Compliance

2015 Compliance *Retail Agency*		
Actual 2015 GPCD	2015 Interim Target GPCD	Did Supplier Achieve Targeted Reduction for 2015? Y/N
152	189	Yes
**All values are in Gallons per Capita per Day (GPCD)*		
NOTES:		

2.5.3 Regional Alliance

A retail supplier may choose to meet the SBx7-7 targets on its own or it may form a regional alliance with other retail suppliers to meet the water use target as a region. Within a Regional Alliance, each retail water supplier will have an additional opportunity to achieve compliance under both an individual target and a regional 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.

The District is a member of the Orange County 20x2020 Regional Alliance formed by MWDOC, its wholesaler. This regional alliance consists of 29 retail agencies in Orange County as described in MWDOC's 2015 UWMP. MWDOC provides assistance in the calculation of each retail agency's baseline water use and water use targets.

In 2015, the regional baseline and targets were revised to account for any revisions made by the retail agencies to their individual 2015 and 2020 targets. The regional water use target is the weighted average of the individual retail agencies' targets (by population). The Orange County 20x2020 Regional Alliance weighted 2015 target is 176 GPCD and 2020 target is 158 GPCD. The actual 2015 water use in the region is 125 GPCD, i.e. the region has already met its 2020 GPCD goal.

3 WATER SOURCES AND SUPPLY RELIABILITY

3.1 Overview

The District relies on a combination of imported water, urban runoff, purchased groundwater, and recycled water to meet its water needs. The District works together with two primary agencies, Metropolitan and MWDOC, to ensure a safe and reliable drinking water supply that will continue to serve the community in periods of drought and shortage. The sources of imported water supplies include water from the CRA and the SWP provided by Metropolitan and delivered through MWDOC.

The District's main source of water supply is imported water purchased from Metropolitan via MWDOC. In calendar year (CY) 2015, the District total water supply was approximately 78 percent imported water and 22 percent recycled water. No groundwater was used by the District in 2015. The District seeks to minimize its imported water usage by developing alternative domestic water supplies such as groundwater improvements and alternative water sources. By 2040, the District's water supply portfolio is projected to consist of 41 percent Metropolitan treated water, 13 percent alternative sourced water, 13 percent local groundwater, and 29 percent recycled water for irrigation, which is shown on Figure 3-1. The District is also seeking 2,000 AFY of water transfers as an emergency supply source.

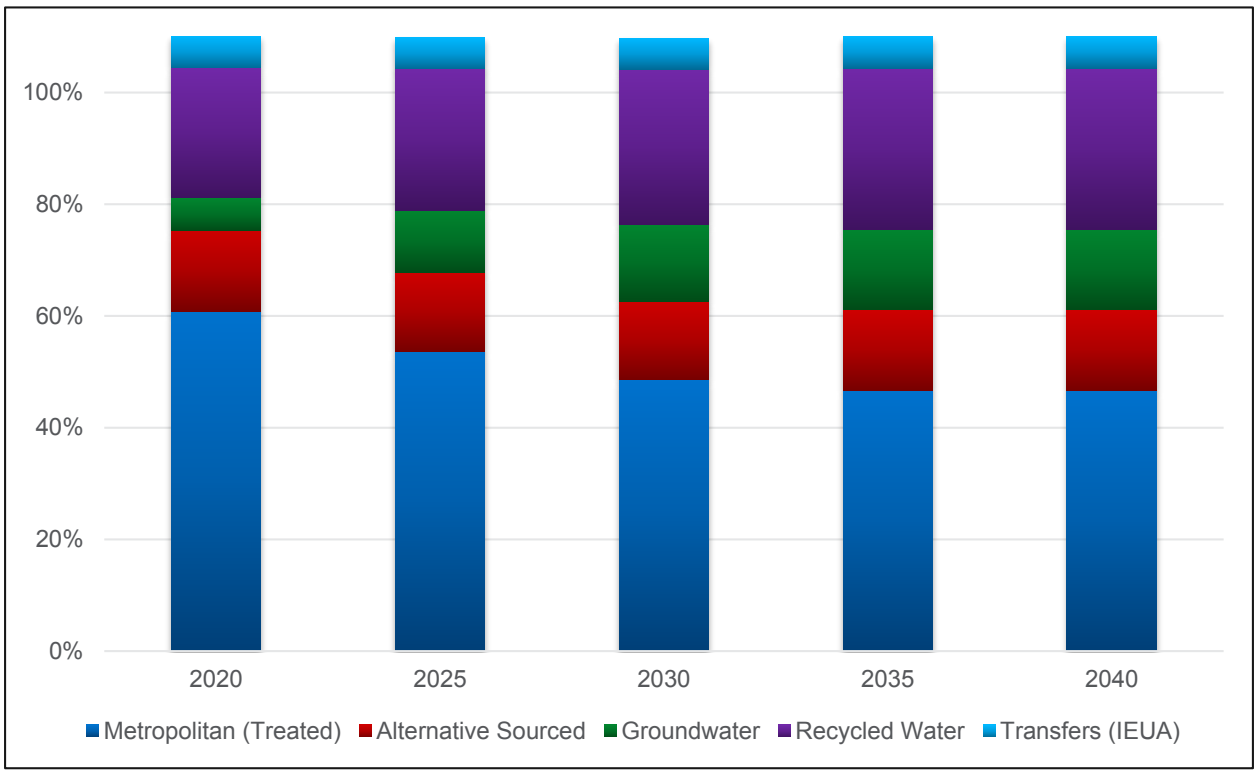


Figure 3-1: Water Supply Sources in the District

The following sections provide a detailed discussion of the District's water sources as well as projections for the District's future water supply portfolio for the next 25 years. Additionally, the District's projected

supply and demand under various hydrological conditions are compared to determine the District's supply reliability for the 25 year planning horizon.

3.2 Imported Water

The District's potable water is entirely dependent on imported water purchased from Metropolitan through MWDOC. Metropolitan's principal sources of water are the Colorado River via the CRA and the Lake Oroville watershed in Northern California through the SWP. Treatment of water taken from Metropolitan will occur at either the Diemer Filtration Plant or the Baker Treatment Plant before being delivered to the District.

The District has connections to the Allen-McColloch Pipeline (AMP) and the East Orange County Feeder No. 2 (EOCF #2) which both deliver potable water. The AMP is the District's primary source of potable water. It is connected to the South County Pipeline (SCP), which is jointly owned by the District and Metropolitan but operated by the District. The EOCF #2 is a pipeline jointly owned by several local agencies and Metropolitan. The District has capacity rights of 10,000 AFY in the EOCF #2. Water is also delivered through the Aufdenkamp Transmission Main to the District's Plaza Pump Station through CM-12. The District has 9,400 AFY capacity in the Baker Treatment Plant, operated by IRWD. This plant receives untreated water from Metropolitan through the Santiago Lateral and treats it to drinking water standards. The water from the Baker Treatment Plant is delivered to the District through the South County Pipeline. The District also import/purchases non-domestic water from IRWD, RMV, and MNWD.

3.2.1 Colorado River Supplies

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 million acre-feet(MAF) entitlement. 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 UWMP, May 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 Bureau of Reclamation, 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 State Water Project Supplies

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.

"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 percent 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 3-1.

Table 3-1: Metropolitan Colorado River Aqueduct Program Capabilities

Year	Average Annual Delta Exports (MAF)	Average Annual Table A Deliveries (MAF)
2005	2.96	2.82
2013	2.61	2.55
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 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 Storage

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.

Lake Oroville is the SWP's largest storage facility, with a capacity of about 3.5 MAF. The water is released from Oroville Dam into the Feather River as needed, which converges with the Sacramento River while some of the water at Bethany Reservoir is diverted from the California Aqueduct into the South Bay Aqueduct. The primary pumping plant, the Harvey O. Banks pumping plant, pumps Delta water into the California Aqueduct, which is the longest water conveyance system in California.

3.3 Groundwater

The District has had limited access to groundwater supply. The District plans to integrate groundwater into its future plans primarily through the use of the San Juan Basin.

3.3.1 San Juan Basin Characteristics

The 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 3-2. The four principal basins consist 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 Basin consists of a heterogeneous mixture of sand, silts, and gravel.

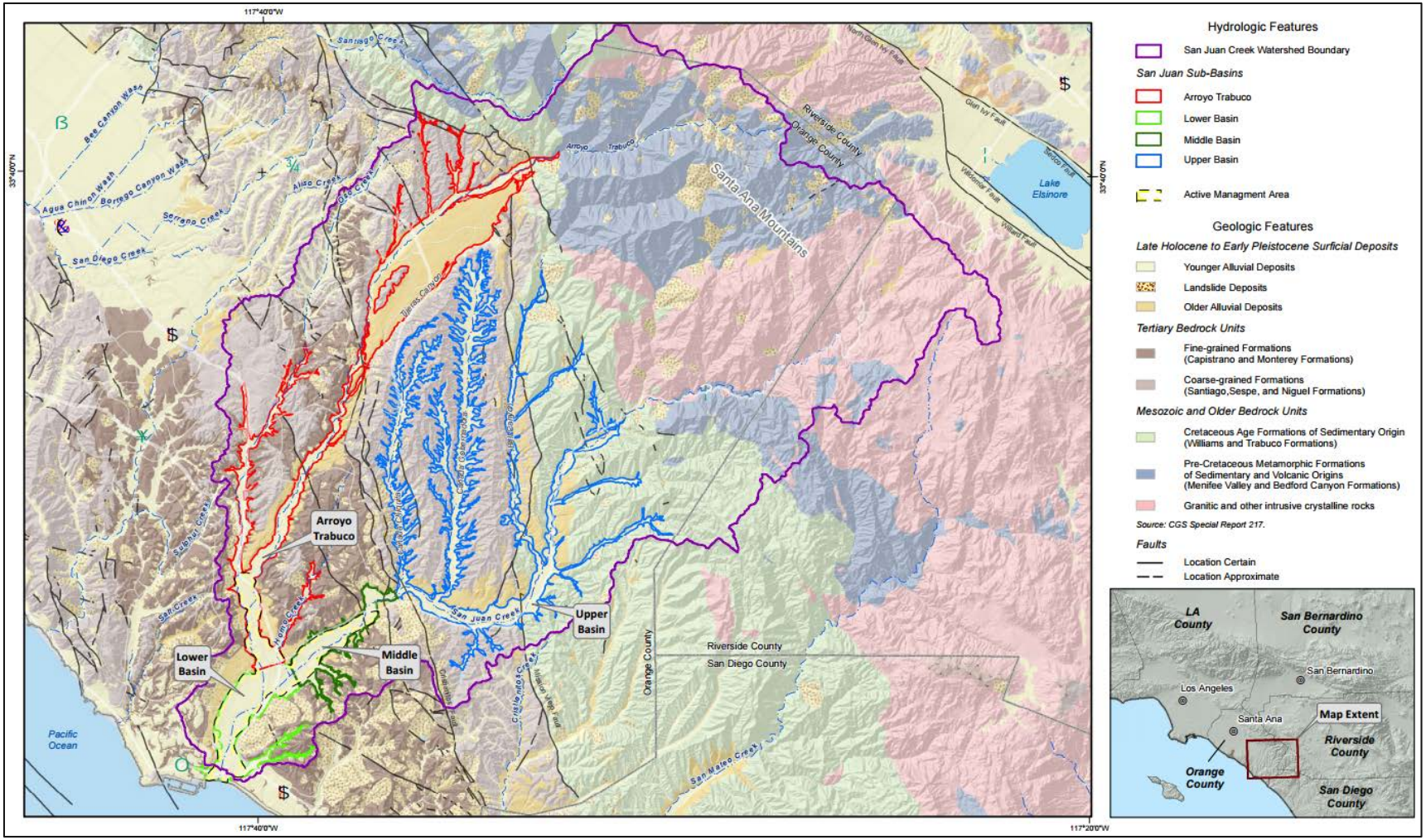


Figure 3-2: Principal Groundwater Basins for the San Juan Groundwater Basin

The physical boundaries of the 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.

The 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 Basin occurs from a variety of sources such as:

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

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

- South Coast Water District: 1,300 AFY
- San Juan Basin Authority: 8,026 AFY
- Santa Margarita Water District: 643 AFY
- San Juan Hills Golf Course: 450 AFY
- City of San Juan Capistrano: 3,325 AFY

The Basin is not adjudicated and differs from 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 San Juan Basin Authority (SJBA) and is a Joint Power Agency comprised of representatives from four local jurisdictions, the District, MNWD, the City of San Juan Capistrano, and South Coast Water District (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. Preliminary design work is underway to construct rubber dams within portions of San Juan Creek to increase the recharge of urban runoff and/or stormwater flows. This is anticipated to increase the yield from 1,000 – 2,000 AFY. Additional future efforts are anticipated that will use recycled water to recharge the basin which may increase the yield an additional 4,000 – 7,000 AFY (San Juan Basin Authority, Draft Foundational Action Program Report, March 2016). A more detailed description of the Basin’s characteristics can be found in Appendix C.

3.3.2 Groundwater Historical Extraction

Historically, the District has not pumped any groundwater from the San Juan Basin to be used within its service area but is projected to begin pumping by 2020.

3.3.3 Transfers and Exchanges

The District currently has transfer and exchange opportunities with CVWD, GSWC, and potentially Inland Empire Utilities Agency (IEUA). Detailed information on these opportunities can be found in Section 7.2.

3.4 Summary of Existing and Planned Sources of Water

The actual sources and volume of water for the year 2015 is displayed in Table 3-2.

Table 3-2: Water Supplies, Actual (AF)

Retail: Water Supplies — Actual			
Water Supply	Additional Detail on Water Supply	2015	
		Actual Volume	Water Quality
Groundwater	San Juan Groundwater Basin	0	Drinking Water
Purchased or Imported Water	MWDOC/MET	26,910	Drinking Water
Recycled Water		7,495	Recycled Water
	Total	34,405	
NOTES: Santa Margarita Water District Demand Forecast Updated Workbook, M.Cubed, January 2016.			

A summary of the current and planned sources of water for the District is shown in Table 3-3.

Table 3-3: Water Supplies, Projected (AF)

Retail: Water Supplies — Projected						
Water Supply	Additional Detail on Water Supply	Projected Water Supply *Report To the Extent Practicable*				
		2020	**2025**	**2030**	**2035**	**2040**
		Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume
Purchased or Imported Water	MWDOC/MET	11,500	9,700	8,100	6,800	6,800
Purchased or Imported Water	Baker	9,400	9,400	9,400	9,400	9,400
Other	Alternative Sources	5,000	5,000	5,000	5,000	5,000
Transfers	Emergency Source	2,000	2,000	2,000	2,000	2,000
Groundwater	San Juan Basin/IPR	2,000	4,000	5,000	5,000	5,000
Recycled Water	Irrigation purposes	10,885	11,411	11,830	11,665	11,515
	Total	40,785	41,511	41,330	39,865	39,715
NOTES: SMWD Demand Forecast, M.Cubed, January 2016.						

3.5 Recycled Water

One of the major components of the District's water conservation program is its recycled water program. The District provides additional treatment to a portion of its secondary treated wastewater. The recycled water is then used for landscape irrigation services. Demands for recycled water continue to increase as new and existing potable water irrigation services are continually being connected to the recycled water system. The District's recycled water program is more fully described in Section 6.

3.6 Supply Reliability

3.6.1 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. The District depends on a combination of imported and local supplies to meet its water demands and has taken numerous steps to ensure it has adequate supplies. Development of various local water augmentation projects will increase 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 are projected to meet full-service demands; Metropolitan's 2015 UWMP finds that Metropolitan is able to meet, full-service demands of its member agencies starting 2020 through 2040 during normal years, single dry year, and multiple dry years.

Metropolitan's 2015 Integrated Water Resource Plan (IRP) update 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 IRP preferred resource mix. This preferred resource mix includes conservation, local resources such as water recycling and groundwater recovery, Colorado River supplies and transfers, SWP supplies and transfers, in-region surface reservoir storage, in-region groundwater storage, out-of-region banking, treatment, conveyance and infrastructure improvements.

In the event of a local source not available at a consistent level of use, it will be supplemented with imported water from Metropolitan through MWDOC.

3.6.2 Factors Impacting Reliability

The following are some of the factors identified by Metropolitan that may have an impact on the reliability of Metropolitan supplies.

3.6.2.1 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.

3.6.2.2 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.

3.6.2.3 Water Quality

3.6.2.3.1 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 total dissolved solids (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 (PPCP). 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 also resulted in Metropolitan eliminating deliveries of CRA water into Diamond Valley Lake to keep the reservoir free from Quagga Mussels.

3.6.2.3.2 Groundwater

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).

3.6.2.4 Climate Change

Changing climate patterns are expected to shift precipitation patterns and affect water supply. 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 to the oceans. A heavy emphases on storage is needed in the State of California.

In addition, the Colorado River Basin supplies have been inconsistent since about the year 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.

3.6.3 Normal-Year Reliability Comparison

The District has entitlements to receive imported water from Metropolitan through MWDOC 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 when it is available to the Metropolitan distribution system. All imported water supplies are assumed available to the District from existing water transmission facilities. The demand and supplies listed below also include recycled water supplies that are available to the District.

For the 2015 UWMP, the normal year was selected as a range between 1995 through 2015. Due to ongoing drought conditions within California and the increased implementation of mitigation measures, this range was determined to represent an average water demand for this UWMP.

3.6.4 Single-Dry Year Reliability Comparison

A Single-dry year is defined as a single year of no to minimal rainfall within a period that average precipitation is expected to occur. The District has documented that it is 100 percent reliable for single dry year demands from 2020 through 2040 with a demand increase of 4 percent using FY 2001-02 as the single dry-year. This percentage was determined for the District by as part of the Santa Margarita Water District Water Demand Forecast based on historical demand from the service area and rainfall data, 2002 has the lowest amount of precipitation in the last 30 years (SMWD Water Demand Forecast, M.Cubed, January 2016).

3.6.5 Multiple-Dry Year Period Reliability Comparison

Multiple-dry years are defined as three or more years with minimal rainfall within a period of average precipitation. The District is capable of meeting all customers' demands with significant reserves held by Metropolitan, local recycled water supplies, and conservation in multiple dry years from 2020 through 2040. Demand increases of two percent for the first year, four percent for the second year and nine percent for the third year represent 2012-2014 as the three driest years in succession (SMWD Water Demand Forecast, M.Cubed, January 2016). These percentages were chosen to show the cumulative impact of low precipitation on demand. The basis of the water year is displayed in Table 3-4.

Table 3-4: Basis of Water Year Data

Retail: Basis of Water Year Data			
Year Type	Base Year	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	1995-2015		100%
Single-Dry Year	2002		104%
Multiple-Dry Years 1st Year	2012		102%
Multiple-Dry Years 2nd Year	2013		104%
Multiple-Dry Years 3rd Year	2014		109%
NOTES:			

3.7 Supply and Demand Assessment

A comparison between the supply and demand for projected years between 2020 and 2040 is shown in Table 3-5. As stated above, the available supply will meet projected demand due to diversified supply and conservation measures.

Table 3-5: Normal Year Supply and Demand Comparison (AF)

Retail: Normal Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040
Supply totals	40,785	41,511	41,330	39,865	39,715
Demand totals	37,273	37,992	37,816	36,360	36,210
Difference	3,512	3,519	3,514	3,505	3,505
NOTES: SMWD Forecast, M.Cubed, January 2016.					

A comparison between the supply and the demand in a single dry year is shown in Table 3-6. As stated above, the available supply will meet projected demand due to diversified supply and conservation measures.

Table 3-6: Single Dry Year Supply and Demand Comparison (AF)

Retail: Single Dry Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040
Supply totals	40,785	41,511	41,330	39,865	39,715
Demand totals	38,764	39,512	39,329	37,814	37,658
Difference	2,021	1,999	2,001	2,051	2,057
NOTES: SMWD Demand Forecast, M.Cubed, January 2016.					

A comparison between the supply and the demand in multiple dry years is shown in Table 3-7.

Table 3-7: Multiple Dry Years Supply and Demand Comparison (AF)

Retail: Multiple Dry Years Supply and Demand Comparison						
		2020	2025	2030	2035	2040
First year	Supply totals	40,785	41,511	41,330	39,865	39,715
	Demand totals	38,018	38,752	38,572	37,087	36,934
	Difference	2,767	2,759	2,758	2,778	2,781
Second year	Supply totals	40,785	41,511	41,330	39,865	39,715
	Demand totals	38,764	39,512	39,329	37,814	37,658
	Difference	2,021	1,999	2,001	2,051	2,057
Third year	Supply totals	40,785	41,511	41,330	39,865	39,715
	Demand totals	40,628	41,411	41,219	39,632	39,469
	Difference	157	100	111	233	246
NOTES: SMWD Demand Forecast, M.Cubed, January 2016.						

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 use reduction targets. The reporting requirements for DMM has been significantly modified and streamlined in 2014 by AB-2067. For a retail agency such as the District the reporting requirements changed from having 14 specific measures to six more general requirements plus an "other" category.

4.1 Water Waste Prevention Ordinances

Water waste prevention measures are undertaken as part of an overall comprehensive program throughout the District's service area directed to maximizing the availability of water for all customers while considering priorities of use by category (i.e. domestic health and safety). A Water Conservation Ordinance was adopted by the Board of Directors in 2009 as Ordinance No. 09-07-02 Comprehensive Water Conservation Program. This Ordinance was updated in 2014 (Ordinance No. 2014-10-03, Appendix D) as a response to California's latest drought and to incorporate the State's mandatory water waste restrictions and the District declared a shortage level two by resolution in August 2014. The Ordinance established a step by step plan for achieving water use efficiency and managing demand in times of a water shortage emergency throughout the District.

Ordinance No. 2014-10-03 constitutes permanent mandatory conservation requirements for all water users and additional requirements for commercial water users related to:

- Limits on Irrigation Practices
- Limits on water hours
- Limits on watering duration
- Efficient irrigation systems
- No water flow or runoff
- No Washing Down Hard or Paved Surfaces
- Obligation to Fix Leaks, Breaks or Malfunctions
- Re-circulating Water Required for Water Fountains and Decorative Water Features
- Swimming Pool and Spa Construction and Operations Best Practice
- Limits on Washing Vehicles
- Drinking Water Served Upon Request Only
- Commercial Lodging Establishments Must Provide Guests Option to Decline Daily Linen Services
- No Installation of Single Pass Cooling Systems
- No Installation of non-re-circulating Water Systems in Commercial Car Wash and Laundry Systems

- Restaurants Required to Use Water Conserving Dish Wash Spray Valves
- Commercial Car Wash Systems

Additionally, Ordinance 2014-10-03 establishes four water supply shortage response levels with increasing restrictions on water use in response to worsening drought or emergency conditions and decreasing supplies as described in Section 5. The current stage 2 conservation shortage level imposes mandatory water use restrictions and projects up to 20 percent water savings. In addition to the permanent conservation requirements described above, a stage 2 shortage imposes the following:

- Watering Days: Watering is limited to three days per week in the summer and one day per week during the winter according to the schedule posted on the District's website.
- Obligation to fix leaks, breaks, or malfunctions: These must be repaired within 48 hours.
- Limits on filling man-made lakes or ponds: This is prohibited except to sustain aquatic life of significant value that have been actively managed within the water feature prior to declaration of a supply shortage.
- Limits on washing vehicles: Vehicles may only be washed with hand-held buckets, hand-held hoses with a shutoff device, high pressure/low volume wash systems, or at commercial car washing facilities that use re-circulating water systems.
- Limits on re-filling residential swimming pools and spas: Re-filling more than one foot of potable water is prohibited.
- New pool construction: Owners, operators, and contractors must follow the District's Best Practices.
- Limits on use of potable water for construction: The use of potable water for construction is only permitted by a construction water use permit; otherwise recycled water must be used.

The District has implemented a residential audit program to help customers reduce their water use and bills. The first step in assisting the customers with water use efficiency is to identify customers with relatively high consumption and possible leaks. The District has developed and implemented a targeting strategy by means of work order codes, meter reading codes, evaluating abnormal water bills, and consumption comparisons. These work order and meter read codes were implemented in 1995 and have been modified periodically to increase efficiency within the conservation program. Table 4-1 summarizes the District's approach to performing audits.

Table 4-1: Audit Program

Audit Type	Generated by	Actions Taken
Audit 1 (A1)	Billing generated. Evaluated at the billing stage looking for abnormal consumption.	Meter readers make site visit to verify the meter read. Leak detection & notification.
Audit 2 (A2)	Customer generated.	Meter readers make site visit to verify the meter read. Leak detection.
Audit 3 (A3)	Staff review of monthly water consumption by customer type.	Review consumption history. Provide customer notification and information.
High Consumption Notifications (HC)	Customer Service and WUE Staff.	WUE staff contacts customers whose water use is abnormal, trending high, or otherwise warrants investigation. Invitation for Site Survey (SS) provided as well as District information related to Conservation Ordinance and WUE programs.
Site Surveys (SS)	Customer or WUE Staff	WUE staff meets on-site with customer to review water use patters, check for leaks, review/adjust irrigation system, recommend changes, and market District programs, rebates, and events.
Water Use Reports	Customer service and WUE team provides data to consultant who develops water use reports and on-line customer portal.	Customers are sent a bi-monthly water use report as well as given access to on-line customer portal. Leaks indicated, water use drought targets provided, as well as information about District's program and event activity.
Other Work Orders		
Pressure Check	Customer generated.	Field personnel obtain static and residual pressure at a customer's home and provides an A2 audit when necessary.
Meter Leak Notifications	Customer call, Customer Service Department, or Meter Reader	Site visit as soon as possible to repair, if needed.

Table 4-2 provides a summary of all audits and work orders conducted by the District over the last five years by year.

Table 4-2: Audit Program Implementation (FY 2010-11 to 2014-15)

Audits Single Family	2011	2012	2013	2014	2015
Audit 1 (A1)	39	148	203	338	263
Audit 2 (A2)	195	322	292	239	234
Audit 3 (A3)	1014	734	1218	622	55
High Consumption Notifications (HC)					385
Site Surveys (SS)					188
Water Use Reports	0	0	0	0	27,500
Pressure Check	53	63	72	72	33
Meter Leak Notifications	521	483	673	686	373

4.2 Metering

The District requires all new water connections to be metered. All of the District's domestic and recycled customer services are metered. The District charges customers by volume of use based on unit prices per billing unit of 100 cubic feet in addition to a fixed meter charge. The District promotes the use of dedicated landscape meters for commercial facilities. Since wastewater charges are based on metered water usage, there is a financial incentive for customers to separately meter interior uses and landscape.

As of January 2016, the District's dedicated irrigation meter and single-family residential services are all given water budgets as part of the District's budget-based rate structure. Water budgets are based on irrigated area and the evapotranspiration rates for a given billing period and residential budgets also factor in household size.

The District does have Automated Meter Reading (AMR) and Automated Metering Infrastructure (AMI). AMR is more prevalent in the newer Rancho Mission Viejo communities as well as in Coto de Caza. In the fall of 2015, the District, as part of its drought response, installed AMI meters on the top 150

dedicated irrigation services that use potable water. District staff monitors the water use of these accounts to assist customers in improving their irrigation efficiencies and for the District to view compliance with the District's Conservation Ordinance and mandatory water waste restrictions. Leaks can be viewed in real-time and notifications of leak alerts are given to irrigation customers so they can proactively fix leaks.

4.3 Conservation Pricing

The District has implemented a conservation-based rate structure since 1991 and bills all customer classes based on the volume of water consumed (measured in hundred cubic feet, or CCF). In 1991, the District implemented a residential ascending five block tiered-rate pricing structure that recovers cost for providing services while creating an economic incentive to use water efficiently. Non-residential customers (commercial and dedicated irrigation accounts) were charged uniform rates based on water consumption.

In 2015, as part of a long-term effort to properly recover costs and motivate efficiency through rate design, the District began the transition to a budget-based tiered rate structure. The new budget-based tiered rate structure establishes water budgets and tiered rates for single-family residential customers and dedicated irrigation customers based on factors such as occupancy and irrigated area. For multi-family customers, the rate structure is not tied to budgets but is based on an ascending five tier structure. Only commercial accounts remain on uniform rates.

Single-family residential budgets are comprised of both indoor and outdoor budgets. Each single-family residential customer will be allocated a reasonable amount of water for their monthly use, split into indoor and outdoor water budgets. For residential customers, the rate structure for the volumetric charge has five tiers. Residential customers who stay within their water budget remain in the first two tiers:

- Tier 1: Indoor Water Budget
- Tier 2**:** Outdoor Water Budget
- Tier 3: 101% to 150% of Total Water Budget
- Tier 4: 151% to 200% of Total Water Budget
- Tier 5: Over 201% of Total Water Budget

Figure 4-1 below provides an overview of how the indoor and outdoor budgets are calculated for single-family residential accounts.

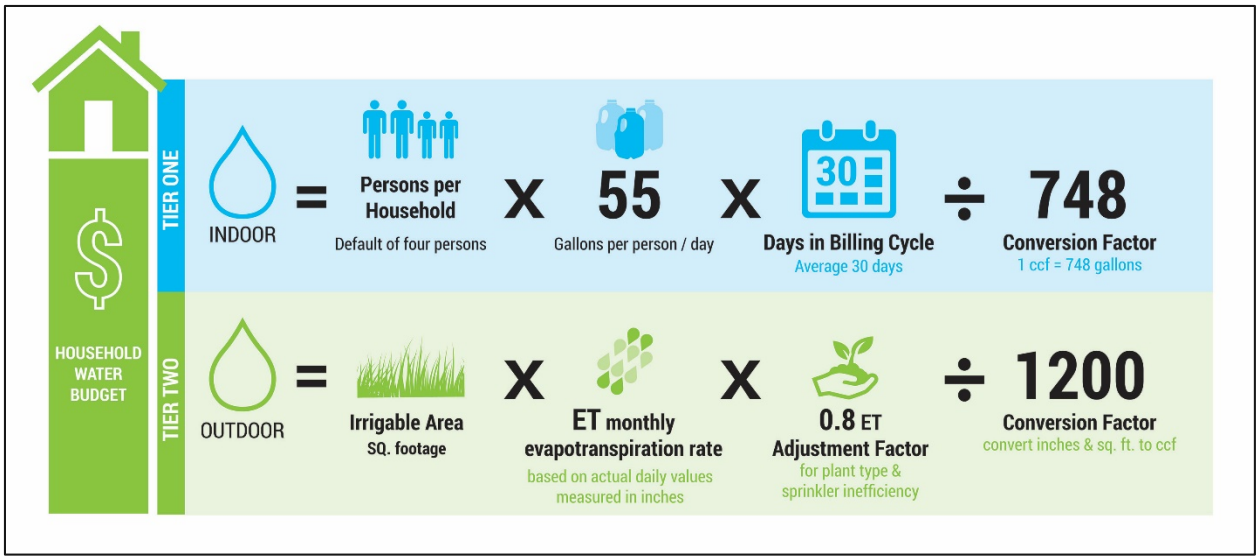


Figure 4-1: Single Family Residential Budget

Dedicated irrigation water budgets are comprised of just an outdoor water budget. Each dedicated irrigation account will be allocated a reasonable amount of water for their monthly use, based on the irrigable area served by that irrigation account (meter) and the evapotranspiration for the billing period. The rate structure for the volumetric charge has five tiers. Irrigation customers who stay within their water budget remain in the first two tiers:

- Tier 1: 50% of Outdoor Budget
- Tier 2: 100% of Outdoor Budget
- Tier 3: 101% to 150% of Outdoor Budget
- Tier 4: 151% to 200% of Outdoor Budget
- Tier 5: Over 201% of Outdoor Budget

Figure 4-2 below illustrates how the outdoor budget for dedicated irrigation accounts is calculated:

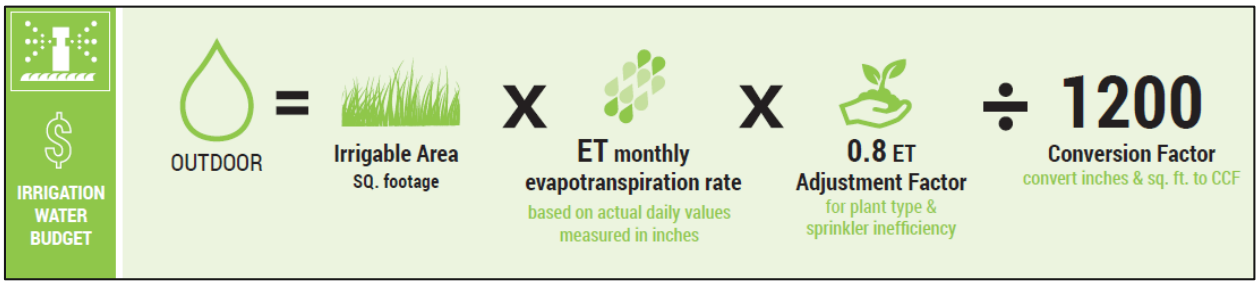


Figure 4-2: Outdoor Budget for Dedicated Irrigation Accounts

In order to properly assign a budget, evapotranspiration rates are required. The District has worked with DWR to bring two new weather stations into the California Irrigation Management Information System

(CIMIS). CIMIS station #241 is based in San Clemente in the community of Talega and CIMIS station #245 is located in Coto de Caza.

The District has built into the budget calculations a drought factor that can reduce a budget by a given percentage as necessary. This provides the District with a tool to manage demand based on water shortage conditions.

The District is committed to implementing this innovative and conservation-based rate structure for the foreseeable future and make changes to it as required over time. Detailed information about the District's budget-based rate structure can be found at **www.SMWD.com/rates**.

4.4 Public Education and Outreach

The District recognizes the importance of water conservation and protection of water resources of the State. As a matter of policy and operational practice, the District seeks to maximize the beneficial use of available water resources. Therefore, it is the policy of the District to discourage and prevent water waste, and to encourage various water conservation methods.

The District's Local Public Information Programs

The District's outreach and education programs complement water conservation programs implemented by Metropolitan and MWDOC. The District provides water conservation tips and helpful information for customers on its website and has the following programs designed to increase public awareness.

Bi-Monthly Newsletter – The District publishes a bi-monthly newsletter called OnTap. The newsletter discusses a variety of topics, including water conservation, water reclamation, and landscape management. The newsletter is distributed to each customer as part of the billing cycle. This involves a mailing of approximately 50,000 newsletters bi-monthly**.**

Bi-Monthly Bill Insert – The District also publishes a bi-monthly bill insert to provide customers with messages during the months when OnTap is not produced. Messages include quick conservation tips, Home Gardener Workshop class information and upcoming event information. The mailing is the same as OnTap with a production of 50,000 inserts. Both the OnTap and bill insert are available for viewing and downloading on the District's website (www.smwd.com).

Water Awareness Festival **-** This annual event is held by the District during Water Awareness Month in May. It is a family fun, education event with crafts, entertainment and activities geared towards water and conservation education. This event typically attracts over 1,000 residents and customers.

Communication with Facebook and Twitter **-** In 2009, the District created Facebook and Twitter pages (@SMWDwater) to increase and streamline communication with its customers. In 2015, the WUE team created an Instagram account which focusses on outdoor efficiency and landscape design. Each week, followers on both sites continue to increase and the District recognizes this social media tool as an invaluable way to communicate with the customers and key stakeholders.

Educational Brochures – The District has developed four educational brochures which are available for customers to view and download from the District's website. These brochures include information about the following:

- **Water Quality**: Describes the source of water in the District's service area and provides specific information regarding water quality issues such as disinfectants, Cryptosporidium, lead, and monitoring programs.
- **Water Costs:** Describes the District's tiered rate structure, imported water cost, energy cost, availability of supply and provides detailed instructions on how a customer can read their water bill to determine their usage patterns.
- **Water Conservation**: Explains the need to conserve water based on limited supply in a semi-arid region and the District's water conservation programs, including voluntary conservation programs and mandatory curtailment. Also provides water saving suggestions, such as installation of low-flow fixtures, landscape irrigation practices, and other water saving tips. The focus is on landscape irrigation efficiency as well as year-round conservation ordinance water waste prohibitions.
- **Water Wise Landscaping**: Comprehensive guide to drought tolerant planting, soil analysis, plant selection, landscape maintenance and irrigation practices. Also provides suggestions on proper watering, fertilizing and mowing of turf grass. (www.OCplants.org)
- **Customizable Watering Schedule**: The District maintains a website where customers can generate custom watering schedules based on plant type and sprinkler system. (www.OCplants.org/calc/)

Speaker Program – The District's Public Affairs efforts include a variety of presentations designed to convey the water conservation message to local organizations including homeowner associations, service clubs, business organizations, church groups, and public and private schools. The District and MWDOC have implemented this program aggressively. MWDOC's regional water education program began in 1973 and provides water education to Orange County students in grades kindergarten through high school. The program teaches students about the water cycle, the importance and value of water and water conservation.

Chiquita Treatment Plant Field Trips - The District offers an on-site field trip to small student groups along with the Boy and Girls Scouts within the District's service area. The educational field trip consists of touring Chiquita Water Reclamation Plant, hands-on water experiments, an explanation of the District's agency structure including the board of directors and the role they play, and an educational video focusing on urban runoff as well as a conservation presentation with a question-and-answer period.

SustainaBlue Landscape Workshop Series – The District offers various workshops for customers to learn from landscaping and design professionals. Details about the workshops offered are available on the District's website.

SustainaBlue Water Heroes – The District awards residents, businesses, students, and organizations every month who have demonstrated a commitment to efficiency and recognizes them at District Board meetings as well as promotes their efforts through traditional and social media.

MWDOC's Regional Public Information Programs

The District participates in public education and outreach programs administered by the District's wholesaler, MWDOC. MWDOC has established an extensive public education and outreach program to

assist its retail agencies in promoting water use efficiency awareness within their service areas. MWDOC's public education and outreach programs consist of five primary activities as described below.

MWDOC's public education and outreach programs are described below:

School Education Programs

MWDOC school education programs reach more than 100,000 Orange County students per year. The program has elementary and high school components.

- **Elementary School Program –** More than 60,000 students throughout Orange County are reached through assemblies hosted by the Discovery Science Center. MWDOC holds a $220,000 contract with the Discovery Science Center, funded proportionally by the participating MWDOC retail agencies. After the assembly, educational hand-out materials and activities are provided to teachers and students in order to encourage further water-related education at home. These materials include a recycled water-themed bag with conservation messaged school supplies, and a 16-page "Journey through Water" activity book produced and printed by MWDOC.
- **Water Education Poster and Slogan Contest -** Kindergarten through Sixth grade students are encouraged by the District to enter the county-wide Poster and Slogan contest by submitting artwork and slogans based on a water conservation theme. Winning artwork and slogans submitted by students in the District service area are recognized by the District Board of Directors during a regular board meeting. Winning students also receive a water conservation-related gift basket and are recognized in the District's OnTap newsletter.
- **High School Program** is new in 2015-16 and will reach students in 20 high schools in Orange County. The program is administered by MWDOC and operated by two contractors, the OC Department of Education and the Ecology Center. Through the three-year contract, those agencies will train more than 100 county teachers on water education on topics such as, water sources, water conservation, water recycling, watersheds, and ecological solutions for the benefit of their current and future students. Teachers will learn a variety of water conservation methods, such as irrigation technology, rainwater harvesting, water recycling, and water foot-printing through a tour at the Ecology Center facility. These trainings allow teachers to support student -led conservation efforts. The program will reach a minimum of 25,000 students by providing in-classroom water education and helping students plan and implement campus wide "Water Expos" that will allow peer-to-peer instruction on water issues. The $80,000 program is funded by participating agencies.

Value of Water Communication Program

MWDOC administers this program on behalf of 14 agencies. The $190,000 program involves the water agencies developing 30 full news pages that will appear weekly in the Orange County Register, the largest newspaper in the county, with a Sunday readership of 798,000. The campaign will educate OC residents and business leaders on water infrastructure issues and water use efficiency measures, as well as advertise water related events and other pertinent information.

Quarterly Water Policy Dinners

The Water Policy Dinner events attract 225 to 300 water and civic leaders every quarter. The programs host speakers topical to the OC water industry, with recent addresses from Felicia Marcus of the state

water board and Dr. Lucy Jones, a noted expert on earthquakes and their potential impact on infrastructure.

Annual Water Summit

The annual Water Summit brings together 300 Orange County water and civic leaders with state and national experts on water infrastructure and governance issues. The half-day event has a budget of $80,000 per year. Portions of the cost are covered by attendance and sponsorships, while MWDOC splits a portion with its event partner, the Orange County Water District.

Water Inspection Trips

Water Inspection trips take stakeholders on tours of the Colorado River Aqueduct, California Delta and other key water infrastructure sites. The public trips are required under Metropolitan's regulations. While Metropolitan covers the cost of the trips, MWDOC has two members of the public affairs staff that work diligently on identifying OC residents and leaders to attend. MWDOC staff also attends each trip. In the past year, MWDOC participated in a dozen trips, each taking an average of 30 residents. MWDOC also works with Metropolitan on special trips to educate County Grand Jurors the key water infrastructure.

4.5 Programs to Assess and Manage Distribution System Real Loss

SB-1420 signed into law in September 2014 requires urban water suppliers that submit UWMPs to calculate annual system water losses using the water audit methodology developed by the AWWA. SB 1420 requires the water loss audit be submitted to DWR every five years as part of the urban water supplier's UWMP. Water auditing is the basis for effective water loss control. DWR's UWMP Guidebook include a water audit manual intended to help water utilities complete the AWWA Water Audit on an annual basis.

The District performed a forensic water loss audit with the assistance of an outside consultant to prepare for these new regulations. The water loss audit was completed for the District from July 1st, 2013 to June 1st, 2014. The resulting performance indicators showed that the District operates an extremely tight system with non-revenue water accounting for less than 5 percent of the total potable water supplied. The District also performed a component analysis on its distribution system to focus its efforts on sustaining a low water loss volume.

4.6 Water Conservation Program Coordination and Staffing Support

Since 2010, the District has committed dedicated full-time staff to implementing water use efficiency programs. In 2014 the District expanded the water use efficiency staff to one full-time Water Use Efficiency Administrator and one full-time Water Use Efficiency Specialist. In early 2015 the WUE staff added another full-time Water Use Efficiency Specialist position to bring the program staff up to three full time employees.

The Water Use Efficiency Specialists report to the Water Use Efficiency Administrator and are responsible for:

- Coordinate, schedules, and conducts site surveys to help customers save water and improve efficiency.

- Identifies and reaches out to high water use customers to market District programs and offer site surveys.
- Prepares water conservation materials and rebate information to be used as handouts and postings on the District website.
- Represents the District at community and special events related to conservation and attend and participates in regional workshops.
- Plans, schedules, and teaches community workshops on subjects related to water conservation.

The Water Use Efficiency Administrator role is to support other District departments in maintaining the District's water supply reliability, manage the District's water use efficiency program, and participate in water policy discussions at the local, regional and state level. The Water Use Efficiency Administrator also assists District customers, particularly Cities and Homeowners Associations with the conversion from potable water to recycled water to help the District meet per capita reduction goals.

The District has funded water conservation programs from the Operating Budget for each FY. In FY 2014-2015, the District supplemented the Operating Budget with Reserve Funds as a drought response to achieve the State's Emergency Conservation drought reduction target. Table 4-3 highlights the previous FY budgets and estimates future conservation budgets.

Table 4-3: Water Education School Program Assemblies

Year	Water Conservation Budget (does not include salary and benefits)
2010	$25,900
2011	$26,100
2012	$41,700
2013	$32,700
2014	$54,000
2015	$287,000
2016	$444,000
2017	$250,000
2018	$250,000
2019	$250,000
2020	$250,000

4.7 Other Demand Management Measures

During the past five years, FY 2010-11 to 2014-15, the District, with the assistance of MWDOC, has implemented many water use efficiency programs for its residential, CII, and landscape customers as described below. Appendix H provides quantities of rebates and installations achieved under each program since program inception. The District will continue to implement all applicable programs in the next five years.

4.7.1 Residential Programs

WaterSmart Home Water Reports

The District implemented a pilot program in January 2015 with WaterSmart Software to provide 2,000 customers with enhanced water use information through home water use reports and an on-line customer dashboard. This pilot program resulted in program participants using approximately 2.5 percent less water than a control group. The District has expanded the program to a broader customer base. Approximately 28,000 single-family residential customers receive home water reports and all customers, regardless of customer classification, are able to login to the customer portal to view pertinent water use information. The District has benefited from its customers receiving timely and actionable information about their water use and this type of program will be carried on into the future.

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; the District offers a $100 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 ($100 rebate from the District) 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. HETS save an average of 38 gallons of water per day while maintaining high performance standards.

4.7.2 CII Programs

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.

Socal Water$mart Rebate Program for Commercial Landscapes

The District through MWDOC offers financial incentives under the Socal Water$mart Rebate Program which offers rebates for various water efficient devices to CII customers, such as high efficiency toilets, ultralow volume urinals, connectionless food steamers, air-cooled ice machines, pH-cooling towers controller, and dry vacuum pumps.

4.7.3 Landscape Programs

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 agencies. 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).

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.

Smart Timer Rebate Program

Smart Timers are irrigation controllers that are either weather-based irrigation controllers (WBIC) 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 appropriate amount of water throughout the year. During the fall months, when property owners and landscape professionals often overwater, Smart Timers have been proven to be capable of saving significant amounts of water.

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 is intended to offset the cost of the device and installation.

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.

Socal Water$mart Rebate Program Commercial for Landscapes

The District, through MWDOC, also offers financial incentives under the SoCal Water$mart Rebate Program for a variety of water efficient landscape devices, such as Central Computer Irrigation Controllers, large rotary nozzles, and in-stem flow regulators.

SustainaBlue Design Studio

The District will help eligible homes to a design custom low water landscape for their yards. Participants receive a 45 minute consultation with a local landscape designer, a landscape design drawing, a customized plant palette, suggested irrigation adjustments and watering guide, a general plant maintenance plan, and information on District programs and rebates.

Landscape Conversion Kit Rebate

The District offers rebates for replacing lawns and high water shrubs. My Avant Garden Native Front Yard Conversion Kits are available for purchase and include a detailed design plan, live California native plants, step-by-step installation instructions, educational classes, and customer support.

Tree of Life Nursery's Design Assistance Rebate

The District will reimburse residents for a $45, half hour garden design consultation with a "Designer in Residence" at the Tree of Life Nursery to help them convert their landscaping to a more sustainable native plant garden. After the consultation, participants also receive a voucher for a ten percent discount on their next plant purchase.

HOA and Large Landscape

The District provides large landscape customers like homeowners associations' with resources, tools, and incentives to efficiently manage water and maintain healthy aesthetic landscapes. The District offers free professional landscape training classes, various rebates, water management programs, landscape irrigation surveys, and informational luncheons.

WaterDex Remote Irrigation Pilot Program

In January – June 2015, the District distributed approximately 500 WaterDex units to homeowners. WaterDex devices attach onto existing sprinkler controllers and allow residents to easily and remotely adjust irrigation runtimes based with a dial that ranges from zero to one hundred, which corresponds to the percentage of summer watering required. Homeowners are given a weekly email indicating what the WaterDex percentage value is that way residents can make adjustments to their watering throughout the year. This pilot program generated water savings of 27.7 gallons per day per home which represents 15 AFY of water savings and 75 AF over the device's five year lifetime. The District expects to implement similar outdoor programs using this or other emerging water smart technology.

5 WATER SHORTAGE CONTINGENCY PLAN

5.1 Overview

Due to current and potential future water supply shortages, Governor Brown issued a drought emergency proclamation on January 2014 and signed the 2014 Executive Order that directs urban water suppliers to implement drought response plans to limit outdoor irrigation and wasteful water practices if they are not already in place. Pursuant to California Water Code Section 106, potable water use is the highest beneficial use of water with the next highest use as irrigation. This section describes the water supply shortage policies Metropolitan and the District have in place to respond to events including catastrophic interruption and reduction in water supply.

5.2 Shortage Actions

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 (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 Diamond Valley Lake (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.

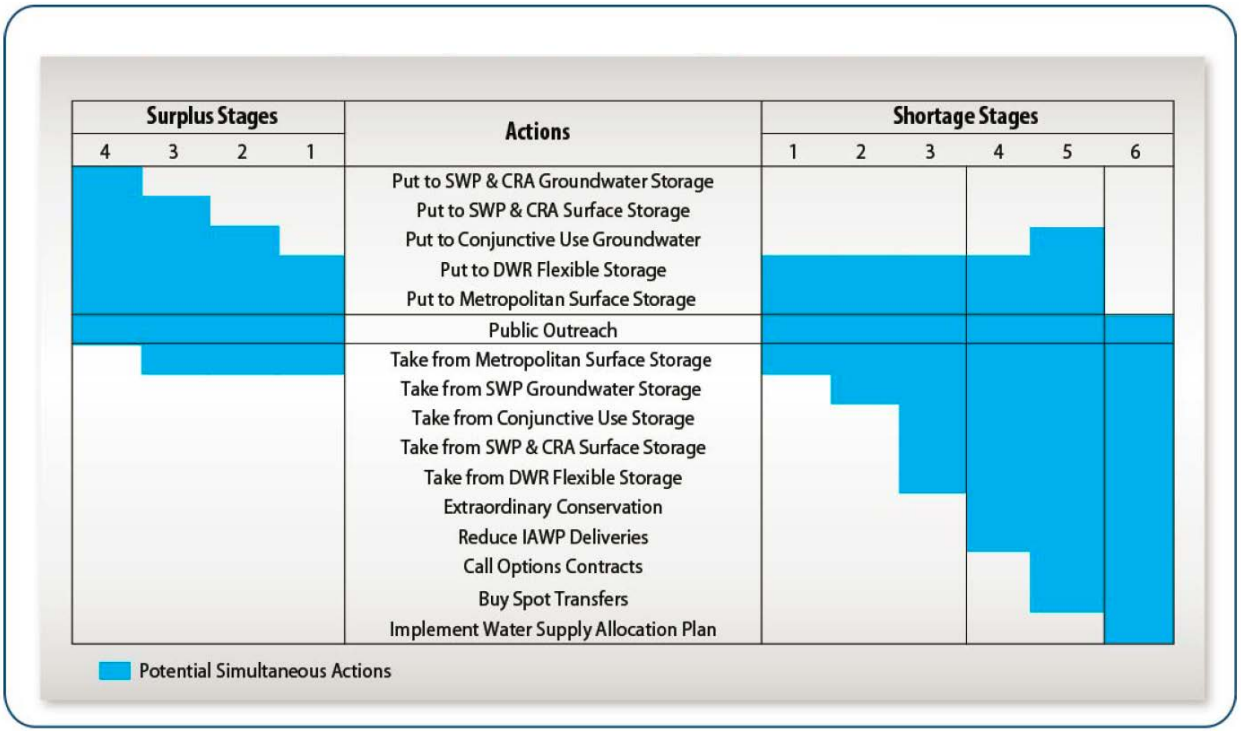


Figure 5-1: Resource Stages, Anticipated Actions, and Supply Declarations

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 UWMP, May 2016).

5.2.2 Metropolitan 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 WSAP.

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 (Metropolitan, 2015 UWMP, May 2016).

5.2.3 MWDOC 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 (acre-feet 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.

5.2.4 Santa Margarita Water District

The District Board of Directors adopted its Comprehensive Water Conservation Program Ordinance No. 2014-10-03 in October 2014, which established a staged water conservation program that will encourage reduced water consumption within the District through conservation, enable effective water supply planning, assure reasonable and beneficial use of water, prevent waste of water, and maximize the efficient use of water within the District. Along with permanent water conservation requirements, the District's Water Conservation and Water Supply Shortage program consists of the following four stages found in Table 5-1 to respond to a reduction in potable water available to the District for distribution to its customers. Stage 1 water use measures are in effect at all times unless a mandatory conservation stage (stages 2, 3, and 4) is issued by the District's Board of Directors (Santa Margarita Water District, Ordinance No. 2014-10-03, October 2014).

Table 5-1: Stages of Water Shortage Contingency Plan

Retail Stages of Water Shortage Contingency Plan		
Stage	Complete Both	
	Supply Reduction[1]	Water Supply Condition
1	Up to 10%	Exists when the District encourages customers to voluntarily conserve water.
2	Up to 20%	Exists when the District determines water supply shortage exists and consumer demand reduction necessary to use water efficiently and respond to water conditions.
3	Up to 40%	Exists when the District notifies residents and businesses significant reduction in consumer demand is necessary to maintain sufficient water supplies for public health and safety.
4	Over 40%	Exists when the District declares severe drought conditions exists and significant reduction in consumer demand necessary to maintain sufficient water supplies for public health and safety.
[1] One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.		
NOTES: District Water Conservation Program		

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 Water District 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 its member agencies accepted the terms and conditions of Metropolitan's shortage allocation plan, which allocated imported water under limited supply conditions. In fact, in FY 2015-2016, Metropolitan implemented its WSAP at a stage level 3 (seeking no greater than 15 percent region reduction of water use), which is the largest reduction Metropolitan has ever imposed on its member agencies. This WSAP level 3 reduction 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.

MWDOC has adopted a shortage allocation plan and accompanying allocation model that estimates firm demands on MWDOC. Assuming MWDOC would not be imposing mandatory restrictions if Metropolitan is not, the estimate of firm demands in MWDOC's latest allocation model has been used to estimate the

minimum imported supplies available to each of MWDOC's retail agencies for 2015-2018. Thus, the estimate of the minimum imported supplies available to the District is 29,202 AFY as shown in Table 5-2 (MWDOC, Water Shortage Allocation Model, November 2015).

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

Retail: Minimum Supply Next Three Years			
	2016	2017	2018
Available Water Supply	29,202	29,202	29,202
NOTES: MWDOC Water Shortage Allocation Model			

5.4 Catastrophic Supply Interruption

Given the great distances that imported supplies travel to reach Orange County, the region is vulnerable to interruptions along hundreds of miles aqueducts, pipelines and other facilities associated with delivering the supplies to the region. Additionally, the infrastructure in place to deliver supplies are susceptible to damage from earthquakes and other disasters.

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 WSDM Plan and WSAP. 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 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 of Orange County

In 1983, the Orange County water community identified a need to develop a plan on how agencies would respond effectively to disasters impacting the regional water distribution system. The collective efforts of these agencies resulted in the formation of the Water Emergency Response Organization of Orange County (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 county, state, and federal disaster coordination agencies. Within the Orange County Operational Area, WEROC is the recognized contact for emergency response for the water community, including the District.

5.4.3 Santa Margarita Water District

The District maintains interconnections with adjacent local water suppliers including MNWD, IRWD, TCWD, ETWD, City of San Juan Capistrano, and City of San Clemente. These interconnections serve as an emergency source of supply and to collectively increase the water supply delivery reliability for interconnected agencies.

The District also has 51 percent of the capacity in the 430 AF El Toro R-6 Domestic Water Reservoir which substantially increased the emergency storage within the District. The District also has 38 percent of the capacity in the 750 AF Upper Chiquita Reservoir, increasing its regional storage capacity to approximately 720 AF.

The District maintains a set of preparation actions to respond to various sorts of catastrophes. These actions items are listed below.

- ***Regional Power Outage:*** The District will coordinate with Southern California Edison and/or San Diego Gas and Electric for schedule of restoration of service. Sites with back-up power generators will check that the generators are functioning and assess their fuel requirements. The District will assess its reservoir levels and coordinate reduction of demand by providing back-up emergency pumps if necessary.
- ***Earthquake:*** The District will activate its emergency response plan and contact customers directly or through media as needed to curtail demand. The District will initiate mutual aid with its neighboring district, coordinate with the Department of Drinking Water (DDW), and issue health directives if necessary.
- ***Facility Failure:*** The District will isolate the facility and coordinate demand reduction as required. The District will issue appropriate health directives as needed and provide alternative service and initiate repairs or replacement of the facility.
- ***Water Supply Interruption:*** The District will curtail water demand reductions as appropriate to insure fire safety and health concerns and use its interconnections and storage if necessary.
- ***Water Supply Contamination:*** The District will notify the DDW, isolate systems that are contaminated, and issue health directives if necessary.

5.5 Prohibitions, Penalties and Consumption Reduction Methods

5.5.1 Prohibitions

The Comprehensive Water Program Ordinance No. 2014-10-03 lists water conservation requirements which shall take effect upon implementation by the District. These prohibitions shall promote the efficient use of water, reduce or eliminate water waste, and enable implementation of the District's Water Shortage Contingency Measures. The water use measures and the stages at which they take effect can be found in Table 5-3. It is important to note that the District is always implementing Stage 1 restrictions.

Table 5-3: Restrictions and Prohibitions on End Uses

Retail Only: Restrictions and Prohibitions on End Uses			
Stage	Restrictions and Prohibitions on End Users	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement ?
1	Landscape - Limit landscape irrigation to specific times	Irrigation prohibited between 8:00 a.m. and 6:00 p.m. any day	No
1	Landscape - Other landscape restriction or prohibition	Irrigation limited to fifteen minutes at most for unattended irrigation systems	No
1	Landscape - Restrict or prohibit runoff from landscape irrigation	-	No
1	Other - Prohibit use of potable water for washing hard surfaces	-	No
1	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Correct leaks, breaks, and other malfunctions in seven days after notice	No
1	Water Features - Restrict water use for decorative water features, such as fountains	Prohibit operating decorative water feature that does not use recirculated water	No
1	Other water feature or swimming pool restriction	Follow Best Practices for construction and operation of swimming pools	No
1	Other –Vehicle washing permitted if by bucket or hose with equipped automatic shut-off nozzle.	-	No
1	CII - Restaurants may only serve water upon request	-	No
1	CII - Lodging establishment must offer opt out of linen service	-	No
1	Other	Prohibit installation of single pass cooling systems	No

Retail Only: Restrictions and Prohibitions on End Uses			
Stage	Restrictions and Prohibitions on End Users	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement ?
1	Other	Prohibit installation of non-re-circulating water systems in new commercial conveyor car wash and commercial laundry operations	No
1	CII - Commercial kitchens required to use pre-rinse spray valves	-	No
1	Other	Commercial conveyor car wash systems required to have operational recirculating water systems	No
2	Landscape - Limit landscape irrigation to specific days	Irrigation limited to three days per week on District posted schedule. Irrigation in months of November through March limited to one day per week	Yes
2	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Correct leaks, breaks, and other malfunctions in two days after notice	Yes
2	Other water feature or swimming pool restriction	Prohibit filling man-made lakes or ponds to sustain aquatic life	Yes
2	Other - Prohibit vehicle washing except at facilities using recycled or recirculating water	Prohibit cleaning vehicles except by use of hand-held bucket or at a commercial car washing facility that uses a recirculating water system	Yes
2	Other water feature or swimming pool restriction	Prohibit refilling of more than one foot of residential swimming pools or outdoor spas with potable water except to protect public health, safety, and welfare	Yes
2	Other water feature or swimming pool restriction	Follow District's Best Practices for swimming pools	Yes
2	Other	Potable water for construction use allowed only in accordance with	Yes

Retail Only: Restrictions and Prohibitions on End Uses			
Stage	Restrictions and Prohibitions on End Users	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement ?
		the provisions of a construction water use permit	
3	Landscape - Limit landscape irrigation to specific days	Irrigation limited to two days per week on District posted schedule. Irrigation in months of November through March is limited to one day per week	Yes
3	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Correct leaks, breaks, and other malfunctions in one day after notice	Yes
3	Other water feature or swimming pool restriction	Lake filling permit required to fill man-made lakes or ponds	Yes
3	Other	No new potable water service provided except with express permission from the District	Yes
3	Other	The District will suspend annexations to its service area	Yes
4	Landscape - Prohibit all landscape irrigation	-	Yes
4	Landscape - Prohibit certain types of landscape irrigation	Prohibit watering for agricultural or commercial nurseries except for livestock watering	Yes
4	Other - Prohibit vehicle washing except at facilities using recycled or recirculating water	Water use at commercial car washes reduced by 50 percent except for health, safety, and welfare of the public	Yes
4	Other water feature or swimming pool restriction	Prohibit filling residential swimming pools, spas, ponds, or lakes	Yes

5.5.2 Penalties

Any customer who violates provisions of the Comprehensive Water Conservation Ordinance by either excess use of water or by specific violation of one or more of the applicable water use restrictions for a particular mandatory conservation stage may be cited by the District and may be subject to written notices, surcharges, fines, flow restrictions, disconnection, and termination of service.

The first instance of non-compliance will result in a citation from the District. The second and third instance of non-compliance will result in a fine not to exceed one hundred dollars and two hundred and fifty dollars, respectively. Fourth and subsequent instances of non-compliance will result in a fine not to exceed five hundred dollars ($500). In addition to fines, the District may, at its own discretion, install a water flow restrictor device and/or terminate service of the offending customer. The customer is responsible for any fees related to the installation and/or removal of any flow restricting device before the device is removed (Santa Margarita Water District, Ordinance No. 2014-10-03, October 2014). As a result of successful conservation, the District has not penalized any customers to date.

5.5.3 Consumption Reduction Methods

Table 5-4 lists the consumption reduction methods that will be used to reduce water use in restrictive stages.

Table 5-4: Stages of Water Shortage Contingency Plan - Consumption Reduction Methods

Retail Only: Stages of Water Shortage Contingency Plan - Consumption Reduction Methods		
Stage	Consumption Reduction Methods by Water Supplier	Additional Explanation or Reference
1	Other	Stage 1 Voluntary Conservation Measures
2	Other	Stage 2 Drought or Emergency Condition Conservation Measures
3	Other	Stage 3 Serious Drought Condition Conservation Measures
4	Other	Stage 4 Mandatory Conservation Measures
NOTES: District Water Conservation Program		

5.6 Impacts to Revenue

During a catastrophic interruption of local water supplies, prolonged drought, or water shortage of any kind, the District will experience a reduction in revenue due to reduced water sales. Throughout this period of time, expenditures may increase or decrease with varying circumstances. Expenditures may increase in the event of significant damage to the water system, resulting in emergency repairs. Expenditures may also decrease as less water is pumped through the system, resulting in lower power costs.

The District receives water revenue from a service charge and a commodity charge based on consumption. The service charge recovers costs associated with providing water to the serviced property. The service charge does not vary with consumption and the commodity charge is based on water usage. Rates have been designed to recover the full cost of water service in the charges. Therefore, the total cost of purchasing water would decrease as the usage or sale of water decreases. The intent of this approach is to insulate the District's necessary revenues from the vagaries of water use.

However, there are significant fixed costs associated with maintaining a minimal level of service. The District will monitor projected revenues and expenditures should an extreme shortage and a large

reduction in water sales occur for an extended period of time. To overcome these potential revenue losses and/or expenditure impacts, the District may use reserves. If necessary, the District may reduce expenditures by delaying implementation of its Capital Improvement Program and equipment purchases, and/or adjust the work force, implement a drought surcharge, and/or make adjustments to its water rate structure.

5.7 Reduction Measuring Mechanism

The District has a variety of mechanisms in place to determine water use reduction. All of the District's connections are metered and read monthly. Records of water usage are kept for analysis. The interval between water use readings can be increased in frequency for high water users during emergency situations. The District also tracks water imports and water production amounts daily and reports those values to appropriate departments for monitoring. The District coordinated with large irrigation customers to establish irrigation cycles and irrigation demands.

MWDOC provides each member agency with monthly water use reports that will compare each member agency's current cumulative retail usage to their allocation baseline.

6 RECYCLED WATER

Southern California discharges treated wastewater to the ocean every day that could potentially be reused to further minimize dependence on imported water sources. Reuse opportunities have continued to grow with public acceptance and increased economic viability. Recycled water provides flexibility and increases reliability during drought conditions as imported water supplies diminish. Recycled water is wastewater that is purified through primary, secondary and tertiary treatment and can be used for most non-potable water purposes such as landscape irrigation, as well as commercial and industrial processes defined by Title 22 requirements. The District's existing recycled water system provides a supplemental landscape irrigation supply within its service area.

6.1 Agency Coordination

There are a number of water agencies in south Orange County that provide wastewater collection and treatment to Title 22 recycled water standards. These agencies have been in the forefront of recycled water development to diversify water supplies in order to reduce their dependence on imported water for non-potable needs and because of limited groundwater supplies impacted by local geography. Each of the south Orange County agencies supplements their supply portfolio with recycled water when needed. The District's current non-potable water supply consists of urban runoff and tertiary recycled water.

6.2 Wastewater Description and Disposal

The District generates approximately 10.35 million gallons per day (MGD) of wastewater and provides sewer collection services to portions of the Cities of Rancho Santa Margarita, Mission Viejo, and San Clemente, as well as unincorporated areas of south Orange County. The District's wastewater system includes approximately 615 miles of pipe ranging from 6 inches to 42 inches in diameter, 20 sewer lift stations, 2 District owned wastewater treatment plants, and 3 jointly owned wastewater treatment plants as shown in Appendix I. The five existing wastewater treatment plants are:

- Oso Creek Water Reclamation Plant
- 3A Water Reclamation Plant
- J.B. Latham Treatment Plant
- Los Alisos Water Recycling Plant
- Chiquita Water Reclamation Plant

The Oso Creek Water Reclamation Plant (OCWRP) is owned and operated by the District and has a design capacity of 3 MGD. OCWRP diverts wastewater from the Oso Trunk Sewer and treats it to Title 22 tertiary levels where it is conveyed to the District's recycled water system where it is beneficially reused. The solids removed during treatment are returned to Oso Trunk Sewer for handling at the J.B. Latham Treatment Plant.

The 3A Water Reclamation Plant (WRP) is jointly owned by the District and MNWD and has been operated by the District since July 1, 2015. Wastewater diverted from the Oso Trunk Sewer is treated at

3A WRP to Title 22 tertiary levels prior to beneficial reuse in the MNWD and District's recycled water systems. Flows exceeding the 2.4 MGD plant tertiary capacity bypass 3A and flow to the J.B. Latham Treatment Plant. Solids are treated onsite. The plant has secondary treatment capacity of 6 MGD. The current tertiary treatment capacity is 2.4 MGD. The District is currently in design for the expansion of the tertiary treatment capacity to 6 MGD

J.B. Latham is a 13 MGD wastewater treatment plant that is owned and operated by Southern Orange County Wastewater Authority (SOCWA) that treats wastewater to secondary effluent standards prior to discharge through the San Juan Creek Ocean Outfall. The District has 2.25 MGD of capacity in the plant. J.B. Latham does not produce tertiary treated water. OCWRP, 3A, and J.B. Latham provide wastewater treatment for a majority of the City of Mission Viejo.

Approximately 670,000 GPD of wastewater from the northeastern portion of Mission Viejo in the District's service area is conveyed to the Los Alisos Water Recycling Plant. The Los Alisos plant is owned and operated by IRWD and the District has an agreement with IRWD to treat up to 0.7 MGD of wastewater. Treated wastewater that is not beneficially reused is discharged through the Aliso Creek Ocean Outfall.

Wastewater flows from Rancho Santa Margarita, Coto de Caza, Talega, Ladera Ranch, Sendero, Esencia, parts of IRWD and TCWD, and other areas within the District service area are treated at the Chiquita Water Reclamation Plant (CWRP). The District owns and operates the CWRP which has a current secondary design capacity of 9 MGD and the CWRP has tertiary treatment capacity of 6 MGD which is distributed to the District's recycled water distribution system. Secondary treated wastewater is discharged to the San Juan Creek Ocean Outfall if the recycled water treatment capacity is reached, there is no recycled demand, or seasonal storage reservoirs are full.

Table 6-1 summarizes the 2015 estimated wastewater generated and collected by the District within its service area. Table 6-2 represents the approximate 2015 wastewater treated, recycled and disposed of at each treatment plant within the District's service area.

Table 6-1: Wastewater Collected within Service Area in 2015

Retail: Wastewater Collected within Service Area in 2015						
Wastewater Collection			Recipient of Collected Wastewater			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected in 2015 (AF)	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located within UWMP Area?	Is WWTP Operation Contracted to a Third Party?
Santa Margarita Water District	Metered	1,896	Santa Margarita Water District	Oso Creek Water Reclamation Plant	Yes	No
Santa Margarita Water District	Metered	0	Santa Margarita Water District	3A Treatment Plant	No	No
Santa Margarita Water District	Estimated	2,072	SOCWA	J.B. Latham Treatment Plant	No	
Santa Margarita Water District	Estimated	784	IRWD	Los Alisos Water Recycling Plant	No	No
Santa Margarita Water District	Metered	6,853	Santa Margarita Water District	Chiquita Water Reclamation Plant	Yes	No
Total Wastewater Collected from Service Area in 2015:		11,335				
NOTES: OCWRP and CWRP flows are from operational data from FY 2014-15. J.B. Latham flow is based on a flow monitoring survey performed in 2013. Los Alisos flows are based on the agreement the District has with IRWD. The OCWRP discharges its solids into the sewer that are treated at J.B. Latham. Volume estimates are recorded in MGD and converted to AFY.						

Table 6-2: Wastewater Treatment and Discharge within Service Area in 2015

Retail: Wastewater Treatment and Discharge within Service Area in 2015									
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Method of Disposal	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level	2015 volumes (AF)			
						Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area
Oso Creek Water Reclamation Plant	San Juan Creek Ocean Outfall	Dana Point / Laguna Beach	Solids discharge into trunk line	No	Tertiary	1,896	241	1,655	0
Chiquita Water Reclamation Plant	San Juan Creek Ocean Outfall	Dana Point / Laguna Beach	Ocean outfall	Yes	Tertiary	6,583	2,344	4,239	0
					Total	8,479	2,585	5,894	0
NOTES: Volumes are estimates from SMWD operation records									

6.3 Current Recycled Water Uses

The District operates a recycled water distribution system that consists of two seasonal storage reservoirs, urban runoff collection, and the ability to purchase recycled water from neighboring agencies. The District's recycled water program provides an alternative, local water supply that allows the service area to be less dependent on imported water. Recycled water within the District's service area is primarily used for irrigation and construction purposes. The recycled water is delivered to parks, medians, slopes, golf courses, and schools throughout Mission Viejo, Coto de Caza, Ladera Ranch, Sendero, Esencia, Las Flores, Wagon Wheel, and Talega with plans to expand this service into the City of Rancho Santa Margarita. In FY 2014-15, the District used approximately 7,495 AFY of recycled water within their service area. The District's recycled water demand is expected to increase significantly by 2020 and gradually increase through 2035 as shown in Table 6-3.

6.3.1 Recycled Water Service Areas

The District's recycled water system is interconnected which allows the District the ability to transfer recycled water from any of the sources to any of the uses. In order to be more operationally efficient, the District typically delivers water to the demands from the nearest sources. The District has two fundamental source/demand areas: Oso Creek and Chiquita.

Oso Creek Service Area

The Oso Creek area primarily serves the City of Mission Viejo.

Oso Creek Water Reclamation Plant

The OCWRP, constructed in 1978 and upgraded in 1989, 2004, and 2007, is owned and operated by the District. The plant produces up to 3 MGD of tertiary treated water.

Oso Creek Barrier

The Oso Creek Barrier and pump station intercept Oso Creek flow in order to protect the downstream San Juan Basin groundwater from degradation. The Oso Barrier serves to restrict the high TDS flows from Oso Creek from running into the San Juan Basin. Intercepted stream flow is pumped to the air gap/blending structure at the OCWRP and subsequently pumped into the nondomestic distribution system. The project is designed to recover up to 1 MGD.

Upper Oso Reservoir

The Upper Oso Reservoir, located near the 241 Toll Road, has been operational since 1979. The uncovered reservoir serves as seasonal storage for recycled water produced during low demand periods and to supplement supplied during high demand periods. The District conveys flows to the reservoir where along with MNWD owns 326 MG of capacity and while the remaining 987 MG is owned by the District. The recycled water and urban runoff stored in the reservoir is used for landscape irrigation in the surrounding communities such as golf courses, major slopes, parks, and school grounds.

Chiquita Service Area

The Chiquita area serves Talega, Coto de Caza, Sendero, Esencia, and Ladera Ranch.

Chiquita Water Reclamation Plant

The CWRP is owned and operated by the District with its most recent expansion completed in 2005. The CWRP has a secondary treatment capacity of 9 MGD where the District owns 7.8 MGD of capacity, 0.64 MGD is owned by IRWD, and the remaining 0.56 MGD is owned by TCWD. Tertiary treatment capacity at the CWRP is 6 MGD.

The District is planning to expand the CWRP tertiary capacity from 6 MGD to 10 MGD by 2018. The expansion would continue to reduce the District's dependency on imported water and provide additional recycled water for irrigation purposes.

Canada Gobernadora Multipurpose Basin

The Canada Gobernadora Multipurpose Basin project is located in the unincorporated portion of southeastern Orange County, south of the Coto de Caza community. The basin captures urban runoff and storm flows and naturally treats it to meet irrigation demands in nearby communities. The basin prevents downstream erosion and sedimentation in the Gobernadora Creek and improves water quality. Approximately 350 to 750 AF is expected to be captured in the basin each year.

The basin provides storm detention and a natural treatment system that captures and diverts flows through wetlands, a pump station, and to a pipeline that delivers flows to the Portola reservoir in Coto de Caza, providing non-potable water storage. The Gobernadora transmission system will also connect the CWRP to the Portola Reservoir for additional recycled water storage.

Los Alisos Water Recycling Plant

The District entered into the Agreement with IRWD to interconnect the two Districts' non-potable water systems so the District can purchase recycled water from the Los Alisos Water Recycling Plant, owned and operated by IRWD. Recycled water from the plant is pumped to the Upper Oso Reservoir for seasonal storage through an interconnection in Mission Viejo. The District can purchase up to 1,500 AFY from IRWD and the supply is expected to be available through 2030. Additional recycled water can be purchased on an as-available basis.

Dove Canyon Water Recovery Project

The Dove Canyon Conservation and Water Recovery Project is an innovative diversion project that helps keeps urban runoff from reaching the natural habitat in Starr Ranch Sanctuary.

In operation since 2007, this project is in partnership with TCWD and Audubon Starr Ranch Sanctuary. Each year, runoff water from Dove Canyon is diverted from Starr Ranch to SMWD's Portola Reservoir and TCWD's Dove Lake, both of which hold recycled water. The project allows both water districts to gain about 200 AF annually of recycled water, freeing up an equal amount of domestic water for customers to use.

Before the project was implemented, delicate habitat along Bell Creek, located within the 4,000 acre Starr Ranch, had been disrupted by the invasion of non-native species due to year-round water runoff from Dove Canyon. Today, the project is helping protect and restore this pristine area for future generations.

Horno Water Quality Basin Urban Runoff Recovery Project

The Horno Water Quality Basin Urban Runoff Recovery Project is built on the southern side of the Ladera Ranch community on the Horno Creek. The basin is designed to provide two functions. The first is to mitigate storm flows with a retention basin, so storm flows to the downstream community in the City of San Juan Capistrano do not exceed pre-development levels. The second is to divert low flows through constructed wetlands for natural treatment prior to recovering the runoff and pumping into the District's recycled water system for beneficial reuse. The project is designed to recover up to 180 AFY.

Table 6-3: Current and Projected Recycled Water Direct Beneficial Use within Service Area (AF)

Retail: Current and Projected Recycled Water Direct Beneficial Uses within Service Area								
Name of Agency Producing (Treating) the Recycled Water:		SMWD						
Name of Agency Operating the Recycled Water Distribution System:		SMWD						
Beneficial Use Type	General Description of 2015 Uses	Level of Treatment	2015	2020	2025	2030	2035	2040
Agricultural irrigation								
Landscape irrigation (excludes golf courses)	Parks, Schools, and greenbelts	Tertiary	5,866	8,925	9,411	9,930	9,765	9,765
Golf course irrigation	Golf courses	Tertiary	1,186	1,200	1,200	1,200	1,200	1,200
Commercial use	Lakefill	Tertiary	0	300	300	300	300	300
Industrial use	Construction/ Grading	Tertiary	258	260	300	200	200	50
Geothermal and other energy production								
Seawater intrusion barrier								
Recreational impoundment								
Wetlands or wildlife habitat								
Groundwater recharge (IPR)								
Surface water augmentation (IPR)								
Direct potable reuse								
Other *(Provide General Description)*	District usage	Tertiary	185	200	200	200	200	200
		Total:	7,495	10,885	11,411	11,830	11,665	11,515
NOTES: Volumes estimated based on historical usage and future development projections. The District is pursuing IPR as a potential source projecting up to 2,000 AF in 2020 and increasing up to 5,000 AF as shown in Table 3-3.								

The projected 2015 recycled water use from the District's 2010 UWMP was compared to the 2015 actual recycled water use as shown in Table 6-4. Recycled water for 2015 was closely projected in the 2010 UWMP compared to the actual recycled water use in 2015.

Table 6-4: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual (AF)

Retail: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual			
Use Type		2010 Projection for 2015	2015 actual use
Agricultural irrigation			
Landscape irrigation (excludes golf courses)		7,439	5,866
Golf course irrigation			1,186
Commercial use			
Industrial use			258
Geothermal and other energy production			
Seawater intrusion barrier			
Recreational impoundment			
Wetlands or wildlife habitat			
Groundwater recharge (IPR)			
Surface water augmentation (IPR)			
Direct potable reuse			
Other	District Usage		185
Total		7,439	7,495
NOTES: 2015 volumes estimated from District's billing database. DWR did not require recycled water breakdown for golf course irrigation in 2010 UWMP.			

6.4 Potential Recycled Water Uses

The District is actively working on sites to convert to recycled water to offset imported water demands in Coto de Caza, Mission Viejo, and Rancho Santa Margarita (Santa Margarita Water District, Comprehensive Annual Financial Report Fiscal Year Ended June 30, 2015). Current recycled water projects are described below.

Califia Recycled Water Conversion Project – Expansion of the recycled water distribution system to increase recycled water use in the Califia area of the City of Mission Viejo is scheduled to be completed in July 2016. The system will consist of approximately 4.5 miles of 1-inch to 8-inch diameter pipeline to deliver 220 AFY for irrigation use as shown on Figure 6-1 (Santa Margarita Water District, Final Initial Study and Mitigated Negative Declaration for Califia Recycled Water Project, June 2015). The Califia HOA Recycled Water Conversion Project will reduce dependence on imported water, reduce the amount of treated wastewater discharged to the ocean, and enhance overall supply reliability (Santa Margarita Water District, Califia Recycled Water Conversion Project, December 2014).

Miscellaneous Conversion Projects - A pipeline to serve the communities of Coto de Caza and Palmia are in design. The total expected recycled water demand for the Califia, Coto de Caza, and Palmia conversion projects is 800-1200 AFY.

Figure 6-1: Proposed Califia Recycled Water System

Rancho Santa Margarita Recycle Conversion – The District is planning recycled water conversions in the City of Rancho Santa Margarita with an estimated budget of $13 million to provide approximately 1,000 AFY of recycled water. All of these conversions will provide recycled water for landscape irrigation (Santa Margarita Water District, Comprehensive Annual Financial Report Fiscal Year Ended June 30, 2015).

Trampas Canyon - The Trampas reservoir, located south of Ortega Highway, is an existing reservoir constructed between 1973 and 1975 that is currently being used as a tailing retention facility for a quarry. The District is preparing plans to rebuild the dam and increase the reservoir capacity to 5,000 AF (Santa Margarita Water District, Final Initial Study and Mitigated Negative Declaration for Califia Recycled Water Project, June 2015). The reservoir will be used to store recycled water from the CWRP approximately 1.5 miles north of the reservoir site and will allow for expansion of the District's recycled water system.

Chiquita Water Reclamation Plant Expansion – The District plans to expand the existing CWRP tertiary treatment capacity from 6 MGD to 10 MGD by 2018 to increase the total production of recycled water for landscape irrigation to meet projected demands from development. Expansion will be required of the following: blowers, SCADA and communication systems, odor control, influent pump station and force main, grit dewatering, and the chlorine contact basin.

3A Treatment Plant Expansion - The 3A Treatment Plant Tertiary Expansion Project will provide an additional 3,000 AFY of capacity for recycled water use. The expansion includes the following components: increase the reliability of the aeration system, expand and/or replacing the existing filters with more effective tertiary filters, expand the disinfection system, expand the tertiary effluent pumps, possible upsizing of the discharge pipeline where it connects to the District's recycled water distribution system, modification to various in-plant piping and electrical systems, and addition of a standby generator to maintain operation during a power outage. The expansion will increase the local water supply reliability by producing an additional 3,000 AFY of recycled water, reducing dependence on imported water.

6.4.1 Direct Non-Potable Reuse

The District currently uses water from its recycled water system for direct non-potable reuse such as landscape irrigation.

6.4.2 Indirect Potable Reuse

SBJA and the District are determining the optimal approach to using the San Juan Groundwater Basin. This includes the possibility of implementing an indirect potable reuse project which is described in further detail in Section 7.3.

6.5 Optimization Plan

In Orange County, the majority of recycled water is used for irrigating golf courses, parks, schools, businesses, and communal landscaping, as well as for groundwater recharge. Future recycled water use can be increased by requiring dual piping in new developments, retrofitting existing landscaped areas and constructing recycled water pump stations and transmission pipelines to reach areas that are further from treatment plants. Gains in implementing some of these projects have been made throughout the county. However, additional costs, large energy requirements, and capital costs for facilities all contribute to the high costs of such projects.

In order to determine if additional projects are feasible, studies must be performed to determine if the project should be pursed. Feasibility studies will include an evaluation of alternatives with a present worth analysis consisting of capital costs (design, environmental reviews, construction, etc.) and operations and maintenance costs (electrical costs for pumps and equipment and maintenance required for the system).

The District will continue to conduct feasibility studies for recycled water and seek out creative solutions such as funding, regulatory requirements, institutional arrangement and public acceptance for recycled water use with MWDOC, Metropolitan and other cooperative agencies.

7 FUTURE WATER SUPPLY PROJECTS AND PROGRAMS

7.1 Water Management Tools

With improvements in the water recycling system, along with conservation efforts, the District can optimize its facilities and more effectively meet projected demands.

7.2 Transfer or Exchange Opportunities

The District has actively pursued water supply reliability through water transfers. Water transfers are a reliable and cost effective means to provide supply for specific purposes such as supplementing dry year supplies. The District 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. The District is currently working with MWDOC, IEUA, Cucamonga Valley Water District (CVWD), and Golden State Water Company (GSWC) to potentially deliver water to the Santa Ana River for infiltration and ultimate extraction through the Orange County Groundwater Basin, subject to agreement with Orange County Water District (OCWD). In dry years, CVWD will deliver up to 4,250 AFY of water and GSWC will deliver up to 2,000 AFY of water to the District.

MWDOC continues to help its retail agencies develop transfer and exchange opportunities that promote reliability within their systems. Therefore, MWDOC will look to help its retail agencies navigate the operational and administrative issues of transfers within the Metropolitan distribution system.

7.3 Planned Water Supply Projects and Programs

The District's planned design and construction projects as described below.

Baker Water Treatment Plant - The Baker Water Treatment Plant is a new drinking water treatment plant in the City of Lake Forest. This plant will have a capacity of 28.1 MGD and is a joint regional project that will increase the local drinking water supply for the District, IRWD, MNWD, ETWD, and TCWD. The plant will treat raw, imported water from Metropolitan and ultimately local surface water from Irvine Lake using advanced microfiltration and ultraviolet (UV) light disinfection, resulting in high quality drinking water that exceeds current regulatory requirements. Metropolitan water from the CRA and SWP, and ultimately local water from Irvine Lake can both be treated independently or as a blend at the plant. Construction is underway and is expected to be completed in October 2016. The District's plant capacity ownership equates to approximately 8.4 MGD if supply is available and capacity fully used as shown on Figure 7-1. A location map of the Baker Treatment Plant and surrounding agencies is provided on Figure 7-2.

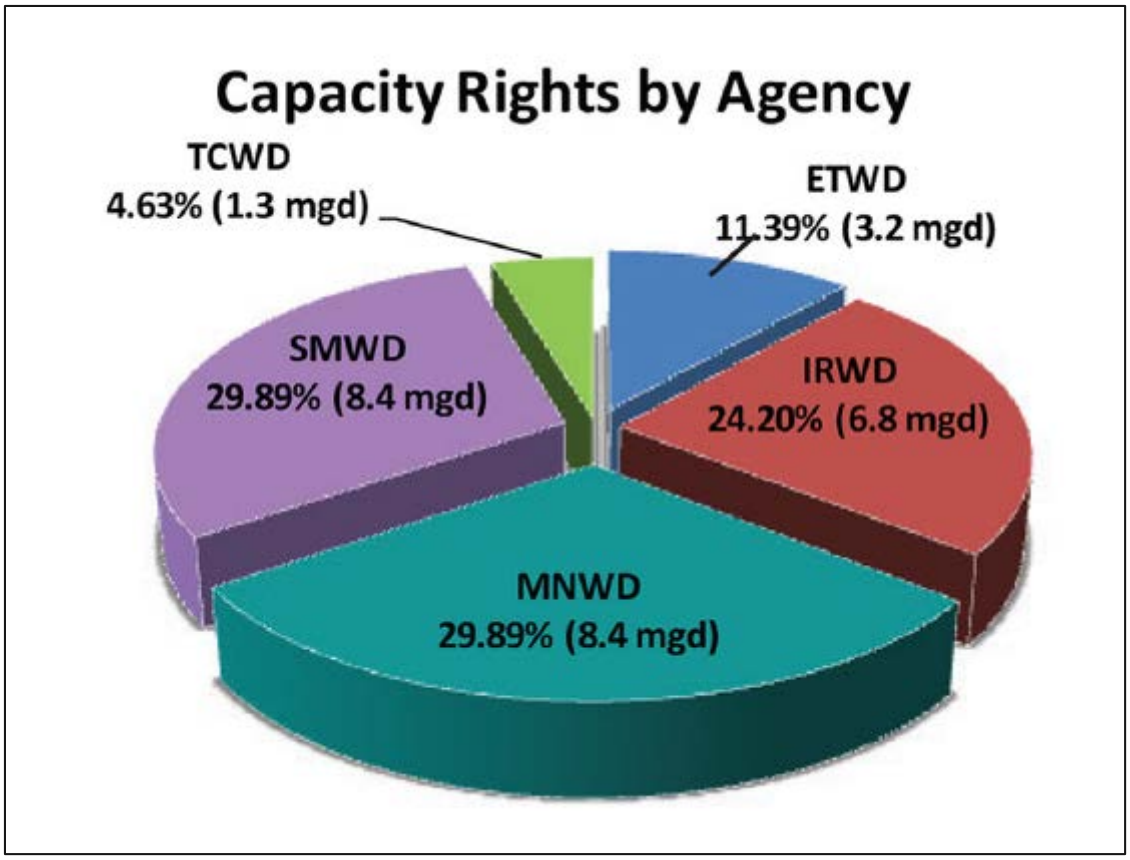


Figure 7-1: Baker WTP Capacity Rights

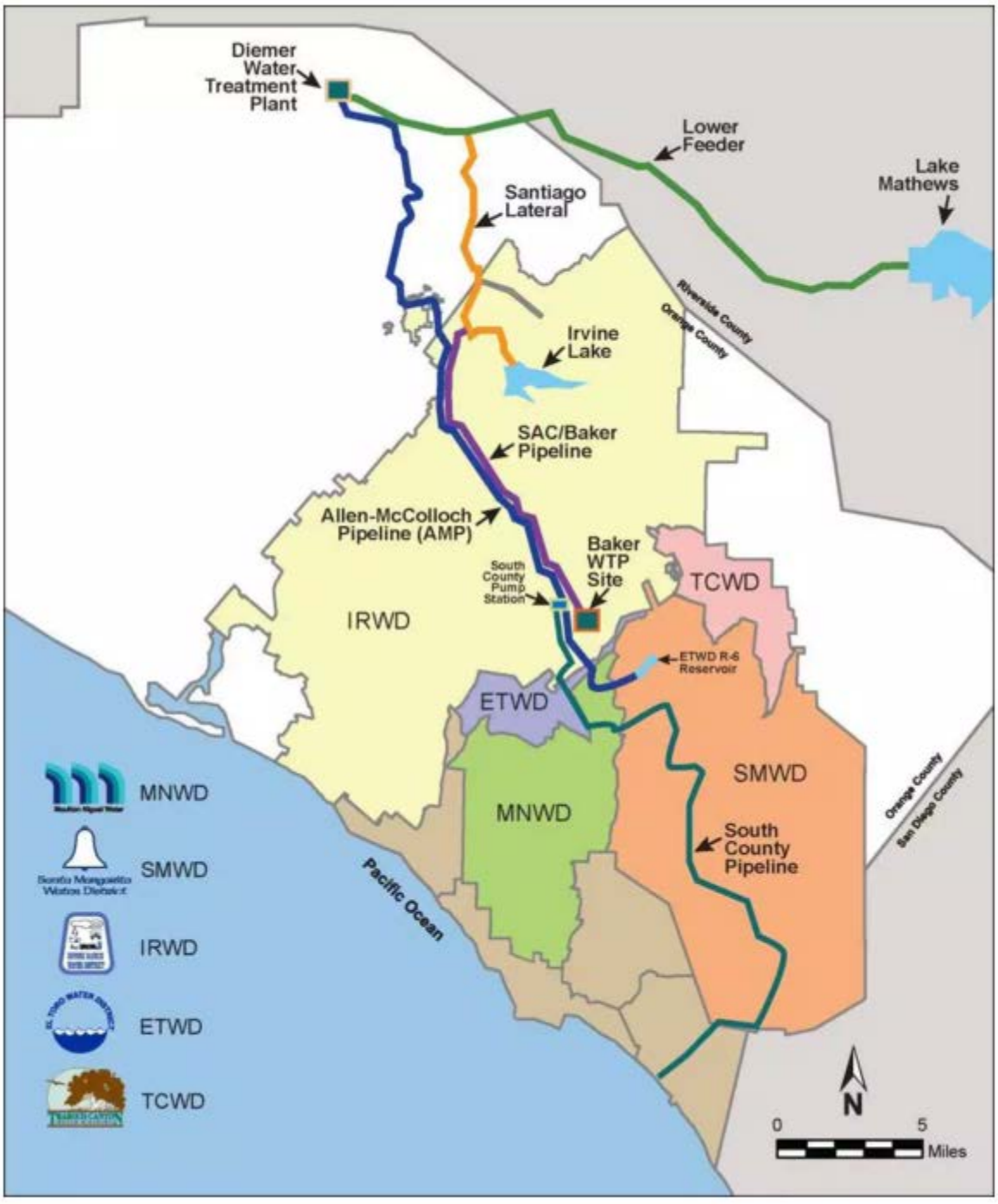


Figure 7-2: Baker WTP Location Map

Rancho Mission Viejo Riparian Non-Potable Water - RMV holds riparian water rights for its ranching, agriculture and tenants uses. RMV and the District have an agreement where RMV will supplement recycled water with non-potable groundwater to areas of The Ranch Plan. The water will be used to supplement the District's recycled water. By 2017, the District will purchase 800 AFY of groundwater from

RMV for non-potable uses. When PA-3 is developed by 2021, the District plans to purchase an additional 400 to 1,200 AFY of groundwater from RMV.

San Juan Basin Recharge – In 2014, SJBA adopted the San Juan Basin Groundwater and Facilities Plan Update that stated it may be possible to recharge the San Juan Basin with a combination of stormflows, urban runoff, and recycled water to maximize the potable water supply. The project would diversify the District's water supply portfolio and reduce reliance on imported water. The San Juan Basin has the ability to produce approximately 10,000 to 14,000 AFY of potable water and the District is considering participating in the project for 5,000 AFY (Santa Margarita Water District, Final Initial Study and Mitigated Negative Declaration for Califia Recycled Water Project, June 2015). The first approach of this project will include installation of rubber dams that will slow stormflows and runoff to promote infiltration and recharge of the San Juan Basin. By 2018, the District plans to pump approximately 1,000 to 2,000 AFY of water, treat it with desalters, and provide as a potable water supply. If the first approach is successful, the recharge program will use recycled water for recharge of the Basin and approximately 5,000 AFY would be extracted by 2027. The Trampas Canyon Reservoir will store the recycled water for recharge.

Advanced Purified Water Project – Construction of a recycled water treatment facility in the City of Mission Viejo will provide additional treatment for the District's disinfected, tertiary effluent and produce advanced purified water to maintain water levels in Lake Mission Viejo. The facility will be owned and operated by the District and has an expected completion in summer 2016.

Lake Mission Viejo is a manmade, recreational lake that also provides emergency firefighting supply. The lake is 125-acres and is subject to water loss through evaporation and subsurface seepage. The lake currently receives water from imported potable water and natural sources, such as precipitation and groundwater.

The Advanced Purified Water (APW) facility will incorporate a collection of treatment processes including ultrafiltration, chemical conditioning, reverse osmosis, and UV disinfection. Effluent will be discharged into Lake Mission Viejo with the remaining effluent distributed in the District's existing recycled water system through additional piping connections. Production capacity of the APW facility is expected to be 600 AFY.

The project may also include construction of a pipeline to connect the APW facility to an existing outfall structure at the toe of the lake's dam. The outfall structure is infrequently used to drain excess water from the lake during wet weather conditions. The pipeline would convey water from the outfall to the Finisterra Pump Station with a lift pump for distribution to the recycled water system.

Cadiz Valley Water Conservation, Recovery and Storage Program – The District is leading the Cadiz Valley Water Conservation, Recovery and Storage Project to provide a potential new, reliable water source to the District and other southern California water agencies by managing a groundwater basin that is part of a 1,300 square miles watershed located in eastern San Bernardino County. The project would manage the aquifer and use water that would otherwise be evaporated from local dry lakes. A future phase of the project could include the ability to store water during wet years from the CRA in the Cadiz Aquifer to be used during dry years. The project is designed to provide 50,000 AFY of potable water on average.

Cadiz, Inc. owns approximately 34,000 acres of land in the Cadiz and Fenner Valleys of the Mojave Desert located in San Bernardino County that is underlain by an extensive aquifer system offering natural

recharge and storage capacity. Cadiz, Inc. and the District entered into a public private partnership to capture and use billions of gallons of groundwater that is currently being evaporated each year when rain and melted snow from the Fenner Valley and Orange Blossom Watersheds reach the local dry lakes. The Cadiz Aquifer can provide approximately 1 MAF of storage capacity that can be used to offset imported water and reduce evaporation at local surface reservoirs.

The project includes construction of a system to capture the aquifer's average annual recharge that would otherwise evaporate from the Bristol and Cadiz Dry Lakes. The project would construct extraction wells on the Cadiz property and a 43-mile buried pipeline within an active railroad right-of-way to convey water to Metropolitan's CRA for delivery to the District and other southern California water agencies. If the region experiences wet weather, the District has the option to decrease or forego its water delivery for that year and carry it over to another year when it may be needed. This carry-over water would be stored in the Cadiz Aquifer.

The project underwent an extensive environmental review for two years and will need additional regulatory approvals from certain public agencies to proceed with design and construction. The District served as the lead agency for the California Environmental Quality Act (CEQA) environmental review to evaluate the potential environmental impacts associated with construction and operation of the project. If alternatives are identified and mitigation measures determined necessary, they must be considered and incorporated prior to approval of the project. The EIR was performed by independent environmental and engineering consultants to conduct studies, obtain public input, and determine the feasibility of the project. The Final EIR was approved on July 31st, 2012.

The District will purchase at least 5,000 AFY of water from the Cadiz Project, which is approximately 20 percent of the District's potable water supply. If implemented, the project would diversify the District's water supply portfolio and provide water supply reliability to ensure its water demands are met regardless of the imported water supply availability.

A Groundwater Monitoring, Management, and Mitigation Plan was developed to ensure the Cadiz project operates as expected and protects desert resources. This plan will actively monitor critical resources in the desert including air, water, natural springs, subsidence, and saline/fresh water movement in the groundwater basin. The goal of the monitoring plan is to provide an early warning of potential impacts that can be addressed before reaching a significant level. Groundwater and surface water resources will be monitored in the watershed and a maximum groundwater draw-down level will be established to ensure the appropriate and safe management of the groundwater basin.

The future projects provided in the Five Year Capital Improvement Program Update included (Santa Margarita Water District, Five Year Capital Improvement Program Update for FY 2014-15, October 2014):

Potable Water:

- Groundwater development from the San Juan Groundwater Basin including additional feasibility studies to optimize the San Juan Basin through adaptive management, stormwater and recycled water recharge and additional extraction wells and treatment.

Recycled Water:

- Recycled water pump station to serve the Sendero/Ladera area.

- Trampas Canyon recycled water seasonal storage reservoir will be constructed to provide 5,000 AF of storage capacity.

Additional future recycled water projects are described in Section 6.4.

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 Local Resources Program (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 two 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

Developing local supplies within Metropolitan's service area is part of their 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 6, 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.

A description of the proposed desalination projects in the region is provided in the following sections. If these projects are developed, Metropolitan's imported water deliveries to Orange County could be reduced.

7.4.1 Groundwater

The District is a member of the SJBA, of which two members operate Groundwater Recovery Facilities (GRF), one owned and operated by the City of San Juan Capistrano and the other in Dana Point that is owned and operated by SCWD to treat brackish groundwater through desalination.

7.4.2 Ocean Water

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. The District has entered into a non-binding letter of intent to purchase 5,000 AFY of water from the Huntington Beach Desalination Project.

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 up to 15 MGD (16,800 AFY) of new potable water supplies to five participating agencies. These agencies were: SCWD, City of San Clemente, City of San Juan Capistrano, Laguna Beach County Water District (LBCWD) and MNWD.

Only SCWD 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.

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
- 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 – San Diego County Water Authority (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 AFY) 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

Recognizing that close coordination among other relevant public agencies is key to the success of its UWMP, the District worked closely with other entities such as MWDOC to develop and update this planning document. The District also encouraged public involvement by holding a public hearing on June 1, 2016 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 the District 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	5/18/16 & 5/25/16	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)	3/18/16	Appendix E
Held public hearing	6/1/16	Appendix E
Adopted UWMP	6/1/16	Appendix F
Submitted UWMP to DWR	7/1/16	-
Submitted UWMP to the California State Library and city or county within the supplier's service area	7/1/16	-
Made UWMP available for public review	8/1/16	-

This UWMP was adopted by the Board of Directors on June 1, 2016. A copy of the adopted resolution is provided in Appendix F.

A change from the 2004 legislative session to the 2009 legislative session required the District 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, the District sent a Letter of Notification to the County of Orange and cities within its service area on March 18, 2016 to state that it was in the process of preparing an updated UWMP (Appendix E).

Table 8-2: Notification to Cities and Counties

Retail: Notification to Cities and Counties		
City Name	60 Day Notice	Notice of Public Hearing
Mission Viejo	☑	☑
Rancho Santa Margarita	☑	☑
San Clemente	☑	☑
San Juan Capistrano	☑	☑
County Name	60 Day Notice	Notice of Public Hearing
Orange County	☑	☑
NOTES:		

8.1 Public Participation

The District encouraged community and public interest involvement in the plan update through public hearings and inspection of the draft document. Public hearing notifications were posted on the District's website, www.smwd.com. A copy of the published 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 in addition to the District's plans for providing a reliable, safe, high-quality water supply. Copies of the draft plan were made available for public inspection at the District's main office and its website. Public hearings were held on June 1, 2016 for plan discussion, review, and adoption.

8.2 Agency Coordination

The District's water supply planning relates to the policies, rules, and regulations of its regional and local water providers. The District is dependent on imported water from Metropolitan through MWDOC, its regional wholesaler.

As the District is a member agency of MWDOC, MWDOC provided assistance to the District's 2015 UWMP development by providing a portion of the data and analysis such as population projections, demand projections, and SBx7-7 modeling. The District's UWMP was developed in collaboration with MWDOC's 2015 RUWMP to ensure consistency between the two documents as well as Metropolitan's 2015 RUWMP and 2015 Integrated Water Resources Plan.

8.3 UWMP Submittal

8.3.1 Review of 2010 UWMP Implementation

As required by California Water Code, the District summarizes the implementation of the Water Conservation Programs 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 signatory to the MOU regarding urban water use efficiency, the District's commitment to implement Best Management Practice (BMP)-based water use efficiency program continues today. For the District's specific achievements in the area of conservation, please see Section 4 of this Plan.

Comparison of 2010 Projected Recycled Water Use with 2015 Actual Use

Current recycled water projections for the District in 2015 are about 19 percent less than previously forecasted for 2015 in the 2010 UWMP, as illustrated in Table 6-4.

8.3.2 Filing of 2015 UWMP

The Board of Directors reviewed the Final Draft Plan on June 1, 2016. The five-member Board of Directors approved the 2015 UWMP on June 1, 2016. See Appendix F for the resolution approving the Plan.

By July 1, 2016, the District's Adopted 2015 UWMP was filed with DWR, California State Library, County of Orange, and cities within its service area.

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APPENDIX A

UWMP Checklist

APPENDIX B

Standardized Tables

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APPENDIX C

Groundwater Management Plan

APPENDIX D

District Ordinance

APPENDIX E

Notification of Public and Service Area Suppliers

APPENDIX F

Adopted UWMP Resolution

APPENDIX G

AWWA Water Loss Audit Worksheet

APPENDIX H

Water Use Efficiency Implementation Report

APPENDIX I

SMWD Facilities List

Arcadis U.S., Inc.

445 South Figueroa Street

Suite 3650

Los Angeles, California 90071

Tel 213 486 9884

Fax 213 486 9894

www.arcadis.com

Appendix B

Santa Margarita Water District – The Ranch Plan: Planning Areas Nos. 5 and 8 Water Supply Verification

THE RANCH PLAN:
PLANNING AREA NOS. 5 AND 8
WATER SUPPLY VERIFICATION

May 2018

Prepared for:

SANTA MARGARITA WATER DISTRICT

Santa Margarita Water District

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ABBREVIATIONS/ACRONYMS

AF	Acre-feet
AFY	Acre-feet per year
AMP	Allen-McColloch Pipeline
APW	Advanced Purified Water
CEQA	California Environmental Quality Act
Cfs	cubic feet per second
CRA	Colorado River Aqueduct
CVP	Central Valley Project
CWRP	Chiquita Water Reclamation Plant
DW	Domestic water
DU	Dwelling Unit
DWR	California Department of Water Resources
EIR	Environmental Impact Report
EOCF	East Orange County Feeder
ESA	Endangered Species Act
ET	Evapotranspiration
ETWD	El Toro Water District
FEIR	Federal Environmental Impact Report
FY	Fiscal Year
FVWA	Fenner Valley Water Authority
GERA	Gobernadora Ecological Restoration Area
gpcd	Gallons Per Capita per Day
gpd	gallons per day
HCP	Habitat Conservation Plan
ID	Improvement District
IPR	Indirect Potable Reuse
IRP	Integrated Resources Planning
IRWD	Irvine Ranch Water District
ksf	Thousand square feet
LAWRP	Los Alisos Water Reclamation Plant
MAF	Million Acre Feet
MCB	Marine Corps Base
MGD	Million gallons per day
MWELO	Model Water Efficient Landscape Ordinance
Metropolitan, MWD	Metropolitan Water District of Southern California
MWC	Mutual Water Company
MWDOC	Municipal Water District of Orange County
NDW	Non-Domestic Water
OCWRP	Oso Creek Water Reclamation Plant
PA	Planning Area
QSA	Quantification Settlement Agreement
RMV	Rancho Mission Viejo
SAMP	Special Area Management Plan

SB	Senate Bill
SC	South County
SCWD	South Coast Water District
SDCWA	San Diego County Water Authority
SJBA	San Juan Basin Authority
Sf	square feet
SMWD	Santa Margarita Water District
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAF	Thousand Acre-Feet
TCWD	Trabuco Canyon Water District
TDS	Total Dissolved Solids
UWMP	Urban Water Management Plan
WRP	Water Reclamation Plant
WSA	Water Supply Assessment
WSAP	Water Supply Allocation Plan
WSDM	Water Surplus and Drought Management
WSV	Water Supply Verification
WTP	Water Treatment Plant

ES EXECUTIVE SUMMARY

This Water Supply Verification (WSV) has been prepared for Planning Area (PA) Nos. 5 and 8 of the Rancho Mission Viejo (RMV) Planned Community (Ranch Plan), which is located in unincorporated Orange County (County), (Project) by Santa Margarita Water District (District or SMWD) pursuant to the requirements of Government Code Section 66473.7.

Both PA-5 and PA-8 include a residential development of more than 500 dwelling units, and, therefore, both meet the definition of a "subdivision" that requires a WSV (Gov. Code §66473.7(a)(1).). As PA-5 and PA-8 are located within the SMWD water service area and SMWD meets the definition of a "public water system", RMV, on behalf of the County requested SMWD to prepare this WSV to provide proof of the availability of a sufficient water supply to meet the demand associated with the Project, in addition to all existing and planned future demands within SMWD's service area.

The water demands for PA-5 and PA-8 were projected in the District's 2003 Water Supply Assessment (WSA) prepared for the Ranch Plan, and in their 2015 Urban Water Management Plan (UWMP), and these documents provided background information utilized to determine demand sufficiency for the Project in this WSV.

ES.1 Project Development Characteristics and Estimated Water Demands

PA-5 has a total area of 1,190 acres, which will be divided into two subareas for development purposes: Subarea 5.1 (342 acres) contains the Trampas Reservoir, which will serve as a SMWD non-domestic water (NDW) seasonal storage reservoir; and Subarea 5.2 (848 acres) will consist of engineered slopes, 1,250 single-family detached homes, 75 affordable houses, and 150 thousand square feet (ksf) of neighborhood commercial (NC). Of the 1,190 acres, only 360 acres will be developed, all in Subarea 5.2.

PA-8 has a total area of 1,349 acres, of which 500 acres will be developed. The new development will consist of engineered slopes, 1,250 single-family detached homes, 75 affordable houses, 740 ksf for an Urban Activity Center (UAC), 150 ksf of NC, and 5 acres designated for parkland.

All the existing land uses in PA-5 and PA-8 will be phased out to accommodate the new development land uses with the exception of the existing Trampas Reservoir.

Water system infrastructure improvements have been planned to support the RMV Planned Community including PA-5 and PA-8. The infrastructure costs will principally be borne by RMV, the developer.

Domestic (potable) water and non-domestic water (NDW) demands (primarily for landscape irrigation) were developed for PA-5 and PA-8 (as summarized in Table ES.1) using standard District domestic water coefficients; and District-accepted NDW irrigation parameters that are consistent with the 2015 Model Water Efficient Landscape Ordinance

(MWELO). Domestic and NDW demands reported in Table ES.1 in acre-feet per year (AFY) include 4.0% and 8.0%, respectively, to account for system losses.

Table ES.1
Phased Project Water Demands[a]

	Domestic Water Demand[b] (AFY)	Non-Domestic Water Demand[c] (AFY)	Total Water Demand (AFY)
2031 – 2035			
Subarea 5.1[d]	-	-	-
Subarea 5.2	710	514	1,224
Subarea 8	904	537	1,441
Total	1,614	1,051	2,665

(a) Totals may not add exactly due to Excel rounding
(b) Includes 4.0% water loss
(c) Includes 8.0% water loss
(d) Subarea 5.1 will consist of the Trampas Reservoir & will not have any water demands

SMWD's Board of Directors adopted its Comprehensive Water Conservation Program Ordinance No. 2014-10-03 in October 2014, which established a staged water conservation program to encourage reduced water consumption within the District through conservation; enable effective water supply planning; assure reasonable and beneficial use of water; prevent waste of water; and maximize the efficient use of water within the District.

The District's adoption of the Water Conservation Program Ordinance and implementation of Stage 2 water use restrictions were in response to California's worst drought on record that persisted from 2012 through 2016. The Governor officially declared an end to the drought emergency on April 7, 2017.

Since 2010 and especially since 2014, SMWD's domestic water use has decreased through the implementation of water conservation ordinances and measures. Many of the water conservation measures already implemented and being implemented by SMWD customers such as conversion to recycled water for irrigation, turf removal, conversion to drought resistance landscapes, conversion to more efficient irrigation systems and ET-based irrigation controllers, retrofits to high efficiency clothes washers and toilets, implementation of weather-based irrigation controllers, etc. will have permanent impacts on water use (reduction) in the future.

District domestic water demands for calendar year (CY) 2014, 2015, 2016 and 2017 are shown in Table ES.2. As shown, relative to CY 2014, domestic water demands decreased 18.7 percent in CY 2015, 19.9 percent in CY 2016, and 17.7 percent in CY 2017.

Table ES.2
SMWD Domestic Water Demands, Calendar Year 2014 - 2017 (AFY)

Calendar Year	2014	2015	2016	2017
DW Demand[(a)]	27,786	22,586	22,254	22,869
% Reduction Relative to 2014	-	18.7%	19.9%	17.7%

(a) Based on metered water use plus an estimated 4.0% for system water losses

Actual CY 2017 and projected future domestic water and NDW demands for the District water service area including the Project demands are shown in Table ES.3. Water demand projections for PA-5 and PA-8 were included in the District's 2015 UWMP but have been re-estimated as part of this WSV, utilizing more detailed and current statistical information. Future District domestic water demands were also revised in this WSV from the projections made in the 2015 UWMP based on a presentation at the District's Strategic Planning Workshop 2018. These projections take into consideration the demand reductions occurring in 2015 through 2017. It has become evident that many of the water conservation measures implemented by SMWD customers resulting in the demand reductions in 2015 through 2017 will have permanent impacts going forward. In Table ES.3 RMV projected demands, excluding the Project demands, are based on indoor and outdoor demand factors determined from actual Sendero (PA-1) and Esencia (PA-2) domestic water use.

District NDW demands were also revised in this WSV relative to the projections made in the 2015 UWMP based on a NDW System Supply and Demand Balance prepared as part of this project.

Table ES.3
Water Demand Projections for SMWD Service Area (AFY)

	2017[a]	2020	2025	2030	2035	2040
Domestic Water						
Project (PA-5 and PA-8) [b]	0	0	0	0	1,614	1,614
Other District Service Area [c]	22,241	23,384	24,266	25,044	23,648	23,648
Total Domestic Water [d]	22,241	23,384	24,266	25,044	25,262	25,262
Non-Domestic Water						
Project (PA-5 and PA-8) [e]	0	0	0	0	1,051	1,051
Other District Service Area [f]	7,993	8,787	10,090	11,269	12,848	12,878
Total Non Domestic Water	7,993	8,787	10,090	11,269	13,899	13,929
Total Water Demands	30,234	32,171	34,356	36,313	39,161	39,191

(a) Actual water demand for 2017, with added water loss (4 percent domestic water; 8 percent non-domestic water)
(b) From RMV Report dated October 2017: Planning Area 5 and 8 Report for Domestic Water Demand, Recycled Water Demand and Wastewater Generation, Appendix A, prepared by David Evans and Associates, Inc. (1,552 AFY avg daily demand plus water loss of 4 percent). Domestic Water Demand Factors - Conventional SF and Planned Concept: Detached 450 gpd/DU; Multi-Family 175 gpd/DU; Age Qualified 300 gpd/DU; Affordable 175 gpd/DU.
(c) Calculated, 2020-2040 Total Domestic Water Projection (from SMWD Strategic Plan Workshop 2018) less RMV projections
(d) 2020-2040 water demands projected using existing District water demands, as presented at the SMWD Strategic Planning Workshop 2018, plus projected RMV growth. RMV demand projected using RMV-provided planned dwelling unit growth and applying indoor and outdoor demand factors based on actual Sendero and Esencia domestic water use. Water demands were adjusted to include commercial and irrigation use using an adjustment factor based on historical residential water use of 74 percent of total demand. Total water demand was increased by four percent to account for dw losses.
(e) From RMV Report dated October 2017: Planning Area 5 and 8 Report for Domestic Water Demand, Recycled Water Demand and Wastewater Generation, Appendix B, (973 AFY plus water loss of 8 percent to account for evaporation/percolation). Non-Domestic Water Demand based on Landscape Area by Type Acres in planning areas with applied demand by type.
(f) From Table 4.4, total NDW demand minus Project NDW demand. Does not include planned conversions, RSM 1,150 AFY; Las Flores 200 AFY; other 50 AFY in 2019-2020.

ES.2 Water Supply

The District has historically relied on treated imported water purchased from the Metropolitan Water District of Southern California (Metropolitan or MWD) through the Municipal Water District of Orange County (MWDOC) for domestic water supply; and recycled water produced at three District water recycling plants, and collected urban return flows for NDW supply. Although the District has some groundwater rights in the San Juan Basin, it has not been a significant source of supply. All of these historical water supply sources are reliable and are based on water supply rights, contracts, agreements and entitlements. District water supplies for FY 2017 are shown in Table ES.4. Projected available water supplies for the District under normal conditions through the planning period, 2020 through 2040, are shown in Table ES.5.

Table ES.4
SMWD FY 2017 Supplies

Water Supply	FY 2017	
Source	Supply (AFY)	Water Quality
San Juan Basin Groundwater	0	Domestic Water
MWDOC Purchased Imported Water	22,795	Domestic Water
Recycled/NDW[(a)]	8,833	Non-Domestic Water
Total	31,628	

(a) Includes estimated 8.0% water loss in NDW system

Table ES.5
Projected Available SMWD Water Supplies – Normal Conditions (AFY)

Water Supply	2020	2025	2030	2035	2040
Domestic Water					
Treated Imported Water[(a)]	29,202	29,202	29,202	29,202	29,202
Cadiz[(b)]	5,000	5,000	5,000	5,000	5,000
Total Domestic Water	34,202	34,202	34,202	34,202	34,202
Non-Domestic Water					
Recycled Water	8,598	10,110	11,075	11,773	11,773
Urban Return Flows	1,715	1,715	1,715	1,715	1,715
RMV MWC Groundwater	816	1,321	1,605	1,957	2,500
Total Non-Domestic	11,129	13,146	14,395	15,445	15,988
Total Available Supply	45,331	47,348	48,597	49,647	50,190

(a) In their 2016 WSAP, MWDOC determined a "non-shortage" imported water supply of 29,202 AFY for SMWD in FY 2016, which is conservatively estimated for the planning period
(b) SMWD has a firm capacity of 5,000 AF and an option to receive an additional 10,000 AF from Cadiz.

In their 2016 Water Supply Allocation Plan (WSAP), MWDOC determined a "non-shortage" imported water supply of 29,202 AFY for SMWD in FY 2016. This "non-shortage" imported water supply will change in a given year considering a MWDOC-determined growth factor for the District (growth adjustment); and also considering any significant changes in supply from other sources (other than Metropolitan/MWDOC imported water) relative to a 2013 to 2014 base period. It is estimated in Table ES.5 that the FY 2016 "non-shortage" imported water supply will be available to SMWD through 2040, which is a conservative estimate because the available supply should increase consistent with adjustments for growth due to population increases within the SMWD service area. Any reduction in imported supply due to the addition of a new SMWD supply source will be offset by supply from that new source.

SMWD has typically received imported water treated at Metropolitan's Diemer Water Treatment Plant (Diemer WTP). However, the Baker Water Treatment Plant (Baker WTP), which is operated by Irvine Ranch Water District (IRWD), went on-line in 2016 to provide another source of treated imported water for local water agencies including SMWD, which has 8.4 million gallons per day (MGD) (9,400 AFY) of treatment capacity in the plant. This capacity does not increase the amount of treated imported water SMWD can receive from MWDOC, but it does offer the District another treatment path for supply reliability, and also can be used to receive treated water via other non-Metropolitan supply sources.

By contract agreement, the District is participating in the Cadiz Valley Water Conservation, Recovery and Storage Project (Cadiz) that will provide a new, reliable water source to the District from a groundwater basin that is part of a 1,300-square mile watershed located in eastern San Bernardino County. Cadiz will develop, construct and finance all project facilities necessary for the production and delivery of project water. SMWD has first priority rights to 5,000 AFY, along with an option to purchase an additional 10,000 AFY. The District also has 15,000 AF of carry-over rights. The water will be produced and conveyed via Cadiz Project Facilities or alternate facilities to the Colorado River Aqueduct (CRA); and then wheeled through Metropolitan's CRA and other transmission pipelines to the Baker WTP or the Deimer WTP for treatment.

Additionally, the San Juan Basin Authority adopted the San Juan Basin Groundwater and Facilities Plan Update that foresees the potential to recharge the San Juan Basin with a combination of stormflows, urban return flows, and recycled water to maximize the potable water supply, i.e. indirect potable reuse (IPR). The District has plans to participate in this project to increase their domestic water supply reliability.

The District operates a recycled water (NDW) production and distribution system that is supplied from the following sources:

1. Two District-owned water reclamation plants, namely Chiquita Water Reclamation Plant (CWRP) and Oso Water Reclamation Plant (OWRP)
2. One jointly-owned water reclamation plant (3A Plant)
3. Urban return flows collection from multi-purpose basins (Oso Barrier, Cañada Gobernadora, Dove Canyon, Trabuco, and Horno)
4. The ability to purchase recycled water from IRWD's Los Alisos Water Reclamation Plant (LAWRP) through an existing agreement during dry year conditions.

The District's NDW demand is expected to increase significantly by 2025, and then gradually increase through 2040 primarily in alignment with the development of planning areas in the Ranch Plan. SMWD will accommodate this increase in recycled water demand with expansions of their NDW system: expansion of the CWRP, construction of a seasonal storage reservoir, and expansions of supplementary NDW supplies.

The District is planning to expand the CWRP tertiary capacity from 6.0 MGD to 9.0 MGD by FY 2021. The expansion will primarily serve recycled water to the Ranch Plan planning areas including PA-5 and PA-8. The Trampas Canyon Reservoir, which was used as a tailing retention facility for a quarry, will be rebuilt and expanded to 5,000 AF to provide additional seasonal storage in the NDW system. The reservoir is expected to be operational by FY 2019.

To augment the NDW supply, the District has an agreement with RMV to purchase groundwater from the RMV well system, as requested, and prorated for supply to Ranch Plan planning areas, as they are developed. The District will acquire up to a maximum 2,500 AFY with the development of PA-5. SMWD also has the ability to purchase up to 1,500 AFY of recycled water from IRWD's LAWRP through an existing agreement during dry year conditions.

ES.3 Water Supply Reliability

In order to become less dependent on imported water and to develop a more diverse water supply, SMWD is expanding its recycled water system and constructing seasonal storage for the NDW system, as well as developing new supply sources.

With regard to imported water reliability, Metropolitan estimated supply capability and projected demands in their 2015 UWMP for an average (normal) year based on an average of hydrologies for the years 1922-2012; for a single dry-year based on a repeat of the hydrology in the year 1977; and for multiple dry years based on a repeat of the hydrology of 1990-1992. For each of these scenarios there is a projected surplus of supply in every forecast year. Projected supply surpluses, based on the capability of current supplies, range from 1% to 89% of projected demands. With the inclusion of supplies under development, potential surpluses range from 7% to 110% of projected demands.

In April 2015 Governor Brown declared a continuing state of drought emergency and issued Executive Order B-29-15 requiring mandatory conservation actions. In response, Metropolitan declared a Stage 3 Shortage Level of its WSAP with the goal of achieving a 15 percent reduction in regional deliveries to its member agencies starting on July 1, 2015. In response to Metropolitan's WSAP, MWDOC developed a Shortage Allocation Model as part of their 2016 WSAP to determine water allocation to its member agencies during a water shortage. For FY 2016, based on the Stage 3 Shortage Level set by Metropolitan (15% regional shortage), MWDOC determined an imported water supply allocation of 26,277 AFY for SMWD.

Metropolitan's 2015 WSAP was only the second time a WSAP has ever been issued and the first shortage level as high as Stage 3. The drought emergency officially ended in April 2017.

Normal year, single-dry year, and multiple-dry year supplies available to the District were compared with estimated District service area demands for each of these three conditions, and a supply surplus was estimated for the entire planning period, 2020 through 2040, for each condition as shown in Table ES.6. A non-shortage imported water supply of 29,202 AFY, as determined for SMWD in FY 2016 in the 2016 WSAP, was conservatively estimated as a normal MWDOC imported water supply for the planning period; while a

Stage 3 Shortage supply of 26,277 AFY for SMWD in FY 2016 was conservatively estimated as a single-dry year and multiple-dry year MWDOC supply. Single-dry year demands were increased by 4.0% relative to normal year demands; and multiple-dry year demands were increased by 2.0% for the first year, 4.0% for the second year, and 9.0% for the third year relative to normal year demands.

Table ES.6
Estimated Normal, Single-Dry and Multiple-Dry Year Supply Surplus[(a)] (AFY)

	2020	2025	2030	2035	2040
Normal-Year	13,160	12,992	12,284	10,486	10,999
Single-Dry Year	8,948	8,693	7,906	5,995	6,506
Multiple-Dry Year					
Year 1	9,592	9,380	8,633	6,778	7,290
Year 2	8,948	8,693	7,906	5,995	6,506
Year 3	7,340	6,975	6,091	4,037	4,547

(a) Total surplus for both domestic and non-domestic water systems

ES.4 Conclusion

Relative to 2017, total District water demands are projected to increase by 29.6% by 2040 with a projected population increase of 24.2% (161,000 in 2017 to 200,026 in 2040). Total domestic water demands are projected to increase by approximately 13.6% by 2040 relative to 2017, while NDW demands are projected to increase by approximately 74.3% for the same time span.

Historical District water supplies consisting of treated imported water purchased from MWDOC for domestic water supply; recycled water produced at three water recycling plants; and collected urban return flows for NDW supply have all proven to be reliable supply sources. To meet future demands, ensure supply reliability, and to develop a more diverse water supply, SMWD is expanding its recycled water system, and constructing seasonal storage for the NDW system, as well as developing new supply sources, i.e. Cadiz groundwater recovery project, RMV well supply lease agreement, and potentially, San Juan Basin IPR.

All existing and proposed new supplies projected to provide for District water demands through the planning period are substantiated by water supply rights, contracts, agreements and entitlements. Water system infrastructure improvements are being planned to support the RMV Planned Community including PA-5 and PA-8. The infrastructure costs will principally be borne by RMV, the developer.

In comparing normal year, single-dry year, and multiple-dry year supplies available to the District with estimated District service area demands for that condition, a supply surplus was estimated for the entire planning period, 2020 through 2040, for each condition.

Based on the information and analyses provided in this WSV, including the documents relied upon herein, and the District's current and projected water conservation and water

management efforts, this WSV concludes the total projected water supplies available to the District during normal, single-dry, and multiple-dry year scenarios over the planning period, 2020 through 2040, as sufficient to meet the demands associated with the Proposed Project in addition to the District's other existing and planned future water demands.

1.0 INTRODUCTION

This Water Supply Verification (WSV) is prepared by the Santa Margarita Water District (SMWD) to demonstrate that SMWD has sufficient water supplies to meet the projected water demands of Planning Area (PA) Nos. 5 and 8 of the Ranch Plan (Project) pursuant to the requirements of Government Code Section 66473.7. SMWD is the public water system that will supply water for the Project.

1.1 The Ranch Plan Description

SMWD was notified by the County of Orange (County) on February 26, 2003, in accordance with Water Code Section 10910 of its Notice of Preparation of a draft Environmental Impact Report (EIR) No. 589 for General Plan Amendment/Zone Change (PA 01-114), known as The Ranch Plan. The County is the Lead Agency and was therefore responsible for preparation of the EIR pursuant to CEQA. The Ranch Plan is located within SMWD's current service territory made up of Improvement Districts (IDs) 4C, 4E, 5, and 6. The County certified the EIR on November 8, 2004.

The Ranch Plan consists of six development areas, Planning Area (PA) Nos. l, 2, 3, 4, 5 and 8, on approximately 7,683 of the 22,815 acres of land owned by Rancho Mission Viejo (RMV) north and east of the City of San Juan Capistrano. The remaining land between and surrounding the development will remain as open space. The Ranch Plan is proposing 14,000 dwelling units ranging from apartments to estate lots, 130 acres of urban activity center uses, 258 acres of business park uses, 39 acres of neighborhood retail development, and a 1,079-acre regional park.

The first planning area, PA-1 (Sendero), opened in 2013 and the second planning area, PA-2 (Esencia) opened in September 2015. Sendero encompasses approximately 495 acres and consists of 1,287 dwelling units; an additional 107 affordable housing units; an additional 610 living units within a congregate care and retirement community; and a 140,000 square foot (sf) urban activity center for retail and office use. Esencia encompasses approximately 895 acres and consists of 2,700 dwelling units; an additional 112 affordable housing units; and a 525,000-sf facility dedicated towards retail use.

PA-3 and PA-4 consist of 2,176 and 515 gross development acres, respectively. There are another 683 gross acres in PA-3 and PA-4 dedicated to open space. PA-3 and PA-4 are planned to have 7,885 and 575 total dwelling units, respectively (maximum); consisting of conventional single-family detached; high-density single-family detached; multiple-family; age-qualified; and affordable housing. The opening for PA-3 is planned for spring 2021, while it is estimated that the opening for PA-4 will occur sometime between 2031 and 2035. A WSV for PA-3 and PA-4 was prepared and approved by the District in September 2017.

1.2 The Ranch Plan Water Supply Assessment

The preparation of a Water Supply Assessment (WSA) is required for development "Projects" subject to CEQA review as defined by Water Code Section 10912. The purpose of a WSA is to determine whether total projected water supply is sufficient during normal, single-dry, and multiple-dry year scenarios over the next 20-year projection to meet the demands associated with the proposed Project in addition to the responsible public water system's other existing and planned future demands. The WSA utilizes information developed and presented in the responsible public water system's most recent Urban Water Management Plan (UWMP) to assess water supply sufficiency.

The Ranch Plan met the definition of a "Project" per Water Code Section 10912, and SMWD prepared a WSA, which was approved in August 2003. The District utilized information from its 2000 UWMP, which included demand projections for The Ranch Plan, to prepare the 2003 WSA. SMWD determined that its total projected water supplies will meet the projected water demands associated with the Project in combination with existing and other planned uses within SMWD's service area.

1.3 Water Supply Verification Requirements

A WSV is required for any "subdivision," which is defined to mean proposed residential development of more than 500 dwelling units. (Gov. Code §66473.7(a)(1).) The verification must be from the applicable "public water system," which is defined to mean the "water supplier that is, ... a public water system, as defined in section 10912 of the Water Code, that may supply water for a subdivision." (Id. §66473.7(a)(3).) Section 10912 of the Water Code defines a "public water system" to mean a system for the provision of piped water to the public for human consumption that has 3,000 or more service connections.

Both PA-5 and PA-8 include a residential development of more than 500 dwelling units; and, therefore, meet the definition of a "subdivision" that requires a WSV. SMWD's current service area includes approximately 57,000 service connections, and thus operates a "public water system" as defined in section 10912 of the Water Code.

Consistent with Government Code section 66473.7(b)(1), RMV, on behalf of the County, requested SMWD to prepare this WSV to provide proof of the availability of a sufficient water supply to meet the demand associated with the Project, in addition to all existing and planned future uses within SMWD's service area.

Gov. Code §66437.7(b)(1) authorizes the legislative body (or advisory agency) with tentative map approval authority, which is the County for this Project, to include as a condition in any tentative subdivision map a requirement that "a sufficient water supply ... be available." "Sufficient water supply" means the total water supplies available during normal, single-dry, and multiple-dry years within a 20-year projection that will meet the projected demand associated with the proposed subdivision, in addition to existing and planned future uses, including, but not limited to, agricultural and industrial uses. (Gov. Code §66437.7(a)(2).)

In determining "sufficient water supply" all of the following factors must be considered:

a) the availability of water supplies over a historical record of at least 20 years;

b) the applicability of an urban water shortage contingency analysis prepared pursuant to section 10632 of the Water Code;

c) the reduction in water supply allocated to a specific water use sector pursuant to a resolution or ordinance adopted, or a contract entered into, by the public water system, as long as that resolution, ordinance, or contract does not conflict with section 354 of the Water Code; and

d) the amount of water that the water supplier can reasonably rely on receiving from other water supply projects. (Gov. Code §66437.7 (a)(2)(A)-(D).)

If the subdivision relies on projected water supplies that are not currently available to the public water system, the WSV must substantiate its reliance on such supplies using written contracts, proof of valid rights, copies of capital outlay programs for delivery financing, securing of construction permits, and any necessary regulatory approvals. (Gov. Code §66437.7(d)(1)-(4).)

In addition to the above requirements, the WSV must include analysis of reasonably foreseeable impacts of the proposed subdivision on the availability of water resources for agricultural and industrial uses within the public water system's service area. (Gov. Code §66437.7(g).) The WSV also must evaluate the entitlement to extract any groundwater on which the subdivision will rely. (Gov. Code §66437.7(h).)

The demands for PA-5 and PA-8 were projected in the District's 2003 WSA for The Ranch Plan and in its 2015 UWMP, and these documents were utilized to determine demand sufficiency for the Project in this WSV. SMWD previously prepared WSVs for PA-1 (2012), PA-2 (2014), and PA-3 and PA-4 (2017), which were approved as they demonstrated sufficient water supply for the subject project as well as existing and future District demands including the entire Ranch Plan through a 20-year planning period.

2.0 PROJECT DESCRIPTION

2.1 Project Location

2.1.1 RMV Planned Community

The 22,683-acre RMV Planned Community is located in southeast Orange County within unincorporated Orange County. The Ladera Ranch Planned Community (Ladera Ranch) and the cities of San Juan Capistrano and San Clemente border the RMV Planned Community on the west. The planned community of Coto de Caza and the City of Rancho Santa Margarita border the northern edge of the site; the United States Marine Corps Base (MCB) Camp Pendleton in San Diego County borders the southern edge; and Caspers Wilderness Park, the Cleveland National Forest, and several private properties in Riverside and San Diego Counties border the site on its eastern edge. A regional location map is shown on Figure 2.1.

2.1.2 PA-5 and PA-8

Both PA-5 and PA-8 are located within SMWD Improvement District (ID) No. 6. PA-5 is located east of La Pata Avenue, south of Ortega Highway, just north of the City of San Clemente, and west of Caspers Wilderness Park. PA-8 is located east of the City of San Clemente, south of Ortega Highway, and just to the north of Camp Pendleton.

2.2 Existing Land Uses

Portions of PA-5 have been used for agricultural, nursery, industrial and other leases for many years. The Trampas Canyon Reservoir is located in PA-5 (Subarea 5.1). The reservoir was used as a tailing retention facility for a quarry until recently. As discussed in Section 4.4.2, the District is rebuilding the dam and increasing the reservoir capacity to 5,000 AF so it can function as a seasonal storage reservoir in the District's non-domestic water (NDW) system. PA-8 has limited existing land uses. All of the existing land uses in PA-5 and PA-8, with the exception of Trampas Reservoir in PA-5, will be removed prior to the development of the proposed land uses.

2.3 Project Characteristics

PA-5, which has a total area of 1,190 acres, will be divided into two subareas for development purposes: Subarea 5.1 (342 acres), which is the southern portion, contains the Trampas Reservoir; and Subarea 5.2 (848 acres) will consist of engineered slopes, 1,250 single-family detached homes, 75 affordable houses, and 150 thousand square feet (ksf) of neighborhood commercial (NC). Only 360 acres of Subarea 5.2 will be developed, with 8 acres allocated for NC, and 167 acres allocated for greenbelts and common areas that will be irrigated with recycled water. After deducting an estimated 25% for roads, the net density for 1,250 single family homes is estimated at approximately 9.0 dwelling units per acre (DU/ac). The average lot size will be approximately 4,800 square feet (sf).

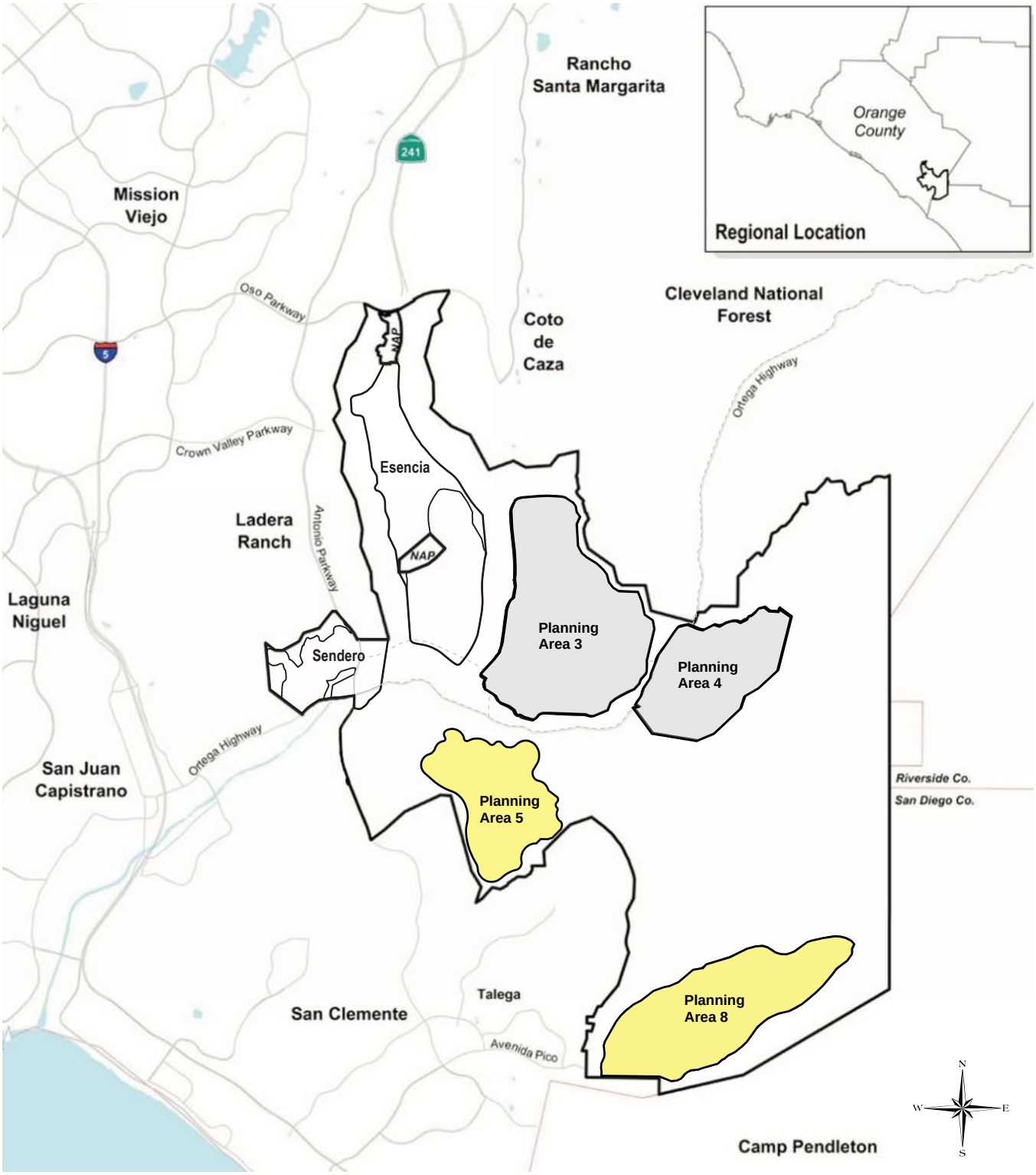

Figure 2-1. Regional Location Map

PA-8 has a total area of 1,349 acres, of which 500 acres will be developed. The new development will consist of engineered slopes, 1,250 single-family detached homes, 75 affordable houses, 740 ksf for an Urban Activity Center (UAC), 150 ksf of NC, and 5 acres designated for parkland. Of the land to be developed, approximately 35 acres will be allocated for the UAC and NC land uses, and 175 acres will be allocated for greenbelts and common areas that will be irrigated with recycled water. After deducting an estimated 25% for roads, the net density for 1,250 single family homes is estimated at approximately 6.0 DU/ac. The average lot size will be approximately 7,200 sf.

The development characteristics for PA-5 and PA-8 are shown in Table 2.1.

Table 2.1
PA-5 and PA-8 Development Characteristics

Planning Area	Residential Dwelling Units			Parks	UAC[a]	NC[a]
	Conventional Single-Family Detached	Affordable Housing	Total Dwelling Units	Parkland Gross Acres	Maximum Non-Residential ksf	Maximum ksf
2031 - 2035						
Subarea 5.1[b]	-	-	-	-	-	-
Subarea 5.2	1,250	75	1,325	-	-	150
Subarea 8	1,250	75	1,325	5	740	150
Totals	2,500	150	2,650	5	740	300

(a) UAC: Urban Activity Center; NC: Neighborhood Commercial
(b) Subarea 5.1 will consist of the Trampas Reservoir

2.4 Infrastructure Improvements

Water system infrastructure improvements have been planned to support the RMV Planned Community including PA-5 and PA-8. The infrastructure costs will principally be borne by RMV, the developer.

2.4.1 Domestic Water System

Imported water will be supplied to PA-5 via an existing turnout (SC-6) on the South County Pipeline (SCP); and via Zone 1 (hydraulic grade line (HWL) of 650 feet) and Zone 2 (HWL of 830 feet) transmission mains connected to respective transmission mains in Cow Camp Road, and then routed south across San Juan Creek via Gibby Bridge into PA-5. A Zone 1 and a Zone 2 domestic water storage reservoir (two reservoirs) will be constructed in PA-5 to provide operational, fire-protection, and emergency storage. The reservoir sites have not yet been determined. Distribution system piping, pressure reducing station and

appurtenant facilities will be constructed to distribute and serve water to customers in PA-5. The District is also considering serving domestic water for PA-5 from a new SCP as opposed to using the existing SC-6 turnout.

Imported water will be supplied to PA-8 from a proposed new service turnout on the SCP that will be located directly west of PA-8. The timeline for the construction of this service connection has not yet been determined. Depending on the land use plan for PA-8, this development area may be served by two to four domestic water pressure zones. Zone 1 and Zone 2 transmission pipelines will connect to the proposed SCP service connection and will be routed into PA-8.

A Zone 1 and a Zone 2 domestic water storage reservoir (two reservoirs) will be constructed in PA-8 to provide operational, fire-protection, and emergency storage. Higher Zone 3 (for pad elevations 680 to 900 feet) and Zone 4 (for pad elevations 900 to 1,020 feet) service areas might be necessary. If required, each higher zone would have a storage reservoir (or hydropneumatic tank), and would be supplied from the immediate lower zone via a pump station. Distribution system piping, pressure reducing station and appurtenant facilities will be constructed to distribute and serve water to customers in PA-8.

2.4.2 Non-Domestic Water System

PA-5 and PA-8 will be supplied recycled water from the District's existing and expanded recycled water system. The District is planning to expand the tertiary capacity of the Chiquita Water Reclamation Plant (CWRP) from 6.0 MGD to 9.0 MGD by FY 2021. The expansion will primarily serve recycled water to the Ranch Plan planning areas including PA-5 and PA-8.

SMWD is rehabilitating and expanding the Trampas Canyon Reservoir so it can function as a seasonal storage reservoir in the District's NDW system by FY 2019. The reservoir, which will have a capacity of 5,000 AF, will store NDW during the low-demand winter months so it can be used to supply peak irrigation demands during the high-demand summer months. The reservoir will primarily store recycled water from CWRP, but will also store recycled water from the Oso Creek WRP, the 3A WRP, and possibly the City of San Clemente WRP via interconnections with the Chiquita recycled water system. A pump station is also being constructed to pump water from this proposed reservoir into the transmission/distribution systems.

Recycled water and other NDW will be supplied to PA-5 via a Zone A (HWL of 626-feet) 30-inch transmission main (connected to a transmission main located in Cow Camp Road in PA-3) routed south across San Juan Creek via Gibby Bridge into PA-5. A reservoir located in PA-5 will provide operational storage for Zone A. A pump station in PA-5 will supply water to Zone B (HGL of 830 feet) where water will be stored in a Zone B reservoir. Distribution system piping, pressure reducing station and appurtenant facilities will be constructed to distribute and serve recycled water to customers in PA-5.

Recycled water will be conveyed to PA-8 from CWRP via the existing 16-inch transmission main that conveys recycled water to Talega. A new 16-inch pipeline and pump station would convey recycled water east to PA-8 where additional pump stations,

storage reservoirs, distribution piping and appurtenant facilities will be required to distribute and serve recycled water to customers in PA-8.

2.5 Estimated Project Water Demands

Domestic water demands were developed for PA-5 and PA-8 land use categories using the standard SMWD unit demand factors shown in Table 2.2.

Table 2.2
Domestic Water Demand Factors

Land Use	Units	Demand Factor (gpd/Unit)
Conventional Single-Family Detached Homes	DU	450
High-Density Single-Family Detached	DU	450
Multi-Family Homes	DU	175
Age Qualified Homes	DU	300
Affordable Housing	DU	175
Parkland	AC	200
School	Student	12.5
Urban Activity Center	KSF	225
Neighborhood Center	KSF	225
Business Park	KSF	225

DU: dwelling unit; AC: acre; KSF: thousand square feet

Using the land use statistics shown in Table 2.1 along with the standard SMWD unit domestic water demand factors and an estimated 4.0 percent water loss (consistent with the 2015 UWMP estimate for potable water system loss), domestic water demands were developed for PA-5 and PA-8 and are summarized in Table 2.3. Non-domestic water demands including an estimated 8.0 percent water loss are also summarized in Table 2.3. All demands within both Planning Areas are assumed to be phased in the 2031 to 2035 5-year timeframe. For the Project, the total domestic water demand is estimated at 1,614 AFY and the total non-domestic water demand is estimated at 1,051 AFY as shown in Table 2.3. A more detailed breakdown of the estimated domestic and non-domestic water demand by land use for PA-5 and PA-8 is included in Appendix A.

Table 2.3
Phased Project Water Demands

	Domestic Water Demand[(a)] (AFY)	Non-Domestic Water Demand[(b)] (AFY)	Total Water Demand (AFY)
2031 – 2035			
Subarea 5.1[(c)]	-	-	-
Subarea 5.2	710	514	1,224
Subarea 8	904	537	1,441
Total	1,614	1,051	2,665

(a) Includes 4.0% water loss
(b) Includes 8.0% water loss
(c) Subarea 5.1 will consist of the Trampas Reservoir & will not have any water demands

Water Concern Ltd. specializes in irrigation system planning and design and has developed numerous recycled water plans/systems for SMWD and RMV including those for Ladera, Sendero, and Esencia. Water Concern developed recycled water demands for PA-5, and the detailed demand development is included in Appendix A of this report. In summary, local, historical, average monthly evapotranspiration (ETo) was used in conjunction with irrigation efficiencies, plant factors, contingency factors, and net irrigation areas associated with landscape irrigation schemes to estimate monthly and annual recycled water demands for PA-5. The landscape irrigation schemes include: 1) moderate water use shrub area irrigated with overhead spray, 2) low water use shrub area irrigated with overhead spray, 3) moderate water use shrub area irrigated with drip irrigation, and 4) warm season turf grass irrigated with overhead spray. The irrigation system planning parameters are consistent with the 2015 Model Water Efficient Landscape Ordinance (MWELO).

Using the rationale summarized above and detailed in Appendix A, an average irrigation rate of 2.85 AF/acre, excluding water loss, was estimated for PA-5. It is estimated that 167 acres of the 360 acres to be developed in PA-5 will be irrigated with recycled water. Using an average irrigation rate of 2.85 AF/acre for PA-5 results in an estimated recycled water demand of 476 AFY excluding water loss.

Based on actual, average landscape irrigation data for PA-1 and PA-2, and the average landscape irrigation design for PA-3, PA-4, and PA-5, the average landscape irrigation rate for these planning areas is calculated to be 2.84 AF/acre. It is estimated that 175 acres of the 500 acres in PA-8 will be irrigated with recycled water. Using an average irrigation rate of 2.84 AF/acre for PA-8 results in an estimated recycled water demand of 497 AFY excluding water loss.

The phased recycled water (non-domestic water) demands for PA-5 and PA-8 are shown in Table 2.3 with the inclusion of an estimated 8.0 percent in system water loss. The total (buildout) recycled water demand for PA-5 and PA-8 is estimated at 1,051 AFY.

3.0 WATER DEMAND ANALYSIS

3.1 SBx7-7 Water Use Requirements

Senate Bill x7-7 (SBx7-7) was enacted in November 2009 (Water Conservation Act of 2009), requiring all water suppliers to increase water use efficiency. The legislation set an overall statewide goal of reducing per-capita urban water use by 20% by December 31, 2020 and to make incremental progress towards this goal by reducing per capita water use by at least 10% by December 31, 2015.

In their 2010 UWMPs, each urban retail water supplier was required to develop baseline daily per-capita water use, minimum baseline daily per-capita water use, and target daily per-capita water use for 2015 and 2020 based on utilizing one of four methods provided; with the target reduction for 2020 greater than the legislation's minimum water use reduction requirement. In their 2015 UWMPs, each water agency had to demonstrate compliance with their established water use target for 2015, and show whether it was on track to achieve its 2020 target.

In their 2015 UWMP, the District's per-capita water use was calculated to be 153 gallons per capita per day (gpcd) for FY 2015, which was significantly lower than their 2015 SBx7-7 target of 190 gpcd, and was also lower than their 2020 SBx7-7 target of 169 gpcd.

3.1.1 SBx7-7 Compliance with Regional Alliance

A retail supplier may choose to meet the SBx7-7 targets on its own (as reported above) or it may form a regional alliance with other retail suppliers to meet the water use targets as a region. Within a regional alliance, each retail water supplier will have an additional opportunity to achieve compliance under both an individual target and a regional 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.

The District is a member of the Orange County 20x2020 Regional Alliance formed by MWDOC, its wholesaler. This regional alliance consists of 29 retail agencies in Orange County as described in MWDOC's 2015 UWMP. MWDOC provides assistance in the calculation of each retail agency's baseline water use and water use targets.

In 2015, the regional baseline and targets were revised to account for any revisions made by the retail agencies to their individual 2015 and 2020 targets. The regional water use target was the weighted average of the individual retail agencies' targets (by population). The Orange County 20x2020 Regional Alliance weighted 2015 target was 176 gpcd and the 2020 target was 158 gpcd. The actual 2015 water use in the region was 125 gpcd, which was lower than both the 2015 and 2020 SBx7-7 targets.

3.2 SMWD Water Conservation

SMWD's Board of Directors adopted its Comprehensive Water Conservation Program Ordinance No. 2014-10-03 in October 2014, which established a staged water conservation program to encourage reduced water consumption within the District through conservation; enable effective water supply planning; assure reasonable and beneficial use of water; prevent waste of water; and maximize the efficient use of water within the District. The District's Water Shortage Contingency Plan consists of the four stages shown in Table 3.1. Stage 1 water use measures are in effect at all times unless a mandatory conservation stage (Stage 2, 3, or 4) is issued by the Board of Directors to address a respective water supply shortage (Santa Margarita Water District, Ordinance No. 2014-10-03, October 2014).

Table 3.1
SMWD Stages of Water Shortage Contingency Plan

Stage	Supply Reduction	Water Supply Condition
1	Up to 10%	Exists when the District encourages customers to voluntarily conserve water.
2	Up to 20%	Exists when the District determines water supply shortage exists and consumer demand reduction necessary to use water efficiently and respond to water conditions.
3	Up to 40%	Exists when the District notifies residents and businesses significant reduction in consumer demand is necessary to maintain sufficient water supplies for public health and safety.
4	Over 40%	Exists when the District declares severe drought conditions exists and significant reduction in consumer demand necessary to maintain sufficient water supplies for public health and safety.

The District's adoption of the Water Conservation Program Ordinance and implementation of Stage 2 water use restrictions were in response to California's worst drought on record that persisted from 2012 through 2016. The Governor officially declared an end to the drought emergency on April 7, 2017.

3.3 District Demand Characteristics and Trends

SMWD has approximately 57,000 customer connections to its domestic (potable) water distribution system in FY 2017, up from 55,000 shown in the 2015 UWMP. All connections in SMWD's service area are metered. Approximately 72% of SMWD's potable water demand in FY 2017 was residential; water losses totaled 4.7%; and commercial/industrial, landscape, and other users consumed the remaining water. SMWD does not currently provide any sales to agriculture or to other water agencies. The District also does not provide water for saline water intrusion barriers, groundwater recharge, or participate in conjunctive use.

With regard to the reduction in water supply allocated to a specific water use sector pursuant to a resolution or ordinance adopted, or a contract entered into, by the public water system, SMWD's Comprehensive Water Conservation Program Ordinance No. 2014-10-03 established voluntary and mandatory water conservation requirements consistent with four water conservation stages that will take effect when implemented by the Board of Directors to address a respective water supply shortage.

The supply and demand comparisons incorporated from the District's 2015 UWMP into this WSV do not reflect any supply reduction pursuant to this ordinance beyond the voluntary measures (Stage 1). This represents a conservative approach where the demand projections for single-dry and multiple dry-years are not assumed to be reduced by mandatory rationing as further discussed in Section 4.0 of this WSV.

Since 2010 and especially since 2014, SMWD's domestic water use has decreased through the implementation of water conservation ordinances and measures. Many of the water conservation measures already implemented and being implemented by SMWD customers such as conversion to recycled water for irrigation, turf removal, conversion to drought resistance landscapes, conversion to more efficient irrigation systems and ET-based irrigation controllers, retrofits to high efficiency clothes washers and toilets, implementation of weather-based irrigation controllers, etc. will have permanent impacts on water use (reduction) in the future.

District domestic water demands for calendar year (CY) 2014, 2015, 2016, and 2017 are shown in Table 3.2. As shown, relative to CY 2014, domestic water demands decreased 18.7 percent in CY 2015, 19.9 percent in CY 2016, and 17.7 percent in CY 2017.

Table 3.2
SMWD Domestic Water Demands, Calendar Year 2014 - 2017 (AFY)

Calendar Year	2014	2015	2016	2017
DW Demand[(a)]	27,786	22,586	22,254	22,869
% Reduction Relative to 2014	-	18.7%	19.9%	17.7%

(a) Includes an estimated 4.0% of system water loss

3.4 Projected District Water Demands

Actual CY 2017 and projected future domestic water and non-domestic water demands for the District service area including the Project demands are shown in Table 3.3. Water demand projections for PA-5 and PA-8 were included in the District's 2015 UWMP, but have been re-estimated as part of this WSV, utilizing more detailed and current statistical information. Future District domestic water demands were also revised in this WSV from the projections in the 2015 UWMP based on a presentation at the District's Strategic Planning Workshop 2018. These projections take into consideration the demand reductions occurring in 2015 through 2017. it has become evident that many of the water conservation measures implemented by SMWD customers resulting in the demand reductions in 2015 through 2017 will have permanent impacts going forward. In Table 3.3 RMV projected

demands, excluding the Project demands, are based on indoor and outdoor demand factors determined from actual Sendero (PA-1) and Esencia (PA-2) domestic water use.

District NDW demands were also revised in this WSV relative to the projections made in the 2015 UWMP based on the NDW System Supply and Demand Balance prepared in this WSV (see Table 4.4 in Section 4). All domestic water demands and all non-domestic water demands include 4.0% and 8.0%, respectively, for system water loss. The NDW water loss is in addition to treatment plant losses, which are accounted for separately.

Table 3.3
Water Demand Projections for SMWD Service Area (AFY)

	2017[a]	2020	2025	2030	2035	2040
Domestic Water						
Project (PA-5 and PA-8) [b]	0	0	0	0	1,614	1,614
Other District Service Area [c]	22,241	23,384	24,266	25,044	23,648	23,648
Total Domestic Water [d]	22,241	23,384	24,266	25,044	25,262	25,262
Non-Domestic Water						
Project (PA-5 and PA-8) [e]	0	0	0	0	1,051	1,051
Other District Service Area [f]	7,993	8,787	10,090	11,269	12,848	12,878
Total Non Domestic Water	7,993	8,787	10,090	11,269	13,899	13,929
Total Water Demands	30,234	32,171	34,356	36,313	39,161	39,191

(a) Actual water demand for 2017, with added water loss (4 percent domestic water; 8 percent non-domestic water)
(b) From RMV Report dated October 2017: Planning Area 5 and 8 Report for Domestic Water Demand, Recycled Water Demand and Wastewater Generation, Appendix A, prepared by David Evans and Associates, Inc. (1,552 AFY avg daily demand plus water loss of 4 percent). Domestic Water Demand Factors - Conventional SF and Planned Concept: Detached 450 gpd/DU; Multi-Family 175 gpd/DU; Age Qualified 300 gpd/DU; Affordable 175 gpd/DU.
(c) Calculated, 2020-2040 Total Domestic Water Projection (from SMWD Strategic Plan Workshop 2018) less RMV projections
(d) 2020-2040 water demands projected using existing District water demands, as presented at the SMWD Strategic Planning Workshop 2018, plus projected RMV growth. RMV demand projected using RMV-provided planned dwelling unit growth and applying indoor and outdoor demand factors based on actual Sendero and Esencia domestic water use. Water demands were adjusted to include commercial and irrigation use using an adjustment factor based on historical residential water use of 74 percent of total demand. Total water demand was increased by four percent to account for dw losses.
(e) From RMV Report dated October 2017: Planning Area 5 and 8 Report for Domestic Water Demand, Recycled Water Demand and Wastewater Generation, Appendix B, (973 AFY plus water loss of 8 percent to account for evaporation/percolation). Non-Domestic Water Demand based on Landscape Area by Type Acres in planning areas with applied demand by type.
(f) From Table 4.4, total NDW demand minus Project NDW demand. Does not include planned conversions, RSM 1,150 AFY; Las Flores 200 AFY; other 50 AFY in 2019-2020.

Relative to 2017, total District water demands are projected to increase by 29.6% by 2040 with a projected population increase of 24.2% (161,000 in 2017 to 200,026 in 2040). Total domestic water demands are projected to increase by approximately 13.6% by 2040 relative to 2017, while NDW demands are projected to increase by approximately 74.3% for the same time span.

As discussed in Section 4.0, NDW demands are supplied by recycled water produced by District water reclamation plants and collected urban return flows. In the future non-domestic groundwater supplied by RMV will also be utilized to provide for District non-domestic water demands. A breakdown of District NDW demands projected through 2040 is detailed in Table 4.4 in Section 4.0.

4.0 WATER SUPPLY ANALYSIS

The District has historically relied on a combination of purchased treated imported water, recycled water produced at District water recycling plants, intercepted flow from Oso Creek, collected urban return flows, and some groundwater produced from the San Juan Groundwater Basin (San Juan Basin) to meet water demands in its service area. As shown in Table 4.1, the District's primary source of water supply has been treated imported water purchased from MWDOC via Metropolitan. In FY 2017, the District's water supply was comprised of approximately 72% imported water and 28% recycled water (including other NDW sources).

Table 4.1
Historical SMWD Water Supply (AF) (2000 – 2017)

Water Supply Sources	FY 2000	FY 2005	FY 2010	FY 2015	FY 2017
MWDOC Treated Imported	27,923	30,268	28,077	26,910	22,795
San Juan Basin Groundwater	154	90	65	0	0
Recycled/NDW	3,344	2,503	6,027	7,495	8,833
Total	31,421	32,861	34,169	34,405	31,628

In addition to recycled water produced at District water recycling plants from sanitary wastewater influent, a portion of the reported recycled water supply is water intercepted at the Oso Creek Barrier and pumped to the air gap/blending structure at the District's Oso Creek Water Reclamation Plant (OCWRP), where it is subsequently pumped into the District's NDW distribution system.

Cañada Gobernadora, Horno, Trabuco, and Dove Canyon are multi-purpose basins designed to provide water quality control, trash/debris collection, wetlands and habitat restoration, water reclamation, and storm water detention. Collected urban return flows from these basins is used in the NDW system. The District has operated a well under Nichol's Institute water rights in the San Juan Basin, but has produced less than 154 AFY of groundwater since 1995. It is projected that the Nichols Institute will utilize imported water instead of groundwater from 2018 into the future.

The Baker Water Treatment Plant (Baker WTP), which is operated by IRWD, went on-line in 2016 to provide another source of treated imported water for local water agencies including SMWD, which owns 8.4 MGD (9,400 AFY) of treatment capacity in the plant.

The District has developed an agreement to purchase groundwater stored on the Cadiz property in eastern San Bernardino County.

The District has also developed a water supply transfer contract with Cucamonga Valley Water District (CVWD) to augment imported water supplies in order to accommodate domestic water demands of the Ranch Plan developments during times of limited imported water supply conditions.

To augment the NDW supply, the District has entered into an agreement with RMV Mutual Water Company (MWC) to purchase groundwater from the RMV MWC well system, as requested, and prorated for supply to Ranch Plan planning areas, as they are developed. The District also has an agreement to receive supplementary recycled water from IRWD's Los Alisos WRP.

SMWD water supply rights, contracts, agreements, and entitlements for existing and future water supply are shown in Table 4.2 and are discussed in greater detail throughout this section of the report.

Additionally, the San Juan Basin Authority adopted the San Juan Basin Groundwater and Facilities Plan Update that foresees the potential to recharge the San Juan Basin with a combination of stormflows, urban return flows, and recycled water to maximize the potable water supply. The District is preparing California Environmental Quality Act Documentation for the first phase of this project and has plans to participate in this project to increase their domestic water supply reliability.

4.1 Imported Water (Domestic Water)

The District's domestic water supply has been entirely dependent on imported water purchased from Metropolitan through MWDOC. Metropolitan's principal sources of water are the Colorado River via the Colorado River Aqueduct (CRA), and the Lake Oroville watershed in Northern California through the State Water Project (SWP). Treatment of water from Metropolitan will take place at either the Diemer Filtration Plant or the Baker WTP, which started up in 2016, before being delivered to the District.

The District has connections to the Allen-McColloch Pipeline (AMP) and the East Orange County Feeder No. 2 (EOCF #2), both of which deliver potable water. The AMP is the District's primary source of potable water. It is connected to the South County Pipeline (SCP), which is jointly owned by the District and Metropolitan but operated by the District. The EOCF #2 is a pipeline jointly owned by several local agencies and Metropolitan. The District has capacity rights of 10,000 AFY in the EOCF #2. Water is also delivered through the Aufdenkamp Transmission Main to the District's Plaza Pump Station through the CM-12 turnout.

MWDOC developed a Shortage Allocation Model as part of their 2016 Water Supply Allocation Plan (WSAP) to determine water allocation to its member agencies during a water shortage. For FY 2016, based on a Stage 3 Shortage Level set by Metropolitan (15% regional shortage), MWDOC determined an imported water supply allocation of 26,277 AFY for SMWD. A FY 2016 "non-shortage" supply of 29,202 AFY was first determined for SMWD (2013-2014 base-period supply adjusted by a growth factor); and then reduced to 26,277 AFY considering the regional shortage of 15%; and taking into account the District's dependence on imported water (retail impact adjustment) and the District's success in implementing water conservation measures (conservation credit). The reduction from a "non-shortage" supply of 29,202 AFY to 26,277 AFY amounted to a 10.0% net reduction in imported water supply for the District. Metropolitan's 2015 WSAP was only the second time a WSAP has ever been issued and the first shortage level as high as Stage 3. The drought emergency officially ended in April 2017.

Table 4.2
SMWD Water Supply Rights, Contracts, Agreements and Entitlements

Source	Existing or Future	Supply (AFY)	Quality	Source Details
MWDOC	Existing	22,795 FY 2017	Domestic	Imported water allocation based on a "non-shortage" supply allocation of 29,202 AFY and a MWD-declared Stage 3 Shortage (10.0% reduction for SMWD)
Baker Treatment Plant	Existing	9,400	Domestic	District's treatment plant capacity rights
Cadiz Water Purchase and Sale Agreement	Future	5,000 to 15,000	Domestic	5,000 AFY first priority rights; option to purchase additional 10,000 AFY; and 15,000 AF carry-over rights for groundwater stored on Cadiz property in eastern San Bernardino
Cucamonga Valley Water District Water Supply Transfer Contract	Existing	4,200	Domestic	Contract to purchase water from CVWD only if SMWD's available Tier I and Tier II water supplies/deliveries from Metropolitan/MWDOC are insufficient to accommodate water demands of the Ranch Plan: water is exchanged for treated Met water in their delivery system
Recycled Water	Existing	7,495 (2015)	Non-Domestic	Entitlement from the larger of either influent wastewater to or tertiary capacity of District WRPs: Chiquita, Oso, 3A; as required to meet NDW service area demands
Oso Creek Barrier	Existing	900	Non-Domestic	Intercepted Oso Creek streamflow pumped to air gap/blending at OCWRP and then ultimately pumped into NDW system; entitlement
Cañada Gobernadora Multipurpose Basin	Existing	250	Non-Domestic	Storm detention basins and a natural treatment system that capture and divert flows to the wetlands and pumps water to NDW system; entitlement
Horno Multipurpose Basin	Existing	170	Non-Domestic	Low flows diverted through constructed wetlands for natural treatment then pumped into recycled water system for beneficial reuse
Los Alisos WRP	Existing	Up to 1,500	Non-Domestic	Agreement with IRWD to receive recycled water from IRWD's LAWRP (supplemental supply)
RMV Lease of Supplemental Water Agreement	Future	400 to 2,500	Non-Domestic	SMWD can lease groundwater from the RMV NDW well supply system, as requested, up to 2,500 AFY, as prorated for supply to Ranch Plan Planning Areas, as developed (supplemental)

A "non-shortage" imported water supply for SMWD will change in a given year considering a MWDOC-determined growth factor for the District (growth adjustment); and also considering any significant changes in supply from other sources (other than Metropolitan/MWDOC imported water) relative to the base period.

4.1.1 Colorado River Supplies

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 (QSA) and related agreements to transfer water from agricultural agencies to urban uses. The 2003 QSA 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.

Water from the Colorado River system 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. 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 exist (Metropolitan, 2015 UWMP, June 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
    - Colorado River water apportioned to but unused by Arizona and/or Nevada

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 period from 2000-2015, there have only been three years when the Colorado River flow has been above average (Metropolitan, 2015 UWMP, June 2016).

Approximately 40 million people rely on the Colorado River system for water with 5.5 million acres of land using Colorado River water for irrigation. Climate change also has the potential to 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.

According to a report issued by the United States Bureau of Reclamation, 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, such as:

- Resolution of issues related to water conservation, reuse, water banking, and weather modification concepts.
- Costs, permitting, 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.

  (U.S. Department of the Interior Bureau of Reclamation, Colorado River Basin Water Supply and Demand Study, December 2012)

Quagga Mussel Control Program

The presence and spawning of quagga mussels in the lower Colorado River from Lake Mead through Lake Havasu poses a threat to Metropolitan and other Colorado River water users due to the potential to continuously seed water conveyance systems with mussel larvae. Chlorination is the most frequently used means to control mussel larvae entering water systems.

Metropolitan developed the Quagga Mussel Control Program in 2007 to address the long-term introduction of mussel larvae into the CRA from the lower Colorado River which is now heavily colonized from Lake Mead through Lake Havasu. The Quagga Mussel Control Program consists of surveillance activities and control measures. Surveillance activities are conducted annually alongside regularly scheduled 2-3 week long CRA shutdowns. Control activities consist of continuous chlorination at the outlet of Copper Basin Reservoir (5 miles into the aqueduct), a mobile chlorinator for control of mussels on a quarterly basis at outlet towers and physical removal of mussels from the trash racks at Whitsett Intake Pumping Plant in Lake Havasu. Since 2007, the CRA has had scheduled 2 to 3 week-long shutdowns each year for maintenance and repairs which provide the opportunity for direct inspections for mussels and the additions benefit of desiccating quagga mussels. Recent shutdown inspections have demonstrated that the combined use of chlorine and regularly scheduled shutdowns effectively control mussel infestation in the CRA since only few and small mussels have been found during these inspections.

In addition, Metropolitan has appropriated $9.55 million to upgrade chlorination facilities in the aqueduct and at two additional locations in its system, the outlets of Lakes Mathews and Skinner. It is likely that additional upgrade costs will be incurred for these facilities. Chemical control (chlorination) at Copper Basin Reservoir, Lake Mathews, and the Lake Skinner Outlet costs approximately $3.0-3.2 million per year depending on the amount of Colorado River water conveyed through the aqueduct.

4.1.2 State Water Project Supplies

Much of the SWP water supply passes through the San Francisco-San Joaquin Bay-Delta (Bay-Delta). The SWP consists of a series of pump stations, reservoirs, aqueducts, tunnels, and power plants operated by DWR. This statewide water supply infrastructure provides water to 29 urban and agricultural agencies throughout California. More than two-thirds of California's residents obtain some of their drinking water from the Bay-Delta system.

The Bay-Delta's ecosystem is facing challenges caused by a number of factors such as agricultural runoff, predation of native fish species, urban and other discharge, changing ecosystem food supplies, and overall system operation. These and other issues in the Delta have led to reductions in the availability and reliability of water supply deliveries from the SWP.

SWP supplies are estimated using the 2015 SWP Delivery Capability Report distributed by DWR in July 2015. The 2015 Delivery Capability Report presents the current DWR estimate of the amount of water deliveries for current (2015) conditions and conditions 20 years in the future. A Draft 2017 Delivery Capability Report was released by DWR in December 2017 but delivery estimates are very similar to the 2015 report, which is adopted by DWR so those will be discussed herein rather than the values in the draft report. These estimates incorporate restrictions on SWP and Central Valley Project (CVP) operations in accordance with the biological opinions of the U.S. Fish and Wildlife Service and National Marine Fisheries Service issued on December 15, 2008, and June 4, 2009, respectively. Under the 2015 Delivery Capability Report with existing conveyance and low outflow requirements scenario, the delivery estimates for the SWP for 2020 conditions as a percentage of Table A amounts are 12 percent, equivalent to 257 TAF for Metropolitan, under a single dry-year (1977) condition and 51 percent, equivalent to 976 TAF for Metropolitan, under the long-term average condition[1].

In dry, below-normal conditions, Metropolitan has increased the supplies received from the California Aqueduct by developing flexible Central Valley/SWP storage and transfer programs. For 2014 and 2015, under the pumping restrictions of the SWP, Metropolitan has worked collaboratively with the other contractors to develop numerous voluntary Central Valley/SWP storage and transfer programs. The goal of these storage/transfer programs is to develop additional dry-year supplies that can be conveyed through the California Aqueduct during dry hydrologic conditions and regulatory restrictions.

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

[1] Generally, two types of deliveries are assumed for all SWP contractors: Table A and Article 21. Table A Amount is the contractual amount of allocated SWP supply, set by percentage amount annually by DWR; it is scheduled and uninterruptible. Article 21 water refers to the SWP contract provision defining this supply as water that may be made available by DWR when excess flows area available in the Delta (i.e., Delta outflow requirements have been met, SWP storage south of the Delta is full, and conveyance capacity is available beyond that being used for SWP operations and delivery of allocated and scheduled Table A supplies). Article 21 water is made available on an unscheduled and interruptible basis and is typically available only in average to wet years, generally only for a limited time in the later winter.

maximize deliveries through the California Aqueduct during dry hydrologic conditions and regulatory restrictions.

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.

In April 2015, the Brown Administration announced California WaterFix, as well as a separate ecosystem restoration effort called California EcoRestore. Together, the California WaterFix and California EcoRestore will make significant contributions toward achieving the coequal goals of providing a more reliable water supply for California and protecting, restoring and enhancing the Delta ecosystem established in the Sacramento-San Joaquin Delta Reform Act of 2009. In addition to enhancing the Delta Ecosystem, there are a number major actions, projects, and programs Metropolitan has undertaken to improve SWP reliability.

4.1.3 Imported Water Delivery, Conveyance and Treatment

Allen-McColloch Pipeline

The Allen-McColloch Pipeline (AMP) is SMWD's primary source of domestic water in which SMWD has specified capacity rights for the delivery of water. The AMP is connected to and provides water supply to the South County Pipeline (SCP), which is jointly owned on the basis of capacity allocation, by SMWD and Metropolitan. The SCP traverses the SMWD service area from north to south and passes through the area encompassed by The Ranch Plan. Additionally, SMWD has a connection to the AMP in Mission Viejo near the El Toro Reservoir. Metropolitan owns and operates the AMP. SMWD's AMP capacity ownership, expressed as rate of flow, is 139.19 cubic feet per second (cfs).

The Agreement for Sale and Purchase of Allen-McColloch Pipeline (Metropolitan Agreement No. 4623) among Metropolitan, MWDOC, MWDOC Water Facilities Corporation and certain other identified participants, including SMWD, dated July 1, 1994 (AMP Sale Agreement) requires Metropolitan, among other things, to meet SMWD's requests for water deliveries (subject to the availability of water from Metropolitan). The AMP Sale Agreement further requires Metropolitan to augment/increase capacity necessary to meet SMWD's projected ultimate service area water demands, which includes The Ranch Plan and other undeveloped lands within SMWD.

East Orange County Feeder No.2

The EOCF #2 is a pipeline jointly owned by several local agencies and Metropolitan. SMWD has 14 cfs, or 10,000 AFY of capacity rights in the EOCF #2 per the agreement entitled "1970 Agreement Municipal Water District of Orange County and SMWD," dated

December 4, 1970. Water is delivered via the EOCF #2 to the Aufdenkamp Transmission Main and then to SMWD's Plaza Pump Station.

The EOCF #2 is considered a back-up system to the AMP and is currently used intermittently for facilities maintenance purposes. Water supplies are deliverable through this system as necessary to augment or replace deliveries, through the AMP. SMWD's capacity rights in the EOCF #2, and connecting local facilities, enable SMWD to receive water from sources including agencies located within the Orange County Water District (OCWD) service area. The delivery and method of delivery (i.e., direct delivery or exchange) of such water is likely to occur under dry year(s) conditions or emergencies and will be subject to agreements or understandings involving MWDOC, OCWD and its member agencies and IRWD.

Baker Pipeline and Baker Water Treatment Plant

The Baker Pipeline conveys untreated water via a connection to Metropolitan's raw (untreated) water feeder system. SMWD owns capacity in the pipeline pursuant to Santiago Aqueduct Commission Joint Powers Authority Agreement dated September 1961.

The Baker WTP is a domestic water treatment plant that was completed in 2016 in the City of Lake Forest. The plant, which has a treatment capacity of 28.1 MGD, is a joint regional project, operated by IRWD, on behalf of SMWD, Moulton Niguel Water District (MNWD), El Toro Water District (ETWD), and Trabuco Canyon Water District (TCWD). The plant treats raw, imported water from Metropolitan, and may treat local surface water from Irvine Lake, using advanced microfiltration and ultraviolet light disinfection, resulting in high quality drinking water that exceeds current regulatory requirements. Metropolitan water from the CRA and SWP, and local water from Irvine Lake, can be treated independently or as a blend at the plant.

SMWD has a treatment capacity of 8.4 MGD (9,400 AFY), which is in association with receiving treated imported water from MWDOC via the Diemer WTP and does not increase the amount of imported water SMWD can receive through MWDOC.

4.2 Cadiz Water Purchase and Sale Agreement (Domestic Water)

By contract agreement (included in Appendix B), the District is participating in the Cadiz Valley Water Conservation, Recovery and Storage Project (project) that will provide a potential new, reliable water source to the District and other southern California water agencies from a groundwater basin that is part of a 1,300 square miles watershed located in eastern San Bernardino County. The project would manage the aquifer and use water that would otherwise be evaporated from local dry lakes. A future phase of the project could include the ability to store water during wet years from the CRA in the Cadiz Aquifer to be used during dry years. The project is designed to provide 50,000 AFY of potable water on average.

Cadiz, Inc. is the owner of approximately 45,000 acres of land in eastern San Bernardino County, most of which overlies the Fenner Valley Aquifer System. Cadiz has formed the Fenner Valley Mutual Water Company, a nonprofit entity that will operate and manage the project designed to appropriate groundwater from wells on the property overlying the

Fenner Valley Aquifer System, and to deliver that groundwater for reasonable and beneficial uses via the CRA and other facilities necessary to deliver the groundwater to project participants that include SMWD, which has primary responsibilities for the Project and was the lead agency for the Project EIR.

Cadiz will develop, construct and finance all project facilities necessary for the production and delivery of project water and will transfer a possessory interest in the project facilities to the Fenner Valley Water Authority (FVWA). SMWD is the managing entity for the FVWA. Project Facilities include a wellfield located on the property, manifold, 43-mile conveyance pipeline between the wellfield and CRA, and interconnection between the conveyance pipeline and the CRA. In addition to construction and financing, Cadiz is also responsible for obtaining all permits and approvals required for the project in coordination with FVWA and SMWD.

The project underwent an extensive environmental review for two years and will need additional regulatory approvals from certain public agencies to proceed with design and construction. The District served as the lead agency for the California Environmental Quality Act (CEQA) environmental review to evaluate the potential environmental impacts associated with construction and operation of the project. If alternatives are identified and mitigation measures determined necessary, they must be considered and incorporated prior to approval of the project. The EIR was performed by independent environmental and engineering consultants to conduct studies, obtain public input, and determine the feasibility of the project. The Final EIR was approved on July 31, 2012.

SMWD has first priority rights to 5,000 AFY of water supply from the project, along with an option to purchase an additional 10,000 AFY. The District also has 15,000 AF of carry-over rights. The water will be produced and conveyed via Cadiz Project Facilities or alternate facilities to the CRA; and then wheeled through Metropolitan's CRA and other transmission pipelines to the Baker WTP or the Deimer WTP for treatment.

4.3 Cucamonga Valley Water District Water Supply Contract (Domestic Water)

SMWD entered into a water supply contract on March 22, 2006 with Cucamonga Valley Water District (CVWD) (included in Appendix B) to purchase up to 4,250 AFY from CVWD's water supply, which includes adjudicated water rights from the Chino Groundwater Basin and contracted imported water obtained from Metropolitan through the Inland Empire Utilities Agency (IEUA) that is sufficient to generate an excess supply available for export. SMWD receives a first priority right to purchase and receive up to 4,250 AFY from CVWD only if SMWD's available Tier I and Tier II water supplies/deliveries are insufficient to accommodate the water demands of the Ranch Plan. SMWD would exchange the CVWD water for treated Metropolitan water in their delivery system. In essence, this supply option would not be available or utilized unless direct Metropolitan imported water supply to SMWD was reduced due to a drought, Metropolitan facilities outage, or other emergency condition. Accordingly, this supply is considered a supplementary supply as opposed to a normal supply for the District.

4.4 Recycled Water and Other Non-Domestic Water

Recycled water is wastewater that is treated to primary, secondary, and tertiary or higher standards that can be used for most NDW purposes such as landscape irrigation, commercial and industrial processes, and other uses as specified by Title 22 requirements. Recycled water can also be used for groundwater recharge. The District's existing recycled water system will be expanded in the near future to accommodate future NDW demands including landscape irrigation demands for future Ranch Plan planning areas, i.e. PA-5 and PA-8 as well as areas currently using potable water. The District also has other NDW supply sources to supplement their recycled water supply, storage and distribution system.

4.4.1 Wastewater Collection and Treatment

The District generates approximately 10.35 MGD of wastewater and provides sewer collection services for portions of the cities of Rancho Santa Margarita, Mission Viejo and San Clemente, as well as unincorporated areas of south Orange County. The District's wastewater collection system includes approximately 615 miles of pipe ranging from 4 inches to 36 inches in diameter, 20 sewer lift stations, and five wastewater treatment plants that the District owns or partially owns. Wastewater volume collected within the District's service area in FY 2015 is shown in Table 4.3. The collected wastewater is treated by five existing wastewater treatment plants:

- Chiquita Water Reclamation Plant (CWRP)
- Oso Creek Water Reclamation Plant (OCWRP)
- 3A Treatment Plant (3A Plant)
- J.B. Latham Treatment Plant (J.B. Latham Plant)
- Los Alisos Water Recycling Plant (LAWRP)

Table 4.3
Wastewater Collected Within SMWD Service Area in 2015

Name of Wastewater Collection Agency	Volume of Wastewater Collected in 2015 (AF)	Volume of Wastewater Collected in 2015 (MGD)	Name of WW Treatment Agency	Treatment Plant Name
SMWD	2,016	1.8	SMWD	OCWRP
SMWD	0	0	SMWD	3A Plant
SMWD	2,072	1.9	SOCWA	J.B. Latham Plant
SMWD	784	0.7	IRWD	LAWRP
SMWD	6,720	6.0	SMWD	CWRP
Total	11,592	10.4	-	-

NOTES: OCWRP and CWRP flows are from operational data from FY 2014-15. J.B. Latham flow is based on a flow monitoring survey performed in 2013. LAWRP flows are based on the agreement the District has with IRWD. The OCWRP discharges its solids into the sewer system for treatment at J.B. Latham.

4.4.2 Recycled Water Facilities

The District operates a recycled water production and distribution system that consists of two District-owned treatment plants, one jointly-owned treatment plant, urban return flows collection, and the ability to purchase recycled water from IRWD through an existing agreement during dry year conditions. The District's recycled water system diversifies their water supply portfolio and lessens their dependence on imported water. Recycled water within the District's service area is primarily used for irrigation and construction purposes. The recycled water is delivered to parks, medians, slopes, golf courses, and schools throughout the City of Mission Viejo, Ladera Ranch, the village of Sendero (PA-1 and PA-2 in the Ranch Plan), Coto de Caza, the Village of Esencia and the Talega community within the City of San Clemente with plans to expand this service into the City of Rancho Santa Margarita. Recycled water will be provided to all planning areas in the Ranch Plan including PA-5 and PA-8.

In FY 2016 and FY 2017, the District utilized 7,630 AFY and 7,993AFY of recycled/NDW water, respectively, within their service area that included water intercepted at the Oso Creek Barrier and pumped to the air gap/blending structure at the District's OCWRP for subsequent delivery into District's NDW distribution system. These totals also included urban return flows captured by the Gobernadora, Horno, Dove Canyon, and Trabuco basins. The District's NDW demand is expected to increase significantly by 2025 and gradually increase through 2040 primarily in alignment with the development of planning areas in the Ranch Plan. SMWD will accommodate this increase in recycled water demand with expansions of their NDW system, i.e. expansions of their water recycling plant tertiary treatment capacities, construction of a seasonal storage reservoir, and expansions of supplementary NDW supplies.

OCWRP, Upper Oso Reservoir, and Oso Creek Barrier

The District owns and operates the OCWRP, which was constructed in 1978 and subsequently upgraded in 1989, 2004, and 2007. In addition to OCWRP with 3 MGD of tertiary treatment capacity, there is an interceptor system for low flow urban return flows in the Oso Creek (Oso Creek Barrier), a pressurized recycled water distribution system, and a 1.3 billion-gallon Upper Oso Reservoir that holds Title 22 water and urban return flows.

Recycled water from the OCWRP, and urban return flows collected at the Oso Creek Barrier is pumped to the Upper Oso Reservoir, which has been operational since 1979 and is located near the 241 Toll Road in the cities of Mission Viejo and Rancho Santa Margarita. The Upper Oso Reservoir is an uncovered, seasonal NDW storage reservoir with an earthen dam designed to receive and store water during low season demands and to supplement supplies during high demand scenarios. The reservoir has 4,000 AF of storage capacity with 3,600 AF operational. The District owns 3,000 AF of capacity in the reservoir and MNWD owns the remaining 1,000 AF. The recycled water and urban return flows stored in the reservoir is used for landscape irrigation uses such as golf courses, major slopes, parks, and school grounds in the surrounding communities.

Since 1979, the District has operated the Oso Creek Barrier in Mission Viejo (the Barrier). The Barrier was constructed pursuant to San Diego Regional Water Quality Control Board

Order 77-11. The Regional Board required operation of the Barrier to mitigate potential degradation of the lower San Juan Creek Basin that may be caused by the use of recycled water produced and distributed from the District's OCWRP. The Barrier is operated during non-storm periods and produces approximately 900 AFY on a reliable basis. OCWRP performance data for FY 2016 and projected performance data for FY 2020 through FY 2040 is shown in Table 4.4 as part of a SMWD NDW system supply and demand balance.

Table 4.4 SMWD NDW System Supply and Demand Balance (AFY)

	2017	2020	2025	2030	2035	2040
NDW SUPPLY						
Chiquita Water Reclamation Plant (CWRP)						
2016 CWRP Influent Flow Baseline [a]	6,721	6,721	6,721	6,721	6,721	6,721
PA-2 (Esencia) [b]	98	941	941	941	941	941
PA-3 [c]	-	-	659	1,680	2,240	2,240
PA-4 [c]	-	-	-	-	569	569
PA-5 [d]	-	-	-	-	368	368
PA-8 [d]	-	-	-	-	554	554
CWRP Total Influent Flow [e]	6,819	7,662	8,321	9,342	11,393	11,393
CWRP Plant Water Use/Losses (5.5%) [f]	(370)	(370)	(458)	(514)	(554)	(554)
CWRP Tertiary Capacity [g]	6,721	6,721	10,081	10,081	10,081	10,081
CWRP Recycled Water Supply [h]	6,449	6,351	7,863	8,828	9,527	9,527
Oso Creek Water Reclamation Plant (OCWRP)						
OCWRP Influent WW [i]	1,924	1,924	1,924	1,924	1,924	1,924
OCWRP Plant Water Use/Losses (11.7%) [f]	(225)	(225)	(225)	(225)	(225)	(225)
OCWRP Tertiary Capacity [j]	2,016	2,016	2,016	2,016	2,016	2,016
OCWRP Recycled Water Supply [h]	1,699	1,699	1,699	1,699	1,699	1,699
3A Water Reclamation Plant (3A WRP)						
3A WRP Influent WW [k]	319	2,117	2,117	2,117	2,117	2,117
3A WRP Plant Water Use/Losses (5.5%) [f]	(18)	(116)	(116)	(116)	(116)	(116)
3A WRP Tertiary Capacity	2,688	2,688	2,688	2,688	2,688	2,688
3A WRP Recycled Water Supply [l]	301	548	548	548	548	548
Captured Urban Return Flow						
Dove Canyon	115	115	115	115	115	115
Gobernadora	250	250	250	250	250	250
Horno Basin	170	170	170	170	170	170
Trabuco	280	280	280	280	280	280
Oso Barrier	900	900	900	900	900	900
Total Urban Return Flow [m]	1,715	1,715	1,715	1,715	1,715	1,715
RMV MWC Supply [n]	400	816	1,321	1,605	1,957	2,500
Total Available NDW Supply	**10,565**	**11,129**	**13,146**	**14,395**	**15,445**	**15,988**
NDW DEMAND[o]						
	2017	**2020**	**2025**	**2030**	**2035**	**2040**
Coto de Caza [p]	324	324	324	324	324	324
Coto / Wagon Wheel [p]	932	932	932	932	932	932
Ladera Ranch [p, q]	1,634	1,654	1,654	1,654	1,654	1,654
Las Flores [p]	114	97	97	97	97	97
Mission Viejo [p, r]	2,990	3,086	3,086	3,086	3,086	3,086
Lake Mission Viejo (AWT) [s]	298	270	270	270	270	270
RSM [p]	1	1	1	1	1	1
Talega [p]	1,094	1,094	1,094	1,094	1,094	1,094
PA-1 (Sendero) [p, t]	241	498	569	569	569	569
PA-2 (Esencia) [p, t]	365	831	972	972	972	972
PA-3 [t]	-	-	1,091	2,270	3,360	3,360
PA-4 [t]	-	-	-	-	489	519
PA-5 [t]	-	-	-	-	514	514
PA-8 [t]	-	-	-	-	537	537
Total NDW Demand	**7,993**	**8,787**	**10,090**	**11,269**	**13,899**	**13,929**
Surplus NDW Supply	**2,572**	**2,342**	**3,056**	**3,126**	**1,546**	**2,059**

(a) 2017 CWRP Influent Flow Baseline metered CWRP influent flow from Ladera, Sendero, Talega, RSM, Coto de Caza, and small flows from TCWD & IRWD. Existing Talega sewer flow diverted to City of San Clemente WRP in 2018 with corresponding RW to be distributed back to SMWD.

(b) 2017 flow calculated difference of metered 2017 influent less metered 2016 influent. 2020 and beyond projections from PA-2 Subarea Plan of Works, August 2013

(c) From PA-3 and PA-4 Infrastructure Design Report for Cow Camp Road, April 2017

(d) From PA-5 and PA-8 Report for Domestic Water Demand, Recycled Water Demand, and Wastewater Generation, October 2017

(e) 2017 CWRP Influent Flow from metered flow

(f) Losses calculated as percentage of tertiary flow, estimated by SMWD staff. OCWRP higher loss factor due to solids handling, July 2017

(g) CWRP currently has 6.0 mgd (6,720 AFY) of tertiary capacity; to be expanded to 9.0 mgd (10,081 AFY) in FY 2020

(h) (Lower of tertiary capacity or influent wastewater) minus plant water use/losses

(i) 2017 Metered plant influent flow from Mission Viejo

(j) Treatment capacity of 1.8 MGD (2,016 AFY)

(k) 2016 volume from metered influent flow from Mission Viejo. 2020 and beyond value is calculated by diverting 1.8 mgd (2,016 AFY) of SMWD flows from JB Latham Plant to 3A WRP

(l) Assumes SMWD has 0.5 MGD (1.5 acre-feet per day x 365 = 548 AFY) net supply capacity in 3A WRP with no expansion occuring in the future

(m) 2015 + 2016 production from SMWD records, July 2017

(n) From RMV MWC Lease Agreement (April 2012) and build-out timing as of July 2017

(o) All NDW demands below increased by 8.0% to account for distribution system and seasonal storage losses (not including treatment plant losses, which are accounted for in reduced supply values). Demands do not include construction water 533 AFY, export to SJC 230 AFY, Colorspot Nursery 120 AFY, Lapeyre Industrial Sands 128 AFY considered short term demands

(p) 2017 production from SMWD billing database increased by 8% to account for NDW system losses (see footnote o, above)

(q) Anticipated conversions in Ladera (20 AFY)

(r) Anticipated conversions in Mission Viejo in 2020(Upper Mission Viejo/North of Alicia = 45 AFY, Lower Mission Viejo = 20 AFY, and Hidden Ridge/Trabuco Canyon = 24 AFY)

(s) Planned average 230 AFY, 20% reject rate

(t) From PA-5 and PA-8 Report for Domestic Water Demand, Recycled Water Demand & Wastewaste Water Generation, October 2017, Appendix B - Recycled Water Demands (Summary Table) increased by 8% to account for NDW system losses (see footnote o, above)

CWRP

The CWRP is owned and operated by the District with its last expansion completed in 2005. The CWRP has a secondary treatment capacity of 9.0 MGD. Tertiary treatment capacity at the CWRP is currently 6.0 MGD. The existing recycled water distribution system includes a NDW transmission main serving the Talega development. The other system includes a NDW transmission main extending westerly to an operational storage reservoir in Covenant Hills.

The District is planning to expand the CWRP tertiary capacity from 6.0 MGD to 9.0 MGD by FY 2021. The expansion will primarily serve recycled water to the Ranch Plan planning areas including PA-5 and PA-8. CWRP performance data for FY 2016 and projected performance data for FY 2020 through FY 2040 is shown in Table 4.4 as part of a SMWD NDW system supply and demand balance.

Future Trampas Canyon Recycled Water (NDW) Seasonal Storage Reservoir

The Trampas Canyon Reservoir, which is located just south of Ortega Highway and in PA-5, was originally constructed between 1973 and 1975, and until recently, was used as a tailing retention facility for a quarry. The District is preparing to rebuild the dam and increase the reservoir capacity to 5,000 AF. The reservoir will be used to primarily store recycled water from the CWRP and will allow for the capture of the year-round recycled water production from the plant, with recycled water stored during the low-demand winter months and withdrawn to supply peak irrigation demands during the high-demand summer months.

It will also be possible to share Trampas Canyon seasonal storage with the Oso Creek and 3A Plant recycled water systems, including Upper Oso Reservoir, via interconnections with the Chiquita recycled water system; and possibly with the City of San Clemente WRP via an interconnection.

The proposed Trampas Reservoir site is included in the approved Ranch Plan, the Habitat Conservation Plan (HCP) and the Special Area Management Plan (SAMP) environmental documentation. Geotechnical and CEQA evaluation of the proposed site and bidding of the ultimate facility has been completed. It is estimated that the reservoir will be operational by FY 2019.

3A WRP

The 3A WRP is jointly owned by the District and MNWD and has been operated by the District since July 1, 2015. Wastewater from the MNWD sewer system and diverted from the SMWD Oso Trunk Sewer is treated at the 3A WRP to Title 22 tertiary levels prior to beneficial reuse in the MNWD and SMWD recycled water systems, or is treated to secondary levels for discharge to the ocean through the effluent transmission main.

Flows not diverted to the 3A WRP flow to the J.B. Latham Treatment Plant. Solids are treated onsite. The plant has secondary treatment capacity of 6.0 MGD. The plant's current tertiary treatment capacity of 2.4 MGD is all owned by MNWD. Currently, MNWD uses approximately 1.8 mgd of its tertiary treatment capacity and allows SMWD to use the

remaining unused capacity. SMWD flows average about 0.5 mgd. 3A WRP performance data for FY 2016 and projected performance data for FY 2020 through FY 2040 is shown in Table 4.4 as part of a SMWD NDW system supply and demand balance.

SMWD Nichols Institute WRP

The Nichols Institute WRP is operated by SMWD and owned by Quest Diagnostics a private company that owns property within SMWD's boundaries. This small facility treats approximately 34 AFY of wastewater. No outfall is available for the facility. Therefore, all wastewater is treated to Title 22 standards for recycling purposes.

Advanced Treated Water Facility

The District constructed and opened its Advanced Treated Water (ATW) facility in 2017 in the City of Mission Viejo to produce advanced treated water to maintain water levels in the 3,650 AF Lake Mission Viejo, which is a manmade, recreational lake that also provides emergency firefighting supply. The lake has 125 acres of surface area and is subject to water loss through evaporation and subsurface seepage. Historically the lake has received make-up water from imported potable water supplies, precipitation and groundwater.

The ATW facility houses a collection of treatment processes including ultrafiltration, chemical conditioning, reverse osmosis, and ultra violet (UV) disinfection. Production capacity of the ATW facility is 600 AFY. Average annual demand for the ATW production is 230 AFY, with full production in the summer months and reduced production in spring and fall.

Los Alisos Water Recycling Plant

SMWD entered into an agreement with IRWD to interconnect their NDW systems so SMWD can purchase recycled water from the LAWRP, owned and operated by IRWD. Recycled water from the plant can be pumped to the Upper Oso Reservoir for seasonal storage through an interconnection in Mission Viejo. The District can purchase up to 1,500 AFY from IRWD and the supply is expected to be available through 2030. Additional recycled water can be purchased on an as-available basis. This is considered a supplementary NDW supply for SMWD as opposed to a normal supply.

Cañada Gobernadora Multipurpose Basin

SMWD's Cañada Gobernadora Multipurpose Basin (Gobernadora Basin) is located within an unincorporated portion of southeastern Orange County, just south of the community of Coto de Caza. The basin captures and naturally treats urban return flows and uses this source to help meet irrigation demands in the nearby community. The Gobernadora Basin consists of a storm detention basin and a natural treatment system, a system to capture and divert flows to the wetlands, a pump station, and a pipeline to deliver flows to the Portola Reservoir, a 550-AF recycled water storage reservoir located in Coto de Caza. The District is also connecting the Gobernadora transmission system to the Chiquita Water Reclamation Plant to deliver recycled water from that plant to Portola Reservoir.

Located along the 8.5-mile Gobernadora Creek, a major tributary to San Juan Creek, the Gobernadora basins intercept a significant portion of the Gobernadora Creek flow for storm detention and treatment of urban return flows. This reduces downstream erosion and sedimentation of the Gobernadora Creek and improves water quality. Approximately 250 AF of water is expected to be captured by the basin each year and used for outdoor irrigation.

Horno Water Quality Basin Urban Return Flows Recovery Project

The Horno Water Quality Basin Urban Return Flows Recovery Project is built on the southern side of the Ladera Ranch community on Horno Creek. The basin is designed to provide two functions. The first is to mitigate storm flows with a retention basin, so storm flows to the downstream community in the City of San Juan Capistrano do not exceed pre-development levels. The second is to divert low flows through constructed wetlands for natural treatment prior to recovering the urban return flows and pumping into the District's recycled water system for beneficial reuse. The project is designed to recover up to 170 AFY.

Other Urban Return Flows Basins

The Dove Canyon and Trabuco basins also collect and supply urban return flows for use in the District's NDW system with estimated supplies of 115 AFY and 280 AFY, respectively.

4.5 Groundwater

The San Juan Watershed is bounded by the Santa Ana Mountains to the north, sedimentary rock formations to the sides of the Upper Basin and Arroyo Trabuco, and the Pacific Ocean to the south. The San Juan Basin is located in the San Juan Creek Watershed is comprised of four principal groundwater basins: 1) Lower Basin, 2) Middle Basin, 3) Upper Basin, and 4) Arroyo Trabuco. The four principal basins consist 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 Basin consists of a heterogeneous mixture of sand, silts, and gravel.

The San Juan Basin (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 Basin occurs from a variety of sources such as:

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

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

- South Coast Water District: 1,300 AFY (Permit No. 21138)
- San Juan Basin Authority: 8,026 AFY (Permit No. 21074)
- Santa Margarita Water District/Gobernadora: 800 AFY (Permit in Acquisition Phase)
- San Juan Hills Golf Course: 450 AFY (Permit No. 21142)
- City of San Juan Capistrano: 3,325 AFY (By Agreement)

The Basin, which is unadjudicated, is governed by San Juan Basin Authority (SJBA) which is a Joint Power Agency comprised of representatives from four local jurisdictions, the District, MNWD, the City of San Juan Capistrano, and South Coast Water District (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.

Historically, the District has used 154 AFY or less of groundwater from the Basin. Groundwater in the Basin is typically high in chlorides, total dissolved solids, iron, and manganese and needs treatment to be used for domestic water purposes.

4.5.1 Lease Agreement with Rancho Mission Viejo

RMV holds riparian water rights in the San Juan Creek watershed for its ranching, agriculture and tenants' uses. RMV MWC and the District have entered into a lease agreement wherein RMV MWC will provide non-domestic groundwater from its well supply system to the District to supplement the District's recycled water and other NDW water supplies to planning areas in the Ranch Plan including PA-5 and PA-8. Per the agreement, which is included in Appendix B, the District can request a minimum quantity of supply that would be prorated with scheduled Ranch Plan development for PA-1, PA-2, PA-3, PA-4, PA-5 and PA-8, with the water delivered to the District at "certain mutually agreed upon locations." The District can lease up to a maximum 2,500 AFY with the development of PA-5. SMWD received 400 AF of this supply in FY 2017 and are scheduled to receive 550 AF in FY 2018.

4.5.2 San Juan Basin Recharge

In 2014, SJBA adopted the San Juan Basin Groundwater and Facilities Plan Update which, among other things, identifies the potential to recharge the San Juan Basin with a combination of stormflows, urban return flows, and recycled water to maximize the potable water supply through indirect potable reuse (IPR). The IPR project would diversify the District's water supply portfolio and reduce reliance on imported water. Currently the District is considering participating in the project for 5,000 AFY. The first phase of this project is envisioned to include installation of rubber dams that will slow runoff to promote infiltration and recharge of the San Juan Basin.

The Project estimate is to produce approximately 250 to 1,500 AFY of water under the IPR project and treat it with desalters for use as a potable water supply. If this initial phase is successful, the recharge program will use recycled water for recharge of the basin and approximately 5,000 AFY would be extracted by 2027. The Trampas Canyon Reservoir will store the recycled water for recharge.

4.6 FY 2017 and Projected SMWD Water Supply Sources

SMWD water supplies for FY 2017 are shown in Table 4.5. A summary of SMWD water supplies projected to be available under normal conditions, i.e. non-drought and non-outage/reduction of a supply source, is shown in Table 4.6. The supply sources shown in Table 4.6 are deemed to be reliable based on past use and/or rights, contract, agreement and/or entitlement.

Table 4.5
SMWD FY 2017 Supplies

Water Supply	FY 2017	
	Supply (AFY)	Water Quality
San Juan Basin Groundwater	0	Domestic Water
MWDOC Purchased Imported Water[(a)]	22,795	Domestic Water
Recycled/NDW[(b)]	8,833	Non-Domestic Water
Total	35,005	

(a) Includes 4.7% of water loss in DW system
(b) Includes estimated 8.0% of water loss in NDW system

In their 2016 WSAP, MWDOC determined a "non-shortage" imported water supply of 29,202 AFY for SMWD in FY 2016. This "non-shortage" imported water supply will change in a given year considering a MWDOC-determined growth factor for the District (growth adjustment); and also considering any significant changes in supply from other sources (other than Metropolitan/MWDOC imported water) relative to the base period. It is estimated in Table 4.6 that the FY 2016 "non-shortage" imported water supply will be available to SMWD through 2040, which is a conservative estimate because the available supply should increase relative to SMWD service area growth. Any reduction in imported supply due to the addition of a new SMWD supply source will be offset by supply from that new source.

The District has 9,400 AFY of treated water capacity from the Baker WTP, which is part of the District's supply of treated imported water.

By contract, SMWD has first priority rights to 5,000 AFY of water supply from the Cadiz Valley Water Conservation, Recovery and Storage Project along with an option to purchase an additional 10,000 AFY.

Table 4.6
Projected Available SMWD Water Supplies – Normal Conditions (AFY)

Water Supply	2020	2025	2030	2035	2040
Domestic Water					
Treated Imported Water[(a)]	29,202	29,202	29,202	29,202	29,202
Cadiz[(b)]	5,000	5,000	5,000	5,000	5,000
Total Domestic Water	34,202	34,202	34,202	34,202	34,202
Non-Domestic Water					
Recycled Water	8,598	10,110	11,075	11,773	11,773
Urban Return Flows	1,715	1,715	1,715	1,715	1,715
RMV MWC Groundwater	816	1,321	1,605	1,957	2,500
Total Non-Domestic	11,129	13,146	14,395	15,445	15,988
Total Available Supply	45,313	47,330	48,579	49,629	50,172

(a) In their 2016 WSAP, MWDOC determined a "non-shortage" imported water supply of 29,202 AFY for SMWD in FY 2016, which is conservatively estimated for the planning period
(b) SMWD has a firm capacity of 5,000 AF and an option to receive an additional 10,000 AF from Cadiz.

Additionally, the San Juan Basin Authority adopted the San Juan Basin Groundwater and Facilities Plan Update that foresees the potential to recharge the San Juan Basin with a combination of stormflows, urban return flows, and recycled water to maximize the potable water supply. The District has plans to participate in this project to increase their domestic water supply reliability. Since this supply source has not yet been definitely developed or contracted, it is not shown as a reliable supply source for the District in Table 4.6.

NDW supply available to the District through the planning period was summarized in Table 4.4. Increased recycled water supply will occur with expansion of CWRP in FY 2019. To augment the NDW supply, the District has entered into an agreement with RMV MWC to purchase groundwater from the RMV MWC well system, as requested, and prorated for supply to Ranch Plan planning areas, as they are developed.

By agreement, SMWD can purchase up to 1,500 AFY from IRWD from their Los Alisos Water Reclamation Plant. However, this is considered a supplementary NDW supply for SMWD as opposed to a normal supply, and therefore not included in Table 4.6.

4.7 Water Supply Reliability Assessment

4.7.1 Imported Water Reliability

In its 2015 UWMP, Metropolitan estimated its regional water supply capability and projected demands for an average (normal) year based on an average of hydrologies for the years 1922-2012; for a single dry-year based on a repeat of the hydrology in the year 1977; and for multiple dry years based on a repeat of the hydrology of 1990-1992. A summary of the supply reliability assessment provided in Metropolitan's 2015 UWMP is shown in Table 4.7.

Table 4.7
Metropolitan Supply Capability and Projected Demands (AFY)

Single Dry Year MWD Supply Capability and Projected Demands (1977 Hydrology)					
Fiscal Year	**2020**	**2025**	**2030**	**2035**	**2040**
Capability of Current Supplies	2,584,000	2,686,000	2,775,000	2,905,000	2,941,000
Projected Demands	2,005,000	2,066,000	2,108,000	2,160,000	2,201,000
Projected Surplus	579,000	620,000	667,000	745,000	740,000
Projected Surplus %[(a)]	29%	30%	32%	34%	34%
Supplies under Development	63,000	100,000	316,000	358,000	398,000
Potential Surplus	642,000	720,000	983,000	1,103,000	1,138,000
Potential Surplus %[(a)]	32%	35%	47%	51%	52%
Multiple Dry Year MWD Supply Capability and Projected Demands (1990-1992 Hydrology)					
Fiscal Year	**2020**	**2025**	**2030**	**2035**	**2040**
Capability of Current Supplies	2,103,000	2,154,000	2,190,000	2,242,000	2,260,000
Projected Demands	2,001,000	2,118,000	2,171,000	2,216,000	2,258,000
Projected Surplus	102,000	36,000	19,000	26,000	2,000
Projected Surplus %[(a)]	5%	2%	1%	1%	0.1%
Supplies under Development	43,000	80,000	204,000	245,000	286,000
Potential Surplus	145,000	116,000	223,000	271,000	288,000
Potential Surplus %[(a)]	7%	5%	10%	12%	13%
Average Year MWD Supply Capability and Projected Demands (1922 - 2012 Hydrology)					
Fiscal Year	**2020**	**2025**	**2030**	**2035**	**2040**
Capability of Current Supplies	3,448,000	3,550,000	3,658,000	3,788,000	3,824,000
Projected Demands	1,860,000	1,918,000	1,959,000	2,008,000	2,047,000
Projected Surplus	1,588,000	1,632,000	1,699,000	1,780,000	1,777,000
Projected Surplus %[(a)]	85%	85%	87%	89%	87%
Supplies under Development	63,000	100,000	386,000	428,000	468,000
Potential Surplus	1,651,000	1,732,000	2,085,000	2,208,000	2,245,000
Potential Surplus %[(a)]	89%	90%	106%	110%	110%

(a) As a percentage of projected demand
Source – 2015 Metropolitan Urban Water Management Plan, June 2016

For each of these scenarios there is a projected surplus of supply in every forecast year. Projected surpluses, based on the capability of current supplies, range from 0.1% to 89% of projected demands. With the inclusion of supplies under development, Metropolitan's potential surpluses range from 5% to 110% of projected demands (Metropolitan 2015 UWMP, pp. 2-15 to 2-17).

Metropolitan's ability to provide redundant layers of water supply availability and reliability to its member agencies is predicated on the regionally developed framework between Metropolitan and its members. As part of this process, Metropolitan has developed and adopted its Water Surplus and Drought Management Plan (WSDM) to provide policy guidance and manage regional water supply actions under both surplus and drought conditions to achieve the overall goal of ensuring water supply reliability to its member agencies as set forth in Metropolitan's 2015 UWMP and 2015 Integrated Water Resources Plan.

The WSDM Plan outlines various water supply conditions and corresponding actions Metropolitan may undertake in response to moderate, serious and extreme water shortages. One example is the implementation of its Water Supply Allocation Plan (WSAP), which allocates available water supplies among Metropolitan's member agencies based on factors such as impacts to retail customers, population and projected growth of particular member agencies, the availability of recycled water and other local supplies, conservation efforts, and other factors.

At times when the WSAP is implemented, Metropolitan member agencies do not lose their ability to receive any particular amount of imported water supplies, but instead Metropolitan places limits on the amount of water its member agencies can purchase without facing a surcharge.

In April 2015, Governor Brown declared a continuing state of drought emergency and issued Executive Order B-29-15 requiring mandatory conservation actions. In response, Metropolitan declared a Stage 3 Shortage Level of its WSAP with the goal of achieving a 15 percent reduction in regional deliveries to its member agencies starting on July 1, 2015.

As noted above, the WSAP does not restrict the actual amount of imported water available from Metropolitan, but instead placed limits on the amount of water its member agencies could purchase without facing a surcharge. In response to Metropolitan's WSAP, MWDOC developed a Shortage Allocation Model as part of their 2016 WSAP to determine water allocation to its member agencies during a water shortage. For FY 2016, based on the Stage 3 Shortage Level set by Metropolitan (15% regional shortage), MWDOC determined an imported water supply allocation of 26,277 AFY for SMWD.

A FY 2016 "non-shortage" supply of 29,202 AFY was first determined for SMWD (2013-2014 base-period supply adjusted by a growth factor); and then reduced to 26,277 AFY considering the regional shortage of 15%; and taking into account the District's dependence on imported water (retail impact adjustment) and the District's success in implementing water conservation measures (conservation credit). The reduction from a "non-shortage" supply of 29,202 AFY to 26,277 AFY amounted to a net 10.0% reduction in imported water supply for the District.

This WSAP was only the second time a WSAP has ever been issued and the first shortage level as high as Stage 3. The drought emergency officially ended in April 2017.

A "non-shortage" imported water supply for SMWD will change in a given year considering a MWDOC-determined growth factor for the District (growth adjustment); and also considering any significant changes in supply from other sources (other than Metropolitan/MWDOC imported water) relative to the base period.

As discussed above, Metropolitan will enforce its allocations through a tiered surcharge rate structure. Metropolitan will assess surcharge rates to a member agency that exceeds its total annual allocation at the end of the twelve-month allocation period. These surcharge rates will be assessed according to Metropolitan water rates in effect at the time of billing. Any surcharge funds collected by Metropolitan will be invested back to the Metropolitan member agency through conservation and local resource development.

If MWDOC exceeds its allocation with Metropolitan for a given allocation year, MWDOC will charge a surcharge to each client agency that exceeded their allocation. This surcharge would be assessed according to the client agency's prorated share (acre-feet over usage) of MWDOC surcharge amount with Metropolitan. Under the melded surcharge rate structure, client agencies will only be assessed penalties if MWDOC exceeds its total allocation and is required to pay a surcharge to Metropolitan.

4.7.2 SMWD Supply Reliability Measures

In order to become less dependent on imported water and to develop a more diverse water supply, SMWD is expanding its recycled water system and constructing seasonal storage for the NDW system as well as developing new supply sources.

The District is planning to expand CWRP tertiary capacity from 6.0 MGD to 9.0 MGD by FY 2019. The expansion will primarily serve recycled water to the Ranch Plan planning areas including PA-5 and PA-8. The Trampas Canyon Reservoir will also provide for additional seasonal storage in the NDW system by FY 2019. The reservoir will be used to primarily store recycled water from the CWRP and will allow for year-round recycled water production from the plant, with recycled water stored during the low-demand winter months and withdrawn to supply peak irrigation demands during the high-demand summer months.

To augment the NDW supply, the District has entered into an agreement with RMV MWC to purchase groundwater from the RMV MWC well system, as requested, and prorated for supply to Ranch Plan planning areas, as they are developed. Per the agreement, the District can lease up to a maximum 2,500 AFY with the development of PA-5.

The District has developed a water purchase and sale agreement to purchase groundwater stored on the Cadiz property in eastern San Bernardino County.

Additionally, the San Juan Basin Authority adopted the San Juan Basin Groundwater and Facilities Plan Update that foresees the potential to recharge the San Juan Basin with a combination of stormflows, urban return flows, and recycled water to maximize the potable water supply. The District plans to participate to increase their domestic supply reliability.

4.7.3 SMWD Normal Year Water Supply Reliability

In the District's 2015 UWMP, supply and demand projections for an average (normal) year were based on hydrology in the year 2015 to account for recent drought conditions and various measures that were implemented in response to the drought. Normal year water supply and demand projections for the planning period 2020 through 2040 are compared in Table 4.8.

Table 4.8
Normal Year Supply and Demand Comparison (AFY)

	2020	2025	2030	2035	2040
Domestic Water					
Demand					
Project (PA-5 and PA-8)	0	0	0	1,614	1,614
Remaining SMWD	23,384	24,266	25,044	23,648	23,648
Total SMWD DW Demand	23,384	24,266	25,044	25,262	25,262
Supply					
MWDOC[(a)]	29,202	29,202	29,202	29,202	29,202
Cadiz	5,000	5,000	5,000	5,000	5,000
Total DW Supply	34,202	34,202	34,202	34,202	34,202
DW Supply Surplus	10,818	9,936	9,158	8,940	8,940
Non-Domestic Water					
Demand					
Project (PA-5 and PA-8)	0	0	0	1,051	1,051
Remaining SMWD	8,787	10,090	11,269	12,848	12,878
Total SMWD NDW Demand	8,787	10,090	11,269	13,899	13,929
Supply					
Recycled Water	8,598	10,110	11,075	11,773	11,773
Urban Return Flow	1,715	1,715	1,715	1,715	1,715
RMV MWC Groundwater	816	1,321	1,605	1,957	2,500
Total NDW Supply	11,129	13,146	14,395	15,445	15,988
NDW Supply Surplus	2,342	3,056	3,126	1,546	2,059
Total Demand	32,171	34,356	36,313	39,161	39,191
Total Supply	45,331	47,348	48,597	49,647	50,190
Total Supply Surplus	13,160	12,992	12,284	10,486	10,999

(a) In their 2016 WSAP, MWDOC determined a "non-shortage" imported water supply of 29,202 AFY for SMWD in FY 2016, which is conservatively estimated for the planning period

In their 2016 WSAP, MWDOC determined a "non-shortage" imported water supply of 29,202 AFY for SMWD in FY 2016, which is conservatively estimated as a "normal" MWDOC imported water supply for the planning period. The amount of potable water SMWD can receive through the Cadiz Project is currently restricted by their Baker WTP rights (9,400 AFY). As shown, a supply surplus is projected throughout the planning period for the domestic water supply system, non-domestic water supply system, as well as the entire water supply system.

4.7.4 SMWD Single-Dry Year Water Supply Reliability

In the District's 2015 UWMP, FY 2002 was used as the basis for single dry-year demand, and a demand increase of 4.0% was assumed to account for drier than normal weather conditions. The lowest precipitation in the last 30 years occurred in 2002. Single-dry year water supply and demand projections for the planning period 2020 through 2040 are compared in Table 4.9.

In their 2016 WSAP, MWDOC determined a Stage 3 Shortage water supply of 26,277 AFY for SMWD in FY 2016, which is conservatively estimated as a "single-dry" MWDOC imported water supply for the planning period. As shown in Table 4.9, even with the demand increase of 4.0% and decreased imported water supply availability, a supply surplus is still projected throughout the planning period.

4.7.5 SMWD Multiple-Dry Year Water Supply Reliability

Based on historical demand and rainfall data, 2012 through 2014 was determined to be the driest 3-year period for the SMWD water service area in the District's 2015 UWMP; with demands projected to increase 2.0% for the first year; 4.0% for the second year; and 9.0% for the third year, to account for drier weather conditions and consistent with the District's 2015 UWMP. Multiple-dry year water supply and demand projections for the planning period 2020 through 2040 are compared in Table 4.10. The same supply assumptions used for the single-dry year comparison are also used in each year of the multiple-dry year comparison. As shown in Table 4.10, a supply surplus is still projected throughout the planning period for each of the three years.

Table 4.9
Single-Dry Year Supply and Demand Comparison (AFY)

	2020	2025	2030	2035	2040
Domestic Water					
Demand[(a)]					
Project (PA-5 and PA-8)	0	0	0	1,679	1,679
Remaining SMWD	24,319	25,237	26,046	24,594	24,594
Total SMWD DW Demand	24,319	25,237	26,046	26,272	26,272
Supply					
MWDOC[(b)]	26,277	26,277	26,277	26,277	26,277
Cadiz	5,000	5,000	5,000	5,000	5,000
Total DW Supply	31,277	31,277	31,277	31,277	31,277
DW Supply Surplus	6,958	6,040	5,231	5,005	5,005
Non-Domestic Water					
Demand					
Project (PA-5 and PA-8)	0	0	0	1,093	1,093
Remaining SMWD	9,138	10,494	11,720	13,362	13,393
Total SMWD NDW Demand	9,138	10,494	11,720	14,455	14,486
Supply					
Recycled Water	8,598	10,110	11,075	11,773	11,773
Urban Runoff	1,715	1,715	1,715	1,715	1,715
RMV MWC Groundwater	816	1,321	1,605	1,957	2,500
Total NDW Supply	11,129	13,146	14,395	15,445	15,988
DW Supply Surplus	1,991	2,652	2,675	990	1,502
Total Demand	33,458	35,730	37,766	40,727	40,759
Total Supply	42,406	44,423	45,672	46,722	47,265
Total Supply Surplus	8,948	8,693	7,906	5,995	6,506

(a) Demands are estimated to be 4.0% higher in a single-dry year than in a normal year consistent with the assumption made in the District's 2015 UWMP

(b) In their 2016 WSAP, MWDOC determined a Stage 3 Shortage imported water supply of 26,277 AFY for SMWD in FY 2016, which is conservatively estimated for the planning period considering that a Stage 3 Shortage has only been reached once before

Table 4.10
Multiple-Dry Year Supply and Demand Comparison (AFY)

Supply[a]/Demand (AFY)		2020	2025	2030	2035	2040
First year	Supply totals[b]	42,406	44,423	45,672	46,722	47,265
	Demand totals[c]	32,814	35,043	37,039	39,944	39,975
	Supply Surplus	9,592	9,380	8,633	6,778	7,290
Second year	Supply totals[a]	42,406	44,423	45,672	46,722	47,265
	Demand totals[b]	33,458	35,730	37,766	40,727	40,759
	Supply Surplus	8,948	8,693	7,906	5,995	6,506
Third year	Supply totals[a]	42,406	44,423	45,672	46,722	47,265
	Demand totals[b]	35,066	37,448	39,581	42,685	42,718
	Supply Surplus	7,340	6,975	6,091	4,037	4,547

(a) Domestic + non-domestic supplies
(b) Each year has the same supply assumptions as in a single-dry year (see Table 4.9)
(c) Demands projected to increase 2% for the first year; 4% for the second year; and 9% for the third year relative to a normal year (consistent with assumptions in District's 2015 UWMP)

5.0 CONCLUSION

Relative to 2017, total District water demands are projected to increase by 29.6% by 2040 with a projected population increase of 24.2% (161,000 in 2017 to 200,026 in 2040). Total domestic water demands are projected to increase by approximately 13.6% by 2040 relative to 2017, while NDW demands are projected to increase by approximately 74.3% for the same time span.

Historical District water supplies consisting of treated imported water purchased from Metropolitan through MWDOC for domestic water supply; and recycled water produced at three District water recycling plants and collected urban return flows for NDW supply have all proven to be reliable supply sources. To meet future demands, ensure supply reliability, and to develop a more diverse water supply, SMWD is expanding its recycled water system and constructing seasonal storage for the NDW system, as well as developing new supply sources.

The District is planning to expand the CWRP tertiary capacity from 6.0 MGD to 9.0 MGD by FY 2021 and place a revamped and expanded Trampas Canyon Reservoir into operation as a NDW seasonal storage reservoir by FY 2019. To augment the NDW supply, the District has entered into an agreement with RMV MWC to purchase groundwater from the RMV MWC well system for supply to Ranch Plan planning areas as they are developed.

As a new domestic water supply source, the District has developed an agreement to purchase groundwater stored on the Cadiz property in eastern San Bernardino County.

All existing and proposed new supplies projected to provide for District water demands through the planning period are substantiated by water supply rights, contracts, agreements and entitlements. Water system infrastructure improvements have been approved and financed to support the RMV Planned Community including PA-5 and PA-8. The infrastructure costs will principally be borne by RMV, the developer.

In comparing normal year, single-dry year, and multiple-dry year supplies available to the District with estimated District service area demands for that condition, a supply surplus was estimated for the entire planning period, 2020 through 2040, for each condition.

Based on the information and analyses provided above, including the documents relied upon herein, and the District's current and projected water conservation and water management efforts, this WSV concludes the total projected water supplies available to the District during normal, single-dry, and multiple-dry year scenarios over the planning period, 2020 through 2040, as sufficient to meet the demands associated with the proposed Project in addition to the District's other existing and planned future water demands.

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APPENDIX A

Domestic and Non-Domestic Water Demand Calculations

Water Supply Verification for PA-5 and PA-8

Appendix A - Domestic Water Demand Calculations for PA-5 and PA-8

Updated Land Use - September 2017 (Per RMV Planning Area / Subarea Plan Development Table - Project Absorption)	Domestic Water Demands					
	Net Land Area	Units: DU or KSF or AC or Student	Unit Demand Factor (gpd)	Average Day (gpm)	Average Day (gpd)	Average Day (AFY)
Planning Area 5						
Subarea 5.1						
Trampas Reservoir	342	-	-		-	-
Subarea 5.2						
Conventional SF Detached	-	1,250	450	390.6	562,500	630
Subtotal	**-**	**1,250**	-	**391**	**562,500**	**630**
	-	-	-	-	-	-
Affordable Housing (1)	-	75	175	9.1	13,125	15
Subtotal	**-**	**75**	**-**	**9**	**13,125**	15
Parkland (Parks)	-	-	200	-	-	-
Neighborhood Center (Commercial)	-	150	225	23.4	33,750	38
Business Park / Urban Activity Centers, UAC (Community Rec. Ctr)	-	-	225	-	-	-
Subtotal	**-**	**-**	**-**	**23.4**	**33,750**	38
Planning Area 5 Total	**360**	**1,325**		**423**	**609,375**	**683**
Planning Area 8						
Conventional SF Detached	-	1,250	450	390.6	562,500	630
Subtotal	-	**1,250**	-	**391**	**562,500**	**630**
	-	-	-	-	-	-
Affordable Housing (1)	-	75	175	9.1	13,125	15
Subtotal	**-**	**75**	**-**	**9**	**13,125**	**15**
Parkland (Parks)	-	5	200	-	-	-
Neighborhood Center (Commercial)	-	150	225	23.4	33,750	38
Business Park / Urban Activity Centers, UAC (Community Rec. Ctr)	-	740	225	115.6	166,500	187
Subtotal	**-**	**-**	**-**	**139.1**	**200,250**	**224**
Planning Area 8 Total	**500**	**1,325**		**539**	**775,875**	**869**
2031 through 2035 Total				**962**	**1,385,250**	**1,552**

(1) Affordable Housing assumes 75 DU for PA-5 and 75 DU for PA-8

(2) Unit counts taken from Planning Areas 5 & 8 Subarea Development Table - Project Absorption.

PA-5 & PA-8 NON-DOMESTIC WATER CALCULATIONS

Summary

Planning Areas 1 and 2 have landscape area data for each hydrozone category classification by actual design.

Planning Areas 3 – 5 have assumed hydrozone category and landscape to gross pad ratios based on historical landscape data.

Planning Area 8 uses the average demand of 2.84 AF per year for PA1-5 and applies it toward a net landscape area of 175 acres.

The following table identifies the gross area, net landscape by hydrozone category and volume demand for Planning Areas 1-5, and 8:

Planning Area	Gross Area (Acres)	Landscape Area (Acres)	Landscape Area by Type (Acres)					Volume Demand (AF/Yr)	AF per Acre
			Low Water Use Spray	Moderate Water Use Spray	Moderate Water Use Drip	Fescue Turf Spray	Bermuda Turf Spray		
1	577	176.89	91.20	67.90	0	9.93	7.85	526.77	2.98
2	895	322.69	176.79	40.27	70.66	0	34.97	899.84	2.79
3	2,176	1,087.13	607.27	164.6	157.95	0	157.31	3,110.58	2.86
4	515	180.41	122.97	30.83	22.51	0	4.10	480.95	2.67
5	360	167.10	86.46	21.46	35.42	0	23.77	475.83	2.85
Subtotal	**4,523**	**1,934.22**	**1,084.69**	**325.06**	**286.54**	**9.93**	**228.00**	**5,493.97**	**2.84**
8	500	175						497.00	2.84
Total	**5,023**	**2,109.22**						**5,990.97**	**2.84**
Percent of Landscape Area			56.1%	16.8%	14.8%	0.5%	11.7%		

TABLE 5A - RANCHO MISSION VIEJO - PA5 LANDSCAPE AREA HYDROZONE CLASSIFICATION

November 21, 2016

Planning Area 5 Landscape Measurements				Planning Area 5 Landscape Classification							
	Gross Area (Ac.)	Pct Landscape	Area (Ac.)	Spray / Low		Spray / Moderate		Drip / Moderate		Spray / Bermuda Turf	
Builder Pad - Unknown type	170.00	25%	42.50					75%	31.88	25%	10.63
Fuel Modification	5.00	100%	5.00	100%	5.00						
Market Rate Homes	60.00	15%	9.00					10%	0.90	90%	8.10
Parks	5.00	80%	4.00	20%	0.80	20%	0.80			60%	2.40
Slopes	100.00	100%	100.00	80%	80.00	20%	20.00				
Streetscapes	20.00	33%	6.60	10%	0.66	10%	0.66	40%	2.64	40%	2.64
Subtotal	**360.00**		**167.10**		**86.46**		**21.46**		**35.42**		**23.77**
Total	**360.00**		**167.10**		**86.46**		**21.46**		**35.42**		**23.77**
					52%		13%		21%		14%

Analysis by Landscape Type	Gross Area (Ac.)	Area (Ac.)	Spray / Low	Spray / Moderate	Drip / Moderate	Spray / Bermuda Turf
Builder Pad - Unknown type	170.00	42.50			31.88	10.63
Fuel Modification	5.00	5.00	5.00			
Market Rate Homes	60.00	9.00			0.90	8.10
Parks	5.00	4.00	0.80	0.80		2.40
Slopes	100.00	100.00	80.00	20.00		
Streetscapes	20.00	6.60	0.66	0.66	2.64	2.64
Subtotal	**360.00**	**167.10**	**86.46**	**21.46**	**35.42**	**23.77**
		46.93%				

TABLE 5B - RANCH PLAN PA5 ESTIMATED IRRIGATION RECYCLED WATER USAGE

November 21, 2016

MODERATE WATER USE SHRUB AREA IRRIGATED WITH OVERHEAD SPRAY

Area	Month	Days/mo.	Monthly ETo	Irrig Effic	Kc	Monthly ET	Daily ET	Water Consumption			
(Ac.)			(In)	Rate		(In)	(In)	(Gallons)	(Ac Ft)	Gal/Day	HCF/Month
21.46	Jan	31	2.38	70%	0.50	1.70	0.05	990,574	3.04	31,954	1,324
	Feb	28	2.58	70%	0.50	1.84	0.07	1,073,815	3.30	38,351	1,436
	Mar	31	3.79	70%	0.50	2.71	0.09	1,577,426	4.84	50,885	2,109
	Apr	30	4.78	70%	0.50	3.41	0.11	1,989,472	6.11	66,316	2,660
	May	31	5.32	70%	0.50	3.80	0.12	2,214,224	6.80	71,427	2,960
	Jun	30	5.75	70%	0.50	4.11	0.14	2,393,193	7.34	79,773	3,199
	Jul	31	6.34	70%	0.50	4.53	0.15	2,638,756	8.10	85,121	3,528
	Aug	31	6.17	70%	0.50	4.41	0.14	2,568,000	7.88	82,839	3,433
	Sep	30	4.76	70%	0.50	3.40	0.11	1,981,148	6.08	66,038	2,649
	Oct	31	3.60	70%	0.50	2.57	0.08	1,498,347	4.60	48,334	2,003
	Nov	30	2.63	70%	0.50	1.88	0.06	1,094,626	3.36	36,488	1,463
	Dec	31	2.12	70%	0.50	1.51	0.05	882,360	2.71	28,463	1,180
Yearly Total			**50.22**			**35.87"**		**20,901,941**	**64.15**		**27,944**
						3.0'					

LOW WATER USE SHRUB AREA IRRIGATED WITH OVERHEAD SPRAY

Area	Month	Days/mo.	Monthly ETo	Irrig Effic	Kc	Monthly ET	Daily ET	Water Consumption			
(Ac.)			(In)	Rate		(In)	(In)	(Gallons)	(Ac Ft)	Gal/Day	HCF/Month
86.46	Jan	31	2.38	70%	0.40	1.36	0.04	3,192,731	9.80	102,991	4,268
	Feb	28	2.58	70%	0.40	1.47	0.05	3,461,028	10.62	123,608	4,627
	Mar	31	3.79	70%	0.40	2.17	0.07	5,084,223	15.60	164,007	6,797
	Apr	30	4.78	70%	0.40	2.73	0.09	6,412,292	19.68	213,743	8,573
	May	31	5.32	70%	0.40	3.04	0.10	7,136,693	21.90	230,216	9,541
	Jun	30	5.75	70%	0.40	3.29	0.11	7,713,531	23.67	257,118	10,312
	Jul	31	6.34	70%	0.40	3.62	0.12	8,505,007	26.10	274,355	11,370
	Aug	31	6.17	70%	0.40	3.53	0.11	8,276,955	25.40	266,999	11,065
	Sep	30	4.76	70%	0.40	2.72	0.09	6,385,462	19.60	212,849	8,537
	Oct	31	3.60	70%	0.40	2.06	0.07	4,829,341	14.82	155,785	6,456
	Nov	30	2.63	70%	0.40	1.50	0.05	3,528,102	10.83	117,603	4,717
	Dec	31	2.12	70%	0.40	1.21	0.04	2,843,945	8.73	91,740	3,802
Yearly Total			**50.22**			**28.70"**		**67,369,312**	**206.76**		**90,066**
						2.4'					

TABLE 5B - RANCH PLAN PA5 ESTIMATED IRRIGATION RECYCLED WATER USAGE

November 21, 2016

MODERATE WATER USE SHRUB AREA IRRIGATED WITH DRIP IRRIGATION

Area (Ac.)	Month	Days/mo.	Monthly ETo (In)	Irrig Effic Rate	Kc	Monthly ET (In)	Daily ET (In)	Water Consumption (Gallons)	(Ac Ft)	Gal/Day	HCF/Month
35.42	Jan	31	2.38	85%	0.50	1.40	0.05	1,346,243	4.13	43,427	1,800
	Feb	28	2.58	85%	0.50	1.52	0.05	1,459,373	4.48	52,120	1,951
	Mar	31	3.79	85%	0.50	2.23	0.07	2,143,807	6.58	69,155	2,866
	Apr	30	4.78	85%	0.50	2.81	0.09	2,703,799	8.30	90,127	3,615
	May	31	5.32	85%	0.50	3.13	0.10	3,009,249	9.24	97,073	4,023
	Jun	30	5.75	85%	0.50	3.38	0.11	3,252,478	9.98	108,416	4,348
	Jul	31	6.34	85%	0.50	3.73	0.12	3,586,211	11.01	115,684	4,794
	Aug	31	6.17	85%	0.50	3.63	0.12	3,490,051	10.71	112,582	4,666
	Sep	30	4.76	85%	0.50	2.80	0.09	2,692,486	8.26	89,750	3,600
	Oct	31	3.60	85%	0.50	2.12	0.07	2,036,334	6.25	65,688	2,722
	Nov	30	2.63	85%	0.50	1.55	0.05	1,487,655	4.57	49,589	1,989
	Dec	31	2.12	85%	0.50	1.25	0.04	1,199,175	3.68	38,683	1,603
Yearly Total			**50.22**			**29.54"**		**28,406,862**	**87.18**		**37,977**
						2.5'					

WARM SEASON TURFGRASS IRRIGATED WITH OVERHEAD SPRAY

Area (Ac.)	Month	Days/mo.	Monthly ETo (In)	Irrig Effic Rate	Kc	Monthly ET (In)	Daily ET (In)	Water Consumption (Gallons)	(Ac Ft)	Gal/Day	HCF/Month
23.77	Jan	31	2.38	70%	0.55	1.87	0.06	1,206,668	3.70	38,925	1,613
	Feb	28	2.58	70%	0.54	1.99	0.07	1,284,285	3.94	45,867	1,717
	Mar	31	3.79	70%	0.76	4.11	0.13	2,655,222	8.15	85,652	3,550
	Apr	30	4.78	70%	0.72	4.92	0.16	3,172,549	9.74	105,752	4,241
	May	31	5.32	70%	0.79	6.00	0.19	3,874,242	11.89	124,976	5,179
	Jun	30	5.75	70%	0.68	5.59	0.19	3,604,332	11.06	120,144	4,819
	Jul	31	6.34	70%	0.71	6.43	0.21	4,149,498	12.74	133,855	5,547
	Aug	31	6.17	70%	0.71	6.26	0.20	4,038,234	12.39	130,266	5,399
	Sep	30	4.76	70%	0.62	4.22	0.14	2,720,487	8.35	90,683	3,637
	Oct	31	3.60	70%	0.54	2.78	0.09	1,792,026	5.50	57,807	2,396
	Nov	30	2.63	70%	0.58	2.18	0.07	1,406,150	4.32	46,872	1,880
	Dec	31	2.12	70%	0.55	1.67	0.05	1,074,847	3.30	34,672	1,437
Yearly Total			**50.22**			**48.01"**		**30,978,540**	**95.08**		**41,415**
						4.0'					

TABLE 5B - RANCH PLAN PA5 ESTIMATED IRRIGATION RECYCLED WATER USAGE

November 21, 2016

TOTAL LANDSCAPE AREA - PA5

Area (Ac.)	Month	Days/mo.	Monthly ETo (In)					Water Consumption (Gallons)	(Ac Ft)	Gal/Day	HCF/Month
167.10	Jan	31	2.38					6,736,216	20.67	217,297	9,006
	Feb	28	2.58					7,278,501	22.34	259,946	9,731
	Mar	31	3.79					11,460,679	35.17	369,699	15,322
	Apr	30	4.78					14,278,113	43.82	475,937	19,088
	May	31	5.32					16,234,408	49.82	523,691	21,704
	Jun	30	5.75					16,963,534	52.06	565,451	22,679
	Jul	31	6.34					18,879,472	57.94	609,015	25,240
	Aug	31	6.17					18,373,240	56.39	592,685	24,563
	Sep	30	4.76					13,779,583	42.29	459,319	18,422
	Oct	31	3.60					10,156,048	31.17	327,614	13,578
	Nov	30	2.63					7,516,533	23.07	250,551	10,049
	Dec	31	2.12					6,000,327	18.42	193,559	8,022
Yearly Total			**50.22**					**147,656,655**	**453.17**		**197,402**

5% Contingency	22.66
Total Volume Requirement	**475.83**

AF / Acre	**2.85**

Formulas
Monthly ET = (Monthly ETo x Kc) / Irrig Effic
Daily ET = Monthly ET / Days/mo.
Water Consumption
Ac Ft = (Monthly ET x Contingency x Area) / 12
Gallons = Ac Ft x 7.48 x 43,560
Gal/Day = Gallons / Days/mo.
HCF/Month = Gallons / 748
Flow Demand
GPM(24 HR) = Gal/Day / (24*60)
GPM(# HR) = GPM(24 HR) x (24 / #) x Peaking Factor
* # = Hours in Water Window

Flow factors	
ET Contingency	1.0
Peaking Factor	1.4

APPENDIX B

Water Supply Contracts and Agreements

WATER PURCHASE AND SALE AGREEMENT

This Water Purchase and Sale Agreement ("Agreement") is made and entered into as of July 31, 2012 ("Effective Date"), by and between Cadiz, Inc., a Delaware corporation, and its affiliate Cadiz Real Estate LLC, a Delaware limited liability company (as appropriate, each entity or both together being "Cadiz"), Fenner Valley Mutual Water Company, a California nonprofit mutual benefit corporation ("FVMWC"), and Santa Margarita Water District, a California Water District ("SMWD"). Cadiz, FVMWC and SMWD are each a "party" and collectively the "parties."

RECITALS

A. Cadiz is the owner of approximately forty-five thousand (45,000) acres of land in eastern San Bernardino County, most of which overlies the Fenner Valley Aquifer System ("Property"). Cadiz has proposed, and SMWD has decided, in its discretion, to carry out the Project.

B. Cadiz will grant to FVMWC the right to take Project Water from the Property and to use the Property for Project Storage in accordance with the terms set forth herein, with SMWD acquiring a first priority right to Project Water in the amount of the SMWD Base Allotment, as well as certain rights to Project Storage.

C. Cadiz will develop, construct and finance all Project Facilities necessary for the production and delivery of Project Water and will transfer a possessory interest in the Project Facilities to the Fenner Valley Water Authority ("FVWA").

D. Cadiz has formed FVMWC, a nonprofit entity that will operate and manage the Project and whose members will be solely comprised of entities which have contracted to receive Project Water, including SMWD, other public water systems and the Arizona California Railroad Company. Cadiz will not be a member of FVMWC.

E. SMWD is a California Water District in Orange County, a local agency of the State of California with broad powers under the California Water District Act, Cal. Water Code §§ 34000 *et seq.*, who will carry out and be primarily responsible for the Project, and is the lead agency for the Project EIR.

F. On or about August 16, 2010, Cadiz and SMWD entered into that certain Option Agreement (the "Option Agreement"), pursuant to which SMWD has timely and effectively exercised its right to acquire the SMWD Base Allotment and SMWD Option Capacity, with this Agreement being a further refinement of the Option Agreement.

G. SMWD and FVMWC will execute a Joint Exercise of Powers Agreement as contemplated herein to form and operate the FVWA, with SMWD serving as managing member of FVWA and the "designated entity" of FVWA under Government Code Section 6509.

H. FVWA, under the management of SMWD, will review and approve the design and construction of the Project Facilities by Cadiz in accordance with the Project EIR, GMMMP, SMWD standards and specifications, and such other covenants, agreements and documents as may be applicable.

I. Cadiz, or a special purpose entity formed by Cadiz, intends to arrange financing from private or public sources to fund the design and construction costs of the Project and Project Facilities (all such financing referred to as "Third Party Financing"). Cadiz will repay and secure Third Party Financing from the revenues that are generated by the Project.

J. The parties desire to enter into this Agreement to provide the material terms and conditions for carrying out the Project, including the acquisition, construction and operation of Project Facilities, the sale and conveyance to SMWD of the SMWD Base Allotment and SMWD Option Capacity and certain other matters.

AGREEMENT

NOW THEREFORE, in consideration of the foregoing recitals, which are incorporated into the operative provisions of this Agreement by this reference, and for all the good and valuable consideration herein, the parties hereto agree as follows:

1. Definitions.

The following terms have the following meanings for purposes of this Agreement:

1.1. "Administrative Costs" means the administrative costs associated with the operation and management of the Project by FVMWC following the Commencement Date, calculated in accordance with generally accepted accounting principles, which shall include costs related to insurance, taxes (if any), and professional service providers such as accountants, attorneys and engineers; provided, however, that Administrative Costs shall not include any Retained Costs of Cadiz.

1.2. "Agreement" has the meaning assigned thereto in the preamble.

1.3. "Annual Storage Management Fee" has the meaning assigned thereto in Section 5.4.

1.4. "Cadiz" has the meaning assigned thereto in the preamble.

1.5. "Capital Investment" means any and all capital costs incurred by Cadiz to develop and build the Project, including design, permitting, construction and financing costs related to Project Facilities. For the purposes of this definition, construction costs shall include the costs of inspecting and performance testing the Project Facilities and preparing them for operation through the Commencement Date.

1.6. "Capital Recovery Charge" means the charge payable in connection with the purchase of Project Water as described in Section 9.2.2 to allow for the recovery of the Capital Investment by Cadiz and to permit Cadiz to make timely payment of all Debt Service.

1.7. "Carry-Over Account" has the meaning assigned thereto in Section 5.4.

1.8. "CEQA" means the California Environmental Quality Act.

1.9. "Commencement Date" means the date on which FVMWC first delivers water to the CRA.

1.10. "County" means the County of San Bernardino.

1.11. "County MOU" means that certain Memorandum of Understanding By and Among The Santa Margarita Water District, Cadiz, Inc., Fenner Valley Mutual Water Company, and the County of San Bernardino (Related to County Ordinance for Desert Groundwater Management) dated May 11, 2012.

1.12. "CRA" means the Colorado River Aqueduct.

1.13. "Debt Service" means all amounts necessary for Cadiz to repay when due all interest, principal and other charges payable by Cadiz under any Third Party Financing.

1.14. "Effective Date" has the meaning assigned thereto in the Preamble.

1.15. "Facility Lease" has the meaning assigned thereto in Section 4.2.

1.16. "Facility Operation Agreement" means that agreement between FVMWC and FVWA pursuant to which the extraction, conveyance and delivery of water from the Project shall be governed. The terms of the Facility Operation Agreement shall include: (i) the responsibility of FVMWC for paying or reimbursing costs incurred by FVWA, County and SMWD for overseeing compliance with the GMMMP on a time and materials basis; (ii) permitting FVWA and FVMWC to contract with third parties, including another Project Participant, another local public agency, other person or entity, to provide for the day-to-day operation and maintenance of the Project, as well as bookkeeping and administration duties; (iii) the responsibility of FVMWC for all day-to-day operations; (iv) the responsibility of FVMWC for the collection of proceeds from the sale of water to SMWD and other Project Participants; and (v) the proper allocation and payment of all costs and charges related to the operation of the Project, including payment due and payable to Cadiz, as described in Section 9.2.

1.17. "Fenner Valley Aquifer System" has the meaning assigned thereto in Section 1.30.

1.18. "Fixed O&M Costs" means all Project Operation and Maintenance Expenses which do not vary with the amount of water extracted, conveyed and delivered during the applicable time period.

1.19. "FVMWC" has the meaning assigned thereto in the preamble.

1.20. "FVMWC Members" means SMWD and other Project Participants who own membership shares in FVMWC.

1.21. "FVWA" has the meaning assigned in Recital C.

1.22. "GMMMP" means the Groundwater Management, Monitoring, and Mitigation Plan for the Project as generally set forth in the Project EIR and as it may be subsequently amended and approved by and between SMWD, FVMWC and the County.

1.23. "Initial Term" has the meaning assigned thereto in Section 14.4.

1.24. "Joint Exercise of Powers Agreement" has the meaning set forth in Recital G.

1.25. "Material Increase in Financial Risk to SMWD" means any circumstance that causes SMWD to be obligated, either directly or indirectly, to assume greater financial obligations of any kind, including any increase in the cost to SMWD of Project Water or Project Storage, by virtue of an agreement between Cadiz and another Project Participant.

1.26. "MWD" means The Metropolitan Water District of Southern California.

1.27. "MWD Fees" has the meaning assigned thereto in Section 9.3.4.

1.28. "MWDOC" means the Municipal Water District of Orange County.

1.29. "Option Agreement" has the meaning assigned thereto in Recital F.

1.30. "Project" means the Cadiz Valley Water Conservation, Recovery and Storage Project designed to appropriate groundwater from wells on the Property overlying the Orange Blossom Wash, Cadiz, Bristol and Fenner Valley aquifers (collectively, such aquifers being the "Fenner Valley Aquifer System"), and to deliver that groundwater for reasonable and beneficial uses via the CRA and other facilities necessary to deliver the groundwater to Project Participants. For purposes of this Agreement, the "Project" includes the right to carry-over from one Year to a subsequent Year up to one hundred fifty thousand (150,000) AF, but does not include the Imported Water Storage component as described in the Project EIR.

1.31. "Project EIR" means the Environmental Impact Report for the Project, for which SMWD is the lead agency.

1.32. "Project Facilities" means any and all facilities deemed necessary, advisable or appropriate to extract, convey or deliver Project water to Project Participants, including facilities associated with the Groundwater Conservation and Recovery Component phase of the Project, as described in the Project EIR, *viz.*, a wellfield located on the Property, manifold, 43-mile conveyance pipeline between the wellfield and CRA, and interconnection between the conveyance pipeline and the CRA.

1.33. "Project Operation and Maintenance Expenses" means:

(a) Following the Commencement Date, the actual costs spent or incurred for labor, materials, services or utilities related to the operation, maintenance and repair of the Project and Project Facilities (including costs of FVWA under the Facility Operation Agreement), calculated in accordance with generally accepted accounting principles and Section 9 hereof, including: (i) the cost of all scheduled and unscheduled maintenance of the Project Facilities as necessary to preserve the Project in good repair and working order; (ii) following the Commencement Date, the cost of providing field staff, data collection and reporting as necessary for compliance with the GMMMP; and (iii) all costs payable to FVWA, SMWD and the County to oversee compliance with the GMMMP; and

(b) The current cost of funding adequate reserves for (i) operations; and (ii) capital repairs, replacements or improvements which are necessary to keep the Project Facilities in good repair and working order over the term of the Project (excluding any capital improvements related to the Imported Water Storage Component phase of the Project);

(c) But excluding in all cases: (i) depreciation, replacement and obsolescence charges or reserves therefor; (ii) amortization of intangibles or other bookkeeping entries of a similar nature; and (iii) Administrative Costs.

1.34. "Project Participant" means each entity listed in Exhibit A, who are identified in the Project EIR as "Project Participants," and as the context dictates shall include SMWD. The parties acknowledge that the attached list is not final and that no party shall be considered a Project Participant until it has executed a water purchase agreement with Cadiz.

1.35. "Project Storage" means the right to carry-over and store up to one hundred fifty thousand (150,000) acre-feet ("AF") of Project Water.

1.36. "Project Water" means the right to produce and deliver fifty thousand (50,000) acre-feet per year ("AFY") of groundwater from the Fenner Valley Aquifer System over the Initial Term, aggregating two million, five hundred thousand (2,500,000) AF of such groundwater cumulatively over the life of the Project. The parties acknowledge that the right to Project Water is a contractual right pursuant to the Water Lease and that no transfer of the water rights of Cadiz in the Property or the Fenner Valley Aquifer System is intended by this Agreement.

1.37. "Property" has the meaning assigned thereto in Recital A.

1.38. "Reimbursement Agreements" means that certain Environmental Processing and Cost Sharing Agreement as of June 23, 2010, between Cadiz and SMWD, that certain Escrow Agreement dated January 25, 2012 between Cadiz and SMWD, and that certain Joint Defense and Confidentiality Agreement dated as of May 25, 2012 between Cadiz, SMWD, FVMWC and the County, as amended.

1.39. "Retained Costs" means costs that will remain the responsibility of Cadiz under the various agreements to implement the Project, including the Facility Lease and the Water Lease, which will not be recovered by Cadiz from SMWD or FVMWC, including:

(a) All professional fees and costs associated with any private or regulatory challenge to the Project or the right of Cadiz to convey, transfer or lease the Project Water, Project Storage or Project Facilities in connection with the Project, including the indemnity obligations of Cadiz and FVMWC under the Reimbursement Agreements;

(b) All costs of implementing mitigation measures required in connection with the Project during the entire Project term, including the implementation of the GMMMP and any agreement or settlement entered into between Cadiz and any third party;

(c) Prior to the Commencement Date, (i) the cost of funding an escrow account for FVMWC to provide field staff, data collection and reporting as necessary for compliance with the GMMMP, as well as the costs incurred by FVWA, SMWD and the County to oversee compliance with the Project EIR and the GMMMP as contemplated in this Agreement and the Reimbursement Agreements; and (ii) all administrative costs and expenses incurred by SMWD in connection with carrying out its responsibilities in connection with the Project (including a reasonable allocation and reimbursement for the time of SMWD staff), whether or not such costs are expressly subject to reimbursement under the Reimbursement Agreements;

(d) A proportional share of the Capital Recovery Charge and the Fixed O&M Costs to the extent that the Total Annual Project Allotment of Project Water is reduced or curtailed for any reason, including reduced deliveries as a result of mitigation requirements, it being understood that SMWD and the Project Participants are agreeing to pay the Capital Recovery Charge and the Fixed O&M Costs on an AF basis spread over the entire 50,000 AF of Project Water with Cadiz responsible for the per AF cost with respect to the total amount of any reduction or curtailment;

(e) Cadiz's responsibility for SMWD's portion of the Fixed O&M Costs which are related to capital repair and replacement during the first ten (10) years of the Facility Lease, pursuant to Section 9.3.1; and

(f) Any increase in Administrative Costs of FVMWC as a direct result of regulatory or reporting requirements of Cadiz as a public company.

1.40. "SMWD" has the meaning assigned thereto in the preamble.

1.41. "SMWD Base Allotment" has the meaning assigned thereto in Section 5.2.

1.42. "SMWD Base Payment" has the meaning assigned thereto in Section 9.2.1.

1.43. "SMWD Option Capacity" has the meaning assigned thereto in Section 5.3.

1.44. "SMWD Water System" means the system of physical infrastructure owned and used by SMWD for the acquisition, treatment, reclamation, transmission, distribution and sale of water.

1.45. "Third Party Financing" has the meaning assigned thereto in Recital I.

1.46. "Total Annual Project Allotment" means 50,000 AFY.

1.47. "Variable O&M Costs" means all Project Operation and Maintenance Expenses which vary with the amount of water extracted, conveyed and delivered during the applicable time period.

1.48. "Water Lease" has the meaning assigned thereto in Section 4.1.

1.49. "Water Storage Account" has the meaning assigned thereto in Section 5.5.

1.50. "Year" means a calendar year during the Initial Term.

2. Purpose.

The purpose of this Agreement is to: (a) define the rights and obligations of the parties and the contractual documents that will govern the development, design, acquisition, construction, finance, operation, repair and replacement of the Project and Project Facilities and the compliance of the Project with the mitigation measures adopted by SMWD for the Project and the GMMMP; (b) identify the rights to ownership, possession and responsibility for the assets of the Project; (c) identify the mechanism for the allocation and delivery of Project Water and Project Storage; and (d) define the separate rights of SMWD in the Project Water, Project Storage and its easement for priority use of the Project Facilities. A flow chart showing the structure of the Project and the contractual relationships between the various parties is attached hereto as Exhibit B and incorporated herein by this reference. The parties acknowledge that this Agreement is unique due to the role of SMWD in carrying out the Project and its management and oversight role with FVWA and FVMWC, and that the water purchase agreements between Cadiz, FVMWC and other Project Participants may contain terms for the purchase of Project Water and Project Storage that vary from the terms granted to SMWD hereunder; provided, however, that no such agreements with Project Participants shall alter the responsibilities of the parties with respect to the Project as set forth in this Agreement.

3. Construction, Operation and Financing: Roles and Responsibilities.

3.1. Intent. The parties will use their best efforts to cause or accomplish the development, construction, finance and operation of the Project and the Project Facilities, the obtaining of all necessary authority and rights, consents and approvals, and the performance of all things necessary and convenient therefor, subject to compliance with all necessary federal and state laws, including CEQA, the terms and conditions of the permits and licenses relating to the Project, and all other agreements relating thereto.

3.2. Creation, Governance and Responsibilities of FVWA.

3.2.1. The Joint Exercise of Powers Agreement for FVWA will be prepared consistent with the authority granted under Government Code §§ 6500 *et seq*., within one hundred eighty (180) days of the execution of this Agreement, in a form which is consistent with this Agreement and mutually acceptable to the parties. SMWD will serve as the "designated entity" of FVWA pursuant to Government Code § 6509. The purpose of FVWA will be to lease and eventually own the Project Facilities for the extraction, conveyance and delivery of water by the Project and in connection therewith, to coordinate with Cadiz in securing permits and regulatory approvals required to operate and maintain such Project Facilities. In the event that SMWD does not approve the execution of the Joint Exercise of Powers Agreement and the formation of FVWA for any reason, then SMWD and Cadiz will agree on a mutually acceptable amendment to this Agreement whereby SMWD will directly assume the rights and obligations of FVWA.

3.2.2. The governance of FVWA shall be as set forth in the Joint Exercise of Powers Agreement, which shall provide SMWD with full management and operational control of FVWA during the term of the Project. SMWD and FVMWC shall be the founding members of FVWA and other Project Participants may become members of FVWA under terms to be agreed upon between SMWD and such other Project Participants.

3.2.3. FVWA responsibilities will include: (i) reviewing and approving Project designs and specifications in coordination with SMWD; (ii) managing and providing oversight of the operation of the Project Facilities in coordination with FVMWC pursuant to the terms of the Facility Operation Agreement; and (iii) overseeing compliance of the Project with the GMMMP in coordination with SMWD.

3.3. Responsibilities of FVMWC. FVMWC responsibilities will include:

3.3.1. Carrying out its obligations in connection with the operation and maintenance of Project Facilities as set forth in the Facility Operation Agreement;

3.3.2. Collecting all payments received from the sale of water and allocating such payments to: (i) Project operation and compliance costs incurred by FVMWC and FVWA; (ii) Capital Recovery Charges due to Cadiz for the Capital Investment; and (iii) payments due to Cadiz for making available the Project Water as negotiated in this Agreement, the Water Lease and the water purchase agreements with other Project Participants, subject to offset by FVMWC for any Retained Costs of Cadiz that are paid by FVMWC;

3.3.3. Complying with all regulatory requirements for the operation of a public water system, including the requirements of the

California Department of Public Health under the direction of FVWA and SMWD as set forth in the Facility Operation Agreement;

3.3.4. Carrying out the day-to-day implementation of mitigation measures adopted by SMWD as part of its approval of the Project, and the protective measures contained within the GMMMP under the review of FVWA pursuant to the Facility Operation Agreement;

3.3.5. Enforcing mitigation measures contained in the Project EIR as directed or delegated by SMWD as the lead agency;

3.3.6. Providing regular and routine updates to Cadiz, FVWA, SMWD and the County concerning compliance with the GMMMP; and

3.3.7. Coordinating the extraction, conveyance and delivery of the Total Annual Project Allotment received under the Water Lease pursuant to the Facility Operation Agreement.

3.4. Implementation of the GMMMP.

3.4.1. After the Effective Date and upon certification of the Project EIR, SMWD and the County will provide annual time and materials budget estimates to review data, establish procedures and appoint representatives to the Technical Review Panel (as defined in the GMMMP). Cadiz will deposit adequate funding to cover these costs in its escrow account established under the Reimbursement Agreements for the benefit of SMWD on behalf of FVWA and the County in advance of their performance of the duties reasonably budgeted as anticipated to be incurred by SMWD and the County, in quarterly installments commencing within 30 days of receipt of the initial budgets and at the start of each subsequent SMWD and County fiscal year.

3.4.2. The obligation set forth in Section 3.4.1 is separate and independent from Cadiz's agreement to reimburse SMWD in full for all costs reasonably incurred by SMWD in connection with its independent review and analysis of the Project EIR and GMMMP pursuant to the Reimbursement Agreements. Notwithstanding the terms set forth in the Reimbursement Agreements, Cadiz agrees that it shall reimburse SMWD (i) for all costs incurred by SMWD, including costs that are subject to reimbursement pursuant to the Reimbursement Agreements, as of the Effective Date in connection with the Project, including all environmental review and litigation costs, within five (5) business days of the submission of an invoice from SMWD setting forth such amounts in reasonable detail. Cadiz may elect to make such payment directly or through a release of funds currently held in escrow or both at the election of Cadiz; and (ii) all Retained Costs described in Section 1.39(c)(ii).

3.4.3. Between the Effective Date and the Commencment Date, Cadiz will be responsible for providing field staff, data collection and reporting to the satisfaction of SMWD and the County. Furthermore, Cadiz and SMWD agree that the execution of this Agreement will trigger the annual reporting requirement under Section 9.1 of the GMMMP, provided, however, that until the Commencement Date, Cadiz will be responsible for the preparation of the annual reports required by Section 9.2.1 of the GMMMP and the ongoing monitoring and collection of data necessary to prepare such reports. The first annual report under Section 9.2.1 of the GMMMP will be due within twelve months of the Effective Date. The reporting and monitoring requirements contemplated in this Section 3.4 and the GMMMP shall be conducted on a continuous basis following the Effective Date notwithstanding any tolling of the deadlines or other requirements of this Agreement due to litigation as contemplated in Section 14.2, subject to the order of any court or regulatory authority requiring Cadiz to suspend such activities.

3.4.4. SMWD will establish a community advisory committee to provide a mechanism for local input on issues related to SMWD's oversight of the monitoring of the Project as contemplated in the GMMMP. Cadiz shall cooperate with SMWD's requests for resources in connection with the committee, including without limitation, providing SMWD with access to Cadiz monitoring data, advisors and expertise and hosting visits by the committee to the Project site.

3.4.5. On and after the Commencement Date, FVMWC will be responsible for providing field staff, data collection and reporting under the supervision of SMWD and to the satisfaction of the County. All costs associated with these activities will be components of Fixed O&M Costs and recovered through the sale of water to SMWD and other Project Participants.

3.4.6. FVMWC shall retain responsibility for compliance with the GMMMP during the term of the Facility Lease, and annually, SMWD and the County will provide a budget for their respective costs for review and enforcement for the next SMWD and County fiscal year by May of the then-fiscal year to Cadiz.

3.4.7. Notwithstanding anything to the contrary herein, any responsibility of FVMWC, SMWD or FVWA with respect to the implementation of the GMMMP shall not relieve Cadiz of its financial obligations and responsibilities as set forth in this Agreement, it being the intent that Cadiz shall retain responsibility for all costs and liability associated with corrective measures and compliance with the GMMMP except for those costs included in Fixed O&M Costs pursuant to Section 3.4.4.

3.5. Responsibilities of Cadiz.

3.5.1. Cadiz will be responsible for the development, design, acquisition and construction of the Project Facilities, subject to the review and approval of FVWA and SMWD.

3.5.2. Cadiz will be responsible for obtaining all Third Party Financing necessary to provide the Capital Investment for the Project. FVMWC and SMWD acknowledge that Cadiz may be required to provide a pledge of all Project revenues payable to Cadiz, as well as a collateral assignment of the Facility Lease and the Water Lease as security for the Third Party Financing. FVMWC and SMWD agree to cooperate with Cadiz with respect to such assignment; provided, however, that the terms of the Third Party Financing shall not vary the terms of this Agreement or any other Project contracts described herein without the express written consent of FVMWC, FVWA and SMWD, and the Facility Lease and the Water Lease shall provide that any collateral assignee of such documents shall assume all obligations of Cadiz thereunder.

3.5.3. Cadiz will be responsible for obtaining all permits and approvals required for the Project in coordination with FVWA and SMWD.

3.5.4. Cadiz will be responsible for all Retained Costs and to the extent that Retained Costs include allocations of Fixed O&M Costs or other expenses as a result of any reduction or curtailment of Project Water below the Total Annual Project Allotment, then Cadiz agrees that FVMWC has the right to offset such Retained Costs against any amounts payable to Cadiz under this Agreement.

3.5.5. Cadiz will reimburse SMWD, FVMWC and the County for all costs reasonably incurred prior to the Commencement Date as set forth in this Agreement and the Reimbursement Agreements. At SMWD's sole discretion, Cadiz may be requested for quarterly deposits for SMWD's costs incurred prior to the Commencement Date, including but not limited to, plan review, inspection, construction management, legal services and administration.

3.6. SMWD Financing. SMWD reserves the right, but has no obligation, to obtain independent financing to repay the Cadiz Capital Investment (including any costs of Third Party Financing that are due and payable at the time or are related to repayment, such as penalties for prepayment), after which repayment SMWD shall have no obligation to pay any Capital Recovery Charge as set forth in Section 9.2.2. SMWD may exercise its financing right at any time; provided, that such exercise does not materially impede or delay construction or operation of the Project and subject to the reasonable terms of any Third Party Financing of the Capital

Investment (it being understood that there may be time period limitations or penalties for prepayment).

4. Interests.

4.1. Lease of Project Water and Project Storage. Cadiz will enter into a long term lease with FVMWC which gives FVMWC a possessory interest and right to take the Total Annual Project Allotment of Project Water from the Property and the Fenner Valley Aquifer System for the Initial Term of fifty (50) years ("Water Lease"). In consideration of the Water Lease, FVMWC shall collect and deliver to Cadiz all charges and payments which are negotiated between Cadiz and the Project Participants, subject to an offset for Retained Costs payable by Cadiz as set forth in Section 9.2.1. FVMWC shall retain payments made by the Project Participants for Fixed O&M Costs and Variable O&M Costs, as well as any other Project costs that are paid directly by FVMWC pursuant to the Water Lease (such as MWD Fees) as set forth in Section 9.3. FVMWC's right to take the full Total Annual Project Allotment will be subject to the mitigation measures set forth in the Project EIR and the requirements of the GMMMP; provided, however, that for the purpose of calculating the Capital Recovery Charge and the Fixed O&M Costs, such costs shall always be calculated on the full 50,000 AF, with Cadiz taking all risk in connection with the loss of such charges and costs with respect to the total number of AF subject to a reduction or curtailment. The Water Lease shall recognize the priority right of SMWD to the SMWD Base Allotment pursuant to Section 5.2. The Water Lease shall further provide for the provision of Project Storage within the subsurface of the Property and the Fenner Valley Aquifer System and the delivery of water that is held in Project Storage. The terms of the Water Lease will be consistent with the terms set forth in this Agreement and will be subject to the approval of FVMWC and SMWD. Cadiz will deliver a draft of the Water Lease for review and approval by FVMWC and SMWD within ninety (90) days of the execution of this Agreement. The effectiveness of the Water Lease shall be contingent upon the satisfaction of the conditions set forth in Section 14 and shall terminate in the event of an event of early termination in accordance with this Agreement. The Water Lease will be recorded against the Property.

4.2. Lease of Project Facilities. Cadiz will enter into a long term lease with FVWA which gives FVWA a possessory interest in the Project Facilities for the Initial Term of fifty (50) years or until the Capital Investment has been paid in full, whichever is shorter ("Facility Lease"). The use of the Project Facilities to produce and deliver Project Water shall be governed by the Facility Operation Agreement between FVWA and FVMWC. At the end of the term of the Facility Lease, the Project Facilities shall become the property of FVWA, but shall continue to be operated and maintained for the duration of the Water Lease in accordance with the terms of the Facility Operation Agreement. In consideration of the Facility Lease, Cadiz shall be entitled to the payment of the Capital Recovery Charge, which shall be collected and paid to Cadiz by FVMWC on behalf of FVWA as set forth in Section 9.2.2. The terms of the Facility Lease will be consistent with the terms set forth in this Agreement and will be subject to the approval of FVWA, FVMWC and SMWD. Cadiz will deliver a draft of the Facility Lease for review and approval by the parties within ninety (90) days of the execution of this Agreement. The effectiveness of the Facility Lease shall be contingent upon the satisfaction of the conditions set forth in Section 14 and shall terminate in the event of an event of early termination in accordance with this Agreement. The Facility Lease will be recorded against the Property.

4.3. Issuance of Membership Shares; FVMWC Rules and Regulations. Within thirty (30) days of the Effective Date of this Agreement, FVMWC will issue to SMWD 5,000 membership shares in FVMWC, which shares shall represent the right to delivery of water from FVMWC pursuant to the terms and conditions of this Agreement. Within ninety (90) days of the Effective Date of this Agreement, Cadiz shall deliver to SMWD for review and approval a draft set of Bylaws and the proposed rules and regulations for Project operations by FVMWC as described in Section 5.1. The form of Bylaws and rules and regulations shall be customary for mutual water companies, subject to the unique aspects of the Project.

4.4. Facilities Easement for SMWD. Following the construction of the Project Facilities and prior to the execution of the Facility Lease, Cadiz will record an easement in favor of SMWD over the Project Facilities which grants to SMWD the priority right to use the Project Facilities in order to take the SMWD Base Allotment in accordance with the terms of this Agreement. Such easement shall include the right to make use of any right of way in which the Project Facilities are located. The easement shall provide for subordination to any security interest granted in connection with any Third Party Financing subject to the execution of a non-disturbance agreement with the lender acceptable to SMWD. SMWD shall deliver a draft of the form of easement to Cadiz within ninety (90) days of the Effective Date for Cadiz's review and approval.

5. Delivery of Water.

5.1. Delivery Schedule. FVMWC, in consultation with SMWD, will establish rules and regulations regarding the process and schedule for delivering water to its members, including SMWD, which schedule shall be adopted on an annual basis for each Year. Such rules and regulations will include the date for members submitting delivery orders for the following Year, including member orders for delivery of water from storage, the date for FVMWC releasing a delivery schedule, the scheduling of delivery interruptions due to regular maintenance, repair and replacement activities, and other matters as deemed necessary or appropriate by FVMWC. The primary objective will be for FVMWC to meet all delivery requests of its members, consistent with operation of the Project in accordance with the Project EIR, all Project permits and the GMMMP. To the extent that all delivery requests cannot be met, FVMWC will establish deliveries consistent with the priorities set forth in this Agreement and similar agreements executed with other members of FVMWC.

5.2. SMWD First Priority Right. SMWD shall have the right to delivery of the first five thousand (5,000) AFY of Project Water ("SMWD Base Allotment"), including the priority right to use of capacity in the Project Facilities for delivery of the SMWD Base Allotment. This right will have priority pursuant to the Water Lease with FVMWC over deliveries to the other Project Participants and shall not be subject to reduction or curtailment. The SMWD Base Allotment shall further have priority over any delivery of water to the County pursuant to the County MOU, it being understood that the "availability of capacity" in the Project Facilities for the delivery of water to the County is determined after taking into account the priority rights of SMWD.

5.3. SMWD Second Priority Right. In addition to the water described in Section 5.2, SMWD shall have an option to purchase an additional ten thousand (10,000) AFY on the same

priority as the other Project Participants ("SMWD Option Capacity") and subject to any reduction or curtailment in the Total Annual Project Allotment on a *pari passu* basis with the other Project Participants. SMWD shall have the right to exercise its option for the SMWD Option Capacity, or any portion thereof, at any time on purchase terms mutually agreed to by SMWD and Cadiz; provided, that (i) at any such time as the Project only has ten thousand (10,000) AFY of excess capacity remaining, FVMWC shall give SMWD notice of any proposed acquisition of capacity by any other Project Participant, and SMWD shall be required to either exercise its option for such capacity within sixty (60) days of such notice, or the failure by SMWD to provide notice to Cadiz of such exercise shall constitute a release of said capacity from the option so that FVMWC can sell the water to such other Project Participant, and (ii) the purchase price for the SMWD Option Capacity shall be subject to agreement between Cadiz and SMWD at the time of exercise of the option, but SMWD shall have the right at all times to benefit from the most favorable terms of water purchase that are negotiated by Cadiz with any other Project Participant, whether before or after the exercise of the SMWD Option Capacity. Further, to the extent that there is unused capacity in the Project, SMWD shall have the right to make use of its SMWD Option Capacity on an as-needed annual basis without any long term commitment upon giving notice to FVMWC and paying all applicable charges for such water.

5.4. Carry-Over Account. SMWD may instruct FVMWC to carry over any portion of the SMWD Base Allotment or the SMWD Option Capacity which is not taken by SMWD for delivery in a given Year as a credit to SMWD's Carry-Over Account with an equal amount of water; provided, that SMWD's Carry-Over Account shall be limited to a balance of fifteen thousand (15,000) AF. In no event shall SMWD be required to take a credit for Project Water that is not delivered by FVMWC as a result of any reduction or curtailment in the Total Annual Project Allotment, it being understood that SMWD has no obligation to purchase such Project Water. If SMWD elects to carry over water that is purchased by SMWD rather than take delivery of such water, then SMWD shall pay an annual management fee for the amount of water which it has in storage at the rate of twenty dollars ($20.00) per AF per Year ("Annual Storage Management Fee") for each acre-foot of water actually held in SMWD's Carry-Over Account, which fee shall be subject to annual escalation on July 1 of each Year in accordance with any increase in the Consumer Price Index - All Items for Los Angeles, Orange and Riverside Counties (or such similar index approved by the parties in the event that this CPI index is no longer available at any time during the Initial Term). If SMWD possesses water in its Carry-Over Account, FVMWC will deliver water to SMWD from its Carry-Over Account pursuant to the delivery process set forth in Section 5.1. This water shall be delivered as the third priority for water delivered by the Project, which priority may be shared with other FVMWC Members.

5.5. Water Storage Account. SMWD shall be entitled to fifteen thousand (15,000) AF of water in storage in the Fenner Valley Aquifer System as of the Effective Date, at no cost to SMWD, to be accounted for by FVMWC in a Water Storage Account. SMWD shall have the right to take delivery of such stored water at any time, subject to capacity in the Project Facilities. The exercise of this storage right shall be at SMWD's sole discretion, subject to availability, and in no event shall SMWD be required to purchase and store water as a result of the inability of the Project to deliver such water to SMWD. Furthermore, subject to further environmental review as deemed necessary or required by the parties, SMWD, in its sole discretion, may elect to use such storage right for the storage of imported water. If SMWD possesses water in its Water Storage Account, FVMWC will deliver water to SMWD from its

Water Storage Account pursuant to the delivery process set forth in Section 5.1. This water shall be delivered as the third priority for water delivered by the Project, which priority may be shared with other FVMWC Members. SMWD shall not pay any delivery or Annual Storage Management Fee in connection with the original 15,000 AF of water held in storage; provided, however, that such fees shall be payable to the extent that SMWD makes use of such storage capacity following delivery of the original 15,000 AF for the storage of other water.

5.6. Points of Delivery; Flow Rate. FVMWC will deliver to the CRA for the account of SMWD the amount of water specified in each request at a maximum flow rate as may be conditioned by MWD and otherwise agreed by FVMWC and SMWD.

5.7. Right of First Refusal. SMWD shall have a right of first refusal to participate in any future water storage project developed in connection with the Property on terms mutually agreed to by SMWD and Cadiz in good faith.

5.8. Water Accounting. FVMWC shall maintain, and update on at least a monthly basis, a detailed accounting of the water delivery rights of SMWD and other FVMWC Members, including the Carry-Over Account and Water Storage Account of SMWD and similar accounts that may be possessed by such other FVMWC Members.

6. Curtailment of Deliveries.

6.1. FVMWC May Curtail Deliveries. FVMWC may temporarily discontinue or reduce the delivery of water to SMWD hereunder for the purposes of necessary investigation, inspection, maintenance, repair or replacement of any of the Project Facilities necessary for the delivery of water to SMWD and other FVMWC Members. FVMWC shall notify SMWD as far in advance as possible of any such discontinuance or reduction, except in cases of emergency, in which case notice shall be given as soon thereafter as possible.

6.2. SMWD May Receive Later Delivery of Water Not Delivered. In the event of any discontinuance or reduction of delivery of water pursuant to Section 6.1, SMWD may elect to receive the amount of water which otherwise would have been delivered to it during such period under the water delivery schedule for that Year, to the extent that such water is then available and with respect to the SMWD Option Capacity, such election is consistent with FVMWC's overall delivery ability, considering the then-current delivery schedules of all FVMWC Members. The schedule for the delivery of SMWD Base Allotment shall always have priority. If SMWD elects not to receive such water, FVMWC shall add such water to the SMWD Carry-Over Account for use in subsequent Years.

6.3. Reduction or Curtailment Due to Corrective Measures. In the event that a determination is made by FVWA and FVMWC that a reduction or curtailment of the Total Annual Project Allotment will be necessary for the current or upcoming Year due to the imposition of corrective measures under the GMMMP, FVMWC shall reduce the allotment of each Project Participant on a *pari passu* basis by the percentage reduction in available Project Water for the then current or upcoming Year. FVMWC shall use its best efforts to make any such determination prior to the commencement of each Year so as to avoid an unscheduled interruption or reduction of water deliveries. Upon declaring a reduction or curtailment of the

Total Annual Project Allotment pursuant to this Section 6.3, FVMWC shall notify Cadiz of the total number of AF subject to such reduction or curtailment and the corresponding amount of Fixed O&M Costs that will be payable by Cadiz as a Retained Cost, as well as the Capital Recovery Charges that will not be payable to Cadiz during such Year.

7. Measurement of Water Delivered.

FVMWC shall measure, or cause to be measured, all water delivered to SMWD and shall keep and maintain accurate and complete records thereof. For this purpose and in accordance with Section 4 hereof, FVMWC shall install, operate, and maintain, or cause to be installed, operated and maintained, at all delivery structures for delivery of water to SMWD at the point of delivery determined in accordance with Section 5.6 such measuring devices and equipment as are satisfactory and acceptable to the parties. Said devices and equipment shall be examined, tested, and serviced by FVMWC regularly to insure their accuracy. At any time or times, SMWD may inspect such measuring devices and equipment, and the measurements and records taken therefrom.

8. Responsibility for Delivery and Distribution of Water.

8.1. Responsibility Prior to Delivery.

8.1.1. Cadiz shall indemnify and hold harmless FVMWC and the Project Participants and their respective officers, agents and employees from any damages or claims of damages, including property damage, personal injury or death, arising out of or connected with the existence of any contaminant or hazardous material that is present in the Project Water taken by FVMWC pursuant to the Water Lease in excess of the levels allowed for water to be conveyed in the CRA, as long as FVMWC has conducted monitoring of water quality sufficient to determine the presence of such contaminant or hazardous material and provided Cadiz with notice and an opportunity to cure.

8.1.2. FVMWC shall indemnify and hold harmless the Project Participants and their respective officers, agents and employees from any damages or claims of damages, including property damage, personal injury or death, arising out of or connected with the improper carriage, handling, use, disposal or distribution of Project Water following production and prior to such water passing from the well head to the designated points of delivery and including attorney fees and other costs of defense in connection therewith. Notwithstanding the foregoing, nothing contained herein shall relieve Cadiz of its obligations under Section 8.1.1 if FVMWC can demonstrate that any contaminant in the Project Water that is delivered by FVMWC was present in the Project Water pumped from the Property.

8.2. Responsibility After Delivery. Neither Cadiz nor FVMWC nor any affiliate nor any of their respective directors, officers, agents or employees shall be liable for the control, carriage, handling, use, disposal, or distribution of water delivered by FVMWC to SMWD after

such water has passed the points of delivery established by the rules and regulations of FVMWC; nor for claim of damage of any nature whatsoever, including property damage, personal injury or death, arising out of or connected with the control, carriage, handling, use, disposal or distribution of such water beyond said points of delivery and including attorney fees and other costs of defense in connection therewith. Notwithstanding the foregoing, nothing contained herein shall relieve Cadiz or FVMWC of their respective obligations under Sections 8.1.1 and 8.1.2 if SMWD can demonstrate that any contaminant in the Project Water that is delivered by FVMWC was present in the Project Water prior to delivery to the point of delivery specified in Section 5.6. SMWD shall indemnify and hold harmless FVMWC, Cadiz and their respective directors, officers, agents and employees from any such damages or claims of damages to the extent that the claim arises following delivery of Project Water to the SMWD Water System.

8.3. Responsibility for Corrective Measures. Each water purchase agreement entered into between Cadiz and a Project Participant shall contain a waiver and limitation of liability for any damages arising as a result of a determination that the Total Annual Project Allotment must be reduced or curtailed in connection with implementation of the corrective measures in the GMMMP. In no event shall FVMWC, FVWA or SMWD have any liability to any Project Participant for the loss of Project Water arising as a result of any such corrective measures or any action taken by FVMWC, FVWA or SMWD in connection with the enforcement of the GMMMP and Cadiz shall indemnify, defend and hold harmless, FVMWC, FVWA and SMWD from any claim by a Project Participant or other third party that it has been damaged as a result of enforcement of any corrective measure or a challenge to the determination by FVMWC, FVWA or SMWD that such enforcement is not required under the GMMMP.

9. Purchase Price.

9.1. Price Goal. It is the goal of the parties for the Project to produce water at a cost to SMWD between $639 and $1,089 per AF (in 2012 dollars), including the SMWD Base Payment, the Capital Recovery Charge, Fixed O&M Costs, Variable O&M Costs, Administrative Costs and MWD Fees, but excluding any treatment that may be required. A table showing the various components of the purchase price for Project Water is attached hereto as Exhibit C and incorporated herein by this reference.

9.2. Payments to Cadiz. The following charges shall be paid by SMWD to FVMWC, which FVMWC will then aggregate with similar charges paid by other Project Participants and pay to Cadiz:

9.2.1. Water Supply Payment. SMWD shall pay Cadiz the lesser of $150 per AF or the MWD Tier 1 Supply Rate for each AF of SMWD Base Allotment delivered to SMWD ("SMWD Base Payment"). In addition to the SMWD Base Payment, Cadiz shall be entitled to any revenue generated from Intentionally Created Surplus ("ICS") as a result of water delivered to SMWD, up to a maximum water supply payment (including the SMWD Base Payment) of $500 per AF for the SMWD Base Allotment delivered to SMWD. Any ICS earned by Cadiz on the SMWD Base Allotment that causes the total water supply payment to exceed $500 per AF shall be rebated to SMWD. On the first anniversary of the Commencement Date and each year

thereafter, the SMWD Base Payment shall be adjusted annually (upward or downward) by an amount equal to the percentage increase or decrease in the MWD Tier 1 Supply Rate or if such rate is no longer available, such similar rate that provides a benchmark for changes in water supply costs within the MWD service area which is reasonably acceptable to SMWD and Cadiz. The annual adjustment (increase or decrease) will in no event exceed four percent (4%) of the then current SMWD Base Payment instead of the 5% previously agreed to provide further consideration to SMWD for the services provided under this Agreement. This provision regarding the calculation of the water supply payment shall apply only to the SMWD Base Allotment, and it shall have no application to the terms applicable to the sale by Cadiz of the remaining 45,000 AF of Total Annual Project Allotment to SMWD or any other Project Participant.

9.2.2. Capital Recovery Charge. Cadiz shall receive the Capital Recovery Charge under the Facility Lease for each AF of water delivered to SMWD. The Capital Recovery Charge shall be calculated by amortizing the total Capital Investment of Cadiz over a term of thirty (30) years at a maximum interest rate of six and one-half percent (6.5%) and then dividing the annual repayment amount by the Total Annual Project Allotment of 50,000 AFY. It is understood and agreed that Cadiz is solely at risk for less than the entire Total Annual Project Allotment being delivered, and that the Capital Recovery Charge shall not be subject to adjustment or increase on a per AF basis during any given Year as a result of any shortfall. Notwithstanding the foregoing, to the extent of any shortfall, the annual amortization amount as calculated above shall continue to be payable following the 30-year repayment period and for the remainder of the Facility Lease, until the Capital Investment has been paid to Cadiz in full. In the event that SMWD provides for alternative financing of the Project that repays Cadiz its Capital Investment in full, then the Capital Recovery Charge shall cease to exist, and SMWD, FVMWC and the other Project Participants will agree among themselves regarding the manner of repaying the SMWD alternative financing. Cadiz shall have the right to negotiate its recovery of Capital Investment from other Project Participants on terms agreeable to Cadiz and such other Project Participant; provided, however, that such other capital recovery terms do not create a Material Increase in Financial Risk to SMWD.

9.3. Payments to FVMWC. The following charges shall be paid by SMWD to FVMWC, which FVMWC will then use to pay its own expenses:

9.3.1. Fixed O&M Costs. SMWD and each other Project Participant shall pay to FVMWC a charge per AF to cover Fixed O&M Costs. To the extent that Cadiz is unable to deliver all or a portion of the Total Annual Project Allotment, including reduction pursuant to Section 6.3, then Cadiz (and not SMWD and the other Project Participants) shall be responsible for paying to FVMWC the fixed cost charges associated with the total amount of AF that was not delivered. Cadiz shall further be responsible for SMWD's

portion of the Fixed O&M Cost which is related to capital repair and replacement during the first ten (10) years of the Facility Lease. During the remainder of the term of the Facility Lease, SMWD shall share in the cost of capital repair and replacement with the other Project Participants as a component of Fixed O&M Costs.

9.3.2. Variable O&M Costs. SMWD and each other Project Participant shall pay to FVMWC a charge per AF to cover Variable O&M Costs. Such costs shall be estimated on an annual basis pursuant to a budget to be prepared by FVMWC under SMWD supervision and shall be charged on a per AF basis, subject to reconciliation to actual costs at the end of each Year.

9.3.3. Administrative Costs. SMWD and each other Project Participant shall pay to FVMWC a charge per AF to cover Administrative Costs. Such costs shall be estimated on an annual basis pursuant to a budget to be prepared by FVMWC under SMWD supervision and shall be charged on a per AF basis, subject to reconciliation to actual costs at the end of each Year.

9.3.4. MWD Fees. SMWD and each other Project Participant (as applicable) shall pay a per AF charge in connection with MWD and MWDOC rates, fees and charges incurred by FVMWC ("MWD Fees"), whatever they may be, provided that water is available from the Project. Any MWD or MWDOC charges incurred when water is unavailable from the Project will be the responsibility of Cadiz. The parties acknowledge that Cadiz, in its discretion, may make available benefits to MWD and MWDOC that result in a reduction of the MWD and MWDOC rates, fees and charges or other off-setting benefits. The parties will negotiate in good faith as to how such benefits and/or reductions (if any) should be fairly distributed between Cadiz, SMWD and the other Project Participants. The parties' failure to reach agreement on the distribution of such benefits and/or reductions prior to the Commencement Date shall result in an early termination of this Agreement.

9.4. Payment Schedule. In preparing the rules and regulations of FVMWC as provided in Sections 4.3 and 5.1, Cadiz, FVMWC and SMWD agree to coordinate the payment schedule for water in a manner that is consistent with the cash flows necessary for the timely payment of Debt Service by Cadiz.

10. Obligation in the Event of Default.

10.1. Event of Default. A party shall be in default under this Agreement in the event that such party: (a) fails to make any payment in full when due; or (b) fails to perform any other obligation hereunder, and such failure: (i) continues for a period of thirty (30) days following written notice of the default from the non-defaulting party if the default occurs prior to the Commencement Date; or (ii) ninety (90) days following written notice from the defaulting party if the default occurs following the Commencement Date; provided, however, that if Cadiz is the

defaulting party, SMWD shall provide the lender under any Third Party Financing with an additional cure period equal to the original cure period in which to cure the default. If a default cannot be remedied within the applicable cure period, but the defaulting party commences remedial action within such period, such failure shall not constitute a default hereunder. Notice of any default shall be provided to the other parties and all of the Project Participants.

10.2. Suspension of Water Delivery; Termination. FVMWC shall have the right to suspend water delivery to SMWD during any period in which SMWD is in default of its payment obligations under this Agreement and to sell the Project Water that would otherwise have been deliverable to SMWD during such period of suspension to another Project Participant. If a suspension continues for a period of one (1) Year or more, then FVMWC may give notice of termination of the provisions of this Agreement insofar as the same entitle SMWD to the SMWD Base Allotment and the SMWD Option Capacity, which notice shall be effective within thirty (30) days thereof unless such termination shall be enjoined, stayed or otherwise delayed by judicial action. Any such termination shall result in the forfeiture of SMWD's membership shares in FVMWC. Notwithstanding the foregoing, to the extent that SMWD has already purchased water that is reflected in its Carry-Over Account or its Water Storage Account, then in no event shall SMWD forfeit any such purchased water as a result of the termination of this Agreement; provided, however, that SMWD shall be responsible to pay any Annual Storage Management Fees or delivery charges in connection with the delivery of such stored water.

10.3. Enforcement of Remedies. In addition to the remedies set forth in this Section, upon the occurrence of an event of default as defined herein, Cadiz, FVMWC or SMWD, as the case may be, shall be entitled to proceed to protect and enforce the rights vested in such party by this Agreement by such appropriate judicial proceeding as such party shall deem most effectual, either by suit in equity or by action at law, whether for the specific performance of any covenant or agreement contained herein or to enforce any other legal or equitable right vested in such party by this Agreement or by law. The provisions of this Agreement and the duties of each party hereof, their respective boards, officers or employees shall be enforceable by the other parties hereto by mandamus or other appropriate suit, action or proceeding in any court of competent jurisdiction, with the losing party or parties paying all costs and attorney fees.

11. Transfers, Sales and Assignments of Project Allotment.

SMWD has the right to make transfers, sales, leases, assignments and exchanges (collectively "transfers") of the SMWD Base Allotment, the SMWD Option Capacity or its storage rights in the Project; provided, however, that it shall properly register any such transfer or lease in accordance with the policies and procedures established by FVMWC. Notwithstanding the foregoing, SMWD shall have the right to transfer either or both of the SMWD Base Allotment and the SMWD Option Capacity or its storage rights in the Project on an annual or long-term basis without the payment of any additional fee or charge to FVMWC.

12. Additional Covenants of Cadiz and FVMWC.

12.1. Insurance. FVMWC shall procure and maintain or cause to be procured and maintained insurance on the Project Facilities with responsible insurers so long as such insurance is available from reputable insurance companies, or, alternatively, shall establish a program of

self-insurance, covering such risks, in such amounts and with such deductibles as shall be required pursuant to the Facility Lease.

12.2. Construction Indemnity. Cadiz shall indemnify, defend and hold harmless FVMWC, FVWA and SMWD from any liability for personal injury or property damage resulting from any accident or occurrence arising out of or in any way related to the construction of the Project Facilities.

12.3. Compliance with Law. Cadiz will comply with all local, state and federal laws applicable to the construction of the Project, and FVMWC shall comply with all local, state and federal laws applicable to the operation of the Project.

12.4. Against Sale or Other Disposition of Project. The Water Lease and the Facility Lease shall provide that neither FVMWC, nor FVWA will assign their respective rights or obligations under the Water Lease or the Facility Lease or any part thereof without the prior written consent of Cadiz.

13. Additional Covenants of SMWD.

13.1. Engineering Oversight. Subject to the payment obligations of Cadiz, as the designated entity for FVWA, SMWD will exercise good faith and best efforts in overseeing the permitting, design and construction of the Project and Project Facilities. All plans for the Project and Project Facilities will be consistent with SMWD standards. Cadiz will timely submit all engineering plans to SMWD for approval.

13.2. Transportation Agreements. Consistent with Section 9.3.4, SMWD will cooperate with Cadiz to secure authorization from MWD and MWDOC for the delivery and conveyance of Project Water by the CRA to SMWD and other Project Participants.

13.3. Monitoring and Mitigation. SMWD will carry out its responsibilities for monitoring and mitigation as provided in the Project EIR and its responsibilities pursuant to the GMMMP.

14. Early Termination; Term.

14.1. The Agreement shall be subject to early termination by written notice by any of the parties upon the occurrence of any of the following conditions subsequent:

14.1.1. Failure of Cadiz and FVMWC to execute agreements for the purchase of at least thirty thousand (30,000) AFY of delivery entitlements from the Project within forty-eight (48) months following the Effective Date;

14.1.2. Failure to obtain an agreement on terms acceptable to the parties for the conveyance of water from the Project to SMWD via the CRA and associated conveyance facilities owned by MWD and MWDOC within twenty-four (24) months following the Effective Date unless extended by mutual agreement of the parties;

14.1.3. Failure to secure all required permits and licenses for the construction and operation of the Project, including all regulatory permits for production of raw water, within forty-eight (48) months following the Effective Date unless extended by mutual agreement of the parties;

14.1.4. Failure to obtain financing in an amount sufficient and on terms acceptable to the parties to result in the construction of the Project Facilities and the production and delivery of water from the Project to SMWD and the other Project Participants within twenty-four (24) months following the Effective Date; or

14.1.5. Failure of the parties to reach an agreement on the distribution of benefits or reductions accruing from a reduction of the MWD Fees prior to the Commencement Date.

14.2. The time periods set forth in Section 14.1 shall be tolled by any litigation that challenges the authorization of the Project or the parties' respective legal authorities to proceed with the Project, including actions brought pursuant to CEQA.

14.3. Upon termination pursuant to this Section 14, no party shall have any further rights or obligations hereunder with respect to any other party; provided, however, that Cadiz shall remain solely responsible for all Retained Costs and all obligations under the County MOU and the Reimbursement Agreements.

14.4. The term of this Agreement shall be from the Effective Date through fifty (50) years from the Commencement Date (the "Initial Term"); provided, however, that subject to compliance with all then-applicable laws, including County permitting as defined in the County MOU and CEQA, SMWD may elect, in its discretion, to extend the Initial Term for an additional 40-year term and for whatever additional future extensions may be authorized under then applicable laws, on terms and conditions as are mutually agreeable to the parties.

15. Assignment.

Except as otherwise expressly set forth herein, no party may assign their rights, responsibilities and obligations hereunder without the consent of all other parties, which shall not be unreasonably withheld or delayed. This Agreement shall be binding on and shall inure to the benefit of the parties and their respective, permitted successors and assigns.

16. Amendments.

Except as otherwise provided in this Agreement, this Agreement may only be amended, modified, changed or rescinded in a writing signed by each of the parties hereto.

17. Miscellaneous.

17.1. Interpretation. The provisions of this Agreement should be liberally interpreted to effectuate its purposes. The language of this Agreement shall be construed simply according to its plain meaning and shall not be construed for or against any party, as each party has

participated in the drafting of this Agreement and had the opportunity to have its counsel review it. Whenever the context and construction so requires, all words used in the singular shall be deemed to be used in the plural, all masculine shall include the feminine and neuter, and vice versa. The word "including" means without limitation, and the word "or" is not exclusive. Unless the context otherwise requires, references herein: (i) to Sections and Exhibits mean the Sections of and the Exhibits attached to this Agreement; and (ii) to an agreement, instrument or other document means such agreement, instrument or other document as amended, supplemented and modified from time to time to the extent permitted by the provisions thereof and by this Agreement.

17.2. Headings. The headings of the sections hereof are inserted for convenience only and shall not be deemed a part of this Agreement.

17.3. Partial Invalidity. If any one or more of the covenants or agreements provided in this Agreement to be performed should be determined to be invalid or contrary to law, such covenant or agreement shall be deemed and construed to be severable from the remaining covenants and agreements herein contained and shall in no way affect the validity of the remaining provisions of this Agreement.

17.4. Counterparts. This Agreement may be executed in several counterparts, all or any of which shall be regarded for all purposes as one original and shall constitute and be but one and the same instrument.

17.5. Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the State of California.

17.6. Notices. Any notices required or permitted to be given hereunder shall be given in writing and shall be delivered: (a) in person; or (b) by Federal Express or another reputable commercial overnight courier that guarantees next day delivery and provides a receipt; and such notices shall be addressed as follows:

If to SMWD: Santa Margarita Water District
26111 Antonio Parkway
Rancho Santa Margarita, CA 92688
Attn: General Manager

If to Cadiz: Cadiz, Inc.
550 South Hope Street, Suite 2850
Los Angeles, CA 90017
Attn: President

If to FVMWC: Fenner Valley Mutual Water Company
550 South Hope Street, Suite 2850
Los Angeles, CA 90017
Attn: President

or to such other address a party may from time to time specify in writing to the other parties. Any notice shall be deemed delivered when actually delivered.

17.7. Merger of Prior Agreements. Except for Reimbursement Agreements (as modified by the provisions hereof), this Agreement and the exhibits hereto constitute the entire agreement between the parties and supersede all prior agreements and understandings between the parties relating to the subject matter hereof (including the Option Agreement). This Agreement is intended to implement, and should be interpreted consistently with, the County MOU and the GMMMP.

17.8. Attorney Fees. If any legal action or any arbitration or other proceeding is brought for the enforcement of this Agreement, or because of an alleged dispute, breach, default or misrepresentation in connection with any of the provisions of this Agreement, the successful or prevailing party shall be entitled to recover reasonable attorney fees and other costs incurred in that action or proceeding, in addition to any other relief to which it or they may be entitled.

17.9. Dispute Resolution. The parties shall seek to resolve any dispute concerning the interpretation or implementation of this Agreement through good faith negotiation, involving, as and when appropriate, the general manager or chief executive officer of each of the parties. Any dispute that remains unresolved thirty (30) days after notice of the dispute is made to the parties, shall be resolved by a single arbitrator with substantial experience on the matter or matters in dispute, conducted in accordance with JAMS. If the parties cannot agree on a single arbitrator within ten (10) days of the written election to submit the matter to arbitration, any party may request JAMS to appoint a single, neutral arbitrator. The parties shall use their reasonable best efforts to have the arbitration proceeding concluded within ninety (90) business days of selection of the arbitrator. In rendering the award, the arbitrator shall determine the rights and obligations of the parties according to the substantive and procedural laws of California. All discovery shall be governed by the California Code of Civil Procedure with all applicable time periods for notice and scheduling provided therein being reduced by one-half. The arbitrator may establish other discovery limitations or rules. The arbitrator shall have the authority to grant provisional remedies and all other remedies at law or in equity, but shall not have the power to award punitive or consequential damages. The decision of the arbitrator shall be final, conclusive and binding upon the parties, and any party shall be entitled to the entry of judgment in a court of competent jurisdiction based upon such decision. The losing party shall pay all costs and expenses of the arbitration; provided, however, if no party is clearly the losing party, then the arbitrator shall allocate the arbitration costs between the parties in an equitable manner, as the arbitrator may determine in his or her sole discretion.

17.10. Recordation. Cadiz will cause the recordation of this Agreement in the chain of title for the Property.

[signature page follows]

IN WITNESS WHEREOF, SMWD has executed this Agreement with the approval of its governing body, and caused its official seal to be affixed, and each of the Cadiz parties has executed this Agreement in accordance with the authorization of its respective Board of Directors.

SANTA MARGARITA WATER DISTRICT

By: _____
President

Attest:

By: _____
Secretary

CADIZ, INC.

By: _____
President

Attest:

By: _____
Secretary

FENNER VALLEY MUTUAL WATER COMPANY

By: _____
President

Attest:

By: _____
Secretary

IN WITNESS WHEREOF, SMWD has executed this Agreement with the approval of its governing body, and caused its official seal to be affixed, and each of the Cadiz parties has executed this Agreement in accordance with the authorization of its respective Board of Directors.

SANTA MARGARITA WATER DISTRICT

By: _____
President

Attest:

By: _____
Secretary

CADIZ, INC.

By: _____
President

Attest:

By: _____
Secretary

FENNER VALLEY MUTUAL WATER COMPANY

By: _____
President

Attest:

By: _____
Secretary

EXHIBIT A

Schedule of Project Allotments

Project Participant	Project Allotment (acre-feet per year)
Santa Margarita Water District	15,000
Three Valleys Municipal Water District	5,000
Golden State Water Company	5,000
Suburban Water Systems	5,000
Jurupa Community Services District	5,000
Arizona California Railroad	100
California Water Service Company	5,000
Total Project Allotment Subscribed	40,100
Project Allotment Available	9,900
Total Annual Project Allotment	50,000

EXHIBIT "B"
PROJECT STRUCTURE

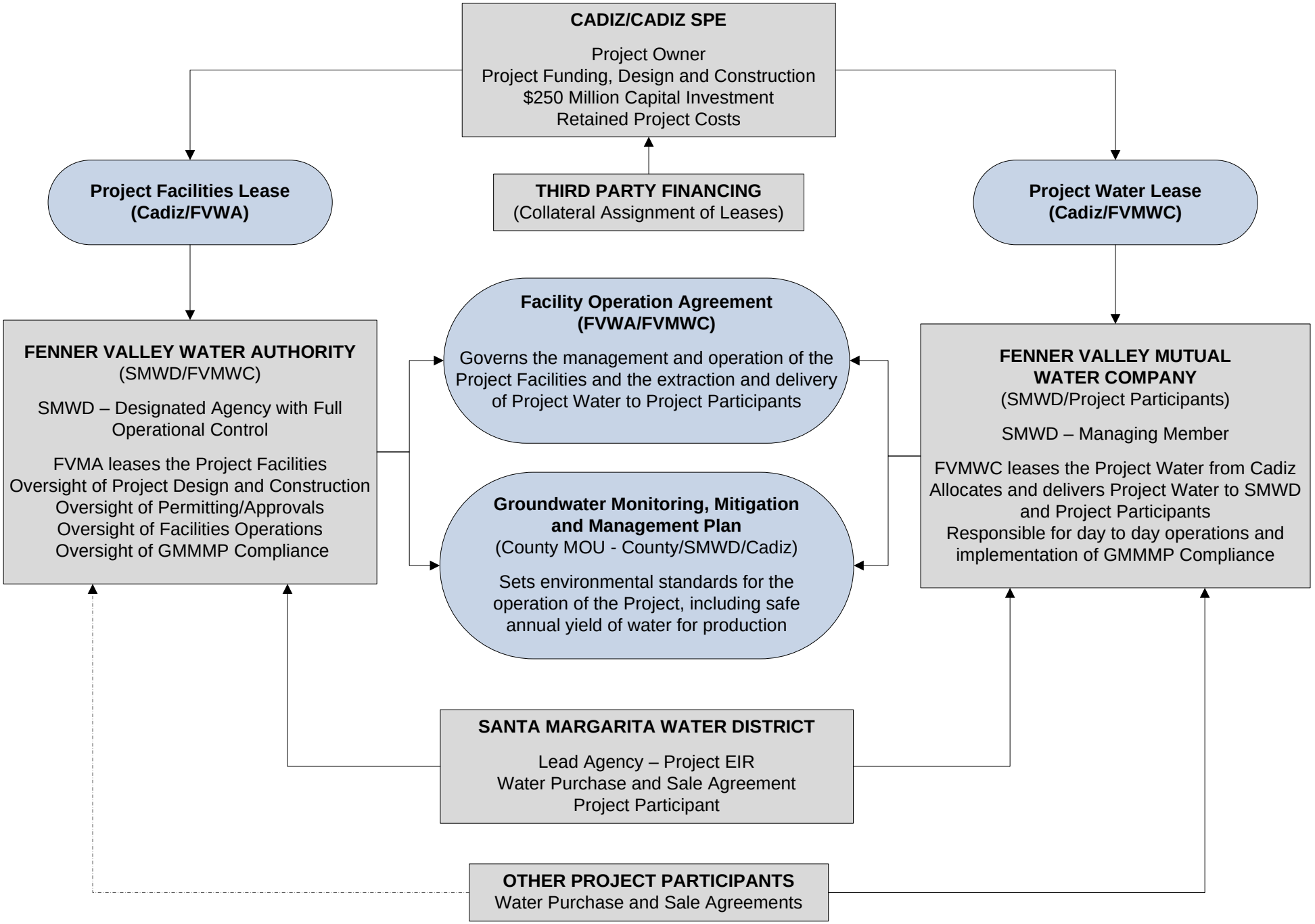


EXHIBIT C
EXAMPLES OF PRICE COMPONENTS FOR SMWD BASE ALLOCATION

Note: The following examples only present the price components for SMWD Base Allocation and do not reflect other value provided to SMWD in the Water Purchase and Sale Agreement. For example, the figures below do not include the right to 15,000 AF of water in storage that will be provided to SMWD free of charge, with a fair maket value exceeding $12 million. Thus, the cost of water shown below does not reflect the overall cost or value of the transaction to SMWD.

Example No. 1

	Annual Cost	Total AF Project Water	SMWD Cost per AF	Cadiz Revenue Per AF
Cadiz Components				
Water Supply Payment			$150	$150
- Escalation - 4%				
Intentionally Created Surplus Credits			-$50	$350
Capital Recovery Charge	$11,000,000	50,000	$220	$0
- Total Capital Investment - $212 Million				
- Amortized over 30 Years				
- Interest Rate - 6%				
Total Cadiz Components			**$320**	**$500**
Operating Costs				
Project Operation and Maintenance Expenses	$3,750,000	50,000	$75	
- Fixed O&M Costs				
- Variable O&M Costs				
Administrative Costs	$900,000	50,000	$18	
Total Operating Cost Components			**$93**	
MWD Fees				
CRA/MWD/MWDOC Transportation Fees			$366	
Local Resource Program Credits			-$250	
Total MWD Fees			**$116**	
Treatment Costs Per AF (MWD)			**$298**	
SMWD Cost of Water (Untreated)			**$529**	
SMWD Cost of Water (Treated)			**$827**	

EXHIBIT C
EXAMPLES OF PRICE COMPONENTS FOR SMWD BASE ALLOCATION

Example No. 2

	Annual Cost	Total AF Project Water	SMWD Cost per AF	Cadiz Revenue Per AF
Cadiz Components				
Water Supply Payment			$150	$150
- Escalation - 4%				
Intentionally Created Surplus Credits			$0	$0
Capital Recovery Charge	$11,000,000	50,000	$220	$0
- Total Capital Investment - $212 Million				
- Amortized over 30 Years				
- Interest Rate - 6%				
Total Cadiz Components			**$370**	**$150**
Operating Costs				
Project Operation and Maintenance Expenses	$3,750,000	50,000	$75	
- Fixed O&M Costs				
- Variable O&M Costs				
Administrative Costs	$900,000	50,000	$18	
Total Operating Cost Components			**$93**	
MWD Fees				
CRA/MWD/MWDOC Transportation Fees			$366	
Local Resource Program Credits			$0	
Total MWD Fees			**$366**	
Treatment Costs Per AF (MWD)			**$298**	
SMWD Cost of Water (Untreated)			**$829**	
SMWD Cost of Water (Treated)			**$1,127**	

04/915/00

WATER SUPPLY CONTRACT

Cucamonga Valley Water District / Santa Margarita Water District

THIS WATER SUPPLY CONTRACT ("**Contract**") is entered into as of March 22, 2006 (the "**Effective Date**"), by and between CUCAMONGA VALLEY WATER DISTRICT, an independent public corporation organized and operating under the provisions of California Water code Section 30000 et seq. ("**CVWD**"), and SANTA MARGARITA WATER DISTRICT, a special district organized and operating under the provisions of California Water Code Section 34000 et seq. ("**SMWD**").

RECITALS

A. CVWD owns, operates and maintains a series of water supply, treatment and distribution resources in San Bernardino County, California.

B. CVWD possesses and holds adjudicated water rights ("**Groundwater**") from the Chino Groundwater Basin (the "**Chino Basin**"), which is governed by a management oversight body ("**Watermaster**") under and pursuant to the Chino Basin Judgment (*Chino Basin Municipal Water District v. City of Chino, et al.*, San Bernardino Superior Court No. 164327) and promulgating agreements, procedures, programs, and rules and regulations adopted by Watermaster and approved by the Court pursuant to the Judgment. CVWD's adjudicated water rights in the Chino Basin ensure a sufficient quantity of safe yield allocation to meet the requirements of this Contract.

C. The parties to the Chino Basin Judgment entered into a Peace Agreement on June 29, 2000 for the purpose of adopting the goals and plans of the Optimum Basin Management Plant ("**OBMP**"), which had been developed by Watermaster for the ongoing administration and management of the Chino Basin; and Watermaster subsequently approved and adopted the Peace Agreement and OBMP.

D. In addition to its Groundwater, CVWD obtains imported contract water ("**Imported Water**") supplied by the Metropolitan Water District of Southern California ("**Metropolitan**"), a regional water wholesaler, through the Inland Empire Utilities Agency ("**IEUA**"), one of Metropolitan's member agencies.

E. CVWD owns, operates, maintains and/or has access to adequate capital facilities to produce, treat and deliver the water supplies necessary to fulfill all of the current demands within its service area. Furthermore, the water resources held, controlled and managed by CVWD are sufficient to generate an excess supply that is available for export, exchange, sale or use outside of CVWD's service area.

F. SMWD provides domestic water services for the benefit of approximately 62,674 acres located in southeastern Orange County, California.

G. SMWD is currently evaluating the projected water demands for a planned community project (the "**Ranch Plan**" proposed by Rancho Mission Viejo, LLC ("**RVM**") within SMWD's service area. The Ranch Plan project would result in the development, over approximately 30 years, of up to 14,000 dwelling units, 130 acres of urban activity center uses, 258 acres of business park uses, 39 acres of neighborhood retail uses, up to four golf courses, a proposed 1,079-acre regional park, and open space areas totaling approximately 13,161 acres.

H. In order to ensure the provision of an adequate water supply for the Ranch Plan, and to mitigate against any future challenges concerning the ability of SMWD to provide a sufficient water supply to meet the needs for the Ranch Plan and other users, SMWD is desirous of securing additional water rights to supplement those water resources that otherwise are (or may hereafter become) available to SMWD.

I. In furtherance of its water supply planning for the Ranch Plan, SMWD is desirous of acquiring certain rights to water from CVWD that will supplement and/or augment SMWD's Tier I and Tier II water deliveries from Metropolitan (as determined from time to time). Specifically, and for the exclusive benefit of the Ranch Plan, SMWD desires the right to purchase up to 4,250 acre-feet per year of firm water supply from CVWD for a period of not less than twenty-five (25) years.

J. Subject to the terms and conditions hereof, CVWD is willing and able to reserve for SMWD's account (with a first priority option to purchase) the water supplies desired by SMWD for the benefit of the Ranch Plan.

NOW, THEREFORE, in consideration of the foregoing recitals and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. Purpose of Contract; Limitations. As set forth in Recitals H and I, above, SMWD is desirous of augmenting those water resources available (presently and prospectively) to serve the Ranch Plan. Although SMWD currently anticipates that its local and imported water resources/rights will be sufficient to accommodate full development of the Ranch Plan, SMWD wishes to expand its array of available water supplies to (i) further ensure that approval and development of the Ranch Plan will not jeopardize or otherwise compromise SMWD's ability to serve all domestic water users within SMWD's service area and (ii) eliminate or otherwise mitigate any further challenges (whether judicial or otherwise) concerning the ability of SMWD to provide a sufficient water supply to meet the needs of the Ranch Plan and other users. SMWD desires to reserve a finite amount of water (see Section 3, below) and to call upon said water (see Section 4, below) if and when SMWD's local water rights and Tier I and Tier II supplies from Metropolitan appear, in any given year, to be insufficient to

accommodate both the Ranch Plan and SMWD's other customers. During any such period of insufficiency, SMWD shall exercise its rights hereunder and call upon CVWD to deliver that amount of water (up to 4,250 acre-feet per annum) necessary to eliminate any shortfall in SMWD's aggregate water supplies that are available to serve the Ranch Plan.

2. Term of the Contract.

a. Initial Term. The initial term of this contract ("**Initial Term**") shall commence upon the Effective Date and shall (unless otherwise earlier terminated in accordance with the provisions of Section 2.c., below) end on the twenty-fifth (25th) anniversary of the Effective Date.

b. Extension of the Contract. At the end of the Initial Term, unless earlier terminated in accordance with the provisions of Section 2.c., below, SMWD shall have the right to extend the term of this Contract for an additional period of twenty-five (25) years (the "**Extension Period**") SUBJECT TO the following terms and conditions: SMWD shall provide written notice to CVWD of its intent to extend the term of the Contract not less than ninety (90) days prior to the expiration of the Initial Term. Following CVWD's receipt of the notice of intent to extend, and prior to the expiration of the Initial Term, the parties shall meet in good faith to negotiate and agree upon the additional/modified terms and conditions (if any) that will govern the parties' relationship hereunder during the Extension Period. In the event that the parties are unable to negotiate and agree upon the additional/modified terms and conditions that will govern the parties during the Extension Period, this Contract shall automatically terminate on the expiration of the Initial Term.

c. Termination of the Contract. Notwithstanding any provision herein to the contrary, the term of this Contract shall expire upon the earlier to occur of the following events:

(1) Upon SMWD's delivery to CVWD of (a) written notice advising that SMWD is terminating the Contract effective as of the date specified in the notice and (b) a document executed by RMV signifying RMV's consent to the proposed termination;

(2) Upon mutual agreement of the parties (SUBJECT TO the prior written consent of RMV); or

(3) Upon breach of this Contract by either party, and the decision of the non-breaching party to terminate this Contract following expiration of any applicable cure period(s).

(i) In the event of a breach by SMWD, CVWD shall notify RMV concerning the alleged breach and shall provide RMV with an opportunity to cure said breach in accordance with the provisions of this Contract.

3. Reservation of Water. Commencing on the Effective Date, and during the Initial Term and any renewal or extension thereof, CVWD shall reserve for SMWD's account, with a first priority option to purchase pursuant to Section 4, below, a firm supply of four thousand two hundred fifty (4,250) acre-feet of Groundwater on an annual basis (the "**Reserved Water Supply**").

a. Substitution of Reserved Water Supply. During the Initial Term of this Contract (including any renewal or extension hereof), CVWD shall have the right to substitute or combine new or additional lawful sources of water to replace (for its own account) the Reserved Water Supply held and maintained for the benefit of SMWD; provided, however, that any such substitutions shall not (i) compromise, jeopardize, impair or adversely affect SMWD's rights and entitlements under this Contract or (ii) increase or enlarge SMWD's financial obligations or exposure with respect to achieving SMWD's purposes set forth in Section 1, above.

4. First Priority Option. CVWD hereby grants to SMWD a first priority option ("Water Option") to purchase all (or any portion of) the Reserved Water Supply set aside by CVWD during each year of the Contract.

a. Preservation of Priority Rights. CVWD covenants and agrees that during the Initial Term of this Contract (including any renewal or extension hereof), CVWD will not enter into any transaction(s), entertain any discussion(s), or execute any agreement(s) that will (or may) compromise, jeopardize or negatively affect SMWD's annual priority rights to the Reserved Water Supply. CVWD further agrees to execute, or otherwise arrange for the execution of, any and all documents requested by SMWD that demonstrate (i) SMWD's annual priority rights with respect to the Reserved Water Supply and (ii) the subordination of any and all third-party agreements, documents, negotiations and/or understandings to SMWD's priority rights vis-à-vis the Reserved Water Supply. CVWD shall immediately notify SMWD concerning the existence or occurrence of any agreements, documents, negotiations and/or discussions that may impact, compromise or otherwise affect SMWD's annual priority rights to the Reserved Water Supply. Furthermore, CVWD shall defend, at its sole cost and expense, the annual priority rights afforded to SMWD hereunder and shall take all steps necessary to ensure that the annual priority rights (and the underlying Reserved Water Supply) are preserved, protected and maintained for the benefit of SMWD.

b. Exercise of Water Option. During the Initial Term of this Contract (including any renewal or extension hereof), SMWD shall have the annual recurring right to exercise the Water Option by complying with the following procedures: On or before March 15 of each calendar year, SMWD shall deliver written notice to CVWD (the "**Call**") declaring SMWD's intention to exercise its priority option rights during the immediate calendar year. The Call shall specify the amount of the Reserved Water Supply that SMWD will purchase from CVWD pursuant to the provisions of Section 6, below. Furthermore, the Call shall identify a definitive delivery schedule for the water supplies thus requested. In no event, however, shall the

water delivery schedule identify a water delivery date (whether for all or part of the Reserved Water supply) that is less than thirty (30) days from the date of the Call.

c. Limitations on Call. Consistent with the provisions of Section 1, above, SMWD shall be entitled to submit a Call and receive the requested water from CVWD only if SMWD's available Tier I and Tier II water supplies/deliveries are insufficient to accommodate the water demands of the Ranch Plan.

5. Delivery of Requested Water; Exchange Program and Individual Party Responsibilities. Upon receipt of a Call from SMWD, CVWD shall deliver to SMWD the amount of Reserved Water Supply identified and requested in the Call.

a. Exchange Program. CVWD shall accomplish its water delivery obligations hereunder through the use of an exchange program (the "**Exchange**") whereby the amount of the Reserved Water Supply identified and requested in the Call shall be exchanged for Imported Water (the "**Exchange Water**"). The Exchange Water shall be made available to SMWD for collection and use at a point/location within Metropolitan's water delivery system (the "**Delivery Location**"). No actual Groundwater from within the Chino Basin shall be physically transferred to SMWD pursuant to this Contract; accordingly, the parties do not anticipate that any additional connections to or additional capacity within Metropolitan's system shall be required in order to accomplish CVWD's water delivery obligations hereunder.

b. CVWD's Responsibilities. CVWD shall make all arrangements and accomplish all tasks necessary for ensuring that a firm, reliable water supply is made available for SMWD at the Delivery Location upon the dates/times specified in the Call. Said obligations include, but are not limited to, coordinating and contracting with Metropolitan and IEUA concerning the Exchange Water, and ensuring that any necessary arrangements for backup exchange and/or source supplies or transportation capacity in Metropolitan's water delivery system are complete and readily available. Furthermore, CVWD shall be responsible for any and all costs, fees and expenses associated with the local production, treatment and delivery of any water utilized by CVWD for its own account to replace the Exchange Water delivered to SMWD (including, but not limited to, the design, construction, operation and maintenance of new capital facilities necessary for making the replacement water available).

(1) Losses. CVWD shall assume all losses (whether arising from storage, delivery or otherwise) with respect to any and all water to be supplied and/or exchanged hereunder, with no recourse to SMWD for such losses.

c. SMWD's Responsibilities. Consistent with the provisions of Section 6, below, SMWD shall pay all costs, fees and expenses charged or otherwise assessed by Metropolitan to accomplish any Exchange contemplated and completed hereunder. Furthermore, SMWD, at its sole cost and expense, shall be

responsible for arranging with Metropolitan and/or the Municipal Water District of Orange County for the delivery of any and all Exchange Water from the Delivery Location to SMWD's service area.

6. Payments; Expense Obligations.

a. Annual Reservation Fee. Commencing on the Effective Date, and continuing thereafter on each successive anniversary of the Effective Date hereof during the term of this Contract, SMWD shall be obligated to pay to CVWD an annual water reservation fee ("**Annual Reservation Fee**") for the water supply reserved hereunder for the benefit of SMWD. The Annual Reservation Fee shall be equal to Three Hundred Eighteen Thousand Seven Hundred Fifty and No/100 Dollars ($318,750.00), calculated as follows:

Annual Reserved Water Supply (i.e., 4,250 acre-feet) –TIMES-
Seventy-Five and No/100 dollars ($75.00) per acre-foot.

Each Annual Reservation Fee due to CVWD hereunder shall be payable by SMWD within thirty (30) days following SMWD's receipt of written invoice from CVWD requesting payment.

(1) Annual Fee Adjustment. Beginning on the first anniversary of the Effective Date, and continuing thereafter on each successive anniversary of this Contract during the term hereof, the Annual Reservation Fee shall be increased by a factor equal to three percent (3%).

b. Exchange Fees. SMWD shall reimburse CVWD for all reasonable fees, costs and expenses ("**Exchange Fees**") assessed or otherwise charged by Metropolitan and/or IEUA as a result of each Exchange contemplated and completed pursuant to the terms of this Contract. CVWD shall invoice SMWD on a monthly basis for any Exchange Fees related to Exchange Water delivered during the previous month. Each Exchange Fee invoice shall be payable by SMWD within thirty (30) days following SMWD's receipt of the relevant invoice.

c. Early Termination Fee. Upon SMWD's early termination of this Contract pursuant to Section 2.c.(1), above, SMWD shall pay to CVWD a termination fee ("**Early Termination Fee**") equal to three (3) years of the then-current Annual Reservation Fee. Notwithstanding the foregoing, in the event that SMWD elects to voluntarily terminate this contract at any time during the final two (2) years of the Initial Term (including any renewal or extension thereof), the Early Termination Fee shall be equal to the remaining number of years in the Contract term (as modified)-TIMES- the then current Annual Reservation Fee.

7. Remarketing of Unclaimed Water. In any year when SMWD does not submit a Call for delivery of all or any portion of the Reserved Water Supply (as more specifically defined in Section 4.b., above), CVWD, in its sole discretion,

shall have the right to sell, transfer, remarket or produce for its own account, any portion of the Reserved Water Supply not claimed or otherwise requested by SMWD in the Call. CVWD shall be entitled to retain any and all proceeds derived from the sale, transfer, remarketing or production of this excess water supply not specifically claimed or requested by SMWD.

8. Supplemental Obligations of CVWD.

a. Cooperation and Assistance. At all times during the Initial Term (including any extension or renewal thereof), CVWD shall cooperate with and assist SMWD in implementing the water supply purchase and exchange transaction that is the subject of this Contract. In thus assisting SMWD, CVWD shall deliver or otherwise make available to SMWD, free of charge, all documents, plans, maps, studies, reports, records, permits, licenses, contracts and other information that (i) pertain to the Reserved Water Supply that is available for exchange and/or transfer pursuant to the terms of this Contract and (ii) demonstrates CVWD's ability to perform its obligations under this Contract. Furthermore, CVWD shall provide SMWD and its representatives with prompt and reasonable access to key employees, consultants, contractors and other individuals who are in possession of information concerning CVWD's operations, the Reserved Water Supply, and CVWD's ability to perform under this Contract.

b. Exclusive Dealing; Defense of Water Rights. During the Initial Term (including any extension or renewal thereof), CVWD will not discuss, negotiate or enter into any agreement with any other water district, corporation, government entity or other person concerning the ownership, operation, rights or use of the Reserved Water Supply that would in any way interfere with, impede, prejudice or compromise SMWD's rights with respect to (or otherwise arising under) the Reserved Water Supply and/or this Contract. Furthermore, CVWD shall, at its sole cost and expense, undertake all actions necessary to (i) defend, preserve and protect the Reserved Water Supply from physical, legal and/or other challenge and (ii) ensure the availability of the Reserved Water Supply for exchange and/or transfer to SMWD pursuant to the terms of this Contract. CVWD's shall also cooperate with and assist SMWD in the defense of any and all challenges concerning the viability and/or enforceability of this Contract (excluding challenges regarding the sufficiency of the Contract and the Reserved Water Supply to satisfy the evidentiary requirements of SB 221 (Kuehl) and/or SB 610 (Costa)). In performing its obligations hereunder, CVWD shall make all of its personnel and information resources reasonably available to SMWD (including testimonial support before all boards, commissions, courts and other venues).

c. Supplemental Documentation. Upon the request of SMWD, CVWD shall prepare, execute and deliver (or, as appropriate shall arrange for the preparation, execution and delivery) of such additional documentation as SMWD may deem necessary, important or essential for purposes of protecting its rights under this Contract and preserving its entitlement to the Reserved Water Supply.

9. Representations and Warranties

a. CVWD. In addition to any express agreements of CVWD contained herein, and in order to induce SMWD to enter into this Contract and to perform its obligations hereunder, the following constitute representations, warranties and covenants of CVWD that are true and correct as of the Effective Date and shall be true and correct throughout the Initial Term (and any renewal or extension thereof):

(1) CVWD is duly formed, validly existing and in good standing under the laws of the State of California and has full power and authority to conduct its business as presently conducted and to enter into and carry out the transactions contemplated herein and in the Contract.

(2) The individuals executing this Contract on behalf of CVWD have the legal power, right and authority to enter into this Contract and the instruments referenced herein and to bind CVWD to the terms and conditions herein.

(3) All requisite action (corporate and otherwise) has been taken by CVWD in connection with the entering into of this Contract and the consummation of the transactions contemplated hereby. CVWD has obtained all necessary third-party and government consents (including all certificates, permits and approvals) required in connection with executing this Contract and making available the Reserved Water Supply pursuant to the express terms hereof.

(4) The execution, delivery and performance of this Contract: (i) will not violate any provision of law; (ii) will not conflict with or result in any breach of any of the terms, conditions or provisions of, or constitute (with or without notice or lapse of time, or both) a default under or a violation of, (A) CVWD's charger or other governing documents, (B) any indenture, loan or credit agreement, note agreement, deed of trust, mortgage, security agreement or other agreement, lease or other instrument, commitment or arrangement to which CVWD is a party or by which any of its properties, assets or rights are bound or affected, (C) any decree, judgment, order, statute, rule or regulation applicable to CVWD, including, but not limited to, governmental pronouncements and requirements dealing with or regulating the quality of water delivered and the location of any facilities or other assets of CVWD; and (iii) will not result in the imposition of any lien or other encumbrance on any property, asset or right held by CVWD or any environmental laws, rules or regulations. CVWD is not in violation of, or (with or without notice or lapse of time or both) in default under, any term or provision of any indenture, loan or credit agreement, note agreement, deed of rust, or arrangement to which CVWD is not a party or by which any of the properties, assets or rights are bound or affected that would have a material adverse effect upon the transaction contemplated in this Contract.

(5) CVWD is the owner of and has good and marketable title to the Reserved Water Supply free and clear of all debts, liens, claims,

mortgages, encumbrances, and any other contractual or legal restrictions. No mortgage, trust deed, financing statement or other instrument similar in effect filed or permitted to be filed by CVWD covering the Reserved Water Supply with respect thereto shall be on file in any recording office except as such may be filed in favor of SMWD or its assignees in accordance with this Contract.

(6) CVWD has not sold, transferred, assigned, licensed or subjected to any lien or other encumbrance, the Reserved Water Supply or any interest therein.

(7) No litigation, including any arbitration, audit, investigation or other proceeding of or before any court, arbitrator or governmental or regulatory authority, is pending (or, to the best knowledge of CVWD, is threatened), involving the Reserved Water Supply, and CVWD is not aware of any likely basis for any such litigation, arbitration, audit, investigation or proceeding. With the exception of the Chino Basin Judgment, CVWD is not a party to or subject to the provision of any judgment, order, writ, injunction, decree or award of any court, arbitrator or governmental or regulatory official, body or authority relative to the Reserved Water Supply.

(8) No statement by CVWD contained in this Contract and no written statement furnished by CVWD or any officer, employee, director, counsel or other agent of CVWD to SMWD or any officer, director, employee, counsel or other agent of SMWD pursuant to or in connection with this Contract contains or will contain any untrue statement of a material fact or omits or will omit to state a material fact necessary in order to make the statements therein contained not misleading. There is no fact that adversely affects, or in the future might reasonably be expected to adversely affect the condition (financial or otherwise), operations (present or prospective), business (present or prospective), properties, assets or liabilities of CVWD relating to the Reserved Water Supply in any material respect that is not set forth in this Contract.

(9) CVWD shall maintain adequate facilities, personnel and resources, including maintenance, service and support personnel, to meet its obligations under this Contract.

b. SMWD. In addition to any express agreements of SMWD contained herein, and in order to induce CVWD to enter into this Contract and to perform its obligations hereunder, the following constitute representations, warranties and covenants of SMWD that are true and correct as of the Effective Date and shall be true and correct throughout the Initial Term (and any renewal or extension thereof):

(1) SMWD is duly formed, validly existing and in good standing under the laws of the State of California and has full power and authority to conduct its business as presently conducted and to enter into and carry out the transactions contemplated herein and in the Contract.

(2) The individuals executing this Contract on behalf of SMWD have the legal power, right and authority to enter into this Contract and the instruments referenced herein and to bind SMWD to the terms and conditions herein.

(3) All requisite action (corporate and otherwise) has been taken by SMWD in connection with the entering into of this Contract and the consummation of the transactions contemplated hereby.

10. Default and Remedies. In the event that either party is in material default of this Contract, the non-defaulting party shall provide written notice to the defaulting party, identifying with reasonable specificity the nature of the claimed default. If the defaulting party has not cured the event(s) of material default which is (are) identified in the notice required by the previous sentence of this Section 10 within ten (10) business days of receipt of such written notice, then the non-defaulting party shall be entitled to any and all remedies which may be available to it at law or in equity. Furthermore, in the event of a material breach by CVWD wherein CVWD fails or otherwise refuses to deliver the Reserved Water Supply in accordance with the provisions hereof, SMWD shall be entitled to the remedy of specific performance against CVWD. Specifically CVWD shall be obligated to perform its obligations hereunder and to provide SMWD (from any and all sources, and irrespective of cost, provider or other terms) the Reserved Water Supply, for a period of not less than 25 years, in exchange for the consideration specified in Section 6, above.

11. Authorized Assignment by SMWD. If, in the exclusive judgment of SMWD, it shall become necessary for SMWD to assign this Contract to the Third Party Beneficiaries (as identified in Section 14(e), below) or a mutual water company (or other entity) designated by the Third Party Beneficiaries (collectively, an "Assignee") in order to accomplish the delivery of any Exchange Water or to otherwise obtain or preserve the benefits accruing to SMWD hereunder, SMWD shall have the unconditional right to assign this Contract (or any portion hereof) to an Assignee. Upon any such assignment, the Assignee shall assume all of the portion hereof) to an Assignee. Upon any such assignment, the Assignee shall assume all of the rights set forth in this Contract and shall be bound according to the terms and conditions hereof.

12. Division of Risk.

a. Indemnity. Each party ("**Indemnitor**") agrees to fully indemnify the other ("**Indemnitee**"), and to hold Indemnitee, its officers, directors, employees, agents, successors and assigns, completely free and harmless from and against any and all liabilities, claims, demands, litigation, or any other claims of whatever kind or nature resulting from pertaining to, or occasioned by (i) Indemnitor's breach of this Contract and (ii) the actual or alleged negligence or willful misconduct of the Indemnitor and/or its agents in performing or attempting to perform any of Indemnitor's obligations under this Contract. The parties' respective obligations hereunder shall survive the expiration or earlier termination of this Contract.

Furthermore, the parties shall provide each other with prompt notice of any such claim(s) as provided for in subpart (f) of this Section 12.

b. Third Party Claims. CVWD will indemnify, defend and hold SMWD harmless from and against any and all liabilities and losses in connection with any claim(s) brought by or on behalf of a third party, arising out of or in any way relating to the water to be reserved or supplied by CVWD to SMWD under this Contract. This duty shall include, but not be limited to, liability or losses because the water deviated from exportability or reliability specifications as set forth herein. CVWD's obligation hereunder shall survive the expiration or earlier termination of this Contract. CVWD shall provide SMWD with prompt notice of any third party claims as provided for in subpart (f) of this Section 12.

c. Condemnation by Third Party. CVWD shall oppose any attempt by a third party to condemn all or any part of the Reserved Water Supply. If the whole of the Reserved Water Supply or so much thereof as to render the balance unusable for Exchange pursuant to Section 5 shall be taken under power of eminent domain, or is sold, transferred or conveyed in lieu thereof, this Contract shall automatically terminate as of the date of such condemnation, or as of the date possession is taken by the condemning authority, at SMWD's option. In the event of total or partial condemnation, though the award shall be paid to CVWD, SMWD shall be entitled to claim and receive from CVWD, in SMWD's sole and absolute discretion, and CVWD hereby assigns to SMWD, from such award: (i) a sum attributable to the then fair market value of the volume of Reserved Water Supply condemned; or (b) a sum equal to the value of the volume of Reserved Water Supply identified and set aside under this Agreement as of the date of condemnation. The parties expect that the total award will fully compensate both parties for their respective losses, and they agree to cooperate in all ways practicable to maximize the total award. If, however, the total award shall not be adequate to compensate both parties fully for their respective losses, then CVWD shall bear the burden of the inadequacy of the award and the award shall be apportioned in a manner that fully compensates SMWD for SMWD's loss. CVWD shall provide SMWD with prompt notice of any third party condemnation attempt as provided for in subpart (f) of this Section 12.

d. Condemnation by CVWD. CVWD shall not use its powers of condemnation or eminent domain to take all or any part of the Reserved Water Supply from SMWD.

e. Force Majeure. CVWD's obligation to deliver water at the Delivery Location shall be temporarily suspended in the event of a disruption of delivery to the Delivery Location resulting from an unexpected event (e.g., earthquake or other natural disaster), other acts of God, or war. During such suspension, SMWD's payment obligations hereunder shall be discharged and waived. CVWD shall use reasonable best efforts to find a deliverable replacement supply and/or implement a cure to the disruption event. Hydrologic conditions (including drought) and/or unexpected events that disrupt CVWD's recharge and/or extraction facilities in the

Chino Basin are expressly excluded as force majeure events and shall not entitle CVWD to disrupt or otherwise suspend deliveries to the Delivery Location. CVWD shall provide SMWD with prompt notice of any force majeure event as provided for in subpart (f) of this Section 12.

f. Notice of Claims. The parties shall promptly notify each other within ten (10) days of becoming aware of: (i) any claims or suits brought against CVWD or SMWD for which they seek indemnification from the other party; (ii) any third-party claims; (iii) any condemnation attempt by a third-party; and (iv) any force majeure event. Any such notice shall conform to the requirements specified in Section 13.

13. Notices. All notices, requests and demands hereunder must be in writing to be effective. All notices required to be given hereunder or by operation of law in connection with the performance or enforcement hereof shall be deemed given upon delivery if delivered personally (which includes notices delivered by messenger, telecopy/facsimile or overnight courier) or, if delivered by mail, shall be deemed given after being deposited by certified mail in any duly authorized United States mail depository, postage prepaid. All such notices shall be addressed as follows or to such other address or addresses as the parties may from time to time specify in writing:

If to CVWD:
Cucamonga Valley Water District
10440 Ashford Street
Rancho Cucamonga, CA 91730-3057
Attn: Robert A. DeLoach, General Manager/CEO
Fax No.: (909) 476-8032

If to SMWD:
Santa Margarita Water District
26111 Antonio Parkway
Las Flores, CA 92688-1993
Attn: John J. Schatz/General Manager
Fax No.; (949) 459-6463

If to RMV:
Rancho Mission Viejo, LLC
P.O. Box 9
San Juan Capistrano, CA 92693
Attn: Vice President of Planning and Entitlement
Fax No.: (949) 248-1763

14. Miscellaneous.

a. Successors and Assigns. This Contract and the rights and obligations of the parties hereunder shall inure to the benefit of, and be binding upon, the parties' respective successors, permitted assigns and legal representatives.

b. Governing Law. This Contract shall be governed by and constructed under the laws of the State of California, as such laws apply to agreements among California residents made and to be performed entirely within the State of California, without giving effect to the choice of law or conflict of law provisions (whether of the State of California or any other jurisdiction) that would cause the application of the laws of any other jurisdiction other than the State of California.

c. Entire Agreement. This writing constitutes the entire agreement among the parties, and no modification of this Contract shall be valid unless executed in writing by the parties hereto. Further, none of the parties to this Contract shall be bound by any representations, warranties, promises, statements, or information unless expressly set forth herein.

d. Change of Control. This Contract shall survive and SMWD shall continue to have the right to call upon and purchase/receive the Reserved Water Supply (or any portion thereof), as set forth herein, upon any change in ownership or control of CVWD.

e. Third-Party Beneficiaries. SMWD and CVWD specifically acknowledge and agree that Rancho Mission Viejo, LLC, and its parent, subsidiary and affiliated entities (collectively, "RMV") are the direct, intended and sole third party creditor beneficiaries of this Contract and the rights and privileges afforded to SMWD hereunder ("Third Party Beneficiaries"). Absent the prior written consent and approval of RMV, any amendment, change or other modification to this Agreement shall be deemed void and unenforceable vis-à-vis the rights, privileges and entitlements accruing to RMV hereunder.

f. No Waiver. The failure of any party to enforce against the other a provision of this Contract shall not constitute a waiver of that party's right to enforce such a provision at a later time.

g. Captions. The captions of the various Sections in this Contract are for convenience and organization only, and are not intended to be any part of the body of this Contract, nor are they intended to be referred to in construing the provisions of this Contract.

h. Counterparts. This Contract may be executed in one or more counterparts, and all the counterparts shall constitute but one and the same agreement, notwithstanding that all parties hereto are not signatories to the same or original counterpart.

i. Attorneys' Fees. In the event of litigation involving this Contract, the prevailing party in any such action or proceeding shall be entitled to recover its costs and expenses incurred in such action from the other party including, without limitation, the cost of reasonable attorneys' fees.

j. Brokerage Fees. The parties expressly acknowledge that Optimal Water, Inc. has performed certain services in relation to the negotiation, execution and delivery of this Contract. However, Optimal Water, Inc. is not owed any compensation or remuneration from either SMWD or CVWD in connection with the services thus provided. Furthermore, CVWD warrants that it has not dealt with any other broker in connection with this transaction, and SMWD warrants that it has not dealt with any other broker in connection with this transaction. If any person or entity shall assert a claim to a finder's fee, brokerage commission or other compensation on account of alleged employment as a finder or broker or performance of services as a finder or broker in connection with this transaction, the party under whom the finder or broker is claiming shall indemnify and hold the other party harmless for, from and against any such claim and all costs, expenses and liabilities incurred in connection with such claim or any action proceeding brought on such claim, including, but not limited to, counsel and witness fees and court costs in defending against such claim. This indemnity shall survive the expiration or earlier termination of this Contract.

k. Public Announcement. All press releases and public announcements, if any, relating to this Contract and the transaction contemplated hereby shall be agreed to and prepared jointly by the parties.

l. Time. Time is of the essence with respect to this Agreement and the rights, obligation, conditions and entitlements set forth herein.

IN WITNESS WHEREOF, the parties have entered into this Contract as of the Effective Date hereof.

"CVWD"

CUCAMONGA VALLEY WATER DISTRICT

By _____

Its General Manager/CEO

"SMWD"

By _____

Its General Manager

C-1764

Agreement No. 04/1021/04

AGREEMENT FOR LEASE OF SUPPLEMENTAL WATER AND PROVISION OF SERVICE

THIS AGREEMENT FOR LEASE OF SUPPLEMENTAL WATER AND PROVISION OF SERVICE ("Agreement") is entered into as of April 23, 2012 (the "Effective Date"), by and between RMV SAN JUAN WATERSHED, LLC, a California limited liability company ("**SJ Watershed**"), DMB SAN JUAN INVESTMENT NORTH, L.L.C., a Delaware limited liability company ("**DMBSJIN**"), RMV MC INVESTMENT, LLC, a California limited liability company ("**MC Investment**"), RMV MIDDLE CHIQUITA, LLC, a California limited liability company ("**Middle Chiquita**"), RMV RANCH HOUSE, LLC, a California limited liability company ("**Ranch House**"), RMV COMMUNITY DEVELOPMENT, LLC, a California limited liability company ("**Community Development**"), RMV HEADQUARTERS, LLC, a California limited liability company ("**HQ**") (SJ Watershed, DMBSJIN, MC Investment, Middle Chiquita, Ranch House, Community Development and HQ are collectively referred to herein as the "**Landowners**"), RANCHO MISSION VIEJO MUTUAL WATER COMPANY, a California nonprofit mutual benefit corporation ("MWC") and SANTA MARGARITA WATER DISTRICT, a special district organized and operating under the provisions of California Water Code Section 34000 *et seq.* ("SMWD").

RECITALS

A. SMWD is responsible for providing domestic and non-domestic water services for the benefit of approximately 62,674 acres (the "SMWD Service Area") located in southeastern Orange County, California.

B. Rancho Mission Viejo, L.L.C., a Delaware limited liability company ("RMV") is the agent and manager for the Landowners, who own certain land in the San Juan Creek Watershed in southeastern Orange County, California (the "SJC Watershed") shown on Exhibit A attached hereto, which land is a portion of the historic Rancho Mission Viejo (the "Ranch") and which is located within the SMWD Service Area.

C. RMV is implementing a comprehensive open space preservation, management, and development plan for the Ranch. This plan, which was approved by the Orange County Board of Supervisors in November of 2004, is commonly referred to as the "Ranch Plan." As the land is developed pursuant to the Ranch Plan, water use on portions of the Ranch and subsequent Ranch Plan development areas will change from existing agricultural irrigation use to non-domestic municipal irrigation use. The first area of the Ranch Plan which will be developed is referred to as Planning Area 1 ("PA-1"). Subsequent planning areas to be developed within the SJC Watershed portion of the Ranch Plan include PA-2, PA-3, PA-4 and PA-5, although not necessarily in that order.

D. The Landowners have riparian water rights through their ownership of riparian land in the SJC Watershed. Based on these rights, the Landowners historically have diverted and used an average of (and sometimes more than) three thousand five hundred (3,500) acre-feet of water per year (the "Water"). The quantity of future diversions and usage depends upon the hydrology in the watershed. Since the Water is riparian, the Landowners can divert

and/or pump in excess of 3,500 acre-feet per year as long as the Water is reasonably and beneficially used on riparian lands within the SJC Watershed.

E. RMV, as agent for the Landowners, has formed the MWC so as to protect and maintain their right to use the Water following the subdivision of riparian lands in the SJC Watershed. The MWC holds the riparian water rights of the Landowners, and the Landowners as members of the MWC have an absolute right to take their proportionate share of the Water. Landowner members of the MWC have the right to take Water for their own use or to assign their allocation of Water for use on riparian lands within the SJC Watershed.

F. The Landowner members of the MWC have appointed RMV to manage their allocation of Water from the MWC, and RMV will act as their agent with the MWC and potential users of the Water. RMV will manage the infrastructure and operations of the MWC pursuant to a separate management agreement. The benefit of both arrangements is that RMV is the single source of contact in connection with the Water.

G. As they are developed, the Ranch Plan planning areas will contain common areas that will be owned by one or more homeowners associations ("HOAs"), and certain investment properties which will continue to be owned by Ranch-related entities. The parcels owned by the HOAs (the "HOA Parcels") and the investment properties ("the Investment Properties") will require water service from SMWD for non-domestic municipal use and it is expected that the Water can be used as supplemental water to offset in part the new water demand generated by the HOA Parcels and Investment Properties. It is mutually beneficial to SMWD, the Ranch and the HOAs for SMWD to lease a portion of the Water as supplemental water to provide such service. As a result, SMWD may defer the Chiquita Water Treatment Plant ("CWTRP") tertiary capacity until an expansion of the secondary capacity is required.

H. Landowners are willing to lease a portion of the Water to SMWD and SMWD is willing to commit to use the leased Water in providing non domestic municipal water service to the HOA Parcels and to the Investment Properties.

I. The anticipated delivery and use of the Water pursuant to this Agreement (i.e., in amounts within the range of historical patterns of water use) is consistent with the Ranch Plan in that riparian water rights will not be severed from those lands to remain as open space, and the habitat and other natural resource values associated with the open space lands will not be adversely affected.

NOW, THEREFORE, in consideration of the foregoing recitals and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. Lease of Water. Landowner members of the MWC agree to lease allocations of Water from the Landowner members of the MWC to SMWD for use as supplemental water to offset in part the new water demand generated by the HOA Parcels and Investment Properties. RMV initially seeks to deliver, and SMWD desires to receive, a minimum of four hundred (400) acre-feet of Water annually to meet the projected need for PA-1. The minimum quantity of Water to be delivered would be increased as development of other planning areas in the SJC

Watershed occurs. The minimum quantity to be delivered for each planning area will generally be as set forth in Exhibit B attached hereto. The actual minimum quantity of Water to be provided each year (the "Yearly Minimum Quantity") would be determined through the process identified in Section 7 below. For purposes of this Agreement, a "year" shall be considered as a fiscal year and shall be for that period of July 1 – June 30.

2. Delivery of Water. (a) The Water shall be delivered to SMWD at certain mutually agreed upon locations (the "RMV Service Locations") as follows: (i) in or along future Cow Camp Road between Antonio Parkway and Ortega Highway, which are near SMWD transmission facilities and RMV delivery facilities and at the SMWD hydraulic grade line for pressure zone B, as defined in the SMWD Plan of Works, pending for approval in 2011; or (ii) in other locations as the parties may mutually agree to, with appropriate adjustments in the price of the Water to account for any material differences in delivery costs (see Section 5(b) below). The RMV Service Locations along Cow Camp Road are shown on Exhibit C attached hereto. (b) Any capital improvements necessary for delivery and metering of the Water to the RMV Service Locations described above shall be at the MWC's expense. All costs, engineering and capital improvements necessary for SMWD to receive, transfer and deliver the Water from RMV Service Locations to the HOA Parcels and Investment Properties shall be the responsibility of SMWD. (c) The Water will be delivered to SMWD "as is" and RMV will not warrant or guarantee the quality of the Water except that SMWD will not be obligated to take delivery of any Water that has an iron or manganese content of more than 0.2 ppm. The parties commit to work together in good faith and to take such actions as may be reasonably necessary to achieve the foregoing threshold for iron and manganese content. (d) The parties commit to work together in good faith and to take such actions that may be reasonably necessary to meet any future regulatory requirements associated with delivering the Water to the RMV Service Locations. To the extent that the costs of delivering the Water are increased due to such regulatory requirements, the parties shall meet and attempt to agree on a mutually satisfactory cost adjustment. If the parties are unable to agree, SMWD shall have the right to terminate its use of the Water and its obligations hereunder, and RMV shall have the right to terminate its obligations hereunder. (e) The timing of delivery of the Water shall be at the discretion of SMWD as identified in Section 7 below, up to the maximum quantity to be delivered pursuant to this Agreement, so long as SMWD fulfills its obligations under this Agreement. SMWD shall accept the Water in full or partial compliance for non-domestic water requirements for applicable portions of the Ranch Plan as necessary for issuing will-serve letters for recycled water; provided all other applicable requirements for the issuance of will-serve letters are satisfied.

3. Provision of Water Service. SMWD shall use the Water as supplemental water to meet the non-domestic municipal water supply needs for the HOA Parcels and Investment Properties within PA-1 and subsequent planning areas. SMWD shall provide the Water to the HOA Parcels and Investment Properties at such time as service is requested by the owners of said parcels subject to owners meeting all rules and regulations of SMWD for provision of service. The owners of said parcels shall pay for the services based on metered use of water on the parcels at the same rates charged similar users throughout SMWD's service area.

4. Term. This Agreement shall commence on the Effective Date and shall be for a term of 25-years plus two consecutive ten-year extensions (the "Term"); provided, however, that the extensions shall only be effective if they are agreed to in writing by the parties.

5. Payments. (a) SMWD will utilize the Water as a source of nondomestic water for irrigation purposes on the HOA Parcels and Investment Properties during such periods that recycled water is not available due to the construction schedule for facilities or for other reasons. . The amount to be paid for Water to be delivered during an upcoming year shall be $701.75 per acre foot subject to an annual adjustment on July 1st commencing July 1, 2013 based on Consumer Price Index changes (CPI Adjustment) as reported in the US Department of Labor-Bureau of Labor Statistics Los Angeles-Riverside-Orange County Region-All Urban Consumers, not seasonally adjusted report. Said CPI adjustment is capped to a maximum of six percent in any annual period. [Note: If the Water is delivered to SMWD at RMV Service locations other than those in or along future Cow Camp Road (see Section 2(a) above), the applicable Water rate may be adjusted as mutually agreed upon to account for material differences in delivery costs (for additional energy, operations, etc.) to said locations and/or water pressure.] (b) Prior to July 1 of each year, SMWD shall determine its demand for Water and provide written notice to RMV of its desire for delivery of that amount of Water (the "SMWD Yearly Notice"). It is expected that the quantity of Water specified in the SMWD Yearly Notice will be equal to the Yearly Minimum Quantity specified for that year but, even if less than that quantity, the payment due shall be based on the Yearly Minimum Quantity because of the "Take or Pay" provision set forth in Section 7 below. Any request by SMWD for Water in excess of the Yearly Minimum Quantity shall be subject to Section 8 below. (c) Subject to the Take or Pay provision, payment for Water will be calculated based on the amount of Water to be purchased at the annual rate. (d) RMV shall divide each yearly payment into equal quarterly installments which shall be due and payable on the last day of September, December, March and June of each year.

6. Alternative Payments; Credits. (a) Alternative methods of payment could include a lump sum payment or payment amounts that are offset with infrastructure improvements provided by SMWD. The parties shall agree on any alternative method of payment and shall approve any proposed offsets or credits for infrastructure so as not to impact Community Facilities District ("CFD") capacities or revenues. (b) To the extent that SMWD elects not to seek reimbursement from RMV or any related or affiliated entity for payments made by SMWD to the Cucamonga Valley Water District ("CVWD") pursuant to (i) Section 2 of the "Agreement" entered into by DMB San Juan Investment North, LLC, and SMWD in March 2003 concerning the provision of a supplemental water supply for the Ranch Plan development, and (ii) parallel provisions of the associated "Water Supply Contract" subsequently entered into by SMWD and the CVWD (that Agreement and Water Supply Contract are collectively referred to hereinafter as the "Cucamonga Water Agreement"), all such payments made by SMWD and not reimbursed by RMV may be used by SMWD as a credit against its payment obligations under Section 5 above. Such credits may be accumulated by SMWD during such period of time as the Cucamonga Water Agreement continues in effect and payments are made by SMWD thereunder. (c) SMWD would also be entitled to a one-time credit against its payment obligations under Section 5 above in an amount equal to the value of the easement that exists for the Chiquita Well for services to the Chiquita Water Treatment Plant (a value to be set mutually by the parties) upon termination of that easement..

7. Minimum Quantity.

(a) As noted in Exhibit B, RMV expects to lease and deliver up to 2,500 acre-feet per year during the Term.

(b) The parties agree that the quantity shown in Exhibit B for each planning area represents the estimated amount required for build out of that planning area and that the amount shown will likely be provided in increments corresponding to the various development phases for the planning area over the development period, until the total amount shown in Exhibit B for that planning area is reached. Parties agree to review the estimated amount for build-out periodically and revise the quantities in Exhibit B to account for actual water requirements of the developments. For its part, RMV commits that the capacities of the respective portions of its delivery system will be adequate to provide the flows required to supply the specified amounts of Water.

(c) The actual Yearly Minimum Quantity which RMV is obligated to deliver to SMWD in a given SMWD fiscal year (July 1 to June 30), and which SMWD is obligated to purchase, will be agreed on by RMV and SMWD through their execution of the form attached hereto as Exhibit D ("the Yearly Notice) by May 30th of the previous fiscal year; provided, however, that the Yearly Minimum Quantity identified in a Yearly Notice for each active planning area in the year of its build-out and in each succeeding year shall be no less than the water supply quantity shown in Exhibit B for that planning area or proportionate areas thereof (unless otherwise agreed to in writing by RMV). The Yearly Notice will identify the date of commencement of development for a planning area (the "Commencement Date"), and specify the Yearly Minimum Quantities of Water for each active planning area. The Yearly Minimum Quantity for each active planning area shall be stated in a Yearly Notice for each year going forward, beginning with the year that water service for the planning area commences and continue through the Term of this Agreement. The Yearly Minimum Quantity is a reserved amount of water for SMWD. At the beginning of each fiscal year, SMWD shall identify the desired time for delivery of water by RMV to the locations identified in Section 2 above. Irrespective of SMWD accepting all, a portion, or none of the Water, SMWD shall pay for the specified Yearly Minimum Quantity each year as a "Take-or-Pay" obligation in return for RMV's reservation of that amount of water. Any amount of the Yearly Minimum Quantity not taken by SMWD shall be forfeited and shall not roll over to the next year. In the event that a Yearly Notice has not been executed by SMWD for a planning area, the Yearly Minimum Quantity for that planning area in the year of its build-out and in each succeeding year shall be the water supply amount of that planning area set forth in Exhibit B.

(d) The Yearly Minimum Quantity for any given planning area and/or development phase within a planning area may be adjusted by RMV to reflect changes in RMV's specific development plans and phasing for that planning area or phase, so long as (i) RMV provides notice to SMWD of the adjustment by May 30th of the previous fiscal year that the adjusted Yearly Minimum Quantity is to be effective, and (ii) the cumulative quantity for the combined planning areas is not exceeded.

(e) Although the minimum quantities of Water to be delivered to SMWD under this Agreement are considered reliable given RMV's historical usage, RMV shall have no liability if a force majeure event (i.e., unforeseeable causes beyond the reasonable control of and without the fault or negligence of RMV including, but not limited to, riot, earthquake or other acts of God, etc.), or seasonality effects on delivery of water (such as an extended drought that reduces the available riparian water resource below levels needed to both maintain riparian habitat values and provide all of the water required to be delivered pursuant to this Agreement), prevents the Yearly Minimum Quantity from being delivered in any given year

and, in that event, SMWD shall only be obligated to take the amount of the Yearly Minimum Quantity available for delivery in that year as determined by RMV.

(f) As noted above, the MWC holds the riparian water rights of the Landowners and the Landowners have appointed RMV as their agent regarding their allocations of Water from the MWC. The amounts of Water to be delivered to SMWD under this Agreement will be from these assigned allocations of Water and SMWD shall have the first priority to such water, subject to the provisions of subsection (e) above.

8. Maximum Quantity. In any given year, if stated in the SMWD Yearly Notice, SMWD may request an additional amount of Water above the Yearly Minimum Quantity identified in Section 7 above and RMV shall thereafter determine, in its sole discretion, whether such amount (or other amount) is available for lease. For each acre-foot of Water delivered above the Yearly Minimum Quantity, SMWD shall pay a Rate that is mutually agreed upon.

9. Legal Title to Water. SMWD acknowledges the Landowners' legal riparian right to the Water, and that SMWD has no right or claim to the Water, or any portion thereof, except as would be expressly granted pursuant to this Agreement.

10. MWC Issues. The parties acknowledge (a) that the MWC will not provide any water service to new water users (including the HOAs) created by development within the SMWD service area, (b) that water rights associated with residential and commercial parcels created within the SJC Watershed and not owned by members of the MWC will be severed from those parcels and retained by the MWC on behalf of the Landowners, (c) that the owners of these parcels from which riparian water rights have been severed will not be members of the MWC, and (d) that the MWC will not provide water to any parcel that has a will-serve letter from SMWD.

11. Remedies.

(a) Available Remedies in the Event of a Breach. Except as otherwise expressly provided in this Agreement, in the event of a material breach under this Agreement, and following exhaustion of the process set forth in Section 11(b) below, the non-breaching party shall be entitled to any and all remedies available at law or in equity, including, but not limited to (i) enforcing, by specific performance, the obligations hereunder of the breaching party; (ii) securing an appropriate injunction or other equitable relief to ensure compliance with the terms of this Agreement; (iii) seeking damages; or (iv) exercising any other rights or remedies specifically set forth herein. No party shall be required or compelled to take any action, or refrain from taking any action, other than those actions required by this Agreement.

(b) Process in the Event of Breach.

(i) Notice of Breach. Prior to commencing any lawsuit asserting a material breach of one or more obligations under this Agreement, a party shall notify the other party of the nature of the alleged breach(es) in writing and provide a written explanation of the basis for its determination.

(ii) Response to Notice of Breach. Within fifteen (15) business days of its receipt of the notice set forth in Section 11(b)(i) above, the party receiving said notice shall provide a written response to the notifying party indicating its concurrence with, or

rejection of, the determination of breach, or indicating that the alleged breach has no bearing on that party's obligations under this Agreement, as the case may be. The party receiving the notice shall also state any counterclaims that it may have against the other party.

(iii) Meet and Confer Obligation. Should the parties disagree with respect to the determination of breach of this Agreement, or the remedy necessary to cure any alleged breach, as soon as is reasonably practicable, but in no event later than ten (10) days after the receipt by the party claiming the breach of all responses by the alleged breaching party, or other mutually agreeable date, the parties shall meet and confer in good faith in an attempt to resolve any differences. Unless such delay would prejudice or otherwise harm the party claiming breach, the party shall not file a lawsuit until at least fifteen (15) days after the meet and confer process pursuant to this Section 11(b)(iii) commences.

12. Assignment. SMWD shall not assign its leasehold interest in the Water, nor any of its obligations under this Agreement, to any other party without the express written consent of RMV. RMV shall not assign its obligations under this Agreement, except to a related or affiliated entity, without SMWD's express written consent.

13. Regulatory and Other Fees and Costs. SMWD shall be responsible for obtaining and administering all regulatory and environmental approvals related to the lease and use of the Water pursuant to this Agreement, and shall assume all responsibilities for litigation activities related thereto. RMV shall assume responsibility for litigation directly challenging the formation of the MWC.

14. Pre-Existing Agreements. This Agreement shall have no effect on those letter agreements and letters of understanding previously entered into between RMV and SMWD (the "Pre-Existing Agreements") whereby certain quantities of water are provided to and/or exchanged between those parties for various uses including but not limited to Ranch agricultural operations. The Pre-Existing Agreements shall continue in effect until terminated in accordance with their respective terms.

15. Notices. All notices, requests and demands hereunder must be in writing to be effective. All notices required to be given hereunder or by operation of law in connection with the performance or enforcement hereof shall be deemed given upon delivery if delivered personally (which includes notices delivered by messenger, telecopy/facsimile [with hard copy to immediately follow] or overnight courier) or, if delivered by mail, shall be deemed given after being deposited by certified mail in any duly authorized United States mail depository, postage prepaid. All such notices shall be addressed as follows, or to such other address or addresses as the parties may from time to time specify in writing:

If to SMWD:	Santa Margarita Water District 26111 Antonio Parkway Rancho Santa Margarita, CA 92688-1993 Attn: General Manager Fax No.: (949) 459-6463
If to Landowners, RMV or MWC:	Rancho Mission Viejo, LLC 28811 Ortega Highway P.O. Box 9

San Juan Capistrano, CA 92693
Attn: Senior Vice President, Planning and Entitlement
Fax No.: (949) 248-1763

16. Miscellaneous.

(a) Successors and Assigns. This Agreement and the rights and obligations of the parties hereunder shall inure to the benefit of, and be binding upon, the parties' respective successors, permitted assigns and legal representatives.

(b) Governing Law. This Agreement shall be governed by and construed under the laws of the State of California, as such laws apply to agreements among California residents made and to be performed entirely within the State of California, without giving effect to the choice of law or conflict of law provisions (whether of the State of California or any other jurisdiction) that would cause the application of the laws of any other jurisdiction other than the State of California.

(c) No Third-Party Rights. This Agreement is entered into for the sole benefit and protection of RMV, the MWC, the Landowners and SMWD. Nothing in this Agreement shall be deemed or otherwise construed as granting any rights, benefits or interests to any other individual, entity or body.

(d) Authority and Requisite Action. The individuals executing this Agreement (the "Signatories") covenant that they have the legal power, right and authority to enter into this Agreement and the instruments referenced herein and to bind their respective principals/entities to the terms and conditions set forth herein. Furthermore, the Signatories covenant that all requisite action has been taken by their respective principals/entities in connection with the entering into of this Agreement and the instruments referenced herein, and the consummation of the transactions contemplated hereby.

(e) Entire Agreement. This writing constitutes the entire agreement among the parties, and no modification of this Agreement shall be valid unless executed in writing by the parties hereto. Further, none of the parties to this Agreement shall be bound by any representations, warranties, promises, statements, or information unless expressly set forth herein.

(f) No Waiver. The failure of any party to enforce against the other a provision of this Agreement shall not constitute a waiver of that party's right to enforce such a provision at a later time.

(g) Captions. The captions of the various Sections in this Agreement are for convenience and organization only, and are not intended to be any part of the body of this Agreement, nor are they intended to be referred to in construing the provisions of this Contract.

(h) Counterparts. This Agreement may be executed in one or more counterparts, and all the counterparts shall constitute but one and the same agreement, notwithstanding that all parties hereto are not signatories to the same or original counterpart.

(i) Attorneys' Fees. Except as otherwise provided herein, in the event of litigation involving this Agreement, the prevailing party in any such action or proceeding shall

be entitled to recover its costs and expenses incurred in such action from the other party including, without limitation, the cost of reasonable attorneys' fees.

(j) Time. Time is of the essence with respect to this Agreement and the rights, obligations, conditions and entitlements set forth herein.

(k) Exhibits. All exhibits attached to this Agreement are hereby incorporated herein.

[remainder of page intentionally blank]

IN WITNESS WHEREOF, the parties have entered into this Agreement as of the Effective Date hereof.

"LANDOWNERS"

DMB SAN JUAN INVESTMENT NORTH, L.L.C., a Delaware limited liability company

By: Rancho Mission Viejo, L.L.C., a Delaware limited liability company, as authorized agent and manager

By: _____
Anthony R. Moiso
Chief Executive Officer

By: _____
Donald L. Vodra
Chief Operating Officer

RMV MIDDLE CHIQUITA, LLC, a California limited liability company

By: Rancho Mission Viejo, L.L.C., a Delaware limited liability company, as authorized agent and manager

By: _____
Anthony R. Moiso
Chief Executive Officer

By: _____
Donald L. Vodra
Chief Operating Officer

RMV RANCH HOUSE, LLC,
a California limited liability company

By: Rancho Mission Viejo, L.L.C.,
a Delaware limited liability company,
as authorized agent and manager

By: _____
Anthony R. Moiso
Chief Executive Officer

By: _____
Donald L. Vodra
Chief Operating Officer

RMV MC INVESTMENT, LLC,
a California limited liability company

By: Rancho Mission Viejo, L.L.C.,
a Delaware limited liability company,
as authorized agent and manager

By: _____
Anthony R. Moiso
Chief Executive Officer

By: _____
Donald L. Vodra
Chief Operating Officer

RMV SAN JUAN WATERSHED, LLC,
a California limited liability company

By: Rancho Mission Viejo, L.L.C.,
a Delaware limited liability company,
as authorized agent and manager

By: _____
Anthony R. Moiso
Chief Executive Officer

By: _____
Donald L. Vodra
Chief Operating Officer

RMV COMMUNITY DEVELOPMENT, LLC,
a California limited liability company

By: Rancho Mission Viejo, L.L.C.,
a Delaware limited liability company,
as authorized agent and manager

By: _____
Anthony R. Moiso
Chief Executive Officer

By: _____
Donald L. Vodra
Chief Operating Officer

RMV HEADQUARTERS, LLC,
a California limited liability company

By: Rancho Mission Viejo, L.L.C.,
a Delaware limited liability company,
as authorized agent and manager

By: _____
Anthony R. Moiso
Chief Executive Officer

By: _____
Donald L. Vodra
Chief Operating Officer

"MWC"

RANCHO MISSION VIEJO MUTUAL WATER COMPANY, a California nonprofit mutual benefit corporation

By: Rancho Mission Viejo, L.L.C.,
a Delaware limited liability company,
as authorized agent and manager

By: _____
Anthony R. Moiso
Chief Executive Officer

By: _____
Donald L. Vodra
Chief Operating Officer

"SMWD"

SANTA MARGARITA WATER DISTRICT,
a California special district

By: _____
General Manager

Exhibit A

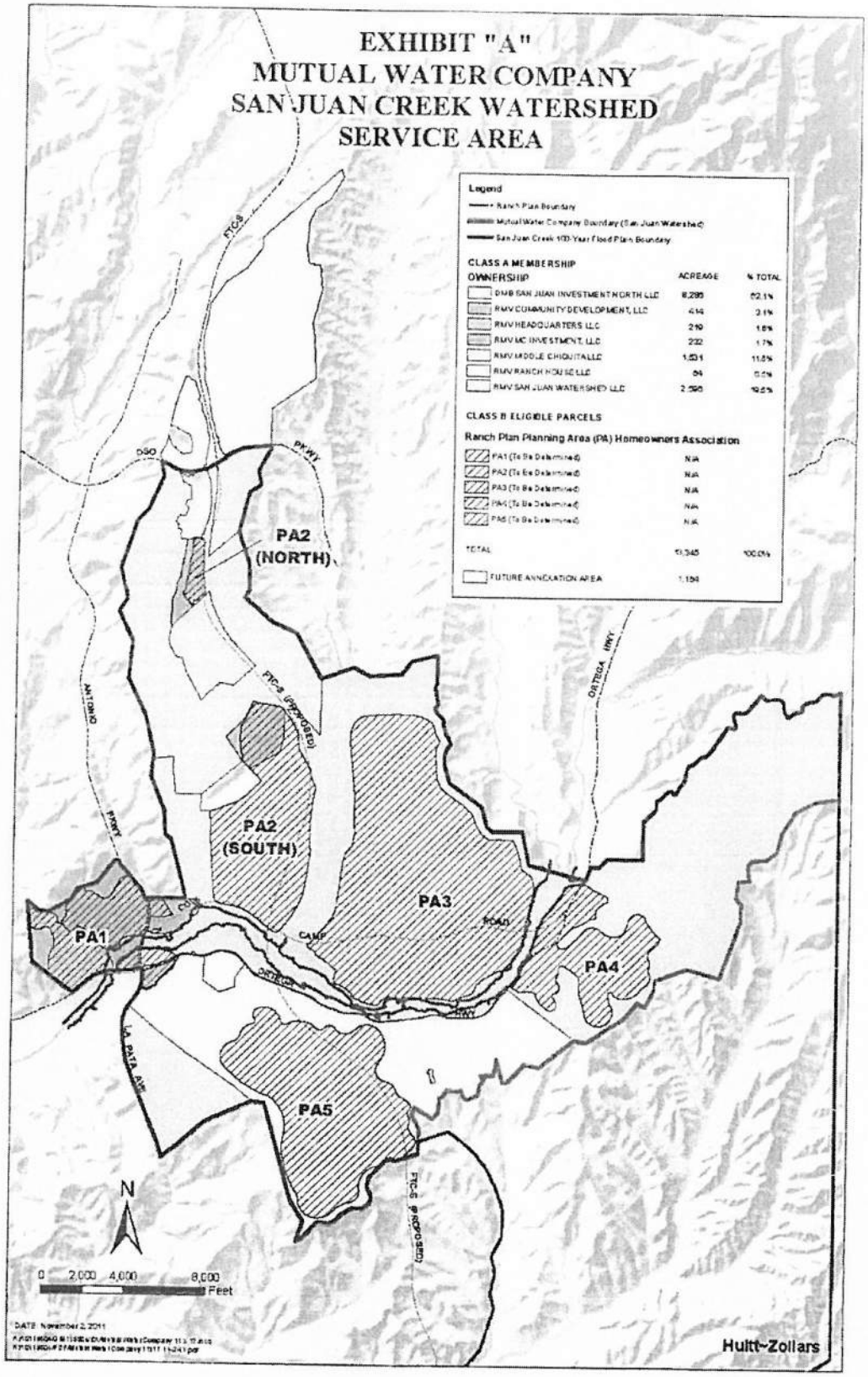


EXHIBIT "A"
MUTUAL WATER COMPANY
SAN JUAN CREEK WATERSHED
SERVICE AREA
Legend
Ranch Plan Boundary
Mutual Water Company Boundary (San Juan Watershed)
San Juan Creek 100-Year Flood Plain Boundary
CLASS A MEMBERSHIP
OWNERSHIP
ACREAGE
% TOTAL
DMB SAN JUAN INVESTMENT NORTH, LLC
8,295
62.1%
RMV COMMUNITY DEVELOPMENT, LLC
414
3.1%
RMV HEADQUARTERS LLC
210
1.6%
RMV MC INVESTMENT, LLC
232
1.7%
RMV MOULE CHIQUITA LLC
1,531
11.5%
RMV RANCH HOUSE LLC
84
0.6%
RMV SAN JUAN WATERSHED, LLC
2,596
19.5%
CLASS B ELIGIBLE PARCELS
Ranch Plan Planning Area (PA) Homeowners Association
PA1 (To Be Determined)
N/A
PA2 (To Be Determined)
N/A
PA3 (To Be Determined)
N/A
PA4 (To Be Determined)
N/A
PA5 (To Be Determined)
N/A
*TOTAL
13,345
100.0%
FUTURE ANNEXATION AREA
1,194
PA1
PA2 (NORTH)
PA2 (SOUTH)
PA3
PA4
PA5
PKWY
ANTONIO
ORTEGA HWY
CAMP
ROAD
LA PATA AVE
PTC-5 (PROPOSED)
N
0
2,000
4,000
8,000
Feet
DATE: November 2, 2011
Hultt-Zollars

Lease Amount of Supplemental Water (Riparian) by RMV for SMWD

Planning Area	Gross Development Area (Acres	Water Supply (acft/year)* ***
1**	577	400
2	895	416
3 & 4	2,721	1,131
5	1,191	553
Total:	**5,384**	**2,500**

Notes:

** Volume of water is determined by prorating 2,500 acft over the Planning Area totals for PA-1 through 5. See Exhibit A for map of MWC boundaries for SJC Watershed. Also, the proportionment of PA-4 is added to PA-3.*

*** PA-1 volume was increased by 132 acft above the prorated amount based on Planning Area total. As a result PA-3 was decreased by 132 acft from the prorated amount.*

**** Allocations of water are made on fiscal year basis. Provision of water shall be no more than 12 hours per day over minimum duration of 90 calendar days.*

Exhibit C

RMV SERVICE LOCATIONS

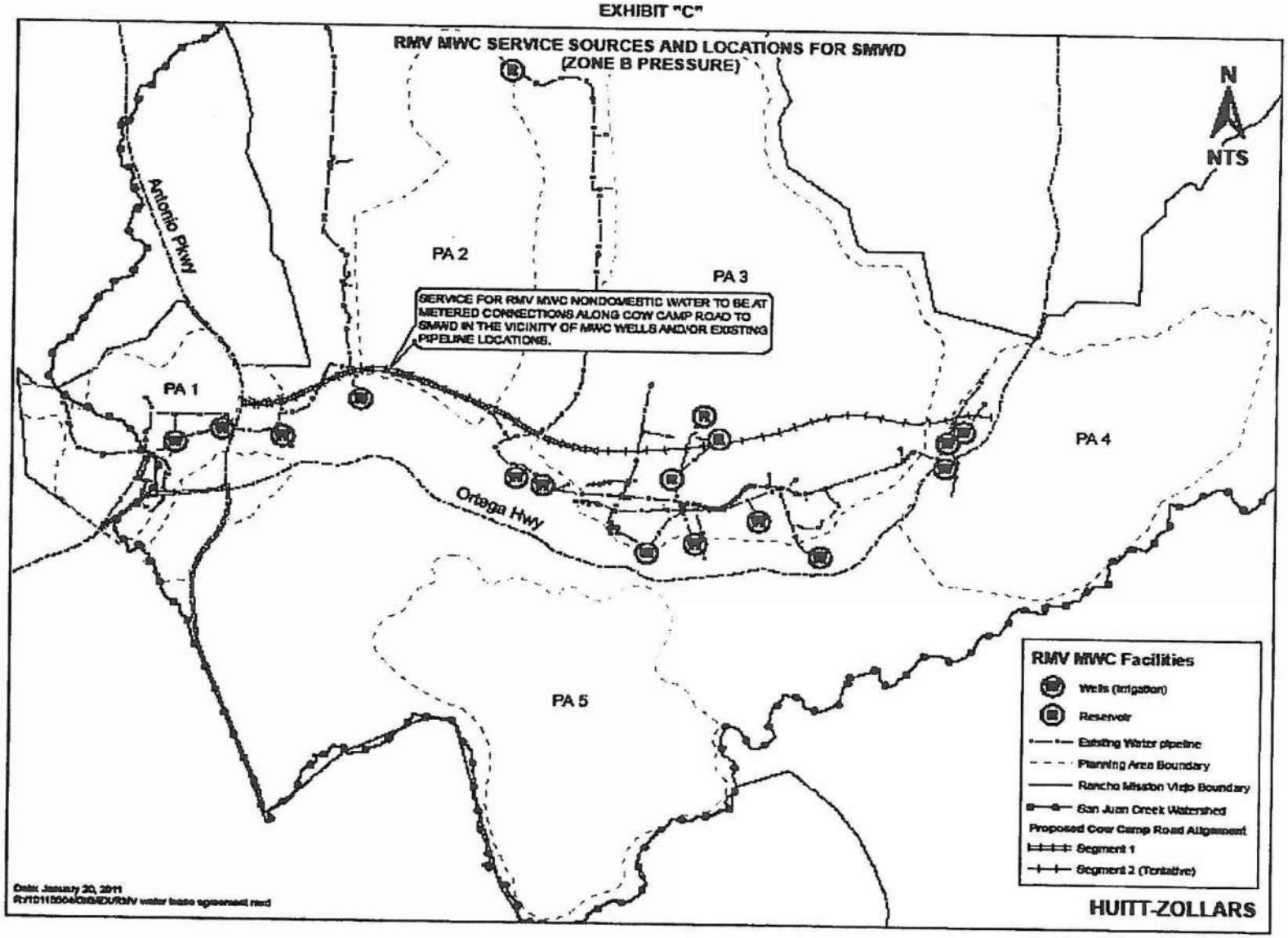


Exhibit D

[Form of Yearly Notice]

Yearly Minimum Quantity of Supplemental Water (Riparian) to be Provided by RMV for SMWD For Fiscal Year 20xx-20xx

Planning Area	Gross Development Area (Acres	Commencement Date	Water Supply (acft/year)
PA-1	577		x.xx
2	895		x.xx
3 & 4	2,721		x.xx
5	1,191		x.xx
Total:	**5,384**		**x.xx**

"RMV"

RANCHO MISSION VIEJO LLC., a Delaware limited liability company

By: _____

By: _____

"SMWD"

SANTA MARGARITA WATER DISTRICT, a California special district

By: _____

Appendix C

Municipal Water District of Orange County 2015 Urban Water Management Plan
Final

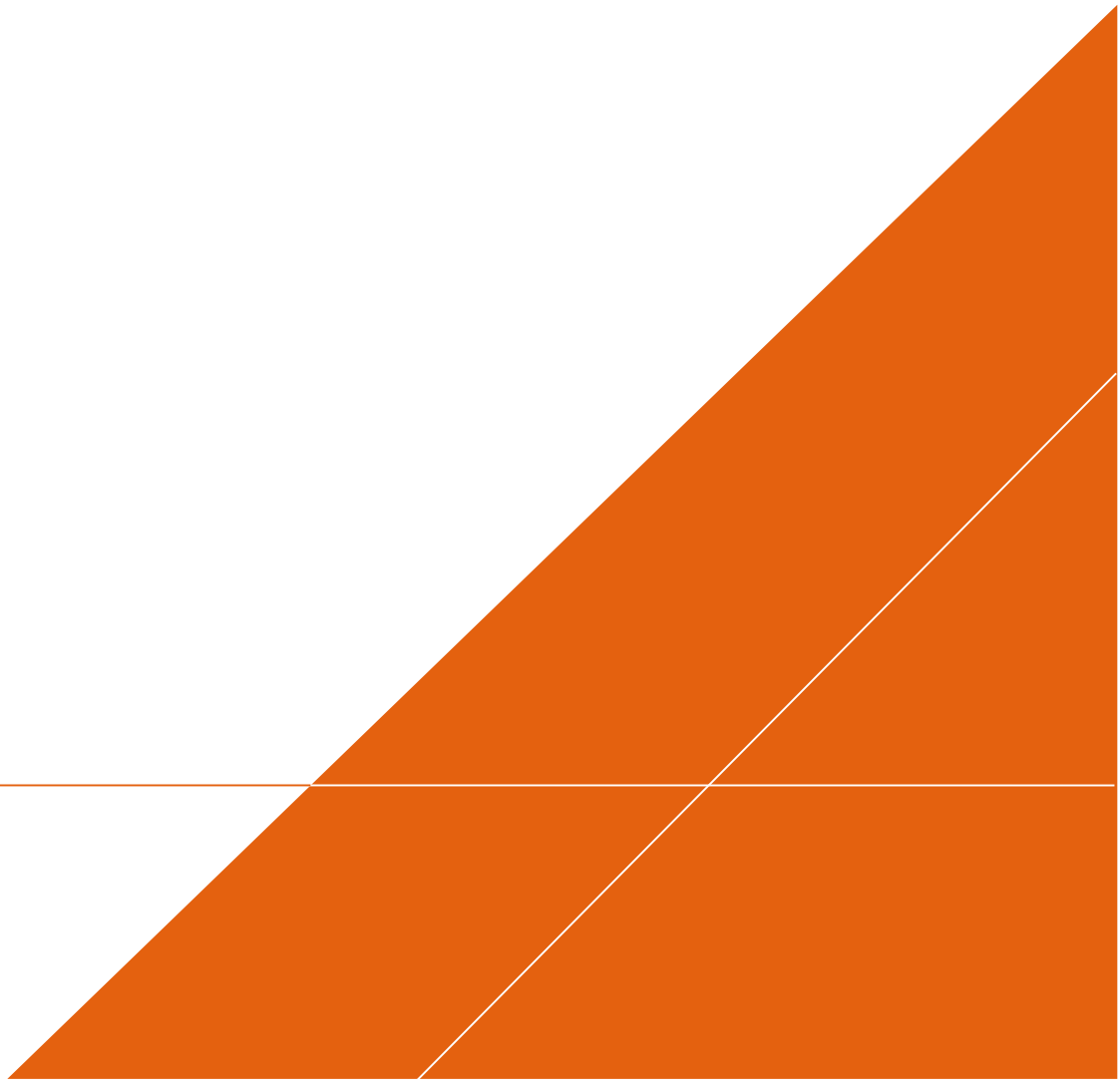
MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

ARCADIS Design & Consultancy for natural and built assets

2015

URBAN WATER MANAGEMENT PLAN

FINAL



MAY 2016

2015 URBAN WATER MANAGEMENT PLAN

Municipal Water District of Orange County

FINAL

Sarina Sriboonlue, P.E.

Staff Environmental Engineer

Prepared for:

Municipal Water District of Orange County

18700 Ward Street

Fountain Valley, California 92708

Prepared by:

Arcadis U.S., Inc.

445 South Figueroa Street

Suite 3650

Los Angeles

California 90071

Tel 213 486 9884

Fax 213 486 9894

Date:

May 2016

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TABLES

FIGURES

APPENDICES

Appendix A - UWMP Checklist

Appendix B - Standardized Tables

Appendix C - 2012 BMP Report

Appendix D - MWDOC Water Supply Allocation Plan

Appendix E - Notification of Public and Service Area Suppliers

Appendix F - Adopted UWMP Resolution

Appendix G - BUMP Methodology/OC Reliability Study

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
Base	Marine Corps Base, Camp Pendleton
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
Cfs	cubic feet per second
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
DRP	Direct Potable Reuse
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
Festival	Children's Water Education Festival
FTE	Full Time Equivalent
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
HEN	High Efficiency Sprinkler Nozzle
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
MGD	Million Gallons per Day
MNWD	Moulton Niguel Water District
MOU	Memorandum of Understanding Regarding Urban Water Conservation in California

MTBE	Methyl Tert-Butyl Ether
MWDOC	Municipal Water District of Orange County
MWRF	Mesa Water Reliability Facility
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
Plan	Urban Water Management Plan
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
SOC	South Orange County
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	Semitropic 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, 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, Tustin, 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, Emerald Bay Service 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 goal by 2020.

In an effort to assist retail agencies in Orange County to 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.

An 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; 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**
☑	**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	
☑	Agency is a wholesaler
☐	Agency is a retailer
Fiscal or Calendar Year	
☐	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	
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.

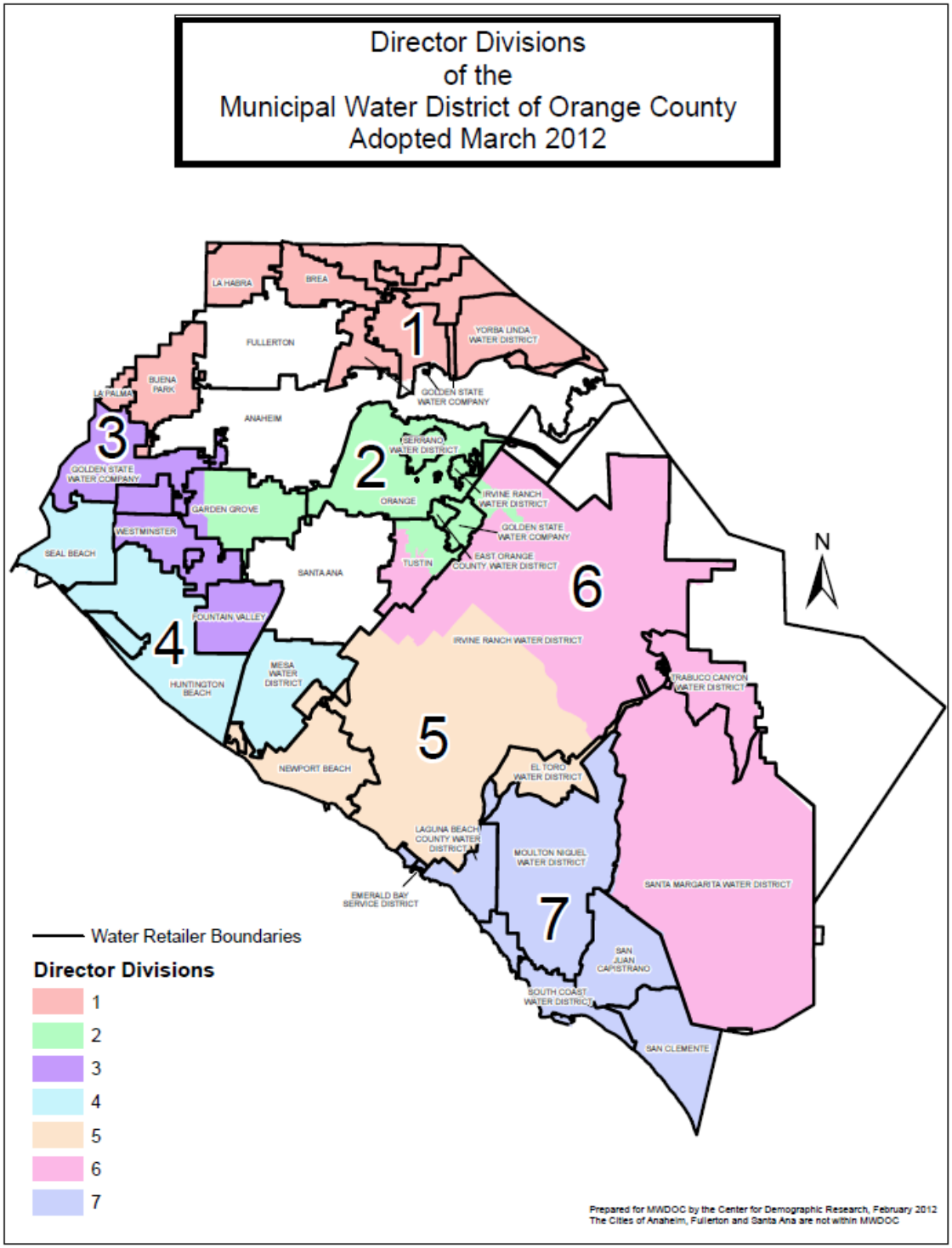


Figure 1-1: MWDOC Board of Directors Map, by Director Division

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.

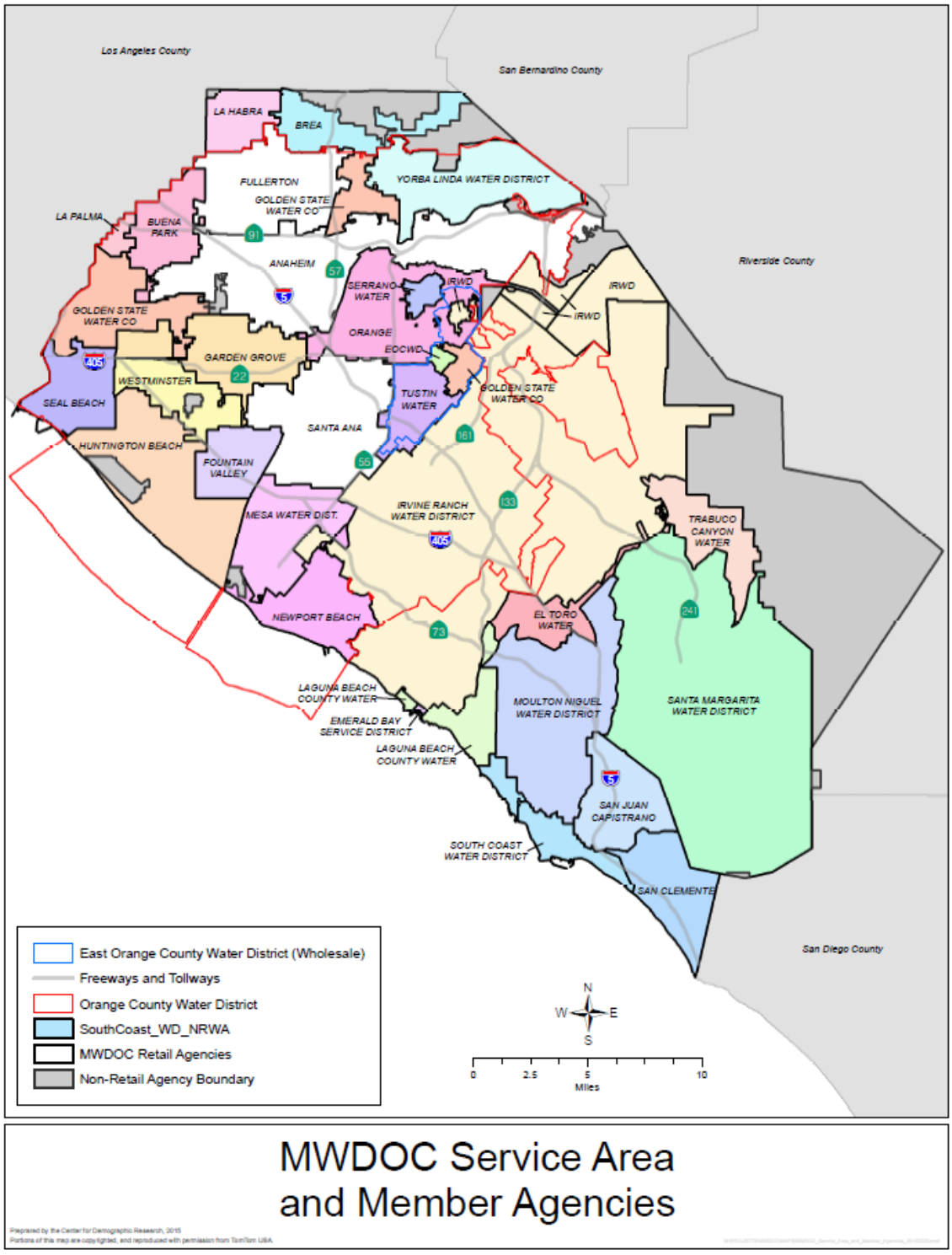
In 2004, MWDOC formed a partnership with the Discovery Science Center to bring the School Education Program to more elementary students and provide them with even greater educational experiences in the areas of water and science. In addition, earlier this year MWDOC formed partnership with the Orange County Department of Education – Inside the Outdoor to reach High School Students in conjunction with the Ecology Center out of San Juan Capistrano.

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)
- Golden State Water Company (GSWC)
- Laguna Beach County Water District (LBCWD)
- Mesa Water District (Mesa Water)
- Moulton Niguel Water District (MNWD)
- Orange County Water District (OCWD)
- Santa Margarita Water District (SMWD)
- Serrano Water District (Serrano)
- South Coast Water District (SCWD)
- 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, with sources including 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.

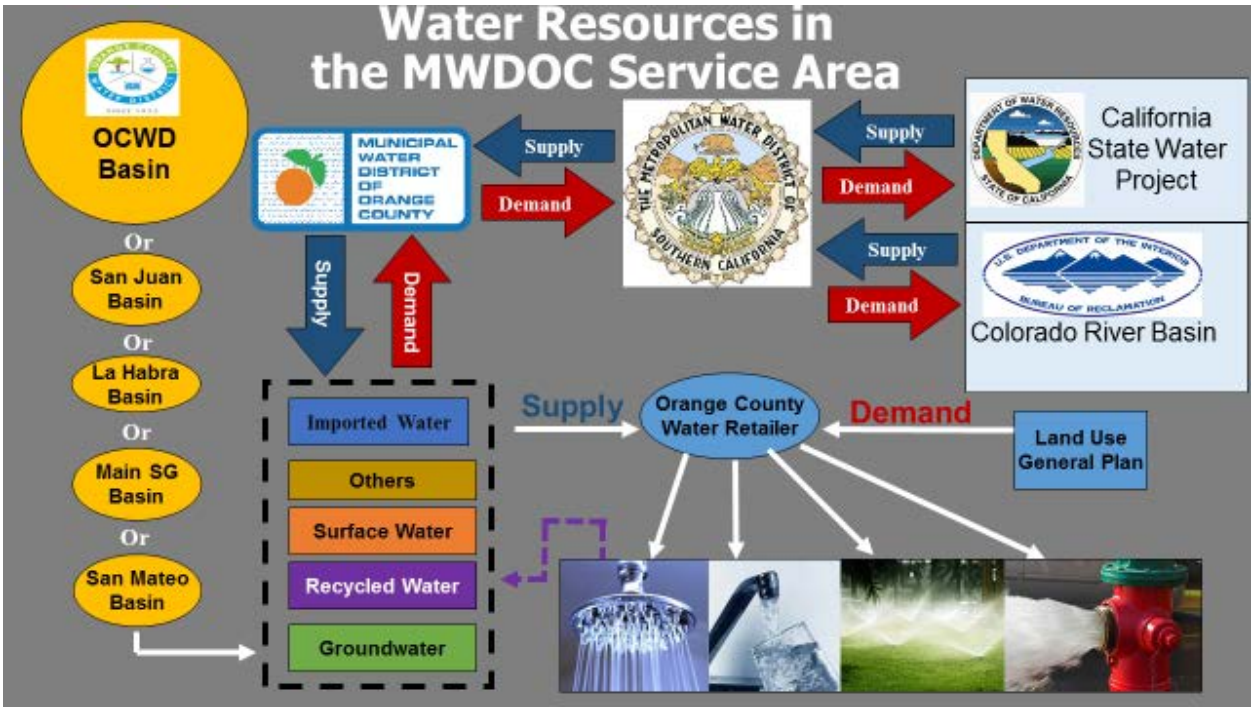


Figure 1-3: Water Service Organization in MWDOC's Service Area

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's 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 the SBx7-7 compliance method selection, baseline water use calculation, and 2015 and 2020 water use targets carried out by MWDOC.

Similar to all of California, MWDOC's urban water demands has been largely shaped by Governor's Emergency Conservation 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 the California State Water Resources Control Board (SWRCB). 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. Based on these emergency regulations, water demand is projected to decrease as much as 75,000 AF for FY 2015-16 for the MWDOC's service area.

As shown below, MWDOC's service area's municipal and industrial (M&I) water use for the 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.

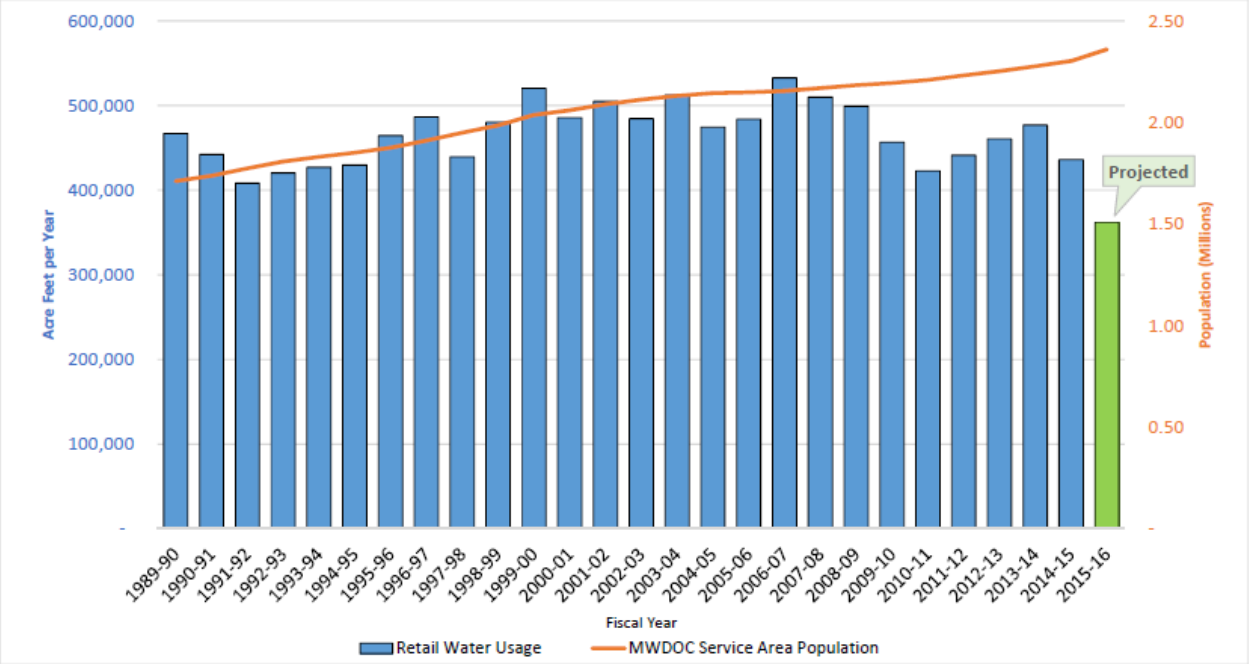


Figure 2-1: MWDOC's Service Area Historical Water Demand and Population

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 economic conditions. 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. 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 its 28 retail agencies. The population is projected to increase 10 percent by 2040, representing an average growth rate of just 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 (treated and untreated), 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 urban 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 was partly due to the recent statewide water conservation mandates imposed on retail agencies throughout the state (whereby mandatory restrictions started on June 2015). While MWDOC’s service area M&I demands are expected to rebound after the drought, 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 local supplies to OCWD, the demand forecast for this type of use is based on the projection of the following supplies under normal conditions:

- Santa Ana River Flows (Base flows & Storm 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 those that occurs with respect to Irvine Lake. The water delivered to Irvine Lake is used for both consumptive and storage water purposes. Imported water delivered into Irvine Lake can be held for a short or long periods of time to be later delivered for consumptive use. On average, surface water supplies total 7,300 acre-feet per year (AFY) in Irvine Lake.

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

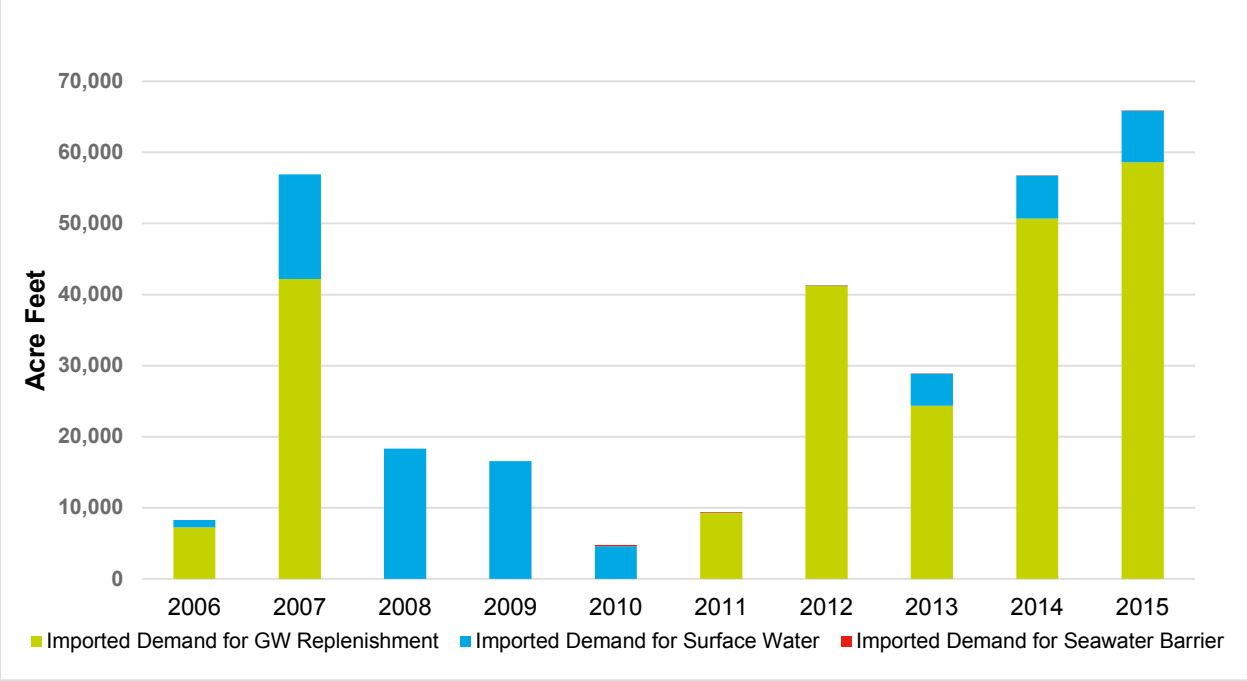


Figure 2-2: MWDOC's Historical Imported Water Demands for Indirect Consumption

2.4 MWDOC Demand Projections

MWDOC's service area total direct and indirect demands 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. Under normal conditions, total direct and indirect 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 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 CDR at California State University of Fullerton 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 demand trajectories were developed representing three levels of conservation: 1) continued with existing levels of conservation as of 2013-14 (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, 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 beyond 2013-14. 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 of direct demands. The figure below does not take in account indirect demands for groundwater and surface water supplies needs.

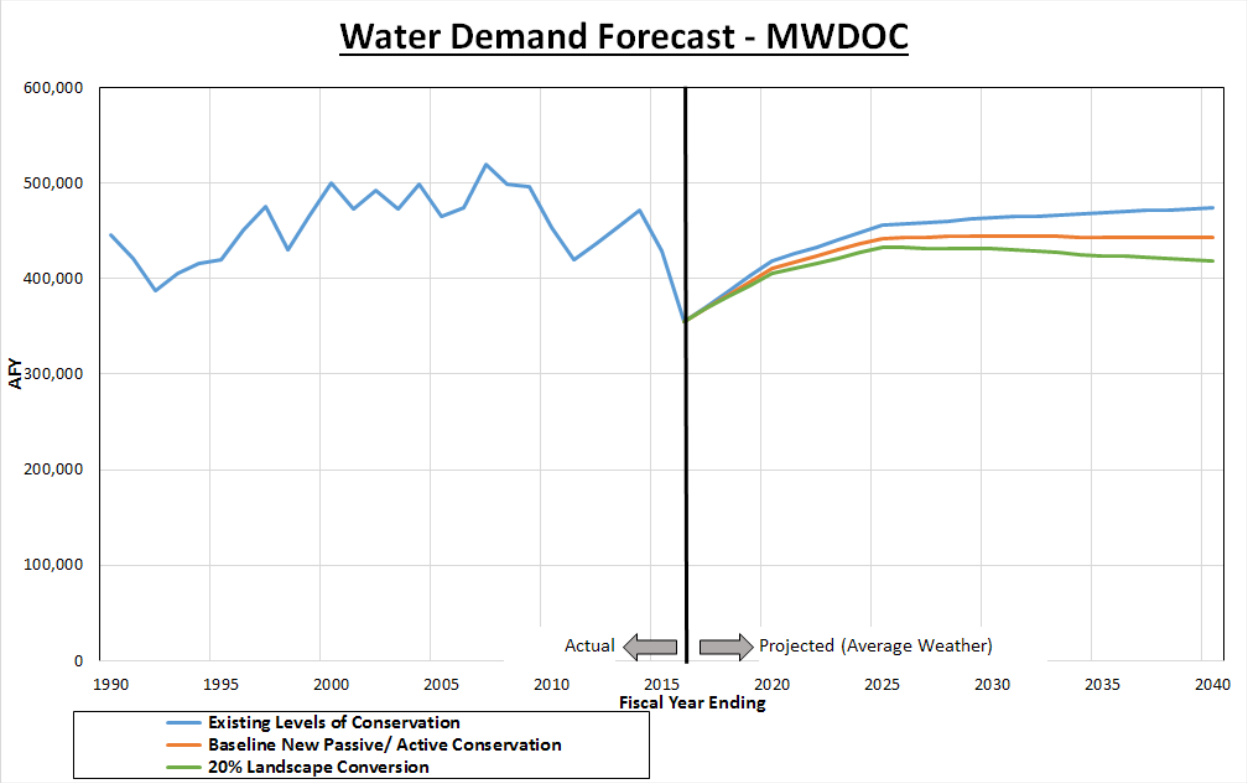


Figure 2-3: MWDOC Water Demand Forecast

Note: This does not include projected indirect water demands, such as groundwater and surface reservoir replenishment needs

2.4.2 25 Year Total Demand Projections

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

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

MWDOC Service Area Total Demands – Projected						
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	**66,844**	**72,306**	**72,306**	**72,306**	**72,306**	**72,306**
Total MWDOC 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 from Metropolitan 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 (AF)

MWDOC's Total Imported Water Demands						
	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 M&I demands to be met via imported supplies 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 of calculations that 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 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.

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 an individual target or a regional water use target.

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

Individual water suppliers in the Orange County 20x2020 Regional Alliance will state their participation in the alliance, and include the regional 2015 and 2020 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, including appropriate deductions for recycled water, 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 221 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 Targets 2015[A,B]**	**(3) Weighted Total 2015**	**(4) Individual Targets 2020[A,C]**	**(5) Weighted Total 2020**
Brea	43,093	248	10,702,145	221	9,513,018
Buena Park	82,791	178	14,740,224	158	13,102,421
East Orange CWD RZ	3,257	261	851,540	232	756,925
El Toro WD	48,797	183	8,945,341	163	7,951,415
Fountain Valley	57,908	157	9,071,479	142	8,196,877
Garden Grove	176,649	152	26,919,945	142	25,004,666
Golden State WC	169,573	157	26,623,806	142	24,003,058
Huntington Beach	198,429	151	30,034,368	142	28,087,625
Irvine Ranch WD	379,510	192	72,746,132	170	64,663,229
La Habra	61,843	151	9,342,976	150	9,292,066
La Palma	16,030	149	2,387,516	140	2,243,890
Laguna Beach CWD	20,311	183	3,722,297	163	3,308,708
Mesa Water	107,588	163	17,496,928	145	15,552,825
Moulton Niguel WD	170,326	194	33,086,891	173	29,410,570
Newport Beach	65,777	228	14,987,798	203	13,322,487
Orange	138,987	203	28,226,005	181	25,089,782
San Clemente	51,385	172	8,835,311	153	7,853,609
San Juan Capistrano	38,829	206	8,006,483	183	7,116,874
Santa Margarita WD	156,949	190	29,779,903	169	26,471,025
Seal Beach	23,706	149	3,526,804	142	3,355,584
Serrano WD	6,464	434	2,804,135	386	2,492,565
South Coast WD	35,004	169	5,918,683	150	5,261,051
Trabuco Canyon WD	12,712	233	2,965,219	200	2,539,757
Tustin	68,088	170	11,581,691	151	10,294,836
Westminster	93,785	137	12,817,421	130	12,195,988
Yorba Linda WD	74,787	266	19,911,283	237	17,698,918
Anaheim	360,142	183	65,767,509	162	58,460,008
Fullerton	140,827	201	28,284,657	179	25,141,917
Santa Ana	335,299	123	41,165,687	116	38,756,257
Regional Alliance Total	3,138,846	**176**	551,250,176	**158**	497,137,952

[A] Targets were 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 1, 2010.
[B] The targets listed in column (2) are the actual GPCDs achieved in 2015, including any recycled water credit.
[C] The targets listed in column (3) are the GPCD goals for 2020, including any recycled water credit.

Table 2-7 provides the regional urban water use targets for the Orange County 20x2020 Regional Alliance – the 2015 target is 176 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[1]	2020 Target[2]
Orange County 20X2020 Regional Alliance	125	158

[1] Actual GPCD achieved in 2015
[2] GPCD Target to achieve by the year 2020

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 to deduct 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 operation, 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 fourfold 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 further increase the deductible amount of indirect recycled water up to approximately 98,400 AF.

3 WATER SOURCES AND SUPPLY RELIABILITY

3.1 Overview

Water supplies within the 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 that GWRS supplies are included as part of groundwater pumping numbers.

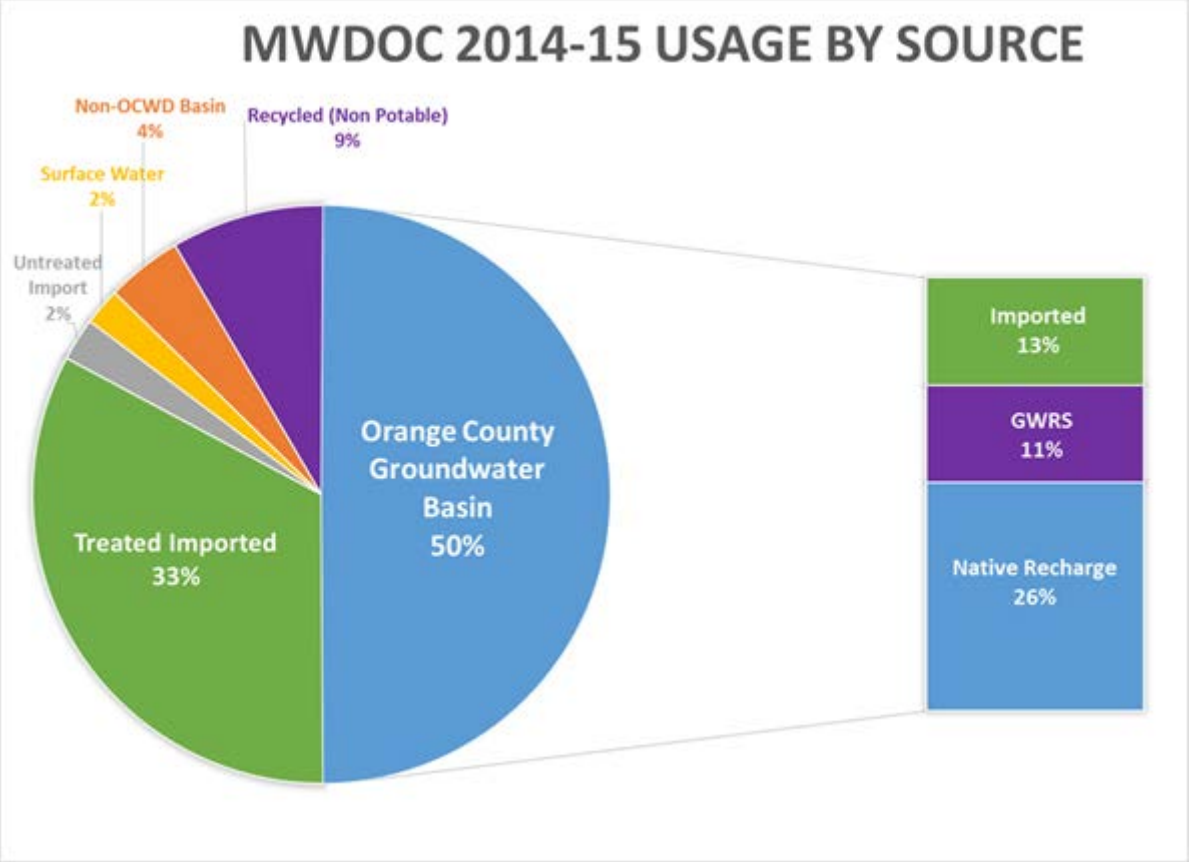


Figure 3-1: Water Supply Sources within MWDOC's Service Area

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 and by developing local projects. 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's service area and for all of Orange County:

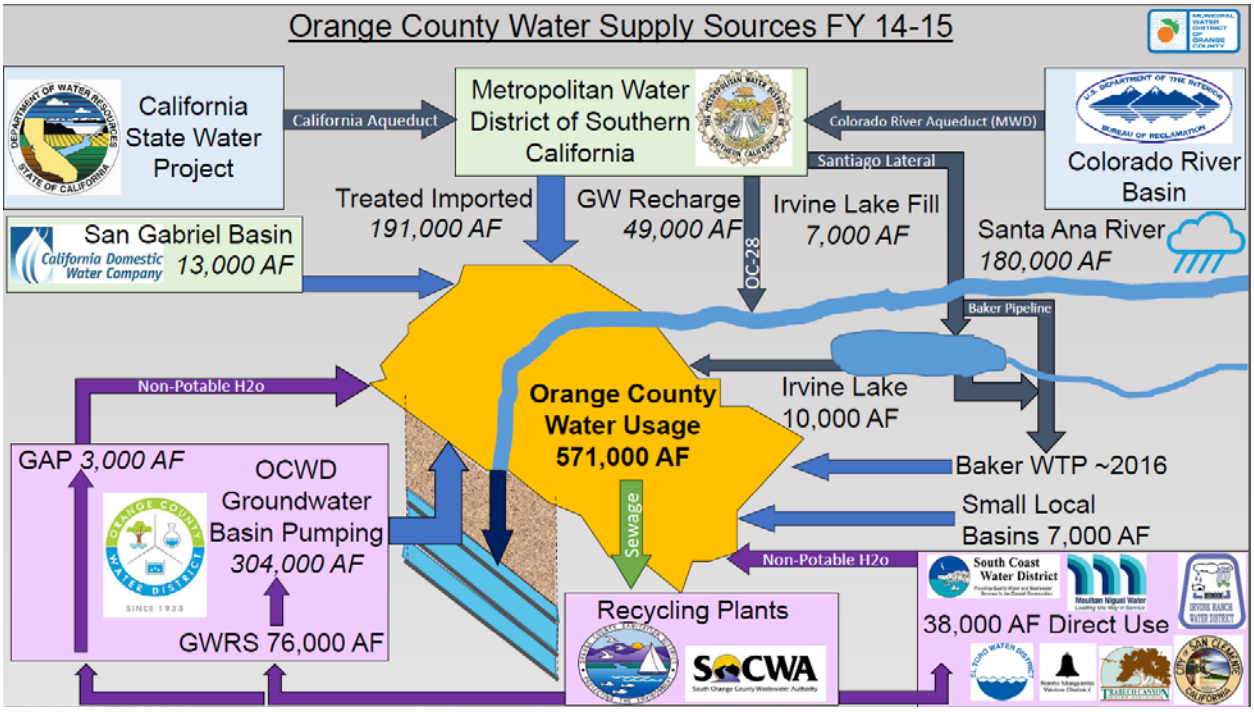


Figure 3-2: Orange County Water Supply Sources

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 in the north to the international boundary with Mexico in the south. This encompasses 5,200 square miles and includes portions of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties. Approximately 85 percent of the population from the aforementioned counties reside within 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 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.

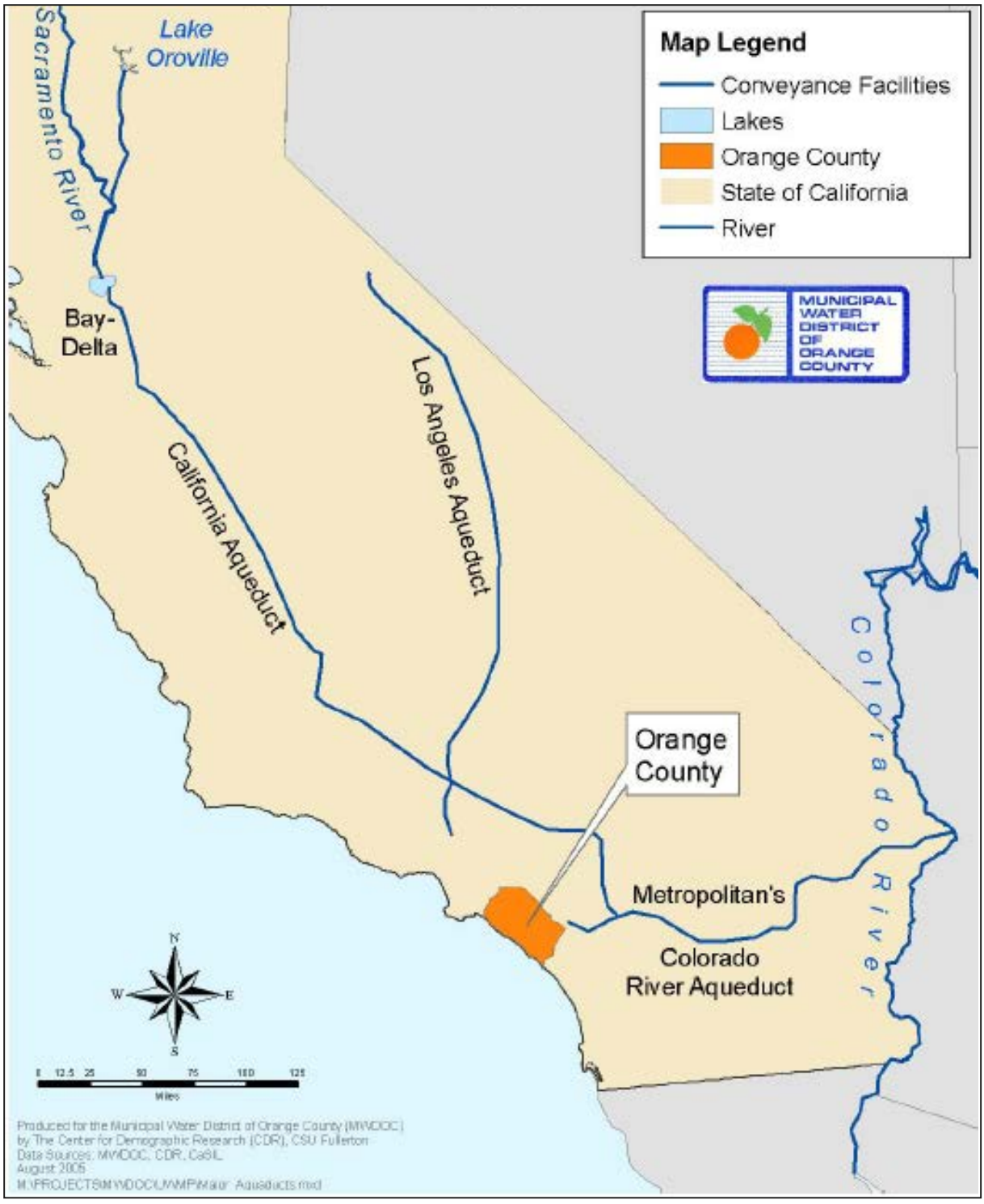


Figure 3-3: Major Aqueducts Bringing Water to Southern California

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.

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

3.2.1 Metropolitan's 2015 Urban Water Management Plan

Metropolitan's 2015 UWMP 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://mwdh2o.com/PDF_About_Your_Water/2.4.2_Regional_Urban_Water_Management_Plan.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, but is limited to no more than the hydraulic capacity of the aqueduct at about 1.20 million acre-feet (MAF).

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 1.20 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 UWMP, June 2016). The long-term imbalance in future supply and demand on the Colorado River 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 Water Rights

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 (PPR). 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, 2015 UWMP, June 2016, Table 3-1). 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, 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 in recent years.

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: State Water Project 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.

In response to this report there have been a number of steps that have been taken, such as ongoing Delta levee improvements by the Delta Reclamation Agencies and property acquisition for rock stockpiling for an improved emergency pathway. All of these scenarios are consistent with the Metropolitan Board adopted Action Plan.

DWR has altered the SWP operations to accommodate species of fish listed under the 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 an 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, 2015 UWMP, June 2016, Table 3-2).

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 2015 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 that MWDOC will obtain from Metropolitan are shown in Tables 3-8 and 3-9.

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

Wholesale: Water Supplies — Actual			
Water Supply	Additional Detail on Water Supply	2015	
		Actual Volume	Water Quality
Purchased or Imported Water	M&I	158,664	Drinking Water
Purchased or Imported Water	GW Recharge	58,617	Untreated Water
Purchased or Imported Water	Surface Storage	8,227	Untreated Water
	Total	225,508	
NOTES:			

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

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	GW Recharge	65,000	65,000	65,000	65,000	65,000
Purchased or Imported Water	Surface Storage	7,306	7,306	7,306	7,306	7,306
	Total	205,132	216,560	212,509	208,219	207,441
NOTES:						

3.3 Groundwater

Among all local supplies available to MWDOC's retail agencies, groundwater supplies make up the majority. The water supply resources within 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 six 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 OCWD overlies the majority of what is called by the California DWR, the Coastal Plain of Orange County Groundwater Basin (Orange County Groundwater Basin). In DWR's Bulletin 118, which describes the extent of all groundwater basins in California, this basin is designated at Basin 8-1 and includes the cities of La Habra and Brea. The Orange County Groundwater Basin underlies the north half of Orange County beneath broad lowlands, 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. Figure 3-5 depicts the extent of the Orange County Groundwater Basin. The aquifers comprising this Basin are over 2,000 feet deep and form a complex series of interconnected sand and gravel deposits. It is estimated to hold approximately 66 MAF of water when full, although the amount of "useable storage" has been established by OCWD at a maximum 500,000 AF below full conditions. Keeping the basin within the usable storage range minimizes the potential for seawater intrusion and other potential deleterious effects.

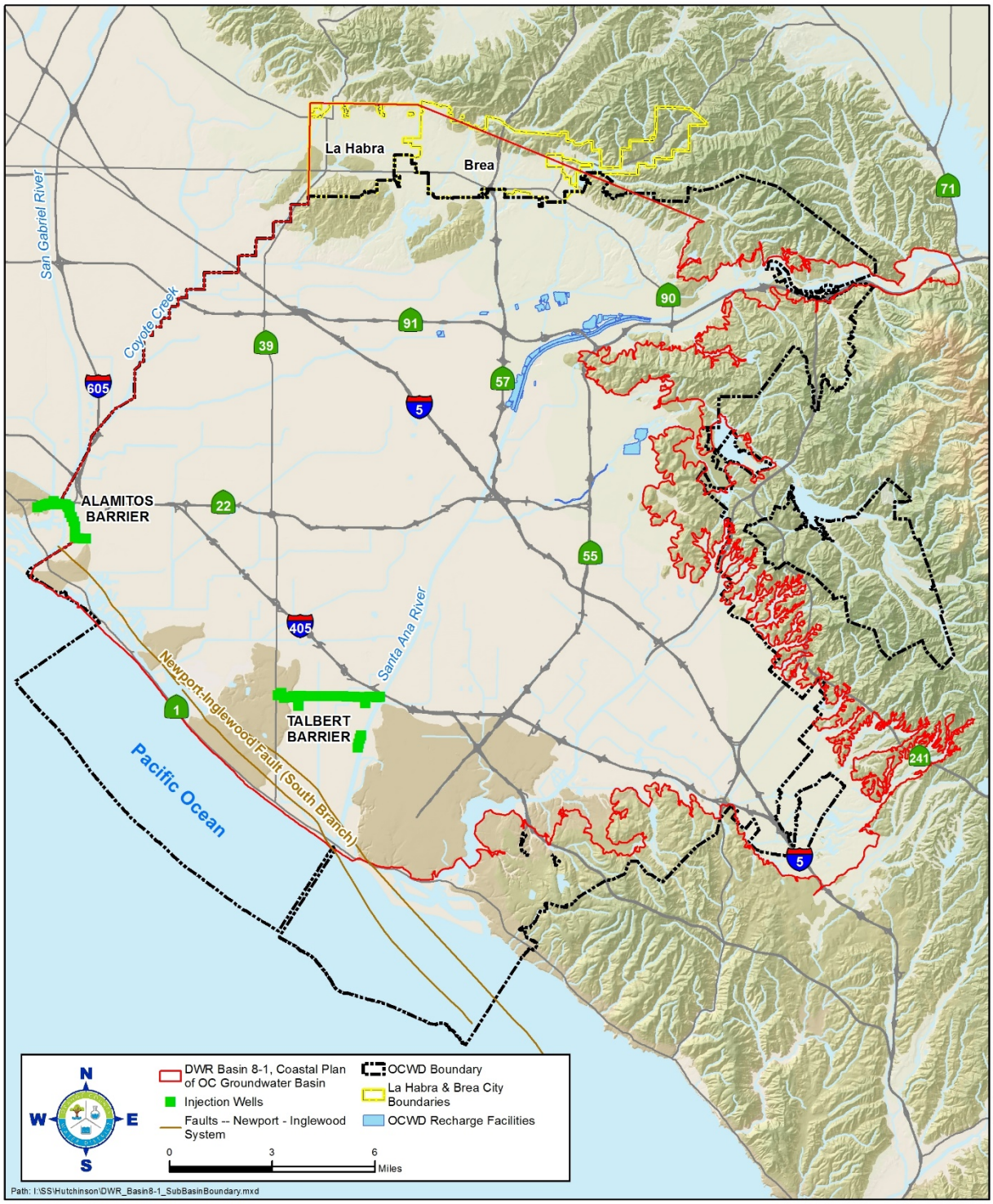


Figure 3-5: Orange County Groundwater Basin

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 Santa Ana River. 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 needs 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 2.4 million.

Groundwater storage is managed within a safe basin operating range to protect the long-term sustainability of the Orange County Groundwater Basin and to protect against seawater intrusion and other potential deleterious effects. OCWD uses financial incentives to modulate the amount of pumping from the basin.

OCWD developed a 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 within a target range established by OCWD. The framework for the financial incentives is based on establishing the BPP, which is 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 equal to MWDOC's full service rate. The BPP is set uniformly for all Producers by OCWD on an annual basis.

The BPP is established each year based on estimated hydrologic conditions for the coming year, basin storage levels, availability of imported water supplies, and other basin management objectives.

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 is able to increase allowable pumping from the Orange County Groundwater Basin, above the natural safe yield, via the recharge of various sources of water.

OCWD currently owns and operates more than 1,500 acres of surface water 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 surface water recharge system, OCWD also operates the Talbert Barrier in Fountain Valley and Huntington Beach, and participates in the financing of the Alamitos Barrier in Seal Beach and Long Beach. The barriers help prevent seawater intrusion and also recharge the Orange County Groundwater Basin.

In addition to natural recharge, 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.

Imported water from Metropolitan via MWDOC is one source of water used for groundwater replenishment. However, imported water is not always available. When imported water for groundwater replenishment is not available for extended periods, OCWD can draw upon groundwater in storage under this operation, the Orange County Groundwater Basin draws on stored water to sustain higher levels 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 the base of its allowable storage range (500,000 AF below full conditions). OCWD has defined a series of steps it will take as basin storage declines, including reducing the BPP. The reduced pumping level can remain in place until basin storage levels increase due to 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.

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 1936, 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, imported water, and recycled water. Today OCWD owns and operates a network of recharge facilities that cover over 1,500 acres.

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. The Talbert Barrier was constructed by OCWD in 1975. Operation of the injection wells in both gaps forms a hydraulic barrier to seawater intrusion.

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.

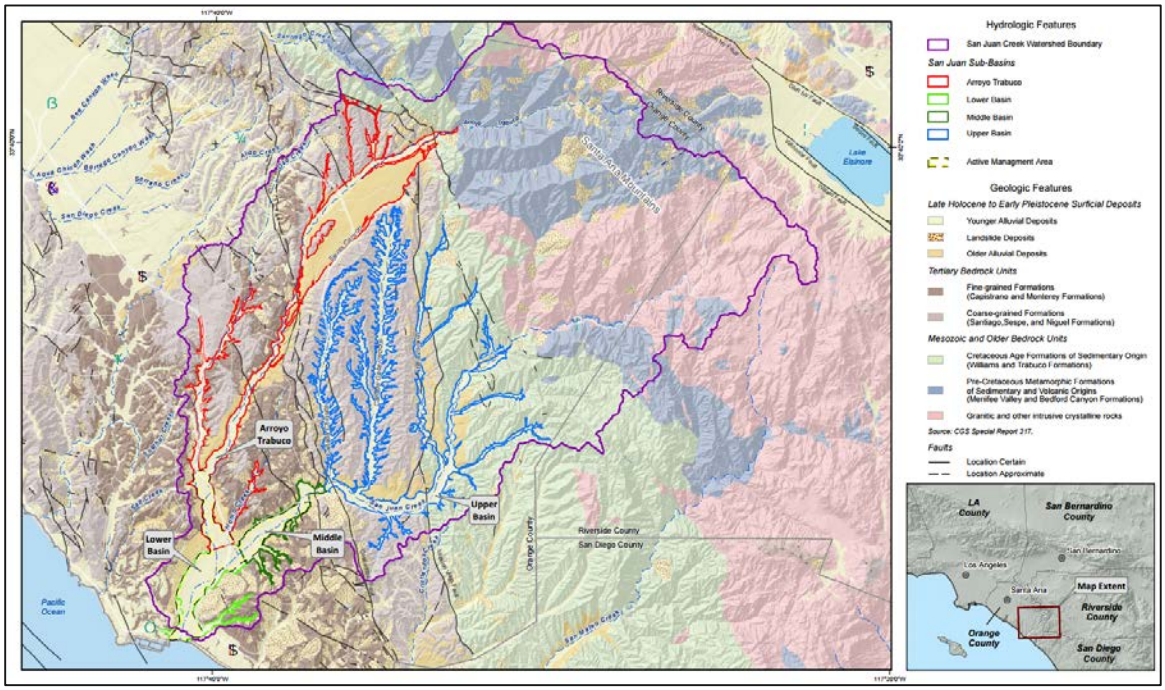


Figure 3-6: Principal Groundwater Formation within the San Juan Groundwater Basin

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 7,700 AFY to 8,600 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 the northernmost part of the Orange County Groundwater Basin (Figure 3-5) and extends into parts of Los Angeles County. The La Habra Groundwater Basin lies entirely within the Coyote Creek Watershed and is shown on Figure 3-7.

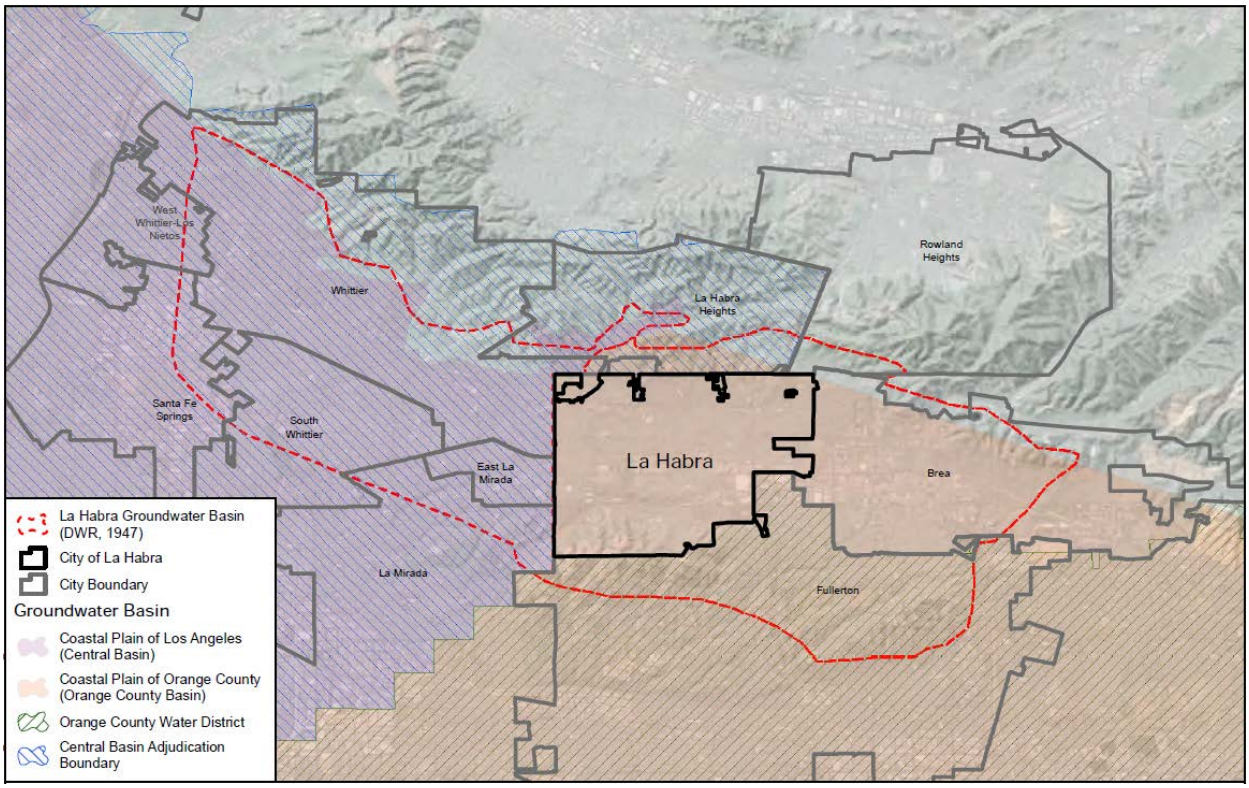


Figure 3-7: La Habra Groundwater Basin

3.3.3.1 La Habra Groundwater Basin Management Objectives

Basin Management Objectives (BMO) 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 boundaries of the Main San Gabriel Basin.

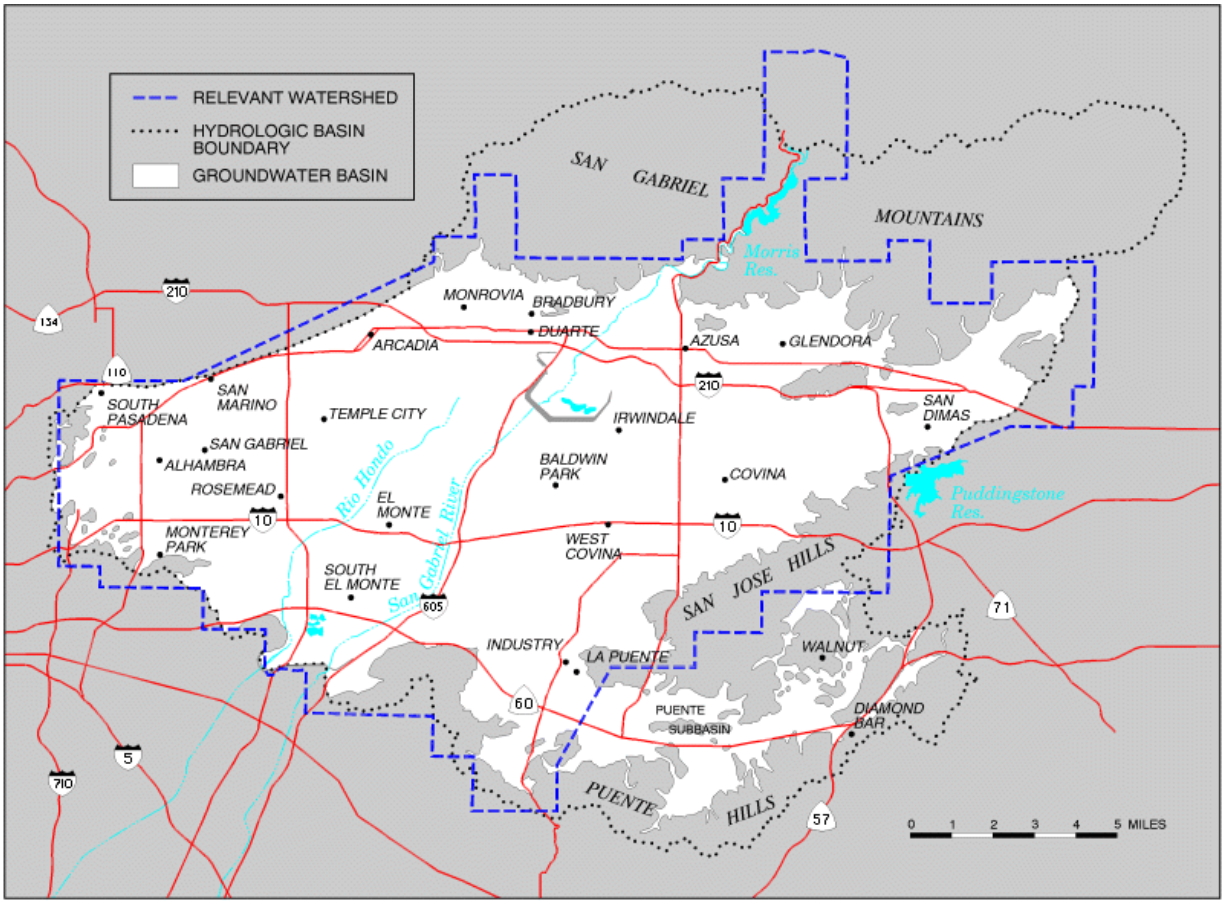


Figure 3-8: Main San Gabriel Groundwater Basin

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 Groundwater Basin

The San Mateo Groundwater Basin is located to the south of the Orange County boundary, within the boundary of the Marine Corps Base, Camp Pendleton (Base) in San Diego County. Historically, the Base utilized groundwater from the San Mateo Basin for Base use and for irrigation of agricultural lease lands on Base property. Recent data have not been obtained on use of water from the basin by the Base but the agricultural leases in the area have been terminated for some time now. The City of San Clemente has a well two wells that produce between 500 and 1000 AF from the groundwater basin.

San Mateo Creek is accessible to the public, as the creek mouth and lagoon lie within the leasehold of San Onofre State Park. San Mateo Creek is the most pristine, intact coastal stream in Southern California. The streambed and floodplain are in a natural state and the riparian habitat is uniquely native. Several distinct tributaries collect winter rains which flow unimpeded to the ocean.

The watershed encompasses a total of 85,402 acres. These include 40,533 acres of Cleveland National Forest lands, 18,686 acres of Camp Pendleton lands, and 26,183 acres of private lands. The topography is rugged mountains with elevations ranging from 400 feet to 3500 feet. Vegetation types present include chaparral, coastal sage scrub, grassland, oak woodland, and riparian woodland. There are 63 miles of perennial streams within the watershed, of which 11 miles are known or suitable habitat breeding habitat for southern steelhead. Currently, the suitable breeding habitat is the main stem of San Mateo Creek and a portion of Devil Creek. All of the stream miles that are suitable breeding habitat for

southern steelhead are within the San Mateo Wilderness of Cleveland National Forest. There are 12 miles of stream on Camp Pendleton that the steelhead use as a corridor.

Five endangered species occur within the watershed: southern steelhead, arroyo toad, tidewater goby, least Bell's vireo, and southwestern willow flycatcher. Of these, the primary concern of this plan is the southern steelhead. Historically San Mateo Creek supported rainbow trout and anadromous steelhead.

In its "Proposed Range Extension for Endangered Steelhead in Southern California," the National Marine Fisheries Service identified increased groundwater extraction, loss of riparian vegetation, stream channel changes, surficial flow reductions, human-caused fires, and the introduction of non-native predator species as the main threats to steelhead in the San Mateo Creek watershed.

Water Gaging records from 1953 to 2009 indicate an average annual streamflow of 8,720 AF per year. The minimum thickness of the alluvial and San Mateo aquifer units ranges from 33 to 1,400 feet. Aquifer tests have been conducted at five locations within the coastal basin. Groundwater quality from the basin indicates total dissolved solids of less than 900 milligrams per liter and nitrate concentrations less than 7 milligrams per liter.

In the 1990's a Conjunctive Use Concept was considered that envisioned a joint venture between the Marine Corps Base Camp Pendleton and Tri-Cities MWD (was subsequently consolidated into South Coast Water District) that would utilize the potential groundwater basin yield of about 2,000 AF ± and also would also consider 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.

3.3.6 Laguna Canyon Groundwater 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 Imported 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 to low Santa Ana River flows as a 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).

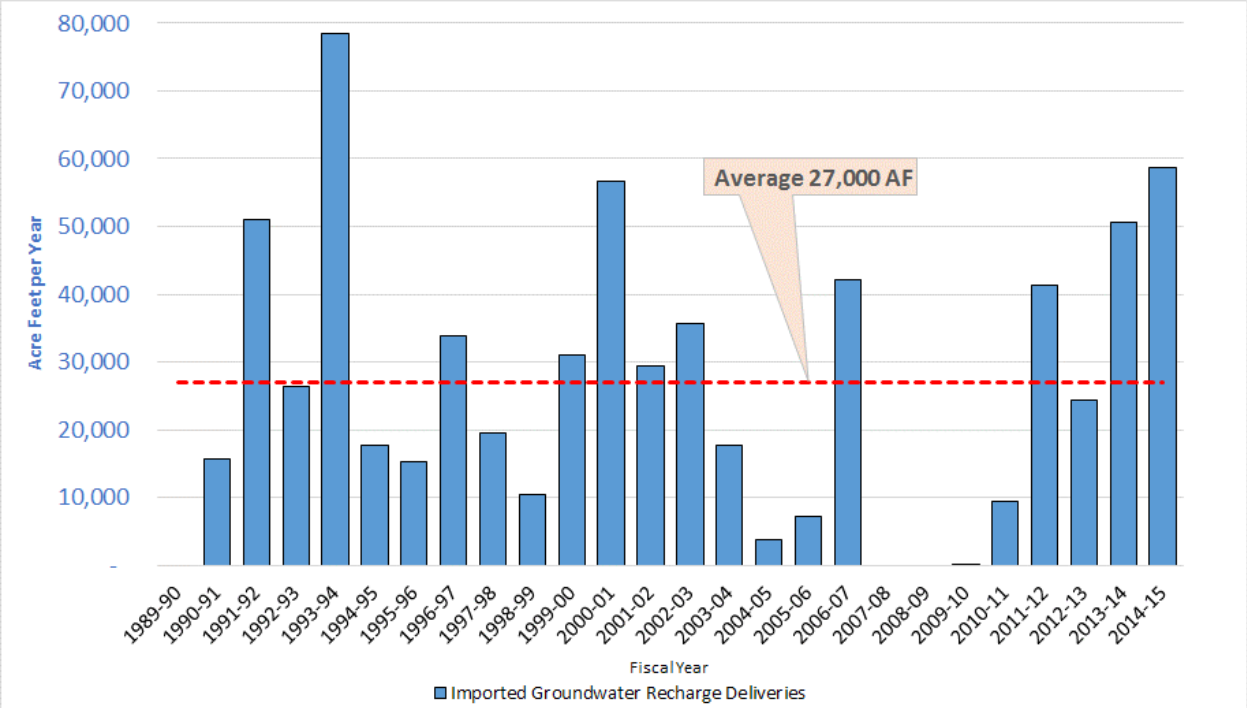


Figure 3-9: MWDOC Imported Water Sales for Groundwater Replenishment

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.

As shown in Figure 3-10, the MWDOC CUP storage account has been utilized over the past ten-years. The CUP account has filled in the wet year of 2007 and withdrawn to zero during the dry-years of 2009

and 2010. Currently, due to the drought conditions, the CUP account is projected to reach 100 AF by the end of 2016.

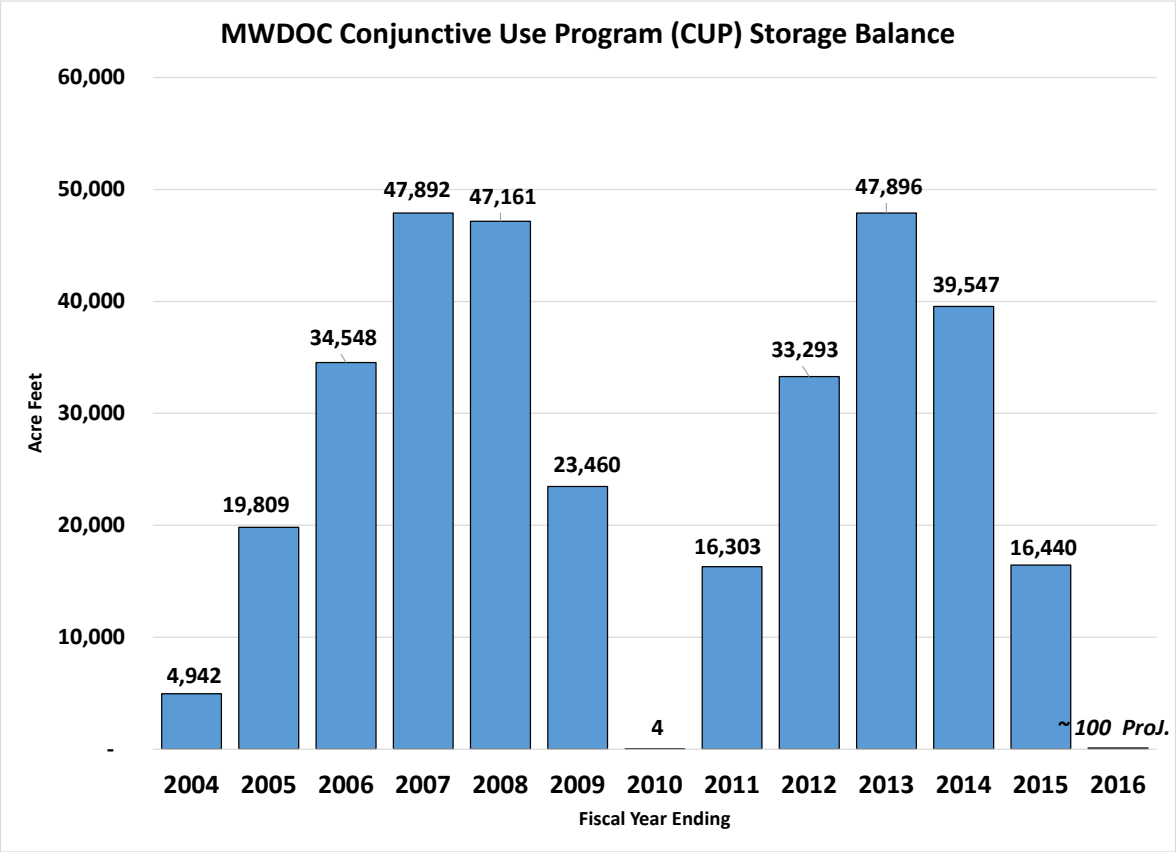


Figure 3-10: MWDOC Conjunctive Use Program Historical Storage Balance

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 (AF)

Groundwater Basin	Fiscal Year Ending				
	2010	2011	2012	2013	2014
Orange County Basin[1]	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**

[1] Includes only the MWDOC member agencies' groundwater production. Does not include the groundwater production of Anaheim, Fullerton, and Santa Ana

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 (AF)

	Fiscal Year Ending					
	2015	2020	2025	2030	2035	2040
Surface Water	8,227	7,306	7,306	7,306	7,306	7,306

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 Existing Transfers and Exchanges

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	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	1990-2014	-	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 (See Appendix G)			

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 that may have an impact on the reliability of imported water 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. In addition, water rights

challenges can occur on a multi-level – State, regional and local basis. Water rights on both the Colorado River, along the California Aqueduct, and in and around the SWP are always under review and challenged.

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 (PPCP). 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 Mussels.

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.

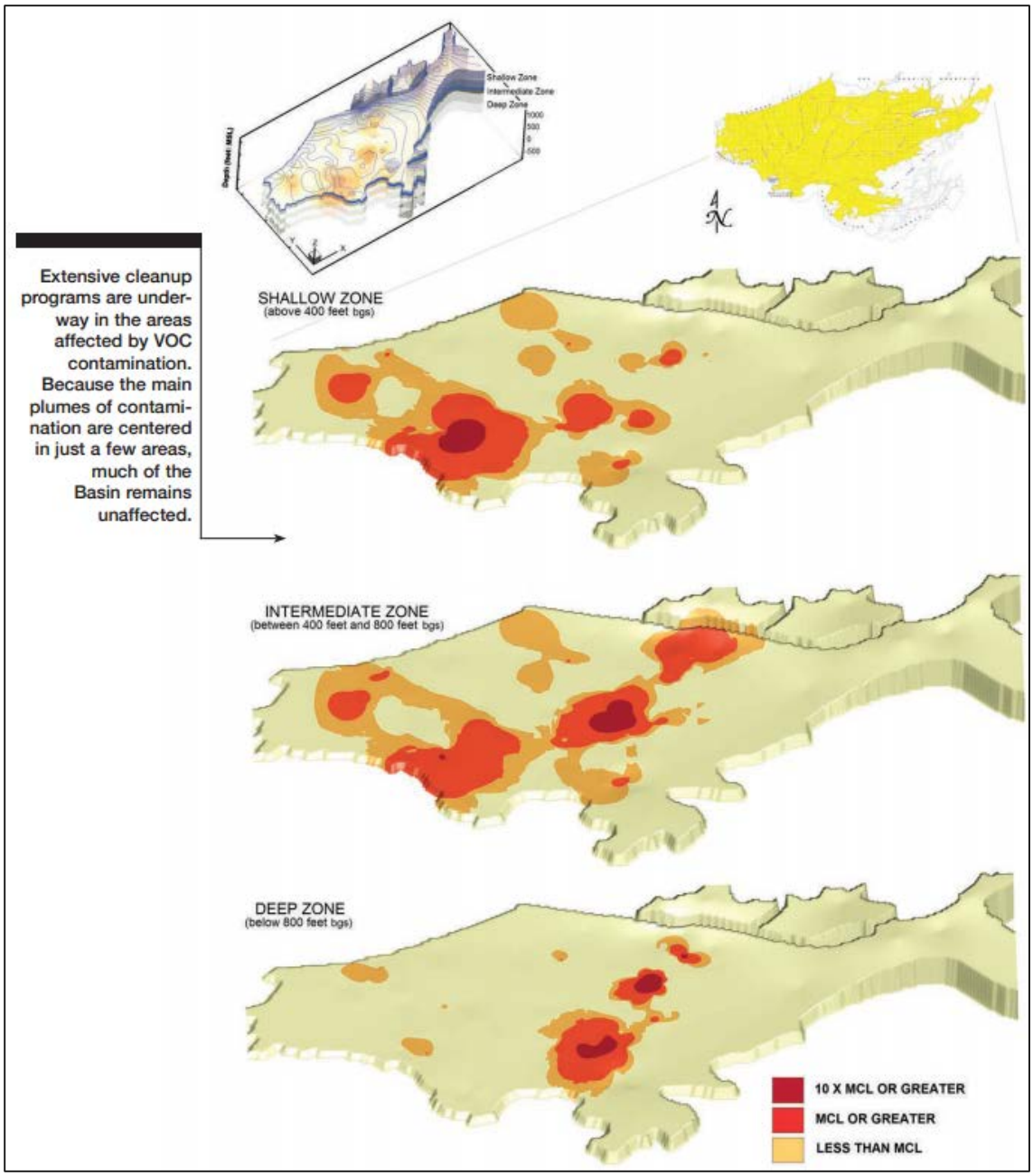


Figure 3-11: VOC levels through the Main San Gabriel Basin

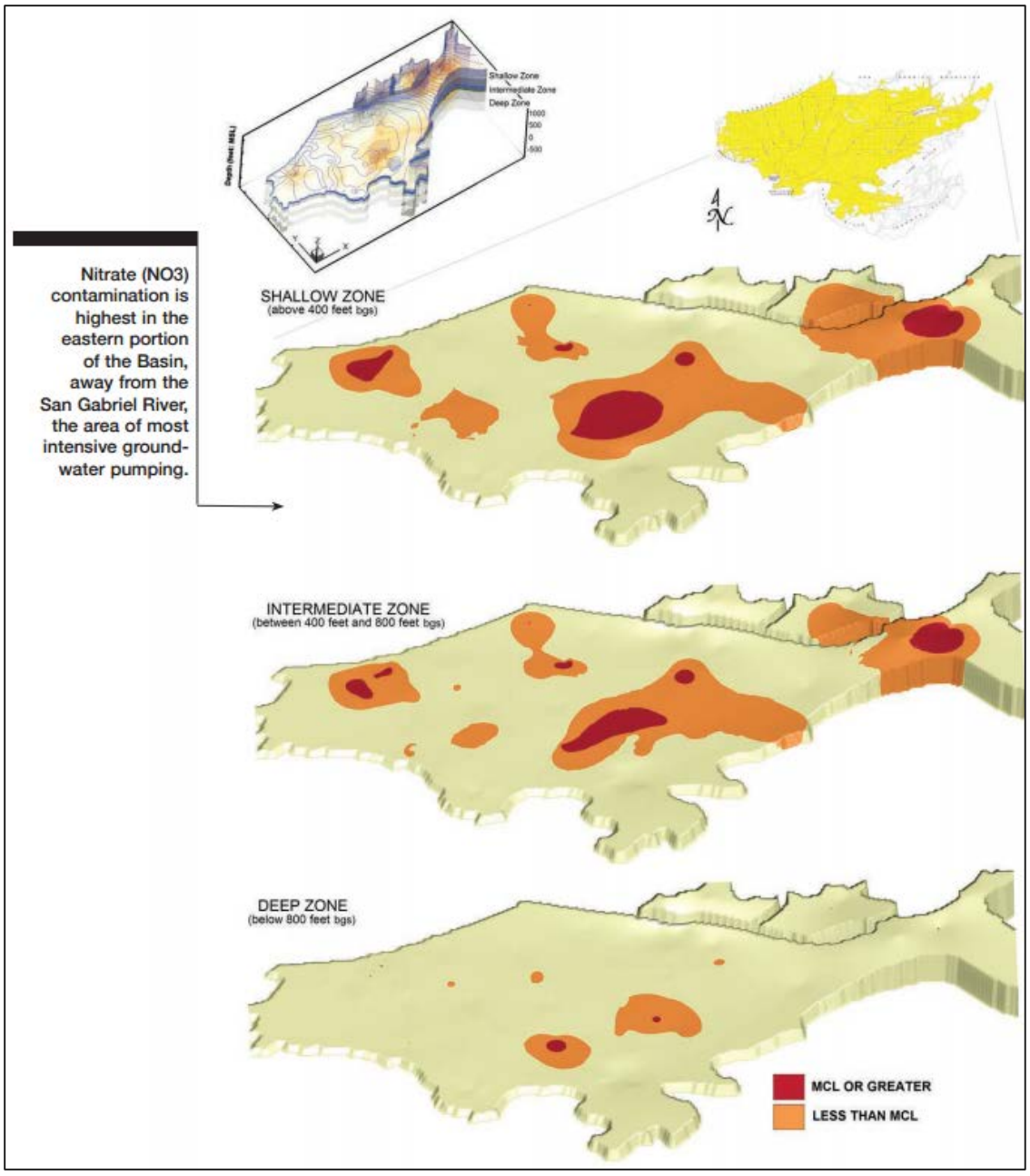


Figure 3-12: Nitrate levels throughout the Main San Gabriel Basin

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.

3.7.3 Normal-Year Reliability Comparison

The water demand forecasting model developed for the Orange County Reliability Study (described in Section 2.4.1), to project the 25-year demand for Orange County water agencies, also isolated the impacts that weather and future climate can have on water demand through the use of a statistical model. The explanatory variables of population, temperature, precipitation, unemployment rate, drought restrictions, and conservation measures were used to create the statistical model. The impacts of hot/dry weather condition are reflected as a percentage increase in water demands from the average condition. The average (normal) demand is represented by the average water demand of 1990 to 2014 (CDM Smith, Final Technical Memorandum #1 of Orange County Reliability Study, April 2016).

MWDOC is 100 percent reliable for normal year demands from 2020 through 2040. 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.

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 imported demands due to a diversified supply and conservation measures limiting and reducing imported demands in the later years.

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

Wholesale: Normal Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040
Supply totals	205,132	216,560	212,509	208,219	207,441
Demand totals	205,132	216,560	212,509	208,219	207,441
Difference	0	0	0	0	0
NOTES: Includes MWDOC Service Area Projected imported M&I and Surface & GW replenishment demands					

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. The water demand forecasting model developed for the Orange County Reliability Study (described in Section 2.4.1) isolated the impacts that weather and future climate can have on water demand through the use of a statistical model. The impacts of hot/dry weather condition are reflected as a percentage increase in water demands from the average condition (1990-2014). For a single dry year condition (FY2013-14), the model projects a six percent increase in demand for the MWDOC's service area (CDM Smith, Final Technical Memorandum #1 of Orange County Reliability Study, April 2016). Detailed information of the model is included in Appendix G.

MWDOC has documented that it is 100 percent reliable for single dry year demands from 2020 through 2040 with a demand increase of six percent from normal demand with significant reserves held by Metropolitan and conservation. A comparison between the supply and the demand in a single dry year is shown in Table 3-14.

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

Wholesale: Single Dry Year Supply and Demand Comparison					
	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
Note: The Single Dry-Year projections estimate a 6% increase on imported M&I and surface water. Groundwater Replenishment remain at 65,000 AF per year.					

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. The water demand forecasting model developed for the Orange County Reliability Study (described in Section 2.4.1) isolated the impacts that weather and future climate can have on water

demand through the use of a statistical model. The impacts of hot/dry weather condition are reflected as a percentage increase in water demands from the average condition (1990-2014). For a single dry year condition (FY2013-14), the model projects a six percent increase in demand for the MWDOC's service area (CDM Smith, Final Technical Memorandum #1 of Orange County Reliability Study, April 2016). It is conservatively assumed that a three-year multi dry year scenario is a repeat of the single dry year over three consecutive years (FY 2011-12 through FY 2013-14).

MWDOC is capable of meeting all customers' demands with significant reserves held by Metropolitan and conservation in multiple dry years from 2020 through 2040 with a demand increase of 6.0 percent from normal condition with significant reserves held by Metropolitan and conservation. The basis of the water year is displayed in Table 3-15.

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

Wholesale: Multiple Dry Years Supply and Demand Comparison						
		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
Note: The Multi Dry-Year projections estimate a 6% increase on imported M&I and surface water. Groundwater Replenishment remain at 65,000 AF per year.						

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. The last BMP Report submitted to the CUWCC is included in Appendix C.

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	√	-	√

Efficiency Measure	Former BMP No.	Applies to:		MWDOC Regional Program
		Retailer	MWDOC as a Wholesaler	
WaterSense Specification toilets (Residential Plumbing Fixture Retrofits(1))	14	√	-	√
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.

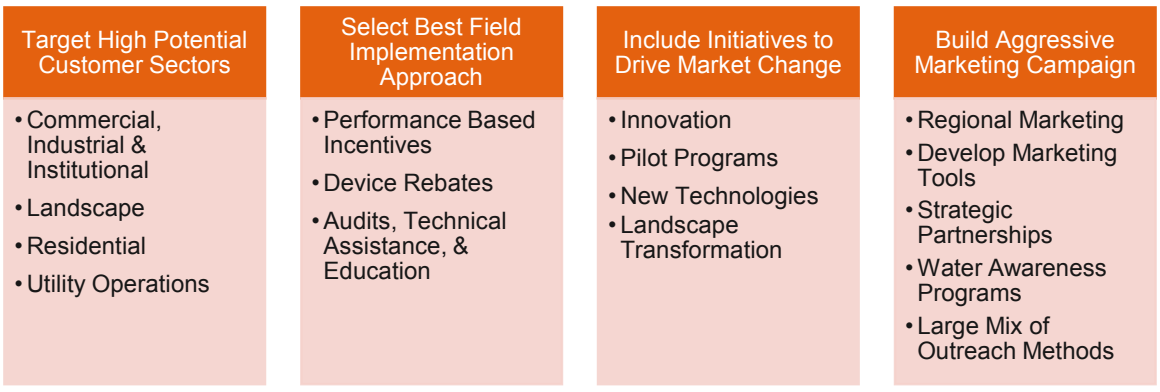


Figure 4-1: Implementation Design Steps

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.

	Field Implementation Approaches		
***Program Segments*:**	**Performance Based Incentives**	**Device Based Incentives**	**Audits, Assistance & Education**
Commercial, Industrial, & Institutional	Industrial Process Pay for Performance Program	**SoCal Water$mart Device Rebates** •ULV Urinals •High Efficiency Toilets •Food Steamers •Ice Machines •pH & Conductivity Controllers •Laminar Flow Restrictors	Hotel Audits Residential Care and Dormitory Audits Future: Restaurant and Hospital Audits
Landscape	Landscape Pay for Performance Program	**SoCal Water$mart Device Rebates (Commercial and Residential)** •Smart Controllers •Large Rotary Nozzles •In-stem Flow Regulators **Public Spaces Program** **Turf Removal Incentive Program**	HOA WaterSmart Landscape Program California Sprinkler Adjustment Notification System Metropolitan program of $200 per AF.
Residential	Single Family -- None Available Multi Family—Landscape planning and future pay for performance.	**SoCal Water$mart Device Rebates** •High Efficiency Washers •High Efficiency Toilets	WaterSmart Software Home Certification Program
Utility Operations	Distribution System Audits and Technical Support Leak Detection and Repair	Budget-Based Rate Technical Assistance Sub-Metering Evaluation	School Education Public Information

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 1-6 about the water cycle, the importance and value of water, and the personal responsibility we all have as environmental stewards.

The School Program features keypad 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.

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 2015-16 school year, more than 60,000 students will be educated through the program.

For the 2015-2016 school year, the Municipal Water District of Orange County also implemented a Water Education School Program in Orange County High Schools for grades 9-12. MWDOC entered into contract with Inside the Outdoors, the Orange County Superintendent of Schools' environmental science program, to administer the program. The target goal for the initial year was to reach 25,000 students.

The program consists of three components: teacher trainings, an online digital platform, and the students' program. The teacher trainings host more than 100 teachers with the goal of teaching them water education and awareness. The topics include water sources, water education, water recycling, watersheds, technological solutions, and water conservation. Due to the current drought conditions in Southern California, water conservation is heavily stressed. They learn about conservation techniques such as irrigation technology, rainwater harvesting, and water recycling.

The online digital platform allow the students to take action by providing them with digital assets that are relevant and meaningful. They are directed to visit The Water Effect website to make a water

conservation pledge. Also, they are encourage to post photographs and conservation related messages on social media using the #thewatereffect.

Each year, MWDOC also holds a Water Education Poster and Slogan Contest and Photography and Digital Arts Contest to increase water awareness. To participate, children in grades K-12 develop posters and slogans that reflect a water awareness message. For the Photography and Digital Arts Contest, which is open to grades 9-12, students submit photographs and digital artwork that also reflects 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 700 poster and slogan entries are received through the contest. During a special judging event, approximately 40 entries 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 entry, a trophy, a certificate, and other fun water-saving prizes. The 2015 winning poster is shown on Figure 4-5.

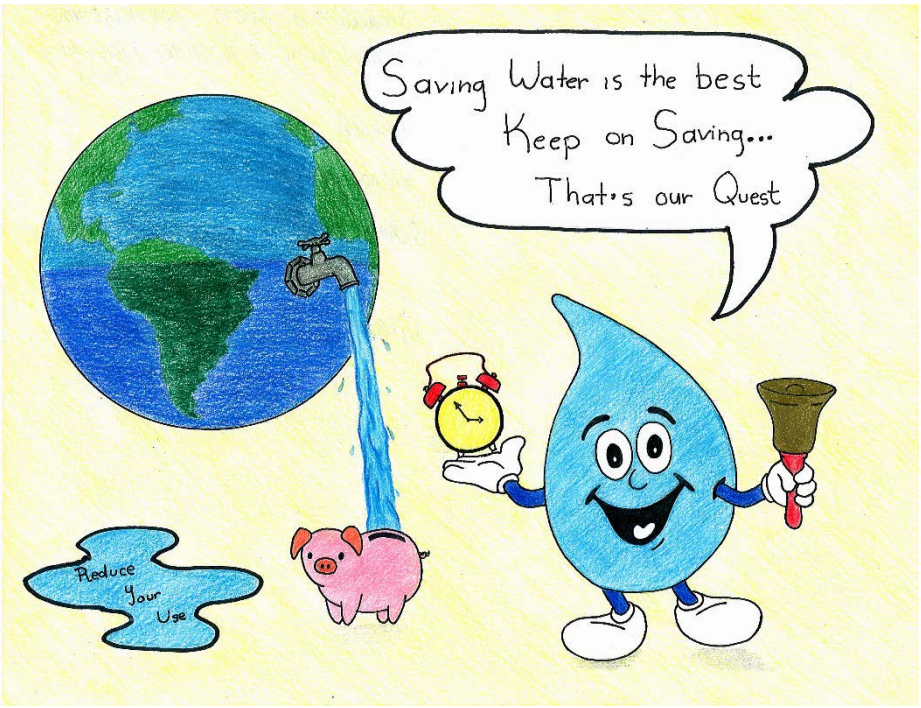


Figure 4-5: 2015 Water Education Poster & Slogan Contest, 4th Grade Winning Poster

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.

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.

MWDOC's WUE department has a long standing practice of conducting regular audits via program process and impact evaluations. The process evaluations are utilized to ensure administrative quality control. An adaptive management approach is taken to implement efficiency practices or to correct for identified process deficiencies. The impact evaluations measure the actual water saving achieved in comparison to the expected industry water savings estimates. Results from impact evaluations have provided insight relating to those devices and programs that yield the best water savings in relationship to program administrative effort, cost effectiveness, and appropriate rebate levels.

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	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	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

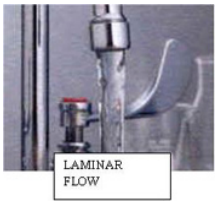
The Water Smart Industrial Program provides engineering surveys to identify water saving process improvements in the Orange County industrial customer base. Additionally it provides Engineering Assistance and Financial incentives to help implement the recommendations from those surveys. This is done 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 AF lifetime 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 by-products. 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 turf grass, 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 (WBIC) 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 (*HEN)*	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 play a factor in the specific stages of retail agency's shortage actions in accordance with their local ordinances. Thus, during past shortages and for the current situation, 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 allocation surcharges imposed on MWDOC by Metropolitan. Below are stages MWDOC and Metropolitan called upon for their Water Shortage Contingency Plan, with the last stage calling for the implementation of Water Supply Allocations.

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 (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 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.

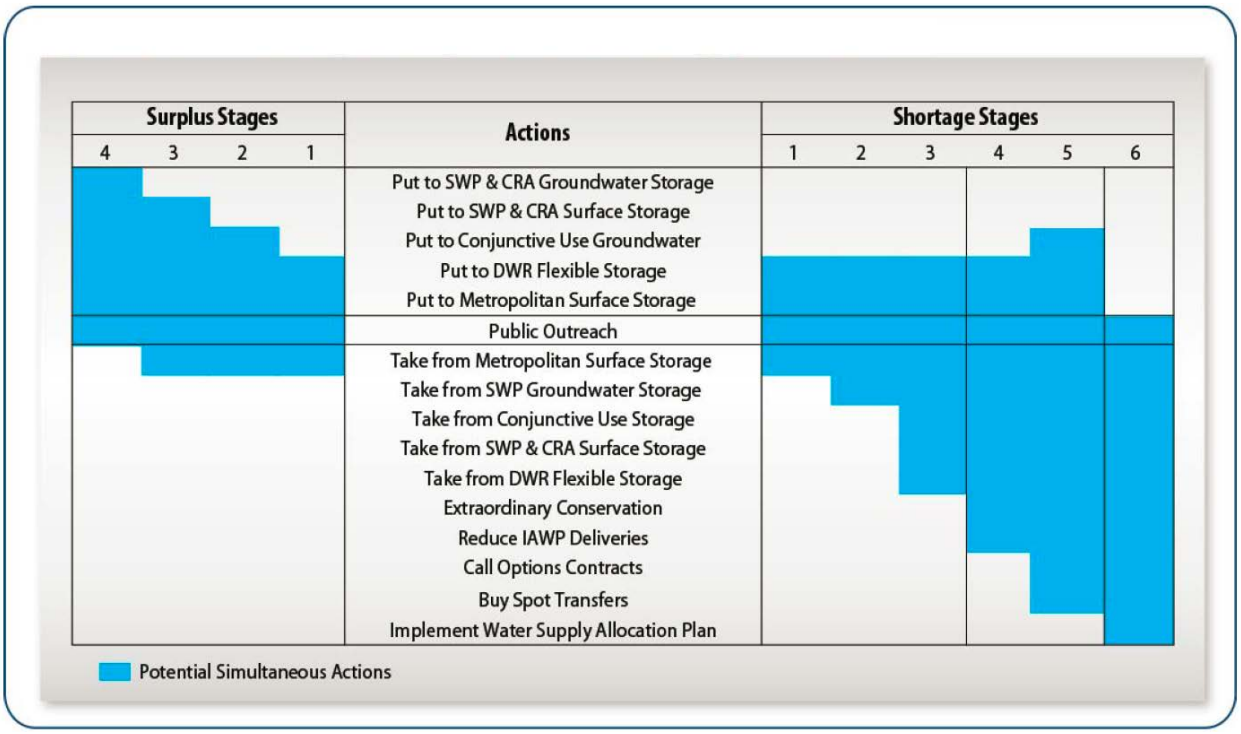


Figure 5-1: Resource Stages, Anticipated Actions, and Supply Declarations

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 an extreme water shortage, within the Metropolitan service area, the implementation of its Water Supply Allocation Plan is recommended.

Metropolitan's Board of Directors adopted the WSAP in February 2008 to fairly distribute a limited amount of water supply 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 current 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 local water supplies.

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 agencies. Moreover, this WSAP reduction level 3 was determined when Metropolitan water supplies from the SWP were at their lowest levels ever delivered and water storage declined more 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 faced in 2014 and 2015, MWDOC estimates it can meet projected imported demands as follows. 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 in 2015-16 is 224,579 AF. It is assumed

this would continue for an additional two years. If the severity of the drought increases, higher levels of curtailment i.e. greater levels of allocations could be needed.

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

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

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 (EOC) 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 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" restrictions 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 collect and evaluate data and report on water usage during such events, such as the Governor's recent mandatory water use reduction requests. 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. Reports prepared from this data allow MWDOC to evaluate the trends of consumption at the retail agency and county 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. As imported water supplies have become more challenged, 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 Discharge

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 MWDOC does not treat or discharge 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 discharge 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 the Aliso Creek Outfall and the 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 nominal capacity of 36.8 MGD which can be increased by pumping 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 discharge 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 discharged 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 discharge 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 discharge 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 uses. 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 7,000 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 discharge 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 discharged 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 discharged 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 discharge, 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 discharge 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 use, 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 discharge 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 reach 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. SMWD is planning to expand the CWRP tertiary capacity from 5 MGD to 10 MGD by 2015, increasing its recycled water supply to 11,200 AFY. The expansion would reduce SMWD's dependency on imported water and provide additional recycled water for irrigation purposes. Because RMV holds riparian water rights for its ranching, agriculture and tenants' uses; RMV and SMWD are looking into an agreement for RMV to potentially provide water in areas of the Ranch Plan to supplement recycled water in the event recycled water is unavailable.

MNWD Plant 3A Expansion - The 3A Treatment Plant Tertiary Expansion Project will provide an additional 3,000 AFY of capacity for recycled water use. The expansion includes the following components: increase the reliability of the aeration system, expand and/or replacing the existing filters with more effective tertiary filters, expand the disinfection system, expand the tertiary effluent pumps, possible upsizing of the discharge pipeline where it connects to SMWD's recycled water distribution system, modification to various in-plant piping and electrical systems, and addition of a standby generator to maintain operation during a power outage. The expansion will increase the local water supply reliability by producing an additional 3,000 AFY of recycled water, reducing dependence on imported water. The expansion will conserve approximately 5,653,000 kWh of energy per year and 3,448,330 pounds of carbon dioxide by producing and distributing recycled water in lieu of imported water. The expansion also benefits MNWD, the project partner.

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 45,280 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 100,000 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;
- Participating in Metropolitan's Foundational Action Funding Program to provide funding for research needed to set the state standards for Direct Potable Reuse (DPR) on AWWA's research Foundation Project.

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 other 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 an average yield of 50,000 AF per year for 50 years that could be produced from the Fenner Valley Groundwater Basin. Cadiz is authorized to pump as much as 75,000 AF per year as long as the average yield over 50 years is 50,000 AF and assuming they are meeting all of the monitoring requirements imposed on the project. If not produced, the water would evaporate from the nearby dry lakes and be lost to productive use. 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 to meet future projected demands as well as projects to improve the County's reliability from Metropolitan's 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 per year 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 (AF)

Recycling Water Projections for Orange County		
	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, which ranges between 7,700 and 8,600 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 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 at that time. MWDOC staff estimated an additional cost of about $500 per AF to get the water integrated into South Orange County.

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 except for the high storm flows.

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 Plan 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 cubic feet per second (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 examine further.

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 accessing previously held water rights in the OC groundwater basin and has elected to move forward with that project instead of ocean desalination. A final decision was reached to secure 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 U.S.

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 Notice)	5/2/16 & 5/9/16	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	5/18/16	Appendix F
Submitted UWMP to DWR	7/1/16	-
Submitted UWMP to the California State Library and cities and county within the supplier's service area	7/1/16	-
Made UWMP available for public review (no later than 30 days after filing with DWR)	8/1/16	-

This UWMP was adopted by the Board of Directors on 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	
☑	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. In addition, MWDOC placed a draft copy of the public on its website on April 4, 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 and on the District website.

A staff report and presentation reviewed the process, key components of the Plan and the conclusions that served as the basis of the 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.

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. The information MWDOC obtained from wastewater collection and treatment providers allows the Plan to describe wastewater discharge 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 May 2016 at the Planning and Operations Committee meeting. The Committee recommended that the Board of Directors approve the 2015 UWMP at its May 18, 2016 meeting. The seven-member MWDOC Board of Directors approved the 2015 UWMP at its May 18, 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

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APPENDIX A

UWMP Checklist

UWMP Checklist

This checklist is developed directly from the Urban Water Management Planning Act and SB X7-7. It is provided to support water suppliers during preparation of their UWMPs. Two versions of the UWMP Checklist are provided – the first one is organized according to the California Water Code and the second checklist according to subject matter. The two checklists contain duplicate information and the water supplier should use whichever checklist is more convenient. In the event that information or recommendations in these tables are inconsistent with, conflict with, or omit the requirements of the Act or applicable laws, the Act or other laws shall prevail.

Each water supplier submitting an UWMP can also provide DWR with the UWMP location of the required element by completing the last column of eitherchecklist. This will support DWR in its review of these UWMPs. The completed form can be included with the UWMP.

If an item does not pertain to a water supplier, then state the UWMP requirement and note that it does not apply to the agency. For example, if a water supplier does not use groundwater as a water supply source, then there should be a statement in the UWMP that groundwater is not a water supply source.

Checklist Arranged by Subject

CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location *(Optional Column for Agency Use)*
10620(b)	Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.	Plan Preparation	Section 2.1	**Section 1.1**
10620(d)(2)	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	Plan Preparation	Section 2.5.2	**Section 8.3**
10642	Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan.	Plan Preparation	Section 2.5.2	**Section 8.2 and Appendix E**
10631(a)	Describe the water supplier service area.	System Description	Section 3.1	**Section 1.3**
10631(a)	Describe the climate of the service area of the supplier.	System Description	Section 3.3	**Section 2.2.1**
10631(a)	Provide population projections for 2020, 2025, 2030, and 2035.	System Description	Section 3.4	**Section 2.2.2**
10631(a)	Describe other demographic factors affecting the supplier's water management planning.	System Description	Section 3.4	**Section 2.2.2**
10631(a)	Indicate the current population of the service area.	System Description and Baselines and Targets	Sections 3.4 and 5.4	**Section 2.2.2**
10631(e)(1)	Quantify past, current, and projected water use, identifying the uses among water use sectors.	System Water Use	Section 4.2	**Section 2.3 and 2.4.2**
10631(e)(3)(A)	Report the distribution system water loss for the most recent 12-month period available.	System Water Use	Section 4.3	**N/A**
10631.1(a)	Include projected water use needed for lower income housing projected in the service area of the supplier.	System Water Use	Section 4.5	**N/A**
10608.20(b)	Retail suppliers shall adopt a 2020 water use target using one of four methods.	Baselines and Targets	Section 5.7 and App E	**N/A**
10608.20(e)	Retail suppliers shall provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along	Baselines and Targets	Chapter 5 and App E	**N/A**

	with the bases for determining those estimates, including references to supporting data.			
10608.22	Retail suppliers' per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use of the 5 year baseline. This does not apply if the suppliers base GPCD is at or below 100.	Baselines and Targets	Section 5.7.2	**N/A**
10608.24(a)	Retail suppliers shall meet their interim target by December 31, 2015.	Baselines and Targets	Section 5.8 and App E	**N/A**
10608.24(d)(2)	If the retail supplier adjusts its compliance GPCD using weather normalization, economic adjustment, or extraordinary events, it shall provide the basis for, and data supporting the adjustment.	Baselines and Targets	Section 5.8.2	**N/A**
10608.36	Wholesale suppliers shall include an assessment of present and proposed future measures, programs, and policies to help their retail water suppliers achieve targeted water use reductions.	Baselines and Targets	Section 5.1	**Section 2.5**
10608.40	Retail suppliers shall report on their progress in meeting their water use targets. The data shall be reported using a standardized form.	Baselines and Targets	Section 5.8 and App E	**N/A**
10631(b)	Identify and quantify the existing and planned sources of water available for 2015, 2020, 2025, 2030, and 2035.	System Supplies	Chapter 6	**Section 2.4.2 and 3.1**
10631(b)	Indicate whether groundwater is an existing or planned source of water available to the supplier.	System Supplies	Section 6.2	**Section 3.3**
10631(b)(1)	Indicate whether a groundwater management plan has been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	System Supplies	Section 6.2.2	**Section 3.3**
10631(b)(2)	Describe the groundwater basin.	System Supplies	Section 6.2.1	**Section 3.3**
10631(b)(2)	Indicate if the basin has been adjudicated and include a copy of the court order or decree and a description of the amount of water the supplier has the legal right to pump.	System Supplies	Section 6.2.2	**Section 3.3**
10631(b)(2)	For unadjudicated basins, indicate whether or not the department has identified the basin as overdrafted, or projected to become overdrafted. Describe efforts by the supplier to eliminate the long-term overdraft condition.	System Supplies	Section 6.2.3	**Section 3.3**
10631(b)(3)	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years	System Supplies	Section 6.2.4	**Section 3.3.10**

10631(b)(4)	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	System Supplies	Sections 6.2 and 6.9	**Section 3.3**
10631(d)	Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.	System Supplies	Section 6.7	**Section 7.2**
10631(g)	Describe the expected future water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and multiple-dry years.	System Supplies	Section 6.8	**Section 7**
10631(h)	Describe desalinated water project opportunities for long-term supply.	System Supplies	Section 6.6	**Section 7.4**
10631(j)	Retail suppliers will include documentation that they have provided their wholesale supplier(s) – if any - with water use projections from that source.	System Supplies	Section 2.5.1	**N/A**
10631(j)	Wholesale suppliers will include documentation that they have provided their urban water suppliers with identification and quantification of the existing and planned sources of water available from the wholesale to the urban supplier during various water year types.	System Supplies	Section 2.5.1	**Section 8**
10633	For wastewater and recycled water, coordinate with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.1	**Section 6.1**
10633(a)	Describe the wastewater collection and treatment systems in the supplier's service area. Include quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.	System Supplies (Recycled Water)	Section 6.5.2	**Section 6.2**
10633(b)	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	System Supplies (Recycled Water)	Section 6.5.2.2	**Section 6.2**
10633(c)	Describe the recycled water currently being used in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.3 and 6.5.4	**Section 6.3**
10633(d)	Describe and quantify the potential uses of recycled water and provide a determination of the technical and economic feasibility of those uses.	System Supplies (Recycled Water)	Section 6.5.4	**Section 6.4**
10633(e)	Describe the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	System Supplies (Recycled Water)	Section 6.5.4	**Section 6.3 and 6.4**
10633(f)	Describe the actions which may be taken to	System Supplies	Section 6.5.5	**Section 6.4**

	encourage the use of recycled water and the projected results of these actions in terms of acre-feet of recycled water used per year.	(Recycled Water)		
10633(g)	Provide a plan for optimizing the use of recycled water in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.5	**Section 6.5**
10620(f)	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	Water Supply Reliability Assessment	Section 7.4	**Section 7.1**
10631(c)(1)	Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage.	Water Supply Reliability Assessment	Section 7.1	**Section 3.7**
10631(c)(1)	Provide data for an average water year, a single dry water year, and multiple dry water years	Water Supply Reliability Assessment	Section 7.2	**Section 3.7.5**
10631(c)(2)	For any water source that may not be available at a consistent level of use, describe plans to supplement or replace that source.	Water Supply Reliability Assessment	Section 7.1	**Section 3.3, 3.7, 4**
10634	Provide information on the quality of existing sources of water available to the supplier and the manner in which water quality affects water management strategies and supply reliability	Water Supply Reliability Assessment	Section 7.1	**Section 3.7.2.3**
10635(a)	Assess the water supply reliability during normal, dry, and multiple dry water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years.	Water Supply Reliability Assessment	Section 7.3	**Section 3.7.5**
10632(a) and 10632(a)(1)	Provide an urban water shortage contingency analysis that specifies stages of action and an outline of specific water supply conditions at each stage.	Water Shortage Contingency Planning	Section 8.1	**Section 5.2**
10632(a)(2)	Provide an estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency.	Water Shortage Contingency Planning	Section 8.9	**Section 5.3**
10632(a)(3)	Identify actions to be undertaken by the urban water supplier in case of a catastrophic interruption of water supplies.	Water Shortage Contingency Planning	Section 8.8	**Section 5.4**
10632(a)(4)	Identify mandatory prohibitions against specific water use practices during water shortages.	Water Shortage Contingency Planning	Section 8.2	**Section 5.5**
10632(a)(5)	Specify consumption reduction methods in the most restrictive stages.	Water Shortage Contingency Planning	Section 8.4	**Section 5.5**
10632(a)(6)	Indicated penalties or charges for excessive use, where applicable.	Water Shortage Contingency Planning	Section 8.3	**Section 5.5**

10632(a)(7)	Provide an analysis of the impacts of each of the actions and conditions in the water shortage contingency analysis on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts.	Water Shortage Contingency Planning	Section 8.6	**Section 5.6**
10632(a)(8)	Provide a draft water shortage contingency resolution or ordinance.	Water Shortage Contingency Planning	Section 8.7	**Appendix D**
10632(a)(9)	Indicate a mechanism for determining actual reductions in water use pursuant to the water shortage contingency analysis.	Water Shortage Contingency Planning	Section 8.5	**Section 5.7**
10631(f)(1)	Retail suppliers shall provide a description of the nature and extent of each demand management measure implemented over the past five years. The description will address specific measures listed in code.	Demand Management Measures	Sections 9.2 and 9.3	**N/A**
10631(f)(2)	Wholesale suppliers shall describe specific demand management measures listed in code, their distribution system asset management program, and supplier assistance program.	Demand Management Measures	Sections 9.1 and 9.3	**Section 4**
10631(i)	CUWCC members may submit their 2013-2014 CUWCC BMP annual reports in lieu of, or in addition to, describing the DMM implementation in their UWMPs. This option is only allowable if the supplier has been found to be in full compliance with the CUWCC MOU.	Demand Management Measures	Section 9.5	**Appendix C**
10608.26(a)	Retail suppliers shall conduct a public hearing to discuss adoption, implementation, and economic impact of water use targets.	Plan Adoption, Submittal, and Implementation	Section 10.3	**Section 8.2**
10621(b)	Notify, at least 60 days prior to the public hearing, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.	Plan Adoption, Submittal, and Implementation	Section 10.2.1	**Appendix E**
10621(d)	Each urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016.	Plan Adoption, Submittal, and Implementation	Sections 10.3.1 and 10.4	**Section 8.4.2**
10635(b)	Provide supporting documentation that Water Shortage Contingency Plan has been, or will be, provided to any city or county within which it provides water, no later than 60 days after the submission of the plan to DWR.	Plan Adoption, Submittal, and Implementation	Section 10.4.4	**Section 8.4.2**
10642	Provide supporting documentation that the urban water supplier made the plan available for public inspection, published notice of the public hearing, and held a public hearing	Plan Adoption, Submittal, and Implementation	Sections 10.2.2, 10.3, and 10.5	**Section 8.2**

	about the plan.			
10642	The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water.	Plan Adoption, Submittal, and Implementation	Sections 10.2.1	**Appendix E**
10642	Provide supporting documentation that the plan has been adopted as prepared or modified.	Plan Adoption, Submittal, and Implementation	Section 10.3.1	**Appendix F**
10644(a)	Provide supporting documentation that the urban water supplier has submitted this UWMP to the California State Library.	Plan Adoption, Submittal, and Implementation	Section 10.4.3	**Section 8.4.2**
10644(a)(1)	Provide supporting documentation that the urban water supplier has submitted this UWMP to any city or county within which the supplier provides water no later than 30 days after adoption.	Plan Adoption, Submittal, and Implementation	Section 10.4.4	**Section 8.3**
10644(a)(2)	The plan, or amendments to the plan, submitted to the department shall be submitted electronically.	Plan Adoption, Submittal, and Implementation	Sections 10.4.1 and 10.4.2	**Section 8.4.2**
10645	**Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the supplier has or will make the plan available for public review during normal business hours.**	**Plan Adoption, Submittal, and Implementation**	**Section 10.5**	**Section 8**

APPENDIX B

Standardized Tables

Table 2-2: Plan Identification			
Select Only One	**Type of Plan**		**Name of RUWMP or Regional Alliance** *if applicable* *drop down list*
☑	**Individual UWMP**		
	☐	Water Supplier is also a member of a RUWMP	
	☑		Orange County 20x2020 Regional Alliance
☐	**Regional Urban Water Management Plan (RUWMP)**		
NOTES:			

Table 2-3: 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:	

Table 2-4 Wholesale: Water Supplier Information Exchange (select one)	
☑	Supplier has informed more than 10 other water suppliers of water supplies available in accordance with CWC 10631. Completion of the table below is optional. If not completed include a list of the water suppliers that were informed. **Provide page number for location of the list.**
Appendix E	
☐	Supplier has informed 10 or fewer other water suppliers of water supplies available in accordance with CWC 10631. **Complete the table below.**

Table 3-1 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						

Table 4-1 Wholesale: Demands for Potable and Raw Water - Actual		
Use Type *(Add additional rows as needed)*	2015 Actual	
Use Drop down list *May select each use multiple times* *These are the only use types that will be recognized by the WUE data online submittal tool*	Level of Treatment When Delivered *Drop down list*	Volume
Sales to other agencies	Drinking Water	158,664
Groundwater recharge	Drinking Water	66,844
	TOTAL	225,508
NOTES:		

Table 4-2 Wholesale: Demands for Potable and Raw Water - Projected					
Use Type *(Add additional rows as needed)*	Projected Water Use *Report To the Extent that Records are Available*				
Drop down list *May select each use multiple times These are the only Use Types that will be recognized by the WUEdata online submittal tool.*	2020	2025	2030	2035	2040
Sales to other agencies	132,826	144,254	140,203	135,913	135,135
Groundwater recharge	72,306	72,306	72,306	72,306	72,306
TOTAL	205,132	216,560	212,509	208,219	207,441
NOTES:					

Table 4-3 Wholesale: Total Water Demands						
	2015	2020	2025	2030	2035	2040
Potable and Raw Water *From Tables 4-1 and 4-2*	225,508	205,132	216,560	212,509	208,219	207,441
Recycled Water Demand *From Table 6-4*	0	0	0	0	0	0
TOTAL WATER DEMAND	225,508	205,132	216,560	212,509	208,219	207,441
NOTES:						

Table 5-1 Baselines and Targets Summary *Retail Agency or Regional Alliance Only*					
Baseline Period	Start Year	End Year	Average Baseline GPCD*	2015 Interim Target *	Confirmed 2020 Target*
10-15 year	*1996*	*2005*	*190*	*176*	*158*
5 Year	*2004*	*2008*	*185*		
*All values are in Gallons per Capita per Day (GPCD)					
NOTES:					

Table 5-2: 2015 Compliance *Retail Agency or Regional Alliance Only**		
Actual 2015 GPCD	2015 Interim Target GPCD	Did Supplier Achieve Targeted Reduction for 2015? Y/N
125	176	Yes
**All values are in Gallons per Capita per*		
NOTES:		

Table 6-1 Wholesale: Groundwater Volume Pumped	
☑	Supplier does not pump groundwater. The supplier will not complete the table below.

Table 6-3 Wholesale: Wastewater Treatment and Discharge Within Service Area in 2015	
☑	Wholesale supplier does not provide supplemental treatment to recycled water it distributes. The supplier will not complete the table below.

Table 6-4 Wholesale: Current and Projected Retailers Provided Recycled Water Within Service Area	
☑	Recycled water is not directly treated or distributed by the supplier. The supplier will not complete the table below.

Table 6-5 Wholesale: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual	
☑	Recycled water was not used or distributed by the supplier in 2010, nor projected for use or distribution in 2015. The wholesale supplier will not complete the table below.

Table 6-7 Wholesale: Expected Future Water Supply Projects or Programs	
☑	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.

Table 6-8 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	GW Recharge	58,617	Raw Water
Purchased or Imported Water	Surface Storage	8,227	Raw Water
	Total	225,508	
NOTES:			

Table 6-9 Wholesale: Water Supplies — Projected						
Water Supply	Additional Detail on Water Supply	Projected Water Supply *Report To the Extent Practicable*				
		2020	2025	2030	2035	2040
		Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume
Purchased or Imported Water	Purchased from Metropolitan	132,826	144,254	140,203	135,913	135,135
Purchased or Imported Water	GW Recharge	65,000	65,000	65,000	65,000	65,000
Purchased or Imported Water	Surface Storage	7,306	7,306	7,306	7,306	7,306
	Total	205,132	216,560	212,509	208,219	207,441
NOTES:						

Table 7-1 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	1990-2014		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%
NOTES: 1) 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.			

Table 7-2 Wholesale: Normal Year Supply and Demand Comparison					
	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 fm 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					

Table 7-3 Wholesale: Single Dry Year Supply and Demand Comparison					
	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					

Table 7-4 Wholesale: Multiple Dry Years Supply and Demand Comparison						
		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		225,215	220,921	216,374	215,549
	Demand totals	0	225,215	220,921	216,374	215,549
	Difference	0	0	0	0	0
Third year	Supply totals	0	225,215	220,921	216,374	215,549
	Demand totals	0	225,215	220,921	216,374	215,549
	Difference	0	0	0	0	0
NOTES: OC Reliability Study						

Table 8-1 Wholesale Stages of Water Shortage Contingency Plan		
Stage	Complete Both	
	Supply Reduction[1]	Water Supply Condition (*Narrative description)*
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	1990-2014	
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
[1] *One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.*		
NOTES: See discussion on Metropolitan's and MWDOC water shortage actions, such as		

Table 8-4 Wholesale: Minimum Supply Next Three Years			
	2016	2017	2018
Available Water Supply	224,579	224,579	224,579
NOTES: MWDOC Water Shortage Allocation Model March 2015			

Table 10-1 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.**
Section 8	Provide the page or location of this list in the UWMP.

APPENDIX C

2012 BMP Report

CUWCC BMP Wholesale Coverage Report 2012

Foundational Best Manegemant Practices for Urban Water Efficiency

Foundational BMPs

BMP 1.1.3 Wholesale Agency Assistance Programs

168 Municipal Water District of Orange County

Name: Joe Berg Email: jberg@mwdoc.com

a) Financial Investments and Building Partnerships

BMP Section	Monetary Amount for Financial Incentives	Monetary Amount for Equivalent Resources	
BMP 1.1 Operation Practices	7948.84	0	
BMP 1.2 Wate Loss Control	7948.84	0	
BMP 1.3 Metering with Commodity	3974.42	10000	
BMP 1.4 Retail Conservation Pricing	11923.26	131705	
BMP 2.1 Public Outreach	71539.56	0	
BMP 2.2 School Education Program	23846.52	0	
BMP 3 Residential	60554.71	0	
BMP 4 CII	102477.97	235862	
BMP 5 Landscape	222300.89	799939	

On Track

b) Technical Support

Not On Track

c) Retail Agency

Retail Agency Name	Program Description
	See uploaded document titled BMP 1-Operations Practices FY11-12-Wholesale for Program Management efforts.

Not On Track

d) Water Shortage Allocation

Adoption Date:

File Name: See uploaded document titled BMP 1-Operations Practices FY11-12-Wholesale for Water Shortage Allocation efforts.

On Track

e) Non signatory Reporting of BMP implementation by non-signatory Agencies

See uploaded document for this BMP

f) Encourage CUWCC Membership List Efforts to Recuit Retailers

CUWCC BMP Wholesale Coverage Report **2012**

Foundational Best Manegemant Practices for Urban Water Efficiency

Foundational BMPs

BMP 1.1.3 Wholesale Agency Assistance Programs

Not On Track

CUWCC BMP Coverage Report 2012

Foundational Best Management Practices for Urban Water Efficiency

Foundational BMPs

BMP 1.2 Water Loss Control

168 Municipal Water District of Orange County

	No	Not On Track	88
Complete Standard Water Audit using AWWA software?	No		Comp
AWWA file provided to CUWCC?			AWV
Municipal Water District of Orange County BMP1.2 FY12			City
AWWA Water Audit Validity Score?			AWV
Complete Training in AWWA Audit Method?			Com
Complete Training in Component Analysis Process?			Com
CompComponent Analisys?		Not On Track	Com
Repaired all leaks and breaks to the extent cost effective?	No	Not On Track	Repa cost
Locate and repar unreported leaks to the extent cost effective?			Loca cost
Maintain a record-keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.		Not On Track	Main leak pipe repa
Provided 7 types of Water Loss Control Info			Prov

Leaks Repars	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost of Interventions	Water Saved (AF)	Lea Rep
136482	211390544.615	167427428.556	50835.092		177774288.642	228827.386	

Not On Track

At LeastAs Effective As	At L
In lieu of an active leak detection program, the City has opted to replace 1% of distribution system lines each year. Lines are replaced based on age and other asset management factors. Attached documentation shows the reduction in main breaks due to Municipal Water District of Orange County 168 BMP 1.2 Results from Main Replacement Program	In lie Line redu
We encourage them every year to join.	We

Not On Track

CUWCC BMP Coverage Report 2011

Foundational Best Manegemant Practices for Urban Water Efficiency

Foundational BMPs

BMP 1.2 Water Loss Control

88 City of Santa Barbara, PWD 88

BMP 1.3 Metering With Commodity

2012

Agency name:	Municipal Water District of Orange County	Reporting unit number:	
Reporting unit name (District name)	Municipal Water District of Orange County	168	

Implementation

Does your agency have any unmetered service connections?	No
If YES, has your agency completed a meter retrofit plan?	No
Enter the number of previously unmetered accounts fitted with meters during reporting year:	
Are all new service connections being metered?	Yes
Are all new service connections being billed volumetrically?	Yes
Has your agency completed and submitted electronically to the Council a written plan, policy or program to test, repair and replace meters?	No

Meters Matrix

Error: Subreport could not be shown.

Number of CII Accounts with Mixed-use Meters	0	Number of CII Accounts with Mixed-use Meters Retrofitted with Dedicated Irrigation Meters during Reporting Period	0

Feasibility Study

Has your agency conducted a feasibility study to assess the merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters? No

If YES, please fill in the following information:

A. When was the Feasibility Study conducted	1/1/0001 12:00:00 AM	B. Describe,	
		upload or provide an electronic link to the Feasibility Study Upload File	

Comments:

As a wholesale MWD member agency, MWDOC does not own/operate a distribution system including water meters. Water is served directly from MWD's distribution system to the MWDOC member agency distribution systems. MWD owns, calibrates & repairs meters.

CUWCC BMP Coverage Report 2012

Foundational Best Manegemant Practices for Urban Water Efficiency

Foundational BMPs

BMP 2.1 Public Outreach

168 Municipal Water District of Orange County Wholesale Only

Does Agency help any retail Agency implement Public Outreach Programs? Yes

List of retail Agencies

	Public Outreach Program List	Number
	General water conservation information	25000
	Flyers and/or brochures (total copies), bill stuffers, messages printed on bill, information packets	631700
	Website	38000
	Newsletter articles on conservation	72800
	Email Messages	555
	Total	**768055**
		On Track

	Number Media Contacts	Number
	Articles or stories resulting from outreach	12
	Editorial board visits	1
	News releases	10
	Newspaper contacts	24
	Radio contacts	2
	Television contacts	5
	Total	**54**
		On Track

An actively maintained website that is updated regularly (minimum = 4 times per year, i.e., at least quarterly) Yes

	Annual Budget Category	Annual Budget Amount
	Total Public Information Budget	254909
	Water Use Efficiency Marketing Budget	40000
	Total Amount:	**294909**
		On Track

Description of all other Public Outreach programs

Rebate and incentive information; California Friendly landscape training class info; water use efficiency reports and studies; surface soil textures map; water use efficiency tips; home water use calculator; native plant resources; irrigation info.

On Track

CUWCC BMP Coverage Report 2012

Foundational Best Manegemant Practices for Urban Water Efficiency

Foundational BMPs

BMP 2.1 Public Outreach

At Least As Effective As **No**

BMP 2.1 Public Outreach

2012

Agency name:	Municipal Water District of Orange County	Reporting unit #	168
Reporting unit name (District name)	Municipal Water District of Orange County	/	Wholesale Only

Does Agency help any retail Agency implement Public Outreach Programs? Yes

List of retail Agencies — Please provide the name of Agency if not CUWCC Group1 members

Is your agency performing public outreach?

Report a minimum of 4 water conservation related contacts your agency had with the public during the year.

Did at least one contact take place duringeach quarter of the reporting year? No

Public Information Programs List

Number of Public Contacts	Public Information Programs Name	
25000	General water conservation information	
631700	Flyers and/or brochures (total copies), bill stuffers, messages printed on bill, information packets	
38000	Website	
72800	Newsletter articles on conservation	
555	Email Messages	

Contact with the Media

Does Agency help any retail Agency implement Public Outreach Programs? Yes

List of retail Agencies — Please provide the name of Agency if not CUWCC Group1 members

OR Retail Agency (Contacts with the Media)

Did at least one contact take place during each quarter of the reporting year? Yes

Media Contacts List

Number of Media Contacts	Public Outreach Media Contact Name List	
12	Articles or stories resulting from outreach	
1	Editorial board visits	
10	News releases	
24	Newspaper contacts	

BMP 2.1 Public Outreach

2012

2	Radio contacts	
5	Television contacts	

Does Agency help any retail Agency implement Public Outreach Programs? No

List of retail Agencies — Please provide the name of Agency if not CUWCC Group1 members

Is Your Agency Performing Website Updates?

Enter your agency's URL (website address):	www.mwdoc.com
Describe a minimum of four water conservationrelated updates to your agency's website thattook place during the year:	Rebate and incentive information; California Friendly landscape training class info; water use efficiency reports and studies; surface soil textures map; water use efficiency tips; home water use calculator; native plant resources; irrigation info.

Did at least one Website Update take place duringeach quarter of the reporting year? Yes

Public Outreach Annual Budget

Enter budget for public outreach programs. You may enter total budget in a single line or brake the budget into discretecategories by entering many rows. Please indicate if personnel costs are included in the entry.

Annual Budget Category	Annual Budget Amount	Personal Cost Included?	Comments	
Total Public Information Budget	254909	V		
Water Use Efficiency Marketing Budget	40000			

Public Outreach Expenses

Enter expenses for public outreach programs. Please include the same kind of expenses you included in the question relatedto your budget (Section 2.1.7, above). For example, if you included personnel costs in the budget entered above, be sure to include them here as well.

Public Outreach Expense Category	Expense Amount	Personal Cost Included?	
Professional service fees	45000		
Postage fees	1000		
Reproduction expenses	19000		

BMP 2.1 Public Outreach

2012

Miscellaneous expenses	33500		
Salaries wages and benefits	156409	V	
Water use efficiency marketing activities	40000		

Additional Public Information Program

Please report additional public information contacts. List these additional contacts in order of howyour agency views their importance / effectiveness with respect to conserving water, with the mostimportant/ effective listed first (where 1 = most important).

Were there additional Public Outreach efforts? Yes

Public Outreach Additional Information

Social Marketing Programs

Branding

Does your agency have a water conservation"brand," "theme" or mascot? Yes

Describe the brand, theme or mascot. Our mascot is an animated, life-size water drop character named Ricki the Rambunctious Raindrop. He educates children of all ages about water and how to use it wisely.

Market Research

Have you sponsored or participated inmarket research to refine your message? No

Market Research Topic

Brand Message

Brand Mission Statement

Community Committees

Do you have a community conservationcommittee? No

Enter the names of the community committees:

Training

Social Marketing Expenditures

Public Outreach Social Marketing Expenses

Partnering Programs - Partners

Name	Type of Program
CLCA?	
Green Building Programs?	

BMP 2.1 Public Outreach

2012

☐	Master Gardeners?	
☐	Cooperative Extension?	
☐	Local Colleges?	
V	Other	Orange County Garden Friendly Program

☐ Retail and wholesale outlet; name(s) and type(s) of programs:

Partnering Programs - Newsletters

Number of newsletters per year	5
Number of customers per year	25000

Partnering with Other Utilities

Describe other utilities your agency partners with, including electrical utilities	County of Orange- OC Stormwater Program; UC Cooperative Extension

Conservation Gardens

Describe water conservation gardens at your agency or other high traffic areas or new homes	

Landscape contests or awards

Describe water wise landscape contest or awards program conducted by your agency	
Additional Programs supported by Agency but not mentioned above:	

Comments

CUWCC BMP Coverage Report 2012

Foundational Best Manegemant Practices for Urban Water Efficiency

Foundational BMPs

BMP 2.2 School Education Programs

168 Municipal Water District of Orange County — Wholesale Only

Does Agency help any retail Agency implement School Education Programs? Yes

List of retail Agencies

City of Anaheim, PUD

Materials meet state education framework requirements and are grade-level appropriate? Yes

Curriculum materials developed and/or provided by Agency:

All lessons are aligned with the California Science Content Standards to achieve the state education framework requirements.

Materials Distributed to K-6? Yes

Describe K-6 Materials

Grade-specific education booklets featuring mascot Ricki the Rambunctious Raindrop. Booklets contain lessons and hands-on activities that are designed to reinforce and augment the concepts taught in the large group assemblies (described below).

Materials distributed to 7-12 students? No (Info Only)

Annual budget for school education program: 201631.00

Description of all other water supplier education programs

All lessons are aligned with the California Science Content Standards to achieve the state education framework requirements. Grade-specific education booklets featuring mascot Ricki the Rambunctious Raindrop. Booklets contain lessons and hands-on activities that are designed to reinforce and augment the concepts taught in the large group assemblies (described below). OC Water Hero Program (described below) The O.C. Water Hero Program enables students to become official water heroes by pledging to save 20 gallons of water per day. Participants receive an OC Water Hero kit with fun water-saving items, like a 5-minute shower timer, "fix-it" tickets, etc. Annual Poster & Slogan Contest wherein K-6 grade students submit original, hand-drawn posters and short slogans that reflect water conservation messages. 30 winning students are selected and invited to a special awards ceremony with Ricki Raindrop.

On Track

At Least As Effective As **No**

WMP 2.2 School Education Programs

2012

School Education Programs

168 Municipal Water District of Orange County

Wholesale Only

Does Agency help any retail Agency implement School Education Programs? Yes

List of retail Agencies

City of Anaheim, PUD

Please provide the name of Agency if not FORTECH Group1 members

V	Materials meet state education framework requirements?	Description	All lessons are aligned with the California Science Content Standards to achieve the state education framework requirements.
V	Materials distributed to K-6 Students?	Description	Grade-specific education booklets featuring mascot Ricki the Rambunctious Raindrop. Booklets contain lessons and hands-on activities that are designed to reinforce and augment the concepts taught in the large group assemblies (described below).
	Number of students reached		78525
	Materials distributed to 7-12 Students? (optional)	Description	

Annual budget for school education program: 201631.00

Description of all other water supplier educationprograms: OC Water Hero Program (described below)

School Programs Activities

Classroom Presentation:

Number of presentation: 0 Number of attendees: 0

Describe the topics covered in your classroom presentations: n/a

Large group assemblies:

Number of presentation: 1033 Number of attendees: 78525

Children's water festivals or other events:

Number of presentation: 14 Number of attendees: 500

Cooperative efforts with existing science/water education programs (various workshops, science fair awardsor judging) and follow-up:

Number of presentation: Number of attendees:

Other methods of disseminating information (i.e. themed age-appropriate classroom loaner kits):

Description: Number distributed:

Staffing children's booths at events & festivals:

Number of booths: 28 Number of attendees: 5500

Water conservation contests such as poster and photo:

Description: Number of participants:

Offer monetary awards/funding or scholarships to students:

WMP 2.2 School Education Programs

2012

Number offered	0	Total funding	0.00

Teacher training workshops:

Number of presentation	1	Number of attendees	32

Fund and/or staff student field trips to treatment facilities, recycling facilities, water conservation gardens,etc.:

Number of tours or fieldtrips	0	Number of participants	0

College internships in water conservation offered:

Number of internship	2	Total funding	24000.0

Career Fairs / Workshops:

Number of presentation	0	Number of attendees	0

Additional program(s) supported by agency but not mentioned above:

Description	Number of events	Number of participants

Comments

APPENDIX D

MWDOC Water Supply Allocation Plan

Municipal Water District of Orange County

Water Supply Allocation Plan

DRAFT
Revised 2016

Table of Contents

List of Tables and Figures

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FIGURES

Section 1: Introduction

The Municipal Water District of Orange County (MWDOC) is dedicated to ensuring water reliability for the communities we serve. Hundreds of thousands of Orange County residents have taken advantage of our water conservation rebates to install water saving toilets, clothes washers, and other water saving devices. We continue to partner with our client agencies to develop new local supplies such as recycled water, brackish water desalting, ocean water desalination, and the Groundwater Replenishment System.

However, a combination of water supply challenges have brought about the possibility that MWDOC may not have access to the imported supplies necessary to meet the demands of its client agencies in the coming years. The following factors have dramatically impacted water supply conditions not only in Orange County, but all of Southern California:

- In CY 2013 many areas of California experienced the driest year on record. California received record low snowpack in FY 2014-15. On January 17, 2014, Governor Brown proclaimed a statewide drought emergency. On May 5, 2015, the State Water Resources Control Board adopted an emergency conservation regulations in accordance with the Governor's directive. The provisions of the emergency regulations went into effect on May 18, 2015. On February 2, 2016, the SWRCB will consider a resolution to extend the existing May 2015 Emergency Regulation as directed in the November 2015 executive order.

- The Colorado River is recovering from a long-term drought. Reservoirs along the river are less than half full. In the summer of 2015, Lake Mead water levels reached record lows. Supplies from this source have been reduced since 2003 and will continue to be limited.

To meet the imported water demands of its member agencies, the Metropolitan Water District of Southern California (MET) is quickly withdrawing supplies from surface and groundwater storage. Over the past three years, MET has drawn down 67% of its available reserves.

The recent dry conditions and the uncertainty about future supplies from the State Water Project have raised the possibility that MET will not have access to the supplies necessary to meet the imported water demands of its member agencies. As a result, MET has developed a Water Supply Allocation Plan that allocates wholesale imported water supplies among its 26 member agencies throughout Southern California.

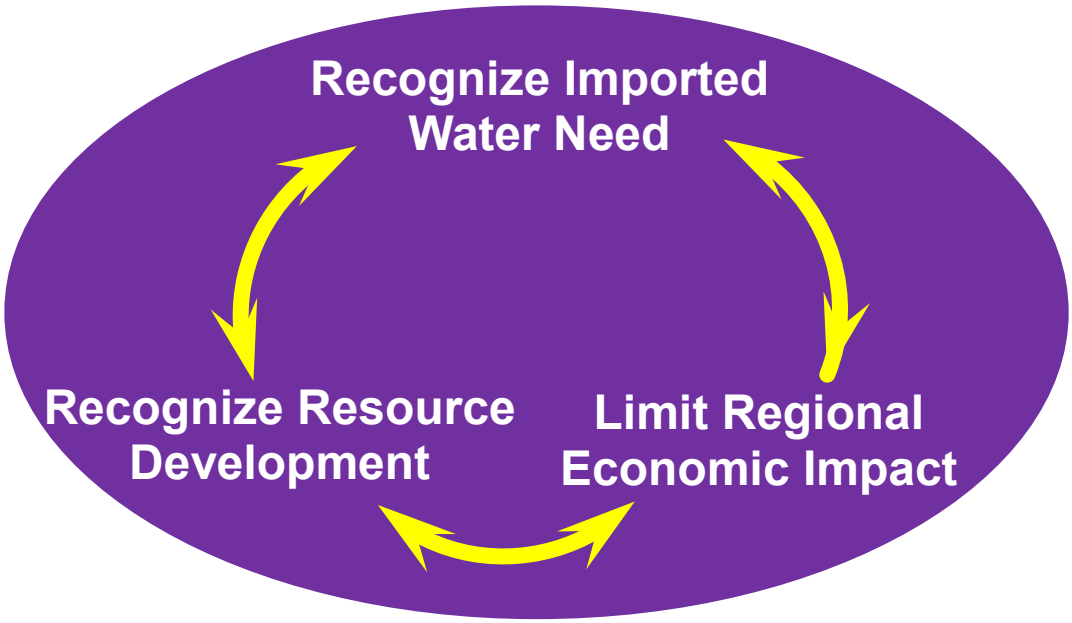
To prepare for the possibility of an allocation of imported water supplies from MET, MWDOC has worked in collaboration with its 28 client agencies to develop this Water Supply Allocation Plan to allocate imported water supplies at the retail level. This document lays out the essential components of how MWDOC plans to determine and implement each agency’s allocation during a time of shortage.

Section 2: Metropolitan Water District's Water Supply Allocation Plan

In February 2008, MET approved a Water Supply Allocation Plan (WSAP) designed to allocate imported water to all of its member agencies during a shortage. In June 2014 MET convened a member agency working group to revisit the WSAP. The purpose of the working group was to collaborate with member agencies to identify potential revisions to the WSAP in preparation for mandatory supply allocations in 2015. There were eight working group meetings and three discussions at the monthly Member Agency Managers' Meetings. The WSAP follows the principles and considerations identified in MET's Water Surplus and Drought Management Plan, which calls upon the allocation of water in a fair and equitable manner to all of MET's member agencies. To the extent possible, this means developing a plan that minimizes regional hardship during times of shortage.

The MET WSAP seeks to balance the impacts of a shortage at the retail level while maintaining equity on the wholesale level. To achieve this, it takes into account:

- The impact to retail customers and the economy
- Allowance for population and growth
- Change and/or loss of local supply
- Reclamation/Recycling
- Conservation
- Investments in local resources
- Investments in MET's facilities



The WSAP states that MET staff will go before the Board with a recommendation in April, from which the Board of Directors will make a determination on the level of the Regional Shortage. If the Board determines allocations are necessary, they will go into effect in July and remain for a twelve-month period. *Note: This schedule is at the discretion of the MET Board, and is subject to change.*

The recommendation to declare a regional shortage will be based upon water supply availability from the State Water Project, the Colorado River Aqueduct, and the amount of surface and groundwater storage remaining in MET's reserves. It will also take into account the implementation of MET's water management actions i.e. Five Year Water Supply Plan, extraordinary conservation efforts, the acceleration of local resource projects, and the purchases of water transfers.

A full copy of MET's Water Supply Allocation Plan as revised in December 2014 is available in Appendix B.

Section 3: Development Process

In preparation for possible allocation of imported water supplies from MET, MWDOC's Board first adopted the following policy principles to help guide staff and the client agency technical workgroup to develop a plan that is fair and equitable for everyone within its service area:

- **Seek best allocation available from MET**
- **Develop MWDOC Plan in collaboration with client agencies**
- **When reasonable, use similar method/approach as MET**
- **When MET's method would produce significant unintended result, use an alternative approach**
- **Develop accurate data on local supply, conservation, recycling, rate structures, growth and other relevant adjustment factors**
- **Seek opportunities within MWDOC service area to provide mutually beneficial shortage mitigation**

Client Agency Input

Between the months of September and January of 2014-15, MWDOC staff worked cooperatively with the client agencies through a series of technical workgroups to develop a formula and implementation plan to allocate imported supplies in the event that MET declares a regional shortage. These workgroups provided an arena for in-depth discussion of the objectives, mechanics, and policy aspects of the different parts of the Plan. MWDOC staff also met individually with a number of client agencies for detailed discussions on elements of the Plan. The discussions, suggestions, and comments expressed by the client agencies during this process played a key part in the development of this Plan.

The following MWDOC client agencies participated in the Technical Workgroup:

- **City of Buena Park**
- **City of Fountain Valley**
- **City of Garden Grove**
- **City of Huntington Beach**
- **City of Newport Beach**
- **City of Orange**
- **City of San Clemente**
- **City of San Juan Capistrano**
- **City of Tustin**
- **City of Westminster**
- **East Orange County Water District**
- **El Toro Water District**
- **Golden State Water Co.**
- **Irvine Ranch Water District**
- **Laguna Beach County Water District**

- **Mesa Water District**
- **Moulton Niguel Water District**
- **Orange County Water District**
- **Serrano Water District**
- **Santa Margarita Water District**
- **South Coast Water District**
- **Trabuco Canyon Water District**
- **Yorba Linda Water District**

In addition to the workshops, individual meetings were held between MWDOC staff and the following MWDOC client agencies to address more specific and agency-related questions.

These individual meetings provided MWDOC staff with a great deal of insight on exactly how a retail agency would implement allocations at the customer level. Such information was extremely valuable in our regional discussion at MET and in the development of this Plan.

Board of Directors Input

Throughout the Plan's development process, the MWDOC Board of Directors was provided with regular progress reports on the status of the Plan and the technical workgroup discussions. During the months the Plan was being developed, the Board Planning and Operations Committee was kept apprised of key issues regarding MET's and MWDOC's allocation plan. Moreover, the Committee played an integral part in the development of key implementation issues such as the appeal process and the surcharge rate structure.

Section 4: Water Supply Allocation Formula

The MWDOC Water Supply Allocation Model follows five (5) basic steps to determine an agency's imported supply allocation:

- Step 1: Determine Baseline Information
- Step 2: Establish Allocation Year Information
- Step 3: Assess the Shortage Reduction Stage (Based on MET's Declared Shortage Level)
- Step 4: Apply Allocation Adjustments and Credits in the areas of retail impacts, conservation, groundwater recharge.
- Step 5: Sum total allocations and determine retail reliability

A description of how the calculation is used in each step is described below:

Step 1 – Determine Baseline Information

In order to determine a client agency's retail demands and imported supply needs in the allocation year, the model needs to establish a historical base period for water supply and delivery data. The base period for each of the different categories of demands and supplies is calculated using data from fiscal years (July through June) ending 2013 and 2014.

The following is a description of the base period calculations:

Base Period Local Supplies: Local supplies for the base period are calculated using a two-year average (from fiscal years ending 2013 and 2014) of groundwater production, groundwater recovery, surface water production, and other non-imported supplies.

Base Period Wholesale ("Imported") Firm Demands: Firm demands on MWDOC for the base period are calculated using a two-year average (from fiscal years ending 2013 and 2014) of full-service, and surface storage operating agreement demands.

Base Period In-lieu Deliveries: Base period in-lieu deliveries to client agencies are calculated using a two year average (from fiscal years ending 2013 and 2014) of In-lieu deliveries to long-term groundwater replenishment, conjunctive use, cyclic, and supplemental storage programs. In-lieu deliveries are not calculated as imported supplies from MET. They are calculated as local supplies to account for the corresponding reduction in base year local production that was required to take In-lieu deliveries.

Base Period Retail Demands: Total retail municipal and industrial demands for the base period are calculated by adding the Base Period Local Supplies, Base Period Wholesale Imported Firm Demands, and Base Period In-Lieu Deliveries.

Step 2 – Establish Allocation Year Information

In this step, the model adjusts for each member agency's water need in the allocation year. To do so, it adjusts the base period estimates for population growth and changes in local supplies.

The following is a description of how the allocation year information is established:

Allocation Year Retail Demands: Total retail M&I demands for the allocation year are calculated by adjusting the Base Period Retail Demands for growth. The method in which MWDOC determines each client agency's growth is through population increases for the fiscal years ending 2013 to 2014[1]. Based on the data received from California State University of Fullerton, Center for Demographic Research, MWDOC prorates each agency's population increase share to MWDOC's growth adjustment received from MET[2], as shown in Appendix C.

Growth Adjustment: The growth adjustment is calculated by taking the average percent of growth from fiscal years ending 2013 and 2014, as generated by the Center for Demographic Research at California State University, Fullerton.

Allocation Year Local Supplies: Allocation year local supplies include groundwater production, groundwater recovery, surface water production, and other imported supplies not from MET. In-lieu deliveries are considered as local supplies to account for the corresponding reduction in base year local production that was required to take in-lieu deliveries. Allocation year local supplies reflect a more accurate estimate of actual supplies in the allocation year, and in turn more accurately estimates an agency's demand for imported supplies.

Extraordinary Increased Production Adjustment: This adjustment accounts for extraordinary increases in local supplies above the base period. Extraordinary increases in production include such efforts as purchasing water transfers. In order not to discourage such extraordinary efforts, a percentage of the yield from these supplies is added back to Allocation Year Local Supplies in shortage levels as shown below. This has the effect of "setting aside" the majority of the yield for the agency who procured the supply. The percentage of the extraordinary increases in local supply corresponds according to the regional shortage level, as shown in Table 4.1.

[1] Although many options were discussed in the technical workgroup sessions, this option was chosen to best reflect the increase in water demand due to population growth as intended by MET's allocation formula for each client agency in the MWDOC service area.

[2] MET's growth adjustment is calculated by using the average of the last two year County-wide population growth rates, which include not only MWDOC's service area but also the cities of Fullerton, Anaheim, and Santa Ana.

Table 4.1
Extraordinary Increased Production Adjustment

Regional Shortage Level	Regional Shortage Percentage	Extraordinary Increase Percentage
1	5%	5%
2	10%	10%
3	15%	15%
4	20%	20%
5	25%	25%
6	30%	30%
7	35%	35%
8	40%	40%
9	45%	45%
10	50%	50%

Step 3 – Calculate Initial Minimum Allocation Based on Declared Shortage Level

This step sets the initial allocation. After a regional shortage level is established, MWDOC will calculate the initial allocation as a percentage of adjusted Demand for Firm MET Supplies within the model for each client agency.

Regional Shortage Levels: The model allocates shortages of supplies over ten levels: from 5 to 50 percent, in 5 percent increments.

Initial (Wholesale Minimum) Allocation: The Wholesale Minimum Allocation is established to ensure a minimum level of imported supplies. The Wholesale Minimum Allocation ensures that client agencies will not experience shortages on the wholesale level that are greater than one-and-a-half times the percentage shortage of MET's regional water supplies. As illustrated in Table 4.2, the Wholesale Minimum Allocation percentage is equal to 100 minus one-and-a-half times the shortage level. The allocation is based on each agency's demand of firm MET water.

Table 4.2
Wholesale ("Imported")
Supply Minimum Allocation

Regional Shortage Level		Wholesale Minimum Allocation
1		92.5%
2		85.0%
3		77.5%
4		70.0%
5		62.5%
6		55.0%
7		47.5%
8		40.0%
9		32.5%
10		25.0%

Step 4 – Assign Allocation Adjustments and Conservation Credit

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.

Retail Impact Adjustment: The Retail Impact Adjustment is the factor used to address major differences in retail level shortages associated with across-the-board cuts. The purpose of this adjustment is to ensure that agencies with a high level of dependence on MET do not experience highly disparate shortages compared to other agencies when faced with a reduction in imported supplies. The Retail Impact Adjustment is calculated as the difference between the Regional Shortage Percentage and the Wholesale Imported Minimum Allocation. The amount of the adjustment each client agency receives is prorated on a linear scale, based on its dependence on imported water at the retail level. The prorated amount of allocation is referred to as the Retail Impact Adjustment Allocation. Table 4.3 below illustrates the maximum adjustment an agency may receive according to the regional shortage level.

Table 4.3
Retail Impact Adjustment

Regional Shortage Level	Regional Shortage Percentage	Retail Impact Adjustment Maximum
1	5%	2.5%
2	10%	5.0%
3	15%	7.5%
4	20%	10.0%
5	25%	12.5%
6	30%	15.0%
7	35%	17.5%
8	40%	20.0%
9	45%	22.5%
10	50%	25.0%

Unfortunately, the Retail Impact Adjustment MWDOC receives from MET may be less than the aggregate retail impact adjustment for its client agencies. To mitigate this difference, MWDOC decreases each client agency's retail impact adjustment according to their prorated share.

Conservation Demand Hardening Credit: The Conservation Demand Hardening Credit addresses the increased difficulty in achieving additional water savings at the retail level that comes as a result of successful implementation of water conserving devices and conservation savings programs. To estimate conservation savings, each member agency has a historical baseline Gallons Per Person Per Day (GPCD) calculated by the maximum usage from fiscal year ending 2004 to fiscal year ending 2014. Reductions from the baseline GPCD to the Allocation Year are used to calculate the equivalent conservation savings in acre-feet. The Conservation Demand Hardening Credit is based on an initial 10 percent of the GPCD-based Conservation savings plus an additional 5 percent for each level of Regional Shortage set by the Board during implementation of the WSAP. The credit will also be adjusted for:

- The overall percentage reduction in retail water demand
- The member agency's dependence on Metropolitan

The credit is calculated using the following formula:

Conservation Demand Harding Credit = Conservation Savings x (10% + Regional Shortage Level Percentage) x (1 +((Baseline GPCD – Allocation Year GPCD)/Baseline GCPD))x Dependence on MWD Percentage.

Minimum Per-Capita Water Use Credit: This adjustment creates a minimum daily gallons per capita (GPCD) water use threshold. Member agencies' retail-level water use is

compared to a total water use of 100 GPCD. Agencies that fall below this threshold receive additional allocation to bring them up to the minimum GPCD water use level[3].

Step 5 – Sum Total Allocations and Calculate Retail Reliability

This is the final step in calculating an 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.

Final Metropolitan Allocation: The final allocation of imported supplies to an agency for its retail demand is the sum of the Wholesale Imported Minimum Allocation, their Retail Impact Adjustment, their Conservation Demand Hardening Credit, and Per-Capita Adjustment Allocation (if applicable).

Total Metropolitan Supply Allocations: In addition to the WSAP Allocation described above, agencies may also receive separate allocations of supplies for seawater barrier and groundwater replenishment demands. Allocations of supplies to meet seawater barrier demands are to be determined by the MET Board of Directors independently, but in conjunction with the WSAP. Separating the seawater barrier allocation from the WSAP allocation allows the MET Board to consider actual barrier requirements in the Allocation Year and address the demand hardening issues associated with cutting seawater barrier deliveries. According to the principles outlined for allocating seawater barrier demands, allocations should be no deeper than the WSAP Wholesale Minimum Percentage implemented at that time. The WSAP also provides a limited allocation for drought-impacted groundwater basins based on the following framework:

1. Metropolitan staff will hold a consultation with the requesting member agency and the appropriate groundwater basin manager to document whether the basin is in one of the following conditions:

    a. Groundwater basin overdraft conditions that will result in water levels being outside normal operating ranges during the WSAP allocation period; or
    b. Violations of groundwater basin water quality and/or regulatory parameters that would occur without imported deliveries.

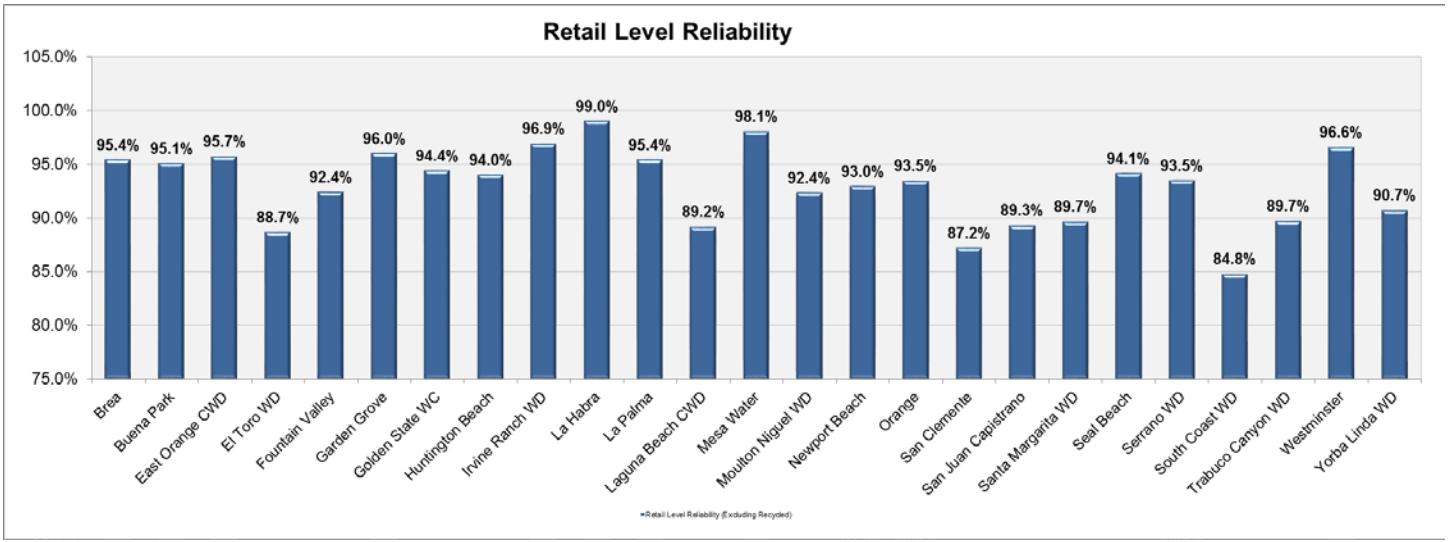
2. An allocation is provided based on the verified need for groundwater replenishment. The allocation would start with a member agency's ten-year average purchases of imported groundwater replenishment supplies (excluding years in which deliveries were curtailed). The amount would then be reduced by the declared WSAP Regional Shortage Level.

Agency's Retail Reliability: This calculates an agency's total MET allocation versus their allocation year retail demands to determine their overall reliability percentage (supplies

3 Per capita water used based on Total Retail-Level Use and population data received from California State University of Fullerton, Center for Demographic Research

as a percentage of retail demand) under a regional shortage level. This percentage excludes recycled water supplies from an agency's total water supply. Figure 4.1 illustrates the MWDOC client agencies' reliability percentages under a stage 3 regional shortage level (15%).

Figure 4.1
MWDOC's Water Supply Allocation Plan
Stage 3 with a Regional Shortage of 15%*



Source: MWDOC Allocation Model Version 3.1 and assumes a BPP of 75%.
[*] These are estimated reliability percentages for MWDOC client agencies under a regional shortage stage 3 (15%) based on initial local supply data received from the client agencies and OCWD's projected BPP for 2015/16.

Section 5: Plan Implementation

This section covers implementation issues which include: the appeal process, penalties rate structure and billing, tracking and reporting water usage, timeline and option to revisit the plan.

Allocation Appeals Process

The purpose of the appeals process is to provide client agencies the opportunity to request a change to their allocation based on new or corrected information. The grounds for appeal can include but are not limited to:

- Adjusting errors in historical data used in the Base period calculations
- Adjusting for unforeseen losses or gains in local supplies
- Adjusting for extraordinary increases in local supplies
- Adjusting for population growth rates
- Adjusting for credits with the Conservation base data, including Conservation Rate Structure

MWDOC anticipates that under most circumstances, a client agency's appeal will be the basis for an appeal to MET by MWDOC. MWDOC staff will work with client agencies to ensure that such an appeal is a complete and accurate reflection of the client agency's allocation and is properly reviewed by MET. To accomplish this, MWDOC will require the following information from the client agency submitting an appeal:

- Written letter (in the form of a letter or e-mail) from the client agency requesting an appeal
- Brief description of the type of appeal e.g. incorrect base data, loss/gain in local supply, extraordinary increase in local supply, adjustment in agency's conservation base data, or other
- Rationale for the appeal
- Quantity in acre-feet in question
- Verifiable documentation that supports the rationale i.e. billing statements, invoices for conservation device installations, Groundwater reports

To provide clarity of the process and ensure your appeal is properly handled, the following steps will occur:

Step 1 – Submit Appeal – Client agency will submit the necessary information, described above, to MWDOC.

Step 2 – Notification of Response and Appeal Meeting – Once MWDOC staff receives the appeal information, MWDOC will send a response and schedule a meeting with MWDOC staff and the client agency, within two weeks of receiving the information, to discuss the appeal in further detail.

Step 3 – Submittal to MET & MWDOC Board Notification – Using the information received from the client agency, MWDOC will prepare and submit the appeal to MET no later than one month of receiving the information. In addition, MWDOC staff will notify its Board of the submittal to MET.

Step 4 – MET Appeal Process - MWDOC will follow the terms of MET's appeal process, as described in Appendix B. Client agencies will also be invited, as deemed appropriate, by MWDOC to attend any meetings with MET on their appeal.

Step 5 –Client Agency Notification of MET's Decision – Once MET has made a determination of the appeal, MWDOC staff will notify the client agency of the decision and determine if additional actions are needed i.e. Appeal to MET Board.

In the event that MET denies the appeal, MWDOC staff will continue to work with the appealing agency to resolve their issue(s). Any action that will result in adjustments to client agency's allocation will be submitted to the Board for review and approval.

Allocation Surcharge Rates & Billing

MET's Surcharge Rates

MET will enforce its allocations through a tiered surcharge rate structure. MET will assess surcharge rates to a member agency that exceeds its total annual allocation at the end of the twelve-month allocation period, according to the rate structure below:

Table 5.1: Metropolitan Water District
Allocation Surcharge Rate Structure
(FY2015/16 Rates)*

Water Use up to:	(1) **Base Rate**	(2) **Surcharge Rate****	(1)+(2) = **Total Rate**
100% Allocation	Tier 1 ($942/AF)	-	**$942/AF**
100% < = 115%	Tier 1 ($942/AF)	Tier 1 + (1,480/AF)***	**$2,422/AF**
Use > 115%	Tier 1 ($942/AF)	Tier 1 + (2,960/AF)***	**$3,902/AF**

[*] The base rate shall be the applicable water rate for the water being purchased (Model shows CY 2016 rate).
[**] If MWDOC exceeds its allocation limit but is within its equivalent preferential right amount, MET will decrease the surcharge rate by one level.
[***] Surcharge rate is applied to water use in excess of an agency's WSAP allocation.

These surcharge rates will be assessed according to MET water rates in effect at the time of billing. Any surcharge funds collected by MET will be invested back to the MET member agency through conservation and local resource development.

MWDOC Surcharge Rates

As a water wholesaler, MWDOC has the opportunity to assess penalties in many different ways. A number of options were discussed and analyzed with the client

agencies and Board Committee members. The key components that helped guide development of a surcharge structure included:

- A financial incentive to discourage water usage above a client agency's allocation
- A surcharge rate structure that is administratively easy to understand and implement
- Surcharge rates that are fair and appropriate during a shortage

From these components and input received from both the MWDOC Board and the client agencies, a melded surcharge rate structure was recommended. This was mainly due to its "region-wide" style approach and similar structure to other MWDOC rates and charges.

MWDOC Surcharge Rate Structure – At the end of the allocation year, MWDOC would charge a surcharge to each client agency that exceeded their allocation. This surcharge would be assessed according to the client agency's prorated share (acre-feet over usage) of MWDOC surcharge amount with MET. Below is an example of how this surcharge rate structure would apply:

Under the melded surcharge rate structure, client agencies will only be assessed penalties if MWDOC exceeds its total allocation and is required to pay a surcharge to MET.

MWDOC Billing

During the allocation period, MWDOC billing will remain the same. Only at the end of the twelve-month allocation period will MWDOC calculate each member agency's total potable water use based on the local supply certification and MWDOC allocation model and determine which agencies exceeded their annual allocation. From those agencies that exceeded their allocation, MWDOC will assess surcharge rates according to the melded surcharge rate structure on their next water invoice.

Understanding that the penalties can be significant to a retail agency, MET and MWDOC will allow payment of these penalties to be spread over three monthly billing periods. Therefore, a third of the penalties will be applied each month to the agency's water invoice over a three-month period

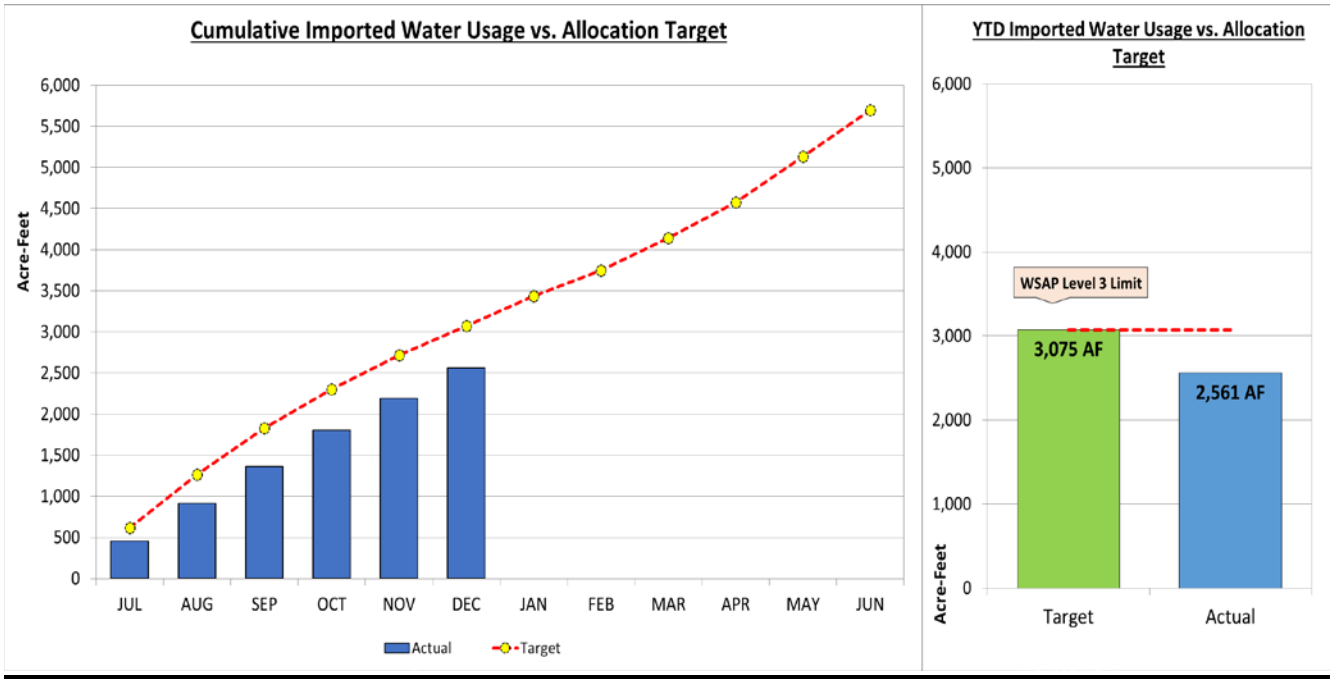
Tracking and Reporting

In preparing for allocations, it is important to track the amount of water the region and each client agency is using monthly. This data is important to help MWDOC and client agencies project their annual usage, evaluate their current demands, and avoid any over usage that will result in allocation penalties. MWDOC will provide water use monthly reports upon request or when necessary that will compare each client agency's current cumulative imported usage to their allocation target (Based off historical monthly percentages of imported usage). In addition, MWDOC will provide quarterly reports on its cumulative retail usage compared to its allocation baseline.

To develop these reports, MWDOC will need to work closely with each client agency to get their local supply data on a monthly basis. This data will not only be used by MWDOC to track monthly usage, but also by MET to assess MWDOC's total projected water demands.

Below in Figure 5.2 is an example of the type of monthly report MWDOC will provide to each client agency during the allocation period.

Figure 5.2
Example of a Client Agency's Monthly Usage Report



Key Dates for Implementation

If a regional shortage is declared, the allocation period will cover twelve consecutive months, e.g. July 1st of a given year through June 30. Barring unforeseen large-scale circumstances, the Regional Shortage Level will be set for the entire allocation period, which will provide the client agencies an established water supply shortage allocation amount. Figure 5.3 Illustrates the Metropolitan timeline for allocations during a two year period.

Figure 5.3: Metropolitan Water District
Adopted Allocation Timeline

Year	Month	Year 1 Board Allocation Decision	Year 1 Allocation Year	Year 2 Board Allocation Decision	Year 2 Allocation Year
YEAR 1	January				
	February				
	March				
	April	**Declaration**			
	May				
	June				
	July		**Effective Period** Continuous Tracking of Member Agency Local Supply and Imported Water Use		
	August				
	September				
	October				
	November				
	December				
YEAR 2	January				
	February				
	March				
	April			**Declaration**	
	May				
	June				
	July				
	August		**Assess Penalties**		**Effective Period** Continuous Tracking of Member Agency Local Supply and Imported Water Use
	September				
	October				
	November				
	December				
YEAR 3	January				
	February				
	March				
	April				
	May				
	June				

It is important to note that MWDOC does not anticipate calling for allocation unless the MET Board declares a shortage through it WSAP; and no later than 30 days from MET's declaration will MWDOC announce allocation to its client agencies.

Revisiting the Plan

Calculating the amount of imported water each client agency receives during a water shortage is not an easy task. The key objective in developing this allocation plan is to ensure that a proper and fair distribution of water is given to each client agency. However, due to the complexity of this issue and the potential for unforeseen circumstances that may occur during an allocation year, MWDOC offers the opportunity to review and refine components of this plan where deemed necessary.

The MWDOC staff and client agencies have the opportunity to revisit the plan and offer any recommendations to the MWDOC Board that will improve the method, calculation, and approach of this plan.

MET has a similar process which will allow opportunity to review their plan when deemed necessary.

Appendix A

List of Acronyms:

AF- Acre-feet
M&I- Municipal and Industrial
MET-Metropolitan Water District of Southern California
SWRCB-State Water Resources Control Board
WSAP-Water Supply Allocation Plan

Definitions:

Extraordinary Increases in Production: water production efforts that increase local supplies during an allocation year such as purchasing water transfers.

Groundwater Recovery: The extraction and treatment of groundwater making it usable for a variety of applications by removing high levels of chemicals and/or salts.

In-lieu deliveries: MET-supplied water bought to replace water that would otherwise be pumped from the groundwater basin.

Overproducing groundwater yield: Withdrawal (removal) of groundwater over a period of time that exceeds the recharge rate of the supply aquifer. Also referred to as overdraft or mining the aquifer.

Seawater Barrier: The injection of water into wells along the coast to protect the groundwater basin from seawater intrusion. The injected water acts like a wall, blocking seawater that would otherwise migrate into groundwater basins as a result of pumping inland.

Appendix B

Metropolitan's Draft Water Supply Allocation Plan

MET Final Water Supply Allocation Pl

Appendix C
MWDOC Growth Adjustment Table per Client Agency

Population of MWDOC Retail Water Agencies

Water Agency	Jan-13	Jan-14	Avg of 2013 & 2014
Brea	41,129	42,181	**41,655**
Buena Park	82,053	82,364	**82,209**
East Orange CWD Retail Zone	3,233	3,247	**3,240**
El Toro WD	48,453	48,628	**48,541**
Fountain Valley	57,129	57,590	**57,360**
Garden Grove	175,096	175,873	**175,485**
Golden State Water Company	167,779	168,561	**168,170**
Huntington Beach	193,873	196,041	**194,957**
Irvine Ranch WD	357,781	369,724	**363,753**
La Habra	60,989	61,455	**61,222**
La Palma	15,890	15,946	**15,918**
Laguna Beach CWD includ. Emerald Bay Service District	20,130	20,204	**20,167**
Mesa Water	105,779	106,152	**105,966**
Moulton Niguel WD	168,301	169,405	**168,853**
Newport Beach	65,404	65,551	**65,478**
Orange	137,814	138,182	**137,998**
San Clemente	50,757	50,960	**50,859**
San Juan Capistrano	37,943	38,491	**38,217**
Santa Margarita WD	152,245	153,358	**152,802**
Seal Beach	23,543	23,618	**23,581**
Serrano WD	6,408	6,437	**6,423**
South Coast WD	34,672	34,816	**34,744**
Trabuco Canyon WD	12,588	12,640	**12,614**
Tustin	67,445	67,700	**67,573**
Westminster	92,939	93,322	**93,131**
Yorba Linda WD	73,378	73,990	**73,684**
Total of MWDOC Agencies	**2,252,751**	**2,276,436**	**2,264,594**

Source: Center for Demographic Research, CSU Fullerton, December 2014. CDR's estimates were based on the 2010 Census. Water agency counts were made for the actual area served, which may be different than the political boundary. Numbers are tied to the State Dept. of Finance numbers for total population of Orange County.

Water Agency	Growth % from 2012 to 2013	Growth % from 2013 to 2014	Avg Growth % 2013 to 2014
Brea	1.13%	2.56%	1.84%
Buena Park	0.62%	0.38%	0.50%
East Orange CWD Retail Zone	0.56%	0.43%	0.50%
El Toro WD	0.56%	0.36%	0.46%
Fountain Valley	0.71%	0.81%	0.76%
Garden Grove	0.19%	0.44%	0.32%
Golden State Water Company	0.87%	0.47%	0.67%
Huntington Beach	0.61%	1.12%	0.87%
Irvine Ranch WD	2.68%	3.34%	3.01%
La Habra	0.53%	0.76%	0.65%
La Palma	0.75%	0.35%	0.55%
Laguna Beach CWD includ. Emerald Bay Service District	0.60%	0.37%	0.48%
Mesa Water	0.58%	0.35%	0.47%
Moulton Niguel WD	0.78%	0.66%	0.72%
Newport Beach	0.51%	0.22%	0.37%
Orange	0.59%	0.27%	0.43%
San Clemente	0.55%	0.40%	0.48%
San Juan Capistrano	0.89%	1.44%	1.17%
Santa Margarita WD	0.55%	0.73%	0.64%
Seal Beach	0.59%	0.32%	0.45%
Serrano WD	0.60%	0.45%	0.52%
South Coast WD	0.61%	0.42%	0.51%
Trabuco Canyon WD	0.55%	0.41%	0.48%
Tustin	0.63%	0.38%	0.50%
Westminster	0.64%	0.41%	0.53%
Yorba Linda WD	1.11%	0.83%	0.97%
Total of MWDOC Agencies	**0.95%**	**1.05%**	1.00%

Appendix D

MWDOC Conservation Hardening Credit Table per Client Agency

Member Agency	GPCD Baseline	GPCD for 2014	Change in GPCD	AF Savings
Brea	288.58	246.61	**41.97**	**1,983**
Buena Park	199.59	165.57	**34.02**	**3,138**
East Orange CWD includ. Tustin	196.19	170.20	**25.99**	**2,065**
El Toro WD	214.96	185.54	**29.42**	**1,748**
Fountain Valley	192.48	184.64	**7.84**	**506**
Garden Grove	166.11	133.16	**32.95**	**6,491**
Golden State Water Company	175.11	146.27	**28.84**	**5,445**
Huntington Beach	163.73	141.79	**21.94**	**4,818**
Irvine Ranch WD	304.13	244.30	**59.83**	**24,778**
La Habra	160.60	150.19	**10.41**	**717**
La Palma	154.88	123.75	**31.13**	**556**
Laguna Beach CWD includ. EBSD	203.74	173.46	**30.28**	**685**
Mesa WD	191.25	166.35	**24.90**	**2,961**
Moulton Niguel WD	236.66	194.91	**41.75**	**7,922**
Newport Beach	258.85	239.36	**19.49**	**1,431**
Orange	231.08	210.84	**20.24**	**3,134**
San Clemente	198.09	178.51	**19.58**	**1,118**
San Juan Capistrano	236.93	206.65	**30.28**	**1,306**
Santa Margarita WD	235.06	201.77	**33.29**	**5,719**
Seal Beach	157.34	147.07	**10.27**	**272**
Serrano WD	485.61	468.88	**16.73**	**121**
South Coast WD	205.86	196.91	**8.95**	**349**
Trabuco Canyon WD	314.13	270.88	**43.25**	**612**
Tustin	191.31	164.21	**27.10**	**2,055**
Westminster	145.76	120.75	**25.01**	**2,614**
Yorba Linda WD	299.73	272.75	**26.98**	**2,236**

[*] The "GPCD Baseline" is the highest Ten-year average from 2004 to present, and includes Recycled water in order to normalize the conservation savings

Source: MWDOC 20% by 2020 OC Regional Alliance Model updated in 2014

WSAP GPCD.pdf

APPENDIX E

Notification of Public and Service Area Suppliers

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

Street Address:
18700 Ward Street
Fountain Valley, California 92708

Mailing Address:
P.O. Box 20895
Fountain Valley, CA 92728-0895

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Fax: (714) 964-9389
www.mwdoc.com

March 1, 2016

Ms. Mitzi Ortiz
City Clerk
City of Aliso Viejo
12 Journey, Suite 100
Aliso Viejo, CA 92656-5335

Dear Ms. Ortiz:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

The Municipal Water District of Orange County (MWDOC) is in the process of preparing its 2015 Urban Water Management Plan (UWMP). UWMPs are prepared by California's urban water suppliers to support their long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. Every urban water supplier that either provides over 3,000 acre-feet of water annually or serves 3,000 or more connections is required to prepare an UWMP every five years.

Pursuant to the requirement of California Water Code, Division 6, Part 2.6 Urban Water Management Planning, Section 10621 (b), every urban water supplier required to prepare a plan shall, at least 60 days prior to the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.

This letter is intended to notify your agency that MWDOC is in the process of preparing the 2015 UWMP. Based on MWDOC's current schedule, a draft will be available for review prior to the public hearing, which is tentatively scheduled for May 2016.

If your agency would like more information or has any questions, please contact Harvey De La Torre at 714/593-5027 or hdelatorre@mwdoc.com

Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Ms. Linda Andal
City Clerk
City of Anaheim
200 South Anaheim Boulevard
Anaheim, CA 92805

Dear Ms. Andal:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

The Municipal Water District of Orange County (MWDOC) is in the process of preparing its 2015 Urban Water Management Plan (UWMP). UWMPs are prepared by California's urban water suppliers to support their long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. Every urban water supplier that either provides over 3,000 acre-feet of water annually or serves 3,000 or more connections is required to prepare an UWMP every five years.

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Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Ms. Lillian Harris-Neal
City Clerk
City of Brea
1 Civic Center Circle
Brea, CA 92821

Dear Ms. Harris-Neal:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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If your agency would like more information or has any questions, please contact Harvey De La Torre at 714/593-5027 or hdelatorre@mwdoc.com

Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Ms. Shalice Tilton
City Clerk
City of Buena Park
6650 Beach Boulevard
Buena Park, CA 90621

Dear Ms. Tilton:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

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March 1, 2016

Ms. Brenda Green
City Clerk
City of Costa Mesa
77 Fair Drive
Costa Mesa, CA 92628-1200

Dear Ms. Green:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

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March 1, 2016

Ms. Denise Basham
City Clerk
City of Cypress
5275 Orange Avenue
Cypress, CA 90630

Dear Ms. Basham:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Ms. Kathy Ward
City Clerk
City of Dana Point
33282 Golden Lantern Street, Suite 203
Dana Point, CA 92629

Dear Ms. Ward:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Mr. Rick Miller
City Clerk
City of Fountain Valley
10200 Slater Avenue
Fountain Valley, CA 92708

Dear Mr. Miller:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Ms. Lucinda Williams
City Clerk
City of Fullerton
303 West Commonwealth Avenue
Fullerton, CA 92832-1775

Dear Ms. Williams:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

The Municipal Water District of Orange County (MWDOC) is in the process of preparing its 2015 Urban Water Management Plan (UWMP). UWMPs are prepared by California's urban water suppliers to support their long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. Every urban water supplier that either provides over 3,000 acre-feet of water annually or serves 3,000 or more connections is required to prepare an UWMP every five years.

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Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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18700 Ward Street
Fountain Valley, California 92708

Mailing Address:
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www.mwdoc.com

March 1, 2016

Ms. Kathy Bailor
City Clerk
City of Garden Grove
11222 Acacia Parkway
Garden Grove, CA 92840

Dear Ms. Bailor:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

The Municipal Water District of Orange County (MWDOC) is in the process of preparing its 2015 Urban Water Management Plan (UWMP). UWMPs are prepared by California's urban water suppliers to support their long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. Every urban water supplier that either provides over 3,000 acre-feet of water annually or serves 3,000 or more connections is required to prepare an UWMP every five years.

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This letter is intended to notify your agency that MWDOC is in the process of preparing the 2015 UWMP. Based on MWDOC's current schedule, a draft will be available for review prior to the public hearing, which is tentatively scheduled for May 2016.

If your agency would like more information or has any questions, please contact Harvey De La Torre at 714/593-5027 or hdelatorre@mwdoc.com

Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

Street Address:
18700 Ward Street
Fountain Valley, California 92708

Mailing Address:
P.O. Box 20895
Fountain Valley, CA 92728-0895

(714) 963-3058
Fax: (714) 964-9389
www.mwdoc.com

March 1, 2016

Ms. Joan Flynn
City Clerk
City of Huntington Beach
2000 Main Street
Huntington Beach, CA 92648

Dear Ms. Flynn:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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Fax: (714) 964-9389
www.mwdoc.com

March 1, 2016

Ms. Molly McLaughlin
City Clerk
City of Irvine
One Civic Center Plaza
Irvine, CA 92606-5208

Dear Ms. McLaughlin:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

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Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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Fountain Valley, California 92708

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P.O. Box 20895
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www.mwdoc.com

March 1, 2016

Ms. Tamara Mason
City Clerk
City of La Habra
201 East La Habra Boulevard
La Habra, CA 90633-0337

Dear Ms. Mason:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

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Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

Street Address:
18700 Ward Street
Fountain Valley, California 92708

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Fax: (714) 964-9389
www.mwdoc.com

March 1, 2016

Ms. Lisette Chel
City Clerk
City of Laguna Beach
505 Forest Avenue
Laguna Beach, CA 92651

Dear Ms. Chel:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

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Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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www.mwdoc.com

March 1, 2016

Ms. Melissa Au-Yeung
Assistant to the City Manager/ City Clerk
City of Laguna Hills
24035 El Toro Road
Laguna Hills, CA 92653

Dear Ms. Au-Yeung:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

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Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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www.mwdoc.com

March 1, 2016

Ms. Eileen Gomez
City Clerk
City of Laguna Niguel
30111 Crown Valley Parkway
Laguna Niguel, CA 92677

Dear Ms. Gomez:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

Street Address:
18700 Ward Street
Fountain Valley, California 92708

Mailing Address:
P.O. Box 20895
Fountain Valley, CA 92728-0895

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Fax: (714) 964-9389
www.mwdoc.com

March 1, 2016

Ms. Yolie Trippy
Deputy City Clerk
City of Laguna Woods
24264 El Toro Road
Laguna Woods, CA 92637

Dear Ms. Trippy:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

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Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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18700 Ward Street
Fountain Valley, California 92708

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P.O. Box 20895
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Fax: (714) 964-9389
www.mwdoc.com

March 1, 2016

Ms. Stephanie Smith
City Clerk
City of Lake Forest
25550 Commercentre Drive
Lake Forest, CA 92630

Dear Ms. Smith:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

Street Address:
18700 Ward Street
Fountain Valley, California 92708

Mailing Address:
P.O. Box 20895
Fountain Valley, CA 92728-0895

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Fax: (714) 964-9389
www.mwdoc.com

March 1, 2016

Ms. Windmera Quintanar
City Clerk
City of Los Alamitos
3191 Katella Avenue
Los Alamitos, CA 90720-5600

Dear Ms. Quintanar:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

Street Address:
18700 Ward Street
Fountain Valley, California 92708

Mailing Address:
P.O. Box 20895
Fountain Valley, CA 92728-0895

(714) 963-3058
Fax: (714) 964-9389
www.mwdoc.com

March 1, 2016

Ms. Karen Hamman
City Clerk/Director of Community Relations
City of Mission Viejo
200 Civic Center
Mission Viejo, CA 92691

Dear Ms. Hamman:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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18700 Ward Street
Fountain Valley, California 92708

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P.O. Box 20895
Fountain Valley, CA 92728-0895

(714) 963-3058
Fax: (714) 964-9389
www.mwdoc.com

March 1, 2016

Ms. Leilani Brown
City Clerk
City of Newport Beach
100 Civic Center Drive
Newport Beach, CA 92660

Dear Ms. Brown:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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18700 Ward Street
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P.O. Box 20895
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(714) 963-3058
Fax: (714) 964-9389
www.mwdoc.com

March 1, 2016

Ms. Mary Murphy
City Clerk
City of Orange
300 East Chapman Avenue
Orange, CA 92866

Dear Ms. Murphy:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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Fax: (714) 964-9389
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March 1, 2016

Mr. Patrick Melia
City Clerk
City of Placentia
401 East Chapman Avenue
Placentia, CA 92870

Dear Mr. Melia:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Ms. Amy Diaz
City Clerk
City of Rancho Santa Margarita
22112 El Paseo
Rancho Santa Margarita, CA 92688

Dear Ms. Diaz:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Ms. Joanne Baade
City Clerk
City of San Clemente
100 Avenida Presidio
San Clemente, CA 92673

Dear Ms. Baade:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Ms. Maria Morris
City Clerk
City of San Juan Capistrano
32400 Paseo Adelanto
San Juan Capistrano, CA 92675

Dear Ms. Morris:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

The Municipal Water District of Orange County (MWDOC) is in the process of preparing its 2015 Urban Water Management Plan (UWMP). UWMPs are prepared by California's urban water suppliers to support their long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. Every urban water supplier that either provides over 3,000 acre-feet of water annually or serves 3,000 or more connections is required to prepare an UWMP every five years.

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MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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Fountain Valley, California 92708

Mailing Address:
P.O. Box 20895
Fountain Valley, CA 92728-0895

(714) 963-3058
Fax: (714) 964-9389
www.mwdoc.com

March 1, 2016

Ms. Maria Huizar
City Clerk
City of Santa Ana
20 Civic Center Plaza
Santa Ana, CA 92702

Dear Ms. Huizar:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

The Municipal Water District of Orange County (MWDOC) is in the process of preparing its 2015 Urban Water Management Plan (UWMP). UWMPs are prepared by California's urban water suppliers to support their long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. Every urban water supplier that either provides over 3,000 acre-feet of water annually or serves 3,000 or more connections is required to prepare an UWMP every five years.

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If your agency would like more information or has any questions, please contact Harvey De La Torre at 714/593-5027 or hdelatorre@mwdoc.com

Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

Street Address:
18700 Ward Street
Fountain Valley, California 92708

Mailing Address:
P.O. Box 20895
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March 1, 2016

Ms. Jill Ingram
City Manager
City of Seal Beach
211 8th Street
Seal Beach, CA 90740

Dear Ms. Ingram:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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Fountain Valley, California 92708

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www.mwdoc.com

March 1, 2016

Ms. Patricia Vazquez
City Clerk
City of Stanton
7800 Katella Ave.
Stanton, CA 90680

Dear Ms. Vazquez:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Ms. Erica Rabe
City Clerk Services Supervisor
City of Tustin
300 Centennial Way
Tustin, CA 92780

Dear Ms. Rabe:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Mr. Jarad Hildenbrand
City Manager/City Clerk
City of Villa Park
17855 Santiago Boulevard
Villa Park, CA 92861

Dear Mr. Hildenbrand:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Ms. Amanda Jensen
City Clerk
City of Westminster
8200 Westminster Boulevard
Westminster, CA 92683

Dear Ms. Jensen:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

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Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Mr. Todd Litfin
City Attorney
City of Yorba Linda
4845 Casa Loma Avenue
Yorba Linda, CA 92886-8714

Dear Mr. Litfin:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

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Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Mr. Hugh Nguyen
Clerk-Recorder
County of Orange
10 Civic Center Plaza
Santa Ana, CA 92701

Dear Mr. Nguyen:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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Fountain Valley, CA 92728-0895

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March 1, 2016

Ms. Marilyn Thoms
Watershed Manager
County of Orange/Public Works
2301 N. Glassel St.
Orange, CA 92865

Dear Ms. Thoms:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

Street Address:
18700 Ward Street
Fountain Valley, California 92708

Mailing Address:
P.O. Box 20895
Fountain Valley, CA 92728-0895

(714) 963-3058
Fax: (714) 964-9389
www.mwdoc.com

March 1, 2016

Ms. Lisa Ohlund
General Manager
East Orange County Water District
185 N. McPherson Road
Orange, CA 92869-3720

Dear Ms. Ohlund:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

Street Address:
18700 Ward Street
Fountain Valley, California 92708

Mailing Address:
P.O. Box 20895
Fountain Valley, CA 92728-0895

(714) 963-3058
Fax: (714) 964-9389
www.mwdoc.com

March 1, 2016

Mr. Robert Hill
General Manager/ Assistant Secretary
El Toro Water District
24251 Los Alisos Boulevard
Lake Forest, CA 92630

Dear Mr. Hill:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Mr. Michael Dunbar
General Manager
Emerald Bay Service District
600 Emerald Bay
Laguna Beach, CA 92651

Dear Mr. Dunbar:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Mr. Paul Cook
General Manager
Irvine Ranch Water District
P.O. Box 57000
Irvine, CA 92619-7000

Dear Mr. Cook:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Ms. Renae Hinchey
General Manager / Board Secretary
Laguna Beach County Water District
306 Third Street
Laguna Beach, CA 92651

Dear Ms. Hinchey:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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March 1, 2016

Mr. Paul Shoenberger
General Manager
Mesa Water
1965 Placentia Avenue
Costa Mesa, CA 92627

Dear Mr. Shoenberger:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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March 1, 2016

Ms. Joone Lopez
General Manager
Moulton Niguel Water District
27500 La Paz Road
Laguna Niguel, CA 92677-3489

Dear Ms. Lopez:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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March 1, 2016

Mr. Dan Ferons
General Manager
Santa Margarita Water District
26111 Antonio Parkway
Rancho Santa Margarita, CA 92688

Dear Mr. Ferons:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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If your agency would like more information or has any questions, please contact Harvey De La Torre at 714/593-5027 or hdelatorre@mwdoc.com

Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

Street Address:
18700 Ward Street
Fountain Valley, California 92708

Mailing Address:
P.O. Box 20895
Fountain Valley, CA 92728-0895

(714) 963-3058
Fax: (714) 964-9389
www.mwdoc.com

March 1, 2016

Mr. Michael Markus
General Manager
Orange County Water District
18700 Ward Street
Fountain Valley, CA 92708

Dear Mr. Markus:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

The Municipal Water District of Orange County (MWDOC) is in the process of preparing its 2015 Urban Water Management Plan (UWMP). UWMPs are prepared by California's urban water suppliers to support their long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. Every urban water supplier that either provides over 3,000 acre-feet of water annually or serves 3,000 or more connections is required to prepare an UWMP every five years.

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Sincerely,

Karl W. Seckel
Assistant Manager

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www.mwdoc.com

March 1, 2016

Mr. Jerry Vilander
General Manager
Serrano Water District
18021 East Lincoln Street
Villa Park, CA 92861-6446

Dear Mr. Vilander:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

The Municipal Water District of Orange County (MWDOC) is in the process of preparing its 2015 Urban Water Management Plan (UWMP). UWMPs are prepared by California's urban water suppliers to support their long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. Every urban water supplier that either provides over 3,000 acre-feet of water annually or serves 3,000 or more connections is required to prepare an UWMP every five years.

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Sincerely,

Karl W. Seckel
Assistant Manager

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March 1, 2016

Mr. Hector Ruiz
General Manager
Trabuco Canyon Water District
32003 Dove Canyon Drive
Trabuco Canyon, CA 92679

Dear Mr. Ruiz:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

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www.mwdoc.com

March 1, 2016

Mr. Marc Marcantonio
General Manager
Yorba Linda Water District
1717 East Miraloma Ave.
Placentia, CA 92870

Dear Mr. Marcantonio:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

Street Address:
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Fountain Valley, California 92708

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P.O. Box 20895
Fountain Valley, CA 92728-0895

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www.mwdoc.com

March 1, 2016

Mr. Jeffrey Kightlinger
General Manager
Metropolitan Water District of Southern CA
700 North Alameda Street
Los Angeles, CA 90012

Dear Mr. Kightlinger:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

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March 1, 2016

Ms. Danielle Gerardo
Administrative Assistant/Secretary
Midway City Sanitary District
14451 Cedarwood Avenue
Westminster, CA 92683

Dear Ms. Gerardo:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

Street Address:
18700 Ward Street
Fountain Valley, California 92708

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P.O. Box 20895
Fountain Valley, CA 92728-0895

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www.mwdoc.com

March 1, 2016

Ms. Maria Ayala
Clerk of the Board
Orange County Sanitation District
10844 Ellis Ave.
Fountain Valley, CA 92708

Dear Ms. Ayala:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

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www.mwdoc.com

March 1, 2016

Mr. Dan Ferons
Co-Administrator
San Juan Basin Authority
26111 Antonio Parkway
Rancho Santa Margarita, CA 92688

Dear Mr. Ferons:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

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March 1, 2016

Ms. Kelly Berry
Clerk of the Board
Santa Ana Watershed Project Authority
11615 Sterling Ave.
Riverside, CA 92503

Dear Ms. Berry:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

Street Address:
18700 Ward Street
Fountain Valley, California 92708

Mailing Address:
P.O. Box 20895
Fountain Valley, CA 92728-0895

(714) 963-3058
Fax: (714) 964-9389
www.mwdoc.com

March 1, 2016

Ms. Betty Burnett
General Manager
South Orange County Wastewater Authority
34156 Del Obispo
Dana Point, CA 92629

Dear Ms. Burnett:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

The Municipal Water District of Orange County (MWDOC) is in the process of preparing its 2015 Urban Water Management Plan (UWMP). UWMPs are prepared by California's urban water suppliers to support their long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. Every urban water supplier that either provides over 3,000 acre-feet of water annually or serves 3,000 or more connections is required to prepare an UWMP every five years.

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March 1, 2016

Ms. Chris Montana
Clerk of the Board
Sunset Beach Sanitary District
P.O. Box 1185
Sunset Beach, CA 90742

Dear Ms. Montana:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Karl W. Seckel
Assistant Manager

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March 1, 2016

Mr. Jim Byerrum
Treasurer
California Domestic Water Co.
15111 Whittier Blvd., Suite 220
Whittier, CA 90603

Dear Mr. Byerrum:

NOTICE OF PREPARATION OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY'S 2015 URBAN WATER MANAGEMENT PLAN

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Sincerely,

Karl W. Seckel
Assistant Manager

AFFIDAVIT OF PUBLICATION

STATE OF CALIFORNIA,)
) ss.
County of Orange)

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of **The Orange County Register**, a newspaper of general circulation, published in the city of Santa Ana, County of Orange, and which newspaper has been adjudged to be a newspaper of general circulation by the Superior Court of the County of Orange, State of California, under the date of November 19, 1905, Case No. A-21046, that the notice, of which the annexed is a true printed copy, has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

May 2, 9, 2016

"I certify (or declare) under the penalty of perjury under the laws of the State of California that the foregoing is true and correct":

Executed at Santa Ana, Orange County, California, on

Date: May 9, 2016

Signature

The Orange County Register
625 N. Grand Ave.
Santa Ana, CA 92701
(714) 796-2209

PROOF OF PUBLICATION

NOTICE OF PUBLIC HEARING
2015 URBAN WATER MANAGEMENT PLAN

Municipal Water District of Orange County ("MWDOC"), has directed the preparation of a 2015 Urban Water Management Plan ("UWMP") for the MWDOC service area pursuant to the Urban Water Management Planning Act ("Act"). Adoption of the 2015 UWMP is required under the Act by July 1, 2016.

The Act requires that an urban water supplier hold a public hearing before adopting a plan. MWDOC's public hearing is scheduled for May 18, 2016 at 8:30 a.m. and will take place at the MWDOC Board Room located in the MWDOC Administration Building at 18700 Ward Street, Fountain Valley CA 92708.

For additional information regarding the public hearing, please contact Maribeth Goldsby, MWDOC Board Secretary, at (714)593-5006.

Published: Orange County Register May 2, 9, 2016 10156597

AFFIDAVIT OF PUBLICATION

STATE OF CALIFORNIA,)
) ss.
County of Orange)

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of **The Orange County Register**, a newspaper of general circulation, published in the city of Santa Ana, County of Orange, and which newspaper has been adjudged to be a newspaper of general circulation by the Superior Court of the County of Orange, State of California, under the date of November 19, 1905, Case No. A-21046, that the notice, of which the annexed is a true printed copy, has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

May 2, 9, 2016

"I certify (or declare) under the penalty of perjury under the laws of the State of California that the foregoing is true and correct":

Executed at Santa Ana, Orange County, California, on

Date: May 9, 2016

Signature

The Orange County Register
625 N. Grand Ave.
Santa Ana, CA 92701
(714) 796-2209

PROOF OF PUBLICATION

NOTICE OF PUBLIC HEARING
2015 URBAN WATER MANAGEMENT PLAN

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For additional information regarding the public hearing, please contact Maribeth Goldsby, MWDOC Board Secretary, at (714)593-5006.

Published: Orange County Register May 2, 9, 2016 10156597

APPENDIX F

Adopted UWMP Resolution

RESOLUTION NO. 2029

RESOLUTION OF THE BOARD OF DIRECTORS OF THE MUNICIPAL WATER DISTRICT OF ORANGE COUNTY ADOPTING THE 2015 URBAN WATER MANAGEMENT PLAN

WHEREAS, the California Urban Water Management Planning Act requires urban water suppliers providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually prepare and adopt, in accordance with prescribed requirements, an urban water management plan every five years; and

WHEREAS, the California Urban Water Management Planning Act specifics the requirements and procedures for adopting such Urban Water Management Plans; and

WHEREAS, the Board of Directors of the Municipal Water District of Orange County has duly reviewed, discussed, and considered such Urban Water Management Plan and has determined the 2015 Urban Water Management Plan to be consistent with the California Urban Water Management Planning Act and to be an accurate representation of the water resource plan for the Municipal Water District of Orange County.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Municipal Water District of Orange County that, on May 18, 2016 this District hereby adopts this 2015 Urban Water Management Plan for submittal to the state of California.

Said Resolution was adopted, on roll call, by the following vote:

AYES:	Directors Finnegan, Hinman, Osborne, Tamaribuchi & Thomas
NOES:	Director Barbre
ABSENT:	Director Dick
ABSTAIN:	None

I hereby certify that the foregoing is a true and correct copy of Resolution No. 2029adopted by the Board of Directors of Municipal Water District of Orange County at its meeting held on May 18, 2016.

ATTEST:

Maribeth Goldsby, Secretary
Municipal Water District of Orange County

APPENDIX G

BUMP Methodology/OC Reliability Study

Final Technical Memorandum #1

To: *Karl Seckel, Assistant Manager/District Engineer*
Municipal Water District of Orange County

From: *Dan Rodrigo, Senior Vice President, CDM Smith*

Date: *April 20, 2016*

Subject: Orange County Reliability Study, Water Demand Forecast and Supply Gap Analysis

1.0 Introduction

In December 2014, the Municipal Water District of Orange County (MWDOC) initiated the Orange County Reliability Study (OC Study) to comprehensively evaluate current and future water supply and system reliability for all of Orange County. To estimate the range of potential water supply gap (difference between forecasted water demands and all available water supplies), CDM Smith developed an OC Water Supply Simulation Model (OC Model) using the commercially available Water Evaluation and Planning (WEAP) software. WEAP is a simulation model maintained by the Stockholm Environment Institute (http://www.sei-us.org/weap) that is used by water agencies around the globe for water supply planning, including the California Department of Water Resources.

The OC Model uses indexed-sequential simulation to compare water demands and supplies now and into the future. For all components of the simulation (e.g., water demands, regional and local supplies) the OC Model maintains a given index (e.g., the year 1990 is the same for regional water demands, as well as supply from Northern California and Colorado River) and the sequence of historical hydrology. The planning horizon of the model is from 2015 to 2040 (25 years). Using the historical hydrology from 1922 to 2014, 93 separate 25-year sequences are used to generate data on reliability and ending period storage/overdraft. For example, sequence one of the simulation maps historical hydrologic year 1922 to forecast year 2015, then 1923 maps to 2016 … and 1947 maps to 2040. Sequence two shifts this one year, so 1923 maps to 2015 … and 1948 maps to 2040.

The OC Model estimates overall supply reliability for MET using a similar approach that MET has utilized in its 2015 Draft Integrated Resources Plan (MET IRP). The model then allocates available imported water to Orange County for direct and replenishment needs. Within Orange County, the OC Model simulates water demands and local supplies for three areas: (1) Brea/La Habra; (2) Orange County Basin; (3) South County; plus a Total OC summary (see Figure 1).

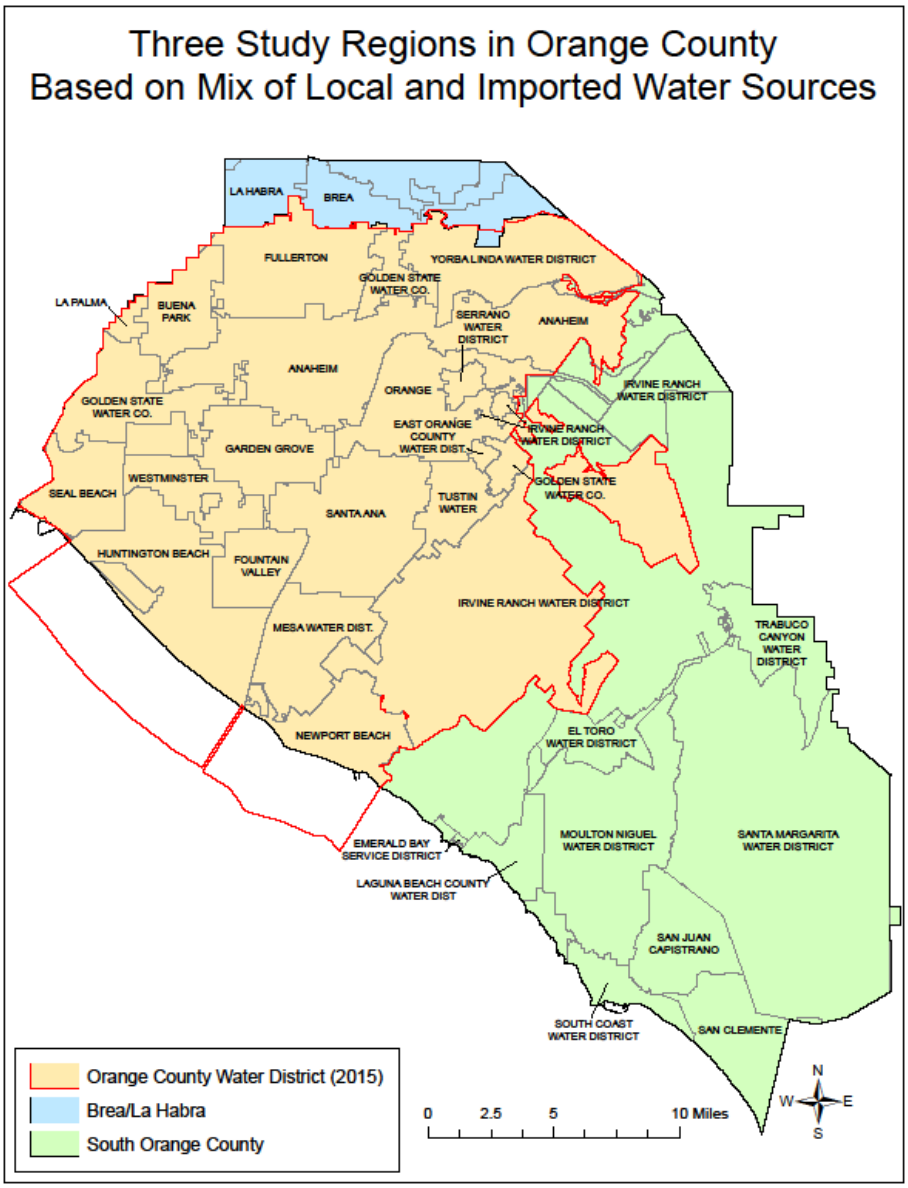

Figure 1. Geographic Areas for OC Study

The OC Model also simulates operations of the Orange County Groundwater Basin (OC Basin) managed by the Orange County Water District (OCWD). Figure 2 presents the overall model schematic for the OC Model, while Figure 3 presents the inflows and pumping variables included in the OC Basin component of the OC Model. A detailed description of the OC Model, its inputs, and all technical calculations is documented in Technical Memorandum #2: Development of OC Supply Simulation Model.

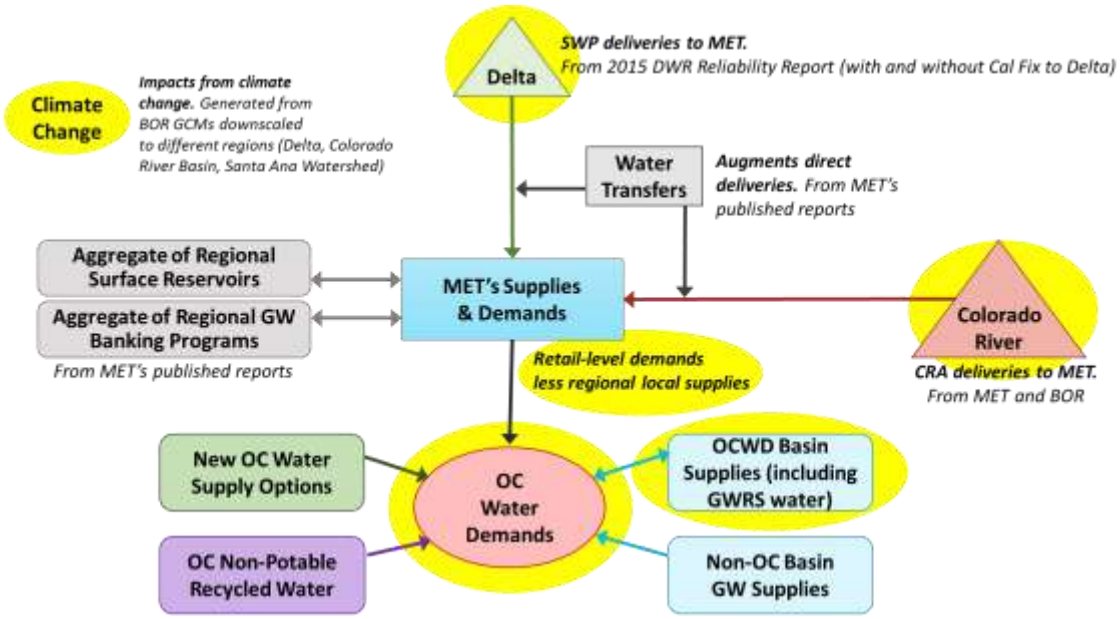

Figure 2. Overall Schematic for OC Model

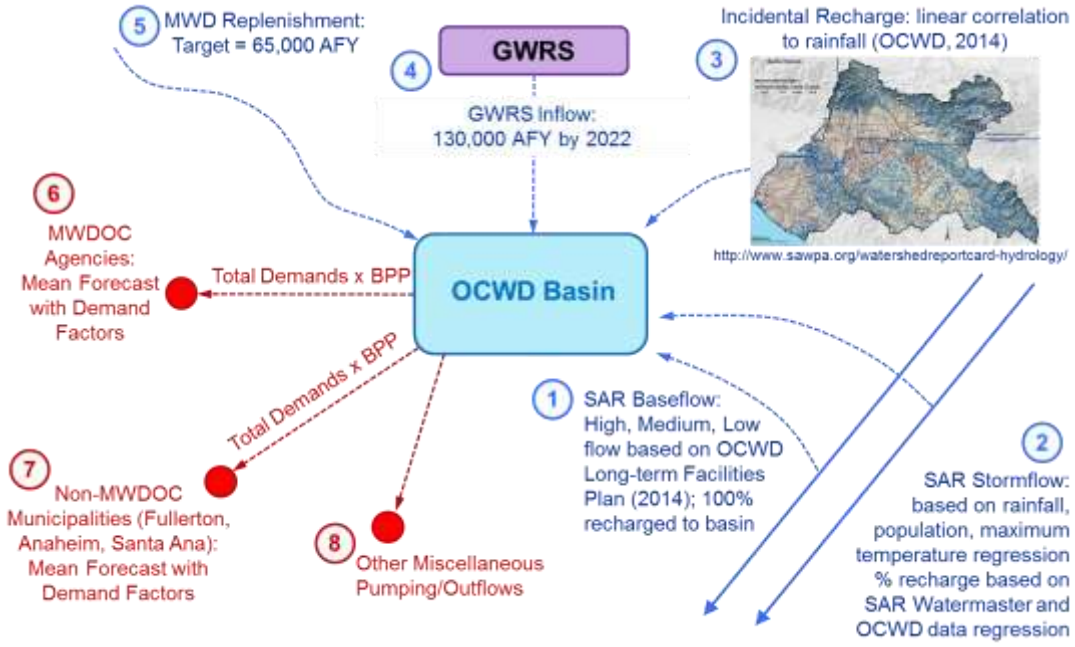

Figure 3. Inflows and Pumping Variables for OC Basin Component of OC Model

The modeling part of this evaluation is a necessity to deal with the number of issues impacting water supply reliability to Orange County. Reliability improvements in Orange County can occur due to water supply investments made by MET, the MET member agencies outside of Orange County, or by Orange County agencies. In this sense, future decision-making regarding reliability of supplies should not take place in a vacuum, but should consider the implications of decisions being made at all levels.

This technical memorandum summarizes the water demand forecast for Orange County and the water supply gap analysis that was generated using the OC Model. The outline for this technical memorandum is as follows:

- Section 1: Water Demand Forecast for Orange County
- Section 2: Planning Scenarios
- Section 3: Water Supply Gap
- Section 4: Conclusions
- Section 5: References

2.0 Water Demand Forecast for Orange County

The methodology for the water demand forecast uses a modified water unit use approach. In this approach, water unit use factors are derived from a baseline condition using a sample of water agency billing data and demographic data. In early 2015, a survey was sent by MWDOC to all water agencies in Orange County requesting Fiscal Year (FY) 2013-14 water use by billing category (e.g., single-family residential, multifamily residential, and non-residential). In parallel, the Center for Demographic Research (CDR) in Orange County provided current and projected demographics for each water agency in Orange County using GIS shape files of agency service areas. Water agencies were then placed into their respective areas (Brea/La Habra, OC Basin, South County), and water use by billing category were summed and divided by the relevant demographic (e.g., single-family water use ÷ single-family households) in order to get a water unit use factor (expressed as gallons per day/demographic unit).

In addition, the water agency survey collected information on total water production. Where provided, the difference between total water production and billed water use is considered non-revenue water. Table 1 summarizes the results of the water agency survey information and calculates the water unit use factors for the three areas within Orange County.

Table 1. Water Use Factors from Survey of Water Agencies in Orange County (FY 2013-14)

	SF Res		MF Res		Com/Instit.		Indust.		Non Revenue	
	Units[1]	Unit Use[2]	Units	Unit Use	Units	Unit Use	Units	Unit Use	total acc	%
Basin Area										
ANAHEIM	50,030	441	58,618	193	169,902	90	19,260	160	63,004	7%
BUENA PARK	16,455	346	8,600	224	31,566	137	4,837	39	19,004	11%
FOUNTAIN VALLEY	12,713	336	6,964	141	30,282	124	2,093	134	17,149	13%
FULLERTON	26,274	454	22,575	176	60,839	115	6,251	398	31,557	5%
GARDEN GROVE	31,400	422	17,580	295	48,394	134	7,221	163	No data	
GSWC	38,038	383	17,218	215	58,901	122	6,857	68		
HUNTINGTON BEACH	44,605	297	35,964	154	69,266	99	10,355	58	52,855	6%
IRVINE RANCH WATER DISTRICT	39,182	444	80,854	196	263,393	80	39,484	207	85,508	9%
MESA WATER DISTRICT	16,585	320	23,173	215	80,999	97	4,832	87	No data	
NEWPORT BEACH	19,455	329	15,517	177	59,754	86			26,517	5%
ORANGE	28,545	470	15,483	246	96,606	97	No data		35,363	9%
SANTA ANA	35,547	461	42,027	288	151,008	96			No data	
TUSTIN	11,788	505	9,435	253	25,265	79	1,293	92	14,178	3%
WESTMINSTER	17,648	318	10,973	215	24,148	109	976	84	20,379	5%
YORBA LINDA WATER DISTRICT	22,046	586	3,746	249	22,164	120	2,745	230	No data	
Weighted Average		**411**		**211**		**97**		**167**		**7.3%**
South County										
IRVINE RANCH WATER DISTRICT	16,581	444	12,864	196	32,554	80			22,730	9%
MOULTON NIGUEL WATER DISTRICT	47,673	345	17,077	189	70,067	156	Included in		55,149	10%
SAN CLEMENTE	12,047	361	9,045	186	22,921	119	commerical/		No data	
SAN JUAN CAPISTRANO	7,176	502	6,146	206	16,483	158	institutional		11,277	3%
SANTA MARGARITA WATER DISTRICT	36,022	436	19,885	268	37,241	254	category		54,129	2%
Weighted Average		**397**		**216**		**158**				**65%**
Brea/La Habra										
BREA	9,094	425	6,898	160	42,654	93	5,931	140	No data	
LA HABRA	11,995	436	8,051	177	17,331	90	680	135	13,674	6%
Weighted Average		**431.06**		**169.31**		**92.13**		**139.49**		**6%**

[1]Units represent:
SF Res = SF accounts or SF housing (CDR) if SF account data looks questionable.
MF Res = total housing (CDR) minus SF units.
Com/Instit = total employment (CDR) minus industrial employment (CDR).
Industrial = industrial employment (CDR).

[2]Unit Use represents billed water consumption (gallons/day) divided by units.

To understand the historical variation in water use and to isolate the impacts that weather and future climate has on water demand, a statistical model of monthly water production was developed. The explanatory variables used for this statistical model included population, temperature, precipitation, unemployment rate, presence of mandatory drought restrictions on water use, and a cumulative measure of passive and active conservation. Figure 4 presents the results of the statistical model for the three areas and the total county. All models had relatively high correlations and good significance in explanatory variables. Figure 5 shows how well the statistical model performs using the OC Basin model as an example. In this figure, the solid blue line represents actual per capita water use for the Basin area, while the dashed black line represents what the statistical model predicts per capita water use to be based on the explanatory variables.

Using the statistical model, each explanatory variable (e.g., weather) can be isolated to determine the impact it has on water use. Figure 6 presents the impacts on water use that key explanatory variables have in Orange County.

Regression Parameters	Basin Area	South Orange County	Brea / La Habra	OC Total
Adjusted R^2 *	0.90	0.91	0.89	0.91
Standard Error **	0.07	0.09	0.09	0.07
Explanatory Variable Significance***	All at <0.0001	All at <0.0001	All at <0.0001	All at <0.0001

* Adjusted R^2 greater than 0.70 considered good overall correlation.
** Standard Errors less than 0.10 considered good overall predictive models.
*** Explanatory Variables are considered statistically significant (valid) at the 0.05 level or less.

Figure 4. Results of Statistical Regression of Monthly Water Production

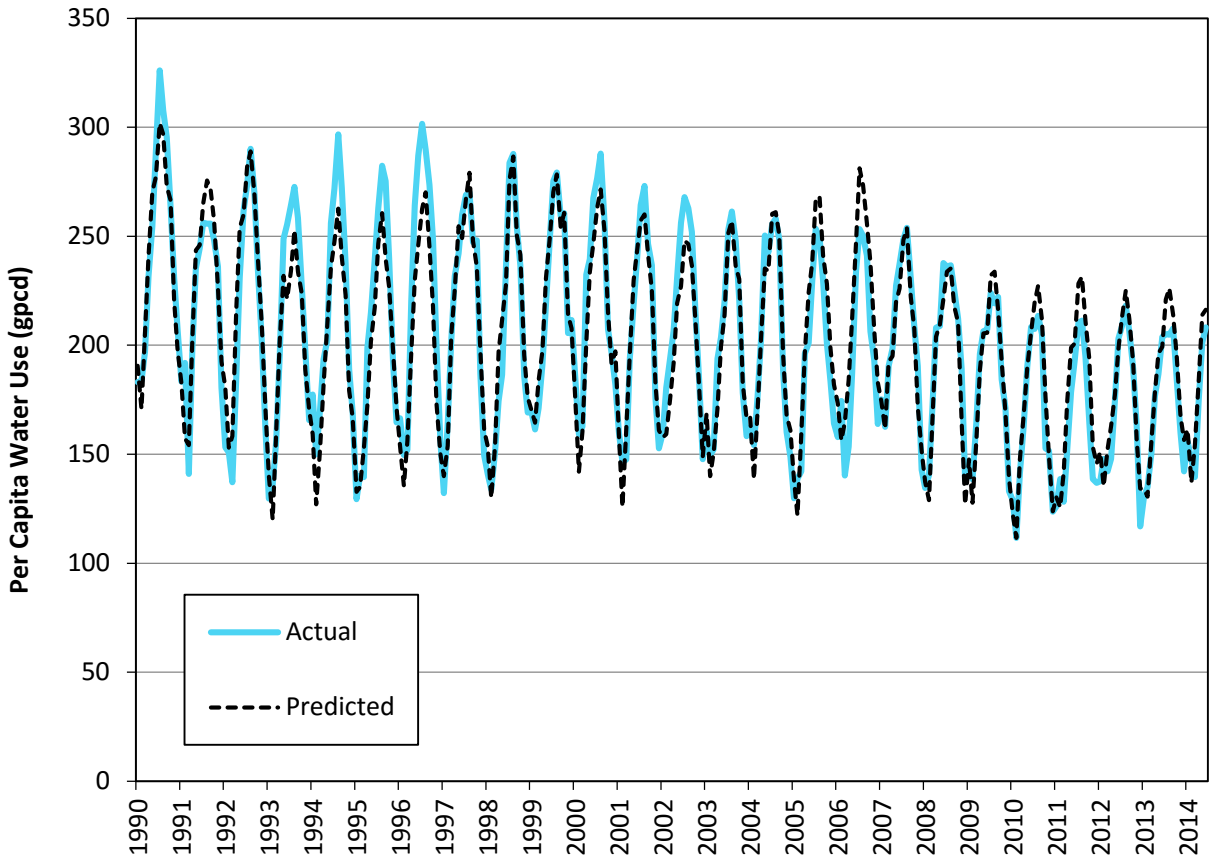

Figure 5. Verification of Statistical Water Use Model

Impacts (% impact on per capita use)	Basin Area	South Orange County	Brea / La Habra	OC Total
Hot/Dry Weather*	+6%	+9%	+6%	+6%
Cool/Wet Weather**	-4%	-7%	-5%	-5%
Economic Recession***	-13%	-12%	-13%	-13%
Drought Conservation	-6%	-5%	-5%	-6%
Passive/Active Cons. (Since 1990)	-20%	-17%	-7%	-19%

*FY 2013-14 for Hot/Dry Weather, relative to average (1990-2014).
**FY 1997-98 for Cool/Wet Weather, relative to average (1990-2014).
*** Comparing unemployment for FY 2009-10 to average (1990-2014).

Figure 6. Impacts of Key Variables on Water Use

2.1 Base Demand Forecast (No Additional Conservation post 2014)

For the purposes of this analysis three types of water conservation were defined. The first type is passive conservation, which results from codes and ordinances, such plumbing codes or model landscape water efficient ordinances. This type of conservation requires no financial incentives and grows over time based on new housing stock and remodeling of existing homes. The second type is active conservation, which requires incentives for participation. The SoCal Water$mart grant that is administered by MET, through its member agencies, provides financial incentives for approved active water conservation programs such as high efficiency toilets and clothes washer retrofits. The third type is extraordinary conservation that results from mandatory restrictions on water use during extreme droughts. This type of conservation is mainly behavioral, in that water customers change how and when they use water in response to the mandatory restrictions. In droughts past, this type of extraordinary conservation has completely dissipated once water use restrictions were lifted—in other words curtailed water demands fully "bounced back" (returned) to pre-curtailment use levels (higher demand levels, within a relatively short period of time (1-2 years).

The great California Drought, which started around 2010, has been one of the worst droughts on record. It has been unique in that for the last two years most of the state has been classified as extreme drought conditions. In response to this epic drought, Governor Jerry Brown instituted the first-ever statewide call for mandatory water use restrictions in April 2015, with a target reduction of 25 percent. Water customers across the state responded to this mandate, with most water agencies seeing water demands reduced by 15 to 30 percent during the summer of 2015. Water agencies in Southern California also ramped up incentives for turf removal during this time. Because of the unprecedented nature of the drought, the statewide call for mandatory water use restrictions, and the success of turf removal incentives it was assumed that the bounce back in water use after water use restrictions are lifted would take longer and not fully recover. For this study, it was assumed (hypothesized) that unit use rates would take 5 years to get to 85 percent

and 10 years to get to 90 percent of pre-drought water use levels. After 10 years, it was assumed that water unit use rates would remain at 90 percent of pre-drought use levels throughout the planning period—reflecting a long-term shift in water demands. Table 2 presents the assumed bounce back in water unit use rates (derived from Table 1) for this drought.

Table 2. Bounce Back in Water Unit Use from Great California Drought

Water Billing Sector	Time Period	Brea/La Habra Unit Use (gal/day)	OC Basin Unit Use (gal/day)	South County Unit Use (gal/day)
Single-Family Residential	2015	431	411	397
	2020	366	349	337
	2025 to 2040	388	369	357
Multifamily Residential	2015	169	211	216
	2020	144	179	183
	2025 to 2040	152	190	194
Commercial *(or combined commercial/ industrial for South County)*	2015	92	97	158
	2020	78	83	134
	2025 to 2040	83	87	142
Industrial	2015	139	167	NA
	2020	119	142	NA
	2025 to 2040	126	150	NA

* Units for single-family and multifamily are households, units for commercial and industrial are employment.

Table 3 presents the demographic projections from CDR for the three areas. These projections were made right after the most severe economic recession in the United States and might be considered low given that fact. In fact, *draft* 2015 demographic forecasts do show higher numbers for 2040.

Table 3. Demographic Projections

Demographic	Time Period	Brea/La Habra	OC Basin	South County	Total Orange County
Single-Family Housing	2020	20,463	386,324	133,989	540,776
	2030	20,470	389,734	138,709	548,913
	2040	20,512	392,387	142,008	554,907
Multifamily Housing	2020	18,561	453,758	118,306	590,625
	2030	19,113	468,972	125,030	613,115
	2040	19,585	478,362	126,736	624,683
Commercial Employment *(or combined commercial/ industrial employment for South County)*	2020	63,909	1,254,415	255,050	1,573,374
	2030	64,961	1,304,353	266,553	1,635,867
	2040	65,743	1,343,509	271,808	1,681,060
Industrial Employment	2020	6,583	138,474	NA	145,057
	2030	6,552	137,763	NA	144,315
	2040	6,523	137,066	NA	143,589

To determine the water demand forecast with no additional (post 2014) water conservation, the water unit use factors in Table 2 are multiplied by the demographic projections in Table 3; then a non-revenue percentage is added to account for total water use (see Table 1 for non-revenue water percentage). These should be considered normal weather water demands. Using the statistical results shown back in Figure 4, demands during dry years would be 6 to 9 percent greater; while during wet years demands would be 4 to 7 percent lower. Table 4 summarizes the demand forecast with no additional conservation post 2014. In year 2040, the water demand with no additional conservation for the total county is forecasted to be 617,466 acre-feet per year (afy). In 2014, the actual county water demand was 609,836; in 2015, the demand was 554,339 and the projected forecast for 2016 is 463,890. This represents a total water demand growth of only 1.25 percent from 2014 to 2040. In contrast, total number of households for the county is projected to increase 4.24 percent for the same period; while county employment is projected to increase by 6.22 percent.

Table 4. Normal Weather Water Demand Forecast with No Additional Conservation Post 2014

Brea / La Habra

	Baseline Demand Forecast (no new conservation)					
	SF AFY	MF AFY	COM AFY	IND AFY	Non Rev AFY	Total AFY
2015	9,404	3,140	6,190	1,033	1,186	20,953
2020	8,397	2,992	5,605	874	1,072	18,941
2025	8,894	3,262	6,033	921	1,147	20,257
2030	8,913	3,342	6,105	917	1,157	20,434
2035	8,913	3,501	6,163	913	1,169	20,659
2040	8,919	3,513	6,205	909	1,173	20,719

South County

	Baseline Demand Forecast (no new conservation)					
	SF AFY	MF AFY	COM AFY	IND AFY	Non Rev AFY	Total AFY
2015	56,181	26,940	41,990		7,507	132,616
2020	50,644	24,300	38,355		6,798	120,097
2025	55,512	27,191	42,443		7,509	132,655
2030	56,832	27,562	43,280		7,660	135,335
2035	57,350	27,884	43,970		7,752	136,956
2040	57,635	28,047	44,459		7,809	137,950

OC Basin

	Baseline Demand Forecast (no new conservation)					
	SF AFY	MF AFY	COM AFY	IND AFY	Non Rev AFY	Total AFY
2015	175,544	100,997	127,252	26,027	30,087	459,907
2020	150,978	91,182	116,082	22,015	26,618	406,874
2025	161,270	99,782	127,803	23,190	28,843	440,889
2030	162,368	101,780	131,640	23,073	29,320	448,181
2035	162,772	103,766	134,543	22,958	29,683	453,722
2040	162,969	105,890	137,083	22,840	30,015	458,797

Total Orange County

	Baseline Demand Forecast (no new conservation)					
	SF AFY	MF AFY	COM AFY	IND AFY	Non Rev AFY	Total AFY
2015	241,129	131,076	175,431	27,059	38,780	613,476
2020	210,019	118,473	160,042	22,889	34,488	545,911
2025	225,676	130,236	176,279	24,111	37,499	593,801
2030	228,113	132,685	181,025	23,990	38,137	603,950
2035	229,034	135,151	184,676	23,871	38,604	611,338
2040	229,524	137,450	187,747	23,750	38,996	617,466

2.2 Future Passive and Baseline Active Water Conservation

2.2.1 Future Passive Water Conservation

The following future passive water conservation estimates were made:

- High efficiency toilets – affecting new homes and businesses (post 2015) and remodels
- High efficiency clothes washers – affecting new homes (post 2015)
- Model Water Efficient Landscape Ordinance – affecting new homes and businesses (post 2015)

High Efficiency Toilets

A toilet stock model was built tracking different flush rates over time. All new homes (post 2015) are assumed to have one gallon per flush toilets. This model also assumes a certain amount of turn-over of older toilets due to life of toilet and remodeling rates. This analyses was done for single-family, multifamily and non-residential sectors. The following assumptions were made:

- Number of toilet flushes is 5.5 per person per day for single-family and multifamily homes.
- Household size is calculated from CDR data on persons per home. In single-family, household size decreases over time.
- Number of toilet flushes is 2.5 per employee per day for non-residential.
- Replacement/remodeling rates are 7% per year for 5 gal/flush toilet; 6% per year for 3.5 gal/flush toilets; and 5% per year for 1.6 gal/flush toilets.

Table 5 shows this toilet stock model for the OC Basin for single-family and non-residential sectors as an example.

Table 5. Toilet Stock Model for OC Basin (example)

OC Basin Single-Family										
#		Total	Portion of Homes with Gal/Flush Toilets						Savings	Savings
Flushes	Year	Housing	7	5	3.5	1.6	1	Av Flush	(GPD/H)	(AFY)
17.40	2000	348,114	3,133	53,261	123,232	168,487	-	2.84		
17.40	2013	379,999	-	4,794	27,111	348,094	-	1.78		
17.40	2015	381,806	-	4,122	23,858	313,285	40,541	1.69		
17.37	2020	386,324	-	2,680	16,700	234,964	131,980	1.50	3.32	1,435
17.31	2025	389,734	-	-	11,690	176,223	201,821	1.35	5.98	2,610
17.23	2030	392,387	-	-	8,183	132,167	252,037	1.25	7.54	3,312
17.14	2035	393,363	-	-	5,728	99,125	288,509	1.19	8.64	3,806
17.05	2040	393,840	-	-	4,010	74,344	315,486	1.14	9.43	4,159

OC Basin Non-Residential										
#			Portion of Emp with Gal/Flush Toilets						Savings	Savings
Flushes	Year	Empl	7	5	3.5	1.6	1	Av Flush	(GPD/E)	(AFY)
3,298,440	2015	1,319,376	-	13,194	131,938	461,782	712,463	1.50		
3,510,508	2020	1,404,203	-	8,576	92,356	346,336	956,935	1.34	0.41	641
3,633,438	2025	1,453,375	-	5,574	64,649	259,752	1,123,399	1.23	0.67	1,083
3,729,448	2030	1,491,779	-	3,623	45,255	194,814	1,248,087	1.16	0.84	1,404
3,801,693	2035	1,520,677	-	2,355	31,678	146,111	1,340,533	1.12	0.96	1,635
3,864,600	2040	1,545,840	-	1,531	22,175	109,583	1,412,551	1.08	1.04	1,808

High Efficiency Clothes Washers

It was assumed that all new clothes washers sold after 2015 would be high efficiency and roughly save 0.033 afy per washer[1]. These savings would only apply to new homes (post 2015), and only for the single-family sector.

Model Water Efficient Landscape Ordinance (2015)

The new California Model Water Efficient Landscape Ordinance (MWELO) will take place in 2016. For single-family and multifamily homes it will require that 75 percent of the irrigable area be California Friendly landscaping with high efficiency irrigation systems, with an allowance that the remaining 25 percent can be turf (high water using landscape). For non-residential establishments it will require 100 percent of the irrigable area to be California Friendly landscaping with high efficiency irrigation systems (and no turf areas). There are exemptions for non-potable recycled water systems and for parks and open space. To calculate the savings from this ordinance a parcel database provided by MWDOC was analyzed. This database had the total irrigable area and turf area delineated for current parcels. For each parcel, a target water savings was set depending on the sector. For residential parcels, 25 percent of the total irrigable area was assumed to be turf and the savings from a non-compliant parcel was estimated. For each square feet of turf conversion the estimate savings is 0.00013 afy[1]. Table 6 summarizes the per parcel savings for the total county using this method.

Table 6. Estimated Parcel Savings from MWELO for Total Orange County

Parcel Type	Number of Parcels	Total Irrigable Area (sq. feet)	Current Turf Area (sq. feet)	Turf Conversion (sq. feet)*	Turf Conversion (sq. ft / parcel)	Conservation Savings (afy/parcel)
Single-Family Residential	527,627	2,114,679,368	897,177,779	368,507,937	698	0.091
Multifamily Residential	555,255	155,315,983	51,697,361	12,868,365	23	0.003
Businesses (Non-Residential)	1,623,307	499,127,269	212,043,667	212,043,667	131	0.017

* Assumes 25% turf conversion for single-family and multifamily, and 100% for businesses.

The conservation savings in afy/parcel where then multiplied by new homes and businesses (post 2015), assuming a 75 percent compliance rate.

2.2.2 Future Baseline Active Water Conservation

To estimate a baseline water savings from future active water conservation measures, the actual average annual water savings for the last seven years for the SoCal Water$mart program within Orange County were analyzed. A continuation of this program through 2040 at similar annual implementation rates was assumed to be representative of a baseline estimate for active water conservation into the future.

[1] Per MET's SoCal Water$mart conservation estimates, table provided by MWDOC (2015).

New active conservation measures or more aggressive implementation of existing active conservation will be evaluated as part of a portfolio analysis of water demand and supply options in Phase 2 of the OC Study.

2.2.3 Total Future Water Conservation Savings

Combing future passive and active water conservation results in a total estimated water savings, which is summarized in Table 7. The total passive and active conservation for the total Orange County is shown in Figure 7.

Table 7. Future Passive and Baseline Active Water Conservation Savings

Brea/La Habra Area

	Single-Family Savings (AFY)					Multifamily Savings (AFY)				Non-Residential Savings (AFY)			
	MWELO	HEC Pass	Toilets	Active	Total	MWELO	Toilets	Active	Total	MWELO	Toilets	Active	Total
2020	186	32	78	8	304	11	51	5	67	63	32	17	112
2025	169	33	131	15	348	13	85	10	108	79	52	34	166
2030	166	34	163	30	394	16	106	20	142	91	67	68	226
2035	156	34	186	61	437	21	127	40	188	101	77	136	314
2040	149	34	203	79	465	21	137	53	211	108	85	177	370

OC Basin

	Single-Family Savings (AFY)					Multifamily Savings (AFY)				Non-Residential Savings (AFY)			
	MWELO	HEC Pass	Toilets	Active	Total	MWELO	Toilets	Active	Total	MWELO	Toilets	Active	Total
2020	272	148	1,435	221	2,076	61	1,217	171	1,449	759	641	556	1,956
2025	430	260	2,610	441	3,742	96	2,165	342	2,603	1,199	1,083	1,112	3,394
2030	542	347	3,312	883	5,084	118	2,738	684	3,540	1,542	1,404	2,224	5,170
2035	557	379	3,806	1,766	6,509	139	3,182	1,369	4,690	1,801	1,635	4,447	7,883
2040	544	395	4,159	2,472	7,570	162	3,537	1,916	5,615	2,026	1,808	6,226	10,059

South County

	Single-Family Savings (AFY)					Multifamily Savings (AFY)				Non-Residential Savings (AFY)			
	MWELO	HEC Pass	Toilets	Active	Total	MWELO	Toilets	Active	Total	MWELO	Toilets	Active	Total
2020	558	251	507	116	1,432	11	335	160	506	582	119	329	1,029
2025	812	406	877	232	2,326	22	599	321	942	960	202	657	1,819
2030	972	514	1,148	463	3,097	25	761	642	1,428	1,133	257	1,314	2,704
2035	990	556	1,332	927	3,805	27	876	1,283	2,187	1,275	298	2,628	4,201
2040	967	580	1,480	1,112	4,139	29	969	1,540	2,537	1,376	327	3,154	4,857

Total County

	Single-Family Savings (AFY)					Multifamily Savings (AFY)				Non-Residential Savings (AFY)			
	MWELO	HEC Pass	Toilets	Active	Total	MWELO	Toilets	Active	Total	MWELO	Toilets	Active	Total
2020	1,017	431	2,020	344	3,812	83	1,602	337	2,022	1,404	792	901	3,097
2025	1,411	698	3,618	688	6,416	132	2,848	673	3,653	2,238	1,337	1,803	5,378
2030	1,680	895	4,624	1,377	8,575	159	3,606	1,346	5,111	2,766	1,728	3,606	8,100
2035	1,704	969	5,325	2,754	10,752	188	4,185	2,692	7,065	3,177	2,010	7,212	12,399
2040	1,660	1,009	5,842	3,663	12,175	212	4,643	3,509	8,363	3,510	2,219	9,557	15,286

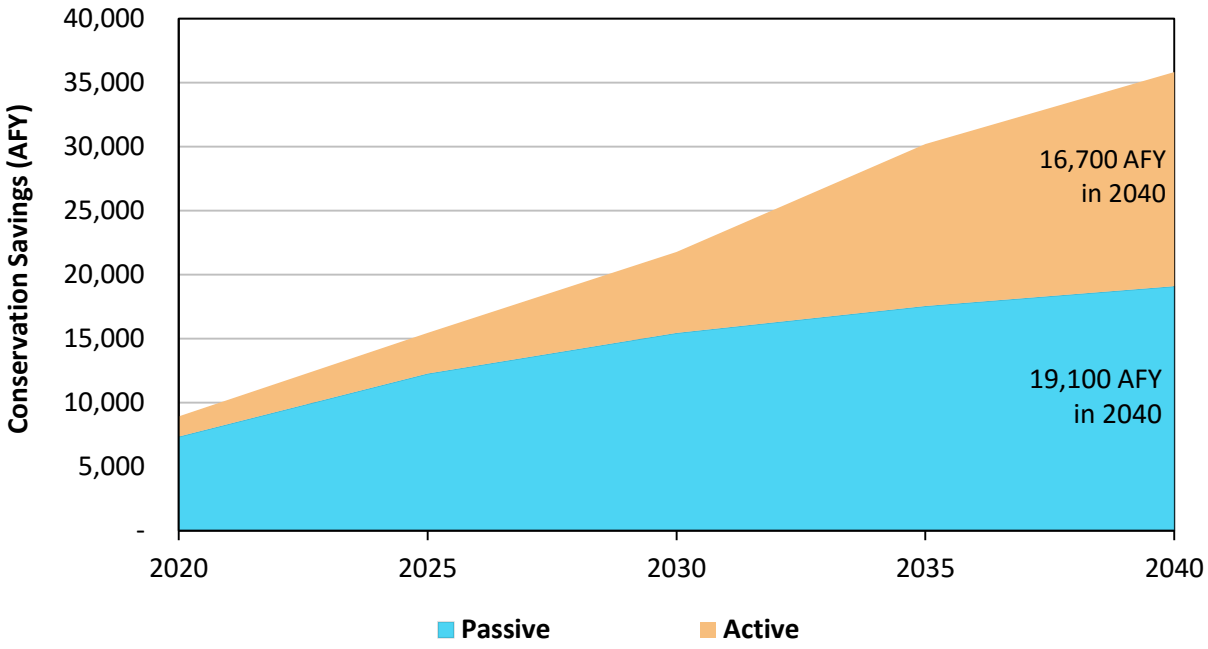

Figure 7. Total Water Conservation in Orange County

1.3 With Conservation Demand Forecast

Subtracting the future water conservation savings shown in Table 7 from the base water demand forecast shown in Table 4 results in the water demand forecast with conservation that is used to model potential water supply gaps for the OC Study. Table 8 presents the demand forecast by area and total Orange County, while Figure 8 presents the historical and forecasted water demands for total Orange County.

Note: Price elasticity of water demand reflects the impact that changes in retail cost of water has on water use. Theory states that if price goes up, customers respond by reducing water use. A price elasticity value of -0.2 implies that if the real price of water increases by 10%, water use would decrease by 2%. Price elasticity is estimated by detailed econometric water demand models, where price can be isolated from all other explanatory variables. Many times price is correlated with other variables making it difficult to estimate a significant statistical value. In addition, there is a potential for double counting reduction in water demand if estimates of future conservation from active programs are included in a demand forecast because customers who respond to price take advantage of utility-provided incentives for conservation. MET's 2015 IRP considers the impact of price elasticity in their future water demand scenarios, but does not include future active conservation in its demand forecast. The OC Study included future estimates of water conservation from active conservation, and thus did not include a price elasticity variable in its statistical modeling of water demand. Including both price elasticity and active conservation would have resulted in "double counting" of the future water savings.

Table 7. Water Demand Forecast with Conservation

Brea / La Habra

	With Conservation Demand				
	SF AFY	MF AFY	CII AFY	Non Rev AFY	Total AFY
2020	8,094	2,925	6,368	1,043	18,429
2025	8,546	3,154	6,789	1,109	19,598
2030	8,519	3,200	6,796	1,111	19,626
2035	8,475	3,313	6,762	1,113	19,663
2040	8,454	3,302	6,745	1,110	19,611

OC Basin

	With Conservation Demand				
	SF AFY	MF AFY	CII AFY	Non Rev AFY	Total AFY
2020	148,902	89,733	136,077	26,230	400,941
2025	157,528	97,180	147,532	28,157	430,396
2030	157,284	98,240	149,476	28,350	433,350
2035	156,263	99,076	149,552	28,342	433,233
2040	155,399	100,275	149,797	28,383	433,854

South County

	With Conservation Demand				
	SF AFY	MF AFY	CII AFY	Non Rev AFY	Total AFY
2020	49,212	23,793	37,326	6,620	116,951
2025	53,186	26,250	40,624	7,204	127,263
2030	53,735	26,135	40,575	7,227	127,672
2035	53,545	25,697	39,769	7,141	126,151
2040	53,496	25,509	39,602	7,116	125,725

Total Orange County

	With Conservation Demand				
	SF AFY	MF AFY	CII AFY	Non Rev AFY	Total AFY
2020	206,207	116,451	179,770	33,893	536,321
2025	219,260	126,583	194,945	36,470	577,257
2030	219,537	127,575	196,848	36,688	580,647
2035	218,283	128,086	196,082	36,596	579,047
2040	217,349	129,087	196,144	36,610	579,189

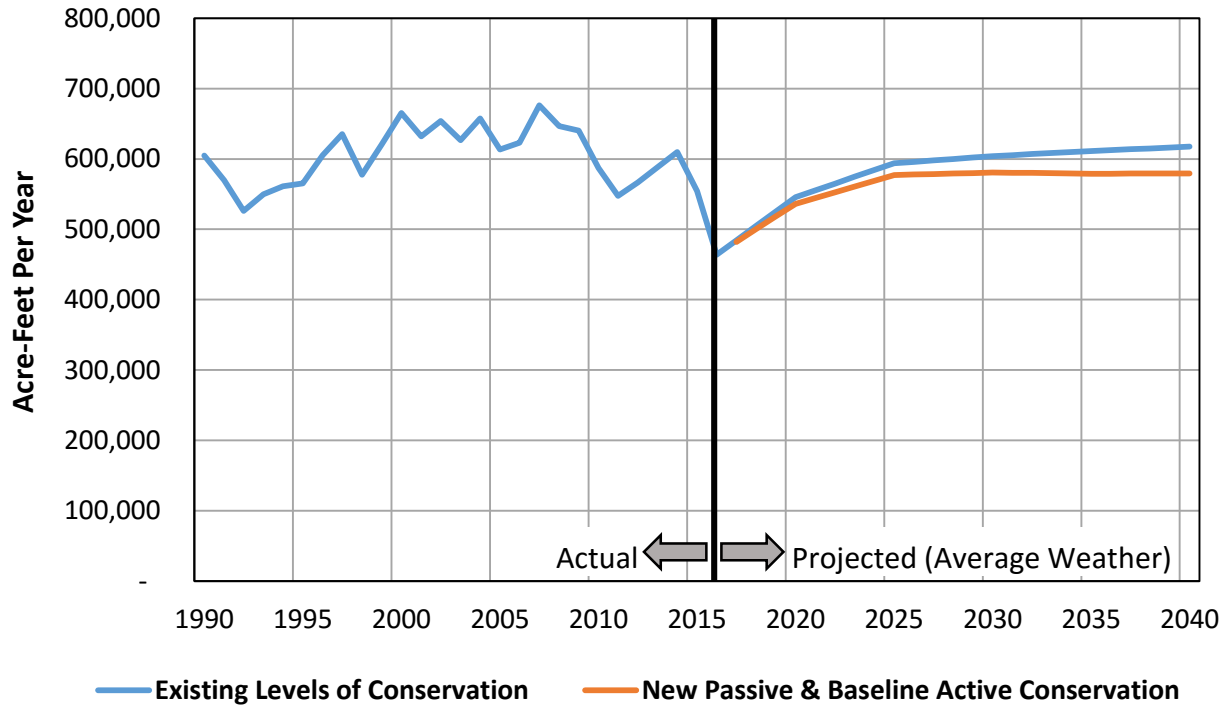

Figure 8. Water Demand Forecast for Total Orange County

3.0 Planning Scenarios

At the start of the Orange County Water Reliability Study, a workgroup was formed made up of representatives from Orange County water agencies. This OC Workgroup met 13 times during the

12-month Phase 1 of the study. During the first four meetings of the OC Workgroup, three basic planning scenarios emerged, each with and without a California WaterFix to the Delta—thus resulting in six scenarios in total. While there was discussion on assigning probabilities or weights to these planning scenarios, consensus was not reached on which scenario was more probable than the others. Assignment of the likelihood that one scenario is more probable than the others will be revisited in Phase 2 of the Orange County Reliability Study. There was, however, general agreement that all of the scenarios represent plausible future outcomes and thus all scenarios should be evaluated in terms of assessing potential water supply gaps (difference between forecasted water demands and existing water supplies). It is important to note that the purpose of estimating the water supply gaps for Orange County is to determine what additional MET and Orange County water supply investments are needed for future reliability planning. Thus, other than the California WaterFix to the Delta, all planning scenarios assume no new additional regional or Orange County water supply investments, with a couple of exceptions. In Orange County, it was assumed that existing and planned non-potable recycling projects would build additional supplies out into the future. It was also assumed that the OCWD GWRS Phase 3 expansion project would be implemented by 2022 to increase the recycled supplies for groundwater replenishment from 100,000 afy to 130,000 afy.

To develop the planning scenarios, the OC Workgroup considered the following parameters:

- California WaterFix to Sacramento-San Joaquin Delta (Cal Fix), which impacts the reliability of the State Water Project.
- Regional MET water demands and supplies, which impacts the availability of water from MET and supply reliability for Orange County.
- Orange County water demands, which impacts the supply reliability for Orange County.
- Santa Ana River baseflows, which impacts the replenishment of the OC Basin and the supply reliability for the water agencies within the OC Basin.
- Climate variability impacts on regional and local water demands and supplies, which impacts the availability of water from MET and the supply reliability for Orange County.

The definition of the six scenarios are:

- **Scenario 1a - Planned Conditions, No Cal Fix:** Essentially represents MET's IRP planning assumptions, with very little climate variability impacts (only impacting Delta supplies and not through 2040), no California Fix to the Delta, and no new regional or OC water supply investments.
- **Scenario 1b - Planned Conditions, with Cal Fix:** Same as Scenario 1a, but with new supply from the California Fix to the Delta beginning in 2030.

- **Scenario 2a - Moderately Stressed Conditions, No Cal Fix:** Moderate levels of climate variability impacts (affecting Delta, Colorado River, and Santa Ana watershed), slightly lower regional local supplies than MET assumes in IRP, 4% higher demand growth reflecting climate impacts and higher demographic growth, no California Fix to the Delta, and no new regional or OC water supply investments. The higher demand growth and fewer local supplies reflects potential future impacts if our existing demographics are low and if local supplies become more challenged, a continuation of the trend in recent times.

- **Scenario 2b - Moderately Stressed Conditions, with Cal Fix:** Same as 2a, but with new supply from California Fix to the Delta beginning in 2030.

- **Scenario 3a - Significantly Stressed Conditions, No Cal Fix:** Significant levels of climate variability impacts (affecting Delta, Colorado River, and Santa Ana watershed), 8% higher demand growth reflecting climate impacts and higher demographic growth, no California Fix to the Delta, and no new regional or OC water supply investments.

- **Scenario 3b - Significantly Stressed Conditions, with Cal Fix:** Same as 3a, but with new supply from California Fix to the Delta beginning in 2030.

All of these scenarios were deemed plausible and likely carry about the same likelihood of occurring. While no attempt was made to specifically assign the probability of any one of the six scenarios occurring over the others, some might postulate that Scenario 2 would be the most likely to occur given that most climate experts believe we are already seeing evidence of climate variability impacts today. But even with this postulation, assigning a probability to the success of the Cal Fix would be difficult at this time.

4.0 Water Supply Gap

To plan for future water supply reliability, a gap between forecasted water demands and existing supplies (plus planned projects that are a certainty) should be estimated. In past planning efforts, this gap is often done for average conditions or at best, using one reference drought condition. However, due to recent droughts and environmental restrictions in the Delta, a more sophisticated approach to estimating the potential water supply gap is needed. The OC Model, described in detail in TM #2: Development of OC Supply Simulation Model, uses "indexed-sequential" simulation to evaluate regional water demands and supplies, and Orange County water demands and supplies. All model demands and supply sources are referenced to the same hydrologic index—meaning that if a repeat of the year 1991 occurred, the OC Model would represent the availability of Delta water supplies in 1991 to MET, the availability of Colorado River water supplies in 1991 to MET, and the local Santa Ana watershed conditions in 1991. The OC Model also preserves the historical sequence of the hydrologic years. This is necessary because the source of availability of Delta and Colorado River water supplies are hydrologic models run by California Department of Water Resources (DWR) and the Bureau of Reclamation (BOR). These hydrologic models incorporate water rights (or contract rights) and storage conditions that are run using a specific sequence of hydrologic conditions. Both MET IRP and OC modeling of water supply maintain these sequences in order to

preserve the accuracy of the DWR and BOR model inputs. The hydrologic period used by the OC Model is 1922 to 2014 (which differs from MET's IRP which is 1922 to 2012). The forecast period is 2015 to 2040. Thus, in the OC Model there are 93 25-year sequences that are mapped to the forecast period. When the year 2014 is reached in any of the sequences, the next year wraps back around starting in 1922. Table 8 illustrates how the indexed-sequential method works.

Table 8. Illustration of Indexed-Sequential Supply Simulation

Forecast Year	Hydrologic Simulation Year – Sequence 1	Hydrologic Simulation Year – Sequence 2	. . .	Hydrologic Simulation Year – Sequence 93
2015	1922	1923		2014
2016	1923	1924		1922
⋮	⋮	⋮		⋮
2040	1947	1948		1946

Using the SWP system as an index, approximately 12 of the 93 historical hydrologic years (13 percent) are considered critically dry; 20 years (22 percent) are considered very wet; and the remaining 61 years (65 percent) are along the below-normal, normal, and above-normal spectrum.

4.1 Assumptions for Supply Gap Analysis

Figure 9 presents the overall assumptions for the water supply gap analysis. Figure 10 presents more specific assumptions regarding groundwater in the OC Basin. In addition to these assumptions, the following summarizes some of the differences between the MET IRP and the supply gap analysis for the OC Study:

- **Simulation Period:** MET IRP uses a historical hydrology from 1922 to 2012; while the OC Study uses a historical hydrology from 1922 to 2014—capturing the recent drought.
- **Cal Fix:** When the Cal Fix is included, MET IRP assumes that new supply from Cal Fix begins in 2020, based on the assumption that a "commitment" to move forward with the Cal Fix project will result in regulatory relief, beginning in 2020; while the OC Study assumes that supplies from Cal Fix begins when project is fully operational in 2030.
- **Water Conservation:** MET IRP only includes new passive conservation in their demand forecast (with new active conservation being reserved as a new supply option); while the OC Study assumes new passive and baseline new active conservation for water demands in Orange County (additional new active conservation will be evaluated in Phase 2 of the OC Study).

- **Climate Variability:** MET IRP only includes minimal impacts of climate variability for Delta water supplies through 2030; while the OC Study includes a range of climate scenario impacts on water supplies from Delta, Colorado River and Santa Ana Watershed through 2040.

Water Demands (AFY)	FY 2014 Actual	FY 2015 Actual	2025 Projected	2040 Projected
MET Demands*	2,300,000	1,850,000	1,920,000	2,028,000
OCWD Basin Demands**	453,000	410,000	425,000	434,000
OC Total Demands**	610,000	554,000	565,000	579,000

* With future passive conservation only ** With future passive and baseline new active conservation

OC Groundwater (AFY)	Brea/La Habra	Net OC Basin	South County	Total
Groundwater Supply	15,000*	188,500**	10,000	213,500

* Based on firm yield from La Habra Basin and groundwater purchases from Main San Gabriel Basin.
** Includes GWRS, SAR baseflows, SAR stormflows, incidental recharge, MET replenishment, and miscellaneous pumping.

OC Non-Potable Recycled Water (AFY)	2015	2040
OC Basin Recycled Water	22,000	27,700
South County Recycled Water	23,900	41,800
Total	45,900	69,500

Note: Irvine Ranch Water District (IRWD) is split between the Basin and South County

Figure 9. Overall Assumptions for Water Supply Gap Analysis

OC Basin Groundwater (AFY)	Near-Term	Long-Term	Range Within Model
Groundwater Replenishment System (GWRS)	100,000	130,000	100,000 to 130,000
SAR Baseflow (mid level assumption)	53,000	53,000	34,000 to 53,000
SAR Stormflow (average of all hydrologies)	53,000	53,000	6,000 to 150,000
SAR Incidental Recharge (average of all hydrologies)	59,000	59,000	20,000 to 140,000
MET Replenishment (average of all hydrologies)*	54,000	34,000	0 to 65,000
BEA Outflows	-22,000	-9,000	-22,000 to -9,000
Misc. Pumping (golf courses, etc.)	-8,500	-8,500	-8,500
Net Groundwater for OC Basin Agencies	**288,500**	**311,500**	**168,000 to 455,000**

* While OCWD replenishment target is 65,000 AFY, replenishment water is not assumed to be taken during very wet years when SAR stormflows are high, and only a portion of replenishment water is available during years in which MET is in allocation of imported water.

Figure 10. Assumptions for Groundwater in OC Basin

4.2 Availability of Water from MET

Key to the assessment of water reliability for Orange County is estimating the availability of imported water from MET under a wide range of scenarios. Availability of MET water to Orange County is a function of the water demands on MET and the reliability of imported water from the Colorado River and Delta to MET, supplemented by withdrawals from various MET storage accounts.

4.2.1 Demands on MET

MET water demands represent that difference between regional retail water demands (inclusive of groundwater replenishment) and regional local supplies (which includes groundwater, Los Angeles Aqueducts, surface reservoirs, groundwater recovery, recycled water, and seawater desalination). Table 9 presents the MET demand forecast under normal/average weather conditions.

A significant challenge for MET in terms of reliability planning is it represents the "swing" water supply for the region. This compounds the variability on demands on MET due to weather and hydrology. For retail water demands, variations in weather can cause water use to change ± 5 to 9 percent in any given year due to varying demands for irrigation and cooling. In addition to retail water demand variability, local supplies can vary ± 80 percent for the Los Angeles Aqueducts and ± 55 percent for surface reservoirs. Thus, the variability for demands on MET in any given year can be ± 15 to 25 percent. This fact alone makes storage so key in assuring supply reliability for MET and the region.

Table 9. Demands on MET

Total Demand (AFY)	2020	2030	2040
Retail M&I	3,707,546	3,865,200	3,954,814
Retail Agricultural	169,822	163,121	159,537
Seawater Barrier	66,500	66,500	66,500
Replenishment	292,777	272,829	272,847
Total Demand	**4,236,645**	**4,367,650**	**4,453,698**

Local Supplies (AFY)			
Groundwater Production	1,308,101	1,321,220	1,322,197
Surface Production	113,705	113,705	113,705
Los Angeles Aqueduct	261,100	264,296	267,637
Seawater Desalination	50,637	50,637	50,637
Groundwater Recovery	142,286	158,816	162,688
Recycled Water	425,131	468,862	495,698
Other Non-Metropolitan Imports	13,100	13,100	13,100
Total Local Supplies	**2,314,061**	**2,390,637**	**2,425,663**

Demand On MET (AFY)			
Consumptive Use	1,743,866	1,826,245	1,880,131
Seawater Barrier	11,635	8,708	5,877
Replenishment	167,083	142,060	142,027
Total Net Demand on Metropolitan	**1,922,584**	**1,977,013**	**2,028,035**

4.2.2 Supplies from Colorado River and Delta

MET's water supply from the Colorado River, via the Colorado River Aqueduct (CRA), has historically been the backbone to MET's supply reliability. Before the settlement agreement between lower Colorado River Basin states and water agencies that use Colorado River water within California, MET kept the CRA full at 1.2 million acre-feet (maf) per year or nearly at that level in many years. The settlement agreement requires California to live within its 4.4 maf apportionment, and dictates how Colorado River water within California is prioritized. This eliminated most of the surplus water that MET was using to keep the CRA full. To deal with this challenge, MET has developed a number of water transfers and land fallowing programs to mitigate the impacts of the settlement agreement. The 2015 MET IRP is assuming that it will maintain minimum CRA supply of 0.90 maf, with a goal of a full CRA during dry years, when needed (although it is not specified exactly how that will occur).

For the OC Study, we have assumed similar baseline assumptions as the MET IRP, but have added some uncertainties with regard to climate scenarios under Scenario 2 and more significant impacts under Scenario 3. Under significant climate scenario impacts (Scenario 3), where the BOR simulates that Lake Mead elevation would fall below 1,000 feet about 80 percent of the time, the OC Study assumed MET would get a proportionate share of shortages that are allocated by BOR. Exactly how BOR would manage water shortages when Lake Mead elevation falls below 1,000 is uncharted territory, but assuming some proportional allocation of Colorado River water among the Lower Basin states and within California is a plausible scenario. Figure 11 presents the assumed CRA water supplies to MET for the OC Study with (Scenario 3) and without (Scenarios 1 & 2) significant climate scenario impacts. Under the significant climate scenario (Scenario 3), there is a 50 percent probability that CRA deliveries would be below 815,000 afy and a 20 percent probability that CRA deliveries would be below 620,000 afy.

The other main source of imported water available to MET is from the Delta and is delivered to Southern California via the State Water Project (SWP). Although MET's contract for SWP water is 2.0 maf, it has never received that amount. Prior to the QSA (in 2003) when MET relied more heavily on CRA supplies, the maximum water taken by MET from the SWP exceeded 1.1 maf in only three years (1989, 1990 and 2000). Beginning in 2001, MET has tried to maximize their delivery of SWP water. In very wet years, MET typically receives about 1.7 maf of supply from the SWP (about 80 to 85% of their total contract). More typically, MET receives closer to 1.2 maf of supply from the SWP (about 60% of their maximum contract). Droughts and environmental regulatory restrictions in the Delta have greatly impacted the reliability of SWP supply. Biological opinions regarding endangered species not only limit Delta exports during dry years, but have greatly impacted exports during more normal years when water agencies such as MET are counting on such water for storage replenishment.

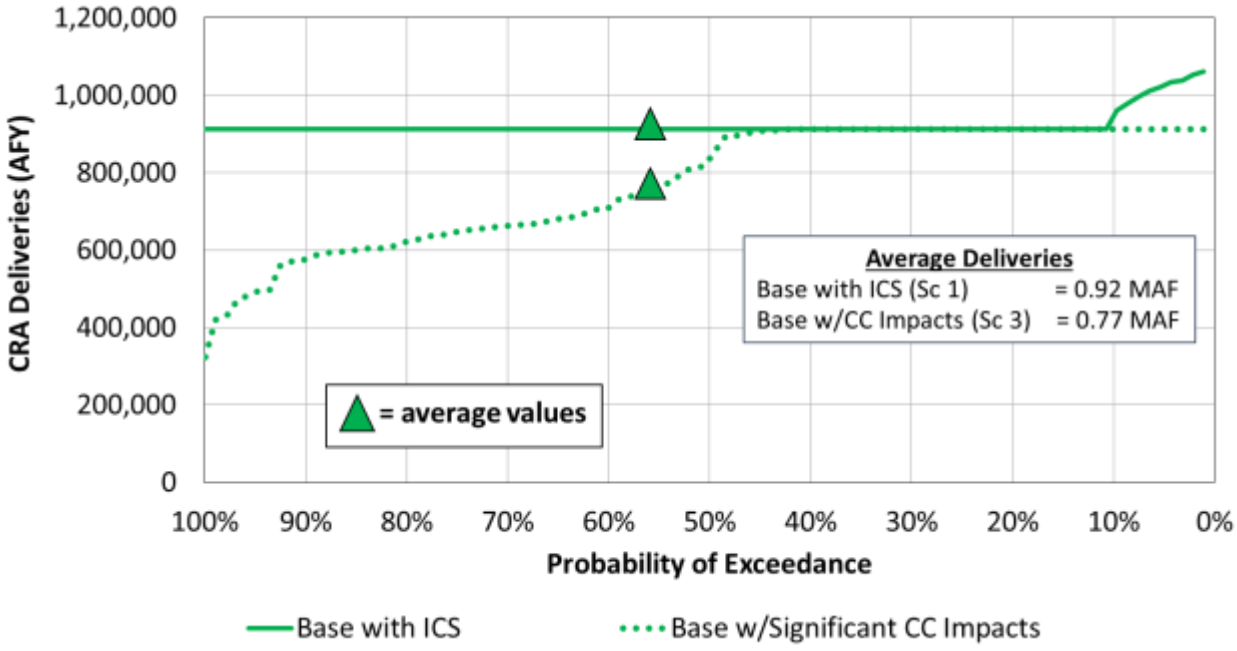

Figure 11. Colorado River Aqueduct Deliveries to MET

To stabilize the decline in SWP deliveries, California has committed to the California WaterFix (Cal Fix) and California EcoRestore. In the long-term, the preferred alternative identified in Cal Fix is expected to increase SWP deliveries (above what they otherwise would have been) by providing more flexible water diversions through improved conveyance and operations. It is important to note that the Cal Fix does not generate **NEW** water supplies per se, but allows supplies lost due to regulatory restrictions to be regained. This project would also provide much needed resiliency during seismic events in the Delta. The new conveyance and diversion facilities will allow for increased water supply reliability and a more permanent solution for flow-based environmental standards. The anticipated implementation of the Cal Fix is expected to be around 2030. Assuming a more flexible, adaptive management strategy, MET is assuming that if Cal Fix moves forward that regulatory relief from further biological opinions in the Delta would occur and SWP deliveries would return to pre-biological opinion deliveries as soon as 2020. However, some might argue this is an optimistic assumption, and there is no certainty that such relief would occur until the project is operational. Therefore for the GAP analysis, the OC Study assumed that improved SWP deliveries from Cal Fix would begin in 2030.

Climate variability can further reduce the reliability of SWP deliveries. The source of water that is pumped from the Delta originates in the Sierra Nevada Mountains as snowpack. It is widely accepted by climate and hydrology experts that climate scenario impacts on snowpack-driven water supplies is even more significant because even a fraction of a degree increase leads to early snowmelt which reduces the ability to capture river flows in surface reservoirs. Using methods described in TM#2, CDM Smith and its climate scenario expert Dr. David Yates estimated the potential impacts to the SWP under significant climate scenario. These estimates are similar to

earlier work that California DWR did on climate scenario impacts on SWP reliability. Figure 12 presents the full range of SWP deliveries to MET with and without Cal Fix and with and without significant climate scenario impacts. As shown, the Cal Fix greatly improves the reliability of SWP supplies to MET—with an average increase in supply (restoration of supplies compared to the no project alternative) of over 400,000 afy. Significant climate scenario reduces SWP deliveries by an average of 200,000 afy, even with the Cal Fix.

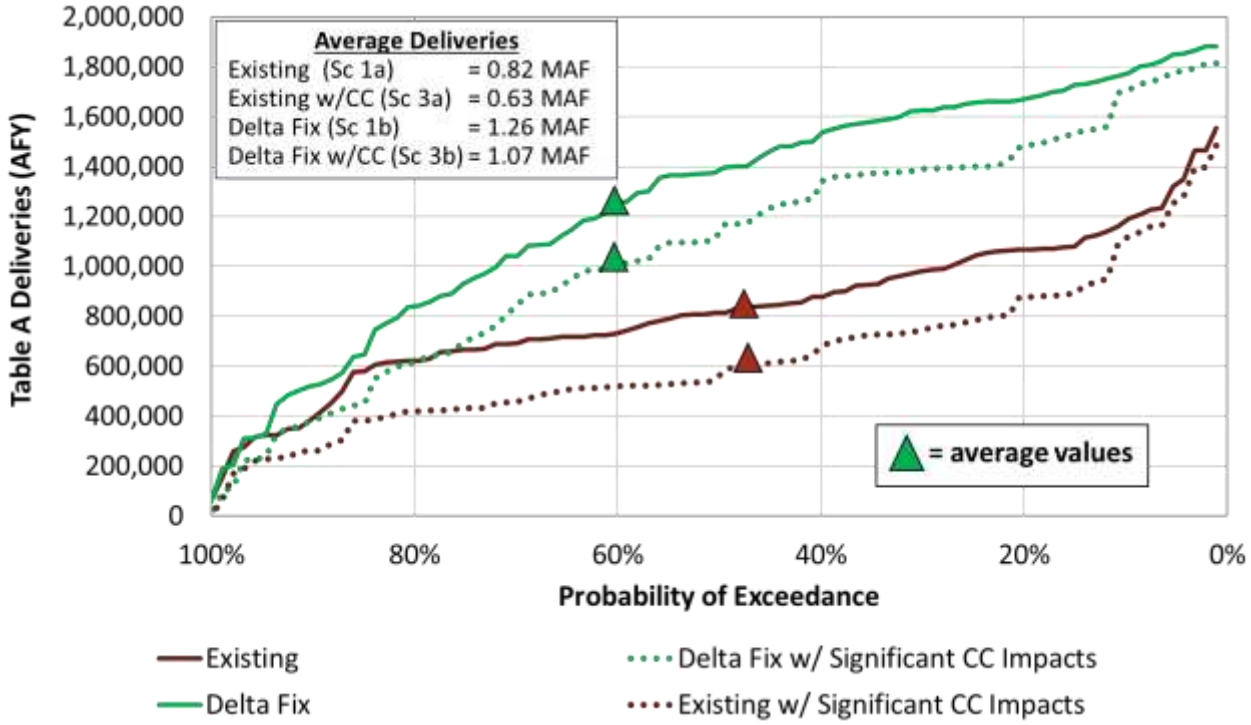

Figure 12. State Water Project Deliveries to MET

4.2.3 Overall MET Reliability

In addition to CRA and SWP water, MET has significant surface storage and groundwater storage programs. MET also has a number of water transfers in the Central Valley. These investments have been critical for the region's supply reliability during droughts. However, since the first MET IRP in 1996 MET has had to allocate its imported water to its member agencies three in the last seven years.

Using the indexed-sequential simulation method described in TM#2, MET water reliability can be illustrated for several hydrologic sequences. Figures 13, 14 and 15 utilize just 2 of the 93 hydrology sequences to demonstrate how the analysis works. Figure 13 shows the MET demands and supplies without a Cal Fix for the forecast period 2015 to 2040 with the last 25-year hydrologic sequence of 1989 to 2014 imposed. In other words, forecast year 2015 is 1989, 2016 is 1990 … and 2040 is 2014. Of all the 93 possible 25-year hydrologic sequences, this one is the worst in terms of cumulative supply shortages.

Figure 14 shows Met demands and supplies without a Cal Fix for a more normal hydrology sequence imposed on the forecast period (this sequence begins with 1950 and ends in 1975). Even with a normal hydrology, there are still some water shortages in the later years. Figure 15, shows this same hydrology (1950 to 1975) but with a Cal Fix. Under this scenario, regional storage replenishes greatly and shortages in the later years are eliminated.

When all 93 hydrologic sequences are simulated, and under all six scenarios representing various climate scenarios and Cal Fix assumptions, the probability of MET shortages exceeding 15 percent can be derived. A regional 15 percent shortage is similar to the allocation MET imposed in 2015. Figure 16 presents this probability of MET shortage. The results presented here for Scenario 1 with and without Cal Fix are similar to those presented in MET's Draft IRP.

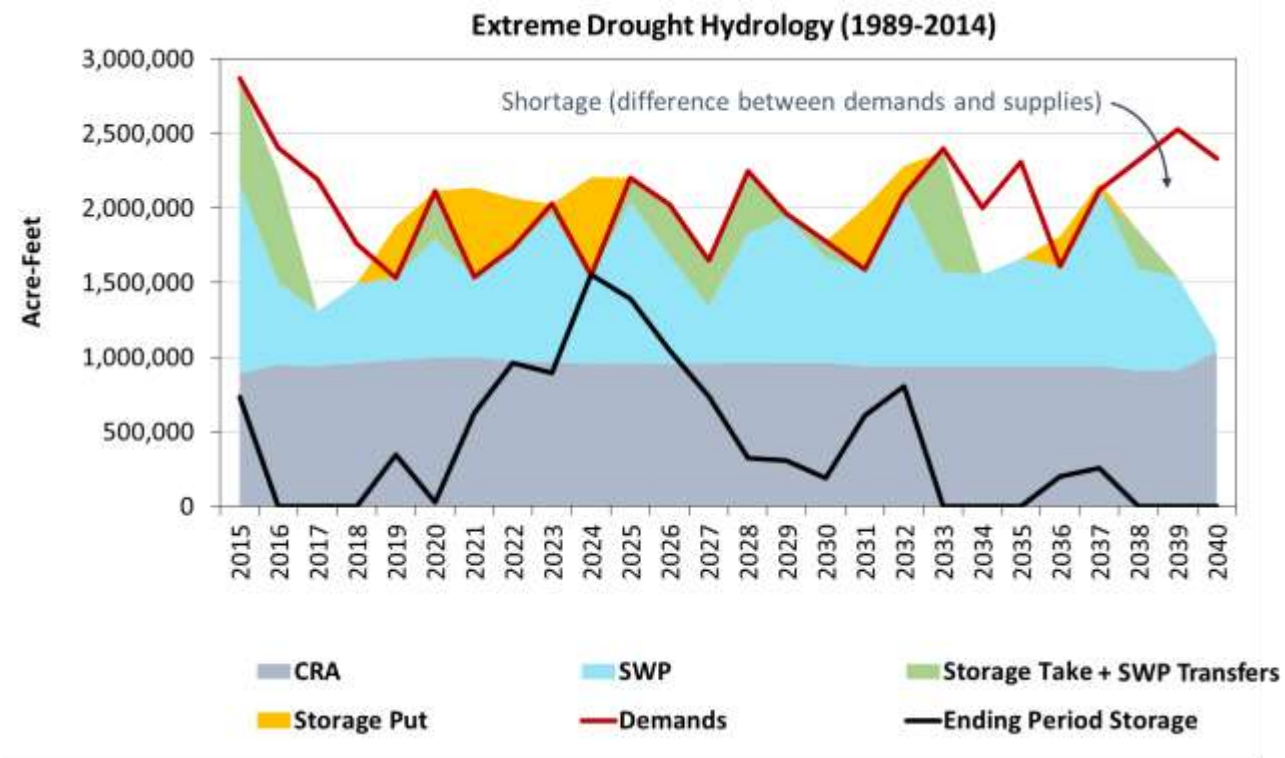

Figure 13. MET Reliability under Drought, for Scenario 1a (no Climate variability, no Cal Fix)

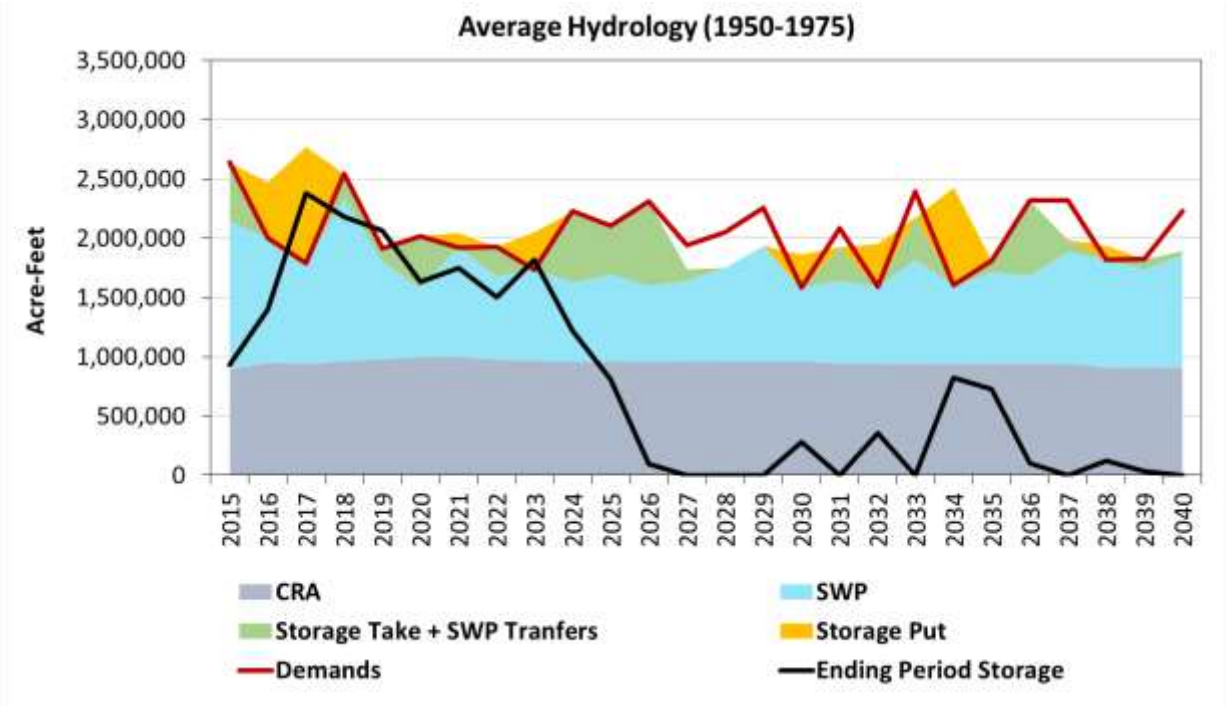

Figure 14. MET Reliability under Average Hydrology, for Scenario 1a (no Climate variability, no Cal Fix)

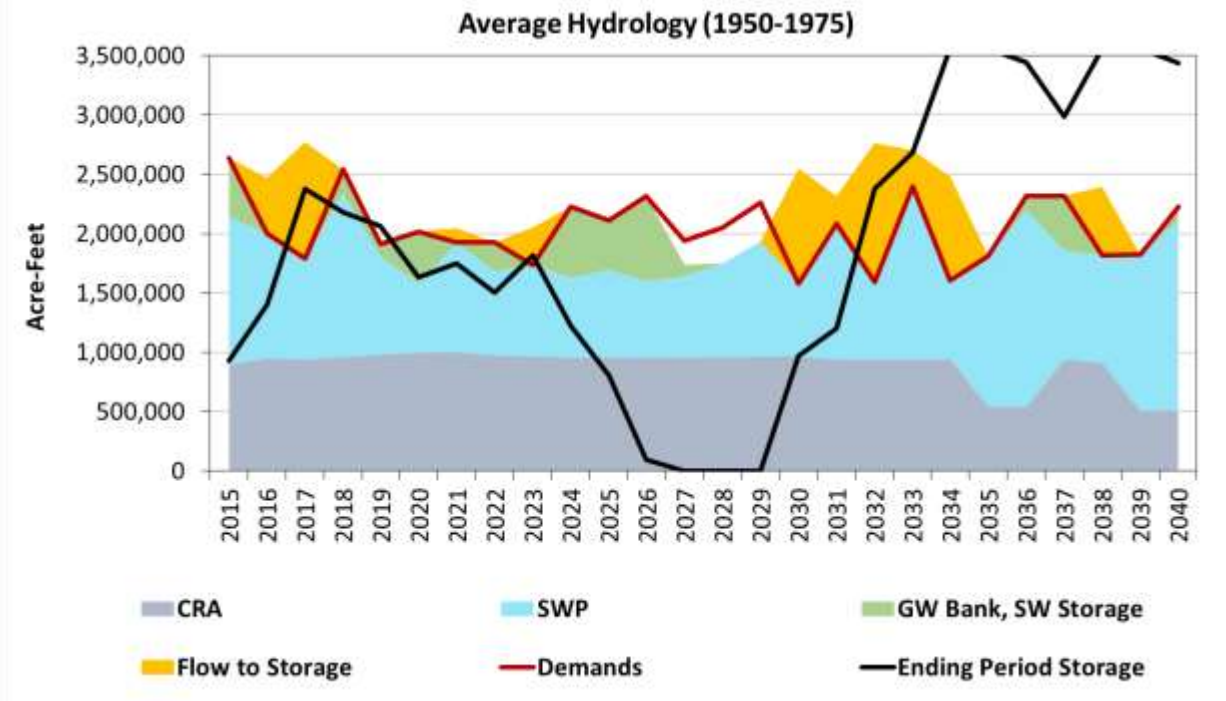

Figure 15. MET Reliability under Average Hydrology, for Scenario 1b (no Climate variability, with Cal Fix)

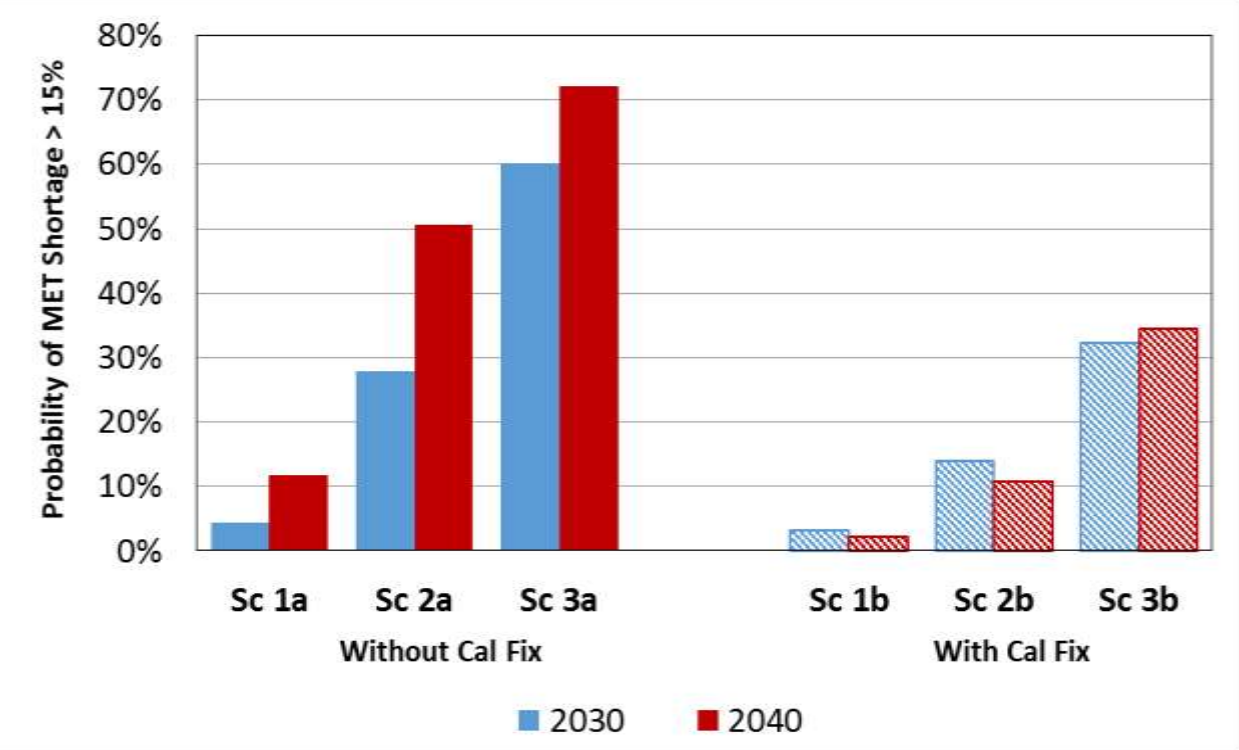

Figure 16. MET Supply Reliability (Percent of Time MET Supply Shortage Greater than 15%)

As shown in Figure 16, the impacts of climate variability (Scenarios 2 and 3) can be significant in increasing the probability and magnitude of MET shortages. In 2040, significant climate scenario (Scenario 3) can increase the probability of shortage by 60 percent without Cal Fix. The analysis also shows the enormous benefit that Cal Fix can have on MET reliability, decreasing the probability of shortage from 50 percent in 2040 to 10 percent under Scenario 2.

4.3 Orange County Water Supply Gap

When MET shortages occur, imported water is allocated to Orange County based on MET's current drought allocation formula. For the OC Basin, the estimation of the water supply gap required that the OC Model be able to simulate the way OCWD manages the OC Basin. The OC Basin's Basin Production Percentage (BPP) was set in the model to look forward each year and estimate all inflows to the basin, then set the BPP so that the cumulative overdraft in the basin would not exceed 500,000 af. In addition, the model does not allow the change in overdraft to exceed certain thresholds—essentially trying to keep some managed overdraft in the basin.

Note: Modeling the management of the OCWD basin is complex, especially with respect to future uncertainties. The discussion of this effort herein was an initial attempt to reflect on how the BPP could be set within the context of a modeling effort. Since this initial effort, CDM Smith and OCWD have met a number of times to refine the analysis for the Phase 2 effort. The refined analysis will be documented in the final Project Technical Memorandum.

Figure 17 presents a simulation of the OC Basin for the forecast period of 2015 to 2040, under an extreme drought hydrology of 1989 to 2014. Under Scenario 1, with no climate scenario and no Cal Fix, Figure 17 shows the pumping from the basin (blue line), the sources of inflows to the basin (shaded color areas), the cumulative basin overdraft (red line), and the BPP (dashed black line read on right-hand axis).

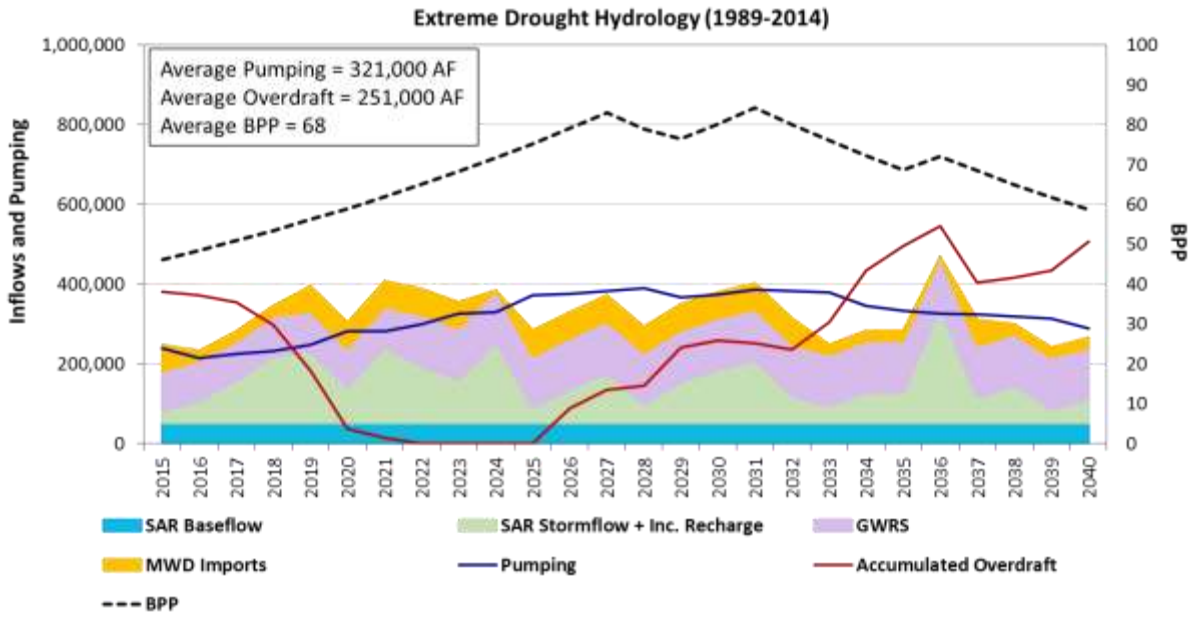

Figure 17. Simulation of OC Basin under Drought, for Scenario 1a (no Climate scenario, no Cal Fix)

When the other local Orange County water supplies from the Brea/La Habra and South County areas are added to the simulation, the OC Model estimates the overall supply reliability for the OC County total. Using all 93 hydrologic sequences, a probability chart can be created. The probability chart shows the percent time that any water shortage occurs and to what magnitude. Figure 18 shows the overall reliability for OC County total for Scenarios 1a, 2a and 3a (no Cal Fix) for the year 2040. As shown on this chart, there is a 50 percent chance that some level of shortage occurs for Scenario 1a. This probability of some shortage occurring increases to 80 percent for Scenario 2a and 98 percent for Scenario 3a. The average shortages are 32,000 afy, 74,000 afy, and 126,000 afy for Scenarios 1a, 2a, and 3a respectively.

Figure 19 compares Scenarios 1, 2, and 3 with and without the Cal Fix. As shown in Figure 19, the Cal Fix dramatically reduces the probability of shortages and thus the average shortages. The average shortages under the Cal Fix are 5,000 afy, 17,000 afy, and 64,000 afy for Scenarios 1b, 2b, and 3b respectively. The one thing to note, however, is that the maximum shortages (which occur about 1 to 3 percent of the time) are not reduced substantially with the Cal Fix. These maximum shortages may require a multipronged strategy to minimize or eliminate, such as new base-loaded supplies, storage, water transfers and mandatory restrictions on some water uses.

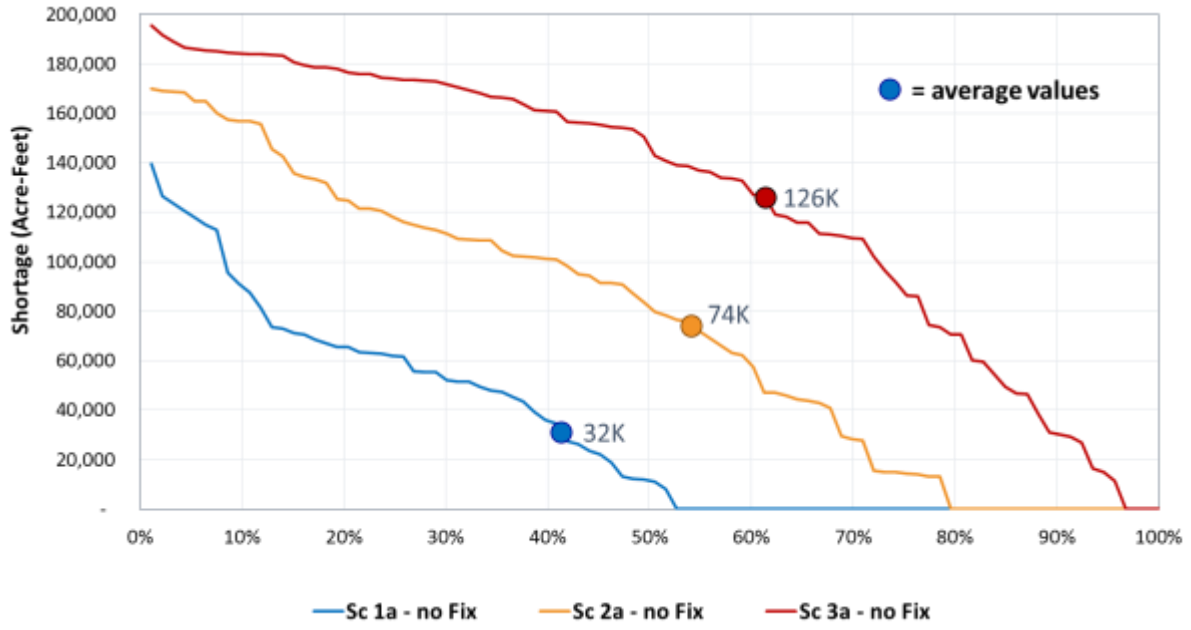

Figure 18. Probability of Water Shortages (Gap) for Orange County Total, No Cal Fix

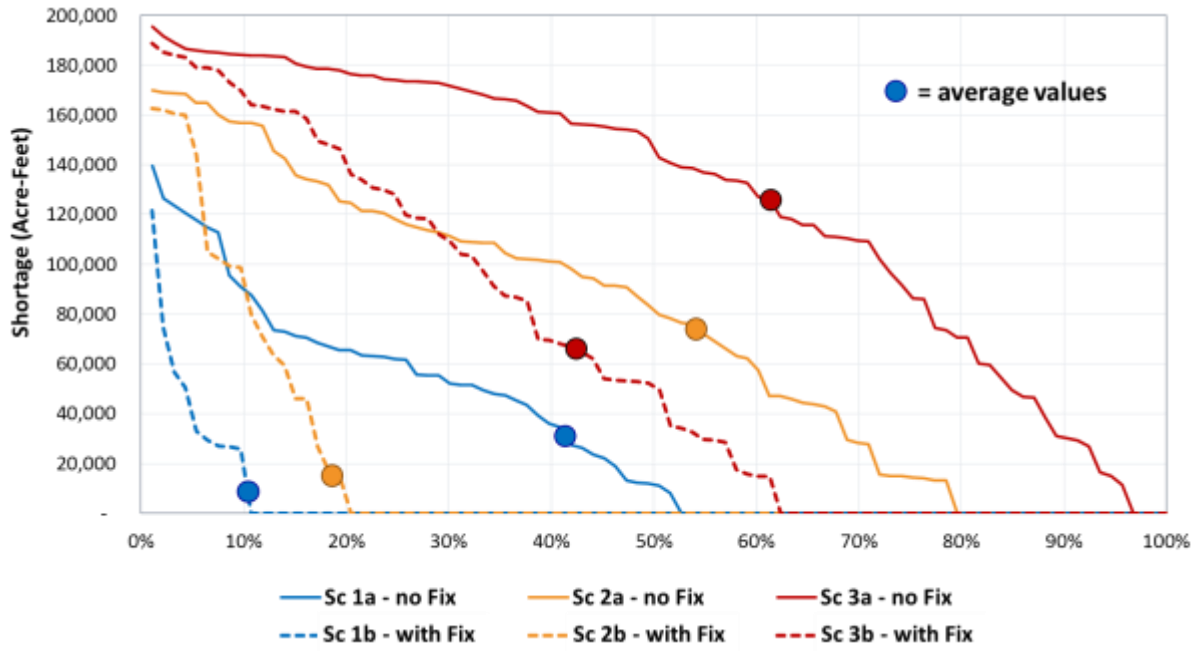

Figure 19. Probability of Water Shortages (Gap) for Orange County Total, with Cal Fix

This supply reliability analysis was done for all three areas of the Orange County, Brea/La Habra, OC Basin, and South County. The average water shortages (averaged for all 93 hydrologic sequences) are shown in Table 10 for all six scenarios.

Table 10. Summary of Average Water Supply Gap for Orange County Areas (acre-feet year)

Area	Scenario 1		Scenario 2		Scenario 3	
Brea / La Habra	**a – no Fix**	**b – with Fix**	**a – no Fix**	**b – with Fix**	**a – no Fix**	**b – with Fix**
2020	110 (1%)	110 (1%)	160 (1%)	160 (1%)	250 (1%)	250 (1%)
2040	820 (4%)	130 (1%)	1,800 (9%)	430 (2%)	3,100 (15%)	1,600 (8%)
OC Basin	**a – no Fix**	**b – with Fix**	**a – no Fix**	**b – with Fix**	**a – no Fix**	**b – with Fix**
2020	3,800 (1%)	3,800 (1%)	5,300 (1%)	5,300 (1%)	9,300 (2%)	9,300 (2%)
2040	19,000 (5%)	2,800 (1%)	49,000 (12%)	11,000 (3%)	85,000 (20%)	42,000 (10%)
South County	**a – no Fix**	**b – with Fix**	**a – no Fix**	**b – with Fix**	**a – no Fix**	**b – with Fix**
2020	2,100 (2%)	2,100 (2%)	3,000 (3%)	3,000 (3%)	4,800 (4%)	4,800 (4%)
2040	12,000 (9%)	1,900 (2%)	23,000 (18%)	5,600 (4%)	38,000 (28%)	20,000 (15%)
OC Total	**a – no Fix**	**b – with Fix**	**a – no Fix**	**b – with Fix**	**a – no Fix**	**b – with Fix**
2020	6,000 (1%)	6,000 (1%)	8,500 (2%)	8,500 (2%)	14,000 (3%)	14,000 (3%)
2040	32,000 (6%)	4,800 (1%)	74,000 (13%)	17,000 (3%)	126,000 (21%)	64,000 (11%)

* Numbers in parentheses ( ) represent % of water demand.

5.0 Conclusions

While no attempt was made during Phase 1 of the OC Study to assign the likelihood of any one of the six scenarios occurring over the others, some might postulate that Scenario 2 would be the most likely to occur given that most climate experts believe we are already seeing evidence of climate variability impacts today. This all said, a number of observations can be made from this study, which are:

1. The most sensitive model parameters are:
    - Whether or not the Cal Fix is implemented, and by when
    - The extent that climate variability impacts our supply reliability, which can take many forms:
        - Loss of the snowpack in the Sierras and Rocky's affecting imported water
        - Higher reservoir evapotranspiration
        - Reduced groundwater recharge statewide and locally
        - Increased water demands for irrigation and cooling from higher temperatures
        - Requires increase storage to capture and utilize available supplies

2. The range in water supply gaps carry different implications, namely:
    - Under Scenario 1a (no climate variability, no Cal Fix), supply shortages are fairly manageable, with average shortages in 2040 being about 6% of demand with an occurrence of about 4 in 10 years.
    - Under Scenario 2a (moderate climate variability, no Cal Fix), supply shortages require moderate levels of new investments, with average shortages in 2040 being about 13% of demands with an occurrence of about 5 in 10 years.
    - Under Scenario 3a (significant climate variability, no Cal Fix), supply shortages require significant levels of new investments, with average shortages in 2040 being about 21% of demands with an occurrence of about 6 in 10 years.
    - Scenarios with Cal Fix significantly reduce average shortages by 85% for Scenario 1, by 77% for Scenario 2, and by 50% for Scenario 3 in 2040.
    - Modest shortages begin in 2020, 8,500 AF per year on average (about 2% of demands) with an occurrence of about 1 in 10 years
3. Decisions made by Orange County water agencies to improve water supply reliability with local water supply investments should consider the following:
    - The large influence of the Cal Fix. MET and Orange County are much more reliable with the Cal Fix; however, the following questions are posed:
        - What is the implication for triggering Orange County supply investments as long as the Cal Fix is an uncertainty?
        - How long should Orange County wait to see where the Cal Fix is headed? 3, 5 or 10 years?
        - What types of Orange County supply investment decisions would be beneficial whether or not the Cal Fix proceeds ahead?
    - MET is potentially undertaking a NEW Indirect Potable Reuse project.
        - What are the implications of this project for decision-making in Orange County?
    - Other MET investments in its recommended 2015 IRP.
        - What success rate does Orange County attribute to these planned MET water supply investments?
        - Will the success rate be influenced by the Cal Fix? (e.g., additional storage without Cal Fix may not provide much benefit if there is no replenishment water during normal hydrologic years)

Phase 2 of the OC Study seeks to address these observations in a collaborative way by providing insights as to the various cost implications of different portfolios made up from MET, the MET member agencies and Orange County water supply options and to discuss policy implications for MET and Orange County. The combined information from Phases 1 and 2 would give local decision

makers both an idea of the risk of water supply shortages under a wide range of plausible scenarios, and the range of cost implications for mitigating the shortages. The intent of the OC Study, however, is to not to make any specific recommendations as to which supply options should be implemented, but rather present common information in an objective manner for local decision making.

6.0 References

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Appendix D

The Metropolitan Water District of Southern California 2015 Urban Water Management Plan

2015
URBAN WATER MANAGEMENT PLAN

JUNE 2016



THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

2015

URBAN WATER MANAGEMENT PLAN

JUNE 2016

WATER TOMORROW

Planning for the Future

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

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LIST OF ABBREVIATIONS

Abbreviation	Terms
Units of Measurement	
AF	Acre-Feet
AFY	Acre-feet per Year
TAF	Thousand Acre-Feet
MAF	Million Acre-Feet
cfs	Cubic feet per second
GPCD	Gallons per Capita per Day
MGD	Million gallons per Day
mg/L	Milligrams per liter
µg/L	Micrograms per liter
ng/L	Nanograms per liter
pCi/L	Picocuries per liter
kWh	Kilo-Watt Hour
Acronyms	
AGWA	Association of Ground Water Agencies
AMPAC	American Pacific Corporation
AVEK	Antelope Valley East Kern Water Agency
AWE	Alliance for Water Efficiency
AWWA	American Water Works Association
BDCP	Bay Delta Conservation Plan
BMPs	Best Management Practices
CAWCD	Central Arizona Water Conservation District
CBM	Condition-based maintenance
CCL3	Contaminant Candidate List 3
CCP	Conservation Credits Program
CCWD	Contra Costa Water District
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CII	Commercial, Industrial, and Institutional
CMMS	Computerized Maintenance Management System
CO_2	Carbon Dioxide
CPE	Comprehensive Program Evaluation
CRA	Colorado River Aqueduct
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
CVWD	Coachella Valley Water District
CY	Calendar Year
D/DBP	Disinfectants/Disinfection Byproduct
DBP	Disinfection Byproduct
DDW	The SWRCB's Division of Drinking Water
DFW	Department of Fish and Wildlife
DLR	Detection Level for purposes of Reporting
DMM	Demand Management Measure
DOE	U.S. Department of Energy

LIST OF ABBREVIATIONS

Abbreviation	Terms
DPC	Delta Protection Commission
DPR	Direct Potable Reuse
DTSC	California Department of Toxic Substances Control
DVL	Diamond Valley Lake
DWA	Desert Water Agency
DWCV	Desert Water Agency/Coachella Valley Water District
DWR	California Department of Water Resources
ECLO	Existing Conveyance and Low Outflow
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ELPH	Equivalent Level of Public Health Protection
ESA	Endangered Species Act
ET_o	Evapotranspiration
FWUA	Friant Water Users Authority
FY	Fiscal Year
GHG	Greenhouse Gas Emissions
GRP	Groundwater Recovery Program
GWRS	Groundwater Replenishment System
HECW	High Efficiency Clothes Washer
HET	High Efficiency Toilet
HTC	Hyatt/Thermalito Complex
ICP	Innovative Conservation Program
ICS	Intentionally Created Surplus
IEUA	Inland Empire Utilities Agency
IID	Imperial Irrigation District
IPR	Indirect Potable Reuse
IRP	Integrated Water Resources Plan
JWPCP	Joint Water Pollution Control Plant
LAA	Los Angeles Aqueduct
LADWP	Los Angeles Department of Water and Power
LRP	Local Resources Program
M&I	Municipal & Industrial
MCL	Maximum Contaminant Level
MFR	Multi-family Residential
MLPA	Marine Life Protected Area
MOU	Memorandum of Understanding
MWD	Metropolitan Water District
MWD-EDM	Metropolitan's Econometric Demand Model
MWDOC	Municipal Water District of Orange County
MWELO	Model Water Efficient Landscape Ordinance
MWQI	Municipal Water Quality Investigations
NASA	National Aeronautics and Space Administration
NDEP	Nevada Division of Environmental Protection
NDMA	N-nitrosodimethylamine
NEPA	National Environmental Policy Act

LIST OF ABBREVIATIONS

Abbreviation	Terms
NERT	Nevada Environmental Response Trust
NMFS	National Marine Fisheries Services
OCWD	Orange County Water District
OEHHA	Office of Environmental Health Hazard Assessment
OMP&R	Operation, Maintenance, Power and Replacement
PG&E	Pacific Gas & Electric
PHG	Public Health Goal
polyDADMAC	polydiallyldimethylammonium chloride
PPCP	Pharmaceutical/Personal Care Product
PPRs	Present Perfected Rights
PVID	Palo Verde Irrigation District
QMCP	Quagga Mussel Control Program
QSA	Quantification Settlement Agreement
RDM	Robust Decision Making
RPAs	Reasonable and Prudent Alternatives
RTP-12	2012-2035 Regional Transportation Plan/Sustainable Communities Strategy
RTS	Readiness-to-Serve
SANDAG	San Diego Association of Governments
SAR	System Access Rate
SARI Line	Santa Ana Regional Interceptor Line
SB X7-7	Senate Bill X7-7, Water Conservation Act of 2009
SCAG	Southern California Association of Governments
SCWC	Southern California Water Committee
SDCWA	San Diego County Water Authority
SDP	Seawater Desalination Program
Series 13	SANDAG Series 13: 2050 Regional Growth Forecast
SFR	Single-Family Residential Model
SNMP	Salt and Nutrient Management Plan
SNWA	Southern Nevada Water Authority
SPR	System Power Rate
SRCSD	Sacramento Regional County Sanitation District
SWC	State Water Contractors
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TVMWD	Three Valleys Municipal Water District
UCMR2	Unregulated Contaminant Monitoring Regulation 2
USBR	U.S. Department of the Interior, Bureau of Reclamation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Services
UWMP	Urban Water Management Plan
VOC	Volatile Organic Compound
WRD	Water Replenishment District of Southern California

LIST OF ABBREVIATIONS

Abbreviation	Terms
WSAP	Water Supply Allocation Plan
WSDM Plan	Water Surplus and Drought Management Plan
WSR	Water Stewardship Rate
WUCA	Water Utility Climate Alliance
WUE	Water Use Efficiency
YCWA	Yuba County Water Agency

Phrases

2015 IRP Update	2015 Integrated Water Resources Plan, Water Tomorrow
Act	Urban Water Management Planning Act
Arvin-Edison	Arvin-Edison Water Storage District
Bay-Delta	San Francisco Bay/Sacramento-San Joaquin Delta
Conservancy	Sacramento-San Joaquin Delta Conservancy
Council	Delta Stewardship Council
Delta	Sacramento/San Joaquin River Delta
Forum	Colorado River Basin Salinity Control Forum
Kern Delta	Kern Delta Water District
Metropolitan	The Metropolitan Water District of Southern California
Metropolitan Act	Metropolitan Water District Act
Plan	Urban Water Management Plan
Policy	State Recycled Water Policy
Regional Board	Regional Water Quality Control Board
Sanitation District	County Sanitation District No. 2 of Los Angeles County
Science Board	Delta Independent Science Board
Semitropic	Semitropic Water Storage District
Urban MOU	California urban Water Conservation Council Memorandum of Understanding Regarding Water Conservation in California

Summary of Compliance

SB X7-7	
Water Code § 10608.36 – Assessment of Measures, Programs, and Policies	Assess present and proposed future measures, programs, and policies to help achieve water use reduction targets • Metropolitan's actions to help achieve the urban per capita water use reduction pursuant to the goals set forth in SB X7-7 are discussed in Sections 3.4, 3.5, and 3.7.
Agency Coordination	
Water Code § 10620(d)(2) Coordination with Appropriate Agencies	Describe the coordination of the plan preparation. • See Section 5.
Water Code § 10620(f) - Describe Resource Maximization / Import Minimization Plan	Discuss how water management tools and options are used to maximize resources and minimize the need to import water. • Metropolitan's planning strategy within the IRP and adaptive implementation approach are discussed in Section 2 and provide an overview of the water management tools and options. See pages 2-1 through 2-9. • Further details are provided in Sections 1.4 (conservation, page 1-23), 3.4 (demand management and conservation, pages 3-30 through 3-45), and 3.5 (recycling, groundwater recovery, and desalination, pages 3-46 through 3-63.)
Water Code § 10621(b) - City and County Notification and Participation	Notify any city or county within service area of Urban Water Management Plan (UWMP) review & revision at least 60 days before public hearing. May consult with and obtain comments from notified cities and counties. • Notification and participation are discussed in Section 5, pages 5-1 through 5-10, and Appendix 10, DWR Table 10-1.
Water Code § 10621(d) – Plan Submittal to Department of Water Resources (DWR)	Each urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016 • Submission of the 2015 UWMP by the July 1, 2016 deadline is detailed in Section 5.
Contents of UWMP	
Water Code § 10631(a) - Service Area Information	Describe service area of supplier • Service area is discussed on Section 1.2, pages 1-6 through 1-10 and shown in Figure 1-1. Include current and projected population • Population is discussed in Section 1.3 and shown in Table 1-1, Figure 1-2, and Figure 1-3. • Population analysis is discussed in Appendix 1, page A.1-4. Projections are on page A.1-9, Table A.1-2. • Current and projected population are shown in Appendix 10, DWR Table 3-1. Population projections must be based on data from state, regional or local service agency projections • See footnote Table A.1-2, page A.1-9. Describe climate characteristics that affect water management • See Section 1.3, pages I-14 through I-16, Figure 1-5, and Table 1-4, and Section 2.6, pages 2-26 through 2-29. Describe other demographic factors affecting water management • See Section 1.3, pages I-13 through 1-14 and Appendix 1.

Summary of Compliance

Water Code § 10631(b) - Water Sources	Identify existing and planned water supply sources Provide existing and planned water supply quantities • Current supplies and quantities are described in Section 1.4, pages 1-18 through 1-28. • Historic and current water supplies are described in Appendix 2. • Planned water supplies and quantities are discussed in Section 2, and details are provided in Appendix 3, and particularly in Table A.3-7, pages A.3-48 through A.3-60. • See Appendix 10, DWR Table 6-8 and 6-9.
Water Code § 10631(b)(1-4) - If Groundwater Identified as Existing or Planned Source	• Metropolitan does not supply or plan to supply groundwater. However, Metropolitan does use groundwater basins for groundwater banking. • See Section 3.6 and Appendix 2 (pages A.2-4 through A.2-5) and Appendix 3 (pages A.3-43 through A.3-46) for discussions of issues related to groundwater basins. • See Section 4 for salinity issues related to groundwater basins.
Water Code § 10631(c)(1) - Reliability of Supply	Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage • Section 2.3, pages 2-13 through 2-17 and the discussions presented under the Colorado River Aqueduct (CRA) and State Water Project (SWP), Sections 3.1 and 3.2. Provide data for an average water year, single-dry water year, and multiple-dry water years • Section 2, Tables 2-4 through 2-6, pages 2-15 through 2-17. • See Appendix 10, DWR Table 7-1.
Water Code § 10631(c)(2) - Water Sources Not Available on a Consistent Basis	Describe plans to supplement or replace inconsistent sources with alternative sources or water Demand Management Measures (DMMs) • For discussion of Metropolitan's recent and near-term drought response actions, see Section 1.4, pages 1-22 through 1-28. • For a discussion on water DMMs, see Section 2.1, pages 2-2 through 2-5, and Section 3.4, pages 3-30 through 3-45. • For discussion on how Metropolitan plans to meet Southern California's water supply needs in the future and supplement or replace inconsistent sources, see Sections 2 and 3.
Water Code § 10631(d) - Transfer or Exchange Opportunities	Describe short term and long term exchange or transfer opportunities • Section 1.4 (augmenting water supplies), pages 1-24 through 1-26. • Section 3.1 (pages 3-2 through 3-9) describes plans for banking, exchange and transfer opportunities along the Colorado River and Aqueduct. • Section 3.2 (pages 3-10 through 3-23) describes plans for banking, exchange and transfer opportunities within the State Water Project. • Section 3.3 (pages 3-24 through 3-29) describes plans for banking, exchange and transfer opportunities within the Central Valley/State Water Project. • Section 3.6 (pages 3-64 through 3-67) describes plans for banking, exchange and transfer opportunities within the local region. • Further details are provided in Appendix 3, particularly Table A.3-7 on pages A.3-48 through A.3-60.

Summary of Compliance

Water Code §§ 10631(e)(1) and (2) - Past, Current, and Projected Water Use	Quantify past, current, and projected water use by sector in five-year increments • See Section 1.3, page 1-14 and Figure 1-4 for historical retail water demands. • Past, current, and future water uses are shown in Appendix 1, Table A.1-13 on page A.1-13. Water uses by sector and county are shown in Tables A.1-6 through A.1-11 on pages A.1-11 through A.1-13. Water demands by sector are shown in DWR Tables 4-1, 4-2, and 4- 3, on pages A.10-3 and A.10-4. Identify and quantify sales to other agencies • See Section 1.3, page 1-13 and Figure 1-4 for historical retail water demands. • Historic sales are presented in Table A.2-2 on page A.2-3. • Metropolitan does not project sales by individual agency. However, total projected sales/demands to other agencies are shown in Section 2.2, pages 2-6 through 2-12.
Water Code §§ 10631(e)(1)(J), (e)(3)(A)&(B) – Distribution System Water Loss	Quantify distribution system water loss for most recent 12-month period available • Section 2.6, page 2-26, Appendix 7, Table A.7-1, and Appendix 10 (DWR Table 4-4).
Water Code § 10631(e)(4)(A) and (B) – Water Savings Estimate	Water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans Provide citations to the codes, standards, ordinances, or transportation and land use plans used to make projections Indicate extent that water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. • See discussion on estimating demands and code based conservation in Section 2, page 2-6 and Appendix 6.
Water Code §§ 10631(f)(2), 10631(i) – Description of Supplier's Water Demand Management Measures, Distribution System Asset Management, Assistance Programs; Option for CUWCC Members	Provide narrative description of items in §10631(f)(1)(B)(ii), (iv), (vi), and (vii), distribution system asset management, and wholesale supplier assistance programs • See discussion on metering, Section 3.4, page 3-37. • See discussion on public education and outreach, Section 3.4, pages 3-32 through 3-35. • See discussion on water conservation programs, Section 3.4, pages 3-35 through 3-37. CUWCC members deemed to be in compliance with Water Code §10631(f) by complying with Dec. 10, 2008 MOU and submitting annual reports required by Section 6.2 of that MOU • See CUWCC filings in Appendix 8. • See discussion on demand management and conservation, Section 3.4, pages 3-30 through 3-42. • See discussion on distribution system asset management, Section 3.4, pages 3-43 through 3-45. • See discussion on assistance programs to retail water agencies (rebate programs, public education and outreach, and other efforts to reduce water demand), Section 3.4, pages 3-32 through 3-42.

Summary of Compliance

Water Code § 10631(g) - Planned Water Supply Projects and Programs	Detailed description of expected future supply projects & programs to meet projected water use Timeline for each proposed project or program Quantification of each projects average yield (AFY) Quantification of each projects single dry-year yield (AFY) Quantification of each projects multiple dry-year yield (AFY) • Section 3.1 (pages 3-2 through 3-9) describes plans for banking, exchange and transfer opportunities along the Colorado River and Aqueduct. • Section 3.2 (pages 3-10 through 3-23) describes plans for banking, exchange and transfer opportunities within the State Water Project. • Section 3.3 (pages 3-24 through 3-29) describes plans for banking, exchange and transfer opportunities within the Central Valley/State Water Project. • Section 3.6 (pages 3-64 through 3-67) describes plans for banking, exchange and transfer opportunities within the local region. • Further details are provided in Appendix 3, particularly Table A.3-7 on pages A.3-48 through A.3-60. • See Appendix 10, DWR Table 6-7.
Water Code § 10631(h) - Opportunities for Development of Desalinated Water	Describe opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply • See discussion on groundwater recovery and seawater desalination in Section 1.4, pages 1-20 through 1-22, and Section 3.5, pages 3-46 through 3-63. • See Appendix 5, Table A.5-2 on pages A.5-9 through A.5-11 for a list of existing and conceptual groundwater recovery projects and their ultimate yield/capacity. • See Appendix 5, Table A.5-3 on page A.5-12 for a list of conceptual, planned, and under construction seawater desalination projects.
Determination of Demand Management Measures Implementation	
Water Code § 10631(i) - Members of CUWCC Deemed in Compliance with §10631(f)	CUWCC members must comply with MOU re Urban Water Conservation in California (Dec. 10, 2008) and submit required annual reports • Metropolitan is a CUWCC member. • 2011-2014 BMP annual updates are included in Appendix 8. • See discussion in Section 3.4.

Summary of Compliance

Water Code § 10631(j) – If Supplier Receives or Projects Receiving Water from a Wholesale Supplier	Urban water suppliers that rely on wholesale agency for water source must provide wholesale agency with water use projections in 5-year increments to 20 years or as far as data is available. Wholesaler to provide existing and planned water supply availability projections, by source, and planned water supply quantities to member agencies • See discussions on Metropolitan and member agency coordination for the IRP Process in Sections 2 and 5. • See Appendix 3, Table A.3-7, and Appendix 10, DWR Table 2-4.
Water Code § 10631.1 - Projected Water Use for Low-Income Housing	Water use projections for single-family and multi-family residential housing for lower income household • This is incorporated with the retail demand forecast, as reflected in Section 2 and Appendix 1.
Water Code § 10631.2 – Voluntary Calculation or Estimation of Energy Intensity of Urban Water Systems	May include any of the following: estimated amount of energy for extraction or diversion (from sources), conveyance, treatment, distribution, and storage of water, and any other appropriate energy-related information • Estimate of the amount of energy used and energy intensity is presented in Appendix 9. • See Section 3.8 for discussion of Metropolitan's Energy Management Initiative.
Water Shortage Contingency Plan	
Water Code § 10632 - Water Shortage Contingency Analysis of Elements within Water Supplier's Authority **Water Code § 10632(a)(1) - Stages of Action**	Provide stages of action in response to water supply shortages Provide the water supply conditions for each stage Includes plan for up to 50 percent reduction in water supply • Documentation of the stages of action Metropolitan would undertake to address up to 50 percent reduction in its water supplies and a catastrophic interruption in water supplies is included in its Water Surplus and Drought Management (Section 2.4) and Water Supply Allocation Plans (Section 2.4 and Appendix 4), in the discussion of the implementation of its Water Supply Allocation Plan in Section 1.4, page 1-26, in the discussion of its Water Shortage Contingency Analysis in Section 2.4, pages 2-18 through 2-23, in the discussion of its Water Supply Condition Framework in Section 2.4, pages 2-20 through 2-21, and in the discussion of its Emergency Storage Requirement developed under its catastrophic supply interruption plan in Section 2.5, page 2-24. • See Appendix 10, DWR Table 8-1,
Water Code § 10632(a)(2) - Three-Year Minimum Water Supply	Identify driest 3-year historic sequence Estimated minimum water supply available for each of the next three years • Metropolitan has projected its supply capabilities for each of the next three years 2016 through 2018 under a multiple dry year hydrology (based on a repeat of 1990-1992 hydrology, which represents the three years of shortest supplies). See Section 1.4, page 1-28, Table 1-7 on page 1-28, and Appendix 10, DWR Table 8-4.

Summary of Compliance

Water Code § 10632(a)(3) - Preparation for Catastrophic Water Supply Interruption	Actions to prepare for and implement during catastrophic water supply interruption Provide catastrophic supply interruption plan and summarize Emergency Response Plan Regional power outage Earthquake Delta levee failure Aqueduct failure • See Sections 2.5 and 2.6, pages 2-24 through 2-29.
Water Code § 10632(a)(4) - Prohibitions on End Users	List the mandatory prohibitions against specific water use practices during water shortages (i.e., prohibiting use of potable water for street cleaning) • Not applicable to Metropolitan because prohibitions against specific water use practices are enforced on end users and are not within Metropolitan's authority as a wholesaler.
Water Code § 10632(a)(5) - Consumption Reduction Methods	List the consumption reduction methods the water supplier will use to reduce water use in the most restrictive stages with up to a 50 percent reduction in water supply. • See Section 1.4, pages 1-22 through 1-28, for a description of Metropolitan's recent and near-term drought response actions. • Section 2.4 for Metropolitan's Water Surplus and Drought Management Plan • Section 2.4 and Appendix 4 for Water Supply Allocation Plan. • See Section 3.4 for a description of Metropolitan's demand management through conservation.
Water Code § 10632(a)(6) - Penalties or Charges	List penalties or charges for excessive use, where applicable • Not applicable to Metropolitan because enforcing penalties or charges for excessive use by end users is not within Metropolitan's authority as a wholesaler. However, Metropolitan's WSDM Plan and WSAP are described in Section 2.4. • Metropolitan's WSAP is attached in Appendix 4.
Water Code § 10632(a)(7) - Revenue and Expenditure Impacts	Describe how actions and conditions impact revenues and expenditures Describe proposed measures to overcome the revenue and expenditure impacts, such as development of reserves and rate adjustments • See Section 2.7, pages 2-30 through 2-36, and Appendix 4.
Water Code § 10632(a)(8) - Water Shortage Contingency Resolution or Ordinance	Attach a copy of the draft water shortage contingency resolution or ordinance. • Not applicable to Metropolitan. The WSDM Plan, Water Supply Condition Framework, and WSAP adopted to deal with water shortages are discussed in Section 2.4, pages 2-18 through 2-23. The WSAP is also included as Appendix 4.
Water Code § 10632(a)(9) - Water Use Reduction Measuring Mechanism	Provide mechanisms for determining actual reductions in water use • Metropolitan's water sales are metered. See Section 3.4.

Summary of Compliance

Water Code § 10632(b) – Water Features	Analyze and define water features artificially supplied with water separately from swimming pools and spas when developing water shortage contingency analysis • Not applicable to Metropolitan because prohibitions against specific water use practices are enforced on end users and are not within Metropolitan's authority as a wholesaler.
Recycled Water Plan	
Water Code § 10633 - Recycled Water as Potential Water Source; Agency Coordination	Provide information, to the extent available, on recycled water and its potential as a water source in the supplier's service area. Coordinate plan preparation with local water, wastewater, groundwater, and planning agencies within supplier's service area. • See Section 1.4, pages 1-20 through 1-26, Section 3.5, pages 3-46 through 3-63, Tables 3-12 and 3-13 on page 3-63, Appendix 2, pages A.2-8 through A.2-9, and Appendix 5, Table A.5-1. • Coordination of the plan preparation is discussed in Section 5.
Water Code § 10633(a) - Wastewater System Description	Describe the wastewater collection and treatment systems in the supplier's service area Quantify the volume of wastewater collected and treated • Not applicable to Metropolitan because it does not collect or treat the wastewater generated within its service area. Instead, Metropolitan provides a general narrative description of the wastewater collection and treatment systems operated by others in its service area. • See Section 3.5, pages 3-46 through 3-63, Table 3-8 on page 3-47, Tables 3-12 and 3-13 on page 3-63, Appendix 2, pages A.2-8 through A.2-9, and Appendix 5, Table A.5-1.
Water Code § 10633(a) through (d) - Wastewater Disposal and Recycled Water Uses	Describes methods of wastewater disposal in the supplier's service area • Not applicable to Metropolitan because it does not dispose of wastewater within its service area. Instead, Metropolitan provides a general narrative description of wastewater disposal by others in its service area. • See Section 3.5, pages 3-47 through 3-48. Describe quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project. • Not applicable to Metropolitan because it does not treat or discharge recycled water. Instead, Metropolitan provides a general narrative description of the treatment and discharge of recycled water by others in its service area. • See Section 3.5, pages 3-48 through 3-49. Describe the current type, place and quantity of use of recycled water in supplier's service area Describe and quantify potential uses of recycled water Determination of technical and economic feasibility of serving the potential uses • Not applicable to Metropolitan because it does not use recycled water in its service area. Instead, Metropolitan provides a general narrative description of the use of recycled water by others in its service area, including potential uses and the technical and economic feasibility of serving the potential uses of recycled water • See Section 3.5, pages 3-46 through 3-63, Section 4, page 4-6, Appendix 2, pages A.2-8 through A.2-9, and Table A.5-1.

Summary of Compliance

Water Code § 10633(e) - Projected Uses of Recycled Water	Projected use of recycled water in service area • See Section 2, Tables 2-1 through Table 2-3, pages 2-10 through 2-12 and Section 3.5. Compare UWMP 2010 projections with UWMP 2015 actual use of recycled water • The 2010 RUWMP, Tables 2-6, 2-7, and 2-8 included the following projections for recycled water use in 2015: 408 TAF for a single dry year; 400 TAF for a multiple dry year; and 404 TAF for an average year. In 2015, actual recycled water use is estimated at 414 TAF, as discussed in Table 3-12 on page 3-63 and Appendix 2, page A.2-8 of this 2015 UWMP. • See Appendix 10, DWR Table 6-5.
Water Code §§ 10633(f), (g) – Actions to Encourage Use of Recycled Water **Plan to Optimize Use of Recycled Water**	Describe actions, including financial incentives, that might be taken to encourage recycled water uses Describe projected results of these actions in terms of acre-feet of recycled water used per year Provide a plan to optimize the use of recycled water in the supplier's service area • Metropolitan provides a general narrative description of the actions it takes to encourage recycled water uses in its service area • See Section 1.4, pages 1-20 through 1-22, 1-24, Table 1-6, Section 3.5, pages 3-46 through 3-63, Tables 3-12 and 3-13 on page 3-63, and Appendix 5, Table A.5-1.
Water Quality Impacts on Reliability	
Water Code § 10631(c)(2) - Water Sources Not Available at a Consistent Level of Use	Discuss plans to supplement or replace with alternative sources or DMMs any water source that may not be available at a consistent level of use given specific water quality factors • See Section 2.1, pages 2-2 through 2-5, and Section 3.4, pages 3-30 through 3-45, for water DMMs. • See Section 3.2, SWP Water Quality, pages 3-18 through 3-19, 3-23. • See Section 4, Water Quality, pages 4-1 through 4-17.
Water Code § 10634 - Water quality impacts on availability of supply	Discuss water quality impacts by source upon water management strategies and supply reliability • See Section 3.2, SWP Water Quality, pages 3-18 through 3-19, 3-23. • See Section 4, Water Quality, pages 4-1 through 4-17.
Water Service Reliability	
Water Code § 10635(a) - Supply and Demand Comparison: Normal Water Year	Compare the projected normal water supply to projected normal water use over the next 20 years, in 5-year increments. • For projected water use, see Section 2, Table 2-3, page 2-12. • For projected water supply, see Table 2-6, page 2-17 and Table A.3-7 in Appendix 3, pages A.3-48 through A.3-60, and Appendix 10, DWR Table 7-2.
Water Code § 10635(a) - Supply and Demand Comparison: Single-Dry Year Scenario	Compare the projected single-dry year water supply to projected single-dry year water use over the next 20 years, in 5-year increments. • For projected water use, see Section 2, Table 2-1, page 2-10. • For projected water supply, see Table 2-4, page 2-15 and Table A.3-7 in Appendix 3, pages A.3-48 through A.3-60, and Appendix 10, DWR Table 7-3.

Summary of Compliance

Water Code § 10635(a) - Supply and Demand Comparison: Multiple-dry Year Scenario	Project a multiple-dry year period occurring between 2015-2020 and compare projected supply and demand during those years Project a multiple-dry year period occurring between 2021-2025 and compare projected supply and demand during those years Project a multiple-dry year period occurring between 2026-2030 and compare projected supply and demand during those years Project a multiple-dry year period occurring between 2031-2035 and compare projected supply and demand during those years • Metropolitan has projected multiple dry year periods for years ending in "0" or "5". Its planning for multiple dry years is based on the three years of shortest supplies (1990-1992 hydrology). The results presented in Section 2 for multiple dry years are for an average of three years with this extreme hydrology. • For projected water use, see Section 2, Table 2-2, page 2-11. • For projected water supply, see Table 2-5, page 2-16 and Table A.3-7 in Appendix 3, pages A.3-48 through A.3-60. • See Appendix 10, DWR Table 7-4.
Water Code § 10635(b) – Plan Submittal to Cities and Counties	Supplier to provide portion of plan on water service reliability to cities and counties within its service area no later than 60 days after plan submittal. • Provision of Plan to cities and counties is described in Section 5.
Water Code § 10641 – Consultations with public agency, state agency or experts	Supplier may consult with and obtain comments from any public agency, state agency, or any person with special expertise as to water demand management methods and techniques • Stakeholder, state agency, public agency, and expert participation, consultation, outreach, comments, and notification are described in Section 5.
Water Code § 10642 – Public Hearing; Notice; Adoption	Encourage involvement of diverse social, cultural & economic community groups prior to and during plan preparation • See Section 5, pages 5-1 through 5-11. Prior to adoption, plan available for public inspection and hold public hearing • See Section 5, pages 5-5 and 5-11. Provide proof of public hearing and notice • See Section 5, page 5-10. Provide meeting notice to any city or county in service area • See Section 5, page 5-9, and Appendix 10, DWR Table 10-1. After hearing, plan adopted as prepared or as modified after hearing. • See Section 5, page 5-11.

Summary of Compliance

Water Code §§ 10615, 10643 – Plan Implementation	Include in plan strategy and time schedule for implementation Implement plan in accordance with the schedule set forth in the plan • Metropolitan has conducted a review of its planning progress through the 2015 IRP Update, discussed in Section 2. In addition, in each section, Metropolitan has included an "Achievement to Date" that discusses progress towards its planning goals, and discusses current issues and potential problems with continued implementation of the plan. • Section 3 summarizes the implementation plan and continued progress in developing a diversified resource mix consistent with the IRP to meet the region's water supply needs DMM Programs • Metropolitan is a member of CUWCC, and has submitted its recent BMP reports to the CUWCC to comply with the UWMP requirements. In addition, Metropolitan has discussed its conservation plan and approach in Section 3.4. Individual conservation programs are discussed on pages 3-30 through 3-42.
Water Code § 10644(a)(1) –Plan Submittal	Submit to DWR, the California State Library, and any city or county within service area copy of plan no later than 30 days after adoption. • Plan submission is described in Section 5.
Water Code § 10644(a)(2) – Plan shall include any Standardized Forms, Tables, or Displays specified by DWR	Submit plan electronically Include in plan DWR standardized forms, tables, or displays • Plan submission is described in Section 5. • DWR standardized tables for wholesale urban water agencies are completed and presented in Appendix 10.
Water Code § 10645 – Plan Available for Public Review	No later than 30 days after plan submittal, the supplier and DWR to make the plan available for public review during normal business hours. • Posting of Plan on Metropolitan's website for public review is described in Section 5.

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Executive Summary

Metropolitan's 2015 Urban Water Management Plan (UWMP) has been prepared in compliance with Water Code Section 10608.36 of SB X7-7, which was enacted in 2009, and Sections 10610 through 10656 of the Urban Water Management Planning Act (Act), which were added by Statute 1983, Chapter 1009, and became effective on January 1, 1984. This Act requires that every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually prepare and adopt, in accordance with prescribed requirements, an urban water management plan.

The Act requires urban water suppliers to describe and evaluate sources of water supply, efficient uses of water, demand management measures, implementation strategy and schedule, and other relevant information and programs. Urban water suppliers are required by the Act to update their UWMP and submit a complete plan to the California Department of Water Resources (DWR) every five years. An UWMP is required in order for a water supplier to be eligible for DWR administered state grants and loans and drought assistance.

As with Metropolitan's previous plans, the 2015 UWMP does not explicitly discuss specific activities undertaken by its member agencies unless they relate to one of Metropolitan's water demand or supply management programs. Presumably, each member agency will discuss these activities in its UWMP.

The information included in the 2015 UWMP represents the most current and available planning projections of supply capability and demand developed through a collaborative process with the member agencies. Metropolitan's Board recently adopted the 2015 Integrated Water Resources Plan, Water Tomorrow (2015 IRP Update), which represents Metropolitan's comprehensive planning process and will serve as Metropolitan's blueprint for long-term water reliability, including key supply development and water use efficiency goals.

Factors Considered

The Act requires reporting agencies to describe their water reliability under a single dry-year, multiple dry-year, and average year conditions, with projected information in five-year increments for 20 years. The factors used to evaluate Metropolitan's supply and demand balance for the 2015 UWMP are presented below. Some of the considerations and resulting projections may change as Metropolitan's planning progresses. These changes may be reflected in future updates of the UWMP.

Demand Projections

Within Metropolitan's service area, retail water demands can be met with local supplies or imported supplies. Metropolitan's supply reliability evaluation focuses on the future demands for Metropolitan's imported supplies. The expected firm demand on Metropolitan is the difference between total demands, adjusted for conservation, and projected total local supplies. Thus, in order to project the regional need for imported water, Metropolitan starts with a projection of total demand including retail Municipal and Industrial (M&I), retail agricultural,

seawater barrier, and replenishment demands, determines the adjustments from total conservation, and subtracts the total local supplies that are available to meet a portion of those demands.

Total Demands

Metropolitan updates its retail M&I projection periodically based on the release of official regional demographic and economic projections. The projections of retail M&I water demands used in the 2015 UWMP are based on data from the following reports:

- Southern California Association of Governments (SCAG) 2012 Regional Transportation Plan/Sustainable Community Strategy (April 2012)
- San Diego Association of Governments (SANDAG) Series 13: 2050 Regional Growth Forecast (October 2013)

The SCAG and SANDAG regional growth forecasts are the core assumptions that drive the estimating equations of the retail demand forecasting in Metropolitan's Econometric Demand Model (MWD-EDM). SCAG's and SANDAG's projections undergo extensive local review, incorporate zoning information from city and county general plans, and are supported by Environmental Impact Reports.

Retail agricultural demands consist of water use for irrigating crops. Metropolitan's member agencies estimate agricultural water use based on many factors, including farm acreage, crop types, historical water use, and land use conversion. Each member agency estimates its agricultural demands differently, depending on availability of information. Metropolitan relies on member agencies' estimates of agricultural demands for the 2015 UWMP.

Metropolitan also includes in its assessment of total demands the local groundwater requirements for seawater barrier and groundwater basin replenishment. Seawater barrier demands represent the amount of water needed to hold back seawater intrusion into the coastal groundwater basins. Replenishment demands represent the amount of water that member agencies plan to use to replenish the groundwater basins as available. Metropolitan relies on member and groundwater management agencies' projections for these demands.

Total Conservation

Projected regional water demand is adjusted to account for water conserved by Best Management Practices from active, code-based, and price-effect conservation. Active conservation levels are derived by calculating water savings from all active program device-based savings installed to date. Code-based conservation levels are derived by calculating water savings from devices covered by existing water conservation ordinances and plumbing codes, including the state Model Water Efficient Landscape Ordinance, with replacement and new construction rates driven by demographic growth consistent with SCAG and SANDAG land use and transportation plans used to derive retail demand. Price-effect conservation is derived by calculating water savings by retail customers attributable to the effect of changes in the real (inflation adjusted) price of water.

Water use reduction under Senate Bill 7 (SB X7-7) (see description below) is factored into local water supplies. This has been done to recognize the fact that one method of compliance with SB X7-7 is the development of recycled water in addition to conservation.

Total Local Supplies

Projections of local supplies are based on information gathered from a number of sources including past urban water management plans, Metropolitan's annual local production surveys, and communications between Metropolitan and member agency staff. The projections include groundwater and surface water production, recycled water and recovery of contaminated or degraded groundwater (funded under the Metropolitan's Local Resources Program, as well as local agency funded programs), and seawater desalination. The local supply projections presented in demand tables for the 2015 UWMP include existing projects that are currently producing water, projects that are under construction, and Metropolitan's IRP local supply targets included as programs under development.

The total local supplies presented in the 2015 UWMP also include Los Angeles Aqueduct deliveries and non-Metropolitan water supplies imported by or exchanged with member agencies from sources outside of Metropolitan's service area.

Water Use Reduction Achievement in 2015

On November 10, 2009, the state Legislature passed Senate Bill 7 as part of the Seventh Extraordinary Session, referred to as SB X7-7 or the Water Conservation Act of 2009. This law is the water conservation component to the historic Delta legislative package, and seeks to achieve a 20 percent statewide reduction in urban per capita water use in California by December 31, 2020. According to Water Code § 10608.36, wholesale agencies are required to include in their UWMPs an assessment of present and proposed future measures, programs, and policies that would help achieve the water use reductions required under SB X7-7. Urban wholesale water suppliers are not required to comply with the target-setting and reporting requirements of SB X7-7.

As a wholesale water agency, Metropolitan is not required to establish or report on an urban water use reduction target. However, Metropolitan's regional conservation programs are designed to assist member agencies and retail water suppliers in the service area to comply with SB X7-7. Therefore, Metropolitan monitors the progress of its service area. Also, in compliance with SB X7-7, Metropolitan assesses its actions, programs, and policies to help achieve the water use reductions required by SB X7-7.

Based on an analysis of population, demand, and the methodologies for setting targets described in the legislation, Metropolitan's baseline is 181 GPCD and the 2020 reduction target is 145 GPCD. From 2011-2014, there was a slight increase in per capita water use explained in part by continued economic recovery and drier weather as compared to previous years. With mandatory restrictions from the state, Water Supply Allocation from Metropolitan and retail water suppliers, the 2015 gallons per capita per day (GPCD) is 131, a 28 percent reduction from the baseline.

Over the next five years, Metropolitan will periodically assess water supply conditions and trends in per capita demand within its service area and evaluate potential programs to ensure attainment of the goal. Metropolitan also continues to provide support for retail agency efforts through technical assistance, legislation, code and standards updates, and potential financial incentives where needed for market transformation to increase water use efficiency.

Supply Capabilities

The 2015 UWMP reports on Metropolitan's water reliability and identifies projected supplies to meet the long-term demand within its service area. Metropolitan's supply capabilities are evaluated using the following assumptions:

Hydrologic Conditions and Reporting Period

The 2015 UWMP presents Metropolitan's supply capabilities from 2020 through 2040 under the three hydrologic conditions specified in the Act: single dry-year (represented by a repeat of 1977 hydrology), multiple dry-year (represented by a repeat of 1990 to 1992 hydrologies), and average year (represented by the average of 1922 to 2012 hydrologies).

Colorado River Aqueduct Supplies

Colorado River Aqueduct (CRA) supplies include supplies that would result from existing and committed programs and from implementation of the Quantification Settlement Agreement (QSA) and related agreements. The QSA establishes the baseline water use for each of the agreement parties and facilitates the transfer of water from agricultural agencies to urban uses. A detailed discussion of the QSA is included in Section 3. Colorado River Water Management Programs are potentially available to supply additional water up to the CRA capacity of 1.2 MAF on an as-needed basis.

State Water Project Supplies

State Water Project (SWP) supplies are estimated using the 2015 SWP Delivery Capability Report distributed by DWR in July 2015. The 2015 Delivery Capability Report presents the current DWR estimate of the amount of water deliveries for current (2015) conditions and conditions 20 years in the future. These estimates incorporate restrictions on SWP and Central Valley Project (CVP) operations in accordance with the biological opinions of the U.S. Fish and Wildlife Service and National Marine Fisheries Service issued on December 15, 2008, and June 4, 2009, respectively. Under the 2015 Delivery Capability Report with existing conveyance and low outflow requirements scenario, the delivery estimates for the SWP for 2020 conditions as percentage of Table A amounts are 12 percent, equivalent to 257 TAF for Metropolitan, under a single dry-year (1977) condition and 51 percent, equivalent to 976 TAF for Metropolitan, under the long-term average condition.

In dry, below-normal conditions, Metropolitan has increased the supplies received from the California Aqueduct by developing flexible Central Valley/SWP storage and transfer programs. Over the last two years under the pumping restrictions of the SWP, Metropolitan has worked collaboratively with the other contractors to develop numerous voluntary Central Valley/SWP storage and transfer programs. The goal of these storage/transfer programs is to develop additional dry-year supplies that can be conveyed through the California Aqueduct during dry hydrologic conditions and regulatory restrictions.

Storage

A key component of Metropolitan's water supply capability is the amount of water in Metropolitan's storage facilities. 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 the Water Supply Allocation Plan, is dependent on its storage resources.

In developing the supply capabilities for the 2015 UWMP, Metropolitan assumed the current (2015) storage levels at the start of simulation and used the median storage levels going into each of the five-year increments based on the balances of supplies and demands. Under the median storage condition, there is an estimated 50 percent probability that storage levels would be higher than the assumption used, and a 50 percent probability that storage levels would be lower than the assumption used. All storage capability figures shown in the 2015 UWMP reflect actual storage program conveyance constraints. It is important to note that

under some conditions, Metropolitan may choose to implement the WSAP in order to preserve storage reserves for a future year, instead of using the full supply capability. This can result in impacts at the retail level even under conditions where there may be adequate supply capabilities to meet demands.

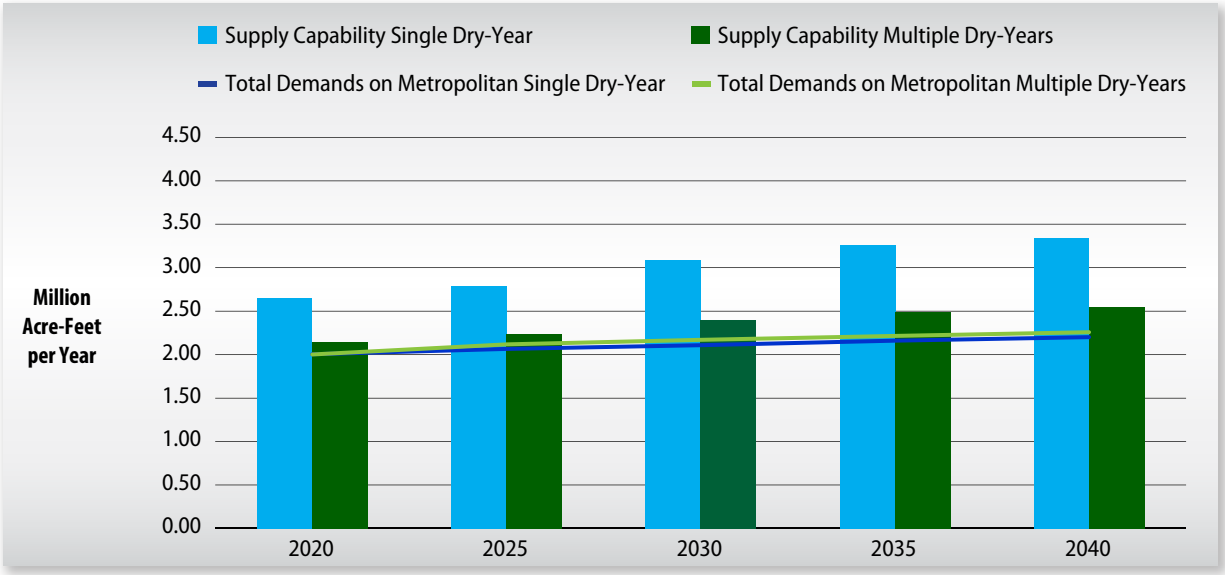
Findings of the 2015 Urban Water Management Plan

The 2015 UWMP provides a comprehensive summary of Metropolitan's demand and supply outlook through 2040. As a reporting document, the UWMP will be updated every five years to reflect changes in water demand and supply projections.

The 2015 UWMP satisfies all the reporting requirements mandated by the Act. The key reporting points of this 2015 UWMP are as follows:

- Metropolitan has supply capabilities that would be sufficient to meet expected demands from 2020 through 2040 under single dry-year and multiple dry-year hydrologic conditions, as presented in Figure ES-1, as well as average year hydrologic conditions.
- Metropolitan has comprehensive plans for stages of actions it would undertake to address up to a 50 percent reduction in its water supplies and a catastrophic interruption in water supplies through its Water Surplus and Drought Management and Water Supply Allocation 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 on the Delta Risk Management Strategy to reduce the impacts of a seismic event in the Delta that would cause levee failure and disruption of SWP deliveries.
- Metropolitan will continue investments in water use efficiency measures to help the region achieve the 20 percent per person potable water use reduction by 2020.
- Metropolitan has plans for supply implementation and continued development of a diversified resource portfolio including programs in the CRA, SWP, Central Valley storage and transfers programs, local resource projects, and in-region storage that enables the region to meet its water supply needs.
- Metropolitan has a collaborative process for its planning initiatives, including the preparation of the 2015 UWMP.

Figure ES -1 Supply Capabilities under Single Dry-Year and Multiple Dry-Year Hydrologies



Note:

1. Supply capabilities are derived using the simulated median storage level going into each of five-year increments based on the balances of supplies and demands. Under the median storage condition, there is an estimated 50 percent probability that storage levels would be higher than the assumption used, and a 50 percent probability that storage levels would be lower than the assumption used.
2. Under some conditions, Metropolitan may choose to implement the WSAP in order to preserve storage reserves for a future year, instead of using the full supply capability. This can result in impacts at the retail level even under conditions where there may be adequate supply capabilities to meet firm demands.
3. All storage capability figures shown in the 2015 UWMP reflect actual storage program conveyance constraints.

Introduction 1

1.1 Introduction to this Document and the Agency

Organization of this Document

This report complies with the Urban Water Management Planning Act of 1984 (Act). In addition to complying with the Act, this report details Metropolitan's current situation and how it will meet the challenges of the future. This document contains five sections. The first section is the Introduction that defines Metropolitan in terms of governance, structure, and current water supply status. This section also briefly outlines how Metropolitan will meet current and future challenges. The second section describes Metropolitan's planning activities and explains how the agency will manage the region's water resources to ensure a reliable water supply for the region. The third section describes the actions Metropolitan has taken to implement the plans outlined in Section 2 and lists future programs and activities. The fourth section addresses the issue of water quality and steps taken to deliver high-quality water to Metropolitan's service area. The last section details the public outreach component integrated with Metropolitan's planning processes. Appendices that include supporting documents for this report are at the conclusion of this report. The sections are further described in detail below:

Section 1 - Introduction

In addition to demonstrating how this report complies with the Act, the 2015 Urban Water Management Plan (UWMP) details Metropolitan's current situation and outlines its plan for meeting the challenges of the future. The Introduction section includes:

- Discussion of the Act and Metropolitan's reporting responsibilities under the Act;
- Introduction to Metropolitan and description of its formation, purpose, service area, member agencies, and governance;
- Historical and demographic information on Metropolitan's service area;
- Discussion of Metropolitan's current condition, challenges, and resource planning strategies; and
- Evaluation of Metropolitan's supply capabilities for the next three years under a multiple dry-year scenario.

Section 2 - Planning for the Future

The Planning for the Future section discusses how Metropolitan plans to meet Southern California's water needs in the future. The section highlights the importance of Integrated Water Resources Planning by summarizing Metropolitan's planning processes over the years and emphasizes the need for Metropolitan to implement adaptive planning strategies that will prepare the region to deal with uncertainties. This section also includes:

- Evaluation of regional water demand under single dry-year, multiple dry-year, and average year conditions for years 2020 through 2040;

- Evaluation of supply capabilities under single dry-year, multiple dry-year, and average year conditions for years 2020 through 2040;
- Discussion of water shortage contingency analysis though the Water Surplus and Drought Management Plan and the Water Supply Allocation Plan;
- Discussion of other supply reliability risks including climate change; and
- Discussion of the different elements of Metropolitan's rate structure and revenue management.

Section 3 – Implementing the Plan

The Implementing the Plan section summarizes Metropolitan's progress in developing a diversified resource mix that enables the region to meet its water supply needs. The investments that Metropolitan has made and its continuing efforts in many different areas coalesce toward its goal of long-term supply reliability for the region. This section includes:

- Discussion of resources and program development for the CRA, SWP, Central Valley/SWP storage and transfers programs, conservation, local resources program (groundwater recovery, recycling, desalination), and groundwater; and
- Discussion of Metropolitan's measures, programs, and policies to help meet the SB X7-7 goal of 20 percent water use reduction by 2020 and the region's progress in meeting this target.

Section 4 - Water Quality

The Water Quality section identifies key regional water quality issues and discusses the protection of the quality of source water and development of water management programs that maintain and enhance water quality. This section also includes:

- Discussion of water quality issues of concern, constituents of emerging concern, and water quality programs that Metropolitan has undertaken to protect its water supplies.

Section 5 – Coordination and Public Outreach

The Coordination and Public Outreach section presents the processes undertaken in the development of the 2015 IRP Update and 2015 UWMP with the public and other stakeholders. It provides a list of all meetings and workshops conducted to promote and achieve consensus and collaborative planning. Included in this section are the public notification letters and announcements distributed by Metropolitan as required by the Act and a copy of the Metropolitan resolution adopting and approving the 2015 UWMP for submittal to DWR.

Appendices

The appendices provide detailed background on the information presented in the 2015 UWMP.

Appendix 1 - Demand Forecast

Appendix 2 - Existing Regional Water Supplies

Appendix 3 - Justifications for Supply Projections

Appendix 4 - Water Supply Allocation Plan

Appendix 5 - Local Projects

Appendix 6 - Conservation Estimates and Water Savings from Codes, Standards, and Ordinances

Appendix 7 - Distribution System Water Losses

Appendix 8 - Recent CUWCC Filings

Appendix 9 - Metropolitan's Energy Intensity Calculations, Including Conveyance and Distribution Generation

Appendix 10 - DWR's Standardized Tables

Urban Water Management Planning Act

This report has been prepared in compliance with Water Code Sections 10610 through 10656 of the Urban Water Management Planning Act (Act), which were added by Statute 1983, Chapter 1009, and became effective on January 1, 1984. This Act requires that "*every urban water supplier shall prepare and adopt an urban water management plan*" (Water Code § 10620(a)). An "urban water supplier" is defined as a supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually (Water Code § 10617). These plans must be filed with the California Department of Water Resources (DWR) every five years. However, the 2015 plans must be submitted to DWR by July 1, 2016. The Act's requirements include:

- Detailed evaluation of the supplies necessary to meet demands over at least a 20-year period, in five-year increments, for a single dry water year, in multi-year droughts, and during average year conditions;
- Documentation of the stages of actions an urban water supplier would undertake to address up to a 50 percent reduction in its water supplies;
- Description of the actions to be undertaken in the event of a catastrophic interruption in water supplies; and
- Evaluation of reasonable and practical efficient water uses, recycling, and conservation activities.

In addition, Water Code § 10608.36 requires wholesale agencies to include in their UWMPs an assessment of present and proposed future measures, programs, and policies that would help achieve water use reduction targets.

Changes in the Act Since 2010

Since 2010, several amendments have been made to the Act. The following is a summary of the significant changes in the Act that have occurred from 2010 to the present:

- Changes the deadline for water suppliers to submit their 2015 UWMPs to DWR to July 1, 2016 (Water Code § 10621(d)).
- Adds "distribution system water loss" to the list of past, present, and projected future water uses that the UWMP is to quantify to the extent that records are available and over the same 5-year increments described in Water Code § 10631(a). (Water Code § 10631(e)(1)(J)). For the 2015 UWMP, the distribution system water loss must be quantified for the most recent 12-month period available. For all subsequent updates, the distribution system water loss must be quantified for each of the 5 years preceding the plan update. (Water Code § 10631(e)(3)(A)). The distribution system water loss quantification must be reported in accordance with a worksheet approved or developed by DWR through a public process. The water loss quantification worksheet must be based on the water system balance methodology developed by the American Water Works Association (AWWA) (Water Code § 10631(e)(3)(B)).
- If available and applicable to an urban water supplier, water use projections may display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as

applicable to the service area (Water Code § 10631(e)(4)(A)). To the extent that an urban water supplier reports the information described in § 10631(e)(4)(A), an urban water supplier shall do both of the following: (1) provide citations of the various codes, standards, ordinances, or transportation and land use plans used in making the projections; and (2) indicate the extent that the water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. Water use projections that do not account for these water savings shall note that fact (Water Code § 10631(e)(4)(B)).

- Requires plans by retail water suppliers to include a narrative description that addresses the nature and extent of each water demand management measure (DMM) implemented over the past 5 years. The narrative must describe the water DMMs that the supplier plans to implement to achieve its water use targets pursuant to Water Code § 10608.20 (Water Code § 10631(f)(1)(A)). The narrative must also include descriptions of the following water DMMs: 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; and other DMMs that have a significant impact on water use as measured in GPCD, including innovative measures, if implemented (Water Code § 10631(f)(1)(B).
- Requires plans by wholesale water suppliers to include a narrative description of metering, public education and outreach, water conservation program coordination and staffing support, and other DMMs that have a significant impact on water use as measured in GPCD, including innovative measures, if implemented, as well as a narrative description of their distribution system asset management and wholesale supplier assistance programs (Water Code § 10631(f)(2)).
- Adds the voluntary reporting in the UWMP of any of the following information: an estimate of the amount of energy used: (1) to extract or divert water supplies; (2) to convey water supplies to water treatment plants or distribution systems; (3) to treat water supplies; (4) to distribute water supplies through the distribution system; (5) for treated water supplies in comparison to the amount used for non-treated water supplies; and (6) to place water into or to withdraw water from storage; and (7) any other energy-related information the urban water supplier deems appropriate (Water Code § 10631.2(a)). DWR included in its UWMP guidance a methodology for the voluntary calculation or estimation of the energy intensity of urban water systems (Water Code § 10631.2(b)).
- Requires urban water suppliers to submit plans or amendments to plans electronically and to include any standardized forms, tables, or displays specified by DWR (Water Code § 10644(a)(2)).

Senate Bill 7 of the Seventh Extraordinary Session of 2009, Water Conservation in the Delta Legislative Package

In addition to changes to the Act, the state Legislature passed Senate Bill 7 as part of the Seventh Extraordinary Session, referred to as SB X7-7, on November 10, 2009, which became effective February 3, 2010. This law was the water conservation component to the historic Delta legislative package, and seeks to achieve a 20 percent statewide reduction in urban per capita water use in California by December 31, 2020. This implements the Governor's similar 2008 water use reduction goals. The law requires each urban retail water supplier to develop urban water use targets to help meet the 20 percent goal by 2020, and an interim urban water reduction target by 2015.

The bill states that the legislative intent is to require all water suppliers to increase the efficiency of use of water resources and to establish a framework to meet the state targets for urban water conservation called for by the Governor. The bill establishes methods for urban retail water suppliers to determine targets to help achieve increased water use efficiency by the year 2020. The law is intended to promote urban water conservation standards consistent with the California Urban Water Conservation Council's adopted best management practices.

An urban retail water supplier may update its 2020 urban water use target in its 2015 UWMP (Water Code § 10608.20(g)).

Urban wholesale water suppliers are not required to perform all of the target-setting and reporting requirements of SB X7-7. However, wholesale agencies must include in their UWMPs an assessment of present and proposed future measures, programs, and policies that would help achieve the water use reductions required under this law (Water Code § 10608.36).

Metropolitan addresses in Sections 3.4, 3.5, and 3.7 the actions it is taking to help urban retail water suppliers to achieve the urban per capita water use reduction pursuant to the goals set forth in SB X7-7.

Metropolitan's Compliance with the Urban Water Management Planning Act

As with Metropolitan's previous plans, this Plan does not explicitly discuss specific activities undertaken by member agencies unless they relate to one of Metropolitan's water demand or supply management programs. Presumably, each member agency will discuss these activities in its Urban Water Management Plan, but elements of this Plan do not necessarily have to be adopted by the urban water suppliers or the public agencies directly providing retail water.

DWR Guidance

In 2010, DWR provided a guidebook to aid water suppliers in developing their urban water management plans. These materials helped water suppliers to comply with the law and DWR staff to review submitted plans for regulatory compliance. The 2010 guidebook consisted of two parts: (1) preparing a UWMP – specific guidance for addressing UWMP requirements in the Water Code; and (2) UWMP supporting information – a detailed discussion of specific subjects or supporting documents related to preparing a UWMP. The 2010 guidebook also included a checklist for cross-referencing sections of the respondent water supplier's plan with the relevant sections of the Water Code to confirm that it addressed all relevant provisions of the Act.

In March 2016, DWR issued the Final 2015 UWMP Guidebook for Urban Water Suppliers. The 2015 guidebook has been updated from the 2010 version to reflect new legislation and to group the Water Code requirements by topic. As part of the guidebook, DWR has developed standardized tables for the reporting and submittal of UWMP data to DWR. As mentioned above, water suppliers are required to use these standardized tables for electronic submittal of their UWMPs to DWR to satisfy the new legislative requirement (Water Code § 10644(a)(2)). For the 2015 UWMP, Metropolitan electronically submitted the standardized tables to the designated DWR portal. In addition, Metropolitan included the standardized submittals in this Plan as Appendix 10.

The 2015 guidebook includes a voluntary checklist to show reporting of required elements to assist DWR with its review of the submitted UWMP. Included in the beginning of this Plan is a compliance checklist, organized by Water Code section, which summarizes Metropolitan's response to the requirements of the Water Code and indicates where each required element can be found in the Plan.

1.2 The Metropolitan Water District of Southern California

Formation and Purpose

The Metropolitan Water District of Southern California (Metropolitan) is a public agency organized in 1928 by a vote of the electorates of 13 Southern California cities. The agency was enabled by the adoption of the original Metropolitan Water District Act (Metropolitan Act) by the California Legislature "for the purpose of developing, storing, and distributing water" to the residents of Southern California. The Metropolitan Act also allows Metropolitan to sell additional water, if available, for other beneficial uses. In 1992, the Metropolitan Board of Directors adopted the following mission statement:

> *"To provide its service area with adequate and reliable supplies of high-quality water to meet present and future needs in an environmentally and economically responsible way."*

The first function of Metropolitan was building the Colorado River Aqueduct (CRA) to convey water from the Colorado River. Deliveries through the aqueduct to member agencies began in 1941 and supplemented the local water supplies of the Southern California member cities. In 1960, to meet growing water demands in its service area, Metropolitan contracted for additional water supplies from the State Water Project (SWP) via the California Aqueduct, which is owned and operated by DWR. SWP deliveries began in 1972. Metropolitan currently receives imported water from both of these sources: (1) Colorado River water via the CRA, and (2) the SWP via the California Aqueduct.

Service Area

Metropolitan's service area covers the Southern California coastal plain. It extends about 200 miles along the Pacific Ocean from the city of Oxnard on the north to the international boundary with Mexico on the south, and it reaches as far as 70 miles inland from the coast (Figure 1-1). The total area served is approximately 5,200 square miles, and it includes portions of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties. Table 1-1 shows that although only 14 percent of the land area of the six Southern California counties is within Metropolitan's service area, nearly 85 percent of the populations of those counties reside within Metropolitan's boundaries.

Member Agencies

Metropolitan is currently composed of 26 member agencies, including 14 cities, 11 municipal water districts, and one county water authority. Metropolitan is a water wholesaler with no retail customers. It provides treated and untreated water directly to its member agencies.

Metropolitan's 26 member agencies deliver to their customers a combination of local groundwater, local surface water, recycled water, and imported water purchased from or exchanged with Metropolitan. For some member agencies, Metropolitan supplies almost all the water used within that agency's service area, while others obtain varying amounts of water from Metropolitan to supplement local supplies. Over the last ten years (from 2006-2015), Metropolitan has provided between 50 and 60 percent of the municipal, industrial, and agricultural water used in its service area. The remaining water supply comes from local wells, local surface water, recycling, the city of Los Angeles' aqueducts from the Owens Valley/Mono Basin east of the Sierra Nevada, and water conserved by the Imperial Irrigation District and the All-American and Coachella Canal Lining Projects for the San Diego County Water Authority which is exchanged for water supplies delivered by Metropolitan. Member agencies also implement conservation programs that can be considered part of their supplies.

Some member agencies provide retail water service, while others provide water to the local area as wholesalers. Table 1-2 shows Metropolitan's member agencies and the type of service that they provide. As shown in the table, 15 member agencies provide retail service to customers, 9 provide only wholesale service, and 2 provide a combination of both. Throughout Metropolitan's service area, approximately 250 retail water suppliers directly serve the population.

Metropolitan's member agencies serve residents in 152 cities and 89 unincorporated communities. Table 1-3 shows the member agencies of Metropolitan, as well as the cities and communities served by those member agencies. Figure 1-1 also shows the geographical area served by the member agencies.

Currently, member agencies receive water from Metropolitan at various delivery points, and pay for service through a rate structure made up of multiple components. The majority of these components consist of uniform volumetric rates, and the majority of the revenue is collected through a tiered volumetric supply charge. The second tier of this rate is set at the cost of developing new supplies. Metropolitan's pricing and rate structure are described in detail in Section 2.7.

To aid in planning future water needs, member agencies advise Metropolitan in April of each year of how much water they anticipate they will need during the next five years. In addition, Metropolitan works with its member agencies to forecast future water demands.

Table 1-1
July 1, 2015 Area and Population in the
Six Counties of Metropolitan's Service Area

County	Total County	In Metropolitan Service Area	Percent in Metropolitan
Land Area (Square Miles)			
Los Angeles County	4,061	1,408	35%
Orange County	789	699	89%
Riverside County	7,208	1,057	15%
San Bernardino County	20,052	242	1%
San Diego County	4,200	1,420	34%
Ventura County	1,845	365	20%
Metropolitan's Service Area	**38,155**	**5,191**	**14%**
Population (Persons)			
Los Angeles County	10,192,000	9,267,000	91%
Orange County	3,165,000	3,153,000	100%
Riverside County	2,331,000	1,679,000	72%
San Bernardino County	2,128,000	839,000	39%
San Diego County	3,276,000	3,169,000	97%
Ventura County	853,000	633,000	74%
Metropolitan's Service Area	**21,945,000**	**18,740,000**	**85%**

Table 1-2
Metropolitan's Member Agencies and Type of Water Service Provided

Member Agency	Retail or Wholesale
Los Angeles County	
Beverly Hills, City of	Retail
Burbank, City of	Retail
Central Basin Municipal Water District	Wholesale
Compton, City of	Retail
Foothill Municipal Water District	Wholesale
Glendale, City of	Retail
Las Virgenes Municipal Water District	Retail
Long Beach, City of	Retail
Los Angeles, City of	Retail
Pasadena, City of	Retail
San Fernando, City of	Retail
San Marino, City of	Retail
Santa Monica, City of	Retail
Three Valleys Municipal Water District	Wholesale
Torrance, City of	Retail
Upper San Gabriel Valley Municipal Water District	Wholesale
West Basin Municipal Water District	Wholesale
Orange County	
Anaheim, City of	Retail
Fullerton, City of	Retail
Municipal Water District of Orange County	Wholesale
Santa Ana, City of	Retail
Riverside County	
Eastern Municipal Water District	Retail & Wholesale
Western Municipal Water District	Retail & Wholesale
San Bernardino County	
Inland Empire Utilities Agency	Wholesale
San Diego County	
San Diego County Water Authority	Wholesale
Ventura County	
Calleguas Municipal Water District	Wholesale

Table 1-3
Member Agencies

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Municipal Water Districts (11)		Member Cities (14)			County Water Authorities (1)
Calleguas	Orange County	Anaheim	Glendale	San Marino	
Central Basin	Three Valleys	Beverly Hills	Long Beach	Santa Ana	
Foothill	Upper San Gabriel Valley	Burbank	Los Angeles	Santa Monica	San Diego
Inland Empire	West Basin	Compton	Pasadena	Torrance	
Eastern	Western	Fullerton	San Fernando		
Las Virgenes					

Cities within Member Agencies

CALLEGUAS MWD
Camarillo
Camarillo Heights
Fairview
Lake Sherwood Valley
Las Posas
Moorpark
NAWS Point Mugu
NCBC Port Hueneme
Oak Park
Oxnard
Port Hueneme
Santa Rosa Valley
Simi Valley
Somis
Thousand Oaks

Central Basin MWD
Artesia
Bell
Bellflower
Bell Gardens
Cerritos
Commerce
Cudahy
Downey
East Los Angeles
Florence
Hawaiian Gardens
Huntington Park
La Habra Heights
Lakewood
La Mirada
Lynwood
Maywood
Montebello
Norwalk
Paramount
Pico Rivera
Santa Fe Springs
Signal Hill
South Gate
South Whittier
Vernon
Whittier

Foothill MWD
Altadena
La Cañada Flintridge
La Crescenta
Montrose

INLAND EMPIRE
Chino
Chino Hills
Fontana
Montclair
Ontario
Rancho Cucamonga
Upland

Eastern MWD
Good Hope
Hemet
Homeland
Juniper Flats
Lakeview
Mead Valley
Menifee
Moreno Valley
Murrieta
Murrieta Hot Springs
Nuevo
North Canyon Lake
Perris
Quail Valley
Romoland
San Jacinto
Sun City
Temecula
Valle Vista
Winchester

Las Virgenes MWD
Agoura
Agoura Hills
Calabasas
Chatsworth
Hidden Hills
Lake Manor
Malibu Lake
Monte Nido
Westlake Village
West Hills

MWD OF ORANGE COUNTY
Aliso Viejo
Brea
Buena Park
Capistrano Beach
Corona Del Mar
Costa Mesa
Coto De Caza
Cypress
Dana Point
Fountain Valley
Garden Grove
Huntington Beach
Irvine
Laguna Beach
Laguna Hills
Laguna Niguel
Laguna Woods
La Habra
Lake Forest
La Palma
Leisure World
Los Alamitos
Mission Viejo
Monarch Beach
Newport Beach
Orange
Placentia
Rancho Santa Margarita
San Clemente
South Laguna

MWD OF ORANGE COUNTY (cont.)
San Juan Capistrano
Seal Beach
Stanton
Tustin
Tustin Foothills
Villa Park
Westminster
Yorba Linda

Three Valleys MWD
Azusa
Charter Oak
Claremont
Covina
Covina Knolls
Diamond Bar
Glendora
Industry
La Verne
Pomona
Rowland Heights
San Dimas
So. San Jose Hills
Walnut
West Covina

Upper San Gabriel Valley MWD
Arcadia
Avocado Heights
Baldwin Park
Bradbury
Citrus
Covina
Duarte
El Monte
Glendora
Hacienda Heights
Industry
Irwindale
La Puente
Mayflower Village
Monrovia
Rosemead
San Gabriel
South El Monte
South Pasadena
South San Gabriel
Temple City
Valinda
West Covina
West Puente Valley

WEST BASIN MWD
Alondra Park
Carson
Culver City
El Segundo
Gardena
Hawthorne
Hermosa Beach
Inglewood
Ladera Heights
Lawndale
Lennox

WEST BASIN MWD (cont.)
Lomita
Malibu
Manhattan Beach
Marina Del Rey
Palos Verdes Estates
Rancho Palos Verdes
Redondo Beach
Rolling Hills
Rolling Hills Estates
Ross-Sexton
Topanga Canyon
West Athens
West Hollywood

WESTERN MWD OF **Riverside County**
Bedford Heights
Canyon Lakes
Corona
Eagle Valley
El Sobrante
Jurupa
Lake Elsinore
Lake Mathews
March AFB
Murrieta
Norco
Riverside
Rubidoux
Temecula
Temescal Canyon
Woodcrest

SAN DIEGO CWA
Alpine
Bonita
Bonsall
Camp Pendleton
Carlsbad
Casa De Oro
Chula Vista
Del Mar
El Cajon
Encinitas
Escondido
Fallbrook
Lakeside
La Mesa
Lemon Grove
Mount Helix
National City
Oceanside
Pauma Valley
Poway
Rainbow
Ramona
Rancho Santa Fe
San Diego
San Marcos
Santee
Solana Beach
Spring Valley
Valley Center
Vista

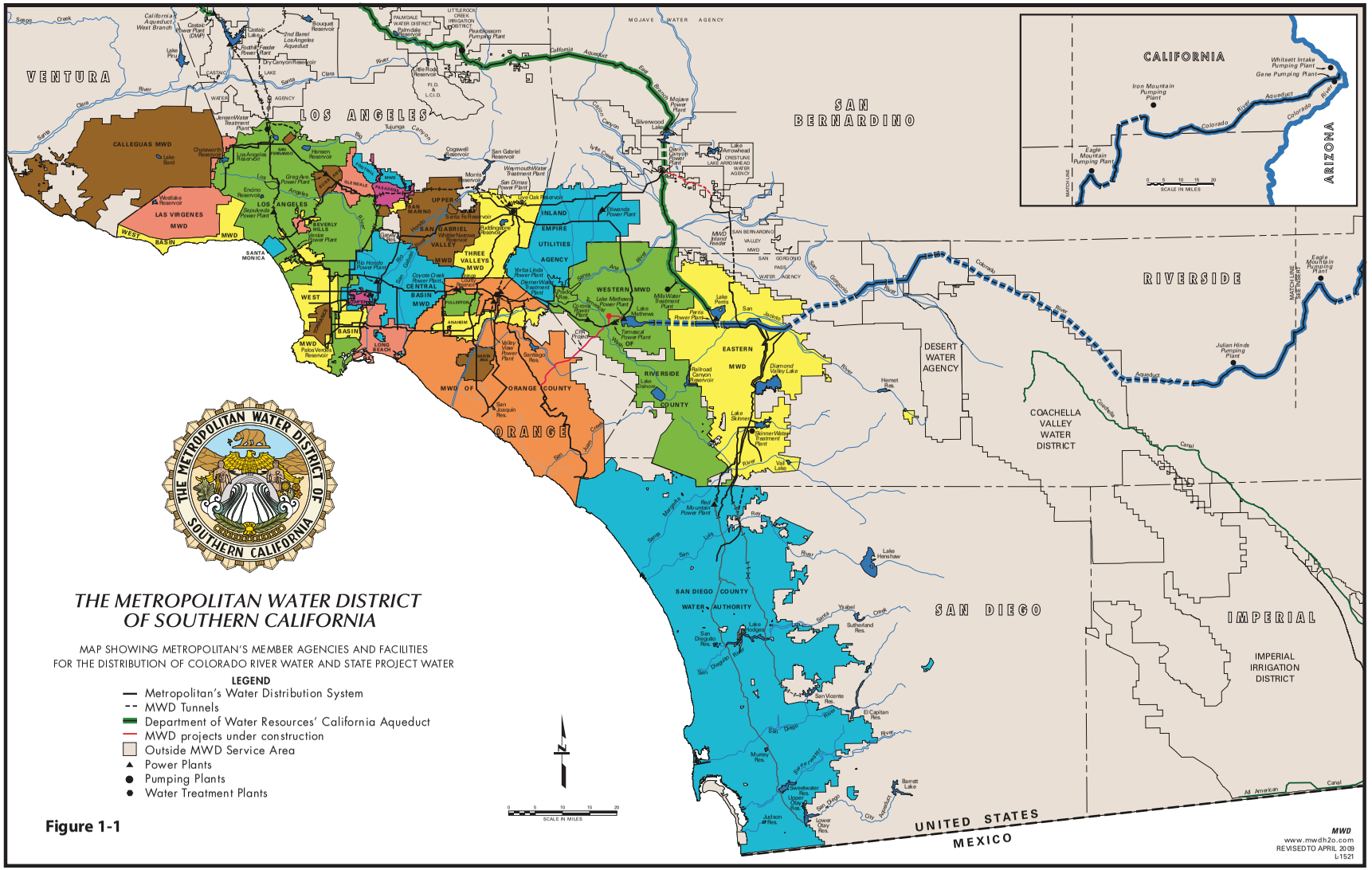

VENTURA
LOS ANGELES
SAN BERNARDINO
RIVERSIDE
ORANGE
SAN DIEGO
IMPERIAL
CALIFORNIA
ARIZONA
CALLEGUAS MWD
LAS VIRGENES MWD
WEST BASIN
SANTA MONICA
LOS ANGELES
BEVERLY HILLS
SAN MARINO
UPPER SAN GABRIEL VALLEY
MWD
INLAND EMPIRE UTILITIES AGENCY
THREE VALLEYS MWD
CENTRAL BASIN MWD
WEST BASIN MWD
MWD OF ORANGE COUNTY
WESTERN MWD
EASTERN MWD
RIVERSIDE COUNTY
DESERT WATER AGENCY
COACHELLA VALLEY WATER DISTRICT
IMPERIAL IRRIGATION DISTRICT
SAN DIEGO COUNTY WATER AUTHORITY
MOJAVE WATER AGENCY
SAN BERNARDINO VALLEY MWD
SAN GORGONIO PASS WATER AGENCY
CRESTLINE LAKE ARROWHEAD WATER AGENCY
UNITED STATES
MEXICO
THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
MAP SHOWING METROPOLITAN'S MEMBER AGENCIES AND FACILITIES
FOR THE DISTRIBUTION OF COLORADO RIVER WATER AND STATE PROJECT WATER
LEGEND
Metropolitan's Water Distribution System
MWD Tunnels
Department of Water Resources' California Aqueduct
MWD projects under construction
Outside MWD Service Area
Power Plants
Pumping Plants
Water Treatment Plants
SCALE IN MILES
MWD
www.mwdh2o.com
REVISED TO APRIL 2009
L-1521

Figure 1-1

Board of Directors and Management Team

Metropolitan's Board of Directors currently consists of 38 directors. The Board consists of at least one representative from each member agency, with each agency's assessed valuation determining its additional representation and voting rights. Directors can be appointed by the chief executive officer of the member agency or be elected by a majority vote of the governing body of the agency. Metropolitan does not compensate directors for their service. The Board includes business, professional, and civic leaders. Board meetings are generally held on the second Tuesday of each month and are open to the public.

Throughout its history, the Board has delegated certain tasks to Metropolitan staff, which are codified in Metropolitan's Administrative Code. In addition, Metropolitan has developed policy principles to help achieve its mission to provide adequate and reliable supplies of high-quality water in an environmentally and economically responsible way. These policies can be found in a variety of documents including: specific policy statements, the Administrative Code, Board-adopted policy principles, and letters submitted to the Board. Policy statements are also embedded in formal Board meeting discussions and recorded in meeting minutes. The policies established by the Board are subject to all applicable laws and regulations. The management of Metropolitan is under the direction of its General Manager, who serves at the discretion of the Board, as do Metropolitan's General Auditor, General Counsel, and Ethics Officer.

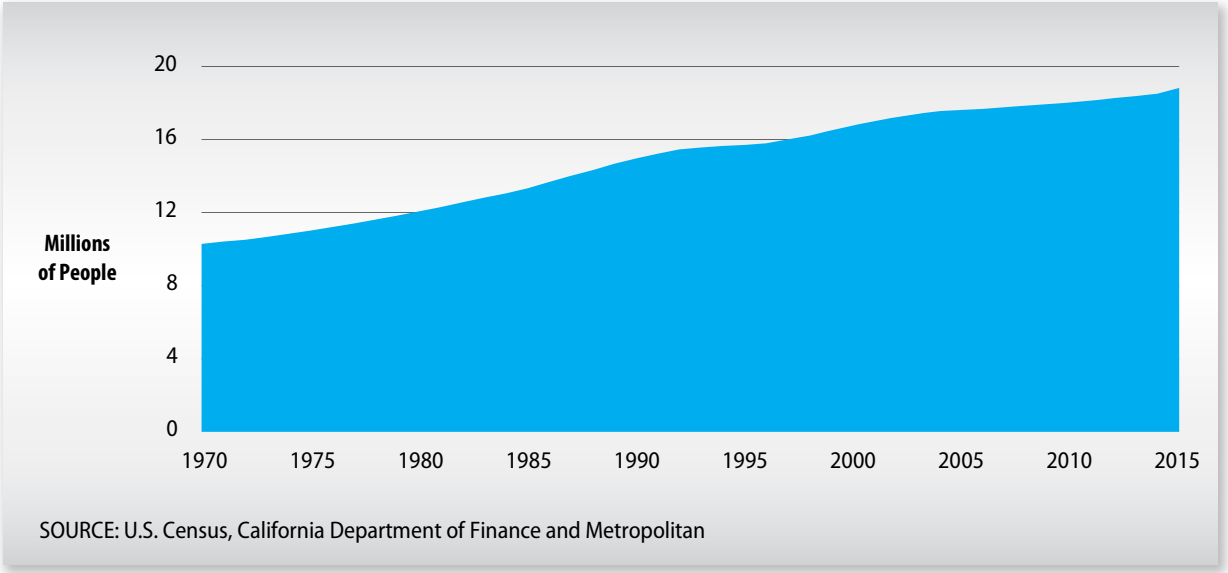
1.3 Metropolitan Service Area Historical Information

Population

In 1990, the population of Metropolitan's service area was approximately 15.0 million people. By 2015, it had reached an estimated 18.7 million, representing almost half of the state's population. In the past, annual growth has varied from about 200,000 annually in the 1970s and early-to-mid-1980s to more than 300,000 annually in the late 1980s. Population growth slowed due to economic recession during the early 1990s to just over 50,000 in 1995, before again rising to more than 250,000 per year in the period 1999 through 2002. Growth has generally averaged 120,000 persons per year during the last 10 years from 2006 to 2015. Figure 1-2 shows the service area population growth from 1970-2015.

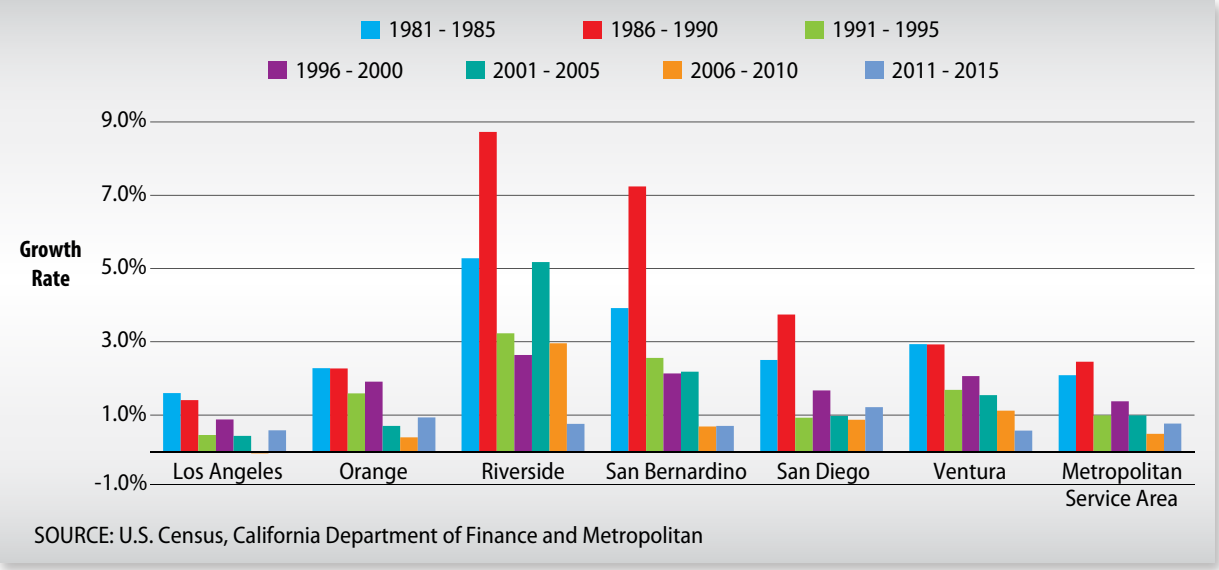
The most populated cities within Metropolitan's service area are Los Angeles (largest city in the state), San Diego (second largest in the state), Long Beach, Anaheim, Santa Ana, and Riverside. The Department of Finance State Population Report from May 2015 reports biggest numeric increases occurring in the cities of Los Angeles and San Diego, consistent with their larger population base. Figure 1-3 shows the 5-year growth rates for the six counties within Metropolitan's service area. As can be seen from this figure, there has been an overall increase in population growth rate in the last 5 years. Appendix 1 presents a detailed discussion of the demographic trends in Southern California and their impacts on regional demand forecasts.

Figure 1-2 Service Area Population Growth 1970-2015



SOURCE: U.S. Census, California Department of Finance and Metropolitan

Figure 1-3 Average Annual Population Growth Rates in Metropolitan's Service Area



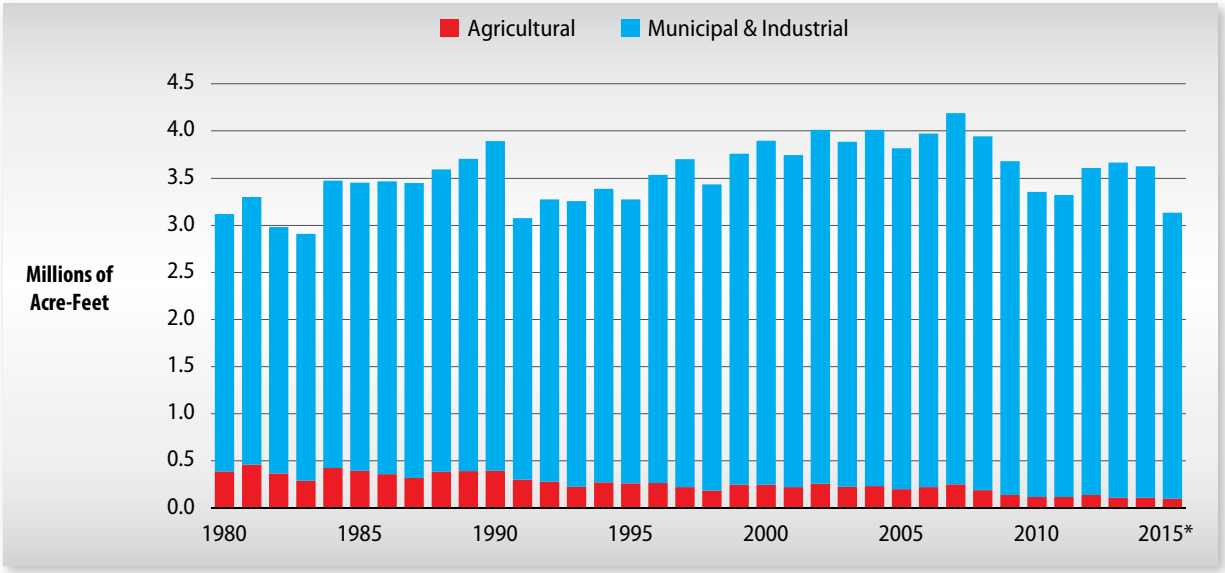
SOURCE: U.S. Census, California Department of Finance and Metropolitan

Historical Retail Water Demands

Figure 1-4 presents historical retail water demands on a calendar year basis in Metropolitan's service area. Since 1980, retail water demands varied from 2.9 million acre-feet (MAF) in 1983 to nearly 4.2 MAF in 2007. Due to the economic recession, drought impacts, conservation, and mandatory water use restrictions, demands declined to 3.1 MAF in 1991. Demand remained below the peak level as a result of continuing effects from the recession and the drought coupled with a number of wet years and ongoing conservation efforts. In 2000, retail demands reached 3.9 MAF, surpassing the early peak level for the first time in a decade. Since 2000, retail demands reached a new peak level in 2007 with nearly 4.2 MAF. Calendar year 2007 was the driest year since 1989, with precipitation measured at 5.66 inches in Downtown Los Angeles. Since the peak retail demand in 2007, a decrease in demand was observed during the economic recession of 2008-2012. Starting in 2012, the severe drought in California led to a massive conservation campaign and water use restriction by the State, Metropolitan, and local water agencies resulting in a decrease in demand in 2015.

In 2015, about 97 percent of the retail demands were used for municipal and industrial purposes (M&I), and 3 percent for agricultural purposes. The relative share of agricultural water use has declined due to urbanization and market factors, including the price of water. Agricultural water use accounted for 19 percent of total regional water demand in 1970, 12 percent in 1980, 10 percent in 1990, and 3.5 percent in 2010.

Figure 1-4 Retail Demand in Metropolitan's Service Area



* 2015 estimated based on best available data as of October 2015.

Climate and Rainfall

As Figure 1-5 shows, Metropolitan's service area encompasses three major climate zones. Table 1-4 reports the 30-year (1985-2014) average temperature, rainfall, and evapotranspiration (expressed as Et_o) information for representative locations within those three zones.

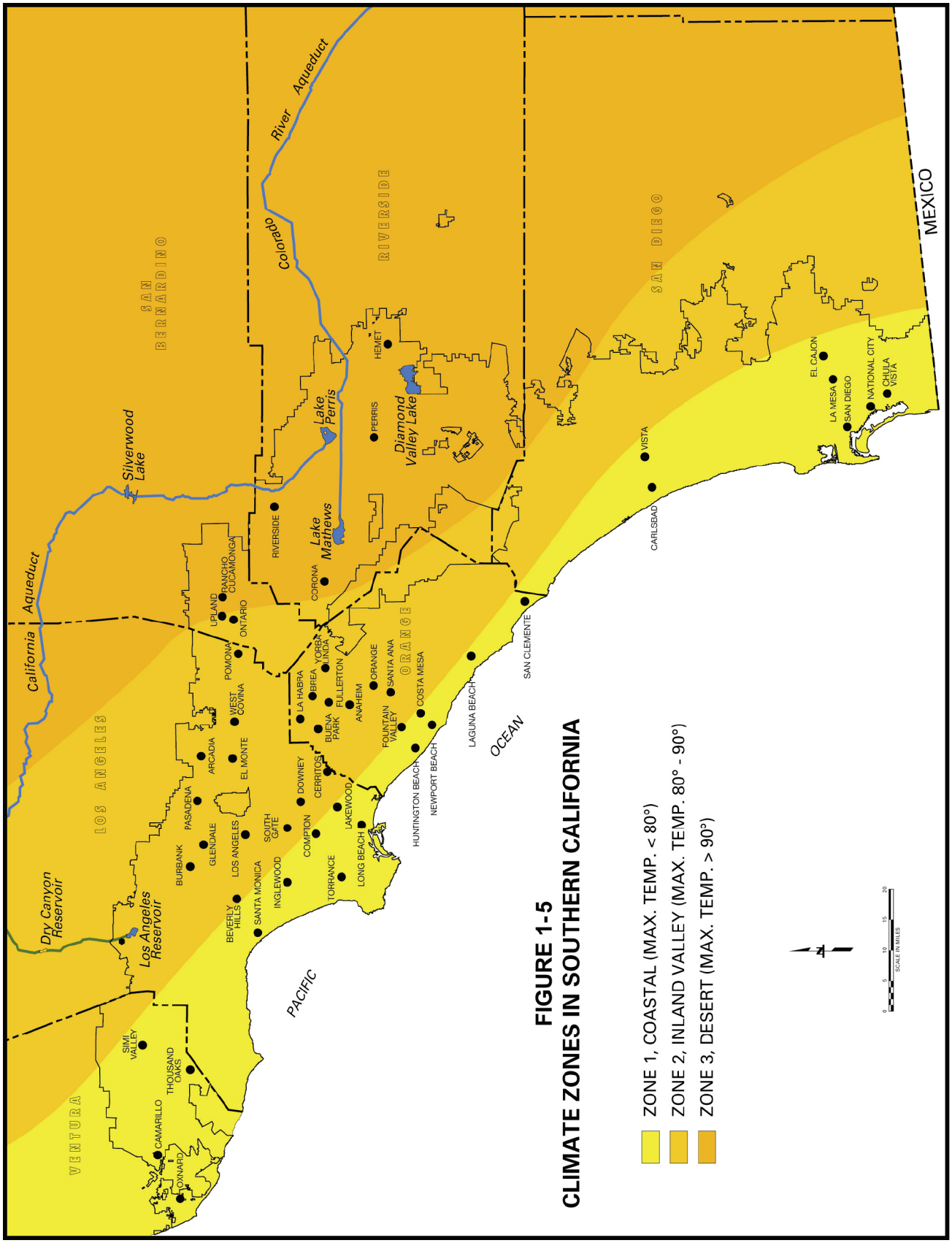


FIGURE 1-5
CLIMATE ZONES IN SOUTHERN CALIFORNIA

Table 1-4 Weather Variables in Three Zones in Metropolitan's Service Area

30-year Average (1985-2014)

Average Temperature	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Los Angeles County[1]	58.06	58.54	60.62	63.52	65.96	68.87	72.62	73.44	72.20	68.19	62.46	57.38	65.15
Riverside County[2]	57.15	57.75	59.42	61.66	63.62	65.70	69.02	70.53	69.67	66.44	61.39	56.66	63.25
San Diego County[3]	54.01	54.85	57.76	61.83	66.19	70.76	75.80	76.54	73.31	66.43	58.69	52.97	64.09

30-year Average (1985-2014)

Average Precipitation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Los Angeles County[1]	2.99	4.08	2.16	0.80	0.33	0.08	0.03	0.02	0.18	0.73	1.16	2.64	15.20
San Diego[2]	1.83	2.20	1.47	0.75	0.19	0.07	0.03	0.01	0.13	0.58	0.94	1.66	9.85
Riverside[3]	2.18	3.07	1.59	0.70	0.20	0.07	0.03	0.01	0.12	0.63	0.71	1.86	11.16

Et_o[4]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Los Angeles County	2.2	2 7	3 7	4 7	5 5	5 8	6 2	5 9	5 0	3 9	2 6	1 9	50.1
San Diego	2.5	2 9	4 2	5 3	5 9	6 6	7 2	6 9	5 4	4 1	2 9	2 6	56.4
Riverside	2.1	2 4	3 4	4 6	5 1	5 3	5 7	5 6	4 3	3 6	2 4	2 0	46.5

1. Temperature and precipitation data are from the National Oceanic and Atmospheric Administration, USC Station KCQT. Last updated July 1, 2015.
2. Temperature and precipitation data are from the National Oceanic and Atmospheric Administration, Riverside Station KNOC. Last updated July 1, 2015.
3. Temperature and precipitation data are from the National Oceanic and Atmospheric Administration, San Diego Airport Station KSAN. Last updated July 1, 2015.
4. Eto values are from Model Water Efficient Landscape Ordinance, September 10, 2009, Appendix A: Reference Evapotranspiration (Eto) Table.
   Eto values were derived from: 1) California irrigation Management Information System (CIMIS); 2) Reference Evapotranspiration Zone Map, UC Department of Land, Air and Water Resources and California Department of Water Resources 1999; 3) Reference Evapotranspiration for California, UC Department of Agriculture and Natural Resources, 1987, Bulletin 1922; and 4) Determining Daily Reference Evapotranspiration, UC Cooperative Extension, Division of Agriculture and Natural Resources, 1987, Publication Leaflet 21426.

1.4 Current Conditions

Current Challenges

Metropolitan faces a number of challenges in providing adequate, reliable, and high quality supplemental water supplies for southern California. One of those challenges is dry hydrologic conditions that can have a significant impact on Metropolitan's imported water supply sources. This section offers a brief discussion of Metropolitan's current challenges, current available resources, short-term supply outlook, and recent and near-term actions to meet these challenges.

Dry conditions persisted into 2015, resulting in a fourth consecutive dry year for California. The year began with the driest January on record. The peak of the snowpack season traditionally occurs on April 1; however, in 2015, the snowpack peaked in January at only 17 percent of the April 1 average measurement, resulting in the earliest and lowest snowpack peak in recorded history. The statewide snowpack was all but gone by April 1, 2015, and registered a record low of 5 percent of average for that day. This dry hydrology produced only 51 percent of average runoff for the water year and consequently kept state reservoirs below average storage levels. As a result, Metropolitan only received 20 percent of its contract water supplies from the State Water Project (SWP) in 2015.

In 2015, the Upper Colorado River Basin snowpack peaked in March at 76 percent of normal. Runoff for that basin measured 94 percent of normal due to above normal rainfall in May, June and July, which averted a Colorado River shortage condition for 2016. This allowed Metropolitan to implement new water management programs and bolster supplies in 2015. The Colorado River, however, is experiencing a 16-year drought causing total storage levels in that system to steadily decline and increasing the likelihood of shortage in future years beyond 2016. The restrictions on water use generated a record demand for water-saving rebates and refocused efforts to increase development of local water resources.

Sacramento-San Joaquin River Delta Issues

The Sacramento-San Joaquin River Delta (Bay-Delta) is the hub of California's water supply and is critically important to the entire state. About 30 percent of Southern California's water supply moves across the Bay-Delta. The Bay-Delta's declining ecosystem, caused by a number of factors that include agricultural runoff, predation of native fish species, urban and agricultural discharge, changing ecosystem food supplies, and overall system operation, has led to reduction in water supply deliveries. SWP delivery restrictions due to regulatory requirements resulted in the loss of about 1.5 MAF of supplies to Metropolitan from 2008 through 2014, reducing the likelihood that regional storage can be refilled in the near-term. Operational constraints will likely continue until a long-term solution to the problems in the Bay-Delta is identified and implemented.

In April 2015, the Brown Administration announced California WaterFix, as well as a separate ecosystem restoration effort called California EcoRestore. Together, the California WaterFix and California EcoRestore will make significant contributions toward achieving the coequal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem established in the Sacramento-San Joaquin Delta Reform Act of 2009. A detailed description of the Bay-Delta issues is included in Section 3.2.

Water Supply Conditions

The water conditions that the region faced in 2015 were shaped by supply conditions and resource actions that occurred in the preceding years, including several extraordinary events, such as:

- Historic drought in California leading to record low contract supplies available from the SWP in 2014 (5 percent of contract supplies) and in 2015 (20 percent of contract supplies);
- An extended 16 year drought in the Colorado River watershed that has decreased storage levels in Lake Mead and Lake Powell to 38 percent and 51 percent of capacity, respectively, at the end of November 2015 and keeping storage below surplus levels despite an ease in drought conditions in 2014 and 2015;
- Groundwater basins and local reservoirs dropping to very low operating levels due to record-dry hydrology in Southern California;
- Restrictions of SWP deliveries by federal court orders due to endangered Delta smelt and salmon which resulted in the combined loss of approximately 3 MAF of SWP supplies between 2008 and 2014. These losses have impacted Metropolitan's ability to meet demands and refill regional storage;
- In 2014, Lake Oroville storage dropped within 10 TAF of its lowest operating levels since the historic drought of 1977; and
- Supply availability in the Los Angeles Aqueduct system continues to be affected by both the drought and environmental mitigation efforts related to Owens Lake and the Lower Owens River.

These dry hydrologic conditions and reduced imported water supplies have led to significant withdrawals from Metropolitan's storage reserves, including Diamond Valley Lake (DVL) and its groundwater banking and conjunctive use programs to meet scheduled water deliveries. During the 2007-2009 drought, Metropolitan withdrew a combined 1.2 MAF from storage reserves to balance supplies and demands. In 2014 alone, Metropolitan withdrew 1.1 MAF from dry-year storage to balance supplies and demands because of the historic low final SWP allocation in that year.

In addition, challenges such as the detection of the quagga mussel in the Metropolitan's CRA supplies and increasingly stringent water quality regulations to control disinfection byproducts exacerbate the water supply condition and underscore the importance of flexible and adaptive regional planning strategies.

Current Available Resources

Metropolitan's primary purpose is to provide a supplemental supply of water for domestic and municipal uses at wholesale rates to its member public agencies. Metropolitan's principal sources of water are the SWP and the Colorado River. Metropolitan's robust planning strategy continues to balance available local and imported water resources and member agencies' demands within Metropolitan's service area.

A. Imported Supplies

Metropolitan receives water from the SWP through the California Aqueduct and from the Colorado River through the Colorado River Aqueduct (CRA). Figure 1-6 shows the historic annual deliveries from the SWP and the CRA.

Colorado River

The Colorado River was Metropolitan's original source of water after Metropolitan's establishment in 1928. Metropolitan has a legal entitlement to receive water from the Colorado River under a permanent service contract with the Secretary of the Interior. The CRA, which has a capacity of 1.2 MAF a year, is owned and operated by Metropolitan. It transports water from Lake Havasu, at the border of the state of California and Arizona, approximately 242 miles to its terminus at Lake Mathews in Riverside County.

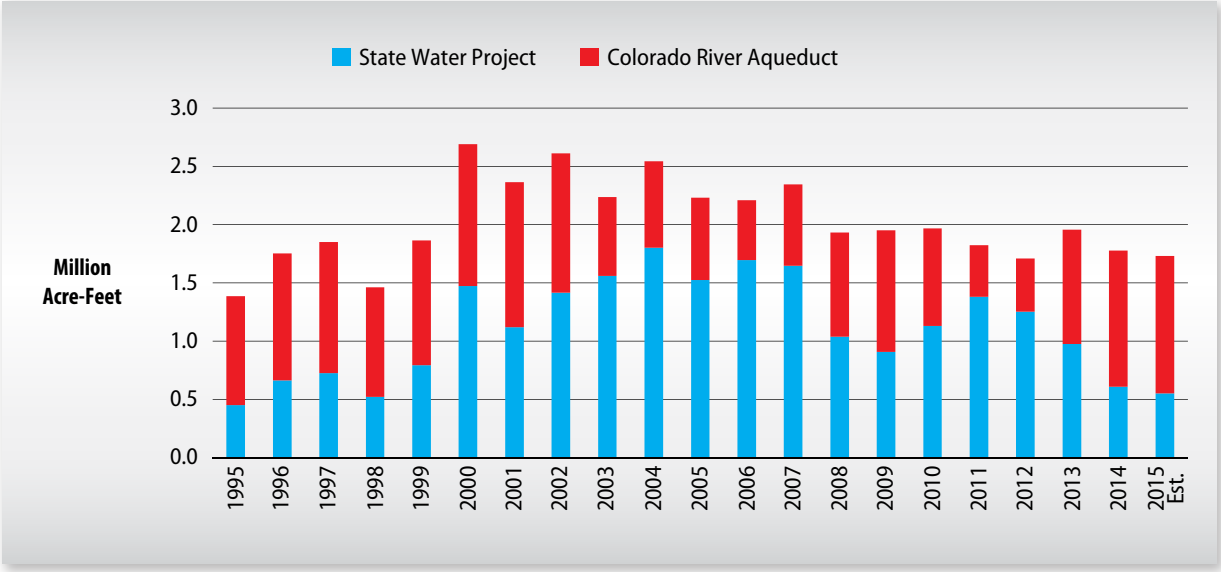
Over the years, Metropolitan increased reliable supply from the CRA through programs that it helped fund and implement including: farm and irrigation district conservation programs, improved reservoir system operations, land management programs, and water transfers and exchanges through arrangements with agricultural water districts in southern California, San Diego County Water Authority, and entities in Arizona and Nevada that use Colorado River water, and the U.S. Department of the Interior, Bureau of Reclamation (USBR). A detailed discussion of availability of Colorado River water for delivery to Metropolitan is described in Section 3.1.

State Water Project

Metropolitan imports water from the SWP, owned by the state of California and operated by the California Department of Water Resources (DWR). This project transports Feather River water stored in and released from Oroville Dam and conveyed through the Bay-Delta, as well as unregulated flows diverted directly from the Bay-Delta south via the California Aqueduct to four delivery points near the northern and eastern boundaries of Metropolitan's service area.

In 1960, Metropolitan signed a contract with DWR for SWP water supplies. Metropolitan is one of 29 agencies that have long-term contracts for water service from DWR, and is the largest agency in terms of the number of people it serves (nearly 19 million), the share of SWP water that it has contracted to receive (approximately 46 percent), and the percentage of total annual payments made to DWR by agencies with State water contracts (approximately 53 percent in 2015). A more detailed discussion of the SWP supplies is provided in Section 3.2.

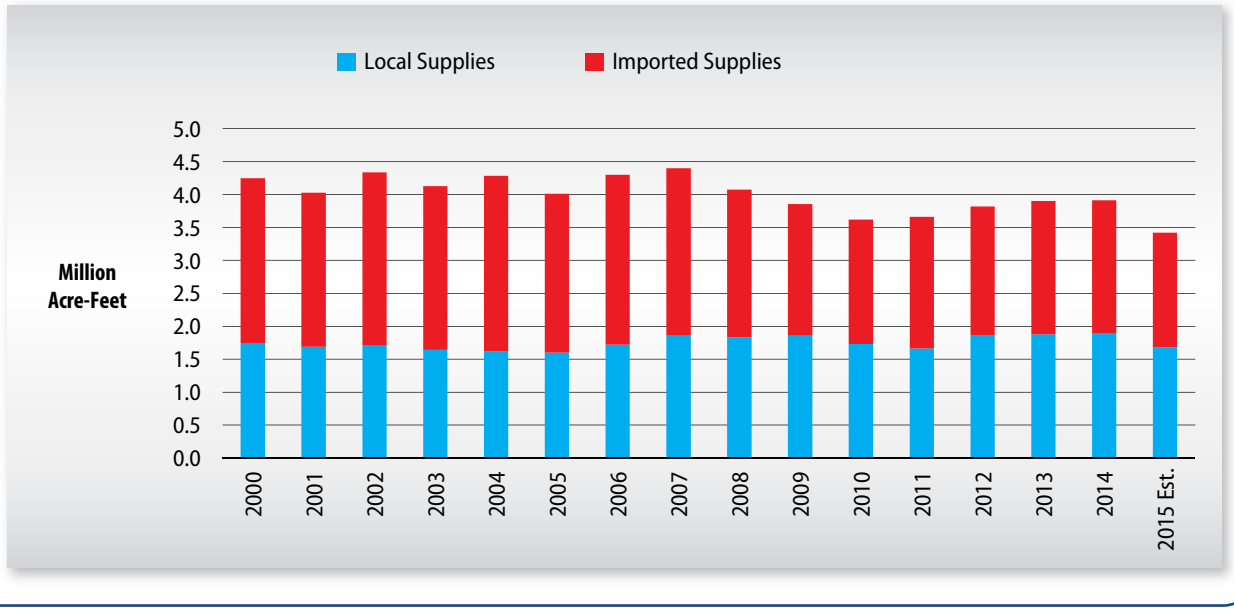
Figure 1-6 Imported Water Supplies in Metropolitan's Service Area



B. Local Supplies

Approximately 50 percent of the region's water supplies come from resources controlled or operated by local water agencies. These resources include water extracted from local groundwater basins, catchment of local surface water, non-Metropolitan imported water supplied through the Los Angeles Aqueduct, and Colorado River water exchanged for Metropolitan supplies. Figure 1-7 shows the historic annual use of local and imported water suppplies within Metropolitan's service area.

Figure 1-7 Annual Regional Water Supplies in Metropolitan's Service Area



Groundwater

The groundwater basins that underlie the region provide nearly 35 percent of the water supply in Southern California. The major groundwater basins provide an annual average supply of approximately 1.35 MAF. Natural recharge of the groundwater basins is supplemented by active recharge of captured stormwater, recycled water, and imported water to support this level of annual production.

Estimates indicate that available storage space in the region's groundwater basins in mid-2015 is approximately 4.8 MAF. Successive dry years have resulted in groundwater depletions that will need to be replaced with natural recharge during wet years and active spreading of captured stormwater, recycled water, and imported water. Groundwater basin managers and water suppliers have taken steps to store water in advance of dry years to soften the potential impact on groundwater aquifers and to maintain reliable local water supplies during dry years.

Recycling, Groundwater Recovery, and Seawater Desalination

Recycling and groundwater recovery are local resources that add balance to Southern California's diverse water portfolio. In addition to replenishment groundwater basins described above, water recycling provides extensive treated wastewater for applicable municipal and industrial uses. Common uses of recycled water include landscape irrigation, agricultural

irrigation, and commercial and industrial applications. Groundwater recovery employs additional treatment techniques to effectively use degraded groundwater supplies that were previously not considered viable due to high salinity or other contamination.

While water recycling and groundwater recovery projects in the Southern California region are primarily developed by local water agencies, many newer projects have been developed with financial incentives provided through Metropolitan's Local Resources Program (LRP). The LRP is a performance-based program that provides incentives to expand water recycling and support recovery of degraded groundwater. In 2015, the regional water production from water recycling and groundwater recovery totaled approximately 530 TAF, of which 244 TAF was developed with Metropolitan funding assistance. A detailed discussion of recycling and groundwater recovery is presented in Section 3.5.

Seawater desalination represents a significant opportunity to diversify the region's water resource mix with a new, locally-controlled, reliable potable supply. Metropolitan supports seawater desalination to its member agencies by providing technical assistance, regional facilitation of research and information exchanges, and financial incentives through the LRP.

In the fall of 2015, the San Diego County Water Authority (SDCWA) began operation of the largest seawater desalination facility in the United States. The 56 TAF project will meet about eight percent of San Diego's demands and add a new, drought-resistant supply to the region. Seawater desalination is discussed in more detail in Section 3.5.

Surface Water

In addition to the groundwater basins, local agencies maintain surface reservoir capacity to capture local runoff. The average yield captured from local watersheds is estimated at approximately 104 TAF per year. The majority of this supply comes from reservoirs within the service area of the SDCWA.

Los Angeles Aqueduct

Although the Los Angeles Aqueduct (LAA) imports water from outside the region, Metropolitan classifies water provided by the LAA as a local resource because it is developed and imported by a local agency (the Los Angeles Department of Water and Power). This resource is estimated to provide approximately 260 TAF per year on average, which may be reduced to approximately 27 TAF during a historical dry period for a year like 2015.

Imperial Irrigation District / San Diego County Water Authority Transfer

The SDCWA has executed an agreement with the Imperial Irrigation District (IID) under which IID is transferring water to SDCWA. Since this supply is developed and transferred through an agreement by a local agency (SDCWA), Metropolitan also classifies this water as a local resource. Currently, the water transferred by IID is made available by SDCWA to Metropolitan for diversion at Lake Havasu. Metropolitan provides a matching volume of water to SDCWA by exchange. Under the transfer, 100 TAF was transferred and exchanged with Metropolitan in 2015. The transfer volumes increase beginning in 2018 in accordance with an annual build-up schedule, reaching 205 TAF in 2021 and stabilizing at 200 TAF annually in 2023. Currently, the water is being conserved through land fallowing and on-farm efficiency conservation arrangements made by IID with its customers. By 2017, all of the transferred water should be made available through efficiency conservation measures.

Coachella and All-American Canal Lining Projects

The Coachella Canal Lining Project consists of a 35-mile concrete-lined canal, including siphons, which replaced an earthen canal. The project was completed in December 2006. The project is conserving 30,850 AF annually. The All-American Canal Lining Project consists of a concrete-lined canal constructed parallel to 23 miles of earthen canal. Two reaches of the project were placed in service in 2008 with the third reach placed in service in 2009. In 2010, this project began conserving 67,700 AF annually.

Pursuant to the QSA and related agreements, the 98,550 AF of water resulting from these projects annually is allocated as follows in 2015: 16,000 AF to Metropolitan, 80,200 AF to SDCWA, and up to 2,350 AF for Coachella Canal Lining Project mitigation, with the amount not needed for mitigation becoming available to SDCWA. The water is made available at Lake Havasu for diversion by Metropolitan, and by exchange, Metropolitan delivers a volume of water to SDCWA equal to the amount made available by SDCWA to Metropolitan. Metropolitan classifies the portion of the supply exchanged with SDCWA as local resources.

Table 1-5 shows the projected local supplies estimated for average and dry years for 2020, 2030, and 2040.

Table 1-5
Local Supplies for Average and Dry Years
(Acre-Feet)

	2020		2030		2040	
	Average Year[1]	Dry Year[2]	Average Year	Dry Year	Average Year	Dry Year
Local Groundwater						
From Natural Recharge	1,011,000	1,007,000	1,004,000	1,005,000	1,005,000	1,006,000
Replenishment	292,000	298,000	297,000	297,000	297,000	297,000
Local Projects						
Groundwater Recovery	143,000	139,000	163,000	162,000	167,000	167,000
Recycling	436,000	427,000	486,000	482,000	509,000	507,000
Seawater Desalination	51,000	56,000	51,000	56,000	51,000	56,000
Local Runoff Stored	110,000	102,000	110,000	102,000	110,000	102,000
Los Angeles Aqueduct	261,000	113,000	264,000	125,000	268,000	133,000
IID-SDCWA Transfer and Canal Linings	274,000	274,000	282,000	282,000	282,000	282,000
Total	**2,578,000**	**2,416,000**	**2,657,000**	**2,511,000**	**2,689,000**	**2,550,000**

[1] Average Year is based on 1922 through 2012.
[2] Dry Year is based on Multiple Dry Years (1990-92)

Metropolitan's Recent and Near-term Drought Response Actions

Metropolitan progressively addressed the challenges of water shortages caused by the unprecedented drought since 2012. Metropolitan took actions that include: (1) Increasing water conservation by expanding outreach, adding devices, and increasing incentives to residents, (2) Increasing local resources by providing incentives for on-site recycled water hook-up and increasing incentives for the LRP, (3) Augmenting water supplies through water transfers and exchanges, (4) Improving return capability of storage programs,

(5) Modifying Metropolitan's distribution system to enhance Colorado River water delivery, and (6) Implementing the Water Supply Allocation Plan to distribute the limited imported supplies and preserve storage reserves.

Increasing Water Conservation

When the most recent drought period started in 2012 and progressed into 2013, Metropolitan recognized the need to increase the efficiency and effectiveness of its conservation program. In September 2013, Metropolitan's Board added several new initiatives to its conservation program to target water reduction by public agencies, landscaping, fitness centers, and the commercial and multi-family housing sectors. In addition, rebates became available for new devices - soil moisture sensor system, plumbing flow control valves, and rain barrels – and increased incentives were provided for high-efficiency toilets (HETs) that are more efficient than the low-flush toilets sold in the market.

In January 2014, Governor Edmund G. Brown Jr. issued a drought emergency proclamation calling for Californians to reduce their water use by 20 percent and for water agencies to implement water shortage plans. In response to the governor's drought proclamation, Metropolitan ramped up conservation efforts in Southern California. In February 2014, Metropolitan declared a Water Supply Alert, calling upon local cities and water agencies to immediately implement extraordinary conservation measures and institute local drought ordinances. In addition, Metropolitan significantly expanded its water conservation and outreach programs and doubled funding for conservation incentive programs to $40 million.

In April 2014, the governor issued a second proclamation, asking the state to redouble drought actions and directing the SWRCB to adopt emergency regulations to implement the directive. Accordingly, the SWRCB adopted outdoor water restrictions on July 15, 2014 that targeted outdoor urban water use that would normally increase under the hot and dry conditions. In May 2014, Metropolitan increased its turf removal incentives from $1 to $2 per square foot; increased the funding for incentives for rain barrels and recycled water hookups; and continued funding rebates for high efficiency toilets to speed up conversion from non-conserving toilets.

In July 2014, Metropolitan launched a $5.5 million outreach campaign, the largest in Metropolitan's history. The campaign seeks to raise awareness of the drought and urges residents and businesses to save water. The campaign features multiple media platforms, including radio and television, with enhanced outreach to the region's ethnic communities. Activity on Metropolitan's bewaterwise.com® website quadrupled as a result of the campaign. Metropolitan's conservation programs saw record-breaking increases in applications for rebates. It is clear that Southern California is responding to these calls for increased conservation efforts. Metropolitan is committed to doing its part in promoting water-use efficiency and increasing local supplies while collaborating with other stakeholders to protect critical reserves. As a result of the strong response to its conservation incentive program, Metropolitan again increased its conservation budget to a total of $100 million in December 2014.

On April 1, 2015, Governor Brown issued an Executive Order (Order) calling for a 25 percent reduction in consumer water use in response to the historically dry conditions throughout the State of California. As a wholesale water agency providing a supplemental water supply to its member agencies, Metropolitan is not subject to the requirements of the Governor's Order, which applies to retail water agencies. However, in May 2015, Metropolitan again increased funding for its conservation program to a total amount of $450 million over fiscal years 2014-15 and 2015-16 due to strong response to the incentive program and to assist retail agencies in the

service area to meet their mandatory water reduction targets established by the SWRCB. Turf removal is the most popular element of Metropolitan's conservation incentive program, and it is expected to result in 172 million square feet of turf removed and water savings of 800 TAF over the next ten years.

Increasing Local Resources

Since 1982, Metropolitan has assisted local agencies in the development of water recycling and groundwater recovery under the LRP. In light of hot and dry conditions in 2013 and the low SWP allocation in 2014, Metropolitan worked with member agencies to identify constraints to local resources development and proposed refinements to the LRP.

In February 2014, Metropolitan's Board approved the On-site Retrofit Pilot Program to offer incentives to modify existing water users' potable water systems to utilize recycled water. In October 2014, Metropolitan's Board approved the LRP refinements to support further development of local resources, which included increasing the maximum incentive amount, offering alternate incentive payment structures, including on-site recycled water retrofit costs, including other water resources (such as seawater desalination and stormwater), and providing reimbursable services for Metropolitan's technical assistance.

Augmenting Water Supplies

Augmenting water supplies through water transfers and exchanges is an element of Metropolitan's IRP to mitigate water shortages during dry periods.

The Colorado River System has been suffering from the effects of drought since 2000, leading to substantially decreased water levels in both Lakes Mead and Powell. In March 2014, Metropolitan's Board approved entering into an agreement with the Central Arizona Water Conservation District, Denver Water, Southern Nevada Water Authority (SNWA), and the United States to establish a two-year pilot program to compensate entitled users of the Colorado River water for voluntary reductions in water use, including fallowing of agricultural lands.

Metropolitan also entered into several agreements to improve Metropolitan's operational flexibility in 2015:

- In January 2015, Metropolitan's Board authorized an exchange of up to 50,000 acre-feet with Westside Mutual Water Company and Kern County Water Agency. This one-for-one exchange provides water at a time in the year when SWP supplies are expected to be low and provides flexibility on timing of returning water.
- In September 2015, Metropolitan's Board authorized an amendment to the operational storage agreement with SNWA and the Colorado River Commission of Nevada allowing Metropolitan access to additional Colorado River water during 2015. Metropolitan would pay SNWA $44.375 million for 150,000 AF of water apportioned to but not used by SNWA during 2015. When SNWA requests return of water stored under this amendment, SNWA would reimburse Metropolitan for the costs paid for the initial delivery of water.
- In November 2015, Metropolitan's Board authorized entering into agreements with Antelope Valley-East Kern Water Agency (AVEK) to develop exchange and storage programs for SWP supplies. This would be an uneven exchange: for every two acre-feet provided to Metropolitan, AVEK would receive back one acre-foot in the future. Metropolitan may also store at least 30,000 AF of its SWP supplies in wet years in the Antelope Valley groundwater basin.

Improving Return Capabilities of Storage Programs

Metropolitan has a number of storage programs with water agencies along the California Aqueduct that would allow it to store SWP supplies during surplus conditions and to have stored water returned when needed. In 2015, Metropolitan provided up-front capital costs to its water management program partners to build infrastructure to improve the return capabilities of several storage programs.

- In September 2014, Metropolitan's Board authorized providing capital funds to Semitropic Water Storage District to enhance the pumpback capacity of the Semitropic Groundwater Storage Program by 13,200 AFY. The capital costs would be reimbursed to Metropolitan should Semitropic market the added capacity to another party after Metropolitan has at least one year of recovery capability.
- In March 2015, Metropolitan's Board authorized entering into agreement with Arvin Edison Water Storage District to restore 2,500 AFY of return capability by replacing groundwater wells of the Arvin Edison/Metropolitan Water Management Program. The capital costs will be reimbursed as credits to future Program costs.
- Also in March 2015, Metropolitan's Board authorized entering into agreement with Kern-Delta Water District to improve the return reliability of the Kern-Delta Water District Water Management Program. The improvement includes a pipeline that would reduce losses when Kern River supplies are delivered for exchange. Metropolitan's upfront costs will be more than offset through an elimination of put regulation fees on the next 20,000 AF delivered into the Program.

Modifying Metropolitan's Distribution System

As a result of ongoing extraordinary dry conditions throughout the state of California, the SWP allocation for calendar year 2014 was five percent, which represents about 96,000 acre-feet of SWP Table A water allocation for Metropolitan, the lowest in the history of the SWP. Although Metropolitan has been utilizing storage reserves to help bridge the gap between the low SWP supplies and the demand for SWP water, a number of extraordinary operational actions were taken in 2014 to deliver available Colorado River water and DVL storage supplies to areas that ordinarily only receive SWP supplies.

Metropolitan modified its normal operations in several areas of the system to deliver Colorado River water to areas as far west as the cities of Thousand Oaks and Calabasas, as well as other locations within Metropolitan's system, some of which had not received Colorado River water for extended periods since the completion of the SWP in the early 1970s. System modifications have also been implemented to increase system flexibility to deliver Colorado River water and DVL water into new areas of the system.

- In April 2014, Metropolitan's Board authorized the project to interconnect between the Inland Feeder and the Lakeview Pipeline, near San Jacinto, California. This project was completed in October 2014, and allowed Metropolitan to serve water from multiple sources, such as DVL, to the Mills Treatment Plant in Riverside.
- In May 2014, Metropolitan's Board authorized enhancing water supply reliability in the West Valley area by rehabilitating a pump station and constructing flow control modifications to the outlet of the Jensen Water Treatment Plant. This project allowed the West Valley area, which was served normally by SWP water only, to receive blended supplies from the SWP and the CRA.

Additionally, several Metropolitan member agencies made modifications within their own local systems to maximize the use of more readily available Colorado River water and DVL supplies, to further reduce the use of scarce SWP supplies.

Implementing the Water Supply Allocation Plan

Metropolitan's Water Supply Allocation Plan (WSAP) was developed in 2008. The WSAP was developed 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. Metropolitan's Board authorized the implementation of the WSAP for the period of July 2009 through April 2011 in response to the drought and low storage reserves.

Dry periods resumed in 2012. In 2014, California was challenged with a third year of severe drought. Metropolitan managed its operations through significant use of regional storage reserves. It was anticipated that end of year total dry year storage reserves would approach levels similar to those when the WSAP was first implemented in 2009. On December 9, 2014, Metropolitan's Board approved adjustments to the formula for calculating member agency supply allocations for future implementation of the WSAP. On April 14, 2015, Metropolitan's Board approved implementation of the WSAP at a Level 3 Regional Shortage Level, effective July 1, 2015 through June 30, 2016. The WSAP allows member agencies the flexibility to choose among various local supply and conservation strategies to help ensure that demands on Metropolitan stay in balance with limited supplies. More details of the WSAP are included in Section 2.4 and Appendix 4.

As of December 2015, Metropolitan has observed an approximate 23 percent reduction in deliveries to member agencies under the WSAP for the rolling 12-month period ending December 31, 2015.

Table 1-6 gives a timeline of Metropolitan's Board authorization for the above actions. It shows Metropolitan's progressiveness and adaptation to changing water supply conditions.

Table 1-6
Recent Metropolitan's Board Drought Response Actions

Year	Month	Actions
2013	September	Authorized new conservation program initiatives and devices for rebates
2014	February	Declared Water Supply Alert Doubled conservation budget to $40 million Approved incentives for on-site recycled water retrofit
	March	Authorized a pilot program to fund water use efficiency measures for increasing Colorado River storage
	April	Authorized and appropriated funds for final design of drought response to enhance water supply reliability for the Henry J. Mills Water Treatment Plant
	May	Increased turf removal incentives from $1 to $2 per square foot Added rebates for new devices including rain barrels Authorized projects to enhance water supply reliability in the West Valley Area
	September	Authorized improvement of the return capacity of the Semitropic Groundwater Storage Program
	October	Authorized refinements to the Local Resources Program to encourage and expedite local resource production
	December	Increased the conservation incentive budget to a total of $100 million
2015	January	Authorized an exchange of up to 50,000 AF with water agencies in Kern County to enhance Metropolitan's operational flexibility in 2015
	March	Authorized projects to improve return capacity from storage programs with Arvin Edison Water Storage District and Kern-Delta Water District
	April	Declared Water Supply Allocation and approved the implementation of Water Supply Allocation Plan at a Regional Shortage Level 3 effective July 1, 2015 through June 30, 2016
	May	Increased conservation incentive budget to a total of $450 million
	September	Authorized an amendment to the operational agreement with SNWA and the Colorado River Commission of Nevada allowing Metropolitan access to additional Colorado River water during 2015
	November	Authorized entering into storage and exchange agreements with Antelope Valley-East Kern Water Agency

Short-term Supply Outlook

Metropolitan evaluated the short-term supply outlook during each of the next three years from 2016 through 2018 and determined the minimum water supplies available based on the driest three-year historic sequence of 1990 through 1992. This analysis incorporates the actual storage levels at the beginning of 2015 and the forecasted supplies and demands under a multiple dry-year sequence. This evaluation of supply capabilities also takes into account the actual storage program conveyance constraints. Table 1-7 shows the projected yields of the in-region storage and imported supplies from the SWP and CRA, for both current programs and those under development. Detailed descriptions of the current programs and programs under development are included in Appendix 3.

For this supply capability evaluation, SWP supplies are estimated using the 2015 SWP Delivery Capability Report distributed by DWR in July 2015. The 2015 Capability Report base scenario represents the current DWR estimate of the amount of water deliveries for current conditions. These estimates incorporate restrictions on SWP and Central Valley Project (CVP) operations in accordance with water quality objectives established by the State Water Resources Control Board and the biological opinions of the U.S. Fish and Wildlife Service and National Marine Fisheries Service issued on December 15, 2008, and June 4, 2009, respectively.

Metropolitan's forecast shows that under a multi-dry year hydrology, Metropolitan could face reduced supply capability during the next three years. This places considerable emphasis on developing robust short-term actions that will increase supply reliability to Metropolitan's service area.

Table 1-7
Multiple Dry-Year
Supply Capability[1]
Repeat of 1990-1992 Hydrologies
(acre-feet per year)

Forecast Year	2016	2017	2018
Current Programs			
In-Region Storage	93,000	40,000	5,000
California Aqueduct[2]	770,000	491,000	673,000
Colorado River Aqueduct[3]	934,000	958,000	964,000
Subtotal of Current Programs	***1,797,000***	***1,489,000***	***1,642,000***
Programs Under Development			
In-Region Storage	8,371	17,530	26,633
California Aqueduct	50,000	50,000	50,000
Colorado River Aqueduct	80,000	80,000	80,000
Subtotal of Proposed Programs	***138,371***	***147,530***	***156,633***
Maximum Metropolitan Supply Capability	**1,935,371**	**1,636,530**	**1,798,633**

[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 water management programs, IID-SDCWA transfer and exchange and canal lining projects.
Maximum CRA deliveries limited to 1.20 MAF including IID-SDCWA transfer and exchange, and canal lining projects.

Planning for the Future

2

The purpose of this section is to show how Metropolitan plans to meet Southern California's water supply needs in the future. In its role as supplemental supplier to the Southern California water community, Metropolitan faces ongoing challenges in meeting the region's needs for water supply reliability and quality. Increased environmental regulations and competition for water from outside the region have resulted in changes in delivery patterns and timing of imported water supply availability. At the same time, the Colorado River watershed has experienced a protracted drought since 2000.

As described in the previous chapter, the water used in Southern California comes from a number of sources. From 2006 through 2015, Metropolitan has provided 50 percent to 60 percent of the water needs in its service area from the Colorado River via the CRA, and from the Sacramento-San Joaquin River Watershed via the SWP. As Metropolitan continues to face various water supply challenges, development of adaptable strategies for managing resources to meet the range of estimated demands into the future and for adjusting to changing resource conditions is ongoing.

Metropolitan's continued progress in developing a diverse resource mix enables the region to meet its water supply needs. The investments that Metropolitan has made and its ongoing efforts in many different areas coalesce toward its goal of long-term regional water supply reliability. Metropolitan's actions have been focused on the following:

- Pursuing long-term solutions for the Delta
- Developing storage programs related to the SWP and the Colorado River
- Developing storage and groundwater management programs within the Southern California region
- Increasing conservation
- Increasing water recycling, groundwater recovery, and seawater desalination
- Developing water supply management programs outside of the region

Metropolitan has undertaken a number of planning initiatives over the years. This section summarizes these efforts, which include the Integrated Water Resources Plan (IRP), three IRP Updates, the Water Surplus and Drought Management Plan, and the Water Supply Allocation Plan. Collectively, they provide a policy framework guidelines and resource targets for Metropolitan to ensure regional water supply reliability.

While Metropolitan coordinates regional supply planning through its inclusive IRP process, Metropolitan's member agencies also conduct their own planning analyses – including their own urban water management plans – and may develop projects independently of Metropolitan. Appendix 5 shows a list of potential local projects provided to Metropolitan by its member agencies.

2.1 Integrated Water Resource Planning

In 1993, Metropolitan commenced an Integrated Water Resources Planning process as the beginning of a new era of regional reliability planning. As this planning process began, Metropolitan held a series of three regional assemblies from 1993 through 1995 addressing strategic planning issues. Attendance at these regional assemblies included Metropolitan's Board, Metropolitan's senior management, member agency managers, local retail water providers, groundwater basin managers, and invited public representatives. The purpose of these regional assemblies was to gain consensus on resource policy issues, provide direction for future work, and to endorse regional objectives, principles, and strategies.

A key outcome of the regional assemblies was the establishment and adoption of water supply principles which provided critical guidance for the development and adoption of future Metropolitan IRPs. In summary, these principles state:

- No water supplier in Southern California is an isolated, independent entity unto itself, and all, to varying degrees, are dependent upon a regional system of water importation, storage, and distribution.
- Metropolitan is Southern California's lead agency in regional water management, having the responsibility for importing water from outside the region and convening dialogues on regional water issues, encouraging local water development and conservation, advocating the region's interests to the state and federal governments, and leading the region's water community.
- Water suppliers at all levels have a responsibility to promote a strong water ethic both within the water community and among the public, developing plans through open processes, committing to achieving adopted regional goals and strategies, and committing to a policy of equity and fairness in development and implementation of water management programs.

These regional assemblies laid the foundation for Metropolitan's integrated regional planning path from 1996 to the present. This path has guided Metropolitan's water resources strategy from the initial adoption of the Metropolitan's IRP in 1996 to successive IRP updates in 2004, 2010, and 2015.

The 1996 IRP

Metropolitan's IRP established a long-term, comprehensive water resources strategy to provide the region with a reliable and affordable water supply. One of the fundamental outcomes of the 1996 IRP was the implementation of a diverse portfolio of resource investments in both imported and in-region supplies, and in water conservation measures. The 1996 IRP further emphasized the construction and creation of a network of water storage facilities, both below and above ground.

The 1996 IRP process identified cost-effective solutions that offered long-term reliability to the region. Having identified the need for a portfolio of different supplies to meet its demands, the 1996 IRP analyzed numerous resource portfolios seeking to find a "Preferred Resource Mix" that would provide the region with reliable and affordable water supplies through 2020. The analysis determined the best mix of resources based on cost-effectiveness, diversification, and reliability. Establishing the "Preferred Resource Mix" was an integral part of the 1996 IRP, and subsequent updates have continued to focus on how best to diversify Metropolitan's water portfolio and establish the broad resource targets for the region.

The 2004 IRP Update

The 2004 IRP Update reviewed the goals and achievements of the 1996 IRP, identified the changed conditions for water resource development, and updated resource development targets through 2025. These targets included increased conservation savings and planned increases in local supplies. The 2004 IRP Update also explicitly recognized the need to handle uncertainties inherent in any planning process. Some of these uncertainties include:

- Fluctuations in population and economic growth
- Changes in water quality regulations
- Discovery of new chemical contaminants
- Regulation of endangered species affecting sources of supplies
- Changes in climate and hydrology

As a result, a key component of the 2004 IRP Update was the addition of a 10 percent "planning buffer." The planning buffer identified additional supplies, both imported and locally developed, that could be implemented to address uncertainty in future supplies and demands.

The 2010 IRP Update

In keeping with this reliability goal of meeting full-service demands at the retail level under all foreseeable hydrologic conditions, the 2010 IRP Update sought to stabilize Metropolitan's traditional imported water supplies and establish additional water resources to withstand California's inevitable dry cycles and growth in water demand. Metropolitan acknowledged the increasing impact that emerging challenges such as environmental regulations, threats to water quality, climate change, and economic unknowns and the uncertainty that these challenges would have on planning for a reliable, high quality, and affordable water supply. By 2010, the Colorado River had experienced below-average precipitation conditions for most of the previous decade, and the SWP was facing historic regulatory cutbacks that significantly reduced its supplies that pass through the Sacramento-San Joaquin Delta in Northern California. Recognizing that the conditions for developing and maintaining water supply reliability had changed, Metropolitan set out not only to update the IRP, but also to examine how best to adapt to the new water supply paradigm.

Adaptive Management Strategy

The 2010 IRP Update specifically planned for uncertainty with a range of adaptive management strategies that both meets demands under observed hydrology and responds to future uncertainty. The plan provided solutions by developing diverse and flexible resources that perform adequately under a wide range of future conditions. Specifically, the adaptive management strategy was a three-component plan that included the following:

- Core Resources Strategy – Designed to maintain reliable water supplies under known conditions. The Core Resources Strategy represented baseline efforts to manage water supply and demand conditions. This strategy was based on "what we know today," including detailed planning assumptions about future demographic scenarios, water supply yields, and a range of observed historical weather patterns. Under this strategy, Metropolitan and its member agencies would advance water use efficiency through conservation and recycled water, along with further local supply development such as groundwater recovery and seawater desalination. Metropolitan would also stabilize traditional imported supplies from the Colorado River and Northern California.

- Uncertainty Buffer – A suite of actions which help to mitigate short-term changes. The 2010 IRP set goals for a range of potential buffer supplies to protect the region from possible shortages in a cost-effective manner, starting with a further expansion of water use efficiency on a region-wide basis. The buffer would enable the region to adapt to future circumstances and foreseeable challenges that were not assumed under the Core Resources Strategy, such as short-term loss of local supplies or regulatory restrictions.
- Foundational Actions – Strategies for additional water resources to augment the core or buffer supplies. Foundational Actions were designed to prepare the region by determining viable alternative supply options for long-range planning. These preparatory actions, including feasibility studies, technological research, and regulatory review, were designed to lay the foundation for potential alternative resource development.

The 2015 IRP Update

Since the 2010 IRP, drought in California and across the southwestern United States has put the IRP adaptive management strategy to the ultimate stress test. Dry conditions in California have persisted into 2015, resulting in a fourth consecutive year of drought. The year 2015 began with the driest January on record, resulting in the earliest and lowest snowpack peak in recorded history at only 17 percent of the traditional snowpack peak on April 1st. In the ten years since 2006, there were only two wet years, with the other eight years having been below normal, dry, or critically dry. The Colorado River watershed has also experienced an extended reduction in runoff. Within Southern California, continuing dry conditions have impacted the region's local supplies, including its groundwater basins.

Southern California has a remarkable, unparalleled tradition of meeting its water challenges as a single cohesive region. Metropolitan serves as both importer of water and regional water planner. For the past generation, the IRP has served as the reliability road map for the region.

Throughout 2015, Metropolitan engaged in a comprehensive process with its Board of Directors and member agencies to review how conditions have changed since the 2010 IRP Update and to establish targets for achieving regional reliability, taking into account known opportunities and risks. Areas reviewed in the 2015 IRP Update include demographics, hydrologic scenarios, water supplies from existing and new projects, water supply reliability analyses, and potential resource and conservation targets. Metropolitan's Board of Directors adopted the 2015 IRP Update on January 12, 2016.[1]

The 2015 IRP Update approach explicitly recognizes that there are remaining policy discussions that will be essential to guiding the development and maintenance of local supplies and conservation. Following adoption of the 2015 IRP Update and its targets for water supply reliability, Metropolitan has begun a process to address questions such as how to meet the targets for regional reliability, what are local and what are regional responsibilities, how to finance regional projects, etc. This discussion will involve extensive interaction with Metropolitan's Board of Directors and member agencies, with input from the public.

Findings and Conclusions

The findings and conclusions of the 2015 IRP Update are:

- Action is needed – Without the investments in conservation, local supplies, and the California WaterFix targeted in the 2015 IRP Update, Metropolitan's service area would experience unacceptable level of shortage allocation frequency in the future.

[1] http://www.mwdh2o.com/PDF_About_Your_Water/2015_IRP_Update_Report.pdf

- Maintain Colorado River supplies – The plan to stabilize deliveries at 900,000 AF in a typical year will require more than 900,000 AF of planned actions.
- Stabilize SWP supplies – A collaborative approach with state and federal agencies to pursue better science for resolving questions about SWP operations and advancing coequal goals of Delta restoration and statewide water supply reliability in the near term. Also work collaboratively with state and federal agencies in the California WaterFix and EcoRestore efforts.
- Develop and protect local supplies and water conservation – The 2015 IRP Update embraces and advances the regional self-sufficiency ethics by increasing the targets for additional local supplies and conservation. These targets are discussed in detail in Section 3 of this UWMP.
- Maximize the effectiveness of storage and transfers – Rebuilding Metropolitan's supply of water reserves is imperative when the drought is over. A comprehensive water transfer approach that takes advantage of water when it is available will help to stabilize and build storage reserves, increasing the ability for Metropolitan to meet water demands in dry years.
- Continue with the adaptive management approach – The IRP is updated periodically to incorporate changed conditions, and an implementation report is prepared annually to monitor the progress in resources development. The 2015 IRP Update also includes Future Supply Actions that would advance a new generation of local supplies through public outreach; development of legislation and regulation; technical studies and support; and land and resource acquisitions.

2.2 Estimating Demands on Metropolitan

The Urban Water Management Planning Act requires that three basic planning analyses be conducted to evaluate supply reliability. The first is a water supply reliability assessment requiring development of a detailed evaluation of the supplies necessary to meet projected demands over at least a 20-year period. This analysis is to consider average, single-year, and multi-year drought conditions. The second is a water shortage contingency plan which documents the actions that would be implemented in addressing up to a 50 percent reduction in an agency's supplies. Finally, a plan must be developed specifying the steps that would be taken under a catastrophic interruption in water supplies.

To address these three requirements, Metropolitan developed estimates of future demands and supplies from local sources and from Metropolitan sources based on 91 years (1922-2012) of historic hydrology. The 91-year period was chosen because the USBR modeling for Colorado River supplies is only available for a period starting in 1922 and ending in 2012. Supply and demand analyses for the single-dry and multiple-dry year cases were based on conditions affecting the SWP as this supply availability fluctuates the most among Metropolitan's sources of supply. Using the same 91-year period of the SWP supply availability, 1977 is the single driest year and 1990-92 is the driest 3 consecutive years for SWP supplies to Metropolitan. In addition, staff analysis of the 8-river index indicated that 1977 is the single driest year and 1990-92 is the lowest 3 consecutive dry years from 1922 through 2015. The 8-river index is used widely by DWR and other water agencies as an estimate of the unimpaired runoff (or natural water production) of the Sacramento and San Joaquin River basins, which are sources of water for the SWP.

Demand Forecast

Metropolitan developed its demand forecast by first estimating total retail demands for its service area and then factoring out water savings attributed to conservation.[2] Projections of local supplies then were derived using data from current and expected local supply programs and the IRP Local Resource Program Target. The resulting difference between total demands net of conservation and local supplies is the expected regional demands on Metropolitan supplies. These various estimates are shown in Tables 2-1 through 2-3. Major categories used in these tables are defined below.

Total Demands

Total demands are the sum of retail demand for M&I and agricultural, seawater barrier demand, and replenishment demand. Total demands represent the total amount of water needed by the member agencies. Total demands include:

- Retail Municipal and Industrial (M&I) Demand — Retail M&I demands represent the full spectrum of urban water use within the region. These include residential, commercial, industrial, institutional, and un-metered water uses. The demographic and economic data used in developing these forecasts were taken from the Southern California Association of Governments' (SCAG) 2012 Regional Transportation Plan/Sustainable Community Strategy (April 2012) and from the San Diego County Association of Governments' (SANDAG) Series 13: 2050 Regional Growth Forecast (October 2013). The SCAG and SANDAG regional growth forecasts are the core assumptions that drive the estimating equations in Metropolitan's Econometric Demand Model (MWD-EDM). SCAG's and SANDAG's projections undergo extensive local review and incorporate zoning information from city and county general plans and are backed by Environmental Impact Reports.

[2] Information generated as part of this analysis is contained in Appendix 1.

Impacts of potential annexation are not included in the demand projections for the 2015 UWMP. However, Metropolitan's Review of Annexation Procedures concluded that the impacts of annexation within the service area beyond 2020 would not exceed two percent of overall demands.

- Retail Agricultural Demand — Retail agricultural demands consist of water use for irrigating crops. Member agencies estimate agricultural water use based on many factors, including farm acreage, crop types, historical water use, and land use conversion. Each member agency estimates its agricultural demand differently, depending on the availability of information. Metropolitan relies on member agencies' estimates of agricultural demands for the 2015 UWMP.
- Seawater Barrier Demand — Seawater barrier demands represent the amount of water needed to hold back seawater intrusion into the coastal groundwater basins. Groundwater management agencies determine the barrier requirements based on groundwater levels, injection wells, and regulatory permits.
- Storage Replenishment Demand — Storage replenishment demands represent the amount of water member agencies plan to use to replenish their groundwater basins or surface reservoirs in order to maintain sustainable basin/reservoir heath and production. For the 2015 UWMP, replenishment deliveries are not included as part of firm demands.

Conservation Adjustment

Savings from conservation reduces total retail demand. Conservation savings consists of the following:

- Code-Based Conservation — Water savings resulting from plumbing codes and other institutionalized water efficiency measures. Sometimes referred to as "passive conservation," this form of conservation would occur as a matter of course without any additional financial incentives from water agencies. Water savings from codes, standards, and ordinances are discussed in Appendix 6.
- Active Conservation — Water saved as a direct result of programs and practices directly funded by a water utility (e.g., measures outlined by the California Urban Water Conservation Council's "Best Management Practices"). Active conservation is unlikely to occur without agency action.
- Price Effect Conservation — Reductions in customer use attributable to changes in the real (inflation adjusted) cost of water. Because water has a positive price elasticity of demand, increases in water price will decrease the quantity demanded.
- Pre-1990 Savings — Conservation savings are commonly estimated from a base-year water-use profile. Beginning with the 1996 IRP, Metropolitan identified 1980 as the base year for estimating conservation because it marked the effective date of a new plumbing code in California requiring toilets in new construction to be rated at 3.5 gallons per flush or less. Between 1980 and 1990, Metropolitan's service area saved an estimated 250,000 acre-feet per year as the result of this 1980 plumbing code and unrelated water rate increases. Within Metropolitan's planning framework, these savings are referred to as "pre-1990 savings."

Local Supplies

Local supplies represent water produced by the member agencies to meet their total demands. Local supplies are a key component in determining how much Metropolitan supply is needed. Projections of local supplies relied on information gathered from a number of

sources including past urban water management plans, Metropolitan's annual local production surveys, and communications between Metropolitan and member agency staff. Local supplies include:

- Groundwater and Surface Water — Groundwater production consists of extractions from local groundwater basins. Surface water comes from stream diversions and rainwater captured in reservoirs.
- The Los Angeles Aqueduct — A major source of imported water is conveyed from the Owens Valley via the Los Angeles Aqueduct (LAA) by Los Angeles Department of Water and Power (LADWP). Although LADWP imports water from outside of Metropolitan's service area, Metropolitan classifies water provided by the LAA as a local resource because it is developed and controlled by a local agency.
- Seawater desalination — Highly treated seawater suitable for municipal and industrial potable use.
- Groundwater Recovery and Recycled Water — Developed and operated by local water agencies, groundwater recovery projects treat degraded groundwater to meet potable use standards. Recycled water projects recycle wastewater for municipal and industrial use.
- Non-Metropolitan Imports — Water supplies imported or exchanged by member agencies from sources outside of the Metropolitan service area.

The local supplies projections presented in demand tables include existing projects currently producing water, projects under construction, and Metropolitan's IRP Local Supply targets. The method for including local supply projects begins with an inventory of local supplies that have been identified within Metropolitan's service area. Appendix 5 contains the inventory of local supplies by type of supply, and includes a classification that shows the current stage of development for each supply in the inventory. The stages of development included in Appendix 5 are: Existing, Under Construction, Fully Designed with Appropriated Funds, EIR/EIS Certified, Feasibility, and Conceptual. The project inventory in Appendix 5 was updated and completed as part of the 2015 IRP Update survey completed by Metropolitan's member agencies in April and July 2015.

Projects, potential supply yields, and online dates from the local supply inventory in Appendix 5 are used in two ways. First, projects that are classified as Existing or Under Construction are included in forecasts that reflect local supply production that is expected to occur without any additional development actions from Metropolitan or the local agencies. Projects in these categories of development are included here because they have a higher level of certainty. Second, projects that are classified as Fully Designed with Appropriated Funds, EIR/EIS Certified, Feasibility, and Conceptual are considered, along with the associated information on supply yield and online dates, as the potential projects that could be developed and go toward meeting IRP Local Supply targets described in Metropolitan's IRP. The IRP Local Supply targets are characterized in forecasts and tables that include Programs Under Development, which are described in Appendix 3.3 in the IRP Development Targets Section under In-Basin Storage and Supplies. It is anticipated that a combination of regional and local approaches will be required in order to meet the IRP Local Supply targets. The local supply inventory provides a connection of the IRP Local Supply targets with potential projects that have been identified, but not developed to a point of relative certainty. The inventory of potential projects is important, as historical implementation, timing, and ultimate production of local supply projects in the service area have fallen short of projections. This is increasingly true with the projects in the less than certain Feasibility and Conceptual categories. It is important that the inventory of

potential projects is greater than the IRP Local Supply targets for new local supply, as the development of projects in the inventory will also be needed under conditions where other existing local supplies are lost or their yields are reduced.

Determining Demands on Metropolitan

Metropolitan serves imported water to its 26 member agencies. For most member agencies, they have other sources of water produced locally from groundwater basins, surface reservoirs, the LAA, recycled water projects, groundwater recovery projects, and seawater desalination projects. When local supplies are not enough to meet retail demands, member agencies purchase imported water from Metropolitan to meet their needs.

In determining demands for imported water, Metropolitan developed its Sales Model to calculate the difference between total forecasted retail demands and local supply projections. The balance is the demand on Metropolitan's imported water supply. The Sales Model calculates the difference between forecasted demands and projected local supplies after factoring in climate impacts. The Sales Model employs a modeling method using historical hydrologic conditions from 1922 to 2012 to simulate the expected demands on Metropolitan supplies based on hydrologic conditions. Each hydrologic condition results in one possible outcome for the forecast year in the planning horizon. For example, each forecast year, such as 2020, has 91 possible outcomes, one for each historical hydrology year during the period 1922 to 2012. This method of modeling produces a distribution of outcomes ranging from the driest to the wettest years within this historical period.

The Sales Model forecasts three types of demands on Metropolitan:

1. Consumptive Use – Metropolitan's supplies that are used to meet retail M&I demand.
2. Seawater Barrier – Imported water needed to hold back seawater intrusion into the coastal groundwater basins.
3. Replenishment – Water for groundwater or reservoir replenishment, when available, to meet replenishment demands.

For additional information on Metropolitan's demand forecast, see Appendix 1.

Table 2-1
Metropolitan Regional Water Demands
Single Dry-Year
(Acre-Feet)

		2020	2025	2030	2035	2040
A.	**Total Demands[1]**	**5,234,000**	**5,409,000**	**5,549,000**	**5,679,000**	**5,808,000**
	Retail Municipal and Industrial	4,739,000	4,874,000	5,016,000	5,148,000	5,279,000
	Retail Agricultural	131,000	168,000	164,000	162,000	160,000
	Seawater Barrier	72,000	72,000	72,000	72,000	72,000
	Storage Replenishment	292,000	295,000	297,000	297,000	297,000
B.	**Total Conservation**	**1,056,000**	**1,127,000**	**1,200,000**	**1,263,000**	**1,339,000**
	Existing Active (through 2015)[2]	210,000	196,000	184,000	166,000	159,000
	Code-based	381,000	423,000	462,000	497,000	532,000
	Price-Effect[3]	215,000	258,000	304,000	350,000	398,000
	Pre-1990 Conservation	250,000	250,000	250,000	250,000	250,000
C.	**Total Local Supplies**	**2,447,000**	**2,497,000**	**2,523,000**	**2,538,000**	**2,550,000**
	Groundwater	1,304,000	1,302,000	1,302,000	1,302,000	1,302,000
	Surface Water	107,000	107,000	107,000	107,000	107,000
	Los Angeles Aqueduct	127,000	127,000	127,000	127,000	127,000
	Seawater Desalination	56,000	56,000	56,000	56,000	56,000
	Groundwater Recovery	143,000	157,000	163,000	165,000	167,000
	Recycling[4]	436,000	466,000	486,000	499,000	509,000
	Other Imported Supplies[5]	274,000	282,000	282,000	282,000	282,000
D.	**Total Metropolitan Demands**	**1,731,000**	**1,784,000**	**1,826,000**	**1,878,000**	**1,919,000**
	Consumptive Use	1,560,000	1,616,000	1,658,000	1,710,000	1,751,000
	Seawater Barrier	5,000	2,000	2,000	2,000	2,000
	Replenishment	166,000	166,000	166,000	166,000	166,000

Notes:
All units are acre-feet unless specified, rounded to the nearest thousand.
Totals may not sum due to rounding.
[1] Growth projections are based on SCAG 2012 Regional Transportation Plan and SANDAG Series 13 2050 Regional Growth Forecast.
[2] Does not include future active conservation savings. 1990 is base year.
[3] Includes un-metered water use savings.
[4] Excludes Santa Ana River base flow, which is used for recharge of Orange County groundwater basin and reflected in the Groundwater production numbers.
[5] IID/SDCWA transfer and canal linings.

Table 2-2
Metropolitan Regional Water Demands
Multiple Dry-Year
(Acre-Feet)

		2020	2025	2030	2035	2040
A.	**Total Demands[1]**	**5,199,000**	**5,450,000**	**5,601,000**	**5,732,000**	**5,865,000**
	Retail Municipal and Industrial	4,701,000	4,920,000	5,063,000	5,197,000	5,332,000
	Retail Agricultural	128,000	164,000	169,000	166,000	164,000
	Seawater Barrier	72,000	72,000	72,000	72,000	72,000
	Storage Replenishment	298,000	294,000	297,000	297,000	297,000
B.	**Total Conservation**	**1,056,000**	**1,127,000**	**1,200,000**	**1,263,000**	**1,339,000**
	Existing Active (through 2015)[2]	210,000	196,000	184,000	166,000	159,000
	Code-based	381,000	423,000	462,000	497,000	532,000
	Price-Effect[3]	215,000	258,000	304,000	350,000	398,000
	Pre-1990 Conservation	250,000	250,000	250,000	250,000	250,000
C.	**Total Local Supplies**	**2,416,000**	**2,487,000**	**2,511,000**	**2,535,000**	**2,550,000**
	Groundwater	1,305,000	1,302,000	1,302,000	1,302,000	1,303,000
	Surface Water	102,000	102,000	102,000	102,000	102,000
	Los Angeles Aqueduct	113,000	129,000	125,000	131,000	133,000
	Seawater Desalination	56,000	56,000	56,000	56,000	56,000
	Groundwater Recovery	139,000	155,000	162,000	165,000	167,000
	Recycling[4]	427,000	461,000	482,000	497,000	507,000
	Other Imported Supplies[5]	274,000	282,000	282,000	282,000	282,000
D.	**Total Metropolitan Demands**	**1,727,000**	**1,836,000**	**1,889,000**	**1,934,000**	**1,976,000**
	Consumptive Use	1,547,000	1,668,000	1,721,000	1,766,000	1,808,000
	Seawater Barrier	6,000	2,000	2,000	2,000	2,000
	Replenishment	174,000	166,000	166,000	166,000	166,000

Notes:
All units are acre-feet unless specified, rounded to the nearest thousand.
Totals may not sum due to rounding.
[1] Growth projections are based on SCAG 2012 Regional Transportation Plan and SANDAG Series 13 2050 Regional Growth Forecast.
[2] Does not include future active conservation savings. 1990 is base year.
[3] Includes un-metered water use savings.
[4] Excludes Santa Ana River base flow, which is used for recharge of Orange County groundwater basin and reflected in the Groundwater production numbers.
[5] IID/SDCWA transfer and canal linings.

Table 2-3
Metropolitan Regional Water Demands
Average Year
(Acre-Feet)

		2020	2025	2030	2035	2040
A.	**Total Demands[1]**	**5,219,000**	**5,393,000**	**5,533,000**	**5,663,000**	**5,793,000**
	Retail Municipal and Industrial	4,725,000	4,859,000	5,001,000	5,133,000	5,264,000
	Retail Agricultural	130,000	167,000	163,000	161,000	160,000
	Seawater Barrier	72,000	72,000	72,000	72,000	72,000
	Storage Replenishment	292,000	295,000	297,000	297,000	297,000
B.	**Total Conservation**	**1,056,000**	**1,127,000**	**1,200,000**	**1,263,000**	**1,339,000**
	Existing Active (through 2015)[2]	210,000	196,000	184,000	166,000	159,000
	Code-based	381,000	423,000	462,000	497,000	532,000
	Price-Effect[3]	215,000	258,000	304,000	350,000	398,000
	Pre-1990 Conservation	250,000	250,000	250,000	250,000	250,000
C.	**Total Local Supplies**	**2,578,000**	**2,631,000**	**2,657,000**	**2,674,000**	**2,689,000**
	Groundwater	1,303,000	1,301,000	1,301,000	1,301,000	1,302,000
	Surface Water	110,000	110,000	110,000	110,000	110,000
	Los Angeles Aqueduct	261,000	264,000	264,000	266,000	268,000
	Seawater Desalination	51,000	51,000	51,000	51,000	51,000
	Groundwater Recovery	143,000	157,000	163,000	165,000	167,000
	Recycling[4]	436,000	466,000	486,000	499,000	509,000
	Other Imported Supplies[5]	274,000	282,000	282,000	282,000	282,000
D.	**Total Metropolitan Demands**	**1,586,000**	**1,636,000**	**1,677,000**	**1,726,000**	**1,765,000**
	Consumptive Use	1,415,000	1,468,000	1,509,000	1,558,000	1,597,000
	Seawater Barrier	5,000	2,000	2,000	2,000	2,000
	Replenishment	166,000	166,000	166,000	166,000	166,000

Notes:
All units are acre-feet unless specified, rounded to the nearest thousand.
Totals may not sum due to rounding.
[1] Growth projections are based on SCAG 2012 Regional Transportation Plan and SANDAG Series 13 2050 Regional Growth Forecast.
[2] Does not include future active conservation savings. 1990 is base year.
[3] Includes un-metered water use savings.
[4] Excludes Santa Ana River base flow, which is used for recharge of Orange County groundwater basin and reflected in the Groundwater production numbers.
[5] IID/SDCWA transfer and canal linings.

2.3 Water Supply Reliability

After estimating demands for single dry year, multiple dry years, and average years, the water reliability analysis requires urban water suppliers to identify projected supplies to meet these demands. Table 2-4 summarizes the sources of supply for the single dry year (1977 hydrology), while Table 2-5 shows the region's ability to respond in future years under a repeat of the 1990-92 hydrology. Table 2-5 provides results for the average of the three dry-year series rather than a year-by-year detail because most of Metropolitan's dry-year supplies are designed to provide equal amounts of water over each year of a three-year period. These tables show that the region can provide reliable water supplies under both the single driest year and the multiple dry-year hydrologies. Table 2-6 reports the expected situation on average over all of the historic hydrologies from 1922 to 2012. Appendix 3 contains detailed justifications for the sources of supply used for this analysis.

Metropolitan's supply capabilities are evaluated using the following assumptions:

Colorado River Aqueduct Supplies

CRA supplies include supplies that would result from existing and committed programs and from implementation of the QSA and related agreements. The QSA establishes the baseline water use for each of the agreement parties and facilitates the transfer of water from agricultural agencies to urban uses. A detailed discussion of the QSA is included in Section 3.1. Colorado River transactions are potentially available to supply additional water up to the CRA capacity of 1.2 MAF on an as-needed basis.

State Water Project Supplies

SWP supplies are estimated using the 2015 SWP Delivery Capability Report distributed by DWR in July 2015. The 2015 SWP Delivery Capability Report presents current DWR estimates of the amount of water deliveries for current (2015) conditions and conditions 20 years in the future. These estimates incorporate restrictions on SWP and Central Valley Project (CVP) operations in accordance with the biological opinions of the U.S. Fish and Wildlife Service and National Marine Fisheries Service issued on December 15, 2008, and June 4, 2009, respectively. Under the 2015 SWP Delivery Capability Report with existing conveyance and low outflow requirements scenario, the delivery estimates for the SWP for 2020 conditions as percentage of Table A amounts are 12 percent, equivalent to 257 TAF for Metropolitan, under a single dry-year (1977) condition and 51 percent, equivalent to 976 TAF for Metropolitan, under long-term average condition.

The goal for the 2015 IRP Update for SWP supplies is to manage flow and export regulations in the near term and ultimately to achieve a long-term Bay-Delta solution. This goal involves continued engagement in collaborative science-based approaches to manage regulations in the near-term and continued participation in the long-term California WaterFix and the California EcoRestore efforts. This approach targets an average of 984 TAF of SWP supplies in the near-term and 1.2 MAF of supplies on average starting in 2030 when the long-term Delta solution is assumed to be in place. More detailed description of SWP supplies is included in Section 3.2.

In dry and below-normal conditions, Metropolitan has increased the supplies received from the California Aqueduct by developing flexible Central Valley/SWP storage and transfer programs. Further descriptions of these programs can be found in Section 3.3.

Storage

A key component of Metropolitan's water supply capability is the amount of water in Metropolitan's storage facilities. Over the past two decades, Metropolitan has developed a large regional storage portfolio that includes both dry-year and emergency storage capacity. Storage is a key component of water management. Storage enables the capture of surplus amounts of water in normal and wet climate and hydrologic conditions when it is plentiful for supply and environmental uses. Stored water can then be used in dry years and in conditions where augmented water supplies are needed to meet demands. Metropolitan's resource analysis model considers all the capacities and constraints of its storage facilities and programs and simulates the fill and withdrawal of these facilities through the 91 hydrologic conditions from 1922-2012.

Table 2-4
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]	691,000	712,000	723,000	749,000	749,000
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	**2,584,000**	**2,686,000**	**2,775,000**	**2,905,000**	**2,941,000**
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	**579,000**	**620,000**	**667,000**	**745,000**	**740,000**
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	**642,000**	**720,000**	**983,000**	**1,103,000**	**1,138,000**

[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 demands 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 2-5
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]	664,000	682,000	687,000	696,000	696,000
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	**2,103,000**	**2,154,000**	**2,190,000**	**2,242,000**	**2,260,000**
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	**102,000**	**36,000**	**19,000**	**26,000**	**2,000**
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	**145,000**	**116,000**	**223,000**	**271,000**	**288,000**

[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 demands 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 2-6
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]	1,555,000	1,576,000	1,606,000	1,632,000	1,632,000
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	**3,448,000**	**3,550,000**	**3,658,000**	**3,788,000**	**3,824,000**
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	**1,588,000**	**1,632,000**	**1,699,000**	**1,780,000**	**1,777,000**
Programs Under Development					
In-Region Supplies and Programs	43,000	80,000	118,000	160,000	200,000
California Aqueduct	20,000	20,000	268,000	268,000	268,000
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**	**386,000**	**428,000**	**468,000**
Potential Surplus	**1,651,000**	**1,732,000**	**2,085,000**	**2,208,000**	**2,245,000**

[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 demands 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.

2.4 Water Shortage Contingency Analysis

In addition to the Water Supply Reliability analysis addressing average year and drought conditions, the Act requires agencies to document the stages of actions that they would undertake in response to water supply shortages, including up to a 50 percent reduction in their water supplies. Metropolitan has captured this planning in its Water Surplus and Drought Management (WSDM)[2] Plan which guides Metropolitan's planning and operations during both shortage and surplus conditions. Furthermore, Metropolitan developed the Water Supply Allocation Plan (WSAP)[3], which provides a standardized methodology for allocating supplies during times of shortage.

Water Surplus and Drought Management Plan

Metropolitan's Board adopted the WSDM Plan in April 1999, which provides policy guidance for managing regional water supplies to achieve the reliability goals of the IRP and identifies the expected sequence of resource management actions that Metropolitan will execute during surpluses and shortages to minimize the probability of severe shortages and reduce the possibility of extreme shortages and shortage allocations. Unlike Metropolitan's previous shortage management plans, the WSDM Plan recognizes the link between surpluses and shortages, and it integrates planned operational actions with respect to both conditions.

WSDM Plan Development

Metropolitan and its member agencies jointly developed the WSDM Plan during 1998 and 1999. This planning effort included more than a dozen half-day and full-day workshops and more than three dozen meetings between Metropolitan and member agency staff. The result of the planning effort is a consensus plan that addresses a broad range of regional water management actions and strategies.

WSDM Plan Principles and Goals

The guiding principle of the WSDM Plan is to manage Metropolitan's water resources and management programs to maximize management of wet year supplies and minimize adverse impacts of water shortages to retail customers. From this guiding principle came the following supporting principles:

- Encourage efficient water use and economical local resource programs
- Coordinate operations with member agencies to make available as much surplus water as possible for use in dry years
- Pursue innovative transfer and banking programs to secure more imported water for use in dry years
- Increase public awareness about water supply issues

The WSDM plan also declared that if mandatory import water allocations become necessary, they would be calculated on the basis of need, as opposed to any type of historical purchases. The WSDM plan contains the following considerations that would go into an allocation of imported water:

- Impact on retail consumers and regional economy
- Investments in local resources, including recycling and conservation

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[2] Metropolitan Water District of Southern California. *Water Surplus and Drought Management Plan*, Report No. 1150, August, 1999.

[3] Metropolitan Water District of Southern California, Water Supply Allocation Plan, December 2014.

- Population growth
- Changes and/or losses in local supplies
- Participation in Metropolitan's non-firm (interruptible) programs
- Investment in Metropolitan's facilities

WSDM Plan Implementation

Each year, Metropolitan evaluates the level of supplies available and existing levels of water in storage to determine the appropriate management stage. Each stage is associated with specific resource management actions designed to: (1) avoid an Extreme Shortage to the maximum extent possible; and (2) minimize adverse impacts to retail customers if an Extreme Shortage occurs. The current sequencing outlined in the WSDM Plan reflects anticipated responses based on detailed modeling of Metropolitan's existing and expected resource mix.

Surplus Stages

Metropolitan's supply situation is considered to be in surplus as long as net annual deliveries can be made to water storage programs. The WSDM Plan further defines four surplus management stages that guide the storage of surplus supplies in Metropolitan's storage portfolio. Deliveries for storage 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. Deliveries to other storage facilities may be interrupted, depending on the amount of the surplus.

Shortage Stages

The WSDM Plan distinguishes between Shortages, Severe Shortages, and Extreme Shortages. Within the WSDM Plan, these terms have specific meanings relating to Metropolitan's ability to deliver water to its customers.

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.

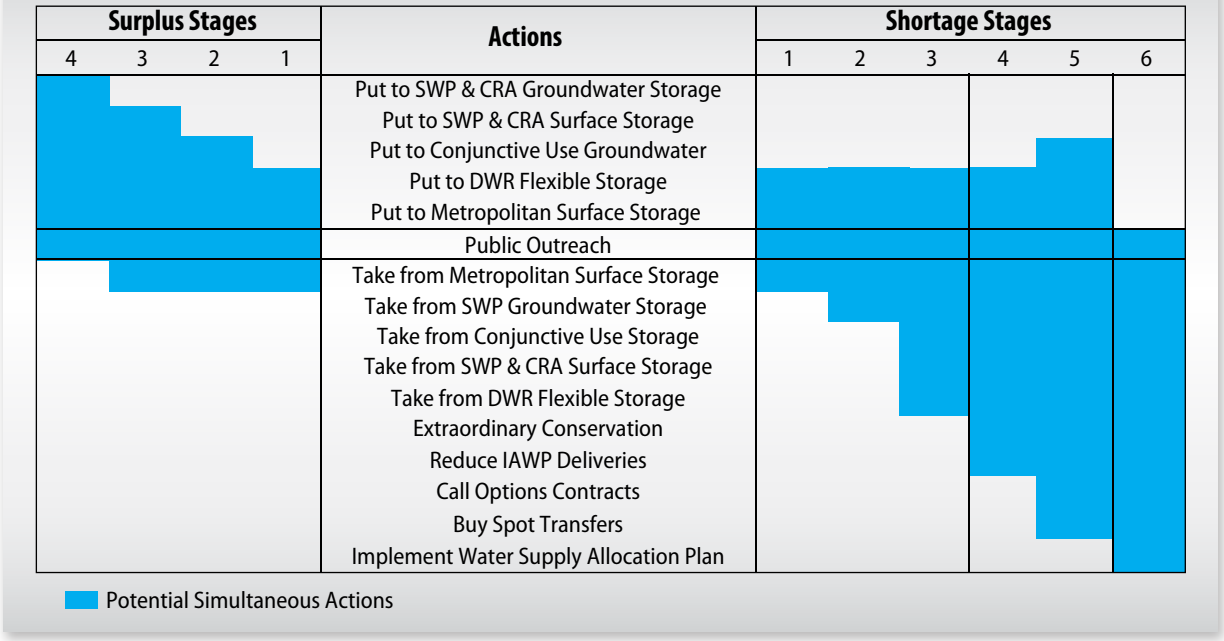
Extreme Shortage: Metropolitan allocates available supply to full-service customers.

The WSDM Plan also defines six shortage management stages to guide resource management activities. These stages are not defined merely by shortfalls in imported water supply, but also by the water balances in Metropolitan's storage programs. Thus, a 10 percent shortfall in imported supplies could be a stage one shortage if storage levels are high. If storage levels are already depleted, the same shortfall in imported supplies could potentially be defined as a more severe shortage.

When Metropolitan must make net withdrawals from storage to meet demands, it is considered to be in a shortage condition. Under most of these stages, Metropolitan is still able to meet all end-use demands for water. For shortage stages 1 through 3, Metropolitan will meet demands by withdrawing water from storage. At shortage stages 4 and 5, Metropolitan may undertake additional shortage management steps, including issuing public calls for extraordinary conservation and exercising water transfer options, or purchasing water on the open market.

Figure 2-1 shows the actions under surplus and shortage stages and when an allocation plan would be necessary to enforce mandatory cutbacks. The overriding goal of the WSDM Plan is to avoid reaching Shortage Stage 6, an Extreme Shortage.

Figure 2-1 Resource Stages, Anticipated Actions, And Supply Declarations



Water Supply Condition Framework

Consistent with the WSDM Plan, Metropolitan's Board adopted a Water Supply Condition Framework in June 2008. The purpose of the framework is to communicate the urgency of the region's water supply situation and the need for further water conservation practices. The framework is intended to encourage proactive steps to reduce the region's water demand to mitigate the need for more severe actions, up to and including implementation of the WSAP to allocate water supply shortages to member agencies. The framework has four conditions, each calling for an increasingly heightened level of conservation response:

- Baseline Water Use Efficiency
- Condition 1: Water Supply Watch
- Condition 2: Water Supply Alert
- Condition 3: Water Supply Allocation

Table 2-7 below shows the framework and the associated conservation actions.

Table 2-7
Water Supply Condition Framework

	Water Supply Condition Framework
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 Water Supply Allocation Plan.

The drought periods of 2007-2011 and 2012-2015 provide an example of how the Water Supply Condition Framework is used. In June 2008, Metropolitan's Board declared a Condition 2: Water Supply Alert to highlight that storage reserves were dropping and that drought conditions were building, corresponding to WSDM shortage stages 1-5. In April 2009 and again in April 2010, Metropolitan's Board moved deeper into a Condition 3: Water Supply Allocation, corresponding to an extreme shortage stage 6 in the WSDM Plan. The April 2010 Water Supply Allocation condition was later terminated by Metropolitan's Board in April 2011 when hydrologic conditions improved during the 2010/2011 water year. The region returned to the Baseline Water Use Efficiency condition following the improvement in water supply. As dry conditions returned in 2012 and 2013, Metropolitan returned to using regional storage and sponsoring outreach efforts with member agencies to encourage voluntary conservation. In 2014, record dry and hot conditions significantly impacted the water resources of both the State of California and Metropolitan. In light of these conditions, which precipitated the January 2014 Emergency Drought Declaration by Governor Brown, Metropolitan's Board declared a Condition 2: Water Supply Alert in February 2014 to again provide public messaging and to urge local water agencies within Metropolitan's service area to adopt and enact water savings ordinances. Extremely dry conditions continued in 2015. In support of the Governor's Executive Order B-29-15 calling for 25 percent reductions in statewide consumer water use, Metropolitan's Board declared a Condition 3: Water Supply Allocation in April 2015.

Water Supply Allocation Plan

The WSAP provides a formula for allocating available water supplies to the member agencies in case of extreme water shortages within Metropolitan's service area. The WSAP was approved by Metropolitan's Board in February 2008 and has since been implemented three times, most recently in April 2015. The WSAP was developed in consideration of the principles and guidelines described in the WSDM Plan, with the objective of creating an equitable needs-based allocation. The WSAP formula seeks to balance the impacts of a shortage at the retail level for shortages of Metropolitan supplies of up to 50 percent. The formula takes into account

growth, local investments, changes in supply conditions, and the demand hardening aspects of non-potable recycled water use and the implementation of conservation savings programs.

Water Supply Allocation Plan Development

Between July 2007 and February 2008, Metropolitan staff worked jointly with Metropolitan's member agencies to develop the WSAP. Throughout the development process, Metropolitan's Board was provided with regular progress reports on the status of the WSAP. The WSAP was adopted at the February 12, 2008 Board meeting. Since the WSAP's adoption in 2008, Metropolitan has worked extensively with the member agencies to periodically review the WSAP formula. Following Board-directed formal review of the WSAP at 12 months after initial implementation and at 3 years after initial adoption, the Board approved adjustments to the WSAP formula on August 17, 2010, and September 13, 2011. In light of drought conditions, Metropolitan staff convened a member agency working group between July and November 2014 to revisit the WSAP before possible implementation in 2015. On December 9, 2014, the Board approved additional adjustments to the formula.

The WSAP Formula

The WSAP formula is calculated in three steps: base period calculations, allocation year calculations, and 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 water supply allocation is to estimate water supply and demand using a historical base 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 fiscal years (July through June) ending 2013 and 2014.

Step 2: Allocation Year Calculations

The next step in calculating the 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. There are a number of adjustments that go into a member agency's water supply allocation. Each element and its application in the allocation formula are discussed in detail in Metropolitan's WSAP.

Annual Reporting Schedule on Supply/Demand Conditions

Managing Metropolitan's water supply resources to minimize the risk of shortages requires timely and accurate information on changing supply and demand conditions throughout the year. To facilitate effective resource management decisions, the WSDM Plan includes a monthly schedule for providing supply/demand information to Metropolitan's senior management and Board, and for making resource allocation decisions. Table 2-8 shows this schedule.

Table 2-8
Schedule of Reporting and Water Supply Allocation Decision-Making

Month	Information Report/Management Decision
January	Initial supply/demand forecasts for year
February - March	Update supply/demand forecasts for year
April - May	Finalize supply/demand forecasts Management decisions re: Contractual Groundwater and Option Transfer Programs Board decision re: Need for Extraordinary Conservation
October - December	Report on Supply and Carryover Storage

2.5 Catastrophic Supply Interruption Planning

The third type of planning needed to evaluate supply reliability is a catastrophic supply interruption plan that documents the actions necessary for a catastrophic interruption in water supplies. For Metropolitan, this planning is captured in the analysis that went into developing the Emergency Storage Requirements.

Emergency Storage Requirements

Metropolitan established its criteria for determining emergency storage requirements in the October 1991 Final Environmental Impact Report for the Eastside Reservoir, which is now named Diamond Valley Lake. These criteria were again discussed in the 1996 IRP. Metropolitan's Board approved both of these documents.

Emergency storage requirements are based on the potential of a major earthquake damaging the aqueducts that transport Southern California's imported water supplies (SWP, CRA, and Los Angeles Aqueduct). The adopted criteria assume that damage from such an event could render the aqueducts out of service for six months. Therefore, Metropolitan has based its planning on a 100 percent reduction in these imported supplies for a period of six months, which is a greater shortage than required by the Act.

To safeguard the region from catastrophic loss of water supply, Metropolitan has made substantial investments in emergency storage. The emergency plan outlines that under such a catastrophe, non-firm service deliveries would be suspended, and firm supplies to member agencies would be restricted by a mandatory cutback of 25 percent from normal-year demand levels. At the same time, water stored in surface reservoirs and groundwater basins under Metropolitan's program would be made available, and Metropolitan would draw on its emergency storage, as well as other available storage. In addition to DVL, Metropolitan has access to emergency storage at its other reservoirs, and at the SWP terminal reservoirs, and in its groundwater conjunctive use storage accounts. With few exceptions, Metropolitan can deliver this emergency supply throughout its service area via gravity, thereby eliminating dependence on power sources that could also be disrupted by a major earthquake. The WSDM Plan shortage stages will guide Metropolitan's management of available supplies and resources during the emergency to minimize the impacts of the catastrophe. Additional discussion of emergency storage is included in Appendix A.3.3.

Electrical Outages

Metropolitan has also developed contingency plans that enable it to deal with both planned and unplanned electrical outages. These plans include the following key points:

- In event of power outages, water supply can be maintained by gravity feed from regional reservoirs such as DVL, Lake Mathews, Castaic Lake, and Silverwood Lake.
- Maintaining water treatment operations is a key concern. As a result, all Metropolitan treatment plants have backup generation sufficient to continue operating in the event of supply failure on the main electrical grid.
- Valves at Lake Skinner can be operated by the backup generation at the Lake Skinner treatment plant.
- Metropolitan owns mobile generators that can be transported quickly to key locations if necessary.

2.6 Other Supply Reliability Risks

Metropolitan provides water to a broad and heterogeneous service area with water supplies from a variety of sources and geographic regions. Each of these demand areas and supplies has its own unique set of benefits and challenges. Among the challenges Metropolitan faces are the following:

Supplies

- The region and Colorado River Basin have been experiencing drought conditions for multiple years. In the past 16 years (2000-2015), there have been only three years when the Colorado River flow has been above average. The last above-average year was 2011, when the unregulated water year inflow to Lake Powell was 139 percent of average.
- Endangered species protection and conveyance needs in the Sacramento-San Joaquin River Delta System have resulted in operational constraints that are particularly important because pumping restrictions impact many water resource programs – SWP supplies and additional voluntary transfers, Central Valley storage and transfers, in-region groundwater storage, and in-region surface water storage.
- Changing climate patterns are predicted to shift precipitation patterns and possibly affect water supply.
- Difficulty and implications of environmental review, documentation, and permitting for multi-year transfer agreements, recycled water projects, and seawater desalination plants.
- Public perception of recycled water use.
- Opposition to local seawater desalination projects from environmental groups and community organizations.

Operations and Water Quality

- The cost and use of energy and greenhouse gas emissions.
- Water quality regulations and issues like the quagga mussels within the CRA. Controlling the spread and impacts of the quagga mussels will require more extensive maintenance and reduced operational flexibility.
- Salt and concentrate balance from a variety of sources.

Demand

- Fluctuations in population and economic growth.
- Uncertain location of growth.
- Uncertain housing stock and density.
- Changes in outdoor water use patterns.

The challenges posed by continued population growth, environmental constraints on the reliability of imported supplies, and new uncertainties imposed by climate change demand that Metropolitan assert the same level of leadership and commitment to taking on large-scale regional solutions to providing water supply reliability. New solutions are potentially available in the form of dramatically improved water-use efficiency, indirect and direct potable use of recycled water, and large-scale application of ocean desalinization.

Distribution System Water Losses

Metropolitan followed the AWWA Water Audit methodology to track all sources of water and uses of water within its system. The AWWA Water Audit methodology quantifies real and apparent water system losses in an agency's distribution system. Section 10631(e)(3)(A) of the California Water Code requires that the 2015 Urban Water Management Plan update quantify distribution system water losses for the most recent 12-month period available.

For the distribution system water losses assessment, Metropolitan included its water balance audit for calendar years 2014 and 2013. In addition, Metropolitan also included a memorandum that provides water balance assessment for year 2012.

The results of Metropolitan's audit showed that the total amount of distribution system water losses in 2014 was approximately 6.4 TAF. A detailed discussion of Metropolitan's distribution system water losses for 2014 is included in Appendix 7 and summarized in Table A.7-1. In addition to the distribution system losses described in the AWWA tables, Metropolitan estimates that 37 TAF was lost from reservoir evaporation occurring in Lake Mathews, Lake Skinner, and DVL during CY 2014.

Climate Change

Climate change adds its own uncertainties to the challenges of planning. Metropolitan's water supply planning has been fortunate in having almost one-hundred years of hydrological data regarding weather and water supply. This history of rainfall data has provided a sound foundation for forecasting both the frequency and the severity of future drought conditions, as well as the frequency and abundance of above-normal rainfall. But, weather patterns can be expected to shift dramatically and unpredictably in a climate driven by increased concentrations of carbon dioxide in the atmosphere. These changes in weather significantly affect water supply planning, irrespective of the debate associated with the sources and cause of increasing concentrations of greenhouse gasses. As a major steward of the region's water supply resources, Metropolitan is committed to performing its due diligence with respect to climate change.

Potential Impacts

While uncertainties remain regarding the exact timing, magnitude, and regional impacts of these temperature and precipitation changes, researchers have identified several areas of concern for California water planners. These include:

- Reduction in Sierra Nevada snowpack;
- Increased intensity and frequency of extreme weather events; and
- Rising sea levels resulting in
    - Impacts to coastal groundwater basins due to seawater intrusion;
    - Increased risk of damage from storms, high-tide events, and the erosion of levees; and
    - Potential pumping cutbacks on the SWP and Central Valley Project (CVP).

Other important issues of concern due to global climate change include:

- Effects on local supplies such as groundwater;
- Changes in urban and agricultural demand levels and patterns;
- Impacts to human health from water-borne pathogens and water quality degradation;
- Declines in ecosystem health and function; and
- Alterations to power generation and pumping regimes.

Metropolitan's Activities Related to Climate Change Concerns

Resource Planning

Under the 2015 IRP Update, Metropolitan recognizes additional risks and uncertainties from a variety of sources:

- Water quality
- Climate change
- Regulatory and operational changes
- Project construction and implementation issues
- Infrastructure reliability and maintenance
- Demographic and growth uncertainty

Any of these risks and uncertainties, should they occur individually or collectively, may result in a negative impact to water supply reliability. While it is impossible to know how much risk and uncertainty to guard against, the region's reliability will be more secure with a long-term plan that recognizes risk and provides resource development to offset that risk. Some risk and uncertainty will be addressed by following the findings of the 2015 IRP Update. But there are other risks that may take longer to manifest, like climate change or shifts in demographic growth patterns that increase or move the demands for water.

Metropolitan has established an intensive, comprehensive technical process to identify key vulnerabilities. This Robust Decision Making (RDM) approach was used with the 2010 IRP Update. The RDM approach can show how vulnerable the region's reliability is to longer-term risks and can also establish "signposts" that can be monitored to see when critical changes may be happening. Signposts include monitoring the direction of ever-changing impacts from improved Global Climate Models, and housing and population growth patterns. The RDM approach will be revisited with the new resource reliability targets identified in the 2015 IRP Update. Initial 2015 IRP analysis indicated an additional 200,000 AF of water conservation and local supplies may be needed to address these risks. This additional supply goal will be considered when examining implementation policies and approaches as the IRP process continues.

Knowledge Sharing and Research Support

Metropolitan is an active and founding member of the Water Utility Climate Alliance (WUCA). WUCA consists of ten nationwide water providers collaborating on climate change adaptation and greenhouse gas mitigation issues. As a part of this effort, WUCA pursues a variety of activities on multiple fronts.

Member agencies of WUCA annually share individual agency actions to mitigate greenhouse gas emissions to facilitate further implementation of these programs. WUCA also monitors development of climate change-related research, technology, programs, and federal legislation.

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

planning is: "Embracing Uncertainty: A Case Study Examination of How Climate Change is Shifting Water Utility Planning" (2015). A fundamental goal of this recent white paper is to provide water professionals with practical and relevant examples, with insights from their peers, on how and why to modify planning and decision-making processes to better prepare for a changing climate.

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

Metropolitan also continues to pursue knowledge sharing and research support activities outside of WUCA. Metropolitan regularly provides input and direction on California legislation related to climate change issues. Metropolitan is active in collaborating with other state and federal agencies, as well as non-governmental organizations, on climate change related planning issues. The following list provides a sampling of entities that Metropolitan has recently worked with on a collaborative basis:

- USBR
- U.S. Army Corps of Engineers
- AWWA Research Foundation
- National Center for Atmospheric Research
- California Energy Commission
- California Department of Water Resources

Quantification of Current Research

Metropolitan continues to incorporate current climate change science into its planning efforts. A major component of the current IRP update effort is to explicitly reflect uncertainty in Metropolitan's future water management environment. This involves evaluating a wider range of water management strategies, and seeking robust and adaptive plans that respond to uncertain conditions as they evolve over time, and that ultimately will perform adequately under a wide range of future conditions. The potential impacts and risks associated with climate change, as well as other major uncertainties and vulnerabilities, have been incorporated into the update. Overall, Metropolitan's planning activities strive to support the Board adopted policy principles on climate change by:

- Supporting reasonable, economically viable, and technologically feasible management strategies for reducing impacts on water supply,
- Supporting flexible "no regret" solutions that provide water supply and quality benefits while increasing the ability to manage future climate change impacts, and
- Evaluating staff recommendations regarding climate change and water resources under the California Environmental Quality Act (CEQA) to avoid adverse effects on the environment.

Implementation of Programs and Policies

Metropolitan has made great efforts to implement greenhouse gas mitigation programs and policies for its facilities and operations. To date, these programs and policies have focused on:

- Exploring water supply/energy relationships and opportunities to increase efficiencies;
- Participating in The Climate Registry, a nonprofit greenhouse gas emissions registry for North America that provides organizations with the tools and resources to help them calculate, verify, report, and manage their greenhouse gas emissions in a publicly transparent and credible way;
- Acquiring "green" fleet vehicles, and supporting an employee Rideshare program;
- Developing solar power at both the Skinner water treatment plant (completed) and the Weymouth water treatment plant (in progress); and
- Identifying and pursuing development of "green" renewable water and energy programs that support the efficient and sustainable use of water.

Metropolitan also continues to be a leader in efforts to increase regional water use efficiency. Metropolitan has worked to increase the availability of incentives for local conservation and recycling projects, as well as supporting conservation Best Management Practices for industry and commercial businesses.

2.7 Pricing and Rate Structures

Revenue Management

A high proportion of Metropolitan's revenues come from volumetric water rates. Water sales revenues are approximately 80 percent of Metropolitan's total revenues. As a result, Metropolitan's revenues vary according to regional weather and the availability of statewide water supplies. In dry years, local demands increase, and Metropolitan may receive higher than anticipated revenues due to increased sales volumes. In contrast, in wet years, demands decrease, and revenues drop due to lower sales volumes. In addition, statewide supply shortages such as those in 2009 and 2015 also affect Metropolitan's revenues. Such revenue surpluses and shortages could cause instability in water rates. To mitigate this risk, Metropolitan maintains financial reserves, with a minimum and target balance, to stabilize water rates during times of reduced water sales. The reserves hold revenues collected during times of high water sales and are used to offset the need for revenues during times of low sales.

Another way to mitigate rate increases is by generating a larger portion of revenues from fixed sources. Metropolitan currently has two fixed charges, the Readiness-to-Serve Charge (RTS) and the Capacity Charge. Metropolitan also collects tax revenue from taxable property within its boundaries. The revenues from fixed charges generate approximately 18 percent of all Metropolitan revenues. RTS revenues have been increasing gradually, from $136 million in fiscal year 2011-12, to $155.5 million in fiscal year 2015-16.

Finally, Metropolitan generates revenue from interest income, hydroelectric power sales, and miscellaneous income such as rents and leases. For the last five fiscal years, these averaged approximately three percent of all Metropolitan revenues. These internally generated revenues are referred to as revenue offsets and reduce the amount of revenue that needs to be collected from rates and charges.

Elements of Rate Structure

This section provides an overview of Metropolitan's rate structure. The different elements of the rate structure are discussed below and summarized in Table 2-9.

System Access Rate (SAR)

The SAR is a volumetric system-wide rate levied on each acre-foot of water that moves through the Metropolitan system. All system users (member agency or third party) pay the SAR to use Metropolitan's conveyance and distribution system. The SAR recovers the cost of providing conveyance and distribution capacity to meet average annual demands.

Water Stewardship Rate (WSR)

The WSR recovers the costs of providing financial incentives for existing and future investments in local resources including conservation and recycled water. These investments or incentive payments are identified as the "demand management" service function in the cost of service process. The WSR is a volumetric rate levied on each acre-foot of water that moves through the Metropolitan system.

System Power Rate (SPR)

The SPR recovers the costs of energy required to pump water to Southern California through the SWP and CRA. The cost of power is recovered through a uniform volumetric rate. The SPR is applied to all deliveries to member agencies.

Treatment Surcharge

The treatment surcharge recovers the costs of providing treated water service through a uniform, volumetric rate. The treatment surcharge recovers all costs associated with providing treated water service, including commodity, demand, and standby related costs.

Capacity Charge

The capacity charge is levied on the maximum summer day demand placed on the system between May 1 and September 30 for a three-calendar year period. Demands measured for the purposes of billing the capacity charge include all firm demands, including wheeling service and exchanges.

The capacity charge is intended to pay for the cost of peaking capacity on Metropolitan's system, while providing an incentive for local agencies to decrease their use of the Metropolitan system to meet peak day demands and to shift demands into lower use time periods. Over time, a member agency will benefit from local supply investments and operational strategies that reduce its peak day demand on the system in the form of a lower total capacity charge.

Readiness-To-Serve Charge (RTS)

The costs of infrastructure projects needed to provide service, including emergency storage and those costs related to the conveyance and distribution system that are available but not used on average, are recovered by the RTS.

The RTS is allocated to the member agencies based on each agency's proportional share of a ten-year rolling average of all firm deliveries. A ten-year rolling average leads to a relatively stable RTS allocation that reasonably represents an agency's potential long-term need for standby service under different demand conditions. Member agencies may choose to have a portion of their total RTS obligation offset by standby charge collections levied by Metropolitan on behalf of the member agency. These standby charges are assessed on parcels of land within the boundaries of a given member agency.

Tier 1 Supply Rate

The costs of maintaining existing supplies and developing additional supplies are recovered through a two-tiered pricing approach. The Tier 1 Supply Rate recovers the cost of maintaining a reliable amount of supply. Each member agency has a predetermined amount of water that can be purchased at the lower Tier 1 Supply Rate. Purchases in excess of this limit will be made at the higher Tier 2 Supply Rate.

Tier 2 Supply Rate

The Tier 2 Supply Rate reflects Metropolitan's cost of purchasing water transfers north of the Delta. The Tier 2 Supply Rate encourages the member agencies and their customers to maintain existing local supplies and develop cost-effective local supply resources and conservation.

Table 2-9
Rate Structure Components

Rate Design Elements	Service Provided/ Costs Recovered	Type of Charge
System Access Rate	Conveyance/Distribution (Average Capacity)	Volumetric ($/AF)
Water Stewardship Rate	Conservation/Local Resources	Volumetric ($/AF)
System Power Rate	Power	Volumetric ($/AF)
Treatment Surcharge	Treatment	Volumetric ($/AF)
Capacity Charge	Peak Distribution System Capacity	Fixed ($/cfs)
Readiness-To-Serve Charge	Conveyance/Distribution/Emergency Storage(infrastructure necessary to provide service)	Fixed ($Million)
Tier 1 Supply Rate	Supply	Volumetric ($/AF)
Tier 2 Supply Rate	Supply	Volumetric ($/AF)

The following tables provide further information regarding Metropolitan's rates. Table 2-10 summarizes the rates and charges effective January 1, 2014, January 1, 2015, and January 1, 2016. Average costs by member agency will vary depending upon an agency's RTS allocation, Capacity Charge, and relative proportions of treated and untreated Tier 1, and Tier 2 water purchases. Table 2-11 provides the details of the Capacity Charge, calculated for calendar year 2016.

Table 2-12 provides the details of the Readiness-to-Serve Charge calculation for calendar year 2016 by member agency. Table 2-13 provides the current Purchase Order commitment quantities that member agencies will purchase from Metropolitan over the 10-year period starting January 2015 through December 2024. Tier 1 annual average limits for each member agency are also shown in this table.

Table 2-10
Metropolitan Water Rates and Charges

Effective	Jan 1, 2014	Jan 1, 2015	Jan 1, 2016
Tier 1 Supply Rate ($/AF)	$148	$158	$156
Tier 2 Supply Rate ($/AF)	$290	$290	$290
System Access Rate ($/AF)	$243	$257	$259
Water Stewardship Rate ($/AF)	$41	$41	$41
System Power Rate ($/AF)	$161	$126	$138
Full Service Untreated Volumetric Cost ($/AF)			
Tier 1	$593	$582	$594
Tier 2	$735	$714	$728
Treatment Surcharge ($/AF)	$297	$341	$348
Full Service Treated Volumetric Cost ($/AF)			
Tier 1	$890	$923	$942
Tier 2	$1,032	$1,055	$1,076
Readiness-to-Serve Charge ($M)	$166	$158	$153
Capacity Charge ($/cfs)	$8,600	$11,100	$10,900

Table 2-11
Capacity Charge Detail Calendar Year 2016

	Peak Day Demand (cfs) (May 1 through September 30) Calendar Year				
Agency	2012	2013	2014	3-Year Peak	Calendar Year 2016 Capacity Charge ($10,900/cfs)
Anaheim	38.3	31.3	34.0	38.3	$417,470
Beverly Hills	32.7	30.8	30.6	32.7	$356,430
Burbank	20.9	19.7	22.6	22.6	$246,340
Calleguas	224.0	228.7	240.8	240.8	$2,624,720
Central Basin	74.5	73.6	61.0	74.5	$812,050
Compton	2.3	2.9	0.0	2.9	$31,610
Eastern	237.2	267.4	239.2	267.4	$2,914,660
Foothill	17.6	18.9	19.9	19.9	$216,910
Fullerton	24.4	20.0	22.2	24.4	$265,960
Glendale	41.5	44.9	43.7	44.9	$489,410
Inland Empire	126.7	153.9	144.0	153.9	$1,677,510
Las Virgenes	41.9	43.2	46.1	46.1	$502,490
Long Beach	60.4	66.9	67.8	67.8	$739,020
Los Angeles	512.9	767.1	782.5	782.5	$8,529,250
MWDOC	398.6	379.4	443.1	443.1	$4,829,790
Pasadena	52.1	52.5	48.5	52.5	$572,250
San Diego	961.5	967.4	1,138.2	1,138.2	$12,406,380
San Fernando	2.8	4.9	0.0	4.9	$53,410
San Marino	5.3	6.1	7.3	7.3	$79,570
Santa Ana	19.2	19.6	17.5	19.6	$213,640
Santa Monica	19.7	22.7	15.2	22.7	$247,430
Three Valleys	133.0	178.6	151.4	178.6	$1,946,740
Torrance	36.2	34.1	33.5	36.2	$394,580
Upper San Gabriel	15.2	16.1	45.4	45.4	$494,860
West Basin	222.6	230.2	217.5	230.2	$2,509,180
Western	193.7	198.6	176.6	198.6	$2,164,740
Total	3,515.3	3,879.5	4,058.5	4,196.0	$45,736,400

Totals may not foot due to rounding

Table 2-12
Readiness-to-Serve Charge (by Member Agency)
Calendar Year 2016

Member Agency	Rolling Ten-Year Average Firm Deliveries (Acre-Feet) FY2004-05 to FY2013-14	RTS Share	12 months @ $153 million per year (1/16-12/16)
Anaheim	21,646	1.26%	1,931,624
Beverly Hills	11,468	0.67%	1,023,387
Burbank	12,769	0.74%	1,139,430
Calleguas MWD	110,216	6.43%	9,835,288
Central Basin MWD	53,106	3.10%	4,739,002
Compton	2,222	0.13%	198,301
Eastern MWD	98,854	5.77%	8,821,351
Foothill MWD	9,999	0.58%	892,228
Fullerton	9,902	0.58%	883,599
Glendale	20,157	1.18%	1,798,733
Inland Empire Utilities Agency	60,390	3.52%	5,389,007
Las Virgenes MWD	22,702	1.32%	2,025,866
Long Beach	33,643	1.96%	3,002,172
Los Angeles	297,705	17.36%	26,566,040
Municipal Water District of Orange County	220,916	12.88%	19,713,676
Pasadena	21,506	1.25%	1,919,148
San Diego County Water Authority	377,077	21.99%	33,648,901
San Fernando	122	0.01%	10,914
San Marino	1,000	0.06%	89,227
Santa Ana	13,091	0.76%	1,168,155
Santa Monica	10,146	0.59%	905,408
Three Valleys MWD	66,509	3.88%	5,935,016
Torrance	18,514	1.08%	1,652,136
Upper San Gabriel Valley MWD	18,292	1.07%	1,632,281
West Basin MWD	128,160	7.47%	11,436,461
Western MWD	74,439	4.34%	6,642,650
Metropolitan Total	1,714,552	100.00%	$153,000,000

Totals may not foot due to rounding

Table 2-13
Purchase Order Commitments and Tier 1 Limits
(by Member Agency)
January 2015 through December 2024

Member Agency	Annual Average Tier 1 Maximum	Purchase Order Commitment (acre-feet)
Anaheim	24,439	148,268
Beverly Hills	13,380	89,202
Burbank	16,776	108,910
Calleguas MWD	118,228	788,185
Central Basin MWD[1]	71,770	
Compton[1]	3,372	
Eastern MWD	117,585	783,898
Foothill MWD	11,773	73,312
Fullerton	11,299	75,322
Glendale	26,222	174,809
Inland Empire Utilities Agency	93,283	398,348
Las Virgenes MWD	24,358	162,387
Long Beach	51,804	263,143
Los Angeles	373,623	2,033,132
Municipal Water District of Orange County	321,635	2,144,233
Pasadena	22,965	153,102
San Diego County Water Authority[1]	393,542	
San Fernando[1]	629	
San Marino	1,442	9,610
Santa Ana	19,617	80,858
Santa Monica[1]	7,406	
Three Valleys MWD	80,687	537,916
Torrance	19,204	128,027
Upper San Gabriel Valley MWD	67,228	110,077
West Basin MWD	135,417	902,783
Western MWD	105,784	705,224
Total	2,133,468	9,870,746

[1] No Purchase Order; Tier 1 maximum is annual, not cumulative.
Totals may not foot due to rounding.

Implementing the Plan 3

This section summarizes Metropolitan's implementation plans and continued progress in developing a diversified resource mix that enables the region to meet its water demands under a wide range of possible future conditions. The investments that Metropolitan has made and its on-going efforts in many different areas coalesce toward its goal of long-term regional water supply reliability. Many of the resource programs discussed are already successfully implemented. Others will take more time to execute. Considerations are also in place for emerging integrated supplies, which could augment sources of regional water supply from non-traditional sources. In addition, water demand reductions brought about by legislative mandates could also affect the landscape of future supply planning and implementation. The following sections discuss each of these programs, presenting both successes to date and the programs that are still underway.

Metropolitan's IRP implementation approach has been consistent with the Governor's California Water Action Plan that was released in January of 2014. The Governor's Plan is discussed briefly below.

California Water Action Plan

California Water Action Plan: Actions for Reliability, Restoration and Resilience, was released by Governor Brown in January 2014. A collaborative effort of the California Natural Resources Agency, the California Environmental Protection Agency, and California Department of Food and Agriculture, the California Water Action Plan was developed to meet three broad objectives: more reliable water supplies, the restoration of important species and habitat, and a more resilient, sustainably managed water resources system (water supply, water quality, flood protection, and environment) that can better withstand inevitable and unforeseen pressures in the coming decades.

Over the next five years, the actions outlined below are designed to move California toward more sustainable water management by providing a more reliable water supply for farms and communities, restoring important wildlife habitat and species, and helping the state's water systems and environment become more resilient.

1. Make conservation a California way of life;
2. Increase regional self-reliance and integrated water management across all levels of government;
3. Achieve the co-equal goals for the Delta;
4. Protect and restore important ecosystems;
5. Manage and prepare for dry periods;
6. Expand water storage capacity and improve groundwater management;
7. Provide safe water for all communities;
8. Increase flood protection;
9. Increase operational and regulatory efficiency; and
10. Identify sustainable and integrated financing opportunities.

3.1 Colorado River Aqueduct

The goal for CRA supplies is to maintain current supplies and programs, while also maintaining flexibility through dry-year programs and storage. This goal involves protecting existing supply and storage programs in the face of risks that could impact CRA supplies in the future. To accomplish this goal, the 2015 IRP Update targets are to develop sufficient base supply programs to ensure that a minimum of 900 TAF of diversions are available when needed, and to ensure access to 1.2 MAF of supplies in dry years through flexible programs and storage.

Background

Metropolitan was established to obtain an allotment of Colorado River water, and its first mission was to construct and operate the CRA. Under its contracts with the federal government, Metropolitan has a basic entitlement of 550 TAF per year of Colorado River water. Metropolitan also holds a fifth priority for an additional 662 TAF per year that exceeds California's 4.4 MAF per year basic apportionment, and another 180 TAF per year when surplus flows are available. Metropolitan can obtain water under the fifth priority from:

- 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, or
- When the U.S. Secretary of the Interior makes available either or both:
  - Surplus water, and
  - Water apportioned to, but unused by, Arizona and/or Nevada.

To satisfy a condition imposed by Congress in the Boulder Canyon Project Act, California's legislature enacted the Limitation Act in 1929, agreeing to limit consumptive use of Colorado River water to 4.4 MAF per year, plus not more than one-half of any excess or surplus waters unapportioned by the Colorado River Compact. The 1931 Seven Party Agreement provides the basis for the priorities among California's contractors to use of Colorado River water made available to California. Palo Verde Irrigation District (PVID), the Yuma Project (Reservation Division), Imperial Irrigation District (IID), and Coachella Valley Water District (CVWD), collectively the "agricultural entities", and Metropolitan are the entities that currently hold the priorities. These priorities are included in the contracts that the Department of the Interior executed with the California agencies in the 1930s for delivery of water from Lake Mead. The first four priorities total 4.4 MAF per year. Metropolitan has the fourth priority of 550 TAF to California's basic apportionment and the fifth priority to 662 TAF per year. Under priorities 1 through 3, an amount not to exceed 3.85 MAF was apportioned to the agricultural entities for beneficial consumptive use. The Seven Party Agreement did not specify individual quantities for each of the first three priorities; rather, the amount of water available under the third priority was limited to the amount unused by the holders of priorities 1 and 2 on designated areas of land. This lack of quantification among the agricultural priorities posed an obstacle to the acquisition of water from the agricultural entities for use in Metropolitan's service area.

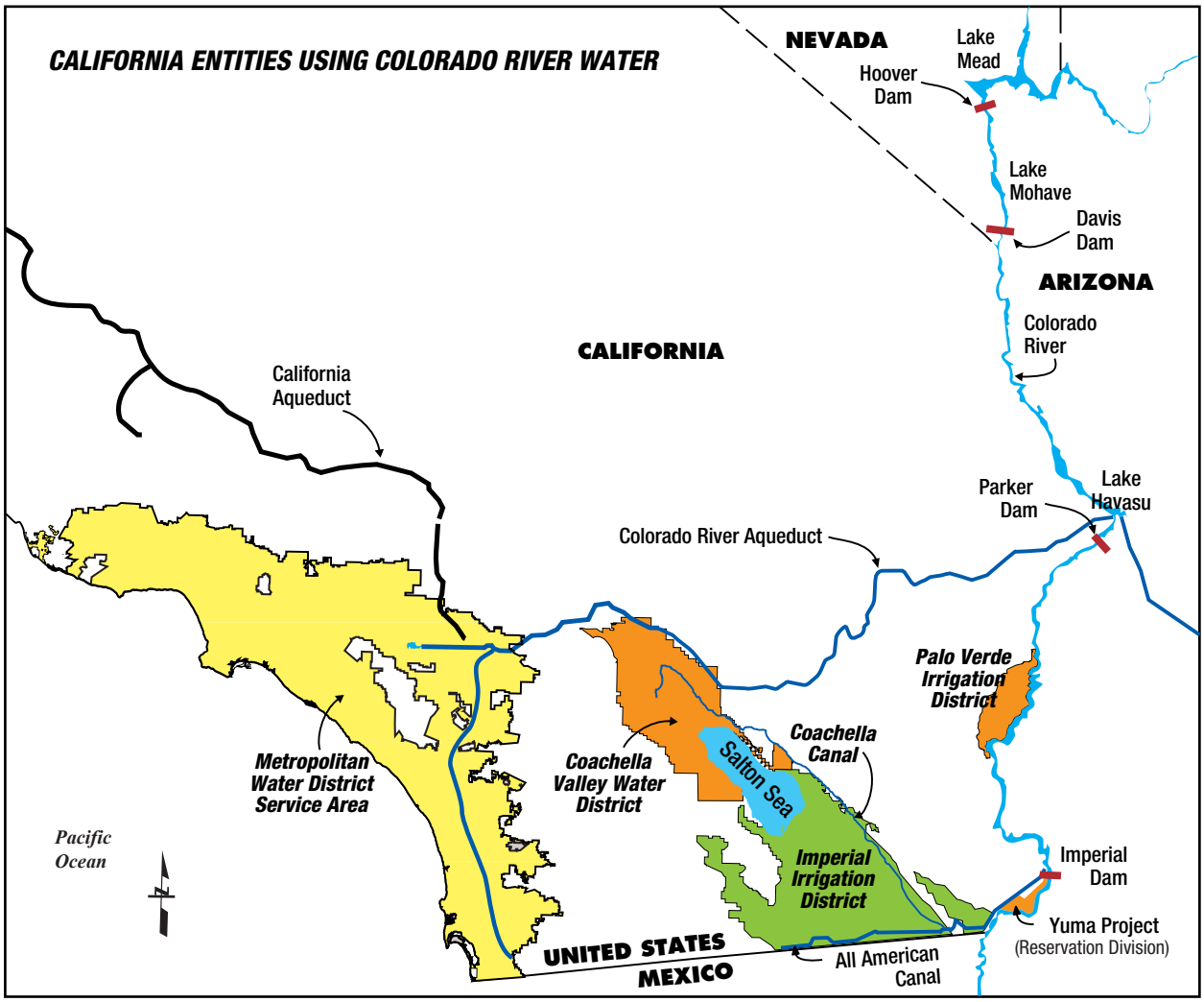
The Consolidated Decree issued in 2006 by the U.S. Supreme Court in *Arizona v. California*, preceded by a 1964 decree, confirmed the allocation of 4.4 MAF per year to California. This limit effectively reduced Metropolitan's dependable supply of Colorado River water to its fourth priority amount of 550 TAF per year. A 1979 decree quantified present perfected rights (PPRs) to the use of Colorado River water by certain Indian reservations, federal wildlife refuges, and other users. Some, but not all of these PPRs, are encompassed by the Seven Party Agreement. Consumptive use under these non-encompassed PPRs, known as "Miscellaneous and Indian

PPRs," could reach as much as 61 TAF annually. Since 1985, these PPR holders have used less than 20 TAF annually. Because over 5.362 MAF of Colorado River water were already allocated by California's Seven Party Agreement, it was not clear which rights would be affected by the use of these non-encompassed PPRs.

For a period following the Court's 1964 ruling, Metropolitan's fifth priority rights were satisfied with water allocated to, but unused by, Arizona and Nevada. With the commencement of Colorado River water deliveries to the Central Arizona Project in 1985, the availability of Colorado River water to meet Metropolitan's needs was determined on a year-by-year basis. At that time, no formal guidelines existed to determine whether surplus water would be available. Decisions regarding surplus water availability were to be made at the discretion of the Secretary of the Interior. As a result, the year-to-year availability of Colorado River water to Metropolitan was uncertain.

Figure 3-1 shows the major aqueducts within southern California including those from the Colorado River, and entities within the state having rights to use water from the Colorado River.

Figure 3-1



Changed Conditions

California's Colorado River Water Use Plan and the Quantification Settlement Agreement

Metropolitan and the State of California acknowledged that Metropolitan would obtain less water from the Colorado River in the future than Metropolitan had in the past, but the lack of clearly quantified water rights hindered efforts to promote water management projects. 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 problem, which was known as "California's Colorado River Water Use Plan" or the "California Plan." It 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 QSA among IID, CVWD, and Metropolitan is a critical component of the California Plan. It establishes the baseline water use for each of the agencies, 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 PPRs not covered by the Seven Party Agreement.

On November 5, 2003, IID filed a validation action in Imperial County Superior Court, seeking a judicial determination that thirteen agreements associated with 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. All of the QSA cases were coordinated in Sacramento County Superior Court. After more than a decade of litigation, the final challenges to the QSA were dismissed, and the agreements were upheld.

SDCWA is participating in two QSA-related projects that are providing additional water supplies to that agency.[4] The water conserved by these projects is made available to Metropolitan, resulting in increased amounts of Colorado River water being diverted into the CRA. In exchange, Metropolitan is delivering an amount of water equal to the amount conserved for SDCWA. Federal law allocates a portion of the water available as a result of the Coachella and All-American Canal lining projects for the benefit of parties, including five Indian Bands, involved in litigation over water rights to the San Luis Rey River in San Diego County once certain conditions have been satisfied. Metropolitan has agreed to exchange that water and provide an equal amount of water to the United States for use by the San Luis Rey Settlement Parties, and SDCWA has agreed to convey the water when capacity is available for use within the Settlement Parties' service areas. As the Settlement Parties have not yet satisfied the conditions required to receive the benefit of those supplies, Metropolitan has utilized this water. The remainder of the water available as a result of the canal lining projects is exchanged with SDCWA.

In 2005, Metropolitan entered into a settlement agreement in *Arizona v. California* with the Quechan Indian Tribe and other parties. The Tribe uses Colorado River water on the Fort Yuma Indian Reservation. Under the settlement agreement, the Tribe, in addition to the amounts of water decreed for the benefit of the Reservation in the 1964 decree, is entitled to (a) an additional 20 TAF of diversions from the Colorado River, or (b) the amount necessary to supply the consumptive use required for irrigation of a specified number of acres, and for the satisfaction of related uses, whichever is less. Of the additional water, 13 TAF became available to the Tribe in 2006. An additional 7 TAF becomes available to the Tribe in 2035. Metropolitan and the Tribe agreed that Metropolitan would provide incentive payments to the Tribe to limit

[4] These projects, the SDCWA/IID transfer and the Coachella and All-American canal lining projects, will be discussed in SDCWA's Urban Water Management Plan.

proposed development and utilization of their lands which would increase the tribal diversion of any of the additional water each year, thereby allowing the water to be diverted by Metropolitan.

Current Dry Condition

The Colorado River Basin has been experiencing a prolonged drought, where runoff above Lake Powell has been below average for twelve of the last sixteen years. Within those sixteen years, runoff in the Colorado River Basin above Lake Powell from 2000 through 2007 was the lowest eight-year runoff on record. While runoff returned to near normal conditions during 2008-2010, drought returned in 2012 with runoff in 2012 being among the four driest in history. During these drought conditions, Colorado River system storage has decreased to 50 percent of capacity.

Quagga Mussels

Quagga mussels were discovered in January of 2007 in Lake Mead and rapidly spread downstream to the Lower Colorado River. The presence and spawning of quagga mussels in the Lower Colorado River and in reservoirs located in southern California poses an immediate threat to water and power systems serving more than 25 million people in the southwestern United States. Quagga mussels (*Dreissena bugensis*) are a related species to the better-known zebra mussels (*Dreissena polymorpha*) and are indigenous to the Ukraine. They were introduced to the Great Lakes in the 1980s from fresh-water ballast of a transoceanic ship traveling from Eastern Europe. Although the introduction of these two species into drinking water supplies does not typically result in violation of drinking water standards, invasive mussel infestations can adversely impact aquatic environments and infrastructure. If unmanaged, invasive mussel infestations have been known to severely impact the aquatic ecology of lakes and rivers; clog intakes and raw water conveyance systems; reduce the recreational and aesthetic value of lakes and beaches; alter or destroy fish habitats; and render lakes more susceptible to deleterious algae blooms.

Implementation Approach

Metropolitan's planning strategy recognized explicitly that program development would play an important part in reaching the target level of deliveries from the CRA. The implementation approach explored a number of water conservation programs with water agencies that receive water from the Colorado River or are located in close proximity to the CRA. Negotiating the QSA was a necessary first step for all of these programs. On October 10, 2003, after lengthy negotiations, representatives from Metropolitan, IID, and CVWD executed the QSA and other related agreements. Parties involved also included SDCWA, the California Department of Water Resources (DWR), the California DFW, the U.S. Department of the Interior, and the San Luis Rey Settlement Parties. One of those related agreements was the Colorado River Water Delivery Agreement: Federal Quantification Settlement Agreement which specifies to which agencies water will be delivered under priorities 3a and 6a of the Seven Party Agreement during its term.

Metropolitan has identified a number of programs that could be used to achieve the regional long-term development targets for the CRA, as shown in Table 3-1. Metropolitan has entered into or is exploring agreements with a number of agencies as described in this section. In addition, Appendix 3 provides a detailed discussion of these programs and describes whether the programs are being implemented, are deferred, or are under investigation.

Colorado River Water Management Programs

Imperial Irrigation District / Metropolitan Water District Conservation Program

Under agreements executed in 1988 and 1989, Metropolitan has funded water efficiency improvements within IID's service area in return for the right to divert the water conserved by those investments. Under this program, IID implemented a number of structural and non-structural measures, including the lining of existing earthen canals with concrete, constructing local reservoirs and spill-interceptor canals, installing non-leak gates, and automating the distribution system. Other implemented programs include the delivery of water to farmers on a 12-hour rather than a 24-hour basis and improvements in on-farm water management through the installation of drip irrigation systems. Through this program, IID has conserved an additional 105 TAF per year on average upon completion of program implementation. Execution of the QSA and amendments to the 1988 and 1989 agreements resulted in changes in the availability of water under the program, extending the term to 2078 if the term of the QSA extends through 2077 and guaranteeing Metropolitan at least 85 TAF per year. The remainder of the conserved water is available to CVWD when needed.

Palo Verde Land Management, Crop Rotation, and Water Supply Program

In May 2004, Metropolitan's Board authorized a 35-year land management, crop rotation, and water supply program with PVID. Under the program, participating farmers in PVID are paid to reduce their water use by not irrigating a portion of their land. A maximum of 29 percent of the lands within the Palo Verde Valley can be fallowed in any given year. Under the terms of the QSA, water savings within the PVID service area are made available to Metropolitan. This program provides up to 133 TAF of water to be available to Metropolitan in certain years. In 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, and 2014 approximately 108.7, 105.0, 72.3, 94.3, 120.2, 116.3, 122.2, 73.7, 32.8, and 43.0 TAF of water, respectively, were saved and made available to Metropolitan. In March 2009, Metropolitan and PVID entered into a one-year supplemental fallowing program within PVID that provided for the fallowing of additional acreage, with savings of 24.1 TAF in 2009 and 32.3 TAF in 2010.

Management of Metropolitan-Owned Land in Palo Verde

In 2001, Metropolitan acquired 8,946 acres of irrigable farmland within the Palo Verde Irrigation District (PVID). These lands were leased to growers and were eventually enrolled in the PVID Land Management, Crop Rotation and Water Supply Program when it began in 2005. In 2015, Metropolitan acquired approximately 12,049 irrigable acres from Verbena LLC, bringing Metropolitan's ownership in the Palo Verde Valley to approximately 20,995 acres of irrigated farmland. The lands have historically been leased to growers who produced high water-using crops, such as alfalfa, using flood irrigation.

With the expiration of all leases in 2016, Metropolitan is currently identifying long-term management objectives for the land, including a shift toward less water-intensive agriculture. Strategies for reducing water use may include transitioning to low water-using crops, adopting efficient irrigation technologies such as microspray, and adopting deficit irrigation practices. In addition, Metropolitan is developing technologies for monitoring crop water use via remote sensing imagery and on-the-ground sensors.

By managing the lands for lower consumptive water use, Metropolitan expects to reduce water use in PVID by 15–29 TAF per year (additional to savings from the fallowing program), while maintaining the valley's agricultural economy. Under the terms of the QSA, any water savings within the PVID service area are made available to Metropolitan. The additional water savings are expected to accrue in 2017, after new leases for the lands are put into place.

Southern Nevada Water Authority and Metropolitan Storage and Interstate Release Agreement

SNWA has undertaken extraordinary water conservation measures to maintain its consumptive use within Nevada's basic apportionment of 300 TAF. The success of the conservation program has resulted in unused basic apportionment for Nevada. As SNWA expressed interest in storing a portion of the water with Metropolitan, the agencies, along with the United States and the Colorado River Commission of Nevada, entered into a storage and interstate release agreement in October 2004. Under the agreement, additional Colorado River water supplies are made available to Metropolitan when there is space available in the CRA to receive the water. SNWA stored approximately 330,000 acre-feet with Metropolitan through 2015. SNWA is not expected to call upon Metropolitan to return water until after 2019.

Lower Colorado Water Supply Project

In March 2007, Metropolitan, the City of Needles, and the USBR executed a Lower Colorado Water Supply Project contract. Under the contract, Metropolitan receives, on an annual basis, Lower Colorado Water Supply Project water unused by Needles and other entities adjacent to the river that do not have rights or have insufficient rights to use Colorado River water. The water supply for the project comes from groundwater wells located along the All-American Canal. A portion of the payments made by Metropolitan to Needles are placed in a trust fund for potentially acquiring a new water supply for the Project should the groundwater pumped from the project's wells become too saline for use. Metropolitan received 6.1 TAF from this project in 2014, and an estimated 5.9 TAF in 2015 based on the amount of water pumped and used by other project water users.

Lake Mead Storage Program

In May 2006, Metropolitan and the USBR executed an agreement for a demonstration program that allowed Metropolitan to leave conserved water in Lake Mead that Metropolitan would otherwise have used in 2006 and 2007. USBR would normally make unused water available to other Colorado River water users, so the program included a provision that water left in Lake Mead must be conserved through extraordinary conservation measures and not simply be water that was not needed by Metropolitan in the year it was stored. This extraordinary conservation was accomplished through savings realized under the Palo Verde Land Management, Crop Rotation, and Water Supply Program. Through the two-year demonstration program, Metropolitan created 44.8 TAF of "Intentionally Created Surplus" (ICS) water. In December 2007, Metropolitan entered into agreements to set forth the rules under which ICS water is developed, stored in, and delivered from Lake Mead. The amount of water stored in Lake Mead, created through extraordinary conservation, that is available for delivery in a subsequent year is reduced by a one-time deduction of five percent, resulting in additional system water in storage in the lake, and an annual evaporation loss of three percent, beginning in the year following the year the water is stored. Metropolitan created ICS water in 2009, 2010, 2011, and 2012 and withdrew ICS water in 2008, 2013, and 2014. As of January 1, 2015, Metropolitan had a total of 61.8 TAF of Extraordinary Conservation ICS water in Lake Mead.

The December 2007 federal guidelines concerning the operation of the Colorado River system reservoirs provided the ability for agencies to create "System Efficiency ICS" through the development and funding of system efficiency projects that save water that would otherwise be lost from the Colorado River. To that end, in 2008 the Central Arizona Water Conservation District (CAWCD), SNWA, and Metropolitan contributed funds for the construction of the Drop 2 (Brock) Reservoir by the USBR. The purpose of the Drop 2 (Brock) Reservoir is to increase the capacity to regulate deliveries of Colorado River water at Imperial Dam, reducing the amount

of excess flow downstream of the dam by approximately 70 TAF annually. In return for its $25 million net contribution toward construction, operation, and maintenance, 100 TAF of water that was stored in Lake Mead was assigned to Metropolitan as System Efficiency ICS. Through 2014, Metropolitan has diverted 35 TAF of this amount, with 65 TAF remaining in storage.

In 2009, Metropolitan entered into an agreement with the United States, SNWA, the Colorado River Commission of Nevada, and CAWCD to have USBR conduct a one-year pilot operation of the Yuma Desalting Plant at one-third capacity. The pilot project operated between May 2010 and March 2011 and provided data for future decision making regarding long-term operation of the Plant and developing a near-term water supply. Metropolitan's contribution toward plant operating costs secured 24.4 TAF of System Efficiency ICS which was stored in Lake Mead as of January 1, 2015.

Quagga Mussel Control Program

The presence and spawning of quagga mussels in the lower Colorado River from Lake Mead through Lake Havasu poses a threat to Metropolitan and other Colorado River water users due to the potential to continuously seed water conveyance systems with mussel larvae. Chlorination is the most frequently used means to control mussel larvae entering water systems.

Metropolitan developed the Quagga Mussel Control Program (QMCP) in 2007 to address the long term introduction of mussel larvae into the CRA from the lower Colorado River which is now heavily colonized from Lake Mead through Lake Havasu. The QMCP consists of surveillance activities and control measures. Surveillance activities are conducted annually alongside regularly scheduled 2-3 week-long CRA shutdowns. Control activities consist of continuous chlorination at the outlet of Copper Basin Reservoir (5 miles into the aqueduct), a mobile chlorinator for control of mussels on a quarterly basis at outlet towers, and physical removal of mussels from the trash racks at Whitsett Intake Pumping Plant in Lake Havasu. Since 2007, the CRA has scheduled 2 to 3 week-long shutdowns each year for maintenance and repairs which provide the opportunity for direct inspections for mussels and the additional benefit of desiccating quagga mussels. Recent shutdown inspections have demonstrated that the combined use of chlorine and regularly scheduled shutdowns effectively control mussel infestation in the CRA since only few and small mussels have been found during these inspections.

In addition, Metropolitan has appropriated $9.55 million to upgrade chlorination facilities in the aqueduct and at two additional locations in its system, the outlets of Lakes Mathews and Skinner. It is likely that additional upgrade costs will be incurred for these facilities. Chemical control (chlorination) at Copper Basin Reservoir, Lake Mathews, and the Lake Skinner Outlet costs approximately $3.0-3.2 million per year depending on the amount of Colorado River water conveyed through the aqueduct.

Achievements to Date

Metropolitan has developed a number of supply and conservation programs to increase the amount of supply available from the CRA. However, other users along the River have rights that will allow their water use to increase as their water demands increase. The Colorado River faces long-term challenges of water demands exceeding available supply with additional uncertainties due to climate change. Because Metropolitan holds the lowest priority rights in California during a normal Lake Mead storage condition, future supply available could decrease. Metropolitan's supply and conservation programs, as well as planned additional water management programs for 2035, are shown in Table 3-1.

Table 3-1
Colorado River Aqueduct
Program Capabilities
Year 2035
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
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 Following 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 State Water Project

Much of the SWP water supply passes through the San Francisco-San Joaquin Bay-Delta (Bay-Delta). The SWP consists of a series of pump stations, reservoirs, aqueducts, tunnels, and power plants operated by DWR. Figure 3-2 shows SWP facilities. This statewide water supply infrastructure provides water to 29 urban and agricultural agencies throughout California. More than two-thirds of California's residents obtain some of their drinking water from the Bay-Delta.

The original State Water Contract called for an ultimate delivery capacity of 4.2 MAF, with Metropolitan holding a contract for 1,911 TAF. For decades, the Bay-Delta has experienced water quality and supply reliability challenges and conflicts due to variable hydrology and environmental standards that limit pumping operations. SWP deliveries in the most recent critically dry years lagged these projections, and were 5 percent of contractual amounts in 2014 and 20 percent of contractual amounts in 2015. Consequently, Metropolitan's key concern is the continual deterioration of water supply reliability.

Another important concern for Metropolitan is sustained improvement in SWP water quality. Metropolitan must be able to meet the increasingly stringent drinking water regulations that are expected for disinfection by-products and pathogens in order to protect public health. Meeting these regulations will require improving the Bay-Delta water supply by cost effectively combining alternative source waters, source improvement, and treatment facilities. Additionally, Metropolitan requires water quality improvements of Bay-Delta water supplies to meet its 500 mg/L salinity blending objective in a cost-effective manner, while minimizing resource losses and helping to ensure the viability of regional recycling and groundwater management programs.

Background

The listing of several fish species as threatened or endangered under the federal or California Endangered Species Acts (respectively, the "Federal ESA" and the "California ESA" and, collectively, the "ESAs") has adversely impacted operations and limited the flexibility of the SWP. Currently, five species (the winter-run and spring-run Chinook salmon, Delta smelt, North American green sturgeon, and Central Valley steelhead) are listed under the ESAs. In addition, on June 25, 2009, the California Fish and Game Commission declared the longfin smelt a threatened species under the California ESA.

In 2004 and 2005, the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) issued biological opinions and incidental take statements that govern operations of the SWP and the CVP with respect to the Delta smelt, the winter-run and spring-run Chinook salmon, and the Central Valley steelhead. In July 2006, the USBR reinitiated consultation with the USFWS and NMFS with respect to the 2004 and 2005 biological opinions (with the addition of the North American green sturgeon, which was listed in April 2006) following the filing of legal challenges to those biological opinions and incidental take statements.

Figure 3-2
Current and Projected Facilities of the State Water Project

The Delta smelt, Sacramento River winter-run and spring-run salmon, and Central Valley steelhead are listed species under the Federal ESA. Because of the listing, the federal Central Valley Project (CVP) and SWP are prohibited from "taking" the fish in their operations and must consult with federal fisheries agencies to determine whether their operations will jeopardize the existence of the species, and if so, establish "reasonable and prudent alternatives" (RPAs) to normal project operations to minimize their impacts on the smelt and salmon.

In its revised Biological Opinion adopted on December 15, 2008, the USFWS provided criteria for operation of the CVP and SWP in a manner not likely to jeopardize the continued existence of the Delta smelt or adversely modify designated critical habitat. The NMFS made a similar finding with respect to project operation effects on the listed salmon and steelhead in its revised Biological Opinion issued on June 4, 2009. Earlier Biological Opinions were found invalid in litigation described in past annual audit-pending litigation reports. Consequently, both agencies issued an "incidental take statement" which allows the CVP and SWP to continue operation despite the fact that such operation would result in incidental take of some of the listed fish. Project operations must incorporate RPAs suggested by the agencies in the 2008 and 2009 Biological Opinions to ensure they are exempt from the otherwise applicable prohibition on "take" of Federal ESA-listed species.

In 2009, multiple lawsuits were filed by water contractors challenging the 2008 Delta smelt Biological Opinion and the USBR's failure to analyze the environmental impacts of accepting and implementing the Biological Opinion's RPAs under the National Environmental Policy Act (NEPA). The lawsuits were adjudicated before Judge Wanger in federal district court in Fresno, California. Following lengthy hearings, on December 14, 2010, the Court granted summary judgment to the water contractor plaintiffs, finding that the Delta smelt Biological Opinion was invalid and would have to be remanded to the USFWS to be redone. The Court issued a final amended judgment on May 18, 2011, remanding the matter to the USFWS. Appeals of the final amended judgment to the U.S. Court of Appeals for the Ninth Circuit were filed by the Federal Defendants and the Environmental-Interveners. The plaintiffs also filed cross-appeals. On March 13, 2014, the Ninth Circuit issued a 2-1 decision reversing the district court, and upholding the Delta smelt Biological Opinion *San Luis & Delta Mendota Water Authority v. Jewell*, 747 F.3d 581 (9th Cir. 2014). The two-judge majority ruled that the district court should not have considered extra-record testimony of experts retained by the parties, and that the Biological Opinion and RPA restrictions were supported by the best available science and were not arbitrary and capricious.[5] In October 2014, Metropolitan and other water contractors petitioned the U.S. Supreme Court for a writ of certiorari for the Court's review of whether USFWS must consider economic impacts of the RPA restrictions on the general public and third parties. On January 12, 2015, the U.S. Supreme Court denied the petitions. *Stewart & Jasper Orchards v. Jewell*, U.S., No. 14-377, *cert. denied* 1/12/15, *State Water Contractors v. Jewell*, U.S., No. 14-402, *cert. denied* 1/12/15. The Court's orders let stand the March 2014 Ninth Circuit ruling upholding the Biological Opinion and RPAs.

In 2009, multiple lawsuits were also filed challenging the 2009 salmon Biological Opinion and also adjudicated before Judge Wanger in federal district court. On September 20, 2011, the Court issued a decision that invalidated the salmon Biological Opinion and remanded it to NMFS for preparation of a new Biological Opinion. Both the Environmental-Interveners and the Federal Defendants appealed the final judgment to the Ninth Circuit. In a decision issued on

[5] The Ninth Circuit confirmed the District Court ruling that USBR must analyze the RPAs under NEPA. USBR has prepared a Final Environmental Impact Statement analyzing the impacts of implementing the RPAs in both Biological Opinions and expects to issue a Record of Decision in early 2016. It remains to be seen whether USBR will approve an alternative to the RPAs or how that may affect SWP supplies.

December 22, 2014, a three-judge panel of the Ninth Circuit unanimously reversed the district court decision by Judge Wanger. The ruling validates the Biological Opinion and the RPAs issued by NMFS in 2009, which include seasonal limits on export and river operations imposed to protect the salmonid species.

The impact on SWP deliveries attributable to the Delta smelt and salmonid species biological opinions combined is estimated to be 1.0 MAF in an average year, reducing SWP deliveries from approximately 3.3 MAF to approximately 2.3 MAF for the year under average hydrology.

In addition to the litigation under the Federal ESA, in March 2009, the State Water Contractors filed suit in Sacramento Superior Court challenging the California ESA 2081 permit that authorizes the incidental take of longfin smelt from SWP operations. The lawsuit alleges that the restrictions on water exports imposed under the 2081 California ESA permit are excessive and are not scientifically justified. This case was voluntarily dismissed without prejudice in February 2014 pursuant to a settlement agreement which provides for dismissal of the litigation and the establishment of a collaborative longfin smelt science study program.

DWR has altered the operations of the SWP to accommodate species of fish listed under the ESAs. These changes in project operations have adversely affected SWP deliveries. Between 2008 and 2014, restrictions on Bay-Delta pumping under the Biological Opinion have reduced deliveries of SWP water by 3 MAF to the state water contractors and by approximately 1.5 MAF to Metropolitan.

Operational constraints likely will continue until a long-term solution to the problems in the Bay-Delta is identified and implemented. The Delta Vision process, established by Governor Schwarzenegger, was aimed at identifying long-term solutions to the conflicts in the Bay-Delta, including natural resource, infrastructure, land use, and governance issues. In addition, State and federal resource agencies and various environmental and water user entities are currently engaged in the development of the Bay Delta Conservation Plan (BDCP)/California WaterFix, which is aimed at making physical and operational improvements to the SWP system in the Delta necessary to restore and protect ecosystem health, south-of-Delta SWP and CVP water supplies, and water quality.

Other issues, such as the recent decline of some fish populations in the Bay-Delta and surrounding regions and certain operational actions in the Bay-Delta, may significantly reduce Metropolitan's water supply from the Bay-Delta. Biological opinions or 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 under the ESAs, or new regulatory requirements imposed by the SWRCB 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. Metropolitan cannot predict the ultimate outcome of any of the litigation or regulatory processes described above, but believes they could have an adverse impact on the operation of the SWP pumps, Metropolitan's SWP supplies, and Metropolitan's water reserves.

Changed Conditions

In July 2015, DWR released the 2015 State Water Project Delivery Capability Report. The 2015 Delivery Capability Report provides estimates of the current (2015) and future (2035) SWP delivery capability for each SWP contractor under a range of hydrologic conditions. These estimates incorporate regulatory requirements in accordance with USFWS and NMFS biological opinions. In addition, these estimates of future capability also reflect potential impacts of climate change and sea level rise.

Metropolitan used a number of modeling studies from the 2015 Delivery Capability Report for its SWP supplies forecasts during the 2015 UWMP planning horizon. Metropolitan used the Base Scenario as the current 2015 condition and transitioned to the delivery capability from the Early Long-Term in the next five years. For 2020 through 2029, Metropolitan uses the forecasts from the Existing Conveyance Low Outflow (ECLO) scenario. Metropolitan uses the Alternative 4a study associated with the recirculated draft environmental impact report (EIR)/supplemental draft environmental impact statement (EIS) on the California Water Fix for SWP deliveries for 2030 and beyond.

Implementation Approach

Metropolitan's implementation approach for the SWP depends on the full use of the current State Water Contract provisions, including its basic contractual amounts, Article 21 interruptible supplies, and Turnback Pool supply provisions. In addition, it requires successful negotiation and implementation of a number of agreements**,** including the Sacramento Valley Water Management (Phase 8 Settlement) Agreement, and the BDCP/California WaterFix. Each of these stakeholder processes or agreements involves substantial Metropolitan and member agency staff involvement to represent regional interests. Metropolitan is committed to working collaboratively with DWR, SWP contractors, and other stakeholders to ensure the success of these extended negotiations and programs.

SWP Reliability

This discussion provides details of the major actions Metropolitan is undertaking to improve SWP reliability. The BDCP/California WaterFix is being prepared through a collaboration of state, federal, and local water agencies, state and federal fish agencies, environmental organizations, and other interested parties. At the outset of the BDCP process, a planning agreement was developed and executed among the participating parties, and a Steering Committee was formed. The plan would identify a set of water flow and habitat restoration actions that would contribute to the recovery of endangered and sensitive species and their habitats in California's Bay-Delta. The goal of the BDCP was to provide for both species/habitat protection and improved reliability of water supplies.

The First Administrative Draft of the BDCP was released in March 2012. The Administrative Draft EIR/EIS analyzed 15 alternatives, including a broad combination of water delivery configurations, capacities, operations and habitat restoration targets, as well as a no action alternative. The alternatives are the result of public scoping sessions conducted in 2008 and 2009, the Sacramento-San Joaquin Delta Reform Act, ongoing public discussions, and input from responsible/trustee state agencies and NEPA cooperating agencies.

In July 2012, Governor Jerry Brown and U.S. Interior Secretary Ken Salazar outlined revisions to the proposed BDCP plan, along with a full range of alternative proposals. Elements of the preferred proposal include construction of two side-by-side tunnels and water intake facilities with a total capacity of 9,000 cfs - down from the earlier proposal of 15,000 cfs. Operation of the facilities was planned to be phased in over several years.

Throughout 2012 and 2013, additional public meetings were held to answer questions and gather public comments. In August 2013, an optimized proposal was released that balanced costs, engineering design, and ease of construction while significantly reducing local dislocation and disturbance in the Delta.

In December 2013, the State released the Draft BDCP and the Draft EIR/EIS. The documents detailed 22 specific actions, called Conservation Measures, which included new water delivery

facilities in the north Delta, as well as measures to restore or protect up to 150,000 acres of habitat and measures to address other stressors to fish and wildlife in the Delta.

In December 2014, the State announced further refinements to the water delivery facilities to reduce impacts to Delta communities, minimize disturbances or dislocation of Greater Sandhill Cranes, and improve the long-term reliability and operation of the proposed infrastructure. During the 2013-2014 public comment period, commenters expressed concerns about the impacts of a large-scale habitat restoration effort on the Delta economy and community character. Other comments articulated concerns about the expected effectiveness of certain habitat restoration measures, the nature of climate change, and the related level of scientific uncertainty. Additionally, there were widespread concerns that the 50-year permit term sought under the BDCP was too long given the uncertainties about climate change and the effectiveness of habitat restoration, and commenters suggested that DWR should pursue permits of shorter duration. These comments prompted the State to reconsider the BDCP's ability to justify the continued pursuit of 50-year permits associated with a comprehensive conservation plan and resulted in the consideration of a sub-alternative to the original proposed project, as well as additional sub-alternatives that do not include a 50-year permit application or associated conservation plan.

In April 2015, State agencies announced a modified preferred alternative, Alternative 4A. Alternative 4A (California WaterFix) was developed as the new CEQA and NEPA Preferred Alternative, replacing Alternative 4 (the proposed BDCP). Alternative 4A includes the conveyance facilities proposed under Alternative 4 and those mitigation measures and environmental commitments needed to obtain necessary permits and authorizations for implementation under Section 7 of the Federal ESA and through the California Department of Fish and Wildlife's 2081(b) process.

California WaterFix and EcoRestore would be implemented under different Federal and State ESA regulatory permitting process (Section 7 versus Section 10(a) of the Federal ESA, and pursuant to section 2081 of the State ESA instead of the Natural Community Conservation Planning Act). This would fulfill the requirement of the 2009 Delta Reform Act to contribute toward meeting the coequal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem.

The new water conveyance facilities would be constructed and operated under the California WaterFix, which proposes design changes to the water conveyance facilities. Refinements to the design reduce the overall environmental/construction impacts, and increase long term operational and cost benefits. Some of the engineering configuration improvements include moving the tunnel alignment away from local communities and environmentally sensitive areas. Reconfiguration of intake and pumping facilities lessen construction impacts in local communities and longer term operational impacts.

The main objective under the EcoRestore Program is the restoration of at least 30,000 acres of Delta habitat, with the near-term goal of making significant strides toward that objective by 2020. These restoration programs would include projects and actions that are in compliance with pre-existing regulatory requirements designed to improve the overall health of the Delta. Other priority restoration projects would also be identified by the Sacramento-San Joaquin Delta Conservancy and other agencies and local governments. Funding would be provided through multiple sources, including various local and federal partners, state bonds, and other state-mandated funds. State Water Project/Central Valley Project contractors would provide funds as part of existing regulatory obligations. The California WaterFix is being evaluated in the partially recirculated draft EIR/supplemental EIS released in July 2015. In that document, the cumulative impacts of the California WaterFix and EcoRestore Program are evaluated,

along with other reasonably foreseeable future projects. The public comment period closed on October 30, 2015. DWR and USBR released a working draft of the ESA biological assessment on January 15, 2016 and the independent science peer review of the draft biological assessment began on March 25, 2016.

Lead agencies for the BDCP/California WaterFix EIR/EIS are DWR, USBR, the USFWS, and NMFS, in cooperation with the California DFW, the U.S. Environmental Protection Agency (USEPA), and the U.S. Army Corps of Engineers.

Monterey Amendment

The Monterey Amendment originated from disputes between the urban and agricultural SWP contractors over how contract supplies are to be allocated in times of shortage. In 1994, in settlement discussions in Monterey, the contractors and DWR reached an agreement to settle their disputes by amending certain provisions in the long-term water supply contracts. These changes, known as the Monterey Amendment, 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. In turn, the agricultural contractors agreed to permanently transfer 130 TAF to urban contractors and permanently retire 45 TAF of their contracted supply. The amendment facilitated several important water supply management practices including groundwater banking, voluntary water marketing, and more flexible and efficient use of SWP facilities such as borrowing from Castaic Lake and Lake Perris and using carryover storage in San Luis Reservoir to enhance dry-year supplies. It also provided for the transfer of DWR land to the Kern County Water Agency for development of the Kern Water Bank. The Monterey Amendment was challenged in court, and the original EIR invalidated. Following a settlement, DWR completed a new EIR and concluded the CEQA review in May 2010.

However, the project has been challenged again in a new round of lawsuits. Central Delta Water Agency, South Delta Water Agency, California Water Impact Network, California Sportfishing Protection Alliance, and the Center For Biological Diversity filed a lawsuit against DWR in Sacramento County Superior Court challenging the validity of the EIR under CEQA and the validity of underlying agreements under a reverse validation action (the "*Central Delta I*" case). These same plaintiffs filed a reverse validation lawsuit against the Kern County Water Agency in Kern County Superior Court ("*Central Delta II*"). This lawsuit targets a transfer of land from Kern County Water Agency to the Kern Water Bank, which was completed as part of the original Monterey Agreement. The third lawsuit is an EIR challenge brought by Rosedale-Rio Bravo Water Storage District and Buena Vista Water Storage District against DWR in Kern County Superior Court ("*Rosedale*"). The *Central Delta II* and *Rosedale* cases were transferred to Sacramento Superior Court, and the three cases were consolidated for trial.

In January 2013, the Court ruled that the validation cause of action in *Central Delta I* was time-barred by the statute of limitations. On October 2, 2014, the court issued its final rulings in *Central Delta I* and *Rosedale*, holding that DWR must complete a limited scope remedial CEQA review addressing the potential impacts of the Kern Water Bank. However, the court's ruling also allows operation of the SWP to continue under the terms of the Monterey Agreement while the remedial CEQA review is prepared and leaves in place the underlying project approvals while DWR prepares the remedial CEQA review. The *Central Delta II* case was stayed pending resolution of the *Central Delta I* case. The plaintiffs have appealed the decision.

SWP Terminal Storage

Metropolitan has contractual rights to 65 TAF of flexible storage at Lake Perris (East Branch terminal reservoir) and 154 TAF of flexible storage at Castaic Lake (West Branch terminal

reservoir). This storage provides Metropolitan with additional options for managing SWP deliveries to maximize yield from the project. Over multiple dry years, it can provide Metropolitan with 73 TAF of additional supply. In a single dry year like 1977, it can provide up to 219 TAF of additional supply to Southern California.

Yuba Dry Year Water Purchase Program

In December 2007, Metropolitan entered into an agreement with DWR providing for Metropolitan's participation in the Yuba Dry Year Water Purchase Program between Yuba County Water Agency and DWR. This program provides for transfers of water from the Yuba County Water Agency during dry years through 2025.

Desert Water Agency/Coachella Valley WD SWP Table A Transfer

Under the transfer agreement, Metropolitan transferred 100 TAF of its SWP Table A contractual amount to Desert Water Agency/CVWD (DWCV). Under the terms of the agreement, DWCV pays all SWP charges for this water, including capital costs associated with capacity in the California Aqueduct to transport this water to Perris Reservoir, as well as the associated variable costs. The amount of water actually delivered in any given year depends on that year's SWP allocation. Water is delivered through the existing exchange agreements between Metropolitan and DWCV, under which Metropolitan delivers Colorado River supplies to DWVC equal to the SWP supplies delivered to Metropolitan. While Metropolitan transferred 100 TAF of its Table A amount, it retained other rights, including interruptible water service; its full carryover amounts in San Luis Reservoir; its full use of flexible storage in Castaic and Perris Reservoirs; and any rate management credits associated with the 100 TAF. In addition, 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. In a single critically dry-year like 1977, the call-back provision of the entitlement transfer can provide Metropolitan about 13 TAF of SWP supply. In multiple dry years like 1990-1992, it can provide Metropolitan about 19 TAF of SWP supply.

Desert Water Agency/Coachella Valley WD 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. In addition to their Table A supplies, Desert Water Agency and CVWD, subject to Metropolitan's written consent, may take delivery of SWP supplies available under Article 21 and the Turn-back Pool Program. 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. This program allows Metropolitan to maximize delivery of SWP and Colorado River water in such years. These Table A deliveries are incorporated into the estimate of SWP Deliveries under Current Programs shown in Table 3-2.

Desert Water Agency/Coachella Valley WD Other SWP Deliveries

Since 2008, Metropolitan has provided Desert Water Agency and CVWD written consent to take delivery of non-SWP supplies separately acquired by each agency from the SWP facilities. These deliveries include water acquired from the Yuba Dry Year Water Purchase Program and the 2009 Drought Water Bank. Metropolitan has also consented to:

- 10 TAF of exchange deliveries to CVWD for non-SWP water acquired from the San Joaquin Valley from 2008 through 2010,
- 36 TAF of exchange deliveries to Desert Water Agency for non-SWP water acquired from the San Joaquin Valley from 2008 through 2015, and
- 16.5 TAF of exchange deliveries to CVWD from groundwater storage of Kern River flood flows or SWP water delivered from Kern County Water Agency provided by Rosedale Rio Bravo Water Storage District from 2012 through 2035.

Table 3-2 summarizes Metropolitan's SWP supply range for 2035. Appendix 3 provides a detailed discussion of the current SWP programs and programs that are under development.

Table 3-2
California Aqueduct
Program Capabilities
Year 2035
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
MWD Table A	362,000	257,000	976,000
DWCV Table A	37,000	26,000	99,000
San Luis Carryover [1]	80,000	240,000	240,000
Article 21 Supplies	0	0	8,000
Yuba River Accord Purchase	0	0	0
Subtotal of Current Programs	***479,000***	***523,000***	***1,323,000***
Programs Under Development			
Delta Improvements	87,000	178,000	248,000
Subtotal of Proposed Programs	***87,000***	***178,000***	***248,000***
Maximum Supply Capability	**566,000**	**701,000**	**1,571,000**

[1] Includes DWCV carryover.

SWP Water Quality

Metropolitan requires a safe drinking water supply from the Bay-Delta to meet current and future regulatory requirements for public health protection. Finding cost-effective ways to reduce total organic carbon (TOC), bromide concentrations, pathogenic microbes, and other unknown contaminants from the Bay-Delta water supply is one of Metropolitan's top priorities. Metropolitan also requires a SWP supply that is consistently low in salinity - Total Dissolved Solids (TDS) - so it can blend SWP water with higher-salinity Colorado River water to achieve salinity goals for its member agencies. In addition, Metropolitan needs consistently low-salinity SWP water to increase in-basin water recycling and groundwater management programs. These programs require that blended water supplied to the member agencies meets the TDS goals adopted by Metropolitan's Board, which specify a salinity objective of 500 mg/L for blended imported water.

Metropolitan is actively involved in DWR's Municipal Water Quality Investigations (MWQI) Program. The highly variable quality of State Water Project water influences the operation of

Metropolitan's system and its water treatment process. Increasingly restrictive State and Federal drinking water standards, concerns over emerging contaminants such as personal care products and pharmaceuticals, algal taste and odors, and Delta ecosystem fisheries issues are critical variables. DWR's MWQI Program strives to monitor, protect, and improve drinking water quality of Delta water deliveries to the urban State Water Contractors and other users of Delta water. The program focuses on issues related to drinking water quality through regular water quality monitoring, special field and laboratory studies, the use of forecasting tools such as computer models and data management systems, and reporting. While the program has developed extensive monitoring in the Delta including real-time monitoring, increased monitoring along the California Aqueduct is the next major step.

Levee modifications at Franks Tract and other source control actions may significantly reduce ocean salinity concentrations in Delta water, which would benefit Delta water users and export interests alike. Franks Tract is an island located in the central Delta that was actively farmed until levee breaches in 1936 and 1938. Since 1938, the tract has remained a flooded island, and its levees remain in disrepair. Tidal flows in the Delta entrap saline ocean water in the flooded tract, resulting in degraded water quality for both in-Delta and export users. Recent computer modeling analyses by Metropolitan, DWR, and the US Geological Survey indicate that reducing this salinity intrusion by partially closing existing levee breach openings and/or building radial gate flow control structures will significantly reduce TDS and bromide[7] concentrations in water from the Delta during the summer and fall months and in drought years. Based on Metropolitan's analysis, improvements to Franks Tract alone could reduce peak bromide concentrations in the summer and fall months by about 33 percent at Contra Costa Water District's (CCWD) Rock Slough intake, by 27 percent at CCWD's Old River intake, and by 24 percent at the SWP intake in the South Delta.

DWR and USBR proposed to implement the Franks Tract Project to improve water quality and fisheries conditions in the Bay-Delta. DWR and USBR are evaluating installing operable gates to control the flow of water at key locations (Three Mile Slough and/or West False River) to reduce sea water intrusion, and to positively influence movement of fish species of concern to areas that provide favorable habitat conditions. By protecting fish resources, this project also would improve operational reliability of the SWP and CVP because curtailments in water exports (pumping restrictions) are likely to be less frequent.

The state has adopted an "equivalent level of public health protection" (ELPH) program that targets water quality actions outside the Delta. The Bay-Delta Program is coordinating a feasibility study on water quality improvement in the California Aqueduct.

Metropolitan and the Friant Water Users Authority (FWUA) have entered into a partnership to investigate the potential of enhancing the quantity and affordability of the eastern San Joaquin Valley's water supply while improving Southern California's water quality. The FWUA and Metropolitan studied projects that benefited both regions. Using Proposition 13 funds, an existing canal belonging to the Arvin-Edison Water Storage District was enlarged, enabling greater volumes of water to be exchanged between their groundwater and the California Aqueduct.

SWP System Outage and Capacity Constraints

As its infrastructure ages, the SWP becomes increasingly vulnerable to natural disasters, particularly the Delta levee system and the California Aqueduct, which are both susceptible to floods and earthquakes. In June 2004, a levee in the Jones Tract of the Delta failed, resulting in

[7] The importance of bromides is discussed in the Water Quality chapter.

total inundation of the island and disrupting SWP operations. Catastrophic loss of either the Delta levee system or the aqueduct would shut down the project, affecting the welfare of millions. While Metropolitan has made substantial investments in local resources and in-basin storage to insulate Southern California against loss of its imported water supplies, additional investment is needed in the at-risk infrastructure.

The Bay-Delta Levees Program coordinates Delta levee maintenance and improvement activities. Its goal is to protect water supplies needed for the environment, agriculture, and urban uses by reducing the threat of levee failure and seawater intrusion. Over the next two to three years, DWR and other agencies will carry out a Comprehensive Program Evaluation (CPE). It will incorporate the risk study that has been commissioned by DWR, including the currently-proposed expanded scope of that study. The CPE will: (a) supplement the DWR risk study to ensure that it considers all relevant levee risks, (b) include the development of a formal strategic plan that contains a description of any proposed future program changes, and (c) recommend priorities and estimate funding needs for the Levees Program. For example, the Army Corps of Engineers' (P.L. 84-99 ROD) target will be reevaluated as part of the CPE using information from the Risk Study.

The California Aqueduct remains susceptible to floods at several points as it travels from the Delta along the west side of the San Joaquin Valley. Key among these is where the aqueduct crosses the Arroyo Pasajero, an alluvial fan located near Coalinga, California. At that spot, the aqueduct effectively forms a barrier to Arroyo flood flows. Although flood control facilities were built to protect the aqueduct, the volumes of runoff and sediment deposition are much greater than originally estimated, so a significant flood risk remains. The aqueduct was severely damaged during March of 1995 when a flood overwhelmed control facilities and overtopped the aqueduct with 10 TAF of floodwater and an estimated 800,000 cubic yards of sediment. Impacts to downstream water users lasted through the summer of 1995. In December of 2004, DWR began construction of "Phase I" improvements to the aqueduct where it crosses the Arroyo. These improvements will increase the size of the detention basins west of the aqueduct to protect it against a 50-year storm event.

DWR is also investing in the replacement of aging SWP infrastructure critical to SWP operations. It is midway into its Turbine Rehabilitation Program at Oroville Reservoir's Hyatt-Thermalito complex. In 2004, DWR awarded a contract to replace four pumps at the Edmonston Pumping Plant. Moreover, improved maintenance procedures have decreased the amount of time pumps at Edmonston come off-line for maintenance to less than 10 percent of the time.

Because of the risk of a prolonged shutdown of the SWP caused by seismic or hydrologic events either within the Delta or along the California Aqueduct, Metropolitan has acted decisively to ensure that Southern California has adequate emergency storage. Diamond Valley Lake (DVL) and SWP terminal reservoir storage, combined with member-agency emergency storage, are jointly capable of providing the region with a six-month supply of water if combined with a temporary 25 percent reduction in demand. Metropolitan engineering studies indicate this would provide sufficient time to repair the SWP and resume delivery.

Metropolitan is investigating potential opportunities for carbon sequestration in subsided islands within the legal Delta to create a potential revenue source for Delta landowners and other interested parties. Farming the Delta peat soils generates a large amount of carbon dioxide (CO_2), and growing native vegetation (versus continued farming operations) not only decreases greenhouse gas emissions, but can actually sequester an even larger amount of CO_2 over time while rebuilding new peat soils. With rebuilding new peat soils to historic elevations, the risk of levee failure would decrease, and may eventually be eliminated.

Achievements to Date

SWP Reliability

Delta Vision

The Delta has suffered from multiple crises for years – ecosystem, water supply, levee stability, water quality, policy, program, and litigation. The ecosystem condition continues to deteriorate, with record-low reports of fish populations, Delta smelt, and other species on the brink of extinction, and the commercial salmon season shut down completely for two years in a row. Continued drought conditions and court-ordered restrictions on water exports have led to reductions in water deliveries to contractors. Deteriorating levees, land subsidence, earthquake risk, and climate change all contribute to growing concerns about mass Delta levee failure. Delta water quality also continues to be a critical issue, as both local agricultural and urban communities contribute contaminants to the system. Litigation related to Delta environmental concerns and the proposed California WaterFix/ EcoRestore/ BDCP will likely continue in the future.

Metropolitan's Long-Term Action Plan

Besides the short- and mid-term actions described earlier in Section 1.4, Metropolitan's adopted Delta action plan in June 2007 includes a long-term Delta Plan. The long-term action plan recognizes the need for a global, comprehensive approach to the fundamental issues and conflicts in the Delta to result in a truly sustainable Delta. A piecemeal approach cannot satisfy the many stakeholders that have an interest in the Delta and will fail; there must be a holistic approach that deals with all issues simultaneously. In dealing with the basic issues of the Delta, solutions must address the physical changes required, as well as the financing and governance. There are three basic elements that must be addressed: Delta ecosystem restoration, water supply conveyance, and flood control protection and storage development. In addition, the state needs to establish governance structures and financing approaches to implement and manage the three identified elements.

Governor's Delta Vision Process

Through this enduring Delta crisis, the Legislature and the Governor initiated, in 2006, a process to develop a new long-term vision for the Delta. SB 1574 (Kuehl/2006) required a cabinet committee to present recommendations for a Delta strategic vision. The governor created a Delta Vision Blue-Ribbon Task Force to advise the Cabinet Committee. The Task Force produced an October 2008 Strategic Plan, which the Cabinet Committee largely adopted and submitted, with its recommendations, to the Legislature on January 3, 2009. Metropolitan, as a stakeholder to the process, provided input to the Task Force.

The 2009 Delta Legislation

After delivery of the Delta Vision recommendations, the Legislature held informational hearings from Delta experts, Task Force members, and the Schwarzenegger Administration, as well as the public at large, and engaged in vigorous water policy discussions. Following the informational hearings, several legislators began developing detailed legislation which culminated in pre-print proposals being issued in early August of 2009 for public review and discussion over the summer recess. The Assembly Water, Parks and Wildlife Committee and the Senate Natural Resources and Water Committee then held joint informational hearings on the pre-print proposals and received extensive public comment. Thereafter, legislative leadership appointed a conference committee, which convened and held additional public hearings,

with further legislator discussions on key issues. That work continued into the 7th Extraordinary Session, which was called by the governor specifically to address the pending Delta and water issues, and culminated in the signing of a historic package of bills. One of the keystones of that package was SB X7-1, which reformed Delta policy and governance. Specifically, SB X7-1:

- Establishes a new legal framework for Delta management, emphasizing the coequal goals of "providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem" as foundation for state decisions as to Delta management.
- Reconstitutes and redefines role of the Delta Protection Commission (DPC), to narrow membership to focus on local representation and to expand the DPC's role in economic sustainability.
- Creates a new Sacramento-San Joaquin Delta Conservancy (Conservancy), to support efforts that advance environmental protection and the economic well-being of Delta residents.
- Creates the Delta Stewardship Council (Council) as an independent state agency to guide actions in the Delta which furthers the coequal goals of Delta restoration and water supply reliability.
- Repeals the CALFED Bay-Delta Authority Act and transfers existing staff, contracts, etc. to the Council.
- Creates the Delta Independent Science Board (Science Board) and Delta Science Program.
- Requires the State Water Resources Control Board (SWRCB), by August 12, 2010, to develop new flow criteria for the Delta ecosystem necessary to protect public trust resources.
- Requires the Department of Fish and Game (DFG), now the Department of Fish and Wildlife (DFW), by December 31, 2010, to develop and recommend to the SWRCB flow criteria and quantifiable biological objectives for aquatic and terrestrial species.
- Creates a Delta Watermaster as the enforcement officer for the SWRCB Division of Water Rights in the Delta.
- Requires the Council to develop, adopt, and commence implementation of the "Delta Plan" by January 1, 2012, with a report to the Legislature by March 31, 2012.
- Requires the DPC to develop a proposal to protect, enhance, and sustain the unique cultural, historical, recreational, agricultural, and economic values of the Delta as an evolving place.
- Requires the Delta Plan to further the coequal goals of Delta ecosystem restoration and a reliable water supply.
- Requires the Delta Plan to promote statewide water conservation, water use efficiency, and sustainable use of water, as well as improvements to water conveyance/storage and operation of both to achieve the coequal goals.
- Requires the Delta Plan to attempt to reduce risks to people, property, and state interests in the Delta by promoting effective emergency preparedness, appropriate land uses, and strategic levee investments.
- Announces a statewide policy to reduce reliance on the Delta in meeting California's future water supply needs through a statewide strategy of investing in improved regional supplies,

conservation, and water use efficiency. Each region that depends on water from the Delta watershed shall improve its regional self-reliance for water through investment in water use efficiency, water recycling, advanced water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts.

- Requires the Council to include the Bay Delta Conservation Plan (BDCP) in the Delta Plan and makes the BDCP eligible for state funding if:
  - The BDCP complies with Natural Community Conservation Planning Act (NCCPA) and is approved as a Habitat Conservation Plan under the Federal ESA.
  - The BDCP complies with the California Environmental Quality Act and includes a full range of alternatives, including a reasonable range of flow criteria, rates of diversion, and other operational criteria.
  - DWR consults with the Council and Science Board during development of the BDCP.
  - DFW approves the BDCP as a Natural Community Conservation Plan and determines that it meets the requirements for incorporation into the Delta Plan.

SWP Water Quality

The most significant achievement for SWP water quality has been continued definition and advancement of the Delta Improvement Package. Most notably, the Franks Tract studies identified cost-effective ways to achieve significant improvements in the quality of Delta export water.

Progress was also made on the Southern California-San Joaquin Regional Water Quality Exchange Project. In 2009, Metropolitan and Arvin Edison Water Storage District enlarged their South Canal to enable exchanging more water between their groundwater basins and the California Aqueduct. Their relatively pure water allows Metropolitan to improve source water, and increase quantities, during times when quality and quantity are relatively poor. This project also allows Metropolitan better access to water it has stored in the Arvin Edison Groundwater Storage Project.

SWP System Reliability

The completion and filling of DVL marked the most important achievement with respect to protecting Southern California against an SWP system outage. Water began pouring into the reservoir in November 1999, and the lake was filled by early 2003. The lake can hold up to 810 TAF which provides Southern California with a six-month emergency water supply, as well as carryover and regulatory storage.

The Inland Feeder Project

The Inland Feeder is a 44-mile-long conveyance system that connects the State Water Project to DVL and the CRA. The Inland Feeder provides greater flexibility in managing Metropolitan's major water supplies and allows greater amounts of State Water Project water to be accepted during wet seasons for storage in DVL. In addition, the Inland Feeder increases the conveyance capacity from the East Branch of the SWP by 1,000 cubic feet per second, allowing the East Branch to operate up to its full capacity. The project also improves the quality of the Southland's drinking water by allowing more uniform blending of better quality water from the SWP with Colorado River supplies, which have a higher mineral content. Construction of the Inland Feeder was completed in September 2009.

3.3 Central Valley/State Water Project Storage and Transfer Programs

Metropolitan endeavors to increase the reliability of supplies received from the California Aqueduct by developing flexible SWP storage and transfer programs. Over the years, Metropolitan has developed numerous voluntary SWP storage and transfer programs, to secure additional dry-year water supplies.

Background

Metropolitan has a long history of managing the wide fluctuations of SWP supplies from year to year by forming partnerships with Central Valley agricultural districts along the California Aqueduct, as well as with other Southern California SWP Contractors. These partnerships allow Metropolitan to store its SWP supplies during wetter years for return in future drier years. Some programs also allow Metropolitan to purchase water in drier years for delivery via the California Aqueduct to Metropolitan's service area.

Because yields from individual programs can vary widely depending on hydrologic conditions and CVP/SWP operations, the dry-year yields for the various programs reported in this section are expected values only. In any given year, actual yields could depart from the expected values. Despite that uncertainty, Metropolitan's models of these programs indicate that in the aggregate, they can meet the resource target under a wide range of hydrologic conditions and CVP/SWP operations.

In addition, the SWP storage and transfer programs have served to demonstrate the value of partnering, and increasingly, Central Valley agricultural interests see partnering with Metropolitan as a sensible business practice beneficial to their local district and regional economy.

Implementation Approach

Metropolitan is currently operating several SWP storage programs that serve to increase the reliability of supplies received from the California Aqueduct. Metropolitan is also pursuing a new storage program with Antelope Valley-East Kern Water Agency, which is currently under development. In addition, Metropolitan pursues SWP water transfers on an as needed basis. Table 3-3 lists the expected yields from these storage and transfer programs. Figure 3-3 shows the location of Metropolitan's statewide groundwater banking programs.

Storage and Transfer Programs

Semitropic Storage Program

Metropolitan has a groundwater storage program with Semitropic Water Storage District located in the southern part of the San Joaquin Valley. The maximum storage capacity of the program is 350 TAF. The specific amount of water Metropolitan can store in and subsequently expect to receive from the program depends upon hydrologic conditions, any regulatory requirements restricting Metropolitan's ability to export water for storage, and the demands placed on the Semitropic Program by other program participants. In 2014, Metropolitan amended the program to increase the return yield by an additional 13.2 TAF per year. The minimum annual yield available to Metropolitan from the program is currently 34.7 TAF, and the maximum annual yield is 236.2 TAF, depending on the available unused capacity and the SWP allocation. During wet years, Metropolitan has the discretion to use the program to store portions of its SWP water that are in excess of the amounts needed to meet Metropolitan's service area demand. In Semitropic, the water is delivered to district farmers who use the water in lieu of pumping groundwater. During dry years, the district returns Metropolitan's previously

stored water to Metropolitan by direct groundwater pump-in return and the exchange of SWP supplies.

Arvin-Edison Storage Program

Metropolitan amended the groundwater storage program with Arvin-Edison Water Storage District in 2008 to include the South Canal Improvement Project. The project increases the reliability of Arvin-Edison returning higher water quality to the California Aqueduct. In addition, Metropolitan and Arvin-Edison often enter into annual operational agreements to optimize program operations in any given year. The program storage capacity is 350 TAF. The specific amount of water Metropolitan can expect to store in and subsequently receive from the program depends upon hydrologic conditions and any regulatory requirements restricting Metropolitan's ability to export water for storage. The storage program is estimated to deliver 75 TAF. During wet years, Metropolitan has the discretion to use the program to store portions of its SWP supplies which are in excess of the amounts needed to meet Metropolitan's service area demand. The water can be either directly recharged into the groundwater basin or delivered to district farmers who use the water in lieu of pumping groundwater. During dry years, the district returns Metropolitan's previously stored water to Metropolitan by direct groundwater pump-in return or by exchange of surface water supplies. In 2015, Metropolitan funded the installation of three new wells at a cost of $3 million that will restore the return reliability by 2.5 TAF per year. The funding will ultimately be recovered through credits against future program costs.

Table 3-3 summarizes Metropolitan's Central Valley/SWP transfer programs supply range for 2035. The supply capabilities shown reflect actual storage program conveyance constraints. In addition, SWP supplies are estimated using DWR's 2015 SWP Delivery Capability Report released in July 2015. Appendix 3 provides a detailed discussion of the current Central Valley and SWP storage and transfers programs and programs that are under development.

Table 3-3
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 (1922-2012)
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**

San Bernardino Valley MWD Storage Program

The San Bernardino Valley MWD Storage program allows for the purchase of a portion of San Bernardino Valley MWD's SWP supply. The program includes a minimum purchase provision of 20 TAF and the option of purchasing additional supplies when available. This program can deliver between 20 TAF and 70 TAF in dry years, depending on hydrologic conditions. The expected delivery for a single dry year similar to 1977 is 20 TAF should supplies be available. The agreement with San Bernardino Valley MWD also allows Metropolitan to store up to 50 TAF of transfer water for use in dry years. The agreement can be renewed until December 31, 2035.

San Gabriel Valley MWD Exchange Program

The San Gabriel Valley MWD program allows for the exchange of up to 5 TAF each year. For each acre-foot Metropolitan delivers to the City of Sierra Madre, a San Gabriel Valley MWD member agency, San Gabriel Valley MWD provides two acre-feet to Metropolitan in the Main San Gabriel Basin, up to 5 TAF. The program provides increased reliability to Metropolitan by allowing additional water to be delivered to Metropolitan's member agencies Three Valleys MWD and Upper San Gabriel Valley MWD.

Antelope Valley-East Kern Water Agency Exchange and Storage Program

The Antelope Valley-East Kern Water Agency (AVEK) exchange and storage program provides Metropolitan with additional supplies and increased reliability. Under the exchange program, for every two acre-feet Metropolitan receives, Metropolitan returns one acre-foot 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 groundwater storage program has 250 TAF of storage capacity. The program is capable of providing up to 50 TAF of dry-year supply. In 2015, Metropolitan funded the cross river pipeline that, when completed, will help improve Metropolitan's return reliability by reducing losses during exchanges. Water for storage can be either directly recharged into the groundwater basin or delivered to district farmers who use the water in lieu of pumping groundwater. During dry years, the district returns Metropolitan's previously stored water to Metropolitan 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 agreement was amended in 2011 to allow for the cumulative storage of up to 390 TAF. The agreement allows for Metropolitan to store water in an exchange account for later return. Through 2021, and when the State Water Project allocation is 60 percent or less, Metropolitan can annually withdraw the Mojave Water Agency's SWP contractual amounts in excess of a 10 percent reserve. When the SWP allocation is over 60 percent, the reserved amount for Mojave's local needs increases to 20 percent. Under a 100 percent allocation, the State Water Contract provides Mojave Water Agency 82.8 TAF of water.

Central Valley Transfer Programs

Metropolitan secures Central Valley water transfer supplies via spot markets and option contracts to meet its service area demands when necessary. Hydrologic and market conditions, and regulatory measures governing Delta pumping plant operations, will determine the amount of water transfer activity occurring in any year. Recent transfer market activity, described below, provides examples of how Metropolitan has secured water transfer supplies as a resource to fill anticipated supply shortfalls needed to meet Metropolitan's service area demands.

In 2003, Metropolitan secured options to purchase approximately 145 TAF of water from willing sellers in the Sacramento Valley during the irrigation season. These options protected against potential shortages of up to 650 TAF within Metropolitan's service area that might have arisen from a decrease in Colorado River supply or as a result of drier-than-expected hydrologic conditions. Using these options, Metropolitan purchased approximately 125 TAF of water for delivery to the California Aqueduct.

In 2005, Metropolitan, in partnership with seven other State Water Contractors, secured options to purchase approximately 130 TAF of water from willing sellers in the Sacramento Valley, of which Metropolitan's share was 113 TAF. Metropolitan also had the right to assume the options of the other State Water Contractors if they chose not to purchase the transfer water. Due to improved hydrologic conditions, Metropolitan and the other State Water Contractors did not exercise these options.

In 2008, Metropolitan, in partnership with seven other State Water Contractors, secured approximately 40 TAF of water from willing sellers in the Sacramento Valley, of which Metropolitan's share was approximately 27 TAF.

In 2009, Metropolitan, in partnership with 8 other buyers and 21 sellers, participated in a statewide Drought Water Bank, which secured approximately 74 TAF, of which Metropolitan's share was approximately 37 TAF.

In 2010, Metropolitan, in partnership with three other State Water Contractors, secured approximately 100 TAF of water from willing sellers in the Sacramento Valley, of which Metropolitan's share was approximately 88 TAF. Metropolitan also purchased approximately 18 TAF of water from Central Valley Project Contractors located in the San Joaquin Valley. In addition, Metropolitan entered into an unbalanced exchange agreement that resulted in Metropolitan receiving approximately 37 TAF.

In 2015, Metropolitan, in partnership with eight other State Water Contractors, secured approximately 20 TAF of water from willing sellers in the Sacramento Valley, of which Metropolitan's share was approximately 13 TAF.

In addition, Metropolitan has secured water transfer supplies under the Yuba Accord, which is a long-term transfer agreement. To date, Metropolitan has purchased approximately 165 TAF.

Finally, Metropolitan has secured water transfer supplies under the Multi-Year Water Pool Demonstration Program. In 2013 and 2015, Metropolitan secured 30 TAF and 1.3 TAF, respectively.

Metropolitan's recent water transfer activities demonstrate 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. Because of the complexity of cross-Delta transfers and the need to optimize the use of both CVP and SWP facilities, DWR and USBR are critical players in the water transfer process, especially when shortage conditions increase the general level of demand for transfers and amplify ecosystem and water quality issues associated with through-Delta conveyance of water. Therefore, Metropolitan views state and federal cooperation to facilitate voluntary, market-based exchanges and sales of water as a critical component of its overall water transfer strategy.

Achievements to Date

Metropolitan has made rapid progress to date developing SWP storage and transfer programs. Most notably, Metropolitan has utilized approximately 457 TAF to supplement its SWP supplies during the recent 2012-2015 unprecedented drought. Of this total, approximately 325 TAF are from SWP storage program extractions in Semitropic, Arvin, Kern Delta, and Mojave; 57 TAF are from the San Bernardino and San Gabriel Valley MWD programs; and 78 TAF of SWP transfer supplies were purchased from the State Water Contractors Buyers Group, Multi-Year Water Pool, and Yuba water purchase programs.

Figure 3-3

METROPOLITAN STATEWIDE GROUNDWATER BANKING PROGRAMS

3.4 Demand Management and Conservation

Demand management through conservation is a core element of Metropolitan's long-term water management strategy. Metropolitan continues to build on a nearly 25-year investment in conservation of more than $495 million, reflecting a long-term commitment to water conservation. Among other measures, this investment has resulted in the replacement of more than 3.4 million toilets with more water efficient models, distribution of more than 530,000 high-efficiency clothes washers (HECWs), and removal of approximately 170 million square feet of grass from both commercial and residential properties. Collectively, Metropolitan's conservation programs and other conservation in the region will reduce Southern California's reliance on imported water by more than 1.0 MAF per year by 2025.

In response to the continuing drought, Metropolitan's Board of Directors took unprecedented action in fiscal year 2014-15 to increase conservation and permanently reduce demand within Southern California. In December 2014, the Board authorized an additional $40 million for regional conservation incentives, raising the two year conservation budget to $100 million (fiscal years 2014-15 and 2015-16). In May 2015, the Board further increased the two-year conservation budget to an unprecedented $450 million, with $340 million committed to turf removal incentives for fiscal years 2014-15 and 2015-16. The Board also authorized $11 million for multimedia, multicultural, water awareness and conservation outreach campaigns that were implemented in 2014 and 2015.

Background

Metropolitan's conservation policies and programs are guided by the conservation savings target adopted in the IRP. These policies and programs directly relate to the demand management measures for wholesale water agencies in the Urban Water Management Planning Act and the urban water conservation Best Management Practices (BMPs) in the California Urban Water Conservation Council Memorandum of Understanding Regarding Water Conservation in California (Urban MOU). As a signatory to the Urban MOU, Metropolitan pledged to make a good faith attempt to implement the BMPs.

Conservation savings result from active, code-based, and price-effect conservation efforts. Active conservation consists of water-agency funded programs such as rebates and incentives for water efficient fixtures and equipment and turf removal. Code-based and price-based conservation consists of demand reductions attributable to conservation-oriented plumbing codes and usage reductions resulting from increases in the price of water. Metropolitan does not currently assign a savings value for public awareness campaigns and conservation education because any initial effect on demand reduction and the longevity of the effect are difficult to measure. It is generally accepted that these outreach programs prompt consumers to install water saving fixtures and change water-use behavior, thereby creating a residual benefit of increasing the effectiveness of complementary conservation programs.

Distinguishing between active, code-based, and price-effect conservation can be analytically complex when, for example, active programs for fixtures are concurrent with conservation-related plumbing codes. Metropolitan uses specially designed estimating models to quantify and project conservation savings. This plan combines active, code-based, and price-effect conservation savings using methods that avoid double counting.

Conservation savings are commonly estimated from a base-year water-use profile. Metropolitan uses 1980 as the base year because it marked the effective date of a new plumbing code in California requiring toilets in new construction to be rated at 3.5 gallons per flush or less. Between 1980 and 1990, the region saved an estimated 250 TAF per year as the

result of this 1980 plumbing code and unrelated water rate increases. These savings are referred to as "pre-1990 savings." Metropolitan's resource planning target combines pre-1990 savings and estimates of more recently achieved savings.

Including regional pre-1990 conservation savings, Metropolitan continues to pursue a 2025 total conservation target of approximately 1.13 MAF per year. A large share of the target has already been achieved through existing Metropolitan and member agency programs, pre-1990 savings, price-effects, and continued savings that accrue from plumbing codes. The remainder is expected to be achieved through additional agency-sponsored active conservation programs, code changes, and price-effects.

Implementation Approach

Metropolitan's approach for achieving the conservation target includes implementing a suite of demand management measures, including public education and outreach, a variety of conservation programs, metering, research and development, and asset management. These programs include cost-effective BMP-oriented active conservation programs and new, innovative programs that address regional water uses. Metropolitan also provides support to member agencies for local programs that assist with implementing retail BMPs and reducing per capita water use. The stewardship charge in Metropolitan's rate structure provides the funding mechanism for active conservation programs and non-incentive strategies. Metropolitan continues to seek state and federal grant funding for conservation in coordination with its member agencies.

Metropolitan's conservation programs are closely linked to the efforts of the California Urban Water Conservation Council (CUWCC), the organization created to administer the Urban MOU. As a signatory to the Urban MOU, Metropolitan has pledged to make a good faith effort to implement a prescribed set of urban water conservation BMPs. Metropolitan provides technical and financial support needed by member agencies in meeting the terms of the Urban MOU. Enclosed with this report, as Appendix 8, are copies of the BMP reports Metropolitan has filed with the CUWCC since Metropolitan's 2010 urban water management plan.

In addition to implementing cost-effective BMPs, Metropolitan actively supports many CUWCC committee and research activities. For example, Metropolitan has historically assisted in CUWCC's ongoing efforts to document and increase the effectiveness of BMP-related conservation efforts. Presently, Metropolitan is represented on the following CUWCC committees:

- Board
- Commercial, Industrial, and Institutional Committee
- Residential Committee
- Landscape Committee
- Research and Evaluation Committee
- Utility Operations Committee
- Education Committee
- BMP Reporting Committee

Metropolitan also participates in national water efficiency efforts. Metropolitan is a USEPA WaterSense partner, helping to promote water efficient products and practices in Southern California. Metropolitan is also a member of the Alliance for Water Efficiency, participating in the committees on research, WaterSense and water efficient products, and education and outreach.

The following sections describe Metropolitan's demand management measures and conservation programs.

Public Education and Outreach

Metropolitan provides comprehensive education and outreach programs throughout its service area. Metropolitan's wide-ranging and comprehensive education program recently received California's highest environmental honor: the Governor's Environmental and Economic Leadership Award.

Public Education Programs

Metropolitan's water education programs reach thousands of students every year with lessons on water quality, conservation, and stewardship. Free teacher workshops, classroom materials, field trips, and class instruction are provided to schools throughout the district. A comprehensive K-12 curriculum meets state standards for each grade level in the areas of science, math, language arts, and social studies. Table 3-4 shows Metropolitan's extensive commitment to conservation-related education programs.

Metropolitan also provides all-day instruction for grades 4-7 through the Diamond Valley Lake Education Program with several thousand students and teachers participating each year. Metropolitan also collaborated with the Western Science Center Outreach Program to provide activities for more than 5,000 students in grades 2-5, and oversaw the Diamond Valley Lake Visitor Center that educated over 10,000 people on Metropolitan's water systems and operations, programs, and water stewardship.

More than 20,000 people viewed student artwork from Metropolitan's "Water is Life" Student Art and Calendar program, which stresses the importance of conservation at home, school, and in the community. The 2015 Student Art Exhibit toured and was displayed at 27 member and retail agencies in 2015.

One of Metropolitan's signature events is the annual Solar Cup™ at Lake Skinner for high school students. This is a team-based educational program in which students develop and apply skills in math, engineering, and communications while learning about water resources and creating conservation-focused public service announcements. In 2015, 41 teams and more than 800 high school students built, equipped, and raced 16-foot solar powered boats in a successful three-day event that received extensive news coverage.

For college students, Metropolitan offers the Southern California World Water Forum College Grant Program with support from USBR and the Los Angeles County Sanitation Districts. The 2014–2017 program will provide 17 grants to colleges and universities for local and globally-focused projects that foster a better understanding and community awareness of water issues, while improving technology related to water supply and delivery, water conservation, and/or sanitation programs.

Metropolitan recently launched a new education resources website. This site highlights Metropolitan's water-based Science-Technology-Engineering-Arts-Math (STEAM) programs for pre-kindergarten through college students and hosts a downloadable curriculum, aligned to the state's education standards. This website, which has many mobile features, is a resource for

students, parents, teachers, and community educators interested in learning and teaching about water's critical role in society.

Metropolitan's education related Twitter postings received more than 37,000 impressions, and Metropolitan's education Web page for kindergarten through college students drew over 40,000 visitors.

Outreach

In fiscal year 2013-14, Metropolitan implemented a variety of conservation and education outreach programs throughout our service area. Since late 2013, the primary focus of these programs has been on the drought and the need for additional conservation in order to maintain the region's water supply reserves. In March 2014, Metropolitan's Board of Directors authorized a $5.5 million regional outreach campaign for conservation and to raise water awareness. The multimedia campaign used television and radio advertisements and traffic report sponsorships, along with online, streaming radio and mobile ads, plus focused billboard and movie theater advertising. Many of the campaign elements were provided in-language to help engage the region's ethnically diverse population. Campaign tools, such as television and radio ads and graphics for bill inserts, billboards, and websites, were available to local agencies at no cost. As part of the campaign, Metropolitan conducted several interviews for television and radio and placed several "advertorial" news stories in the online editions of the *Los Angeles Times* and *Union Tribune-San Diego* newspapers. These elements promoted the ongoing need for conservation in Southern California, describing long-term investments in water storage and development of local water resources, and the availability of rebates and incentives for turf removal and purchase of water-saving devices and appliances.

In March 2015, Metropolitan's Board of Directors authorized $5.5 million for a second multi-lingual communications, outreach, and advertising campaign. The campaign tagline, "Let's All Take A Turn," emphasizes the seriousness of the drought and brings the message to residents that if we all do a little more to save water, it adds up to make a huge difference.

Metropolitan launched the research-based advertising campaign in the spring with digital and radio, in cooperation with the district's 26 member public agencies. For the first time, the entire campaign was produced in five languages: English, Spanish, Mandarin, Korean, and Vietnamese. The summer campaign called for online, social media, streaming radio, and mobile ads, along with billboards, television commercials, and special events -- such as the transformation of the iconic Randy's donut in Inglewood to the giant red Turn knob -- in order to effectively communicate the need for everyone to conserve water during the historic, ongoing drought.

Metropolitan also held press conferences on its own or in conjunction with others such as the Southern California Water Committee (SCWC) urging more conservation during the ongoing drought. These were augmented by op-ed pieces describing Southern California's response to the drought that were placed in newspapers such as the *Los Angeles Times* and *Orange County Register*.

Throughout the year, Metropolitan officials conducted dozens of interviews with news reporters to discuss a wide range of water-related topics such as the impact of the drought, water supply reliability, and conservation. As part of this public outreach, Metropolitan's General Manager blogged on Metropolitan's home web page, mwdh2o.com, about various water challenges facing the region.

In 2014, Metropolitan began a focused outreach effort for leading businesses and industries that are high volume water use customers within Metropolitan's service area. Metropolitan's

executive management has met with executives in the beverage, bottling, refining, aerospace, tourism, and golf industries to discuss Southern California's water outlook, key policy issues, and opportunities to collaborate on water use efficiency projects that will reduce demand for potable water.

Metropolitan's bewaterwise.com® web site continues to play a key role in educating the public, attracting nearly 760,000 unique visitors from July 1, 2014 through June 30, 2015. The website includes a new page focused on the drought and enhanced information on Metropolitan's rebate and incentive programs. Metropolitan also provides a Spanish language version of the site to help educate and inform the region's Spanish-speaking population. In addition, the website features California Friendly® Landscape training classes where home gardeners and landscape professionals can learn the latest ways to reduce water use in landscapes. Classes cover the basics of irrigation systems, watering and fertilizing, landscape design, and plant identification.

Metropolitan is active on social media, regularly posting to Facebook and Twitter. The Facebook page, mwdh2o, has over 12,000 likes, and the Bewaterwise Twitter account, @bewaterwiseh2o, has over 3,000 followers. Metropolitan's Instagram page began in September 2015. To increase collaboration with environmental organizations, Metropolitan helped organize a regional Twitter campaign, #WaterYouDoing, to help spread water-saving messages.

Metropolitan provides a speakers bureau and regularly presents for business and community organizations. Metropolitan also provides direct outreach to federal, state, and local government leaders and their staff to inform them of key water issues and provide updates on Metropolitan's activities and programs.

Community Partnering Program

In fiscal year 2014-15, the Community Partnering Program sponsored and actively participated in nearly 60 water-related education and outreach programs for member agencies, community groups, educational institutions, public agencies, non-profit organizations, and professional associations. Projects included community festivals and events, conservation and garden projects, web-based information and social media, publications in multiple languages, educational materials dealing with watersheds, conservation, water recycling, and other initiatives.

California Friendly Landscape Education and Training Program

Metropolitan provides education and training on ways to conserve water in homes and landscapes. Offerings include in-person and online classes, surveys, and audits.

Landscape Classes

Metropolitan offers in-person and online courses in irrigation efficiency and water-wise garden design through its California Friendly Landscape Training Program. In FY 2014-15, Metropolitan conducted 197 classes for 6,590 students throughout Metropolitan's service area.

Landscape Irrigation Audits

Metropolitan provides irrigation surveys for large landscape customers. These surveys are performed by a certified Landscape Irrigation Auditor and provide the customer with specific recommendations on how to improve irrigation efficiency at the site. The survey report

generated by the auditor also provides information on incentives to help the customer fund the needed improvements. In fiscal year 2014-15, 123 surveys covering 453 acres were conducted.

Irrigation Evaluations and Residential Surveys

Metropolitan provides funding to its member agencies that choose to implement irrigation evaluations and indoor surveys for residents. Irrigation evaluations provide customers with a recommended irrigation schedule and suggested improvements for irrigation systems. Indoor residential surveys provide customers with information on identifying leaks and making changes to water-using devices in the home.

Water Conservation Programs

Metropolitan's water conservation programs focus on two main areas: (1) residential water use, and (2) commercial, industrial, and institutional water use. Metropolitan directly implements regional programs, and provides financial support for local programs that are implemented by the member agencies. Metropolitan's Water Use Efficiency team provides program development, implementation, administration, monitoring, evaluation, and research.

Metropolitan's Conservation Credits Program (CCP) provides the basis for financial incentives and funding for the conservation programs and other demand management related activities. Established in 1988, this funding mechanism supports Metropolitan's commitment to conservation as a long-term water management strategy.

The basis of Metropolitan's financial support to member agency conservation efforts is estimated at $195 per acre-foot of water saved up to the device cost. In general, CCP-funded water conservation project proposals must:

- Have demonstrable water savings;
- Reduce water demands on Metropolitan's system; and
- Be technically sound and require Metropolitan's participation to make the project financially and economically feasible.

Table 3-5 summarizes CCP savings and investments. Additional funding for conservation programs has been made available through federal and state government agencies. Metropolitan has worked to obtain a share of this funding to enhance the region's water conservation investments. Table 3-6 describes past sources and uses of these funds.

Table 3-7 summarizes the types and numbers of efficient devices that have been installed through Metropolitan's conservation programs since they began in fiscal year 1990-91.

Regional Conservation Programs

As mentioned above, Metropolitan's conservation programs focus on two main sectors: (1) residential water use, and (2) commercial, industrial and institutional water use.

Residential Programs

Metropolitan's residential conservation activities consist of two major programs:

- SoCal Water$mart - Metropolitan provides a region-wide residential rebate program named SoCal Water$mart. Since its inception in 2008, rebate activity has increased dramatically as many residential customers became increasingly aware of the financial incentives available to them to help offset the purchase of water-efficient devices. To date, this program helped to replace over 3.3 million toilets, 530,000 washing machines, 37,000 urinals, 300,000 smart

irrigation controllers, 2.3 million rotating nozzles, and hundreds of thousands of other devices and appliances.

- Metropolitan-Funded Residential Programs Administered by Member Agencies - Metropolitan's member and retail agencies also implement local residential water conservation programs within their respective service areas and receive Metropolitan incentives for qualified retrofits and other water-saving actions. Typical projects include high-efficiency toilet (HET) distributions, locally administered clothes washer rebate programs, turf removal programs, and residential water audits.

Residential Rebate Items

Metropolitan provides incentives on a variety of water efficient devices for the residential sector. The following is a brief description of current and past devices that contribute to projected conservation savings:

- Turf Removal (Residential) - About 50 percent of residential household water demand is used for outside irrigation where opportunities to conserve water are substantial. Southern California residents have turned the turf removal program into Metropolitan's most popular conservation measure. With an increased incentive rate ($2 per square foot of turf removed) during this current drought, approximately 45 million square feet of grass have been removed from residential properties since July 2014 through the regional rebate program, and more turf removal projects are anticipated. To encourage market transformation, Metropolitan has committed over $282 million for the regional turf removal program for both residential and commercial properties for fiscal years 14-15 and 15-16.
- High-Efficiency Clothes Washers - HECWs continue to be a major component of indoor water conservation. The water efficiency of clothes washers is represented by the "integrated water factor," which is a measure of the amount of water used to wash a standard load of laundry. Washers with a lower integrated water factor will save more water. Metropolitan has continued to move the water conservation rebate standards by requiring lower integrated water factors for eligible washers. The program eligibility requirement is currently set at an integrated water factor 3.7, which saves over 10,000 gallons per year per washer over a conventional top loading washer.
- High-Efficiency Toilets - Metropolitan has provided incentives for water efficient toilets since 1988. Metropolitan recently changed its rebate program to provide funding for toilets that flush at 1.1 gallons or less. Metropolitan uses the USEPA's WaterSense list of performance tested high-efficiency toilets and the Maximum Performance of Premium Toilet Models testing list to distinguish qualifying models.
- Rotating Nozzles for Sprinklers - Pop-up spray heads with multi-stream, multi-trajectory rotating nozzles provide outdoor water savings. Field tests and studies have demonstrated these nozzles apply water more evenly than traditional nozzles with fixed fan spray patterns, offering the potential for water savings. Low precipitation rates associated with these nozzles can reduce run-off, thereby offering a significant value-added benefit when irrigating sloping landscapes.
- Irrigation Controllers - Smart irrigation controllers and soil moisture sensors adjust irrigation schedules based on rain, temperature, sunlight, soil moisture, soil conditions, plant types, slope or some combination of indicators. Metropolitan uses the USEPA WaterSense list for eligible controllers.

Commercial, Industrial and Institutional Programs

Metropolitan's commercial industrial and institutional (CII) conservation consists of three major rebate and incentive programs:

- SoCal Water$mart Program - The majority of the commercial conservation activity comes from Metropolitan's regional SoCal Water$mart program, which also extends rebates to multi-family properties. The SoCal Water$mart program had its largest year in fiscal year 2014-15, providing about $51.0 million in CII rebates for about 328,000 product replacements.
- Water Savings Incentive Program - The Water Savings Incentive Program provides financial incentives for customized landscape irrigation and industrial process improvements. This program allows large-scale water users to create their own conservation projects and receive incentives for up to 10 years of water savings for measured water-use efficiency improvements.
- Metropolitan-Funded Commercial Programs Administered by Member Agencies - Member and retail agencies also implement local commercial water conservation programs using Metropolitan incentives. Projects target specific commercial sectors, with some programs also receiving assistance from state or federal grant programs. Metropolitan incentives are also used as the basis for meeting cost-share requirements for the grants.

Commercial Rebate Items

Metropolitan's CII programs provide rebates for water-saving plumbing fixtures, landscaping equipment, food-service equipment, cleaning equipment, HVAC (heating, ventilation, air conditioning) equipment, and medical equipment.

- Turf Removal (Commercial) - Similar to the residential sector, water demand for landscape irrigation on commercial, industrial, and institutional properties is significant. Opportunities to conserve water are substantial, particularly in areas with ornamental turf. With an increased incentive rate ($2 per square foot of turf removed) during this current drought, approximately 27 million square feet of grass have been removed from commercial, industrial, and institutional properties since July 2014 through the regional rebate program, and more turf removal projects are anticipated. To encourage market transformation, Metropolitan has committed over $282 million for the regional turf removal program for both residential and commercial properties for fiscal years 2014-15 and 2015-16.
- Commercial Devices - Following is a list of current and past devices that contribute to projected conservation savings:
    - Connectionless Food Steamers
    - Cooling Tower Conductivity Meters
    - Dry Vacuum Pumps
    - High-Efficiency Clothes Washers
    - High-Efficiency Toilets
    - High-Efficiency Urinals
    - Ice Machines
    - In-Stem Flow Regulators
    - Large Rotors - High Efficiency Nozzles
    - Multi Stream Rotating Nozzles
    - pH Cooling Tower Controllers
    - Plumbing Flow Control Valves
    - Pre-rinse Spray Heads
    - Steam Sterilizers
    - Ultra-Low-Flush Toilets
    - Ultra-Low-Flush Urinals
    - Water Brooms
    - Weather-Based Irrigation Controllers
    - X-ray Processors
    - Zero Water Urinals

Metering

Metropolitan's water distribution system is metered. Metropolitan has over 400 service connections that meter water deliveries to our member agencies. Meters at these service connections are checked every six months or sooner to verify that they are measuring correctly. More extensive maintenance is done on a yearly basis to ensure the meter systems continue to operate reliably.

Research and Development Programs

Metropolitan is committed to conservation research as a way to advance technology, improve program results, and help transform markets. Self-funded studies include water savings analysis of various rotating nozzle incentive programs, water savings from turf removal projects, and water savings analysis of smart/weather based irrigation controllers.

Metropolitan's Innovative Conservation Program (ICP) is a competitive grant program that evaluates water savings and reliability of new water saving devices, technologies, and strategies. With funding provided by USBR, SNWA, Central Arizona Project, and Metropolitan, approximately $500,000 of funding was available for research for the 2013 ICP. After evaluating 50 project proposals, thirteen were selected. The majority focused on landscape water use, but there were also commercial, agricultural, and residential water use studies as well. The next round of grants will be implemented in fiscal year 2016-17.

Metropolitan has partnered with the Alliance for Water Efficiency (AWE) for water conservation research. Recent projects include: a drought management study of Australia, a water neutral development ordinance; and a study on commercial kitchen efficiency, outdoor impacts of the drought, and reasons and rationale for landscape choices.

Measurement and Evaluation

Measurement and evaluation are important components of Metropolitan's conservation programs. These serve four primary functions:

- Providing a means to measure and evaluate the effectiveness of current and potential conservation programs
- Developing reliable estimates of various conservation programs and assessing the relative benefits and costs of these interventions
- Providing technical assistance and support to member agencies in the areas of research methods, statistics, and program evaluation
- Documenting the results and the effectiveness of Metropolitan-assisted conservation efforts

Metropolitan's staff has served as technical advisors for a number of state and national studies involving the quantification and valuation of water savings.

Recognition for Conservation Achievements

Conservation is an integral part of water supply planning at Metropolitan. Metropolitan works to improve the understanding of the costs and benefits of conservation so investment decisions are both efficient and effective at meeting program goals. As a cooperative member of California's water conservation community, Metropolitan has made significant contributions to the development and coordination of conservation activities throughout the state. These contributions have been recognized in the form of "Gold Star" certification from the Association of California Water Agencies and awards from the USBR and California Municipal Utilities Association. Metropolitan was recently awarded the AWWA's 2014 Public Communications Achievement Award for its water awareness and conservation outreach campaign.

Table 3-4
School Education Programs

Program or Activity	Date Initiated	Date Updated	Current Status	Grades	Description
Admiral Splash	1983	2006	Ongoing	Grades 4-5	A two-week program focusing on Southern California history, the water cycle, supply and the distribution system, water uses and conservation.
All About Water	1991	2008	Ongoing	K-2	Activities to teach young students about droughts, conservation, water quality and physical properties of water.
Geography of Water	1993	1998	Ongoing	Grades 4-8	A curriculum module on the relationship between population, precipitation, geography, economics, and water distribution.
Guzzler Gang	1993	2004	Ongoing	K-3	Water conservation book introduces students to characters who are known for "guzzling" water.
Water Ways	1995	2006	Ongoing	Grade 5	A supplement integrated into fifth-grade U.S. History curricula regarding water use, sources, ethics, and environment issues selected from three historical periods. This includes historical attitudes towards the stewardship of water.
Water Quality	2001	-	Ongoing	Grades 7-12	Hands-on activities to investigate water quality issues, with conservation as an element of the overall picture.
Water Works	2001	-	Ongoing	Grades 7-12	A school-to-career, job-specific program featuring activities and profiles on a variety of water-related careers, including conservation specialist.
Water Times	2005	-	Ongoing	Grade 6	An age-appropriate newspaper that provides interdisciplinary concepts, tools, and calculations related to water conservation, and that conveys an overall ethic of water stewardship.
Conservation Connection: Water and Energy Use in Southern California	2010	-	Ongoing	Grades 6-8	An activity-focused unit designed to engage students in finding solutions to conserve both water and energy at school and home. The curriculum also contains an online water and energy survey for students and their families.
Little Splash	2012		Ongoing	K-3	Collection of 21 activity and coloring pages including reading, writing, coloring, drawing, and working puzzles that teach concepts about water.

Table 3-5
Metropolitan's Conservation Credits Program

Fiscal Year	Annual Water Savings (AF)	Investment
2014 – 2015	179,000	$142 million
2013 – 2014	157,000	$16.9 million
2012 – 2013	161,000	$11.4 million
2011 - 2012	156,000	$12.9 million
2010 - 2011	153,000	$16.0 million
2009 - 2010	147,000	$36.7 million

Table 3-6
Grant Program Funding

Funding Source	Program/Project	Funding Amount ($1,000s)	Description	Status
CALFED				
	Residential HECW	$925	Increase rebate amount	Completed
	Protector del Agua	$100	Course development	Completed
Prop 13 Grants				
	HECW	$2,500	Increase rebate amount	Completed
	ET Controllers	$1,800	Initiate rebates	Completed
CPUC (w/CUWCC)				
2003	Pre-Rinse Spray Valves: Phase 1	$1,600[1]	12,000 direct installations[1]	Completed
2004	Pre-Rinse Spray Valves: Phase 2	$2,200[1]	17,000 direct installations[1]	Completed
USBR				
2003	CA-Friendly Landscapes	$182	New home landscapes	Completed
2003	Data Loggers	$50	Software error analysis	Deferred
2004	CA-Friendly Landscapes	$60	New home landscapes	Completed
2004	Synthetic Turf pilot	$220	Provide incentives	Completed
2004	World Forum	$50	College/university grants	Completed
2004	CII Region wide	$250	Additional dollars to rebate amounts and for administration	Completed
2005	Protector del Agua	$50	Develop web classes	Completed
2005	Landscape Market Analysis	$50	Analyze landscape conservation opportunities	Completed
2005	City Makeover	$50	Public landscapes	Completed
2006	Innovative Conservation Program	$300	Support research projects	Completed
2008	Innovative Conservation Program	$300	Support research projects	In Progress
2012	Sprinkler Nozzle Incentive Program	$1,501	Provide incentives	In Progress
2013	High Efficiency Clothes Washer Program	$500	Provide incentives	In Progress
2014	California Friendly Turf Replacement – Phase 2 Incentive Program	$300	Provide incentives	In Progress
Water for the West				
	Protector del Agua	$25	Develop web classes	Completed
Prop 50				
	Residential HECW	$1,660	Increase rebate amount	Completed
	CA-Friendly Landscapes	$423	Common area landscapes	Completed
	High Efficiency Toilets	$1,000	Increase rebate amount	Completed
	Protector del Agua	$78	Develop on-line classes	Completed
2008	Residential HECW	$2,000	Increase rebate amount	Completed

[1] This is the funding amount and number of installations that represent Metropolitan's share of the project.

Table 3-7
Conservation Achievements in Metropolitan's Service Area

	Qty	Units
CII Rebated Devices (FY 1990-91 to FY 2014-15)		
Audits/Surveys	13,432	ea
Connectionless Food Steamers	56	ea
Cooling Tower Conductivity Controllers	1,196	ea
Dry Vacuum Pump	33	ea
Toilets	196,939	ea
Urinals	37,162	ea
Ice Machines	56	ea
In-stem Flow Regulators	8,701	ea
High Efficiency Washers	36,427	ea
pH Conductivity Controllers	338	ea
Plumbing Flow Control Valves	13,770	ea
Pre-Rinse Spray Heads	17,177	ea
Laminar Flow Restrictors	13173	ea
Multi-Stream Rotating Nozzles	1,247,644	ea
Soil Moisture Sensors	21	ea
Steam Sterilizers	28	ea
Water Brooms	6,931	ea
Weather Based Irrigation Controllers	11,939	acres
Weather Based Irrigation Controllers	246,593	stations
X-Ray Processors	185	ea
High Efficiency Nozzles	78,105	ea
Synthetic Turf	7,455,647	sq. ft.
Turf Removal	27,194,789	sq. ft.
Residential Rebated Devices (FY 1990-91 to FY 2014-15)		
Aerators	158,817	ea
Audits/Surveys	122,810	ea
High Efficiency Clothes Washers	496,511	ea
Toilets	3,184,362	ea
Multi-Stream Rotating Nozzles	1,007,352	ea
Rain Barrels	18,657	ea
Soil Moisture Sensors	39	ea
Showerheads	1,735,436	ea
Turf Removal	38,387,543	sq. ft.
Weather Based Irrigation Controllers	2,226	acres
Weather Based Irrigation Controllers	10,641	stations

Asset Management Program

In fulfillment of California Water Code §10631(f)(2), provided below is a description of Metropolitan's distribution system asset management program.

Metropolitan's approach to asset management is contained within its Infrastructure Reliability Strategy. The goal of Metropolitan's Infrastructure Reliability Strategy is to ensure long-term reliable performance of the system in an efficient and cost-effective manner. Infrastructure reliability is addressed through two primary programs: the Maintenance Management Program and the Infrastructure Protection Plan. The activities performed under these programs allow for Metropolitan to extend the life span of its facilities and equipment and improve the overall reliability of the entire conveyance, treatment, and distribution system.

Maintenance Management Program

Metropolitan manages the maintenance on approximately 135,000 pieces of equipment located at its five treatment plants, sixteen hydro-electric power plants, five desert pumping plants, 242 miles of canals, and over five thousand structures on 819 miles of pipeline.

Computerized Maintenance Management System**:** A Computerized Maintenance Management System (CMMS) is used to track, plan, and schedule the required activities. The system currently has over 28,000 preventative maintenance cycles scheduled with approximately 96 percent of these performed at fixed intervals (Time Based). The remaining four percent are performed based on the condition or use of the equipment (Condition Based).

Routine Maintenance, Inspection, and Monitoring

Monitoring, inspection, and maintenance of equipment and facilities are a proactive effort to assess the overall condition of the assets. It encompasses identifying needed repairs and performing routine maintenance.

Time-Based Maintenance

Metropolitan currently uses time-based maintenance as the primary means of maintaining equipment reliability. Time-based maintenance for equipment is set at specific time intervals using manufacturer recommendations. These recommendations are used to develop Job Plans in the CMMS which detail the individual steps required for a particular maintenance operation.

Condition-Based Maintenance

Condition-based maintenance (CBM) relies on an understanding of how a piece of equipment degrades or fails to meet its intended function. It requires a greater depth of understanding of the manufacturer's recommended maintenance, industry standards, or practices. This knowledge is used in conjunction with field experience to develop a technique to gauge the equipment's condition. Through trending or analysis, a determination can then be made as to when the equipment may reach a point where corrective maintenance will be required including rehabilitation or replacement. A regular inspection cycle is set in the CMMS software to evaluate current equipment condition. High and low condition alarms are also set that trigger a corrective maintenance activity when equipment is starting to degrade or its use has reached a servicing checkpoint.

Predictive maintenance is a subcategory of CBM that uses diagnostic equipment or testing to determine the equipment condition. Predictive maintenance is also used to detect impending problems before the equipment malfunctions. In some cases, Metropolitan has automated the inspections such as through online vibration monitoring systems that trend the performance of

critical and large equipment. A fundamental characteristic of this type of maintenance is that it provides the capability to anticipate potential problems while the equipment is still operating. This provides several key benefits when compared to time-based maintenance or allowing equipment to reach a point where corrective maintenance is required. These benefits include: improved availability or uptime, enhanced reliability, and reduced cost.

Corrective Maintenance

Corrective maintenance is performed on equipment that either has already failed or has had a problem detected during routine (time or condition based) maintenance. Corrective maintenance needs to be scheduled, requires replacing equipment components, or involves a shutdown of the impacted system. Corrective maintenance is also tracked, planned, and scheduled in the CMMS.

Major Scheduled Outages/Shutdowns

In addition to the general maintenance described above, Metropolitan may take major systems out of service, such as water treatment plants, large pipelines, conveyance systems, or other large facilities, typically for periods of seven to twenty-one days. This is done to perform major maintenance or repairs on several components or systems, upgrade or add new processes, or perform other important work.

Reports and Metrics

Metropolitan produces internal reports that track maintenance management activities including overall backlog and past due work orders (including any missed regulatory preventive maintenance). In addition, other CMMS reports are available that provide managers, planners/schedulers, and maintenance staff with the data needed to evaluate and track work.

Metropolitan utilizes best management practices and performance metrics from the Society of Maintenance & Reliability Professionals to ensure a reliable and cost effective maintenance management program.

Infrastructure Protection Plan

Activities under the Infrastructure Protection Plan ensure long-term infrastructure reliability by conducting special condition assessments and vulnerability assessments of Metropolitan's facilities.

Special Condition Assessments

Special Condition Assessments are extensive inspections, investigations, and evaluations of Metropolitan facilities and equipment that go beyond routine maintenance and monitoring activities. The assessments are conducted to identify needed rehabilitation and replacement projects which can lead to long-term reliability programs. These assessments include: inspections of facilities during shutdowns when the facility may otherwise be non-accessible, investigations of systemic issues, and evaluations of Metropolitan's ability to maintain deliveries in the event of an unplanned facility outage or loss of water supply.

Special Condition Assessments may be initiated through requests from Operations, in response to a specific event or concern within Metropolitan's system, or due to an issue identified within the water industry that could potentially affect Metropolitan. Through these activities, long-term infrastructure reliability programs are developed and executed to ensure that the

reliability of Metropolitan's distribution system is unimpeded and the overall life-expectancy of its assets is maintained to the most cost-effective standard possible.

Vulnerability Assessments

Vulnerability Assessments involve simulating hazards such as vehicle impact, flooding, fire, equipment failure, third-party impacts, and earthquakes in order to identify their potential impacts to Metropolitan's ability to deliver water. Like the condition assessments, Vulnerability Assessments utilize operator experience and event reviews to identify potential vulnerabilities and impacts. The assessments evaluate both the reliability of individual facilities, as well as the reliability of Metropolitan's system as a whole, if it is exposed to a potential hazard. It is through these assessments that mitigation options are identified to improve reliability.

Potential mitigation includes facility and equipment upgrades, and procedural changes for designing, operating, or maintaining facilities. In addition, mitigation options may include recommendations for Metropolitan's emergency response planning to improve the capability to respond to an unplanned outage and restore service as quickly as possible. The types of hazards assessed include: seismic activity, hydraulic surge, vehicle impact, equipment malfunction, erosion or flooding, fire, corrosion, wind-blown projectiles, third party construction, and vandalism.

As a part of the Vulnerability Assessments, a specific set of reliability design criteria for water treatment plants have been developed to ensure optimal reliability, starting in the design phase. These reliability design criteria establish design practices that ensure that reliability is designed into new facilities, and that the staff uses this criterion when reviewing each capital project.

3.5 Recycling, Groundwater Recovery, and Desalination

Metropolitan continues to support local resources development through its Local Resources Program. The Local Resources Program provides financial incentives for local agencies to develop supplies including water recycling, groundwater recovery, and seawater desalination.

Metropolitan's involvement in local resources development started in 1982 as the Local Projects Program to provide financial incentives to its member agencies to develop recycled water projects. In 1991, Metropolitan established the Groundwater Recovery Program to provide financial assistance for the development of groundwater recovery projects. In 1995, these two programs evolved into the Local Resources Program (LRP).

Water recycling projects involve further treatment of secondary treated wastewater that is currently discharged to the ocean, streams, or lands and use it for non-potable uses such as landscape and agricultural irrigation, commercial and industrial purposes, and for indirect potable uses such as groundwater recharge, seawater intrusion barriers, and surface water augmentation. Currently, more than half of the water recycling in California occurs in Metropolitan's service area.

Groundwater recovery projects involve treatment of high salinity or contaminated groundwater for potable uses. Groundwater recovery projects use a variety of treatment technologies to remove undesirable constituents such as nitrates, volatile organic compounds (VOCs), perchlorate, color, and salt. Desalination of brackish groundwater and other local supplies enhances the continued supply reliability of the region by maximizing local groundwater resources.

Metropolitan's service area is also leading the development of seawater desalination in California. The 56 TAF Carlsbad Project in San Diego County started operations in December 2015 and represents the largest seawater desalination project in the country. Several other local water agencies are also considering seawater desalination projects. These projects have the potential to help meet Metropolitan's current goals for new local supplies.

Background

Recycling

This section provides a description of the wastewater sources that potentially could be recycled. This section also discusses the existing and potential uses of recycled water, as well as the technical and economic issues associated with those uses. In general, Metropolitan supports:

- Increasing water recycling in California and the Colorado River Basin
- Advocating funding assistance by parties that benefit both directly and indirectly from the use of recycled water
- Expanding recycled water uses
- Reviewing recycled water regulations to ensure streamlined administration, and public health and environmental protection
- Planning efforts and voluntary cooperative partnerships at the local and statewide levels
- Conducting research and studies to address public acceptance, new technologies, and health effects assessments
- Increasing cooperation between agencies to serve recycled water in other agency service areas

Wastewater Disposal in the Service Area

As part of regional planning that encourages use of recycled water, a database has been developed that includes the name of each wastewater treatment facility, operating agency, location and elevation of the facility, extent of wastewater treatment, capacity and anticipated production, method of effluent disposal, and influent and effluent water qualities. Shown in Table 3-8 are the existing and projected total effluent capacities of the wastewater treatment plants from a database of 89 plants identified within Metropolitan's service area.

Wastewater treatment capacity provides an indication of the amount of wastewater being generated and disposed in Metropolitan's service area. Most wastewater plants in the service area provide secondary treatment, a level of treatment that complies with the Clean Water Act. Inland wastewater plants generally provide treatment to tertiary levels so the effluent may be disposed of in a stream or other water body or for beneficial reuse. A small percentage of tertiary treated effluent undergoes reverse osmosis or electrodialysis reversal processes, producing high-quality recycled water for groundwater recharge, industrial uses, or, in some instances, municipal uses.

Within Metropolitan's service area, many local agencies collect and treat municipal wastewater. Some of the largest agencies include:

- Los Angeles County Sanitation Districts
- Orange County Sanitation District
- City of Los Angeles Bureau of Sanitation
- San Diego Metropolitan Wastewater Department
- Eastern Municipal Water District
- Inland Empire Utilities Agency

Table 3-8
Existing and Projected Total Effluent Capacity
Wastewater Treatment Plants within Metropolitan's Service Area

Treatment Level	Existing Capacity (MGD)	2040 Capacity (MGD)
Primary	1,770	3,139
Secondary	1,169	2,708
Tertiary	434	1,464
Advanced	104	229

This data was compiled as part of the Southern California Comprehensive Water Reclamation and Reuse Study.

Many small special-purpose wastewater agencies, dual-purpose (water and wastewater) special districts, and municipal wastewater agencies also provide wastewater treatment and disposal services within Metropolitan's service area.

Wastewater is collected in a sewer collection system. From there, it flows to a wastewater treatment plant. Once treated, wastewater is disposed of through one of three mechanisms:

Ocean Outfalls

Treated wastewater is either disposed of directly through an ocean outfall or conveyed to the ocean outfall via a land outfall.

Reuse

Currently, about 414 TAF per year of recycled water is used for landscape irrigation, industrial processes, and groundwater recharge applications in the region. A few inland treatment plants (in Riverside and San Bernardino counties) irrigate feed and fodder crops with recycled water. While this use is considered beneficial, it is not necessarily the highest and best use for recycled water. Higher value uses of recycled water include landscape or agricultural irrigation, commercial and industrial applications, groundwater recharge, seawater intrusion barrier, and other uses such as street sweeping and dust control, etc.

Stream Discharge

The majority of inland plants discharge treated effluent into local streams and rivers. That water is then used downstream for beneficial uses, eventually flowing to the ocean. Some of the affected rivers (or ephemeral streams) include:

- Los Angeles River
- Santa Ana River
- Calleguas Creek
- Rio Hondo & San Gabriel Rivers
- Santa Margarita River

Uses of Recycled Water

Water recycling is a reliable water supply, and it helps local agencies comply with environmental regulations. Uses of recycled water can generally be categorized as below.

Industrial

Industrial users represent a large potential market for recycled water, particularly in heavily industrialized areas, such as the cities of Vernon, Commerce, Industry, and the Wilmington area of Los Angeles. Additionally, refineries in West Basin MWD's service area and the city of Torrance use recycled water. Typical industrial uses include cooling tower makeup water, boiler feed water, paper manufacturing, carpet dying, and process water. Industrial users are high-demand, continuous-flow customers, which allows greater operational flexibility by allowing plants to base load operations rather than contend with seasonal and diurnal flow variations. Because of these operational benefits, industrial users reduce the need for storage and other peak demand facilities and management.

Irrigation

Recycled water is used to irrigate golf courses, parks, schoolyards, cemeteries, greenbelts, roadway medians, and agricultural purposes throughout Southern California. Using recycled water for irrigation reduces the need for imported water during the critical summer months and in drought situations when water supplies are scarce. Unlike industrial uses, irrigation demands have large seasonal variations in reuse.

Indirect Potable

Indirect Potable Reuse (IPR) refers to the use of recycled water for groundwater recharge, and surface water reservoir augmentation purposes. These types of uses require additional treatment levels beyond irrigation uses and use of an environmental buffer.

1. *Groundwater Recharge* – Metropolitan's service area overlies numerous groundwater basins, most of which rely on artificial recharge to sustain groundwater production, and some of which are threatened by seawater intrusion. Water agencies along the Los Angeles and Orange Counties coastline inject water into the underlying groundwater basins to create a barrier against this seawater intrusion and protect groundwater quality. The use of recycled water for seawater intrusion barrier projects is increasing and is replacing imported water used for this purpose. Increasing the proportion of recycled water can free imported water for direct consumption. Table 3-9 presents a summary of this recycled water use.
2. *Surface Water Augmentation* – Surface Water Augmentation includes use of advanced treated recycled water to augment a surface water reservoir. The reservoir serves as an environmental buffer (similar to groundwater in the case of groundwater recharge) prior to when recycled water is treated for potable uses. Blended water from the reservoir is then treated at a conventional water treatment plant for potable purposes. There is currently no reservoir augmentation with recycled water in Metropolitan's service area. The Division of Drinking Water (DDW) of the State Water Resources Water Control Board (SWRCB) is required under SB 918 to establish surface water augmentation regulations by December 31, 2016. The City of San Diego is currently operating a demonstration project to evaluate the feasibility and expected permitting requirements of a full-scale reservoir augmentation project.

Table 3-9
2015 Recycled Water Use for
Groundwater Replenishment and Seawater Barrier Injection
(TAF per year)

Groundwater Basin	Recycled Water Use
Central Basin	45
Chino Basin	11
Orange County Basin	88
West Coast Basin	12
Other Basins	2
Total	**158**

Direct Potable Reuse

Direct Potable Reuse (DPR) refers to the use of advanced treated municipal recycled water as a direct supply to or immediately after a conventional water treatment plant. DPR differs from IPR by having no environmental buffer. DPR eliminates the need and cost to store water in an environmental buffer (groundwater or surface water reservoir) for several months and instead

requires additional treatment or testing to ensure public health requirements are achieved. Currently, there are no permitted DPR projects in California. DDW is required under SB 918 to review recommendations of an expert panel to evaluate and report on the feasibility of DPR to the legislature by December 31, 2016.

Technical and Economic Issues of Recycled Water

Recycled water use is growing rapidly in Metropolitan's service area. Further expansion depends on progress in research, regulatory change, public acceptance, water quality issues, cost, operational issues, and conflicting institutional objectives. Each of these challenges, as well as opportunities for recycled water use, lessons learned, and recommendations to enhance the development of recycled water, are discussed below.

Challenges

Lengthy and Variable Permitting Process

The SWRCB established the Recycled Water Policy (Policy). This Policy requires the SWRCB and the nine Regional Water Quality Control Boards (Regional Boards) to encourage the use of recycled water, consistent with state and federal water quality laws. The Policy provides additional directions to the Regional Boards on appropriate criteria to be used in regulating recycled water projects. The DDW and the nine Regional Boards are responsible for setting the rules and permitting for recycled water projects. The timeline and roadmap for getting a permit are challenging and inconsistently implemented in different regions of the state. Limited history and technical information (e.g., on direct potable reuse) to inform regulations and limited staffing at DDW and other agencies have challenged the ability to propose, revise, and adopt new regulations in a timely manner. Agencies planning and designing DPR and IPR projects face delays because of regulatory uncertainty. In addition, many project proponents hoping for grant or loan funding have identified lengthy CEQA review as a challenge.

Indirect potable reuse projects face regulatory constraints such as treatment, blend water, retention time, and Basin Plan Objectives, which are the designated uses assigned by the SWRCB and which may limit how much recycled water can feasibly be recharged into the groundwater basins. For example, the Basin Plan Objective for TDS of a particular basin may be lower than the quality of the tertiary water effluent available, resulting in the need for more blend water or advanced levels of treatment. These treatment requirements impact the economic feasibility of a project.

Public Perception/Conflicting Messaging

Conflicting messaging confuses the public about the safety of recycled water. There is not a clear understanding by the public of the difference between non-potable reuse, indirect potable reuse, and direct potable reuse uses. The public is most familiar with non-potable reuse as they see recycled water in use at parks, golf courses, schools, and other large landscapes. However, public perception and acceptance of drinking recycled water (IPR and DPR) is a much bigger challenge. Signage for non-potable reuse projects at parks, schools, and golf courses that read, "Using recycled water; do not drink" can adversely affect the public's acceptance of DPR and IPR. Although public acceptance of recycled drinking water has improved, effective education and public outreach is still needed. There is a need for new messaging to reduce the confusion.

Cost

Cost, including up-front capital and ongoing operation and maintenance, remains a barrier to recycled water development. Most low-cost projects have been built. The price tag for expanding the recycled water distribution systems remains a barrier to full implementation of non-potable reuse projects – these projects require pipelines connecting the treatment plants and the individual users. Some agencies may also be considering indirect potable reuse and direct potable reuse projects to reduce the need to have extensive recycled water distribution systems because of the cost. Some non-potable reuse and indirect potable reuse projects and all direct potable reuse projects require advanced treatment facilities, which are comparatively expensive. Advanced treatment may also require additional brine concentrate disposal facilities (e.g., a brine line) and extensive infrastructure for injection wells/spreading facilities, or for delivery of the product water to a spreading ground, surface reservoir, or water treatment plant for potable uses. End users play a very important role for recycled water advancement. Site conversion costs (borne by the customer) and additional conveyance infrastructure for new customers can also be a barrier to reaching full non-potable reuse project capacity. Some agencies may be challenged with cash flow issues or cannot secure the funding needed to implement projects.

In addition, with the increasing prospect of statewide regulations for indirect potable reuse and direct potable reuse, some agencies pursuing indirect potable reuse are hesitant to extend their existing distribution system for non-potable reuse projects for fear of stranded facilities. Similarly, some agencies pursuing direct potable reuse may delay their planned indirect potable reuse projects to prevent stranded distribution facilities[7].

Source Control and Effluent Water Quality Needs

Source water quality and flow control is essential to help safeguard the water recycling treatment process and the end use of the water by placing controls on the type, timing, and amount of wastewater that comes into the plant. A good source control program limits treatment plant disruptions and ensures treatment processes are capable of handling spikes in volume, industrial influent, and high salinity influent. When it comes to the treatment process, recycled water policy requires that the effluent meets certain water quality standards. Salt and nutrient management plans protect groundwater beneficial uses and prevent excess degradation, which may limit expanded indirect potable reuse applications if the agency does not have funds for advanced treatment to remove salts to meet the Basin Plan Objectives. In some cases, existing source control plans may need to be updated to deal with constituents of emerging concern and with more stringent needs of the users.

Water use efficiency helps conserve water, but also incidentally reduces wastewater volume resulting in an increase in the concentration of wastewater. As a result, additional treatment is needed, which increases operation and maintenance costs of the system. Source water quality is especially important for implementing indirect potable reuse and direct potable reuse projects to protect potable water systems.

Operational Issues

While each agency is different, it is important to recognize the possible operational issues that may occur with the use of recycled water, including:

- Reduction in wastewater flows due to ongoing conservation and drought

[7] Indirect potable reuse projects usually require injection wells or a distribution system to a surface reservoir or recharge basin, and may also require improvements to a surface reservoir, recharge basin, or treatment facility.

- Lack of seasonal storage to address diurnal and seasonal demands; construction of storage facilities may be needed for flow equalization
- Brine disposal needs
- Environmental flow or stream discharge requirements may limit the ability to deliver recycled water during high demand periods
- Regulatory issues such as blend requirements and water quality objectives may impact the effectiveness of indirect potable reuse
- Lack of regional GIS data to optimize recycled water deliveries
- Need for multiple barriers to ensure recycled water quality and for monitoring techniques that provide feedback in real-time to respond to plant disruptions, especially with DPR projects
- Need for additional operator training and certification

Conflicting Institutional Objectives

Institutional coordination among drinking water, wastewater, and groundwater management agencies may be challenging, and the agencies may face barriers due to the difficulty in aligning varying institutional objectives. The main objective of a wastewater agency is to collect, treat, and safely dispose of wastewater based on a set of established standards. This may conflict with the objectives of a groundwater agency that is legally tasked to protect the quality of groundwater. At the same time, water agencies developing recycled water projects are usually seeking a consistent, higher quality treated wastewater for a successful recycling program – though the wastewater agency may not be treating the wastewater to such higher quality for its normal disposal, and the groundwater agency may still be concerned about the quality of the return flows of this recycled water to the groundwater basin.

Opportunities

Progress Towards New Regulatory Process

The State of California has made some progress in developing permit standards that provide opportunities to expand recycled water use.

Non-potable reuse: The SWRCB developed a general permit for non-potable uses of recycled water in June 2014 that provides an opportunity for new projects to come online sooner with more standardized monitoring requirements. Further, revisions are being considered to attract additional users and further streamline recycled water projects.

Indirect and direct potable reuse: The SWRCB is facing a December 2016 deadline under SB 918 to develop regulations for surface water augmentation and to investigate and report to the legislature the feasibility of DPR.

Metropolitan is also working with the WateReuse Association and other agencies on legislative and regulatory issues to streamline permitting processes and to provide needed funding and support for increased use of the recycled water.

New Funding Opportunities

On January 17, 2014, as part of the governor's emergency drought declaration, the SWRCB, under the Clean Water State Revolving Fund, offered up to $800 million in low-interest loans for water recycling projects that offset or augment state water supplies and can be completed

within three years. Projects must apply for the funding through the SWRCB by December 2, 2015. As of May 27, 2015, over 30 projects had applied requesting more than $1.6 billion in funding.

Proposition 1 (Assembly Bill 1471, Rendon) authorized $7.545 billion in general obligation bonds for water projects with $725 million for water recycling and desalination projects. Another $625 million will be administered through SWRCB's Water Recycling Funding Program for water recycling and $100 million through DWR for desalination.

In 2014, Metropolitan increased the financial incentives under its Local Resources Program (LRP) for agencies to develop recycled water. Metropolitan also established the On-site Retrofit Pilot Program to provide rebates to customers that convert their irrigation and industrial system from potable water to recycled water. In addition, Metropolitan established the Reimbursable Services Program to provide technical and construction assistance to its member agencies for local project development. Under this program, Metropolitan advances funds and is reimbursed by the agency.

Improving Public Perception

The drought has heightened water awareness in the region and has provided momentum for water conservation and reuse. The public is more willing to accept alternative supplies such as recycled water. Public outreach and education have also helped improve the public's perception of recycled water. Public sharing of information, open door stakeholder meetings, and focus groups have been very effective at distributing information and addressing public concerns. Case studies and demonstration projects are used to educate and improve public perception on recycled water.

Ample opportunities exist for cooperation among agencies to address the issue of conflicting and confusing messaging by branding or the use of alternative terminologies. A regional workgroup could explore and encourage outreach partnerships among agencies.

New Technologies, Research, and Information Sharing

New technologies, research, and information sharing greatly enhance the development of recycled water. Programs such as Metropolitan's Foundational Actions Funding Program focus on technical studies and pilot projects that reduce barriers to future local production. Projects under this program include optimizing new treatment techniques for recycled water, exploring new monitoring methodologies, and testing innovative brine concentration technology. In addition to the technical portions of this program, the FAF Program supports collaboration between agencies and regional sharing of information.

Research is especially critical in advancing new water supply options, such as DPR. WateReuse, in partnership with other agencies (including Metropolitan), is leading the California Direct Potable Reuse Initiative[8] to advance DPR as a water supply option in California and to address regulatory, utility, and community concerns. WateReuse's report *Direct Potable Reuse: A Path Forward*[9] provides an overview of DPR and identifies research needs.

Regional studies can also examine the needs of multi-jurisdictional areas and foster communication among agencies to promote the use of recycled water. For example, sharing regional information such as GIS data can identify areas of recycled water surpluses and needs.

[8] https://www.watereuse.org/foundation/research/direct potable reuse-Initiative
[9] https://www.watereuse.org/product/direct-potable-reuse-path-forward

In addition, a clearinghouse could be developed to collect and disseminate information on research and technology developments and studies.

Partnerships

Drinking water, wastewater, and groundwater management agencies share some common objectives, including access to source water, cost minimization, and protection of the environment. Many agencies are successfully cooperating and developing recycled water projects. These partnerships can allow sanitation districts to reduce the cost of disposing treated wastewater in the ocean, reduce impacts to the marine environment, and provide a source of reclaimed water to water agencies for recycling. At the same time, groundwater basin management agencies could be the recipients of final recycled water, helping maintain or increase groundwater levels.

Lessons Learned

There have been many success stories on recycled water development. Focusing on public outreach and education has improved public perception. Partnerships and joint efforts among water and wastewater agencies proved to be an effective way to remove barriers and make progress. Numerous studies and research funded by federal, state, and local agencies are benefitting local and regional effort.

Public Outreach is Important

Public outreach and education have helped improve the public's perception of recycled water. When the public is informed and takes part in the decision making process, they will likely be more accepting of a project.

Water shortages raise awareness for alternate ways to conserve. As a result, the public is more willing to accept alternative supplies such as recycled water, support the more expensive projects, and tolerate rate increases. Some residential property owners are interested in using recycled water for watering plants to help with the drought. For example, residents have access to recycled water from "residential recycled water fill stations" in the Irvine Ranch Water District. Developing similar programs throughout Southern California would help increase recycled water use and conservation of potable supplies.

Additional Funding is Needed

LRP incentives and onsite retrofit program funding have increased use of recycled water in the region by almost 200 percent. However, incentives alone may not be enough to spur project development - capital funding is also necessary because the LRP only provides funding after a project begins operation. As an example, even though Metropolitan recently increased its LRP incentive rates, there are only a few applications for new projects because agencies lack capital funding to construct the project in the first place. Although available construction funding for recycled water projects has increased under the recently passed Proposition 1, projects generally still require a 50 percent local match. One source of funding is typically not enough to fund a recycled water project.

Funding is also needed for studies, pilot projects, and research. Metropolitan's Foundational Actions Funding Program provided funding for studies and pilot projects to help advance the development of local supplies.

Partnerships Can Be Successful

History shows us that partnerships among agencies help advance use of recycled water and provide tangible benefits to each participating agency. A good example of partnerships working well is the agreement between Orange County Water District (OCWD) and the Orange County Sanitation District. This partnership began in the 1970s, when OCWD built the Water Factory 21 to produce recycled water to mitigate seawater intrusion in the Orange County Groundwater Basin. Twenty years later, the two agencies decided to jointly build the Groundwater Replenishment System (GWRS) recycled water project. The GWRS is the largest planned indirect potable reuse facility in the world with a current capacity of 100,000 AFY and future expansion to 130,000 AFY.

Other examples of cooperation between agencies to further recycled water use include partnerships between the city of Los Angeles and West Basin Municipal Water District (West Basin Water Recycling Program), the City of Los Angeles and the City of Burbank (North Hollywood Water Recycling Project), City of Long Beach and the Water Replenishment District (Alamitos Barrier Water Recycling Project), and the Sanitation Districts of Los Angeles County and Central Basin Municipal Water District (Century and Rio Hondo Water Recycling Project).

Water Industry Organizations and Regional Collaboration Help Advance Recycled Water

Recent advancements to recycled water development are due, in large part, to cooperation and collaboration among water and sanitation districts, as well as other water industry organizations. Historically, the WateReuse Association was one of the main advocates for recycled water development in the state. Their activities initially focused on permitting issues, public outreach/education, conferences for information sharing, and research related to recycled water. As recycled water became a core resource for water and wastewater agencies, they started to ramp up their activities to help advance recycled water and utilized partnerships with academia along with other trade organizations such as the Association of California Water Agencies, California Urban Water Agencies, WateReuse Association, and California Association of Sanitation Agencies. Professional organizations such as American Water Works Association (AWWA) are another vehicle to promote recycled water through research, technical seminars, and operator training and certification. These organizations have proven to be effective in promoting regional collaboration on research and leveraging resources.

Recommendations

Explore Opportunities to Improve Permitting Process

- Streamline and simplify water recycling regulations with uniform administration consistent with operations, public health, and the environment
- Support legislation and regulation that expands the types of recycled water uses consistent with the protection of public health and help achieve the state's recycled water goal (an additional 1 million acre-feet by 2020)
- Convene a forum to discuss projects, permitting, and treatment technologies

Improve Public Education and Awareness of Water Recycling

- Pursue unified, consistent messaging
- Consider expanding residential fill stations to further advance public acceptance of recycled water

Explore Various Investment Strategies, Such as Incentives, Ownership, and Partnerships

- Promote collaboration among stakeholders and agencies to facilitate implementation of recycled water projects in California
- Promote development of new financing to increase water recycling, advance research in science and technology, assess health effects, develop additional regional planning, and study innovative technologies
- Explore a business case for further development of recycled water partnerships or ownership
- Consider additional end user programs to replace potable water systems with recycled water
- Collaborate on pursuing grant funding

Consider Joint Technical Studies and Projects

- Explore a collaborative regional effort to develop a regional GIS data set
- Explore integration approaches
- Investigate programs for the development of new technologies, such as comprehensive real-time monitoring devices and techniques that improve water quality and ensure public health, and maintain public confidence
- Study opportunities to protect or improve the quality of wastewater source supplies
- Explore development of a regional study to help identify opportunities for seasonal storage

Groundwater Recovery

All Southern California groundwater basins experience varying degrees of water quality challenges as a result of urban and agricultural uses. The accumulation of high-salinity water and degradation from volatile organics are two common constraints to the economic use of groundwater for urban applications. In some cases, the threat of increased salt buildup can also complicate conjunctive use of groundwater basins and imported supplies.

Use of degraded groundwater normally requires high levels of treatment. Membrane processes used to recover the majority of severely degraded water have a high capital cost and incur a high operational cost for power. Once treated, however, recovered groundwater may be integrated into potable water systems. Metropolitan initiated its Groundwater Recovery Program (GRP) in 1991 to encourage local agencies to treat and use degraded groundwater for municipal purposes. The GRP was open to all technologies that recovered and used degraded groundwater. It was retired in 1998 and folded into Metropolitan's LRP.

Seawater Desalination

The constant availability of ocean water regardless of weather or climate is one of the key benefits of seawater desalination. Thus, Metropolitan and its member agencies have been considering seawater desalination as a potential new supply source since the 1960s. Up until the 1990s, seawater desalination was considered too expensive compared to other resource alternatives, especially imported water. However, advances in membrane technology, energy recovery, and process design in the 1990s lowered desalination costs compared to other new supply alternatives. By the early 2000s, several member agencies began pursuing local projects to diversify their resource portfolios. In 2001, Metropolitan created an incentive program, the

Seawater Desalination Program, to support these projects. Soon after, the Board approved Metropolitan's role as a regional facilitator for seawater desalination with the purpose of assisting the member agencies with state and regional development issues. In 2014, Metropolitan merged seawater desalination projects into the LRP to promote development of additional local supplies in the region.

Changed Conditions

The status of locally planned projects changes from year to year. Metropolitan periodically surveys its member agencies for planned projects to coordinate local supply projections and plans. Recent changes in long-term strategies, regulations, and funding priorities could provide new opportunities to develop these resources.

Recycled Water

Several recent state policies and adopted codes help recycled water development as described below.

SWRCB adopted the State Recycled Water Policy (Policy) in February 2009 after several years of negotiation and amended it in 2013 to include the monitoring and analytical requirements for constituents of emerging concern (CEC). The Policy supports the SWRCB Strategic Plan to promote sustainable local water supplies and establishes a mandate to increase the use of recycled water in California by 1 MAF per year over 2002 levels (approximately 525,000 AF) by 2020 and by an additional 3 MAF per year by 2030. The Policy is organized into recycled water goals, roles of agencies, salt and nutrient management plans, landscape irrigation, groundwater recharge, anti-degradation, emerging constituents, and recycled water incentives.

SWRCB's General Permit for Recycled Water Use was adopted June 4, 2014, in response to the Governor's draught declaration and to facilitate the use of recycled water to offset potable water demands. Coverage is available to most treated municipal wastewater for non-potable uses, but specifically excludes groundwater replenishment. Monitoring for CECs is not required for non-potable uses. Application of recycled water for irrigation sites is limited to agronomic rates.

On November 18, 2009, the Building Standards Commission unanimously voted to approve the California Dual Plumbing Code that establishes statewide standards for installing both potable and recycled water plumbing systems in new commercial, retail, and office buildings, theaters, auditoriums, condominiums, schools, hotels, apartments, barracks, dormitories, jails, prisons, and reformatories. The code was adopted January 15, 2010, with an effective date of January 1, 2011.

Assembly Bill 2071 (Levine 2014) directs SWRCB by December 31, 2016, in consultation with other agencies, to determine if the voluntary use of disinfected treated recycled water for watering animals would pose a significant risk to the public and animal health. The SWRCB shall approve the use or establish uniform statewide recycling criteria to address identified risks. Use of recycled water would be prohibited for dairy animals that are producing items for human consumption.

Assembly Bill 2282 (Gatto 2014) directs the California Building Standards Commission to adopt in the 2016 Intervening Code Adoption Cycle mandatory building standards for the installation of recycled water systems for newly constructed commercial and residential buildings in areas where there is access to a water recycling facility.

Groundwater Recovery Brine Disposal

The management of existing regional brine lines and the development of new brine line systems will be a critical factor in the continued growth in brackish groundwater desalination. The brine line will also be applicable for disposing brine from advanced treatment of wastewater for recycled water use. All processes that recover degraded groundwater also produce concentrated waste flows for which disposal can be problematic. Most importantly, membrane processes such as reverse osmosis – the predominant desalting technology used in Southern California – produce significant volumes of brine that can account for about 15 percent of the treated water. In Southern California, brines generated from brackish water desalination are typically disposed through dedicated brine lines to ocean outfalls or sanitary sewers.

The region currently has one fully operating brine line, the Santa Ana Regional Interceptor (SARI line). The SARI line collects brine from desalters in San Bernardino, Riverside, and Orange Counties. A key benefit of the SARI line is that it has allowed inland water agencies to recover impaired groundwater resources which would otherwise be unusable.

A lower portion of a second brine line, Calleguas Regional Salinity Management Pipeline, is in operation while the upper reach is still under construction. The Calleguas Regional Salinity Management Pipeline delivers brine from recycled water plants and groundwater desalination facilities in Ventura County to the ocean.

A third regional line is in the planning phase in San Diego County. The Southern California Salinity Coalition, a coalition of water and wastewater agencies, has advocated for state and federal financial assistance to build these regional brine lines.

Seawater Desalination

In the past five years, State agencies have implemented new regulations which could negatively impact the future development of seawater desalination. This includes the SWRCB's Ocean Plan amendments and Once-Through Cooling regulations, as well as the establishment of Marine Life Protected Areas (MLPAs) in Southern California. At the same time, the impacts of the current drought and the potential for multi-decadal dry-periods due to climate change have increased interest in seawater desalination as a potential long-term response to water shortages.

Ocean Plan Regulations

In May 2015, after five years of development, the SWRCB updated California's Ocean Plan with regulations affecting new seawater desalination projects. The regulations include stringent requirements for intakes, outfalls, brine discharges, and marine life mitigation. Regional Water Quality Control Boards will be responsible for implementing the regulations and will have broad powers over project design elements. The new regulations may increase project costs and could limit the ability to develop regional-scale projects.

Once-Through Cooling Regulations

Prior to the revised Ocean Plan regulations, the SWRCB in 2010 adopted regulations requiring coastal power plants to phase out the use of once-through-cooling (the use of seawater to cool generators in a single-pass system) by 2030. As once-through-cooling is phased out, many of the environmental and operational benefits of co-locating seawater desalination projects with power plants will be diminished. However, coastal power plants remain attractive sites for

development due to the presence of coastal-dependent industrial zoned land, power infrastructure, and the potential to repurpose existing infrastructure.

Marine Life Protected Areas

In 2011, the California DFW adopted a system of 50 MLPAs covering approximately 15 percent of Southern California's coastline[11]. MLPAs are defined zones along the coast where certain commercial and recreational activities are restricted. Most construction and operational activities associated with seawater desalination are prohibited in MLPAs with the exception of certain types of subsurface intakes. MLPAs are located along the Channel Islands, as well as along the mainland coast. The MLPAs network includes areas near planned seawater desalination projects. Depending on how MLPAs enforcement regulations are interpreted, they could be a limiting factor for some planned seawater desalination projects.

Implementation Approach

Local Resources Program

The Local Resources Program (LRP) is the primary tool for Metropolitan to incentivize local resources development. The success of the LRP is due to its adaptability to changed conditions. Periodically, Metropolitan and its member agencies review and update the LRP in response to water supply conditions.

Metropolitan continues to explore ways to help increase recycled water use. In order for a site to receive recycled water, the potable water systems must be retrofitted for recycled water use. On-site conversion costs (borne by customers) are generally high. In July 2014, Metropolitan established the On-site Retrofit Pilot Program to provide financial incentives to customers for the conversion of their potable industrial and irrigation systems to recycled water.

Furthermore, in October 2014, Metropolitan made significant improvements to the LRP that included increasing the incentive amount and providing three incentive payment structures. Metropolitan offers three LRP incentive payment structure options to choose from: sliding scale incentives up to $340/AF over 25 years, sliding scale incentives up to $475/AF over 15 years, or fixed incentives up to $305/AF over 25 years. In addition, onsite retrofit costs for recycled water uses are eligible for LRP incentives. Under the enhanced program, LRP projects include other local water resources development including seawater desalination. To expedite development of ready-to-proceed projects, Metropolitan would also provide reimbursable services, such as engineering design, to member agencies.

Regional Recycling Program

On November 10, 2015, Metropolitan's Board authorized Metropolitan to enter into an agreement with the County Sanitation District No. 2 of Los Angeles County (Sanitation District) to implement a demonstration-scale recycled water treatment plant and to establish the framework of terms and conditions for development of a regional recycled water supply program. Under this proposed agreement, Metropolitan has the opportunity to work collaboratively with the Sanitation District to develop a potential regional recycled water supply program that would purify and reuse water for the recharge of groundwater basins. Metropolitan and the Sanitation District would jointly develop this program to purify secondary effluent from the Sanitation District's Joint Water Pollution Control Plant (JWPCP) using advanced treatment technologies to produce water that is near-distilled in quality and that

[11] http://www.wildlife.ca.gov/Conservation/Marine/MPAs/Network/Southern-California

would be equal to or better than the quality of water currently used to replenish groundwater basins in the Southern California region. The secondary effluent from the JWPCP is currently discharged to the Pacific Ocean. The purified water would be delivered to Metropolitan's member agencies to meet their groundwater recharge and storage requirements. A collaboration between the two districts could advance the reuse of water at a scale, timing, and strategic location to serve the direct needs of multiple member agencies for recharge of groundwater basins in Southern California, and to augment regional supplies for Metropolitan's service area.

The demonstration project would serve as a proof of concept and would provide critical information needed for implementation of a potential regional recycled water supply program. The demonstration project would consist of three components: (1) a one million gallon per day (MGD) demonstration-scale treatment plant, which would verify source water quality criteria and confirm the advanced treatment process needed to purify water for groundwater recharge; (2) feasibility studies of the delivery system to determine the distribution facilities, routing, capacity, phasing, and timing needed to recharge various groundwater basins within Metropolitan's service area, and (3) a financing plan to assess the economic viability of a full-scale regional program. The proposed agreement also establishes the framework for the development of a full-scale regional recycled water supply program that would enable a potential reuse of up to 150 MGD of treated effluent from the Sanitation District's JWPCP.

Seawater Desalination Program

Metropolitan's Seawater Desalination Program (SDP) was created in 2001 through a competitive Request for Proposals (RFP) to encourage the development of potential projects by local agencies. Like the LRP, it offers sliding-scale incentives to member and local agencies, providing up to $250 per AF for produced supplies. In response to the RFP in 2001, Metropolitan entered into SDP agreements with three member agencies. The Carlsbad Project was originally part of the SDP program, but has proceeded without an SDP agreement or incentives. A fifth potential project in the initial RFP was not pursued.[12] In 2014, Metropolitan expanded regional funding opportunities for seawater desalination by merging it into the LRP incentive program described above. Table 3-10 provides a summary of the status of the SDP projects. Local agencies are also considering a number of projects independent of the SDP with the potential to produce up to 360 TAF per year if developed. Table 3-11 provides a summary of these local agency projects.

Metropolitan also provides regional facilitation for seawater desalination by providing technical assistance, supporting member agency projects during permit hearings and other proceedings, coordinating responses to proposed legislation and regulations, and working with the member agencies to resolve related issues. To further these goals, Metropolitan help found and now participates in CalDesal, a consortium of water utility and private companies promoting desalination as an element of California's future supply portfolio.

Achievements to Date

Metropolitan has continued to develop and refine its programs to encourage the involvement of its member agencies in water recycling, groundwater recovery, and desalination. Developing and managing these programs requires considerable coordination and refinement. Changing conditions over the last five years have reduced the costs of these options and allow Metropolitan to rely on these sources for future water supply.

[12] The LADWP opted to not pursue its potential seawater desalination project in the mid-2000s.

Metropolitan is committed to providing financial assistance to the development of water recycling projects throughout its service area. Since 1982, Metropolitan has executed LRP contracts for 75 recycled water projects, 59 of which produced about 184 TAF in 2015. Local projects not receiving funding from Metropolitan provide an additional 272 TAF of recycled water to the region.

Since 1991, Metropolitan has executed GRP and LRP contracts for 24 recovered groundwater projects, 22 of which produced about 57 TAF in 2015. In addition to the projects under Metropolitan's programs, about 50 TAF of degraded groundwater is recovered by agencies in Metropolitan's service area without Metropolitan's financial assistance.

Table 3-12 provides a summary of recycled water use and groundwater recovery in 2015. To date, Metropolitan has invested $372 million in recycling programs and $132 million for groundwater recovery. Table 3-13 provides a summary of the groundwater and recycled water production and incentive payments under Metropolitan's programs to date.

Member agency seawater desalination projects under Metropolitan's SDP are still in the planning stages, though significant pilot testing and related studies have been completed by the local agencies in support of the projects. The 56 TAF Carlsbad project was completed and is now operational without Metropolitan's financial assistance.

Table 3-10
Seawater Desalination Program Project Status

Project	Member Agency Service Area	Capacity Range AF per Year	Status	SDP Agreement
Long Beach Seawater Desalination Project	Long Beach Water Department	10,000	Long-term intake testing	Yes
Doheny Desalination Project	Municipal Water District of Orange County/ South Coast Water District	5,000 – 16,000	Pre-EIR Studies	Yes
Carlsbad Seawater Desalination Project	San Diego County Water Authority	56,000	Operational	No
West Basin Seawater Desalination Project	West Basin Municipal Water District	20,000 – 60,000	Pre-EIR Studies	Yes
Total: Seawater Desalination Projects		**91,000 – 142,000**		

Table 3-11
Other Potential Seawater Desalination Projects in Metropolitan's Service Area

Project	Member Agency Service Area	AF per Year	Status
Huntington Beach Seawater Desalination Project	Municipal Water District of Orange County / Orange County Water District	56,000	Permitting
Camp Pendleton Seawater Desalination Project	San Diego County Water Authority	56,000 to 168,000	Planning
Ventura County	Calleguas Municipal Water District	20,000 to 80,000	Feasibility Study
Rosarito Beach	San Diego County Water Authority, Otay Water District	56,000 to 112,000[1]	Feasibility study
Total: Other Potential Projects		**160,000 – 360,000**	

[1] Metropolitan's service area would receive a share of the total supply produced by the project.

Table 3-12
2015 Recycled Water Use and Groundwater Recovery
(TAF)

Type of Project	With Metropolitan Funding	Without Metropolitan Funding	Total
Recycled Water[1]	184	230[1]	414
Groundwater Recovery	60	55	115
Total	**244**	**285**	**529**

[1] Including 60 TAF of Santa Ana River baseflow.

Table 3-13
Local Resources Program

	Recovered Groundwater	Recycled Water	Total
Projects			
In Operation	24	75	99
Ultimate Yield (TAF)	112	310	422
Deliveries (TAF)			
FY 2014-2015	60	184	244
Since Inception	791	2,237	3,028
Payments ($ millions)			
FY 2014-2015	$8	$30	$38
Since Inception	$132	$372	$504

3.6 Surface Storage and Groundwater Management Programs: Within the Region

Since the 1950s, local water management in Metropolitan's service area has included the surface water storage and conjunctive use of groundwater. Conjunctive use of water refers to the use and storage of imported surface water supplies in groundwater basins and reservoirs during periods of abundance. This stored water is available for use during periods of low surface water supplies as a way of augmenting seasonal and multiyear shortages.

Background

Metropolitan established general long-term storage guidelines in its WSDM Plan. The WSDM Plan provides for flexibility during dry years, allowing Metropolitan to use storage for managing water quality, hydrology, SWP, and CRA issues. Dry-year surface storage yields have been characterized in several ways, including delivery capabilities over two- and three-year dry periods. The approach used in Metropolitan's resource planning assumes that dry-year surface storage can be used as needed and as available within the WSDM planning framework. In addition to surface reservoirs in the region, storage capacity in the region's groundwater basins allows for conjunctive use programs. In 2000, the Association of Ground Water Agencies (AGWA) published Groundwater and Surface Water in Southern California: A Guide to Conjunctive Use that estimated the potential for dry-year or long-term conjunctive use in Metropolitan's service area at approximately 4.0 MAF. In 2007, Metropolitan published the Groundwater Assessment Study that estimated 3.2 MAF of space in groundwater basins available for storage within Metropolitan's service area. Metropolitan's 1996 IRP calls for the development of conjunctive use programs with member agencies and groundwater basin managers to store surplus imported supplies in wet years to provide dry-year supplies.

To prepare for supply disruptions, Metropolitan and its member agencies have adopted goals for water storage within the region. Metropolitan has identified in-region storage that should be set aside for use in emergencies, such as a disruption to imported supplies due to a major seismic event at the San Andreas Fault.

Implementation Approach

Surface Storage

Since the beginning of the Metropolitan's planning process, two significant changes have occurred to regional surface storage. These two changes are the construction of DVL and Metropolitan receiving operational control of 218,940 AF in Castaic Lake and Lake Perris.

Diamond Valley Lake

Construction of Southern California's newest and largest reservoir nearly doubled the area's surface water storage capacity. Transport of imported water to the lake began in November 1999, and the lake reached capacity in early 2003. DVL holds up to 810 TAF, some of which is for dry-year or seasonal storage, and the remainder for emergency storage.

SWP Terminal Reservoirs

Under the 1994 Monterey Agreement and Amendment, Metropolitan received operational control of 218,940 AF in the reservoirs at the southern terminals of the California Aqueduct. Control of this storage capacity in Castaic Lake and Lake Perris gives Metropolitan greater flexibility in handling supply shortages. In 2005, seismic concerns arose regarding Perris Dam. In response, DWR reduced the storage amount at Lake Perris by half until those concerns can be studied and addressed; however, Metropolitan's operational storage remained the same. Since then, Metropolitan has continued to withdraw and replace water from the reservoir

operating from the lower level. In November 2011, DWR issued a Final EIR for the repair of the dam at Lake Perris. Construction work began on August 2014 and is anticipated to continue through 2017.

Groundwater Storage

Many local groundwater storage programs have been implemented over the years to maximize the use of local water supplies. These programs have included the diversion of water flows into percolation ponds for recharging groundwater basins and the recovery of degraded groundwater.

- For many years, flood control agencies within Metropolitan's service area have captured and spread stormwater for groundwater replenishment. Local runoff and reclaimed water have been conserved via spreading grounds, injection wells, reservoirs, and unlined river channels. In addition, flood control agencies have operated seawater barrier projects in Los Angeles and Orange Counties to prevent seawater intrusion into the coastal groundwater basins.
- Water quality problems have raised serious concerns about the ability to sustain average annual production levels in some groundwater basins. The federal Superfund program, although slow to implement clean-up projects, has helped maintain or increase the usable groundwater. These increased levels have been augmented by groundwater water recovery projects discussed in Section 3.5.

Conjunctive use of the aquifers offers an even more important source of dry year supplies. Unused capacity in Southern California groundwater basins can be used to optimize imported water supplies, and the development of groundwater storage projects allows effective management and regulation of the region's major imported supplies from the Colorado River and SWP. Over the years, Metropolitan has implemented conjunctive water use through various programs. Typically, this storage takes place in one of two ways:

- Direct deliveries to storage – Metropolitan delivers recharge water directly to water storage facilities, including spreading sites and injection wells.
- In-lieu deliveries to storage – Metropolitan delivers additional water directly to a member agency's distribution system. The member agency then uses this water rather than pumping the groundwater it otherwise would have taken out of storage. The deferred local production results in water being left in local storage (surface or groundwater) for future use.

Metropolitan has developed a number of local programs to work with its member agencies to increase storage in groundwater basins. Metropolitan has encouraged storage through its cyclic and conjunctive use storage programs. These programs allow Metropolitan to deliver water into a groundwater basin in advance of agency demands. Cyclic storage agreements allow pre-delivery of imported water for recharge into groundwater basins in excess of an agency's planned and budgeted deliveries making best use of available capacity in conveyance pipelines, use of storm channels for delivery to spreading basins, and spreading basins. This water is then purchased at a later time when the agency has a need for groundwater replenishment deliveries. Conjunctive use agreements provide for storage of imported water that can be called for use by Metropolitan during dry, drought, or emergency conditions. During a dry period, Metropolitan has the option to call water stored in the groundwater basins pursuant to its contractual conjunctive use agreements. At the time of the call, the member agency pays Metropolitan the prevailing rate for that water. Metropolitan has drawn on dry-year supply from cyclic storage accounts and nine contractual conjunctive use storage programs to address shortages from the SWP and the CRA.

Achievements to Date

In 2000, Metropolitan entered an agreement with DWR to administer $45 million of Proposition 13 state bond funds for Metropolitan's Southern California Water Supply Reliability Projects Program. Metropolitan paired the $45 million of state funds with $35 million of Metropolitan capital funds to develop nine groundwater storage programs in partnership with member and retail agencies and groundwater basin managers. These nine contractual storage programs provide for storage of up to 212 TAF and dry-year yield of up to 70 TAF. These programs are summarized in Table 3-14.

In 2007, Metropolitan prepared the Groundwater Assessment Study Report in collaboration with its member agencies and with groundwater basin managers. The report finds that while there is substantial storage space in service area groundwater basins that could be used for conjunctive use, there are significant challenges that must be overcome in order to implement additional storage programs. Use of additional storage opportunity requires:

- Capture, delivery, and recharge of additional local and imported surface supplies;
- Improved capability to store available surplus surface supplies with adequate conveyance and recharge capacity; and
- Resolution of constraints including: remediation of contamination, institutional and legal issues, funding for significant investment in capital infrastructure, and incongruity between aquifer capability with overlying demand for water supplies.

To follow up on the findings of the Groundwater Assessment Study Report, Metropolitan initiated a series of seven groundwater workshops beginning in July 2008 among Metropolitan, member agencies, groundwater basin managers, and stakeholders to discuss challenges for increasing conjunctive use and to develop recommendations for addressing the challenges. The workgroup's recommendations were submitted as a Board Report to Metropolitan's Board of Directors and provided as input to Metropolitan's current planning process. The recommendations are as follows:

1. Enhance groundwater recharge with increased stormwater, recycled water, and imported water recharge.
2. Streamline requirements, remove policy constraints, clarify procedures, increase coordination and sharing of information to accomplish recharge goals.
3. Develop flexible regional policies and programs that can be tailored to meet specific local needs of each groundwater basin.
4. Increase integration of local groundwater and regional water supplies with a proposal for a comprehensive modeling study to initiate review of innovative opportunities.
5. Use appropriate price signals to encourage conjunctive use and investments for storage.
6. Increase coordination among Metropolitan, member agencies, basin managers, groundwater producers, and stakeholders inclusive of collaboration for legislative, regulatory, and educational efforts in support of specific initiatives and funding needed for sound groundwater management.

As part of Metropolitan's 2015 IRP Update, two workshops focusing on sustainable local groundwater were held with member agencies and groundwater basin managers. Since 2013, Metropolitan has also been working with the SCWC Stormwater Task Force to evaluate the feasibility of further supporting groundwater production with increases in stormwater capture for groundwater recharge. In 2015, the SCWC's 4th Annual Stormwater Workshop was held to invite input to Metropolitan's IRP process.

Table 3-14
Contractual Conjunctive Groundwater Projects

Project and Project Proponents	Storage Capacity (TAF)	Dry-Year Yield (TAF/Year)	Storage Account Balance as of 12/31/2015 (TAF)
LOS ANGELES COUNTY			
Long Beach Conjunctive Use Project Long Beach	13.0	4.3	0
Foothill Area GW Storage Project Foothill MWD	9.0	3.0	0
Long Beach CUP: Expansion in Lakewood Long Beach	3.6	1.2	0
City of Compton Conjunctive Use Program City of Compton	2.3	0.8	0
Upper Claremont Heights Conjunctive Use Three Valleys MWD	3.0	1.0	0.3
ORANGE COUNTY			
Orange County GW Conjunctive Use Program OCWD, MWDOC	66.0	22.0	5.7
SAN BERNARDINO COUNTY			
Chino Basin Programs IEUA, TVMWD, Chino Basin Watermaster	100.0	33.0	0
Live Oak Basin Conjunctive Use Project Three Valleys MWD	3.0	1.0	0.7
RIVERSIDE COUNTY			
Elsinore Groundwater Storage Program Western MWD, Elsinore Valley MWD	12.0	4.0	0.1
Total	**211.9**	**70.3**	**6.8**

3.7 Water Use Reduction

In November 2009, Governor Arnold Schwarzenegger signed the Water Conservation Act of 2009 (SB X7-7) into law as part of the historic comprehensive water package designed to address the State's growing water challenges. The Act represented the culmination of efforts by water industry leaders (including Metropolitan), the environmental community, and the Legislature to enact legislation that would answer the governor's call for the state to reduce per capita water use 20 percent by the year 2020 (referred to as "20x2020") as part of a larger effort to ensure reliable water supplies for future generations and restore the Bay-Delta.

The 20x2020 legislation requires urban retail water suppliers to develop urban water use targets to help meet the 20 percent reduction in water use by 2020, with interim targets for 2015. The legislation provides flexibility in how targets are established and achieved. Per capita reductions can be accomplished through any combination of increased water conservation, improved water use efficiency, and increased use of recycled water to offset potable demand. Potable demand offsets can occur through direct reuse of recycled water, such as for irrigation, or indirect potable reuse through groundwater recharge and reservoir augmentation. Retail water suppliers receive partial credit for past efforts in conservation and recycled water; therefore, not all agencies need to reduce demand by 20 percent in order to comply with the law.

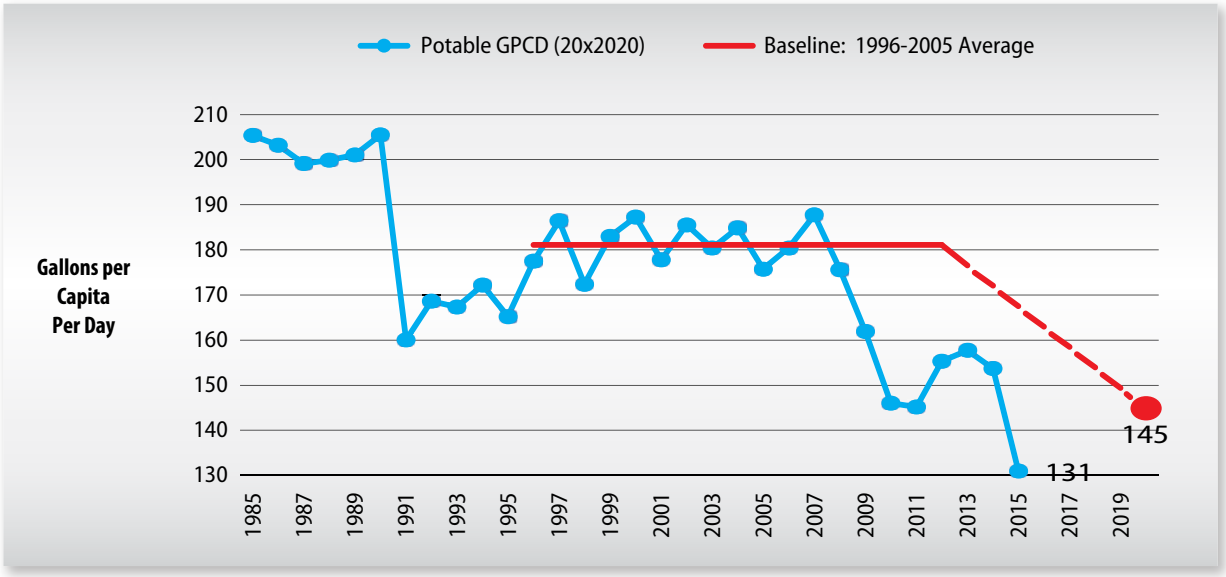
Achievement as of 2015

As a wholesale water agency, Metropolitan is not required to establish or report an urban water use reduction target. However, Metropolitan's CCP and LRP are designed to assist member agencies and retail water suppliers in the service area to comply with SB X7-7. These programs are described in Sections 3.4 and 3.5. Therefore, Metropolitan monitors the progress of its service area.

Based on an analysis of population, demand, and the methodologies for setting targets described in the legislation, Metropolitan's baseline is 181 GPCD, and the 2020 reduction target is 145 GPCD, as illustrated in Figure 3-4. From 2011-2014, there was a slight increase in per capita water use explained in part by continued economic recovery and drier weather as compared to previous years. With mandatory restrictions from the state and water supply allocation from Metropolitan, the 2015 GPCD is 131, a 28 percent reduction from the baseline.

Over the next five years, Metropolitan will periodically assess water supply conditions and trends in per capita demand within its service area and evaluate potential programs to ensure attainment of the goal. Metropolitan also continues to provide support for retail agency efforts through technical assistance, legislation, code and standards updates, and potential financial incentives where needed for market transformation to increase water use efficiency.

Figure 3-4 Potable Per Capita Water Use: 20% Reduction by 2020 Metropolitan's Service Area (Calendar Year)



3.8 Energy Management Initiative

To further Metropolitan's mission to provide its service area with adequate and reliable supplies of high-quality water to meet present and future needs in an environmentally and economically responsible way, Metropolitan has adopted an energy management initiative. The energy management policies guide the agency in energy-efficient design and operation of its facilities, cost-effective power acquisition strategies, and the implementation of cost-effective renewable energy technologies. To highlight a few recent accomplishments, Metropolitan completed the Energy Management & Reliability Study in December 2009 to identify the issues and potential future actions for Metropolitan to consider in achieving energy reliability and cost control. Metropolitan is a registered member in The Climate Registry and has prepared annual greenhouse gas emissions inventories since 2005, and also reports emissions data to the California Air Resources Board under mandatory reporting regulations.

In May 2009, Metropolitan completed a 10-acre field of solar panels at the Robert A. Skinner Water Treatment Plant in the Temecula Valley of southwestern Riverside County. The 1 megawatt solar installation is designed to generate approximately 2.4 million kilowatt-hours (kWh) of clean, renewable energy a year, equal to the power used by about 250 homes annually. Metropolitan received more than $5 million in rebates during the first five years of the facility's operation.

In August 2010, Metropolitan's Board adopted Energy Management Policies, to provide staff with the necessary guidance to move forward with cost-effective and environmentally responsible programs, projects, and initiatives. Identified projects are considered by Metropolitan's Board of Directors for authorization on a case-by-case basis. These policies recognize the upward pressure on costs caused by the reduction of Metropolitan's Hoover power allocation in 2017, by evolving power markets, by increased direct and indirect regulatory pressure to reduce greenhouse gas (GHG) emissions, and by the risk of reduced Colorado River hydropower supplies with climate change. The specific policies are as follows:

- Water/Energy Nexus: Identify collaborative programs and initiatives between the water and energy industries, constructing sustainable partnerships to reduce costs and provide enhanced reliability.
- Regulatory: Track federal and state greenhouse gas regulations and develop strategies to hedge against price and regulatory risks towards Metropolitan.
- Legislation: Pursue legislation to protect or enhance reliability of energy supply and mitigate energy cost risk.
- Contracts: Maintain maximum flexibility on existing and future contracts with Hoover and other energy contracts to hedge against cost and regulatory risks.
- Projects/Partnerships: Pursue cost-effective renewable energy projects and partnerships to hedge against energy price increases and regulatory risks, while reducing Metropolitan's carbon footprint.
- Revenue Stream: Pursue revenue stream renewable energy facilities on operational lands to assist in cost containment.
- Economic & Environmental Stewardship: Based on projected economic and regulatory conditions, develop cost-effective programs, projects, and initiatives to control operational costs.
- Energy Management Updates: Continue to consider/implement actions or projects consistent with Energy Management Policies and report progress to the Board.

On December 20, 2011, the President signed the Hoover Power Allocation Act. The Act stipulated that Metropolitan and the other Hoover power contractors would receive 95 percent of their current Hoover allocation when the new contract becomes effective in 2017. The new contract will have a term of 50 years, from 2017 to 2067.

Metropolitan also started construction work in 2015 for a 3-megawatt solar installation at the Weymouth plant. This planned solar installation would meet up to 20 percent of the Weymouth plant's expected daily power consumption. A 1-megawatt solar project planned for Metropolitan's Jensen facility is now in design.

Moving forward with these energy management initiatives will enhance Metropolitan's ability to provide long-term power reliability, to protect against energy market price volatility, and to hedge against overall cost risks for operation of Metropolitan's distribution system and the CRA.

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Water Quality 4

Metropolitan's planning efforts have recognized the importance of the quality of its water supplies. To the extent possible, Metropolitan responds to water quality concerns by protecting the quality of the source water and developing water management programs that maintain and enhance water quality. Contaminants that cannot be sufficiently controlled through protection of source waters must be handled through changed water treatment protocols or blending. These practices can increase costs and/or reduce operating flexibility. This section discusses source water quality and issues of concern affecting water management strategies and water supply reliability.

Background

Metropolitan's planning efforts for groundwater storage, recycled water, and other water management strategies require meeting specific water quality targets for imported water. Metropolitan has two major sources of water: the Colorado River and the State Water Project (SWP). Groundwater inflows are also received into the SWP through groundwater banking programs in the Central Valley. Each source has specific quality issues, which are summarized in this section. To date, Metropolitan has not identified any water quality risks that cannot be mitigated. As described in this section, the only potential effect of water quality on the level of water supplies based on current knowledge might be increases in the salinity of water resources. Under California's current drought conditions, decreased flows have altered Delta flow patterns and, while the effects of the drought have not been fully studied, there have been some observable changes in water quality such as increased salinity due to increased seawater intrusion. However, even under drought conditions, SWP salinity is significantly lower than Colorado River water salinity, and Metropolitan relies on blending imported water sources to mitigate for the higher salinity Colorado River water. During recent periods of drought, Metropolitan's SWP allocation has been reduced, including to a historical low of zero percent in January 2014, which affected blending operations. Metropolitan increased its reliance on Colorado River water in 2014 and 2015, and subsequently, salinity in treatment plant deliveries increased overall from the higher Colorado River salinity levels. Metropolitan anticipates no significant reductions in water supply availability from imported sources due to water quality concerns, such as salinity, over the next five years.

Colorado River

High salinity levels remain a significant issue associated with Colorado River supplies. In addition, Metropolitan has been engaged in efforts to protect its Colorado River supplies from threats of uranium, perchlorate, and chromium-6, which are discussed later in this section. Metropolitan has also been active in efforts to protect these supplies from potential increases in nutrient loading due to agriculture and urbanization, as well as tracking the occurrence of constituents of emerging concern, such as N-nitrosodimethylamine (NDMA) and pharmaceuticals and personal care products (PPCPs). Metropolitan fully expects its source

water protection efforts to be successful, so the only foreseeable water quality constraint to the use of Colorado River water will be the need to blend (mix) it with SWP supplies to meet Metropolitan's Board-adopted salinity standards.

State Water Project

The key water quality issues for the SWP are disinfection byproduct precursors, in particular, total organic carbon and bromide. Metropolitan is working to protect the water quality of this source, but it has needed to upgrade its water treatment plants to deal adequately with disinfection byproducts. Disinfection byproducts result from total organic carbon and bromide in the source water reacting with disinfectants at the water treatment plant, and they may place some near-term restrictions on Metropolitan's ability to use SWP water. Metropolitan is overcoming these treatment restrictions through the use of ozone disinfection at its treatment plants. Ozone facilities have been completed at four of Metropolitan's treatment plants, and construction is underway for ozone facilities at the Weymouth water treatment plant. Arsenic is also of concern in some groundwater storage programs. Groundwater inflows into the California Aqueduct are managed to comply with regulations and protect downstream water quality while meeting supply targets. Additionally, nutrient levels are significantly higher in the SWP system than within the Colorado River, leading to the potential for algal related concerns that can affect water management strategies. Metropolitan is engaged in efforts to protect the quality of SWP water from potential increases in nutrient loading from wastewater treatment plants.

Local Agency Supplies and Groundwater Storage

Drinking water standards for contaminants, such as arsenic, chromium-6, and other emerging constituents, may add costs to the use of groundwater storage and may affect the availability of local agency groundwater sources. These contaminants are not expected to affect the availability of Metropolitan supplies, but they may affect the availability of local agency supplies. This could affect the level of demands on Metropolitan supplies if local agencies abandon supplies in lieu of treatment options. Metropolitan has not analyzed the effect that many of these water quality issues could have on local agency supply availability.

In summary, the major regional water quality concerns include the following:

- Salinity
- Perchlorate
- Total organic carbon and bromide (disinfection byproduct precursors)
- Nutrients (as they relate to algal productivity)
- Arsenic
- Uranium
- Chromium-6
- Constituents of Emerging Concern (e.g., NDMA and PPCPs)

Metropolitan has taken several actions and adopted programs to address these contaminants and to ensure a safe and reliable water supply. These actions, organized by contaminant, are discussed below, along with other water quality programs that Metropolitan has been engaged in to protect its water supplies.

Issues of Potential Concern

Salinity

The State Water Resources Control Board's Division of Drinking Water (DDW), formerly the California Department of Public Health, established a secondary drinking water standard for salinity, commonly expressed as total dissolved solids (TDS), with a recommended maximum contaminant level (MCL) of 500 milligrams per liter (mg/L) and upper limit MCL of 1,000 mg/L. Imported water from the Colorado River has high salinity levels, so it must be blended (mixed) with lower-salinity water from the SWP to meet salinity management goals. Higher salinity levels in Colorado River water would increase the proportion of SWP supplies required to meet Metropolitan's Board-adopted imported water salinity objectives. High levels of salinity can impact various water uses such as limiting groundwater and recycled water uses, reducing the lifespan of household appliances, and reducing crop yields. These salinity impacts affect various sectors including residential, agricultural, commercial, industrial, utility, groundwater, and recycled water. Metropolitan adopted an imported water salinity goal because higher salinity could increase costs and reduce operating flexibility. For example,

1. If diminished water quality causes a need for membrane treatment to remove TDS, the process typically results in losses of up to 15 percent of the water processed. These losses would result in both an increased requirement for additional water supplies and environmental constraints related to brine disposal. In addition, the process is costly. However, only a portion of the imported water would need to be processed, so the possible loss in supplies is small.
2. High TDS in water supplies leads to high TDS in wastewater, which lowers the usefulness and increases the cost of recycled water.
3. Water quality degradation of imported water supply could limit the use of local groundwater basins for storage because of standards controlling the quality of water recharged to the basins.

In addition to the link between water supply and water quality, Metropolitan has identified economic benefits from reducing the TDS concentrations of water supplies. Estimates show that a reduction in salinity concentrations of 100 mg/L in both the Colorado River and SWP supplies will yield economic benefits of $95 million per year (1999 dollars) within Metropolitan's service area.[12] This economic benefit provides an additional incentive to reduce salinity concentrations within the region's water supplies.

The Salinity Management Policy

Considering all of these factors, Metropolitan's Board approved a Salinity Management Policy on April 13, 1999. The policy set a goal of achieving salinity concentrations in delivered water of less than 500 mg/L TDS when practical, understanding that hydrologic conditions will make this infeasible at times. It also identified the need for both local and imported water sources to be managed comprehensively to maintain the ability to use recycled water and groundwater. To achieve these targets, lower TDS SWP water supplies are blended with Colorado River supplies. Using this approach, the salinity target could be met an estimated seven out of ten years. In the other three years, hydrologic conditions would result in a reduced volume of SWP supplies and increased salinity. Since 1999, Metropolitan has met the salinity objective, but due to drought conditions, the target goal was exceeded between 2008 and 2011 and again

[12] Metropolitan Water District of Southern California and U.S. Bureau of Reclamation, Salinity Management Study: Final Report (June 1999)

between 2013 and 2015. Metropolitan has alerted its local agencies that high salinity levels are inevitable under these drought conditions despite its best efforts. Metropolitan has also urged its member agencies to structure the operation of their local projects and groundwater supplies so they are prepared to mitigate the effect of higher salinity levels in imported waters. In addition, Metropolitan seeks to obtain better quality water in the spring/summer months (April through September) to maximize the use of recycled water in agriculture.

The adoption of the Salinity Management Policy resulted from the completion of a Salinity Management Study in 1999. Metropolitan worked collaboratively with multiple stakeholders to complete the salinity study which assessed regional salinity problems and developed management strategies. Metropolitan is currently working with the USBR and Southern California Salinity Coalition to update the study. The current study objectives include updating the economic impact model to complete a revised salinity economic damage assessment of Metropolitan's service area; developing regional salinity indicators to increase awareness and facilitate salinity management in groundwater basins; and assessing Metropolitan's long-term capability of delivering low-salinity water supplies and determining whether new salinity operational goals should be established.

Within Metropolitan's service area, local water sources account for approximately half of the salt loading, and imported water accounts for the remainder. All of these sources must be managed appropriately to sustain water quality and supply reliability goals. The following sections discuss the salinity issues relevant to each of Metropolitan's major supply sources and other resources.

Colorado River

Water imported via the CRA has the highest level of salinity of all of Metropolitan's sources of supply, averaging around 630 mg/L since 1976. Concern over salinity levels in the Colorado River has existed for many years.

To deal with the concern, the International Boundary and Water Commission approved Minute No. 242, Permanent and Definitive Solution to the International Problem of the Salinity of the Colorado River, in 1973, and the President approved the Colorado River Basin Salinity Control Act in 1974. High TDS in the Colorado River as it entered Mexico and the concerns of the seven Basin states regarding the quality of Colorado River water in the United States drove these initial actions. To foster interstate cooperation on this issue, the seven basin states formed the Colorado River Basin Salinity Control Forum (Forum).

The salts in the Colorado River system are indigenous and pervasive, mostly resulting from saline sediments in the Basin that were deposited in prehistoric marine environments. They are easily eroded, dissolved, and transported into the river system. The Colorado River Basin Salinity Control Program is designed to prevent a portion of this abundant salt supply from moving into the river system. The program targets the interception and control of non-point sources, such as surface runoff, as well as wastewater and saline hot springs. Examples of salinity control measures include improved irrigation practices, rangeland management, and the operation of a deep well brine injection project.

The Forum proposed, the states adopted, and the USEPA approved water quality standards in 1975, including numeric criteria and a plan for controlling salinity increases. The standards require that the plan ensure that the flow-weighted average annual salinity remain at or below the 1972 levels, while the Basin states continue to develop their 1922 Colorado River Compact-apportioned water supply. The Forum selected three stations on the main stream of the lower Colorado River as appropriate points to measure the river's salinity. These stations and numeric

criteria are: (1) below Hoover Dam, 723 mg/L; (2) below Parker Dam, 747 mg/L; and (3) at Imperial Dam, 879 mg/L.

Per the Forum, concentrations of salts in the Colorado River cause approximately $382 million in quantified damages (2014 dollars) in the lower Basin each year.[13] The salinity control program has proven to be very successful and cost-effective. Salinity control projects remove over a million tons of salts from Colorado River water, resulting in reduced salinity concentrations of over 100 mg/L as a long-term average.

During the high water flows of 1983-1986, salinity levels in the CRA dropped to a historic low of 525 mg/L. However, during the 1987-1992 drought, higher salinity levels of 600 to 650 mg/L returned. TDS in Lake Havasu was measured at 626 mg/L in June 2015 and is projected to continue increasing as water development occurs throughout the Colorado River basin, particularly as the Upper Colorado River Basin States continue to develop their apportioned water reducing dilution in the Colorado River. Also, under drought conditions, Lake Powell has received higher salinity water, and as the system normalizes, salinity is expected to increase in the lower Colorado River as water from Lake Powell is released downstream.

State Water Project

Water supplies from the SWP have significantly lower TDS concentrations than the Colorado River, averaging approximately 250 mg/L in water supplied through the East Branch and 325 mg/L on the West Branch over the long-term, with short term variability as a result of hydrologic conditions.[14] Because of this lower salinity, Metropolitan blends SWP water with high salinity CRA water to reduce the salinity concentrations of delivered water. However, both the supply and the TDS concentrations of SWP water can vary significantly in response to hydrologic conditions in the Sacramento-San Joaquin watersheds.

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

A federal court ruling and a resulting biological opinion issued through consultation with U.S. Fish and Wildlife Service addressing the effects of the water supply pumping operations on sensitive fish species in the Delta has limited SWP exports at specified times of the year since December 2007. These restrictions have increased reliance on higher salinity Colorado River water, impacting the ability at times to meet Metropolitan's goal of 500 mg/L TDS at its blend plants. Drought conditions leading to lower SWP water supply allocations in recent years also affect Metropolitan's ability to meet its salinity goal. The target goal was exceeded between 2008 and 2011 when water supply allocations were reduced to 35-50 percent. Similarly, the target goal has been exceeded between 2013 and 2015 under current drought conditions with

[13] Colorado River Basin Salinity Control Program–Briefing Document (May 1, 2015)

[14] The higher salinity in the West Branch deliveries is due to salt loadings from local streams, operational conditions, and evaporation at Pyramid and Castaic Lakes.

restricted annual water supply allocations reduced to 5-35 percent and briefly reduced to a historical zero percent allocation in January 2014.

TDS objectives in Article 19 of the SWP Water Service Contract specify a ten-year average of 220 mg/L and a maximum monthly average of 440 mg/L. These objectives have not been met, and Metropolitan is working with DWR and other agencies on programs aimed at reducing salinity in Delta supplies. These programs aim to reduce salinity on the San Joaquin River through modifying agricultural drainage and developing comprehensive basin plans. In addition, operable gates and channel barriers have been placed in strategic locations in the Delta to impede transport of seawater derived salt. For the first time since 1977, in response to California's drought emergency, DWR installed a temporary rock barrier across False River in May 2015 to help limit salt intrusion from the San Francisco Bay into the central Delta. DWR is also leading the development of the California WaterFix, which involves water delivery upgrades that could reduce SWP salinity levels by diverting a greater percentage of lower salinity Sacramento River flows to the South Delta export pumps.

Recycled Water

Wastewater flows always experience significantly higher salinity concentrations than the potable water supply. Typically, each cycle of urban water use adds 250 to 400 mg/L of TDS to the wastewater. Salinity increases tend to be higher where specific commercial or industrial processes add brines to the discharge stream or where brackish groundwater infiltrates into the sewer system.

Where wastewater flows have high salinity concentrations, the use of recycled water may be limited or require more expensive treatment (e.g., reverse osmosis). Landscape irrigation and industrial reuse become problematic at TDS concentrations over 1,000 mg/L. Some crops such as strawberries and avocados are particularly sensitive to high TDS concentrations, and the use of high-salinity recycled water may reduce yields of these crops. In addition, Basin Plan Objectives may lead to restrictions on the use of recycled water on lands overlying those groundwater basins.

These issues are exacerbated during times of drought, when the salinity of imported water supplies may increase salinity in wastewater flows and recycled water. Basin management plans and recycled water customers may restrict the use of recycled water at a time when its use would be most valuable. Therefore, to maintain the cost-effectiveness of recycled water, the salinity level of the region's potable water sources and wastewater flows must be controlled.

In May 2009, the SWRCB adopted a Recycled Water Policy[15] to help streamline the permitting process and to help establish uniform statewide criteria for recycled water projects. The policy was amended in January 2013 to include monitoring requirements for constituents of emerging concern. This policy promotes the development of watershed- or basin-wide salt management plans (to be adopted by the respective Regional Boards) to meet water quality objectives and protect beneficial uses, rather than imposing project-by-project restrictions. The Recycled Water Policy identifies several criteria to guide recycled water irrigation or groundwater recharge project proponents in developing a salt (and nutrient) management plan (SNMP).

[15] http://www.swrcb.ca.gov/water_issues/programs/water_recycling_policy/docs/recycledwaterpolicy_approved.pdf

Groundwater Basins

Increased TDS in groundwater basins occurs either when basins near the ocean are over drafted, leading to seawater intrusion, or when agricultural and urban return flows add salts to the basins. Much of the water used for agricultural or urban irrigation infiltrates into the aquifer, so where irrigation water is high in TDS or where the water transports salts from overlying soil, the infiltrating water will increase the salinity of the aquifer. In addition, wastewater discharges in inland regions may lead to salt buildup from fertilizer and dairy waste. In the 1950s and 1960s, high-TDS Colorado River water was used to recharge severely overdrafted aquifers and prevent saltwater intrusion, resulting in significant salt loadings to the region's groundwater basins.

In the past, these high salt concentrations have caused some basins within Metropolitan's service area to be unsuitable for municipal uses if left untreated. The Arlington Basin in Riverside and the Mission Basin in San Diego required demineralization before they could be returned to municipal service. The capacity of the larger groundwater basins makes them better able to dilute the impact of increasing salinity. While most groundwater basins within the region still produce water of acceptable quality, this resource must be managed carefully to minimize further degradation. Even with today's more heightened concern regarding salinity, approximately 600,000 tons of salts per year accumulate within the region, leading to ever-increasing salinity concentrations in many groundwater basins.[16] Drought conditions have further impacted salinity levels in recycled water, reflective of increased salinity levels in source water. Increased recycled water salinity levels make it difficult for dischargers to comply with water quality objectives for groundwater basins.

To protect the quality of groundwater basins, Regional Boards often place restrictions on the salinity concentrations of water used for basin recharge or for irrigation of lands overlying the aquifers. Those situations may restrict water reuse and aquifer recharge, or they may require expensive mitigation measures. SNMPs offer an opportunity for stakeholders to work with Regional Boards to address salt and nutrient issues regionally. The SNMP development process is locally-driven and focuses on addressing all sources of salts and nutrients, instead of only regulating individual recycled water projects which may not address all sources impacting groundwater. The SNMP objectives include: optimizing recycled water use, protecting groundwater supply and beneficial uses, protecting agricultural beneficial uses, and protecting human health. SNMPs were to be completed by May 2014 with a possible two year extension. After completion, SNMPs may be adopted in a Basin Plan Amendment.

Several SNMPs were completed by the completion deadline, while other plans were granted an extension for completion in 2016. The Santa Ana Region Basin Plan updated its TDS and Nitrogen Management Plan with a subsequent SNMP amendment in 2014. This SNMP highlights efforts to implement extensive groundwater recharge projects using recycled water in the Chino Basin and expansion of the GWRS in Orange County. The Central Basin and West Coast Basin SNMP was approved as an amendment to the Los Angeles Region Basin Plan in February 2015. This SNMP highlights existing and planned implementation measures to ensure future compliance with water quality objectives including increased recharge at seawater intrusion barriers, increased groundwater pump and treat by the Goldsworthy and Brewer Desalters, and increased recycled water use for irrigation. Multiple SNMPs have been completed in the San Diego Region, and basin plan amendments are being considered. SNMPs are also being developed for the Main San Gabriel Basin, Raymond Basin, San Fernando Valley Basin, and Calleguas Creek and Oxnard Plains.

[16] Metropolitan Water District of Southern California and U.S. Bureau of Reclamation, Salinity Management Study: Final Report (June 1999)

Perchlorate

Perchlorate compounds are used as a main component in solid rocket propellant, and are also found in some types of munitions and fireworks. Perchlorate compounds quickly dissolve and become highly mobile in groundwater. Unlike many other groundwater contaminants, perchlorate neither readily interacts with the soil matrix nor degrades in the environment. Conventional drinking water treatment (as utilized at Metropolitan's water treatment plants) is not effective for perchlorate removal.

The primary human health concern related to perchlorate is its effect on the thyroid. Perchlorate can interfere with the thyroid's ability to produce hormones required for normal growth and development. Pregnant women who are iodine deficient and their fetuses, infants and small children with low dietary iodide intake, and individuals with hypothyroidism may be more sensitive to the effects of perchlorate.

DDW established a primary drinking water standard for perchlorate in 2007 with an MCL of 6 micrograms per liter (μg/L). In February 2015, the California Office of Environmental Health Hazard Assessment (OEHHA) lowered the public health goal (PHG) for perchlorate from 6 μg/L to 1 μg/L. In response to the new PHG, DDW will review the perchlorate MCL. There is currently no federal drinking water standard for perchlorate, but the USEPA is in the process of developing a national primary drinking water regulation.

Perchlorate was first detected in Colorado River water in June 1997 and was traced back to Las Vegas Wash. The source of contamination was found to be emanating from a chemical manufacturing facility in Henderson, Nevada. Tronox, Inc. was responsible for the ongoing perchlorate remediation of the site, although contamination resulted from years of manufacturing operations from site predecessors. Another large perchlorate groundwater plume is also present in the Henderson area from a second industrial site. Remediation activities are ongoing for cleanup of that plume by American Pacific Corporation (AMPAC).

Following the detection of perchlorate in the Colorado River, Metropolitan, along with USEPA and agencies in Nevada including the Nevada Division of Environmental Protection (NDEP), organized the forces necessary to successfully treat and decrease the sources of perchlorate loading. Under NDEP oversight, remediation efforts began in 1998, and treatment operations became fully operational in 2004. These efforts have reduced perchlorate loading into Las Vegas Wash from over 1,000 lbs/day (prior to treatment) to 50-90 lbs/day since early 2007. This has resulted in over 90 percent reduction of the perchlorate loading entering the Colorado River system. In January 2009, Tronox filed for Chapter 11 bankruptcy protection citing significant environmental liabilities taken from the previous site owner. A settlement was reached in February 2011 which resulted in the formation of the Nevada Environmental Response Trust (NERT). NERT received $81 million for cleanup efforts while pursuing additional funding sources.

In April 2014, Tronox reached a $5.15 billion settlement with its predecessors which awarded approximately $1.1 billion, directed to NERT, to clean up perchlorate and other contaminants at the former Tronox site in Henderson. The settlement, which represents one of the largest environmental recoveries in history, went into effect in January 2015 and helps to ensure adequate funds are available for site cleanup and protection of the downstream Colorado River. NERT is currently conducting remedial investigations for long-term soil and groundwater cleanup, while NDEP is initiating a regional investigation of downstream perchlorate-contaminated areas to further reduce loading into Las Vegas Wash. The remedial plan has an established goal to reduce perchlorate loading into Las Vegas Wash to less than 10 lbs/day, which would result in levels well below 1 μg/L in the Colorado River. This would help ensure

compliance with any potential reduction of California's perchlorate MCL of 6 µg/L, in light of the new 1 µg/L public health goal.

As a result of the aggressive clean-up efforts, perchlorate levels in Colorado River water at Lake Havasu have decreased significantly in recent years from a peak of 9 µg/L in May 1998. Levels have remained less than 6 µg/L since October 2002, and have been typically less than 2 µg/L since June 2006. Metropolitan routinely monitors perchlorate at over 30 locations within its system, and levels currently remain below 2 µg/L. Metropolitan has not detected perchlorate in the SWP since monitoring began in 1997.

Perchlorate has also been found in groundwater basins within Metropolitan's service area, largely from local sources. The vast majority of locations where perchlorate has been detected in the groundwater are associated with the manufacturing or testing of solid rocket fuels for the Department of Defense and the National Aeronautics and Space Administration (NASA), or with the manufacture, storage, handling, or disposal of perchlorate (such as Aerojet in Azusa in the Main San Gabriel Basin and the Jet Propulsion Laboratory/NASA in the Raymond Basin). Past agricultural practices using fertilizers laden with naturally occurring perchlorate have also been implicated in some areas. Per SWRCB's water quality database, reported monitoring results from 2011 to 2014 indicate that 10 Metropolitan member agencies have detected perchlorate in their service areas at levels greater than 4 µg/L in 36 sources, while 7 member agencies have detected levels greater than 6 µg/L.

Metropolitan has investigated technologies to mitigate perchlorate contamination. Perchlorate cannot be removed using conventional water treatment. Nanofiltration and reverse osmosis do work effectively, but at a very high cost. AMPAC and NERT utilize a biological fluidized bed reactor (FBR) process train for the cleanup of their Henderson sites. A number of sites in Southern California have successfully installed ion exchange systems to treat perchlorate impacted groundwater. In November 2009, a study of biological treatment for perchlorate removal in the City of Pasadena's groundwater was completed with funding provided through a Congressional mandate from USEPA to Metropolitan. The City of Pasadena decided to continue using ion exchange treatment for perchlorate removal and expanded treatment to two well sites.

Treatment options are available to recover groundwater supplies contaminated with perchlorate. However, it is very difficult to predict whether treatment will be pursued to recover all lost production because local agencies will make decisions based largely on cost considerations, ability to identify potentially responsible parties for cleanup, and the availability of alternative supplies.

Total Organic Carbon and Bromide

Disinfection byproducts (DBPs) form when source water containing high levels of total organic carbon (TOC) and bromide is treated with disinfectants such as chlorine or ozone. Studies have shown a link between certain cancers and DBP exposure. In addition, some studies have shown an association between reproductive and developmental effects and chlorinated water. While many DBPs have been identified and some are regulated under the Safe Drinking Water Act, there are others that are not yet known. Even for those that are known, the potential adverse health effects may not be fully characterized.

Water agencies began complying with new regulations to protect against the risk of DBP exposure in January 2002. This rule, known as the Stage 1 Disinfectants and Disinfection Byproducts (D/DBP) Rule, required water systems to comply with new MCLs and a treatment technique to improve control of DBPs. USEPA then promulgated the Stage 2 D/DBP Rule in

January 2006 requiring systems to comply at terminus locations in the distribution system to be more representative of maximum residence time and to protect the public. Metropolitan has been in compliance with the Stage 2 D/DBP Rule since it became effective.

Existing levels of TOC and bromide in Delta water supplies present challenges for water utilities to maintain safe drinking water supplies and comply with regulations. Levels of these constituents in SWP water increase several-fold due to agricultural drainage and seawater intrusion as water moves through the Delta.

Source water quality improvements must be combined with cost-effective water treatment technologies to ensure safe drinking water at a reasonable cost. Metropolitan has five treatment plants: two that receive SWP water exclusively, and three that receive a blend of SWP and Colorado River water. In 2003 and 2005, Metropolitan completed upgrades to its SWP-exclusive water treatment plants, Mills and Jensen, respectively, to utilize ozone as its primary disinfectant. This ozonation process minimizes the production of certain regulated disinfection byproducts that would otherwise form in the chlorine treatment of SWP water. The non-ozone plants utilizing blended water have met federal guidelines for these byproducts through managing the blend of SWP and Colorado River water. To maintain the byproducts at a level consistent with federal law, Metropolitan limits the percentage of water from the SWP for plants utilizing chlorine as the primary disinfectant. In 2010 and 2015, Metropolitan completed ozone upgrades at Skinner and Diemer water treatment plants, respectively. Construction of ozonation facilities is underway at Weymouth water treatment plant and is expected to be completed in 2017. The estimated ozone retrofit cost for all five treatment plants is over $1.1 billion.

Nutrients

Elevated levels of nutrients (phosphorus and nitrogen compounds) can stimulate nuisance algal and aquatic weed growth that affects water system operations and consumer acceptability, including the production of noxious taste and odor compounds and algal toxins. In addition to taste and odor and toxin concerns, increases in algal and aquatic weed biomass can impede flow in conveyances, shorten filter run times, increase solids production at drinking water treatment plants, and add to organic carbon loading. Further, nutrients can provide an increasing food source that may lead to the proliferation of quagga and zebra mussels, and other invasive biological species. Studies have shown phosphorus to be the limiting nutrient in both SWP and Colorado River supplies. Therefore, any increase in phosphorus loading has the potential to stimulate algal growth, leading to the concerns identified above.

SWP supplies have significantly higher nutrient levels than Colorado River supplies. Wastewater discharges, agricultural drainage, and nutrient-rich soils in the Delta are primary sources of nutrient loading to the SWP. Metropolitan and other drinking water agencies receiving Delta water have been engaged in efforts to minimize the effects of nutrient loading from Delta wastewater plants. The Sacramento Regional County Sanitation District (SRCSD), the primary discharger to the Sacramento River, is in the process of constructing wastewater treatment plant upgrades to comply with its 2010 discharge permit requirements for ammonia and nitrate removal. Excessive levels of ammonia are suspected to be altering the Delta's food web which, in turn, has implications for SWP supply reliability. SRCSD expects to complete its EchoWater Project by 2023 and has stated that the project will serve multiple benefits including improving water quality in the Sacramento River, protecting the fragile Delta ecosystem, and expanding recycled water use opportunities. The improvements include a biological nutrient removal process for ammonia and nitrate removal. The project also includes tertiary treatment processes for filtration and enhanced disinfection. In 2014, the City of Stockton Wastewater

Treatment Plant, a discharger to the San Joaquin River, was issued a draft permit with a more stringent nitrate discharge limit consistent with the final discharge limits issued in SRCSD's permit. The City of Stockton may have to implement similar plant upgrades as SRCSD to comply with discharge permit requirements.

Metropolitan reservoirs receiving SWP water have experienced several taste and odor episodes in recent years. For example, between 2010 and 2014, Metropolitan reservoirs experienced 11 taste and odor events requiring treatment. A taste and odor event can cause a reservoir to be bypassed and potentially have a short-term effect on the availability of that supply. Metropolitan has a comprehensive program to monitor and manage algae in its source water reservoirs. This program was developed to provide an early warning of algae related problems and taste and odor events to best manage water quality in the system.

The issue of cyanotoxins has become a growing concern as a result of increasing occurrences both nationally and internationally. For example, in August 2014, an algae bloom producing Mycrocystin in Lake Erie significantly affected water supply for Toledo, Ohio, prompting the city to issue urgent notices to residents to not drink or boil the drinking water. This event stimulated state and federal legislation to develop health advisories and strategic plans for algal toxins. In June 2015, USEPA issued health advisories for two cyanobacterial toxins: Microcystins and Cylindrospermopsin. The health advisories serve as recommended precautionary levels and are not enforceable federal water quality standards. Cyanotoxins are included on the current Contaminant Candidate List (CCL3), which identifies contaminants considered for regulation under the Safe Drinking Water Act. USEPA is currently developing improved analytical methods for cyanotoxins to support nationwide monitoring for Microcystins, Anatoxin-a, and Cylindrospermopsin through the Unregulated Contaminant Monitoring Rule 4 program, which would be published in late 2016 and require monitoring to begin in January 2018. Metropolitan would comply with Unregulated Contaminant Monitoring Rule monitoring and reporting requirements.

Although phosphorus levels are much lower in the Colorado River than in the SWP, this nutrient is still of concern. Despite relatively low concentrations (Colorado River has been considered an oligotrophic, or low-productivity, system), any additions of phosphorus to Colorado River water can result in increased algal growth. In addition, low nutrient Colorado River water is relied upon by Metropolitan to blend down the high nutrient SWP water in Metropolitan's blend reservoirs. With population growth expected to continue in the Las Vegas area in the future, ensuring high levels of treatment at wastewater treatment plants to maintain existing phosphorus levels will be critical in minimizing the operational, financial, and public health impacts associated with excessive algal growth and protecting downstream drinking water uses. Metropolitan and other affected drinking water agencies collaborate with wastewater dischargers in the Las Vegas area to protect the phosphorus-limited Colorado River. Since 2001, wastewater dischargers have undertaken considerable efforts to improve treated effluent water quality by removing phosphorus on a year-round basis. In 2005, dischargers also began optimizing their treatment processes to remove greater amounts of phosphorus, maintaining levels well below current permit requirements.

Although current nutrient loading is of concern for Metropolitan and is anticipated to have cost implications, with its comprehensive monitoring program and response actions to manage algal related issues, there should be no impact on availability of water supplies. Metropolitan's source water protection program will continue to focus on preventing future increases in nutrient loading as a result of urban and agricultural sources.

Arsenic

Arsenic is a naturally occurring element found in rocks, soil, water, and air. It is used in wood preservatives, alloying agents, certain agricultural applications, semi-conductors, paints, dyes, and soaps. Arsenic can get into water from the natural erosion of rocks, dissolution of ores and minerals, runoff from agricultural fields, and discharges from industrial processes. Long-term exposure to elevated levels of arsenic in drinking water has been linked to certain cancers, skin pigmentation changes, and hyperkeratosis (skin thickening).

In April 2004, OEHHA set a public health goal for arsenic of 0.004 µg/L, based on lung and urinary bladder cancer risk. The MCL for arsenic in domestic water supplies was lowered to 10 µg/L, with an effective date of January 2006 in the federal regulations, and an effective date of November 2008 in the California regulations. Monitoring results submitted to California Department of Public Health (now DDW) since 2010 showed that arsenic is ubiquitous in drinking water sources, reflecting its natural occurrence. They also showed that many sources have arsenic detections above the 10 µg/L MCL. Southern California drinking water sources that contain concentrations of arsenic over 10 µg/L include San Bernardino (25 sources), Los Angeles (27 sources), Riverside (12 sources), San Diego (2 sources), Orange (2 sources), and Ventura (2 sources).[17]

The arsenic drinking water standard impacts both groundwater and surface water supplies. Historically, Metropolitan's water supplies have had low levels of this contaminant and did not require treatment changes or capital investment to comply with the standard. However, some of Metropolitan's water supplies from groundwater storage programs are at levels near the MCL. These groundwater storage projects are called upon to supplement flow only during low SWP allocation years. Under drought conditions, Metropolitan has further relied on groundwater storage programs and continues to participate in the California Aqueduct Pump-in Facilitation Group to ensure that water quality in the SWP is not adversely affected when considering water supply decisions. Metropolitan has had to restrict flow from one program to limit arsenic increases in the SWP. Implementation of an arsenic treatment facility, which is operated by a groundwater banking partner, has increased groundwater supply costs. Moreover, Metropolitan has invested in solids handling facilities at its treatment plants and implemented operational changes to manage arsenic in the treatment process residual solids.

The state detection level for purposes of reporting (DLR) of arsenic is 2 µg/L. Between 2009 and 2014, arsenic levels in Metropolitan's water treatment plant effluents ranged from non-detect (< 2 µg/L) to 3.9 µg/L. For Metropolitan's source waters, levels in Colorado River water have ranged from not detected to 3.5 µg/L, while levels in SWP water have ranged from non-detect to 4.4 µg/L. Increasing coagulant doses at water treatment plants can reduce arsenic levels for delivered water.

Some member agencies may face greater problems with arsenic compliance due to naturally occurring arsenic in groundwater. Per the Water Replenishment District's 2013-2014 Regional Groundwater Monitoring Report, arsenic concentrations greater than the 10 µg/L MCL are detected in about a third of the Central Basin wells.[18] Water supplies imported by the Los Angeles Department of Water and Power may also contain arsenic above the MCL. The cost of arsenic removal from these supplies could vary significantly.

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[17] DDW data reported from web site: http://geotracker.waterboards.ca.gov. Numbers reported may change as the website is frequently updated. Also, the website includes additional source data reported by other entities.

[18] *Regional Groundwater Monitoring Report Water Year 2013-2014, Los Angeles County, California*, prepared by Water Replenishment District, February 2015.

Uranium

The U.S. Department of Energy (DOE) has completed about 50 percent of a project to move a 16-million-ton pile of uranium mill tailings near Moab, Utah which lies approximately 750 feet from the Colorado River. Due to the proximity of the pile to the Colorado River, there is a potential for the tailings to enter the river as a result of a catastrophic flood event or other natural disaster. In addition, contaminated groundwater from the site is slowly seeping into the river. The DOE is responsible for remediating the site, which includes removal and offsite disposal of the tailings and onsite groundwater remediation.

Previous investigations have shown uranium concentrations contained within the pile at levels significantly above the California MCL of 20 picocuries per liter (pCi/L). Metropolitan has been monitoring for uranium in the CRA and at its treatment plants since 1986. Monitoring at Lake Powell began in 1998. Uranium levels measured at Metropolitan's intake have ranged from 1 to 6 pCi/L, well below the California MCL. Conventional drinking water treatment, as employed at Metropolitan's water treatment plants, can remove low levels of uranium; however, these processes would not be protective if a catastrophic event washed large volumes of tailings into the Colorado River. Public perception of drinking water safety is also of particular concern as to uranium.

Remedial actions at the site since 1999 have focused on removing contaminated water from the pile and groundwater. To date, over 4,400 pounds of uranium in contaminated groundwater have been removed. In July 2005, DOE issued its Final Environmental Impact Statement with the preferred alternative of permanent offsite disposal by rail to a disposal cell at Crescent Junction, Utah, located approximately 30 miles northwest of the Moab site.

Rail shipment and disposal of the uranium mill tailings pile from the Moab site began in April 2009 using American Recovery and Reinvestment Act 2009 funding which helped to accelerate initial cleanup efforts. Through August 2015, DOE has shipped over 7.7 million tons of mill tailings to the Crescent Junction disposal cell. DOE estimates completing movement of the tailings pile by 2025, depending on annual appropriations. Metropolitan continues to track progress of the remediation efforts and work with Congressional representatives to support increased annual appropriations and expedite cleanup.

Another uranium-related issue began receiving attention in 2008 due to a renewed worldwide interest in nuclear energy and a resulting increase in uranium mining claims filed throughout the western United States. Of particular interest were thousands of mining claims filed near Grand Canyon National Park and the Colorado River. Metropolitan sent letters to the Secretary of the Interior to highlight source water protection and consumer confidence concerns related to uranium exploration and mining activities near the Colorado River, and advocate for close federal oversight over these activities. In 2009, Secretary of the Interior Ken Salazar announced a two-year hold on new mining claims on 1 million acres adjacent to the Grand Canyon to allow necessary scientific studies and environmental analyses to be conducted. In January 2012, Secretary Salazar formally signed a 20-year moratorium on new uranium and other hard rock mining claims. The moratorium has been challenged by a number of industry groups and was most recently upheld by a U.S. District Court in September 2014. Meanwhile, local conservation groups continue to defend the moratorium and are seeking additional protection of lands with mines that have been inactive for long periods of time, but may resume operations. Although of no direct impact to Metropolitan due to its upstream location and resulting dilution, in August 2015, an accidental release of wastewater from an abandoned mine in southwest Colorado demonstrated the potential threat that mining activities can have on public health and the environment.

Chromium-6

Chromium is a naturally occurring element found in rocks, soil, plants, and animals. Chromium III is typically the form found in soils and is an essential nutrient that helps the body use sugar, protein, and fat. Chromium-6 is used in electroplating, stainless steel production, leather tanning, textile manufacturing, dyes and pigments, wood preservation, and as an anti-corrosion agent. Chromium occurs naturally in deep aquifers and can also enter drinking water through discharges of dye and paint pigments, wood preservatives, chrome plating liquid wastes, and leaching from hazardous waste sites. In drinking water, chromium-6 is very stable and soluble, whereas chromium III is not very soluble. Chromium-6 is the more toxic species and is known to cause lung cancer in humans when inhaled, but the health effects in humans from ingestion are still in question. There is evidence that when chromium-6 enters the stomach, gastric acids may reduce it to chromium III. However, recent studies conducted by the National Toxicology Program have shown that chromium-6 can cause cancer in animals when administered orally.

Effective July 1, 2014, California's Office of Administrative Law approved a primary drinking water standard of 10 μg/L for chromium-6. USEPA regulates chromium-6 as part of the total chromium drinking water standard of 100 μg/L and is currently evaluating whether a new federal drinking water standard for chromium-6 is warranted based on new health effects information.

Metropolitan utilizes an analytical method with a minimum reporting level of 0.03 μg/L, which is less than the State DLR of 1 μg/L. In the past 5 years, the results from all of Metropolitan's source and treated waters are less than the State DLR. The following summarizes chromium-6 levels found in Metropolitan's system:

In the past 5 years, results of source and treated water monitoring for chromium-6 indicate the following:

- Levels in Colorado River water are mostly not detected (<0.03 μg/L), but when detected, levels range from 0.03 to 0.08 μg/L. SWP levels range from 0.03 to 0.8 μg/L. Treated water levels range from 0.03 to 0.7 μg/L.
- There is a slight increase in chromium-6 in the treated water from the oxidation (chlorination and ozonation) of natural background chromium (total) to chromium-6.
- Colorado River monitoring results upstream and downstream of the site of a Pacific Gas and Electric (PG&E) gas compressor station located along the Colorado River near Topock, Arizona (discussed below) have ranged from not detected (<0.03 μg/L) to 0.06 μg/L.
- Chromium-6 in Metropolitan's groundwater pump-in storage programs in the Central Valley has ranged from not detected (< 1 μg/L) to 8.9 μg/L in 2014, with the average for the different programs ranging from < 1 μg/L to 3 μg/L.

PG&E used chromium-6 as an anti-corrosion agent in its cooling towers at the Topock site from 1951 to 1985. Wastewater from the cooling towers was discharged from 1951 to 1968 into a dry wash next to the station. Monitoring wells show the plume concentration has peaked as high as 16,000 μg/L in groundwater. Since 2004, PG&E has operated an interim groundwater extraction and treatment system that is protecting the Colorado River. Quarterly monitoring of the river has shown levels of chromium-6 less than 1 μg/L, which are considered background levels. The California Department of Toxic Substances Control (DTSC) and the U. S. Department of the Interior are the lead state and federal agencies overseeing the cleanup efforts. Metropolitan participates through various stakeholder workgroups and partnerships that

include state and federal regulators, Indian tribes, and other stakeholders (e.g., Colorado River Board) involved in the corrective action process. In January 2011, a final treatment remedy was selected, and an Environmental Impact Report was certified. In November 2015, PG&E completed the final remedy design based on the selected remedy which involves the installation of an in-situ bioremediation treatment system. In April 2015, DTSC required the preparation of a Subsequent Environmental Impact Report (EIR) to address new design details. The Subsequent EIR will be completed in Spring 2017. Construction is expected to be completed in early 2022, followed by operation of the treatment system for an estimated 30 years.

The federal- and state-approved technologies for removing total chromium from drinking water include coagulation/filtration, ion exchange, reverse osmosis, and lime softening. For several years, the cities of Glendale, Burbank, and Los Angeles have been voluntarily limiting chromium-6 levels in their drinking water to 5 µg/L, which is significantly lower than the state MCL of 10 µg/L that went into effect on July 1, 2014.

Constituents of Emerging Concern

N-Nitrosodimethylamine

N-Nitrosodimethylamine (NDMA) is part of a family of organic chemicals called nitrosamines. NDMA is a chloramine disinfection by-product, and it is the most abundantly detected nitrosamine in drinking water systems. Metropolitan utilizes chloramines as a secondary disinfectant at its treatment plants. Wastewater treatment plant discharges can contribute organic matter into source waters, which react with chloramines to form NDMA at drinking water treatment plants. Certain coagulation aid polymers used in water treatment, e.g., polydiallyldimethylammonium chloride (polyDADMAC), can also contribute to NDMA formation. Some NDMA control measures are being used to avoid adverse impacts on Southern California drinking water supplies. Metropolitan is involved in several projects to understand the impact of different treatment processes on NDMA and its precursors at drinking water treatment plants and in distribution systems. Certain pre-oxidation processes, such as chlorine and ozone, have been shown to destroy NDMA precursors. Additional studies are being conducted to better understand how polyDADMAC contributes to NDMA formation and to identify measures to reduce polymer-derived NDMA formation.

USEPA considers NDMA to be a probable human carcinogen. USEPA placed NDMA in the Unregulated Contaminant Monitoring Rule 2 (UCMR2) and on the Contaminant Candidate List 3 (CCL3). Although there is no federal regulation for nitrosamines in drinking water, DDW set a notification level of 0.01 µg/L each for NDMA and two other nitrosamines. Occurrences of NDMA in treated water supplies at concentrations greater than 0.01 µg/L are recommended to be included in a utility's annual Consumer Confidence Report. In December 2006, OEHHA set a public health goal for NDMA of 0.003 µg/L. Since 1999, Metropolitan has conducted voluntary monitoring of the five treatment plant effluents and representative distribution system locations semi-annually. In 2014, NDMA was the only detected nitrosamine in Metropolitan's treated water systems, and it was in a range of non-detect (<0.002 µg/L) to 0.005 µg/L. NDMA or a broader class of nitrosamines may likely be the next class of disinfection by-products to be regulated by USEPA.

Pharmaceuticals and Personal Care Products

Pharmaceuticals and personal care products (PPCPs) are a growing concern to the water industry. Numerous studies have reported the occurrence of these emerging contaminants in

treated wastewater, surface water, and sometimes, in finished drinking water in the United States and around the world. The use of ozone in treatment processes may have a beneficial effect on PPCP removal in drinking water. The sources of PPCPs in the aquatic environment include (but may not be limited to) treated wastewater and industrial discharge, agricultural run-off, and leaching of municipal landfills. Currently, there is no evidence of human health risks from long-term exposure to the low concentrations (low ng/L; parts per trillion) of PPCPs found in some drinking water. Furthermore, there are no regulatory requirements for PPCPs in drinking water. USEPA included 13 PPCPs on the CCL3; however, currently there are no standardized analytical methods for these compounds. USEPA's strategy for addressing PPCPs involves strengthening analytical methods, conducting source studies, improving public understanding of PPCPs in water, building partnerships and promoting stewardship opportunities, and taking regulatory action when appropriate.

In 2007, Metropolitan implemented a short-term monitoring program to determine the occurrence of PPCPs and other organic wastewater contaminants in Metropolitan's treatment plant effluents and selected source water locations within the Colorado River and SWP watersheds. Currently, PPCP monitoring is conducted on an annual basis for Metropolitan's source waters and treatment plants. Some PPCPs have been detected at very low ng/L levels, which is consistent with reports from other utilities. However, analytical methods are still being refined, and more work is required to fully understand occurrence issues. Metropolitan has been actively involved in studies related to PPCPs, including analytical methods improvements, and characterization of drinking water sources in California.

Other Water Quality Programs

In addition to monitoring for and controlling specific identified chemicals in the water supply, Metropolitan has undertaken a number of programs to protect the quality of its water supplies. These programs are summarized below.

Source Water Protection

Source water protection is the first step in a multi-barrier approach to provide safe and reliable drinking water. In accordance with California's Surface Water Treatment Rule, Title 22 of the California Code of Regulations, DDW requires large utilities delivering surface water to complete a Watershed Sanitary Survey every five years to identify possible sources of drinking water contamination, evaluate source and treated water quality, and recommend watershed management activities that will protect and improve source water quality. The most recent sanitary surveys for Metropolitan's water sources are the Colorado River Watershed Sanitary Survey – 2010 Update and the State Water Project Watershed Sanitary Survey – 2011 Update.[20] The next Sanitary Surveys for the watersheds of the Colorado River and the SWP will report on watershed and water quality issues through 2015.

Metropolitan has an active source water protection program and continues to advocate on numerous issues to protect and enhance SWP and Colorado River water quality. As part of its source water protection program, Metropolitan monitors and forecasts source water quality, including closely monitoring the biology and limnology of lakes and aqueducts. Monitoring is conducted to comply with regulatory requirements, respond to water quality events, assess temporal variability, advise operations, and investigate emerging constituents and invasive species.

[20] Metropolitan Water District of Southern California, *Colorado River Watershed Sanitary Survey, 2010 Update*. For the State Water Project, the sanitary survey report was prepared on behalf of the State Water Project Contractors Authority, in 2011, and was titled *California State Water Project Watershed Sanitary Survey, 2011 Update*.

Colorado River Water Quality Partnerships

Metropolitan collaborates with external partners to asses and manage watershed threats to Colorado River water quality. Metropolitan is a member of the Clean Colorado River Sustainability Coalition, which was formed in 1997 and focuses on protecting and enhancing the Colorado River through monitoring and analysis of water quality to assure and sustain high quality water for all users of the Colorado River. In 2011, Metropolitan formed the Lower Colorado River Water Quality Partnership with SNWA and Central Arizona Project to identify and implement collaborative solutions to address water quality issues facing the Colorado River. Metropolitan also participates in the Lake Mead Water Quality Forum which was formed in 2012, and its Lake Mead Ecosystem Monitoring Workgroup subcommittee. The Lake Mead Water Quality Forum's goals are to support the protection of human health and the environment and to preserve and improve the water quality of the Las Vegas Wash, Las Vegas Bay, and Lake Mead (and as a result, the Colorado River). In addition, as discussed earlier, Metropolitan is a member of the Colorado River Basin Salinity Control Forum which facilitates coordination between Basin states and federal agencies on salinity matters and the implementation of the Colorado River Basin Salinity Control Program.

SWP Water Quality Programs

Metropolitan supports DWR policies and programs aimed at maintaining or improving the quality of SWP water delivered to Metropolitan. In particular, Metropolitan supported the DWR policy to govern the quality of non-project water conveyed by the California Aqueduct. In addition, Metropolitan has supported the expansion of DWR's Municipal Water Quality Investigations Program beyond its Bay-Delta core water quality monitoring and studies to include enhanced water quality monitoring and forecasting of the Delta and SWP. These programs are designed to provide early warning of water quality changes that will affect treatment plant operations both in the short-term (hours to weeks) and up to seasonally. The forecasting model is currently suitable for use in a planning mode. It is expected that with experience and model refinement, it will be suitable to use as a tool in operational decision making.

Metropolitan has implemented selective withdrawals from the Arvin-Edison storage program and exchanges with the Kern Water Bank to improve water quality. Although these programs were initially designed to provide dry-year supply reliability, they can also be used to store SWP water at periods of better water quality so the stored water may be withdrawn at times of lower water quality, thus diluting SWP water deliveries. Although elevated arsenic levels have been a concern in one groundwater banking program, there are also short-term water quality benefits that can be realized through storage programs, such as groundwater pump-ins into the California Aqueduct with lower TOC levels (as well as lower bromide and TDS, in some programs).

Regulatory and Legislative Actions

Metropolitan conducts technical reviews of regulatory and legislative actions that may have an effect on the quality of Metropolitan's source waters. These may include changes in federal and state water quality standards; California Environmental Quality Act (CEQA) documents for projects or programs within Metropolitan's source watersheds; National Pollutant Discharge Elimination System permits for wastewater discharges into the Delta or Colorado River systems; and regulations or statewide policies and permits affecting source water quality or reservoir management issues. In addition, Metropolitan advocates and provides funding requests for key source water protection priorities, including the Moab uranium tailings cleanup and Colorado River salinity control.

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Coordination and Public Outreach

5

Collaborative Regional Planning

Southern California has a remarkable, unparalleled tradition of meeting its water challenges as a single cohesive region. Metropolitan serves as both importer of water and regional water planner, and for the past generation, Metropolitan's Integrated Water Resources Plan (IRP) and the related Urban Water Management Plan (UWMP) have served as the reliability road map for the region. Metropolitan's 2015 IRP Update and 2015 UWMP were prepared concurrently through a collaborative process that included extensive coordination with Southern California's wholesale and retail water agencies, as well as municipal service providers and public planning agencies. The process also included outreach to engage the general public, businesses, environmental organizations, diverse communities, and other stakeholders with an interest in the future of Southern California's water supplies.

This chapter describes how Metropolitan's process to develop the 2015 UWMP complies with the provisions for coordination and public outreach in the Urban Water Management Planning Act (CA Water Code §10610, et seq.).

Development of "Water Tomorrow," a Regional Plan

In early 2015, Metropolitan initiated a process to concurrently update its 2010 IRP and prepare the 2015 UWMP. Metropolitan branded this IRP update as "Water Tomorrow," which underlines the purpose of the plan and its importance to the region. The 2015 IRP Update seeks to integrate into a single plan the many local water actions that take place throughout Metropolitan's service area. This information was then used to prepare the UWMP.

For Metropolitan, the process to update the IRP and prepare the UWMP began with considerable homework. Local supply surveys, estimates of retail demands, and data within local urban water management plans were among the many key building blocks. Regional planning agencies provided updated demographics and population projections. In addition, planning processes for the Colorado River supply and the SWP (the region's primary imported water supplies) provided estimates of water supply availability given a range of possible future circumstances. The data were analyzed through Metropolitan's own planning model.

Data and documents are important, but it is the collaboration – with Metropolitan's 26 member agencies, its 38-member Board of Directors, numerous important stakeholders, and the general public – that truly enriched this process and shaped the final plans. Broad policy discussions and reviews were held at the board level. Member agency workshops dug into considerable technical detail. Public meetings, even social media, provided important feedback on how best to plan for a reliable water future.

The end result was the integration of many strategies, and many possible future water scenarios, into an adaptable regional plan – an IRP – and the related UWMP. The comprehensive process behind the 2015 IRP Update and preparation of the 2015 UWMP continues the tradition of Southern California working together to have reliable supplies of water for tomorrow.

Coordination with Other Appropriate Agencies

Metropolitan coordinated the preparation of this UWMP with its 26 member agencies, wastewater management agencies, municipal service providers, groundwater management agencies, and regional planning agencies. The extensive regional coordination is consistent with the requirements of California Water Code Sections 10620(d)(2), 10641, and 10642.

Board of Directors Oversight

Metropolitan's Board of Directors provided oversight throughout the concurrent process for the 2015 IRP Update and the preparation of the 2015 UWMP. The process began with a presentation to Metropolitan's Water Planning and Stewardship Committee in February 2015. To provide focused involvement of the Metropolitan Board, the board created an Integrated Resources Planning Committee (IRP Committee), which is made up of 17 Metropolitan board directors. Beginning in March 2015, the IRP Committee met on a regular basis to provide guidance and receive information from Metropolitan staff. The IRP Committee held 10 meetings between March 2015 and January 2016, as summarized in Table 5-1.

Table 5-1
Summary of Metropolitan Board of Directors Committee Meetings

Date	Committee	Topic
February 9, 2015	WP&S Committee	Overview of the upcoming IRP process
March 24, 2015	IRP Committee	Overview of the upcoming 2015 IRP Update and UWMP process, including a historical overview of previous IRPs, and description of proposed topics and timeline
April 28, 2015	IRP Committee	Detailed review of current IRP targets and initial look at changed conditions
May 26, 2015	IRP Committee	Expert presenters on Conservation Rates and Conservation Potential; Member Agency Technical Process Update
June 23, 2015	IRP Committee	Expert presenters on Groundwater and Stormwater; Member Agency Technical Process Update
July 28, 2015	IRP Committee	Expert presenters on Climate Change and Uncertainty; Member Agency Technical Process Update
August 18, 2015	IRP Committee	Initial Results and Water Balances, IRP/UWMP Outreach, Delta Assumptions
September 29, 2015	IRP Committee	Draft Results; IRP/UWMP Outreach
October 27, 2015	IRP Committee	IRP/UWMP Outreach, Technical Recommendations, Draft IRP Issue Paper Addendum
December 7, 2015	IRP Committee	Draft 2015 IRP Update, Overview of Phase 1 Policy Inventory and Phase 2 Policy Process
January 12, 2016	IRP Committee	Final 2015 IRP Update

Collaboration with Member Agencies and Other Organizations

For guidance, discussion, and information-sharing on technical topics, Metropolitan staff collaborated with Metropolitan's member agencies through an IRP Member Agency Technical Workgroup. The Technical Workgroup met 11 times between April and October 2015. Each meeting focused on specific subjects. Through the workgroup, member agency staff provided Metropolitan staff with data and information essential for updating the 2015 IRP Update forecasts, feedback on draft analyses, and policy topics for the policy discussions following the adoption of the 2015 IRP Update. Additionally, member agency staff and external experts provided input and direction on the development of the 2015 IRP Update Issue Paper Addendum and collaborated with Metropolitan staff during the writing process.

Metropolitan distributed data sets of demographics, total demands after conservation, local supplies, and demands on Metropolitan at the regional and member agency levels using a 25-year planning horizon. The data were provided to the member agencies in five-year increments under single-dry, multi-dry, and average-year conditions as required in California Water Code §10631(j). When requested, Metropolitan staff met individually with the member agencies to review the data sets and discuss any agency-specific questions or issues. Regional issues and analysis methodologies were discussed during the technical workgroup meetings. Demand and supply estimates were included in the draft copy of the 2015 UWMP distributed to the member agencies in December, 2015.

IRP/UWMP briefings were also periodically presented during regular Member Agency Managers meetings held at Metropolitan. Metropolitan's update process also coordinated dialogue with the monthly water use efficiency meeting held with conservation coordinators from Metropolitan's member agencies and their retail sub-agencies. These meetings served as a forum for input on Metropolitan's conservation model methodology. Metropolitan staff also met with the member agency Conservation Program Advisory Committee for technical discussion and comments on Metropolitan's Conservation Savings Model. Additional meetings included the Local Resources Program (LRP) Coordinator's meeting and webinar where member agencies and retailers provided input to the recycled water discussion. The Technical Workgroup and other member agency planning meetings are summarized in Table 5-2.

Public Outreach during IRP/UWMP Preparation

Public involvement was an important element of the process to update the IRP and prepare the 2015 UWMP. Public outreach efforts complement the technical processes with the IRP committee and the member agencies. Most importantly, the efforts that were implemented during 2015 establish a means for the public to provide input to the policy discussions that are occurring following the adoption of the 2015 IRP Update.

Metropolitan's three key objectives for the public involvement element of the 2015 IRP Update and preparation of the UWMP are as follows:

- Ensure that the 2015 IRP Update/UWMP process is understandable and accessible to anyone who has an interest in Southern California's water supplies
- Provide opportunities for learning, dialogue, and input
- Create a pathway to encourage continued engagement in future policy discussions

To achieve the first objective, Metropolitan branded the 2015 IRP Update as "Water Tomorrow," which underlines the purpose of the plan and its importance to the region. Metropolitan then created a new website, MWDWaterTomorrow.com, which provides extensive information on the current update process, as well as the history of Metropolitan's IRP over the past two

decades. For the 2015 IRP Update, the site includes a calendar of past and future meetings, technical analysis and presentations, brief descriptions of Southern California's water resources, a comment section, and ways to participate. Metropolitan shares news and updates about Water Tomorrow through traditional and social media, Metropolitan's "Your Water" e-newsletter, and a variety of social media platforms. Metropolitan also provides speakers for community and business organizations throughout its service area.

While the first objective addresses public awareness, the second objective seeks to ensure that public involvement advances the region's understanding of water issues, challenges and perspectives and benefits Metropolitan's planning process. Metropolitan worked with the Southern California Water Committee to present the 2015 IRP Update process and technical issues at two workshops held at Metropolitan. Approximately 150 people participated in the first workshop in June to discuss a "Drought Proof Strategy." The second workshop was held in August where approximately 125 attendees discussed the future of outdoor water conservation. In September, Metropolitan met with the Southern California Water Dialogue whose diverse membership includes environmental organizations, private industry, and public agencies. The Southern California Association of Governments presented an overview of demographic projections, and Metropolitan staff provided an introduction to the technical analysis for the 2015 IRP Update. The IRP Committee Chair facilitated discussion on the 2015 IRP Update among the approximately 75 participants.

Following the three focused workshops held with the Southern California Water Committee and the Southern California Water Dialogue, Metropolitan convened the Water Tomorrow public workshop on October 22, 2015. More than 450 people participated in the all-day workshop, which was offered both in person and online to encourage broad participation throughout Metropolitan's service area. Staff recapped the technical analysis and key findings. Professional facilitators guided participant discussion in key resource areas: conservation, local resources, groundwater, and imported supplies. The key discussion points, ideas, and outcomes were reported to the IRP Committee to help inform future board policy discussions.

The third outreach objective looks to the future. One of Metropolitan's overarching communication goals is to develop the general public's knowledge of water resource issues and the range of solutions available to Southern California. An informed public is better able to contribute to the discussions and understand the implications and opportunities afforded by decisions. Metropolitan is building on the progress in the first phase of the 2015 IRP Update to encourage continued involvement in future discussions for the IRP and other water issues. These discussions will focus on solutions to challenges, and topics will range from policy and regulations to technology and behavior change.

As social media has become part of mainstream communications, Metropolitan tried a supplemental means of public engagement. Metropolitan worked with Northern Rift, a firm that has created a software platform to engage the public in raising and collaborating on ideas, to offer an online Water Tomorrow Innovation Game. Participants proposed ideas to solve Southern California's water challenges and then collaborated on the ideas to help grow them or discuss their limitations. The top ideas selected by the community of participants and those selected by a panel of water resource and policy experts were recognized at a reception hosted by Metropolitan. The Board of Directors may consider the ideas in future discussions on implementation of the 2015 IRP Update.

UWMP Public Notice and Adoption

Metropolitan provided notice of the availability of the draft 2015 UWMP and the public hearing to consider adoption, in accordance with California Water Code Sections 10621(b) and 10642,

and Government Code Section 6066. The public review draft of the plan was posted prominently on Metropolitan's website, mwdh2o.com, on February 1, 2016, more than 60 days in advance of the public hearing on April 11, 2016. The notice of availability of the document was sent to the member agencies, as well as cities and counties in the Metropolitan service area. In addition, a public notice advertising the public hearing was published in six Southern California newspapers on February 1 and 8, 2016. A copy of the notification letter sent to the member agencies, cities and counties in Metropolitan's service area is included in this chapter, as well as the notice published in the newspapers. Table 5-3 provides a list of participating member agencies and other appropriate agencies that Metropolitan coordinated with in its regional planning, as well as the cities and counties that were notified about the preparation of its 2015 UWMP.

Metropolitan held the public hearing for the draft 2015 UWMP on April 11, 2016, at the Board's Water Planning and Stewardship Committee meeting. On May 10, 2016, Metropolitan's Board determined that the 2015 UWMP is consistent with the Act and an accurate representation of the water resources plan for the Metropolitan service area. As stated in Resolution 9209, the Board adopted the 2015 UWMP and authorized its submittal to the State of California. A copy of Resolution 9209 is included in this section.

Submission and Availability of Final 2015 UWMP

In fulfillment of California Water Code §10645, Metropolitan's Final 2015 UWMP was posted on the mwdh2o.com website on May 10, 2016, following its adoption by the Metropolitan board.

In fulfillment of California Water Code §§ 10635(b) and 10644(a)(1), Metropolitan also mailed copies of the Final 2015 UWMP (in electronic pdf format) to the California State Library and all cities and counties within Metropolitan's service area within 30 days of Board adoption.

In fulfillment of California Water Code § 10621(d) and § 10644(a)(1) and (2), Metropolitan's Final 2015 UWMP was electronically submitted to the State of California through DWR's WUE data website https://wuedata.water.ca.gov/secure/ in June 2016.

Table 5-2
2015 Technical Process Member Agency Participation

Date	Group	Topic
April 8, 2015	Member Agency Technical Workgroup	Introduction to 2015 IRP Update/UWMP process
April 16, 2015	Water Use Efficiency Meeting	Introduction to 2015 IRP Update/UWMP process, Conservation
April 22, 2015	Member Agency Technical Workgroup	Uncertainty planning in the IRP
April 29, 2015	Conservation Program Advisory Committee	Conservation model
May 18, 2015	Member Agency Technical Workgroup	Imported Supplies (Colorado River Aqueduct, State Water Project, Central Valley Transfers and Storage)
May 20, 2015	Water Use Efficiency Meeting	Conservation
May 27, 2015	Member Agency Technical Workgroup	Groundwater (Part 1 of 2)
June 11, 2015	Member Agency Technical Workgroup	Groundwater (Part 2 of 2)
June 16, 2015	LRP Coordinators Meeting	Recycled Water Issue Paper
June 18, 2015	Water Use Efficiency Meeting	Long-term impacts of current water use restrictions, Issue Paper chapter on Conservation
June 24, 2015	Member Agency Technical Workgroup	Local Resources (Part 1 of 2)
July 8, 2015	Member Agency Technical Workgroup	Local Resources (Part 2 of 2)
July 16, 2015	Water-Use Efficiency Meeting	Conservation savings forecast, Draft 2015 IRP Update Issue Paper Addendum
July 22, 2015	Member Agency Technical Workgroup	Retail Demands and Conservation
August 3, 2015	Member Agency Technical Workgroup	Draft IRP Technical Results (Part 1 of 2)
August 21, 2015	Member Agency Managers Meeting	Draft IRP Technical Results briefing
September 15, 2015	Member Agency Technical Workgroup	Draft IRP Technical Results (Part 2 of 2)
September 25, 2015	Member Agency Managers Meeting	IRP/UWMP Technical Process Overview
October 5, 2015	Member Agency Technical Workgroup	Final Technical Results
October 16, 2015	Member Agency Managers Meeting	Final Technical Results
November 16, 2015	Member Agency and Sanitation Districts Coordination Meeting	Overview of draft 2015 UWMP and Water Service Reliability

Table 5-3
Water Supplier Information Exchange

6 Counties			
Los Angeles	Orange	Riverside	San Bernardino
San Diego	Ventura		
136 Cities			
Agoura Hills	Fillmore	Long Beach	Rosemead
Aliso Viejo	Fontana	Los Alamitos	San Clemente
Arcadia	Fountain Valley	Lynwood	San Dimas
Artesia	Fullerton	Malibu	San Fernando
Azusa	Garden Grove	Manhattan Beach	San Gabriel
Bell Gardens	Gardena	Maywood	San Jacinto
Bellflower	Glendale	Menifee	San Marcos
Bradbury	Glendora	Mission Viejo	San Marino
Buena Park	Hawaiian Gardens	Monrovia	Santa Ana
Burbank	Hermosa Beach	Monterey Park	Santa Fe Springs
Calabasas	Hidden Hills	Moorpark	Santa Monica
Camarillo	Huntington Beach	Murrieta	Seal Beach
Carson	Imperial Beach	National City	Sierra Madre
Chino	Industry	Newport Beach	Signal Hill
Chino Hills	Inglewood	Norco	Simi Valley
Chula Vista	Irvine	Norwalk	Solana Beach
Claremont	Irwindale	Ontario	South El Monte
Compton	La Canada Flintridge	Oxnard	South Gate
Corona	La Habra	Palos Verdes Estates	South Pasadena
Covina	La Habra Heights	Paramount	Stanton
Cudahy	La Mesa	Pasadena	Temecula
Culver City	La Mesa	Perris	Temple City
Cypress	La Mirada	Pico Rivera	Thousand Oaks
Dana Point	La Palma	Placentia	Torrance
Del Mar	La Puente	Pomona	Upland
Diamond Bar	La Verne	Port Hueneme	Ventura
Downey	Laguna Beach	Poway	Villa Park
Duarte	Laguna Hills	Rancho Cucamonga	Vista
Eastvale	Laguna Niguel	Rancho Palos Verdes	Walnut
El Cajon	Laguna Woods	Rancho Santa Margarita	West Hollywood
El Monte	Lake Elsinore	Redondo Beach	Westlake Village
El Segundo	Lake Forest	Riverside	Westminster
Encinitas	Lakewood	Rolling Hills	Whittier
Escondido	Lawndale	Rolling Hills Estates	Wildomar

Table 5-3
Water Supplier Information Exchange (continued)

26 Member Agencies			
Anaheim	Foothill MWD	Municipal Water District of Orange County	Three Valleys MWD
Beverly Hills	Fullerton	Pasadena	Torrance
Burbank	Glendale	San Diego County Water Authority	Upper San Gabriel Valley MWD
Calleguas MWD	Inland Empire Utilities Agency	San Fernando	West Basin MWD
Central Basin MWD	Las Virgenes MWD	San Marino	Western MWD
Compton	Long Beach	Santa Ana	
Eastern MWD	Los Angeles	Santa Monica	
9 Groundwater Basin Management Organizations			
Santa Margarita River Watermaster	Ventura County Watershed Protection District	Water Replenishment District	Upper Los Angeles River Area Watermaster
San Bernardino County Flood Control District	Chino Basin Watermaster	Main San Gabriel Basin Watermaster/	Orange County Water District
Raymond Basin Management Board			
Other Agencies / Planning Organizations			
Sanitation Districts of Los Angeles County	City of Los Angeles Bureau of Sanitation	Southern California Association of Governments	Western Riverside Council of Governments
Orange County Sanitation District	City of San Diego Metropolitan Wastewater Department	City of San Diego Recycled Water Section Public Utilities Department	San Diego Association of Governments

(Notification per California Water Code §10621(b) and §10642)

Letter Notifying Cities and Counties

February 1, 2016

[Sent via US Mail to Member Agencies, City Managers and County Administrators]

Notice of Public Hearing on The Metropolitan Water District of Southern California's Draft 2015 Urban Water Management Plan

The Metropolitan Water District of Southern California (Metropolitan) cordially invites you to participate and provide comments at a public hearing on the draft 2015 Urban Water Management Plan (UWMP). The UWMP presents Metropolitan's long-term plan for ensuring water supply reliability and water quality for the region. The draft UWMP complies with California state law requiring urban water suppliers to prepare and update urban water management plans every five years. The hearing will be held as part of the meeting of the Water Planning and Stewardship Committee whose board members are helping to shape a public dialogue on the future of water management and conservation in the region. The meeting is at:

The Metropolitan Water District of Southern California
700 North Alameda Street, Los Angeles, CA 90012
Water Planning and Stewardship Committee Meeting – Room 2-456
Monday, April 11, 2016 at 10:00 AM

The draft UWMP is posted on Metropolitan's web site, mwdh2o.com for your review. Public input is encouraged and will be considered during finalization of the 2015 UWMP. Written comments are due by **April 11, 2016**. Please send comments to:

The Metropolitan Water District of Southern California
PO Box 54153
Los Angeles, CA 90054-0153
Attn: Edgar Fandialan

If you would like more information or have any questions, please contact Edgar Fandialan at (213) 217-6764 or via email at efandialan@mwdh2o.com.

Very Truly Yours,

Devendra Upadhyay
Manager, Water Resource Management

(Newspaper publication per California Water Code §10642 and Government Code §6066)

PUBLIC HEARING SCHEDULED ON DRAFT URBAN WATER MANAGEMENT PLAN

The Metropolitan Water District of Southern California (Metropolitan) will hold a public hearing on **Monday, April 11, 2016** to receive comments on its draft 2015 Urban Water Management Plan (UWMP).

The hearing will be held as part of the meeting of the Water Planning and Stewardship Committee whose board members are helping to shape a public dialogue on the future of water management and conservation in the region. The meeting is at:

The Metropolitan Water District of Southern California
700 North Alameda Street, Los Angeles, CA 90012
Water Planning and Stewardship Committee Meeting – Room 2-456
Monday, April 11, 2016 at 10:00 AM

The UWMP presents Metropolitan's long-term plan for ensuring water supply reliability and water quality for the region. The draft UWMP complies with California state law requiring urban water suppliers to prepare and update urban water management plans every five years.

The draft plan is available on Metropolitan's web site, mwdh2o.com. Public input is encouraged and will be considered during finalization of the 2015 UWMP. Metropolitan will accept written comments on the draft plan. All written comments must be received by **April 11, 2016**, by sending them to:

The Metropolitan Water District of Southern California
P.O. Box 54153
Los Angeles, CA 90054-0153
Attn: Edgar Fandialan

For more information on the draft UWMP, please contact Edgar Fandialan of Metropolitan's Water Resource Management Group at (213) 217-6764.

Resolution 9209

RESOLUTION
OF THE BOARD OF DIRECTORS
OF THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
ADOPTING THE 2015 URBAN WATER MANAGEMENT PLAN

WHEREAS, the California Urban Water Management Planning Act requires urban water suppliers providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually to prepare and adopt, in accordance with prescribed requirements, an urban water management plan every five years; and

WHEREAS, the California Urban Water Management Planning Act specifies the requirements and procedures for adopting such Urban Water Management Plans; and

WHEREAS, the Board of Directors of The Metropolitan Water District of Southern California has duly reviewed, discussed, and considered such Urban Water Management Plan and has determined the 2015 Urban Water Management Plan to be consistent with the California Urban Water Management Planning Act and to be an accurate representation of the water resources plan for The Metropolitan Water District of Southern California.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of The Metropolitan Water District of Southern California that, on May 10, 2016, this District hereby adopts this 2015 Urban Water Management Plan for submittal to the State of California.

I HEREBY CERTIFY that the foregoing is a full, true and correct copy of a resolution adopted by the Board of Directors of The Metropolitan Water District of Southern California, at its meeting held on May 10, 2016.

Secretary of the Board of Directors
of The Metropolitan Water District
of Southern California

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Appendix 1

DEMAND FORECAST

Appendix 1
DEMAND FORECAST

Forecast Overview

Retail water demand forecasting is essential for planning total water requirements in Metropolitan's service area. Retail water demand can be met with conservation, local supplies, or imported supplies. As a wholesale imported water supplier, Metropolitan's long-term plans focus on the future demands for Metropolitan's supplies. In order to project the need for resources and system capacity, Metropolitan begins with a long-term projection of retail water demands.

Total retail demands include:

- Retail Municipal and Industrial (M&I) — Retail M&I demands represent urban water use within the region including residential, commercial, industrial, and institutional water uses. To forecast retail M&I demands, Metropolitan uses econometric models that have been adapted for conditions in Southern California. The econometric models are statistical models that can capture and explain the impacts of long-term socioeconomic trends on retail M&I demands. The econometric models incorporate projections of demographic and economic variables from regional transportation planning agencies to produce forecasts of water demand.
- Retail Agricultural Demand — Retail agricultural demands consist of water use for irrigating crops. Metropolitan's member agencies provide projections of agricultural water use based on many factors, including farm acreage, crop types, historical water use, and land use conversion. Metropolitan relies on member agencies' projections of agricultural demands.
- Seawater Barrier Demand — Seawater barrier demands represent the amount of water needed to hold back seawater intrusion into the coastal groundwater basins. Groundwater management agencies determine the barrier requirements based on groundwater levels, injection wells, and regulatory permits.
- Replenishment Demand — Replenishment demands represent the amount of water member agencies plan to use to replenish their groundwater basins in order to maintain sustainable basin health and production.

Retail M&I Demand Forecast

In forecasting retail M&I water demand, Metropolitan adopted a new econometric model (the Metropolitan Water District – Econometric Demand Model or MWD-EDM) developed by The Brattle Group (January 2015). MWD-EDM utilizes multiple regression, which is generally favored by academics and practitioners for long-term water demand analysis. It uses demand relationships based on actual observed behavior to consider the effect of anticipated changes in demand factors on long-term demand.

MWD-EDM is comprised of three separate regression models described below. Each model is developed using historical water consumption and socio-demographic and economic data specific to the sector:

- Single-Family Residential (SFR) Model - SFR water demand is modeled as a function of price, weather, retailer level housing, socio-demographic characteristics, and member agency level fixed effects. The model used water consumption data from 153 retailers with 3,000 accounts or more in Metropolitan's service area. The dataset, ranging from 1994 to 2011, consisted of 1,225 observations and represented 80 percent of all SFR accounts from all 26 Metropolitan member agencies.
- Multi-family Residential (MFR) Model - MFR demand is modeled as a function of price, retailer level housing, socio-demographic characteristics, and member agency level fixed effects. Water consumption data was collected from 53 water retailers consisting of 469 observations and representing 23 out of 26 Metropolitan member agencies.
- Commercial, Industrial, and Institutional (CII) Model - CII demand is modeled as a function of price, weather, employment, the share of employment in the manufacturing sector, and member agency level fixed effects. Water consumption data was collected from 75 water retailers consisting of 709 observations and representing 25 out of 26 Metropolitan member agencies.

The SFR and MFR models forecast average monthly household consumption before conservation, while the CII model forecasts average monthly consumption per employee. Table A.1-1 shows the dependent and the covariates uses in the econometric models for each sector.

Table A.1-1
MWD-EDM Variables

Sector	Dependent Variable	Independent Variable (Covariate)
SFR	Water-Use Per Household	Total Average Cost Total Average Cost x Median Lot Size Annual precipitation Average Max Temperature Median Income Average Household Size Median Lot Size
MFR	Water-Use Per Household	Median Tier Price Median Income Median Lot Size Average Household Size
CII	Water-Use Per Employee	Median Tier Price Cooling Degree Days Average Max Temperature Share of Employment In Manufacturing Median Tier Price x Share of Manufacturing

Total retail M&I demand is the product of projected household/employee and the average monthly consumption.

Price Elasticity

Price elasticity of demand is a measure used in economics to show the responsiveness of the quantity of water demanded to a change in its price. The assumed price increase reduces the water use. This reduction can be assessed in MWD-EDM and is considered a conservation savings due to price or "price-effect." Consumers can respond to price increases by installing water-conserving fixtures and appliances such as high-efficiency toilets. However, many of the fixture-based conservation savings options are already factored into Metropolitan's Conservation Savings Model. As more water efficient fixtures are installed, the impact of changing water using behavior through price or rates is reduced. Consider consumers who respond to rate increases by taking shorter showers. Their behavior adjustment will save less water if they use a water-efficient low-flow showerhead compared to a regular showerhead. This effect is known as demand hardening. In order to avoid double-counting conservation savings and account for demand hardening, the impact of price elasticity is reduced. In MWD-EDM, price elasticity is reduced to 33 percent by 2020 and is kept constant beyond 2020. Price-effect savings are reduced (and demands increased) as a result of this adjustment. The elasticity is reduced in proportion to increases in conservation savings from the conservation model. Reducing price elasticity to 1/3 of its originally estimated levels is based on professional judgment, assuming that much of the easily obtained water use efficiencies will be achieved by 2020, but allowing for new conservation technologies.

Fixed Effects

MWD-EDM forecasts retail M&I demand for each of the 26 member agencies. To account for the differences observed between each agency, MWD-EDM uses the fixed effects or the constant term that represents the member agency specific intercepts that account for all time-invariant unobserved factors common to an agency.

Demographics

Demographics are recognized by the water industry as drivers of water demand. Metropolitan's retail demand modelling is driven by key demographics such as projected population, households, employment, and median household income.

Metropolitan uses demographic growth projections produced by two regional transportation planning agencies: the Southern California Association of Governments (SCAG) and the San Diego Association of Governments (SANDAG). Together they represent more than 200 cities in Southern California and produce long-term transportation plans for sustainable communities. Among other responsibilities, SCAG and SANDAG also prepare projections of population, households, income, and employment for their regions. Both planning agencies update their regional growth forecasts approximately every four years, at different times. SCAG is the regional planning agency for six counties: Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura. SANDAG is the regional planning agency for San Diego County. Significantly, SCAG's and SANDAG's official growth projections are backed by environmental reports. These regional growth forecasts provide the core assumptions underlying Metropolitan's retail demand forecasting model.

In April 2012, SCAG released the *2012-2035 Regional Transportation Plan/Sustainable Communities Strategy* growth forecast (RTP-12). The RTP-12 incorporated updated data and assumptions that reflected the 2007-2009 economic recession, the 2010 Census count, and 2011 employment data from the California Employment Development Department for the Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties. Metropolitan uses the forecast for every county except Imperial, which is outside of Metropolitan's service area.

In October 2013, SANDAG released the *Series 13: 2050 Regional Growth Forecast* (Series 13). Series 13 is a comprehensive projection of the regional demographic, economic, and housing trends expected over the next four decades for the San Diego region. Metropolitan uses the forecast for the San Diego County Water Authority's service area in the retail demand forecast.

Effects of the Great Recession on SCAG's and SANDAG's Forecasts

The Great Recession of 2007-09 severely impacted the region's economic growth. Economic growth is a major factor in population growth through migration. Job availability attracts people to the region. Conversely, a scarcity of employment leads to out-migration as people leave in search of work. Between 2007 and 2010, the region lost approximately 750,000 jobs. The state and the region experienced disproportionately high job losses compared with the nation. Because patterns of migration are influenced by job availability, Southern California saw net outbound domestic migration. Other major factors that affect population growth are fertility and mortality. The acute economic uncertainties also affected people's decision to start a family. Consequently, delayed family formation and reduced birth rate contributed to slower population growth than was anticipated before the recession. However, mortality rates were projected to be lower as the proportion of older people (age 65+) significantly increases. As a result, the net growth in population in the post-recession era is projected to be lower than previously projected in the 2010 IRP Update.

Trends in Southern California

Population

According to SCAG and SANDAG estimates, the population in Metropolitan's service area will reach 19.4 million in 2020, 20.0 million in 2025, and 21.8 million by 2040. While Los Angeles County leads in total population, the inland areas of Riverside and San Bernardino counties are projected to grow at the fastest rates over the next ten years. Generally speaking, however, annual growth rates will slow for all counties between 2010 and 2040. In part, this is due to changing patterns of migration. It also reflects the effects of the recession of the late 2000s and the ongoing restructuring of the Southern California economy.

Employment

Within Metropolitan's service area, employment growth is likely to occur unevenly across the six counties. Over the 25-year period between 2015 and 2040, the greatest employment increases are expected to occur in Riverside, Los Angeles, and San Diego Counties with estimated increases of 383, 379, and 237 thousand jobs respectively. Relative to existing employment, Riverside and San Bernardino counties are expected to have the highest rates of employment growth.

Figure A.1-2 and Table A.1-3 summarize the projected growth of commercial, industrial, and institutional employment in Metropolitan's service area. Total urban employment is expected to increase from 8.2 million in 2015 to about 9.6 million in 2040. This increase of about 17 percent is greater than the projected population increase of 16 percent, suggesting a slightly increased share of the population will be employed over time.

Figure A.1-1 Actual and Projected Population

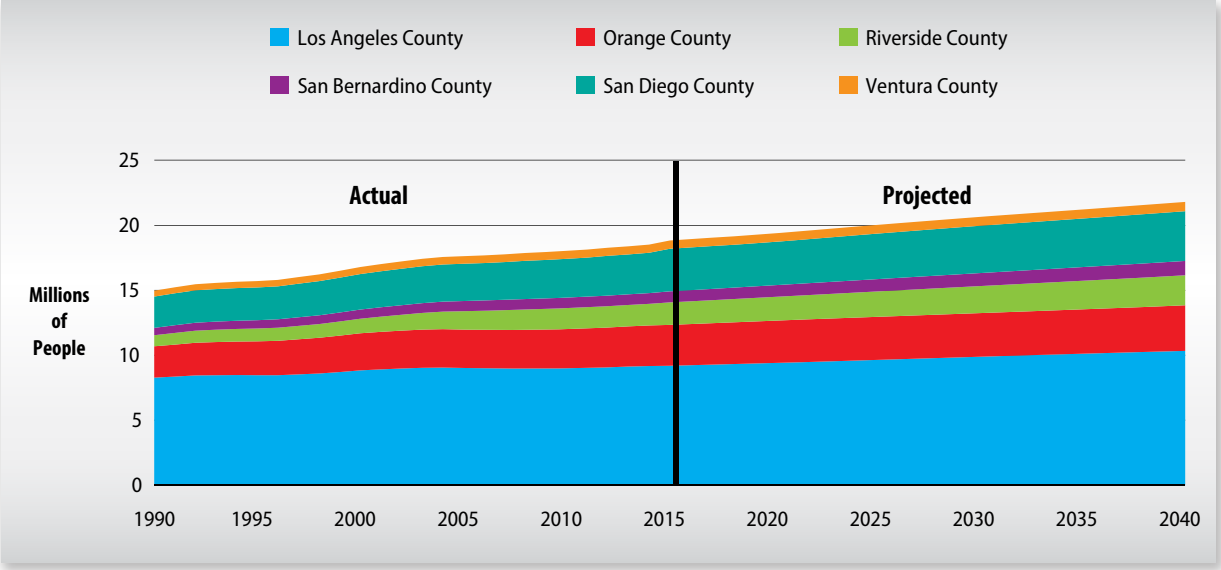
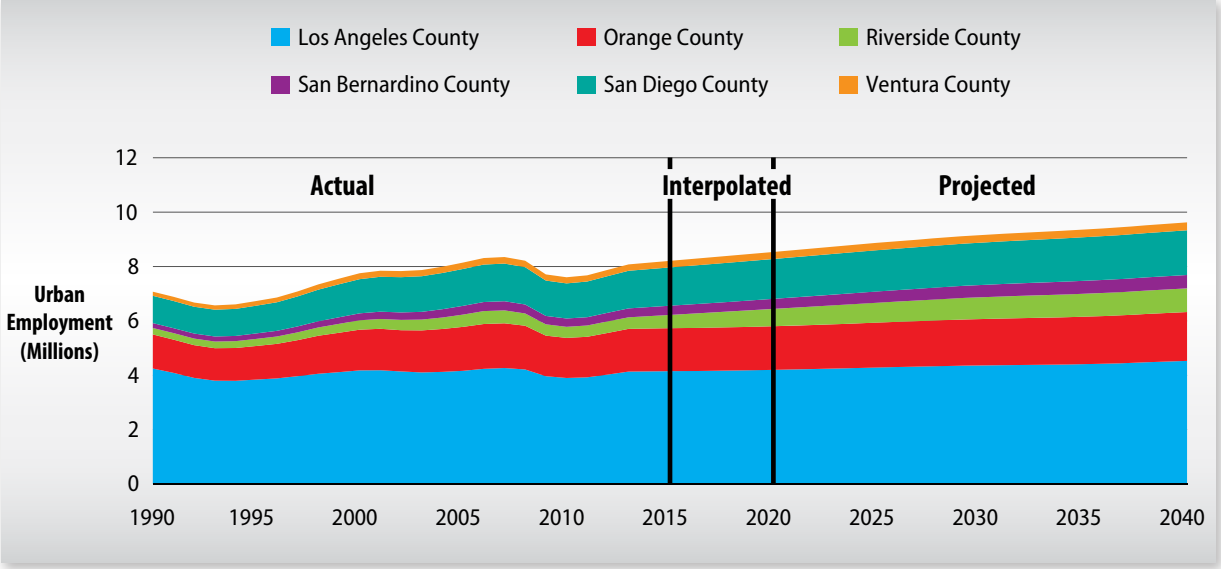


Figure A.1-2 Actual and Projected Urban Employment



Residential Consumers

Southern California's regional planning agencies have forecast residential housing growth in all parts of the Metropolitan service area. These forecasts are shown in Figure A.1-3 and Table A.1-4. The total occupied housing stock is expected to increase more than 20 percent between 2015 and 2040, growing from 6.1 to around 7.3 million housing units. Much of this growth will likely occur in hotter inland areas of Southern California. Within the service territory, the household occupancy size (household population divided by total occupied dwelling units) is projected to decline slightly from about 3.0 persons per unit currently to 2.9 persons per unit by 2040.

Permits for new residential housing construction are another indicator of the future growth in water demand. Figure A.1-4 shows the pattern of historical growth in residential housing permits between 1970 and 2040. The effect of economic cycles can clearly be seen over time with the precipitous fall in housing construction during the 2007 to 2010 recession being most notable. There is a recent slight increase of construction from 2011 to 2014.

Figure A.1-3 Actual and Projected Households

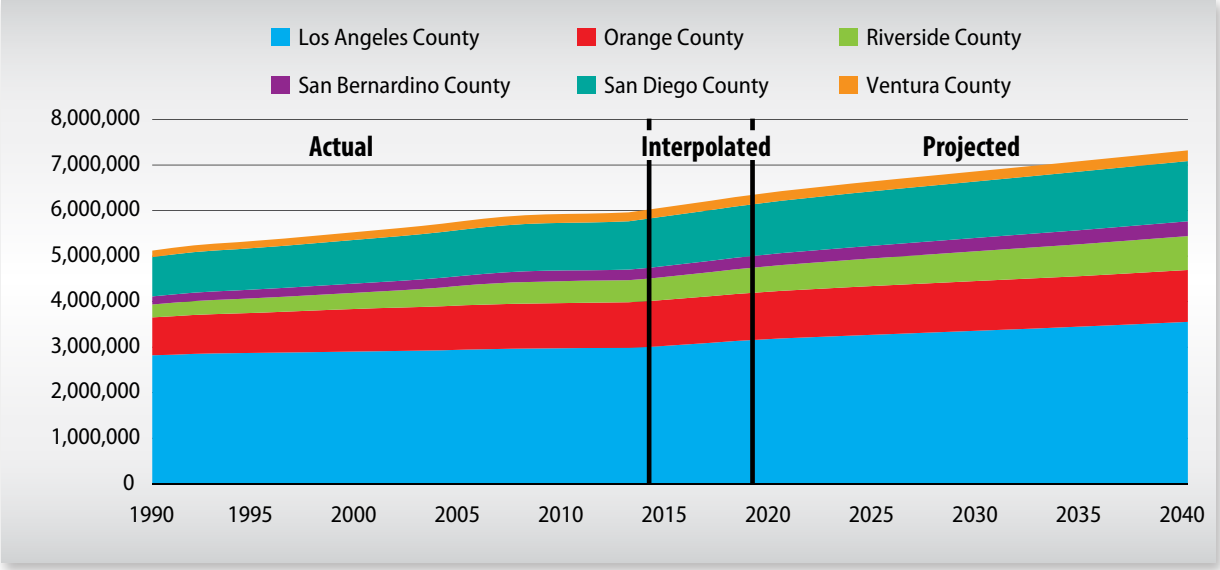
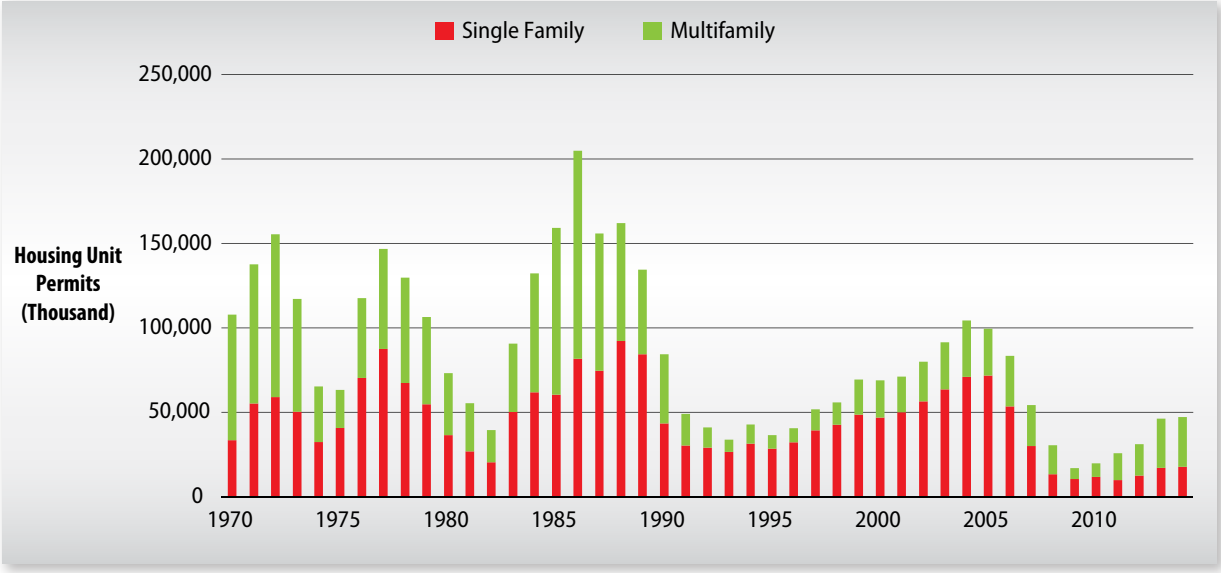


Figure A.1-4 Residential Housing Permits in Six-County Region



Water Demands

As shown in Figure A.1-5 and Table A.1-5, actual retail water demands in 2015 was 3.1 million acre-feet (MAF), which is approximately the same as in 1980. This is due to a number of factors including an aggressive outreach campaign due the severe drought since 2012, advancement in conservation, and mandatory water use restriction.

Of the estimated 3.1 MAF of total retail water use in 2015, agricultural water use was only about 99 TAF. This is due to severe drought, water rate increases, and water use restrictions. By 2040, under average conditions, retail agricultural demand is expected to be about 160 TAF.

Retail Demand

It is estimated that total M&I water use will grow from an annual average of 3.0 MAF in 2015 to 3.8 MAF in 2040. All water demand projections assume normal weather conditions. Future changes in estimated water demand assume continued water savings due to conservation measures such as water savings resulting from plumbing codes, price effects, and the continuing implementation of utility-funded conservation BMPs. Retail demand was greatly reduced in 2015 due to extraordinary response to statewide calls for a 25 percent reduction in water use in light of historic drought conditions. Regional water use is projected to increase slightly until 2020 as demands rebound towards more normal levels. Between 2020 and 2040, regional water use will grow slowly as driven by population and economic growth while water use efficiency increases.

By County

M&I water demand is not expected to grow uniformly across counties. Consistent with the general pattern of future demographic distributions, the largest absolute increases in urban water demands are expected to occur in Los Angeles and Riverside Counties, with respective estimated increases of about 231 TAF and 202 TAF between 2015 and 2040.

By Sector

Water use can also be broken down by sector. Between 2015 and 2040, single-family residential water use is expected to increase by 18.5 percent (Table A.1-8), while multifamily water use is estimated to increase by 32.9 percent (Table A.1-9). Table A.1-10 shows estimated nonresidential water use increasing by 19.0 percent between 2015 and 2040.

Residential Water Use

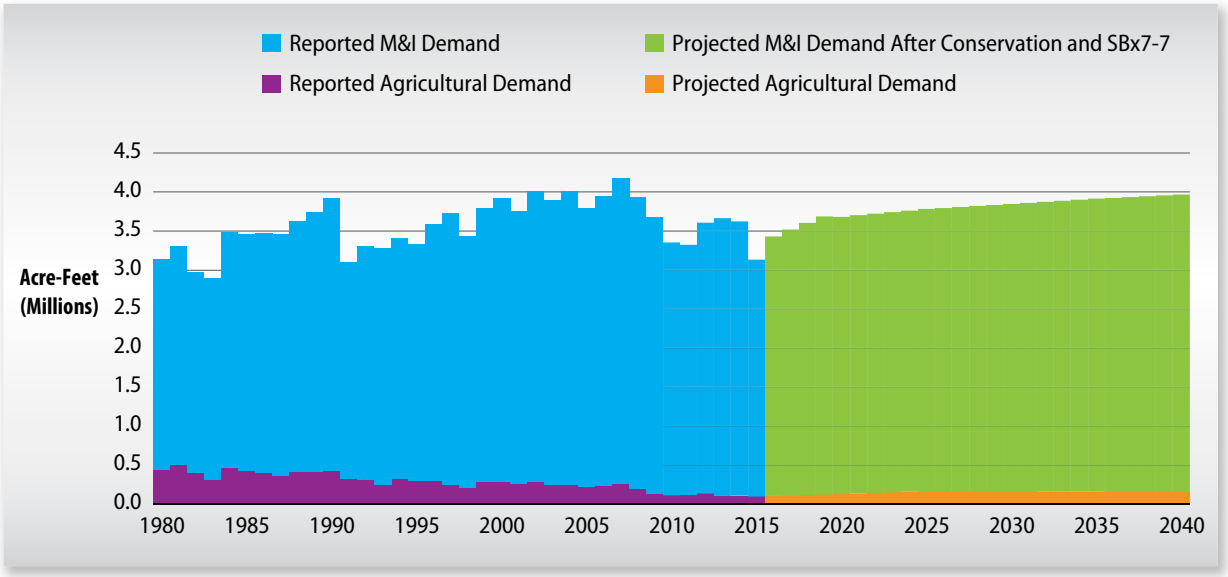
While single-family homes are estimated to account for about 60 percent of the total occupied housing stock in 2015, they are responsible for about 77 percent of total residential water demands (Tables A.1-8 and A.1-9). This is consistent with the fact that single-family households are known to use more water than multifamily households (e.g., those residing in duplexes, triplexes, apartment buildings and condo developments) on a per housing-unit basis. This is because single-family households tend to have more persons living in the household; they are likely to have more water-using appliances and fixtures; and they tend to have more landscaping.

Nonresidential Water Use

Nonresidential water use represented approximately 25 percent of the total M&I demands in Metropolitan's service area in 2015 (Table A.1-10). This includes water that is used by businesses, services, government, institutions (such as hospitals and schools), and industrial (or manufacturing) establishments. Within the commercial/institutional category, the top water

users include schools, hospitals, hotels, amusement parks, colleges, laundries, and restaurants. In Southern California, major industrial users include electronics, aircraft, petroleum refining, beverages, food processing, and other industries that use water as a major component of the manufacturing process.

Figure A.1-5 Actual and Projected Retail Water Demand



Conservation Savings

Table A.1-12 shows estimated conservation savings resulting from active conservation programs ("Active"), ongoing conservation from natural replacement of plumbing fixtures ("Code-Based"), and conservation induced by projected increases in the real price of water ("Price"). Code-Based savings account for the largest share of total conservation. However, aggressive utility-funded conservation programs have made a significant contribution in this area. For example, Metropolitan-assisted programs were responsible for an estimated 179 TAF in savings during FY 2014-15 and nearly 800 TAF in cumulative conservation savings since FY 1990/91.

Projected M&I Demand by Sector

Table A.1-13 provides a summary of municipal and industrial demands, broken down by sector, along with each sector's share of total retail demand. In 2015, residential use accounted for about 70 percent of total projected M&I demand, while non-residential use constituted nearly 21 percent of projected M&I demand. These shares are expected to remain the same until 2040. System losses and unmetered use are expected to remain relatively constant over this period at about 9 percent.

Table A.1-2 Population Growth in Metropolitan's Service Area (July)

(Acre-feet)

County	Actual				Estimated	Projected				
	1995	2000	2005	2010	2015	2020	2025	2030	2035	2040
Los Angeles County	8,461,000	8,833,000	9,025,000	9,004,000	9,267,000	9,397,000	9,636,000	9,875,000	10,122,000	10,332,000
Orange County	2,605,000	2,854,000	2,954,000	3,012,000	3,153,000	3,246,000	3,316,000	3,376,000	3,382,000	3,507,000
Riverside County	989,000	1,120,000	1,409,000	1,618,000	1,679,000	1,825,000	1,951,000	2,074,000	2,201,000	2,309,000
San Bernardino County	638,000	706,000	783,000	810,000	839,000	889,000	947,000	1,001,000	1,059,000	1,103,000
San Diego County	2,519,000	2,730,000	2,863,000	2,987,000	3,169,000	3,341,000	3,496,000	3,631,000	3,746,000	3,825,000
Ventura County	490,000	541,000	583,000	616,000	633,000	657,000	671,000	682,000	696,000	715,000
Metropolitan's Service Area	**15,702,000**	**16,784,000**	**17,617,000**	**18,047,000**	**18,740,000**	**19,355,000**	**20,017,000**	**20,639,000**	**21,206,000**	**21,791,000**

Source: US Census, CA Department of Finance, SCAG RTP-12, and SANDAG Series 13
Note: Totals may not foot due to rounding differences

Table A.1-3 Urban Employment Growth in Metropolitan's Service Area (July)

(Acre-feet)

County	Actual				Estimated	Projected				
	1995	2000	2005	2010	2015	2020	2025	2030	2035	2040
Los Angeles County	3,841,000	4,180,000	4,163,000	3,900,000	4,151,000	4,191,000	4,288,000	4,364,000	4,400,000	4,530,000
Orange County	1,236,000	1,498,000	1,618,000	1,476,000	1,582,000	1,603,000	1,652,000	1,709,000	1,747,000	1,797,000
Riverside County	262,000	346,000	451,000	407,000	488,000	647,000	732,000	803,000	845,000	871,000
San Bernardino County	201,000	255,000	322,000	307,000	339,000	367,000	413,000	453,000	477,000	492,000
San Diego County	1,021,000	1,258,000	1,358,000	1,292,000	1,409,000	1,470,000	1,519,000	1,558,000	1,604,000	1,646,000
Ventura County	172,000	218,000	235,000	226,000	242,000	260,000	270,000	279,000	282,000	292,000
Metropolitan's Service Area	**6,733,000**	**7,755,000**	**8,147,000**	**7,608,000**	**8,211,000**	**8,538,000**	**8,874,000**	**9,166,000**	**9,355,000**	**9,628,000**

Source: US Census, CA Department of Finance, SCAG RTP-12, and SANDAG Series 13
Note: Totals may not foot due to rounding differences

Table A.1-4 Occupied Housing Growth in Metropolitan's Service Area

(Acre-feet)

County	Actual				Estimated	Projected				
	1995	2000	2005	2010	2015	2020	2025	2030	2035	2040
Los Angeles County	2,876,000	2,909,000	2,944,000	2,980,000	3,038,000	3,189,000	3,277,000	3,366,000	3,455,000	3,557,000
Orange County	881,000	937,000	974,000	992,000	1,013,000	1,042,000	1,073,000	1,092,000	1,111,000	1,139,000
Riverside County	323,000	357,000	432,000	483,000	506,000	563,000	609,000	656,000	703,000	744,000
San Bernardino County	192,000	204,000	220,000	232,000	240,000	262,000	278,000	294,000	310,000	325,000
San Diego County	913,000	963,000	1,016,000	1,045,000	1,093,000	1,145,000	1,200,000	1,241,000	1,289,000	1,322,000
Ventura County	156,000	170,000	185,000	195,000	200,000	211,000	217,000	222,000	227,000	235,000
Metropolitan's Service Area	**5,341,000**	**5,540,000**	**5,771,000**	**5,927,000**	**6,090,000**	**6,412,000**	**6,654,000**	**6,871,000**	**7,095,000**	**7,322,000**

Source: US Census, CA Department of Finance, SCAG RTP-12, SANDAG Series 13 2050 Regional Growth Forecast (April 2015)
Note: Totals may not foot due to rounding differences

Table A.1-5 Total Retail Demand in Metropolitan's Service Area with Conservation and SB X7-7

(Acre-feet)

County	Actual					Projected				
	1995	2000	2005	2010	2015	2020	2025	2030	2035	2040
Los Angeles County	1,558,000	1,739,000	1,643,000	1,423,000	1,309,000	1,503,000	1,499,000	1,507,000	1,525,000	1,539,000
Orange County	577,000	660,000	629,000	546,000	539,000	604,000	613,000	617,000	613,000	619,000
Riverside County	404,000	492,000	495,000	467,000	420,000	551,000	593,000	622,000	650,000	666,000
San Bernardino County	184,000	251,000	264,000	249,000	216,000	279,000	296,000	307,000	319,000	327,000
San Diego County	502,000	661,000	614,000	533,000	520,000	597,000	628,000	639,000	652,000	658,000
Ventura County	108,000	132,000	158,000	136,000	131,000	149,000	153,000	154,000	155,000	157,000
Metropolitan's Service Area	**3,333,000**	**3,935,000**	**3,803,000**	**3,354,000**	**3,135,000**	**3,683,000**	**3,782,000**	**3,846,000**	**3,914,000**	**3,966,000**

*2015 based on best available data.

Table A.1-6 Total Retail M&I Demand in Metropolitan's Service Area with Conservation and SB X7-7

(Acre-feet)

County	Actual					Projected				
	1995	2000	2005	2010	2015	2020	2025	2030	2035	2040
Los Angeles County	1,550,000	1,738,000	1,643,000	1,422,000	1,308,000	1,502,000	1,499,000	1,506,000	1,524,000	1,539,000
Orange County	559,000	643,000	619,000	544,000	533,000	599,000	608,000	614,000	611,000	617,000
Riverside County	245,000	357,000	413,000	409,000	379,000	486,000	507,000	537,000	565,000	581,000
San Bernardino County	152,000	221,000	236,000	227,000	190,000	273,000	289,000	302,000	314,000	322,000
San Diego County	438,000	556,000	523,000	506,000	509,000	559,000	580,000	592,000	606,000	613,000
Ventura County	94,000	125,000	145,000	128,000	116,000	132,000	132,000	133,000	133,000	134,000
Metropolitan's Service Area	**3,038,000**	**3,640,000**	**3,579,000**	**3,236,000**	**3,035,000**	**3,551,000**	**3,615,000**	**3,684,000**	**3,753,000**	**3,806,000**

2015 based on best available data.

Table A.1-7 Total Retail Agricultural Demand in Metropolitan's Service Area

(Acre-feet)

County	Actual					Projected				
	1995	2000	2005	2010	2015	2020	2025	2030	2035	2040
Los Angeles County	7,500	500	400	1,000	1,000	300	400	400	400	400
Orange County	17,700	17,300	9,800	1,800	5,700	4,700	4,700	3,400	2,000	2,000
Riverside County	158,700	134,100	81,700	58,100	41,100	65,600	85,500	85,100	84,900	84,500
San Bernardino County	32,200	29,800	27,500	21,600	26,000	5,300	7,000	5,000	5,000	5,000
San Diego County	64,400	105,600	91,300	27,100	10,800	37,800	48,300	47,200	46,100	45,000
Ventura County	14,300	7,500	12,600	8,400	14,700	16,100	21,400	22,000	22,600	22,600
Metropolitan's Service Area	**294,800**	**294,800**	**223,300**	**118,000**	**99,300**	**129,800**	**167,300**	**163,100**	**161,000**	**159,500**

2015 based on best available data.

Table A.1-8 Single Family Retail Demand in Metropolitan's Service Area[1]

(Acre-feet)

County	2015	Projected 2020	2025	2030	2035	2040
Los Angeles County	770,000	854,000	833,000	836,000	850,000	849,000
Orange County	293,000	324,000	327,000	327,000	326,000	328,000
Riverside County	306,000	371,000	371,000	390,000	412,000	421,000
San Bernardino County	144,000	169,000	174,000	180,000	187,000	192,000
San Diego County	316,000	364,000	375,000	380,000	385,000	385,000
Ventura County	93,000	104,000	101,000	102,000	102,000	103,000
Metropolitan's Service Area	1,922,000	2,186,000	2,181,000	2,215,000	2,262,000	2,278,000

[1] Projections do not include savings estimates to meet SB X7-7.

Table A.1-9 Multi-family Retail Demand in Metropolitan's Service Area[1]

(Acre-feet)

County	2015	Projected 2020	2025	2030	2035	2040
Los Angeles County	301,000	330,000	349,000	355,000	362,000	376,000
Orange County	87,000	94,000	96,000	99,000	98,000	102,000
Riverside County	42,000	48,000	63,000	67,000	70,000	77,000
San Bernardino County	32,000	37,000	39,000	42,000	44,000	46,000
San Diego County	103,000	115,000	125,000	133,000	143,000	151,000
Ventura County	13,000	13,000	14,000	15,000	15,000	16,000
Metropolitan's Service Area	578,000	637,000	686,000	711,000	732,000	768,000

[1] Projections do not include savings estimates to meet SB X7-7.

Table A.1-10 Commercial, Industrial and Institutional Retail Demand in Metropolitan's Service Area[1]

(Acre-feet)

County	2015	Projected 2020	2025	2030	2035	2040
Los Angeles County	325,000	355,000	353,000	351,000	349,000	350,000
Orange County	165,000	183,000	186,000	189,000	189,000	189,000
Riverside County	65,000	96,000	104,000	110,000	113,000	113,000
San Bernardino County	57,000	69,000	76,000	81,000	84,000	85,000
San Diego County	99,000	111,000	112,000	110,000	110,000	110,000
Ventura County	33,000	39,000	39,000	39,000	38,000	38,000
Metropolitan's Service Area	744,000	853,000	870,000	880,000	883,000	885,000

[1] Projections do not include savings estimates to meet SB X7-7.

Table A.1-11 Unmetered Use in Metropolitan's Service Area[1]

(Acre-feet)

County	2015	Projected 2020	2025	2030	2035	2040
Los Angeles County	149,000	154,000	156,000	159,000	162,000	165,000
Orange County	69,000	70,000	72,000	73,000	74,000	76,000
Riverside County	34,000	39,000	42,000	46,000	49,000	52,000
San Bernardino County	39,000	42,000	45,000	48,000	51,000	53,000
San Diego County	14,000	15,000	16,000	16,000	17,000	18,000
Ventura County	15,000	16,000	16,000	17,000	17,000	17,000
Metropolitan's Service Area	320,000	336,000	347,000	359,000	370,000	381,000

[1] Projections do not include savings estimates to meet SB X7-7.

Table A.1-12 Conservation Savings in Metropolitan's Service Area – 1980 Base Year[1]

(Acre-feet)

County	Estimated 1995	2000	2005	2010	2015	Projected 2020	2025	2030	2035	2040
Los Angeles	81,000	166,000	235,000	296,000	364,000	406,000	436,000	465,000	484,000	513,000
Orange County	25,000	55,000	81,000	104,000	123,000	130,000	138,000	147,000	156,000	167,000
Riverside	10,000	22,000	37,000	52,000	67,000	76,000	88,000	100,000	113,000	126,000
San Bernardino	5,000	10,000	16,000	22,000	27,000	32,000	37,000	42,000	46,000	52,000
San Diego	25,000	56,000	78,000	96,000	114,000	138,000	152,000	167,000	182,000	197,000
Ventura	4,000	9,000	13,000	16,000	20,000	28,000	30,000	32,000	35,000	37,000
Active, Code, Price	150,000	318,000	460,000	586,000	715,000	810,000	881,000	953,000	1,016,000	1,092,000
Pre-1990 Conservation	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
Total Conservation	400,000	568,000	710,000	836,000	965,000	1,060,000	1,131,000	1,203,000	1,266,000	1,342,000

[1] Estimated conservation savings with active savings installed as of 2015.
Savings projections do not include savings derived from SB X7-7.

Table A.1-13 Projected Municipal and Industrial Demands by Sector

(Acre-feet)

Sector	Historical[1] 1995	2000	2005	2010	2015	Projected[2] 2020	2025	2030	2035	2040
Single-Family	1,792,000	2,169,000	2,150,000	1,925,000	1,922,000	2,186,000	2,181,000	2,215,000	2,262,000	2,278,000
Multi-Family	522,000	632,000	626,000	561,000	578,000	637,000	686,000	711,000	732,000	768,000
Non-Residential	699,000	847,000	839,000	751,000	744,000	853,000	870,000	880,000	883,000	885,000
System Losses/Unmetered	275,000	333,000	330,000	296,000	320,000	336,000	347,000	359,000	370,000	381,000
Metropolitan Total	3,288,000	3,981,000	3,945,000	3,533,000	3,564,000	4,012,000	4,084,000	4,165,000	4,247,000	4,312,000

[1] Estimates of historical water use are prorated using percentages from projected demands and actual water use.
[2] Projected demands are weather normalized and do not include savings estimates to meet SB X7-7

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Appendix 2

EXISTING REGIONAL WATER SUPPLIES

Appendix 2
EXISTING REGIONAL WATER SUPPLIES

Water used in Metropolitan's service area comes from both local and imported sources. Local sources include groundwater, surface water, and recycled water. Sources of imported water include the Colorado River, the State Water Project (SWP), and the Owens Valley/Mono Basin. On average over the last 10 years (from 2006 to 2015), local sources met about 45 percent of the water needs, while imported sources supplied the remaining 55 percent.

The City of Los Angeles imports water from the Owens Valley/Mono Basin east of the Sierra Nevada through the Los Angeles Aqueduct (LAA). This water currently meets about 4 percent of the region's water needs based on a ten-year average from 2006 to 2015, but is dedicated for use by the City of Los Angeles. Metropolitan provides imported water supplies to meet the remaining 51 percent of the region's water needs based on the same ten-year period. These imported supplies are received from Metropolitan's Colorado River Aqueduct (CRA) and the SWP's California Aqueduct. Table A.2-1 and Figure A.2-1 show the historical sources of local and imported supplies within Metropolitan's service area.

Table A.2-2 shows the quantities of Metropolitan water used by member agencies during the last ten years. Metropolitan's largest water customers are the San Diego County Water Authority (27 percent), City of Los Angeles (17 percent), and Municipal Water District of Orange County (13 percent).

The following sections describe the current supply sources in more detail. The main body of the Urban Water Management Plan contains descriptions of planned future supplies.

Local Water Supplies

Local sources of water available to the region include surface water, groundwater, and recycled water. Some of the major river systems in Southern California have been developed into systems of dams, flood control channels, and percolation ponds for supplying local water and recharging groundwater basins. For example, the San Gabriel and Santa Ana Rivers capture over 85 percent of the runoff in their watersheds. The Los Angeles River system, however, is not as efficient in capturing runoff. In its upper reaches, which make up 25 percent of the watershed, most runoff is captured with recharge facilities. In its lower reaches, which comprise the remaining 75 percent of the watershed, the river and its tributaries are lined with concrete, so there are no recharge facilities. The Santa Clara River in Ventura County is outside of Metropolitan's service area, but it replenishes groundwater basins used by water agencies within Metropolitan's service area. Other rivers in Metropolitan's service area, such as the Santa Margarita and San Luis Rey, are essentially natural replenishment systems.

Table A. 2-1
Sources of Water Supply to the Metropolitan Service Area

(Acre-Feet)[1]

Calendar Year	Local Supplies	L.A. Aqueduct	Colorado River Aqueduct[2]	State Water Project[3]	Total
1976	1,363,000	430,000	778,000	638,000	3,209,000
1977	1,370,000	275,000	1,277,000	209,000	3,131,000
1978	1,253,000	472,000	710,000	576,000	3,011,000
1979	1,419,000	493,000	784,000	532,000	3,227,000
1980	1,452,000	515,000	791,000	560,000	3,317,000
1981	1,500,000	465,000	791,000	827,000	3,583,000
1982	1,392,000	483,000	686,000	737,000	3,298,000
1983	1,385,000	519,000	850,000	410,000	3,163,000
1984	1,621,000	516,000	1,150,000	498,000	3,785,000
1985	1,535,000	496,000	1,018,000	728,000	3,776,000
1986	1,510,000	521,000	1,001,000	756,000	3,789,000
1987	1,465,000	428,000	1,175,000	763,000	3,831,000
1988	1,521,000	369,000	1,199,000	957,000	4,047,000
1989	1,542,000	288,000	1,189,000	1,215,000	4,234,000
1990	1,470,000	106,000	1,183,000	1,458,000	4,217,000
1991	1,426,000	186,000	1,252,000	625,000	3,490,000
1992	1,512,000	177,000	1,153,000	744,000	3,586,000
1993	1,408,000	289,000	1,144,000	663,000	3,505,000
1994	1,527,000	133,000	1,263,000	845,000	3,768,000
1995	1,590,000	464,000	933,000	451,000	3,438,000
1996	1,715,000	425,000	1,089,000	663,000	3,892,000
1997	1,759,000	436,000	1,125,000	724,000	4,044,000
1998	1,726,000	467,000	941,000	521,000	3,655,000
1999	1,887,000	309,000	1,072,000	792,000	4,060,000
2000	1,768,000	255,000	1,217,000	1,473,000	4,714,000
2001	1,708,000	267,000	1,245,000	1,119,000	4,340,000
2002	1,706,000	179,000	1,198,000	1,415,000	4,498,000
2003	1,659,000	252,000	676,000	1,561,000	4,148,000
2004	1,627,000	203,000	741,000	1,802,000	4,373,000
2005	1,590,000	369,000	707,000	1,525,000	4,190,000
2006	1,710,000	379,000	514,000	1,695,000	4,297,000
2007	1,852,000	129,000	696,000	1,648,000	4,326,000
2008	1,842,000	147,000	896,000	1,037,000	3,922,000
2009	1,857,000	137,000	1,044,000	908,000	3,946,000
2010	1,729,000	251,000	837,000	1,129,000	3,946,000
2011	1,664,000	370,000	445,000	1,379,000	3,859,000
2012	1,867,000	167,000	455,000	1,252,000	3,741,000
2013	1,866,000	65,000	984,000	974,000	3,889,000
2014	1,885,000	62,000	1,168,000	607,000	3,723,000
2015 [4]	1,676,000	27,000	1,180,000	550,000	3,442,000

1. Not including system losses.
2. Colorado River Aqueduct deliveries to service area: gross Havasu diversions less return flows, deliveries to USBR, Mexico, and storage.
3. State Water Project deliveries to service area: includes Table A, Art. 21, Art. 14(b), Art. 12(d), Art. 55, draws from storage & carryover, DWCV & other exchanges, transfers, Drought Water Bank and Dry Year Pool Purchases, Pools A&B, Flood Water, wheeling, Port Hueneme lease, SBVMWD Purchases.
4. Based on best available data and estimates as of October 2015.

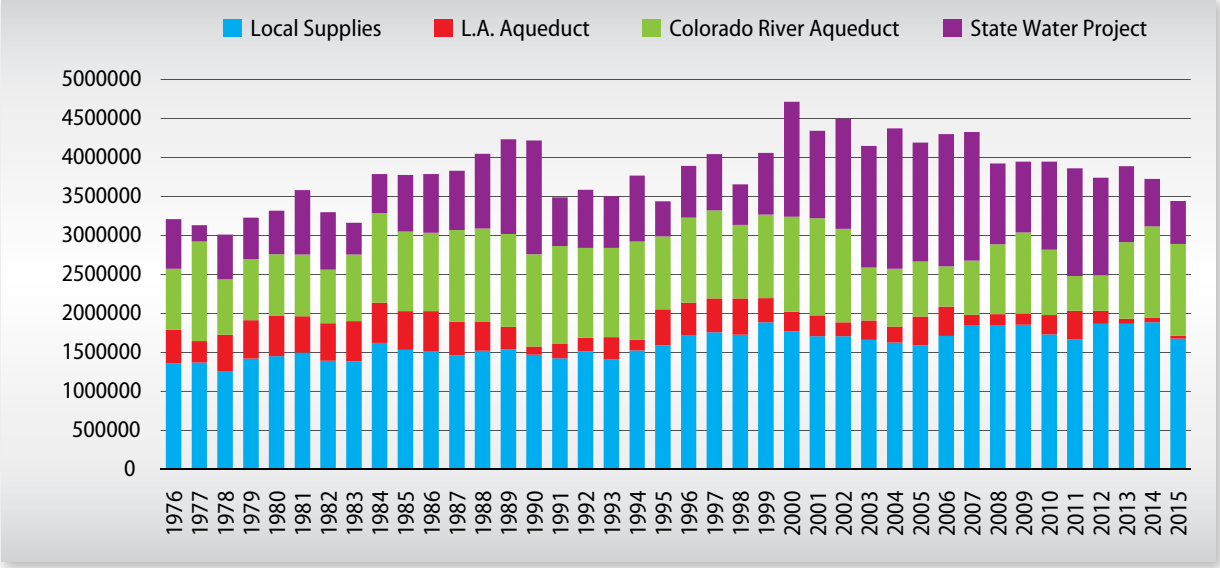
Table A.2-2 Historical Metropolitan Water Deliveries to Member Agencies

(Acre-feet)

Member Agency	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015[1]
City of Anaheim	33,000	25,000	21,000	16,000	21,000	22,000	29,000	20,000	20,000	18,000	13,000
City of Beverly Hills	12,000	12,000	12,000	12,000	11,000	10,000	10,000	11,000	11,000	12,000	10,000
City of Burbank	15,000	16,000	13,000	15,000	12,000	10,000	18,000	15,000	15,000	16,000	8,000
Calleguas Municipal Water District	120,000	126,000	131,000	121,000	101,000	87,000	97,000	106,000	112,000	110,000	85,000
Central Basin Municipal Water District	67,000	114,000	85,000	55,000	53,000	63,000	67,000	38,000	36,000	30,000	58,000
City of Compton	4,000	4,000	3,000	2,000	2,000	2,000	2,000	2,000	1,000	0	0
Eastern Municipal Water District	113,000	126,000	127,000	110,000	99,000	89,000	90,000	93,000	101,000	103,000	74,000
Foothill Municipal Water District	12,000	12,000	12,000	10,000	10,000	9,000	8,000	8,000	9,000	10,000	7,000
City of Fullerton	18,000	20,000	11,000	8,000	11,000	10,000	10,000	10,000	9,000	9,000	6,000
City of Glendale	22,000	22,000	23,000	21,000	19,000	16,000	18,000	18,000	19,000	19,000	14,000
Inland Empire Utilities Agency	93,000	112,000	75,000	58,000	36,000	45,000	76,000	57,000	64,000	68,000	38,000
Las Virgenes Municipal Water District	21,000	23,000	26,000	27,000	21,000	20,000	20,000	21,000	24,000	24,000	18,000
City of Long Beach	51,000	43,000	36,000	35,000	33,000	26,000	43,000	30,000	35,000	37,000	34,000
City of Los Angeles	184,000	185,000	441,000	430,000	352,000	206,000	120,000	328,000	439,000	384,000	389,000
Municipal Water District of Orange County	303,000	319,000	270,000	234,000	211,000	218,000	264,000	240,000	216,000	263,000	197,000
City of Pasadena	21,000	24,000	25,000	24,000	20,000	20,000	18,000	18,000	21,000	21,000	15,000
San Diego County Water Authority	547,000	598,000	698,000	566,000	540,000	447,000	408,000	455,000	492,000	518,000	466,000
City of San Fernando	1,000	0	1,000	0	0	0	0	0	0	0	0
City of San Marino	1,000	2,000	1,000	1,000	1,000	1,000	0	1,000	1,000	1,000	1,000
City of Santa Ana	22,000	22,000	12,000	8,000	7,000	10,000	16,000	12,000	15,000	11,000	6,000
City of Santa Monica	13,000	13,000	13,000	12,000	12,000	10,000	6,000	7,000	6,000	5,000	3,000
Three Valleys Municipal Water District	69,000	68,000	74,000	68,000	58,000	62,000	66,000	64,000	69,000	67,000	44,000
City of Torrance	21,000	21,000	20,000	19,000	18,000	17,000	17,000	17,000	17,000	17,000	14,000
Upper San Gabriel Valley Municipal Water District	45,000	48,000	23,000	13,000	6,000	46,000	35,000	16,000	30,000	27,000	47,000
West Basin Municipal Water District	145,000	144,000	142,000	130,000	120,000	120,000	112,000	117,000	121,000	118,000	107,000
Western Municipal Water District of Riverside County	91,000	103,000	120,000	99,000	86,000	76,000	75,000	82,000	74,000	76,000	55,000
Total of All Agencies	2,044,000	2,202,000	2,415,000	2,094,000	1,860,000	1,642,000	1,625,000	1,786,000	1,957,000	1,964,000	1,709,000

1. Based on best available data and estimates as of September 2015.

Figure A.2-1 Sources of Supply to Metropolitan's Service Area



Local supplies fluctuate in response to variations in rainfall. During prolonged periods of below-normal rainfall, local water supplies decrease. Conversely, prolonged periods of above-normal rainfall increase local supplies. Sources of groundwater basin replenishment include local precipitation, runoff from the coastal ranges, and artificial recharge with imported water supplies. In addition to runoff, recycled water provides an increasingly important source of replenishment water for the region.

Major Groundwater Basins

Groundwater sources account for about 90 percent of the local water supplies, which are found in many basins throughout the Southern California region and provide an annual average total production of about 1.35 MAF per year. Figure A.2-2 shows the location of the groundwater basins within Metropolitan's service area. Groundwater yield comes from natural recharge from the percolation of rainfall and stream runoff and active recharge from spreading and injection of captured stormwater, recycled water, and imported water. In certain major drainage areas, runoff is retained in flood control reservoirs and released into spreading basins for percolation into the ground. In Los Angeles County, many groundwater recharge facilities located along the upper reaches of the Los Angeles River and San Gabriel River systems provide recharge to San Fernando, Raymond, Main San Gabriel, Central, and West Coast groundwater basins. The Orange County Water District operates a system of diversion structures and recharge basins along the Santa Ana River that captures much of the storm runoff, as well as water from reclamation facilities in Riverside and San Bernardino counties. Storm runoff is also diverted to recharge basins in the Chino Basin. This water, which would otherwise flow into the Pacific Ocean, is allowed to percolate into the underlying aquifers so it may be pumped for local use when needed. Recycled water use for groundwater recharge has increased steadily. The Water Replenishment District of Southern California (WRD) has spread recycled water at the Montebello Forebay to recharge Central and West Coast basins for many years and is working to expand this practice. The Inland

Empire Utilities Agency (IEUA) provides recycled water for recharge of the Chino Basin. Orange County Water District has implemented the Groundwater Replenishment System (GWRS) to recharge over 100 TAF per year of highly-treated recycled water to the Orange County Basin. Highly treated recycled water is also used at seawater barriers in the West Coast, Central, and Orange County basins and has largely replaced use of imported water for this purpose.

Almost all major groundwater basins in Southern California are either adjudicated or managed by special districts or agencies. Over 90 percent of the groundwater used in Metropolitan's service area is produced from adjudicated or managed groundwater basins. Adjudicated basins in the region include: Raymond Basin, Upper Los Angeles River Area basins (which include San Fernando, Sylmar, Verdugo, and Eagle Rock Basins), Main San Gabriel Basin, Central Basin, West Coast Basin, Six Basins, Chino Basin, and Cucamonga Basin. The Orange County Groundwater Basin is managed by Orange County Water District; portions of the Ventura County Basins are managed by the Fox Canyon Groundwater Management Agency; and the West San Jacinto Basins and Hemet-San Jacinto Basins are managed by Eastern Municipal Water District. In general, these basins have management plans that include protection from seawater intrusion in the coastal region, water quality deterioration, and excessive lowering of water levels. Groundwater basin managers address treatment of contamination, manage recharge and storage programs, and monitor extraction, water levels, and water quality.

Major River Systems and Reservoirs

Local surface water resources consist of runoff captured in storage reservoirs and diversions from streams. Reservoirs hold the runoff for later direct use, and diversions from streams are delivered directly to local water systems. As Table A.2-3 shows, local water agencies currently own and operate 34 reservoirs. These reservoirs provide a storage capacity of approximately 897 TAF. The historic average yield of these local surface supplies, which come from reservoir releases and stream diversions, is about 90 TAF per year. The annual yield varies widely between wet and dry years, and most reservoirs that capture local surface runoff are operated with minimal carry-over storage. San Diego County has the greatest storage capacity for these types of reservoirs, with approximately 84 percent of the total local agency storage capacity in Metropolitan's service area.

In addition to the storage that is owned and operated by local agencies, Metropolitan operates DVL, Lake Skinner, and Lake Mathews. DVL stores water imported during years of ample supply. Of DVL's 810 TAF capacity, up to half is dedicated to emergency storage; the remainder is available to augment supplies during dry years and for seasonal storage. In contrast, Lake Skinner and Lake Mathews are largely used for system operations rather than dry year storage. Table A.2-4 lists Metropolitan-owned reservoirs with significant storage capacity.

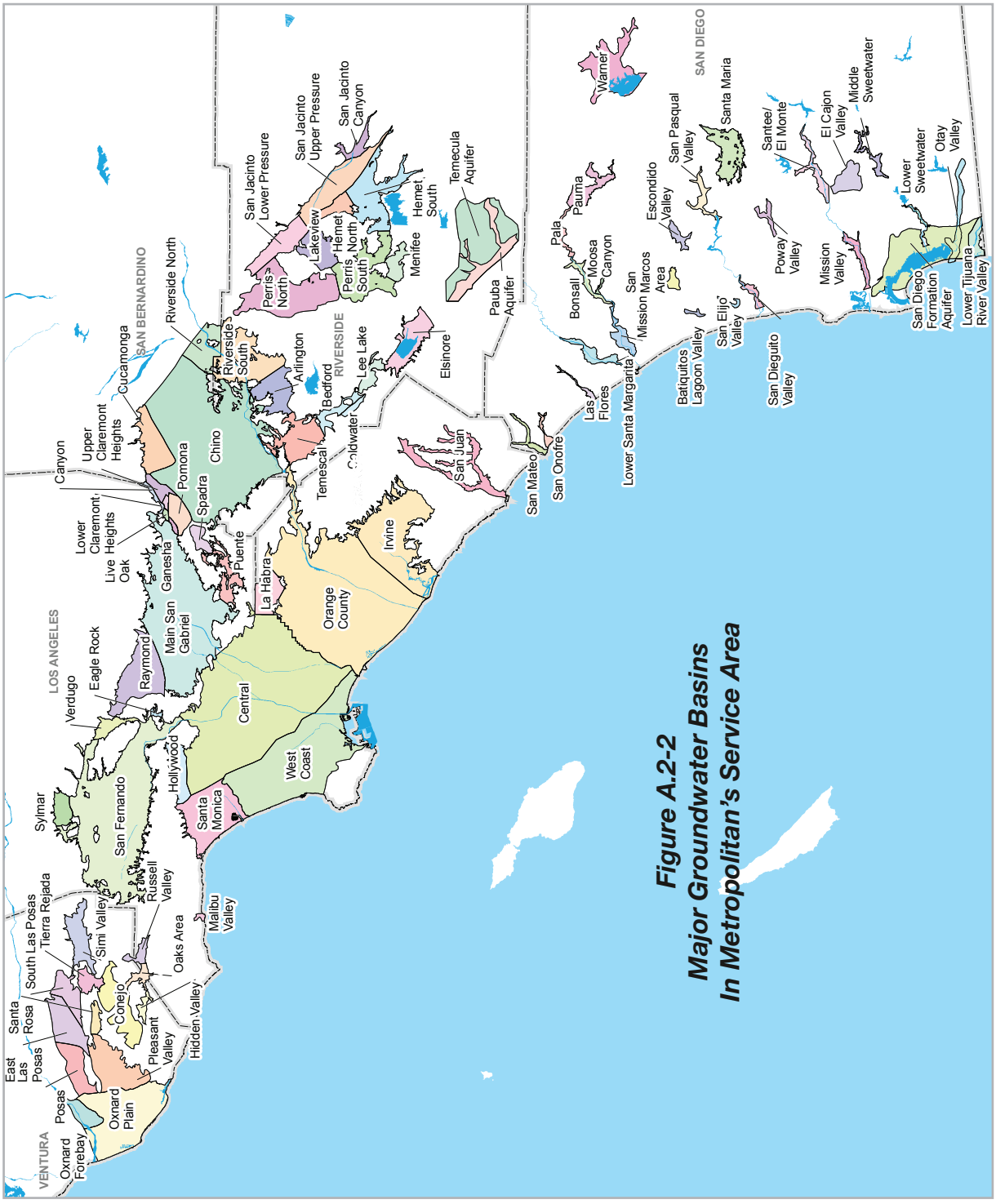


Figure A.2-2
Major Groundwater Basins
In Metropolitan's Service Area
VENTURA
LOS ANGELES
SAN BERNARDINO
RIVERSIDE
SAN DIEGO
Oxnard Forebay
Oxnard Plain
Pleasant Valley
East Las Posas
Santa Rosa
South Las Posas
Tierra Rejada
Simi Valley
Conejo
Russell Valley
Oaks Area
Hidden Valley
Malibu Valley
Santa Monica
Hollywood
West Coast
Central
San Fernando
Sylmar
Verdugo
Eagle Rock
Raymond
Main San Gabriel
Ganesha
Live Oak
Lower Claremont Heights
Upper Claremont Heights
Canyon
Cucamonga
Riverside North
Riverside South
Arlington
Bedford
Lee Lake
Elsinore
Temescal
Coldwater
Chino
Pomona
Spadra
Puente
La Habra
Orange County
Irvine
San Juan
San Mateo
San Onofre
Las Flores
Lower Santa Margarita
Batiquitos Lagoon
San Elijo Valley
San Dieguito Valley
San Mission Marcos Area
Bonsall
Moosa Canyon
Pala
Pauma
Pauba Aquifer
Temecula Aquifer
Hemet South
Menifee
Perris North
Perris South
Lakeview
San Jacinto Lower Pressure
San Jacinto Upper Pressure
San Jacinto Canyon
Warner
Escondido Valley
San Pasqual Valley
Santa Maria
Poway Valley
Santee/ El Monte
El Cajon Valley
Mission Valley
Middle Sweetwater
Lower Sweetwater
Otay Valley
San Diego Formation Aquifer
Lower Tijuana River Valley

Table A.2-3
Local Storage Reservoirs in Metropolitan's Service Area
(Thousands Acre-feet)

Member Agency/Sub-agency	Reservoir	Storage Capacity
Eastern MWD		
Rancho California WD	Vail Lake	51.0
Lake Hemet MWD	Lake Hemet	14.0
Las Virgenes MWD	Westlake Reservoir	10.0
City of Los Angeles	Los Angeles	10.2
	Encino	9.8
	Stone Canyon	10.8
	Hollywood	4.2
MWD of Orange County		
Irvine Ranch WD & Serrano ID	Santiago	25.0
San Diego County Water Authority		
Carlsbad MWD	Maerkle	0.6
Escondido, City of	Dixon	2.6
	Wohlford	6.5
Fallbrook PUD	Red Mountain	1.3
Helix WD	Cuyamaca	8.2
	Jennings	9.8
Poway, City of	Poway	3.3
Rainbow MWD	Beck	0.6
	Morro Hill	0.5
Ramona MWD	Ramona	12.0
San Diego County Water Authority	Olivenhain – CWA	24.8
San Diego, City of	Barrett	37.9
	El Capitan	112.8
	Hodges	30.3
	Lower Otay	49.5
	Miramar	7.2
	Morena	50.2
	Murray	4.8
	San Vicente	249.4
	Sutherland	29.7
San Dieguito WD	San Dieguito	0.9
Sweetwater Authority	Loveland	25.4
	Sweetwater	28.1
Valley Center MWD	Turner	1.6
Vista Irrigation District	Henshaw	51.8
Western MWD of Riverside		
Temescal Water Company	Railroad Canyon	12.0
Total		**896.8**

Table A.2-4
Regional Storage Reservoirs in Metropolitan's Service Area
(Thousands Acre-feet)

Reservoir	Capacity
Diamond Valley Lake	810
Lake Skinner[1]	44
Lake Mathews[1]	182

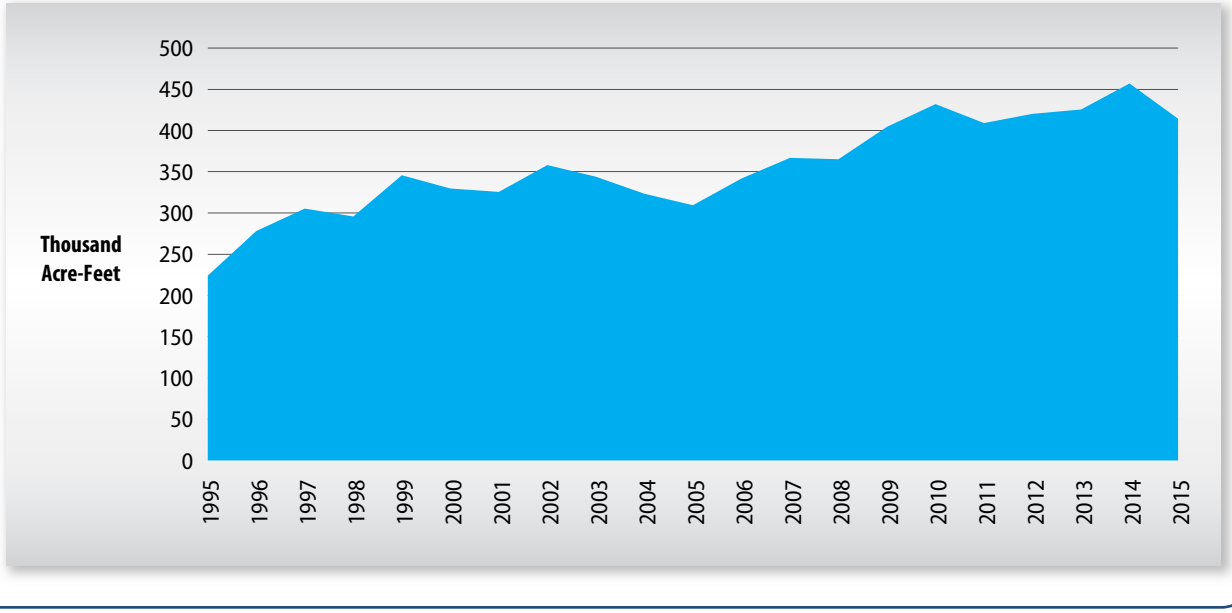
[1] These are used for operations and not primarily for dry year storage.

Lastly, Castaic and Perris are the terminal reservoirs to the West Branch and East Branch of the California Aqueduct operated by DWR. Through the Monterey Amendment to its SWP water service contract, Metropolitan has access to 219 TAF of flexible storage capacity in these SWP terminal reservoirs.

Water Recycling and Groundwater Recovery

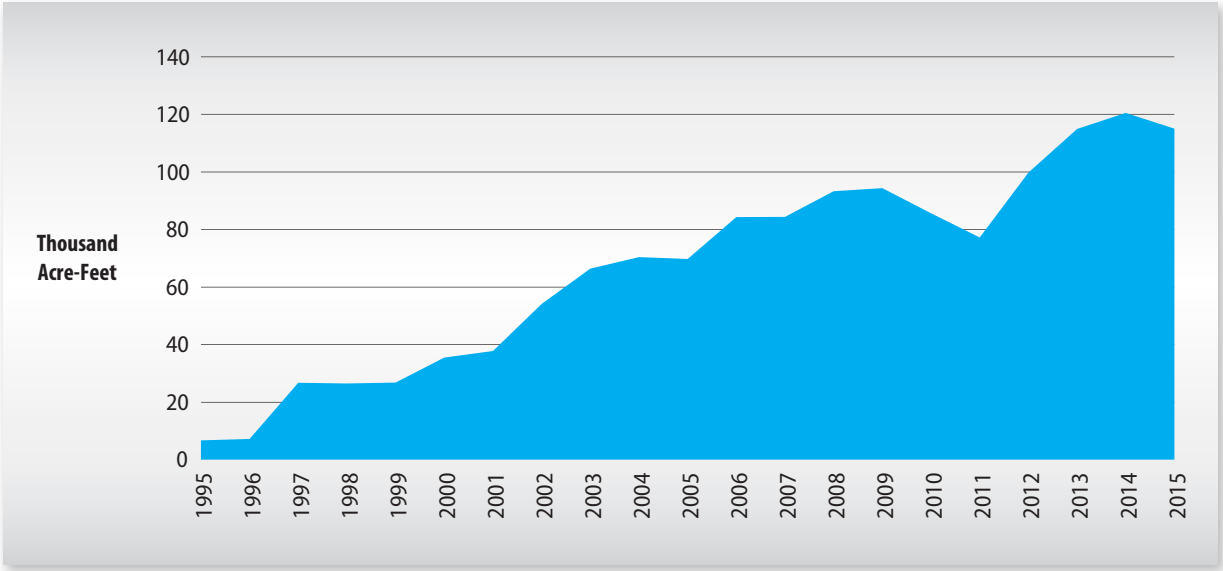
Water recycling projects involve treating wastewater to a level that is acceptable and safe for many non-potable applications. This resource is providing an increasing level of local water. In 1982, Metropolitan began helping to fund its member agencies' recycled water projects. Since that time, Metropolitan has invested approximately $372 million. In fiscal year 2014-15, water recycling projects in which Metropolitan has invested produced over 184 TAF. Local agency projects that did not receive financial assistance from Metropolitan produced an additional 170 TAF, and approximately 60 TAF of Santa Ana River base flow were used to recharge the Orange County basin. This brings the regional total to 414 TAF of recycled water use. Figure A.2-3 demonstrates the increase in this regional supply for direct use.

Figure A.2-3 Recycled Water



In addition, local agencies have implemented several projects to recover contaminated or degraded groundwater for potable uses. The groundwater recovery projects use a variety of treatment technologies to remove nitrates, volatile organic compounds, perchlorate, color, and salt. In 1991, Metropolitan began helping fund its member agencies' groundwater recovery projects. Since that time, Metropolitan has invested approximately $132 million. In FY 2014-15, these groundwater recovery projects produced 60 TAF. Other member agency projects that did not receive funding from Metropolitan produced another 55 TAF, for a regional total of 115 TAF. Figure A.2-4 shows this increase in supply.

Figure A.2-4 Groundwater Recovery



Imported Water

Most member agencies and retail water suppliers depend on imported water for a portion of their water supply. For example, Los Angeles and San Diego (the largest and second largest cities in the state) have historically obtained up to 85 percent of their water from imported sources. These imported water requirements are similar to those of other metropolitan areas within the state, such as San Francisco and other cities around the San Francisco Bay.

Figure A.2-5 shows the conveyance facilities for the state's imported water supplies. Descriptions of each of the imported sources of water available to Metropolitan's service area follow. Justification for projected water supplies from these sources is provided in Appendix 3.

Colorado River

A number of water agencies within California have rights to divert water from the Colorado River. Through the Seven Party Agreement (1931), seven agencies recommended apportionments of California's share of Colorado River water within the state. Table A.2-5 shows the historic apportionment of each agency, and the priority accorded that apportionment.

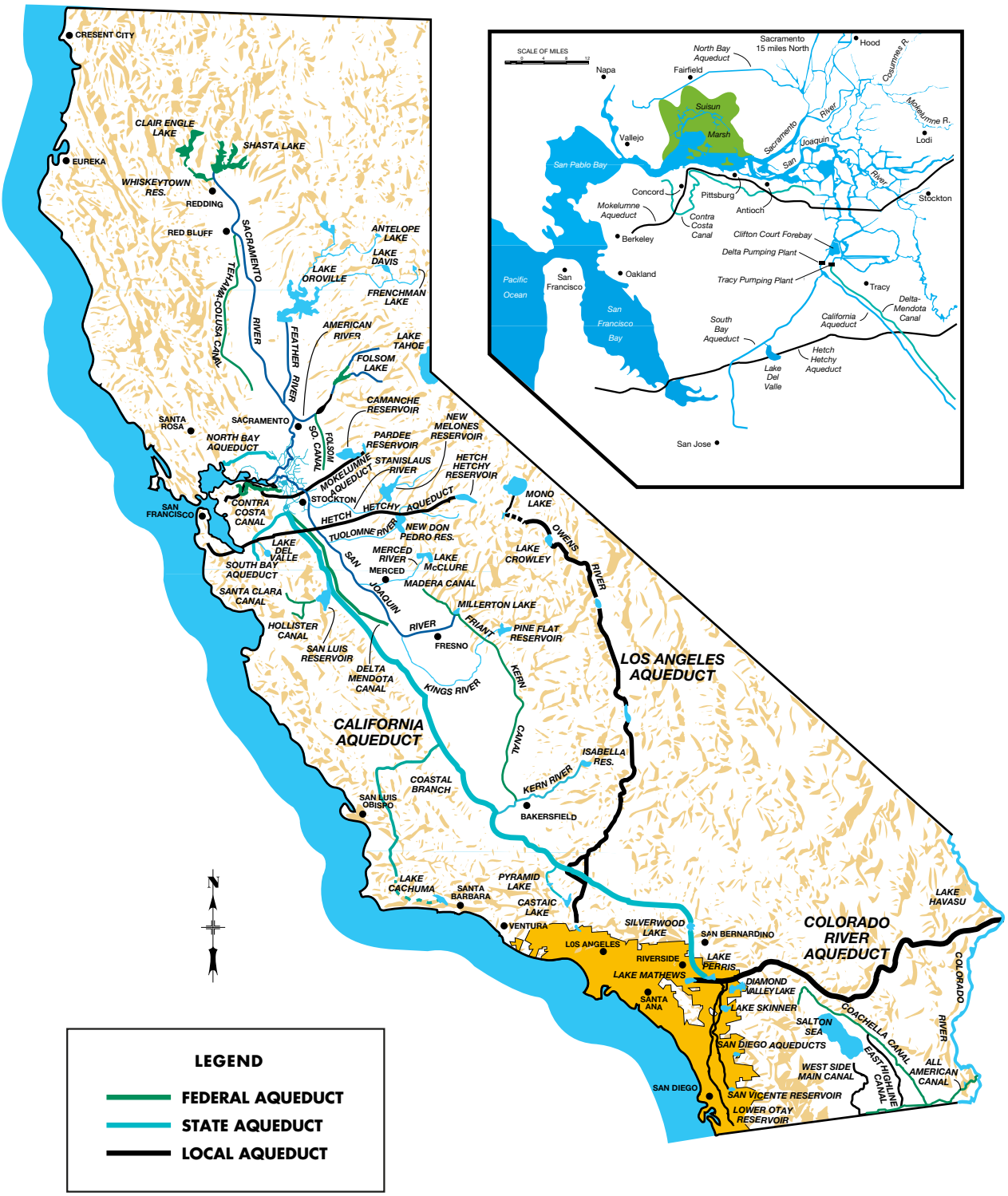
Table A.2-5
Priorities in Seven-Party Agreement and Water Delivery Contracts

Priority	Description	TAF Annually
1	Palo Verde Irrigation District – gross area of 104,500 acres of land in the Palo Verde Valley	
2	Yuma Project (Reservation Division) – not exceeding a gross area of 25,000 acres in California	
3(a)	Imperial Irrigation District and land in Imperial and Coachella Valleys[1] to be served by All American Canal	3,850
3(b)	Palo Verde Irrigation District—16,000 acres of land on the Lower Palo Verde Mesa	
4	Metropolitan Water District of Southern California for use on the coastal plain of Southern California	550
Subtotal		4,400
5(a)	Metropolitan Water District of Southern California for use on the coastal plain of Southern California	550
5(b)	Metropolitan Water District of Southern California for use on the coastal plain of Southern California[2]	112
6(a)	Imperial Irrigation District and land in Imperial and Coachella Valleys[1] to be served by the All American Canal	
6(b)	Palo Verde Irrigation District—16,000 acres of land on the Lower Palo Verde Mesa	300
7	Agricultural Use in the Colorado River Basin in California	
	Total Prioritized Apportionment	**5,362**

[1] The Coachella Valley Water District now serves Coachella Valley.

[2] In 1946, the City of San Diego, the San Diego County Water Authority, Metropolitan, and the Secretary of the Interior entered into a contract that merged and added the City of San Diego's rights to store and deliver Colorado River water to the rights of Metropolitan. The conditions of that agreement have long since been satisfied.

Figure A.2-5
MAJOR WATER CONVEYANCE FACILITIES IN CALIFORNIA



The water is delivered to Metropolitan's service area by way of the Colorado River Aqueduct (CRA), which has a capacity of nearly 1,800 cfs. The CRA conveys water 242 miles from its Lake Havasu intake to its terminal reservoir, Lake Mathews, near the City of Riverside. Conveyance losses along the CRA of 10 TAF per year reduce the amount of Colorado River water received in the coastal plain.

Since the date of the original contract, several events have occurred that changed the dependable supply that Metropolitan expects from the CRA. The most significant event was the 1964 U.S. Supreme Court decree in *Arizona v. California* that reduced Metropolitan's dependable supply of Colorado River water to 550 TAF per year. The reduction in dependable supply occurred with the commencement of Colorado River water deliveries to the Central Arizona Project. In 1987, Metropolitan entered into a contract with the U.S. Bureau of Reclamation (USBR) for an additional 180 TAF per year of surplus water when surplus water is available. In addition, Metropolitan has obtained a minimum of approximately 85 TAF per year of Colorado River water since 1996 through a conservation program with the Imperial Irrigation District.

In 1979, the Present Perfected Rights (PPRs) of certain Indian reservations, cities, and individuals along the Colorado River were quantified. These PPRs predate the Seven-Party Agreement, but the rights holders were not included in the Seven Party Agreement prioritizing California's use and storage of Colorado River water.

In 1999, under the auspices of the Colorado River Board of California, a draft plan, "California's Colorado River Water Use Plan", was developed. The Colorado River Board of California protects California's rights and interests in the resources provided by the Colorado River and represents California in discussions and negotiations regarding the Colorado River and its management. The overall purpose of California's Colorado River Water Use Plan is to provide Colorado River water users with a framework by which programs, projects, and other activities may be coordinated and cooperatively implemented. This framework specified how California would make the transition from relying on surplus water supplies from the Colorado River to living within its normal (basic) water supply apportionment.

To implement these plans, a number of agreements have been executed. In October 2003, representatives from Metropolitan, IID, and Coachella Valley Water District (CVWD) executed the Quantification Settlement Agreement (QSA) and several other related agreements. Parties involved include the San Diego County Water Authority (SDCWA), the California Department of Water Resources (DWR), the California Department of Fish and Wildlife, the U.S. Department of the Interior, and the San Luis Rey Indian Water Rights Settlement Parties. The QSA quantifies the use of water under the third priority of the Seven Party Agreement and allows for implementation of agricultural conservation, land management, and other programs identified in Metropolitan's 1996 IRP. Quantification of the third priority provides the needed numeric baseline from which conservation and transfer programs may be measured. The QSA has helped California reduce its reliance on Colorado River water above its normal apportionment.

The quantification of the agricultural priorities under the QSA provided for the water saved under the Palo Verde Land Management and Crop Rotation Program to be made available to Metropolitan. This program provides up to 133 TAF of water to be available to Metropolitan in certain years and will supply a minimum of 33 TAF per year.

In October 2004, SNWA and Metropolitan entered into a storage and interstate release agreement. Under this program, SNWA can request that Metropolitan store unused Nevada apportionment. The amount of water which Metropolitan diverted through 2014 under this agreement was over 272 TAF. In subsequent years, SNWA may request return of approximately

205 TAF stored before 2015 and 125 TAF of the water stored in 2015. It is expected that SNWA will not request return of water stored prior to 2015 until after 2019. Water stored in 2015 allowed Metropolitan to augment its water supply from the Colorado River in 2015.

In December 2007, the Secretary of the Interior approved the adoption of specific interim guidelines for reductions in Colorado River water deliveries during declared shortages and coordinated operations of Lake Powell and Lake Mead. These guidelines provide water release criteria from Lake Powell and water storage and water release criteria from Lake Mead during shortage, normal, and surplus conditions in the Lower Basin; provide a mechanism for the storage and delivery of conserved system and non-system water in Lake Mead; and modify and extend interim surplus guidelines through 2026. The Record of Decision and accompanying agreement among the Colorado River Basin States protect reservoir levels by reducing deliveries during drought periods, encourage agencies to develop conservation programs, and allow the states to develop and store new water supplies. The Colorado River Basin Project Act of 1968 insulates California from shortages in all but the most extreme hydrologic conditions.

In May 2006, Metropolitan and the USBR executed an agreement for a demonstration program that allowed Metropolitan to leave conserved water in Lake Mead that Metropolitan would otherwise have used in 2006 and 2007. The water left in Lake Mead must have been made available through extraordinary conservation measures, which was accomplished in 2006 and 2007 through savings realized under the Palo Verde Land Management, Crop Rotation, and Water Supply Program. This demonstration program was an activity eligible for creation of Extraordinary Conservation Intentionally Created Surplus (ICS) under the provisions of the December 2007 federal guidelines for the operation of Lake Powell and Lake Mead. Metropolitan continued to store water in Lake Mead through extraordinary conservation measures as provided in the December 2007 federal guidelines in 2009, 2010, 2011, and 2012. Metropolitan took delivery of a portion of its extraordinary conservation ICS in 2013 and 2014. As of January 1, 2015, Metropolitan had approximately 61.8 TAF of extraordinary conservation ICS water in Lake Mead.

The December 2007 federal guidelines provided Colorado River contractors the ability to create System Efficiency ICS through development and funding of system efficiency projects. To that end, in 2008 the Central Arizona Water Conservation District, SNWA, and Metropolitan contributed funds for the construction of the Drop 2 (Brock) Reservoir by the USBR. The purpose of the Drop 2 reservoir is to increase the capacity to regulate deliveries of Colorado River water at Imperial Dam, reducing the amount of water released downstream by approximately 70 TAF annually. In return for funding one-sixth of the project cost, 100 TAF of water stored in Lake Mead was assigned to Metropolitan as System Efficiency ICS in 2008. Including the Drop 2 reservoir, Metropolitan created System Efficiency ICS storage of over 124 TAF from 2008-2011. Of this total, approximately 24 TAF of System Efficiency ICS was achieved through financially contributing to a one-year pilot operation of the Yuma Desalting Plant. As of January 1, 2015, Metropolitan had approximately 89 TAF of System Efficiency ICS water in Lake Mead.

Metropolitan is undertaking ongoing efforts to maintain and improve the flexibility and quality of its water supply from the Colorado River. Section 3.1 of this report describes current programs and plans related to flexibility, and Chapter 4 describes water quality programs.

State Water Project

The State Water Project, which is owned by the state and operated by DWR, is the second source of Metropolitan's imported water supplies. The SWP comprises 32 storage facilities (reservoirs and lakes), 662 miles of aqueduct, and 25 power and pumping plants.

The SWP conveys water from Northern California to the north and south of the San Francisco Bay Area and areas south of the Bay Delta region. Water from the SWP originates at Lake Oroville, which is located on the Feather River in Northern California. That water, along with all additional unused water from the watershed, flows into the Sacramento/San Joaquin Delta. Water from the Delta is then either pumped to water users in the San Francisco Bay area or transported through the California Aqueduct to water users in Central and Southern California.

DWR contracted to deliver water in stages to 32 SWP contractors, with an ultimate delivery of 4,172 TAF per year. Currently, DWR is delivering water to 29 of these SWP contractors. Metropolitan is the largest, with a contractual amount of 1,911 TAF per year, or approximately 46 percent of the total contracted amount. Metropolitan receives deliveries of SWP supplies via the California Aqueduct at Castaic Lake in Los Angeles County, Devil Canyon Afterbay in San Bernardino County, and Box Springs Turnout and Lake Perris in Riverside County. The first delivery of SWP water to Metropolitan occurred in 1972.

The initial facilities of the SWP, completed in the early 1970s, were designed to meet the original needs of the SWP contractors. It was intended that additional SWP facilities would be built over time to meet projected increases in contractors' delivery needs. Each contractor's SWP contract provided for a buildup in contractual amount over time, with most contractors reaching their maximum annual contractual amount by the year 1990. Since the completion of the initial SWP facilities in the early 1970s, major improvements to the system have included: four new pumps added to the Banks Pumping Plant at the Delta, the completion of the Coastal Branch, and the East Branch enlargement. Even with these improvements, however, there are still significant capacity constraints within the SWP that limit the delivery capability of the full contracted amount. During the same time, the contractors' needs for water from the SWP have increased. As a result, the contractors' demands for SWP water currently exceed the dependable yield.[1] Metropolitan has developed groundwater storage programs with Semitropic Water Storage District, Arvin-Edison Water Storage District, and Kern Delta Water District to supplement the available water supply.

The amount of contractual supplies DWR approves for delivery varies annually with contractor demands and projected water supplies from tributary sources to the Delta, based on snowpack in the Sierra Nevada, reservoir storage, operational constraints, and demands of other water users. Deliveries to Metropolitan reached a high of 1,802 TAF in calendar year 2004. Metropolitan experienced shortages in SWP supplies in fiscal years 1991 and 1992, with reduced deliveries of 391 TAF and 710 TAF, respectively.[2] SWP deliveries were limited during the recent drought – a record low 5 percent of contractual amount in 2014 and 20 percent of contractual amount in 2015.

In recent years, the listing of several fish species in the Sacramento/San Joaquin River Delta (Delta) under both state and federal Endangered Species Acts has constrained SWP operations and created more uncertainty in SWP supply reliability. These listed species include Delta smelt, winter-run Chinook salmon, spring-run Chinook salmon, and splittail. In July 2015, DWR released the SWP Delivery Capability Report. The report shows that future SWP deliveries will be impacted by two significant factors. The first is significant restrictions on SWP and Central Valley Project (CVP) Delta pumping required by the biological opinions issued by the U.S. Fish and

[1] The dependable yield of the existing SWP facilities is considered to be the delivery capability during a critically dry seven-year period.

[2] These numbers are Metropolitan's allocated contractual amount. Total water deliveries to Metropolitan's service area are shown in Table A.2-1.

Wildlife Service (December 2008) and National Marine Fisheries Service (June 2009). The second is climate change, which is altering the hydrologic conditions in the State.

Metropolitan is undertaking ongoing efforts to maintain and improve the reliability and quality of its water supply from the State Water Project. Sections 3.2 and 3.3 in the 2015 UWMP describe current programs and plans for reliability, and Chapter 4 addresses water quality issues.

Los Angeles Aqueduct

The City of Los Angeles imports water from the eastern Sierra Nevada through the Los Angeles Aqueduct (LAA). The original LAA, completed in 1913, imported water from the Owens Valley. In 1940, the aqueduct was extended to the Mono Basin. A second aqueduct, which parallels the original, was completed in 1970.

Prior to the 1990-1991 drought, the City of Los Angeles had imported an average of 440 TAF of water annually from the combined Owens Valley/Mono Basin system, of which about 90 TAF came from the Mono Basin. In 1986, the aqueduct delivered a record 520 TAF of water.

In the late 1980s, a series of court injunctions limited the amount of water that Los Angeles could receive from its aqueduct system. In 1990, these limitations, along with a persistent drought, limited the delivery from the aqueduct to only 106 TAF. The Mono Lake Water Rights Decision (Decision) in September of 1994 ended the litigation in the Mono Basin, while negotiations continued with Inyo County on the fate of the Owens Valley water supply. In the Decision, the state ruled that Mono Lake should rise 17 feet over the next 25 years. During this time, Los Angeles would only be permitted to divert a fraction of its historical amounts. After the lake had risen, the City of Los Angeles would still be allowed only significantly reduced diversions. However, the high precipitation during the 1990s allowed increased diversions of water to the LAA to occur at a much earlier time frame than had been foreseen at the time of the Decision.

More recently, the LAA diversions of water from the Owens Valley came under additional pressure. A long history of diversions of water from the Owens River had led to the drying up of Owens Lake by the end of the 1920s. This dry lakebed became a major source of windblown dust, resulting in EPA pressure to develop a State Implementation Plan to bring the region into compliance with federal air quality standards. In 1998, the Los Angeles Department of Water and Power entered into a Memorandum of Agreement with the Great Basin Air Pollution Control District that specified actions needed to control the problem. These actions included shallow flooding and managed vegetation at various lakebed locations. An estimated 54 TAF per year will be required to maintain the dust control measures, further restricting the water available for diversion through the LAA. More recently, the city has been required to restore portions of the Owens River, which could further restrict the water that can be provided from this source. During the last 5 years (2011 to 2015), LAA supplies ranged from 370 TAF in the wet 2011 year to a low of 27 TAF in 2015.

Historic Total Regional Water Supplies

The previous sections have presented the various sources of Metropolitan and the region's water supply. The amount of water supplied by each local and imported source from 1976 through 2015 appears in Table A.2-1. The imported supplies represent the amount of water imported into Metropolitan's service area, not the amount delivered to member agencies, which is shown in Table A.2-2. The difference between Metropolitan's imports and deliveries is water placed into or withdrawn from storage.

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Appendix 3

JUSTIFICATIONS FOR SUPPLY PROJECTIONS

Appendix 3
JUSTIFICATIONS FOR SUPPLY PROJECTIONS

Water Code §10631 requires that urban agencies identify and quantify existing and planned sources of water and include a detailed description of all water supply projects and water supply programs that may be undertaken to meet the total projected water use. In addition, legislation authored by Senator Sheila Kuehl (Senate Bill 221 – now Water Code §10613, *et seq.*) and Senator Jim Costa (Senate Bill 610 – now Water Code §66473.7) requires water retailers to demonstrate that their water supplies are sufficient for certain proposed subdivisions and large development projects subject to the California Environmental Quality Act (CEQA). Although Metropolitan and other wholesalers do not have verification responsibilities under this legislation, information provided by Metropolitan may be useful to retailers in complying with these responsibilities. This Appendix provides the basis for the water availability contained in this report, by major source of supply. Such bases and proofs are required for supply verification under the legislation. Links to the copy of the guidebook for implementation of the legislation can be found at http://www.water.ca.gov/pubs/use/sb_610_sb_221_guidebook/guidebook.pdf.

Throughout this Appendix, references are made to Metropolitan's operating budget and its long-term capital investment plan. The most recent operating budget (for fiscal years 2014-15 and 2015-16) was adopted at the April 8, 2014 Board Meeting. A copy of the budget summary and the Capital Investment Plan for fiscal years 2014-15 and 2015-16 can be found at http://www.mwdh2o.com/PDF_Who_We_Are/1.4.7_Biennial_budget.pdf.

Another document of interest related to Metropolitan's water supply planning is its annual report to the state Legislature in compliance with Senate Bill 60 of 1999 (Hayden).[3] Senate Bill 60 requires that Metropolitan report on its progress in increasing its emphasis on cost-effective conservation, recycling, and groundwater recharge.

A.3.1 Colorado River Aqueduct Deliveries

A. Colorado River Supplies

Metropolitan obtains water from the Colorado River under a number of categories specified in its supplemental water storage and delivery contract with the Secretary of the Interior: its basic apportionment that is classified as Priority 4 water, unused and surplus water that is classified as Priority 5 and Priority 6(a) water, and water resulting from a number of conservation programs that is classified as Priority 3(a) water. Pursuant to a U.S. Supreme Court decree, and regulations and operating guidelines of the USBR, Metropolitan may receive as unused apportionment, water supplies unused by agricultural districts, supplies unused by the states of Arizona and Nevada, and as Intentionally Created Surplus, supplies stored from previous years'

[3] Metropolitan Water District of Southern California, *Annual Progress Report to the California State Legislature: Achievements in Conservation, Recycling and Groundwater Recharge* (February 2016), which can be found at http://www.mwdh2o.com/PDF_About_Your_Water/2.1.1_Regional_Progress_ReportSB60.pdf. The legislation requiring this information can be found at http://www.leginfo.ca.gov/pub/99-00/bill/sen/sb_0051-0100/sb_60_bill_19990916_chaptered.pdf. Similar reports have been filed with the Legislature since 2000.

extraordinary conservation and efficiency improvements to the operations of the Colorado River system. Subject to the terms of agreements, this stored water may be withdrawn as needed during years in which insufficient supplies are available. Appendix 2 describes the history of water supplies and the expected availability from this source, and Section 3.1 of the 2015 UWMP describes the agreements for water supplies.

Rationale for Expected Supply

Historical Record

Water supply under Metropolitan's Priority 4 apportionment of Colorado River water has been delivered since 1939. By existing contract, it is expected to be available in perpetuity because of California's senior water rights to use of Colorado River water.

The historical record for available Colorado River water indicates that Metropolitan's fourth priority supply has been available in every year and can reasonably be expected to be available over the next 20 years.

Written Contracts or Other Proof

Metropolitan's entitlement to Colorado River water is based on a series of interstate compacts, federal laws, agreements, court decrees, and guidelines collectively known as "The Law of the River,"[4] which govern the distribution and management of Colorado River water. The following documents specifically determine Metropolitan's dependable supplies:

1931 Seven Party Agreement.[5] The 1931 Agreement recommended California's Colorado River use priorities and has no termination date. California's basic annual apportionment is 4.4 MAF. Palo Verde Irrigation District (PVID), Yuma Project (Reservation Division), Imperial Irrigation District (IID), Coachella Valley Water District (CVWD), and Metropolitan are the entities that hold the priorities. As shown in Table A.2-5, these priorities are included in the contracts that the Department of the Interior executed with the California agencies in the 1930s for water from Lake Mead. Metropolitan holds Priority 4 to California's basic apportionment of Colorado River water and utilizes this water – 550 TAF per year – every year. In addition, Metropolitan has access to additional Colorado River water – up to 662 and 38 TAF per year, respectively – through its Priority 5 and Priority 6(a) in the California apportionment. Appendix 2 describes the current status of water available under these priorities.

Metropolitan's Basic Contracts.[6] Metropolitan's 1930, 1931, and 1946 basic contracts with the Secretary of the Interior permit the delivery of 1.212 MAF per year when sufficient water is available. Metropolitan's 1987 surplus flow contract with USBR permits the delivery of water to fill the remainder of the Colorado River Aqueduct when water is available.

Consolidated Court Decree.[7] The 1964 U.S. Supreme Court Decree confirmed the Arizona, California, and Nevada basic apportionments of 2.8 MAF per year, 4.4 MAF per year, and 300 TAF per year, respectively. The 1964 Decree also permits the Secretary of the Interior to make water available that is unused by one of the states for use in the other two states. In addition, it permits the Secretary of the Interior to make surplus water available. A number of

[4] A description of many of these documents can be found at http://www.usbr.gov/lc/region/pao/lawofrvr.html.

[5] This agreement among the seven California agencies was dated August 18, 1931, and was codified in federal regulations promulgated by the Secretary of the Interior on September 28, 1931.

[6] Including contract number Ilr-645 dated April 9, 1930, supplemented September 28, 1931.

[7] The Consolidated Decree entered by the U.S. Supreme Court on March 27, 2006, in *Arizona v. California, et al.*, can be found at http://www.usbr.gov/lc/region/pao/pdfiles/scconsolidateddecree2006.pdf.

decrees were subsequently entered by the U.S. Supreme Court in the case *Arizona v. California, et al.*, culminating in the Consolidated Decree entered on March 27, 2006.

2003 Quantification Settlement Agreement (QSA) and several other related agreements were executed in October 2003.[8] The QSA quantifies the use of water under the third priority of the Seven Party Agreement, and further allocates 38 TAF of the sixth priority to Metropolitan. The QSA provides the numeric baseline needed to measure conservation and transfer programs, and it allows for implementation of agricultural conservation, land fallowing, and other programs identified in the 1996 IRP. Although this agreement does not directly impact Metropolitan's entitlements, Metropolitan agreed to forbear consumptive use when necessary so that the Secretary of the Interior can satisfy the uses of holders of miscellaneous and Indian present perfected rights in excess of 14.5 TAF.

2005 Settlement Agreement with Quechan Indian Tribe. In 2005, Metropolitan entered into a settlement agreement with the Quechan Indian Tribe and other parties. The Tribe uses Colorado River water on the Fort Yuma Indian Reservation. Under the settlement agreement, the Tribe, in addition to the amounts of water decreed for the benefit of the Reservation in 1964, is entitled to: (a) an additional 20 TAF of diversions from the Colorado River or (b) the amount necessary to supply the consumptive use required for irrigation of a specified number of acres, and for the satisfaction of related uses, whichever is less. Of the additional water, 13 TAF became available to the Quechan Indian in 2006. An additional 7 TAF becomes available to the Tribe in 2035. Metropolitan and the Tribe agreed that if the Tribe chooses to limit proposed development and utilization of their irrigable lands, which would require the diversion of any of the additional water in a year, and instead allows the water which would otherwise be used to be diverted by Metropolitan, Metropolitan provides an incentive payment to the Tribe to avoid or reduce a loss of supply.

Colorado River Interim Guidelines for Lower Basin Shortage and the Coordinated Operations for Lake Powell and Lake Mead. In December 2007, the Secretary of the Interior approved a Record of Decision establishing specific interim guidelines for reductions in Colorado River water deliveries in the Lower Basin during declared shortages and coordinated operations of Lake Powell and Lake Mead. These guidelines provide water release criteria from Lake Powell and water storage and water release criteria from Lake Mead during shortage, normal, and surplus conditions in the Lower Basin, and provide a mechanism for Metropolitan to store and take delivery of conserved system and non-system water in Lake Mead.

Financing

Metropolitan's operating budget (referenced at the beginning of this appendix) includes the cost of delivering Colorado River water and the payment to the Quechan Indian Tribe, which is paid from water sales revenue.

Federal, State, and Local Permits/Approvals

Metropolitan's fourth priority Colorado River water is currently available, and this priority assures delivery of the basic apportionment.

B. IID - Metropolitan Conservation Program

Source of Supply

The IID-Metropolitan Conservation Program provides an annual supply that is delivered to Metropolitan's service area via its Colorado River Aqueduct (CRA). In 1988, Metropolitan

[8] These agreements can be found at http://www.iid.com/water/library/qsa-water-transfer.

executed a Conservation Agreement to fund water efficiency improvements within IID's service area in return for the right to divert the water conserved by those improvements. The program consists of structural and non-structural measures, including the concrete lining of existing canals, the construction of local reservoirs and spill-interceptor canals, installation of non-leak gates, and automation of the distribution system. Other implemented projects include the delivery of water to farmers on a 12-hour basis rather than a 24-hour basis and improvements in on-farm water management through drip irrigation systems.

Expected Supply Capability

The IID-Metropolitan Conservation Program activity began in 1990, has been fully operational since 1998, and makes available 105 TAF of conserved water annually from 2016 onward. The initial program agreement provided CVWD the option to call up to about 45 TAF per year if needed to meet its demands. Execution of the QSA has reduced CVWD's option to a maximum of 20 TAF. This water is available to Metropolitan if not required by CVWD, but the minimum supply to MWD has been increased to 85 TAF from 2016 onward through a second amendment to the agreement, and the clarification on the number of 12-hour deliveries that would be included in the program through a letter agreement.

Rationale for Expected Supply

Historical Record

The IID-Metropolitan Conservation Program has been fully operational since 1998. Existing agreements have extended the initial term to at least 2041 or 270 days after the termination of the QSA, whichever is later, and they guarantee Metropolitan a minimum of 85 TAF per year from 2016 onward.

With operations beginning in 1990, the program has conserved as much as 109.46 TAF per year to date. By an amendment to the program agreement beginning in 2007, and a 2014 letter agreement, the annual conserved water yield will be 105 TAF. The historical record indicates that Metropolitan's expected minimum supply of 85 TAF per year would be available over the next 26 years at least.

Written Contracts or Other Proof

Metropolitan's annual supply from the IID-Metropolitan Conservation Program is based on three agreements and amendments to the agreements.

1988 IID-Metropolitan Conservation and Use of Conserved Water Agreement. This Agreement was executed in December 1988 by IID and Metropolitan for a 35-year term following completion of program implementation (1998–2033).

1989 Approval Agreement. This Agreement secured the approval of PVID and CVWD to not divert an amount of water equal to the amount conserved except under limited circumstances. The Agreement was executed in December 1989.

1989 Supplemental Approval Agreement. This Agreement was executed in December 1989 between Metropolitan and CVWD to coordinate Colorado River diversions and the use of the conserved water provided by the Program.

2003 Amendments to 1988 Agreement and 1989 Approval Agreement. These amendments revise Metropolitan's potential obligation to reduce its use of the conserved water yield in favor of its use by CVWD down to 20 TAF annually. Any of this water not used by CVWD would be available to Metropolitan.

2007 Amendments to 1988 Agreement and 1989 Approval Agreement. These amendments specify that beginning in 2007, the annual conserved water yield has and will be 105 TAF with continued operation of 24 tailwater pumpback systems, of which up to 20 TAF would be made available to CVWD upon its request.

2014 Letter Agreement Related to the 1988 Agreement. This letter agreement specifies that beginning in 2016, the annual conserved water yield has and will be 105 TAF, of which up to 20 TAF would be made available to CVWD upon its request. This amendment also removes tailwater recovery systems from the conservation actions and quantifies the yield and number of 12-hour deliveries that are included in the program.

Financing

The water efficiency improvements under this Program have already been funded, constructed, and put into operation. Metropolitan's five-year financial forecast in the budget includes the cost of operating, maintaining, and delivering the conserved water under the IID-Metropolitan Conservation Program.

Federal, State, and Local Permits/Approvals

A comprehensive environmental review process supported implementation.

EIR for Program. The IID Board certified the final EIR for the Program in December 1986.[9]

EIR for Supplemental Program. The IID Board certified the final EIR for the Completion Program in June 1994.[10]

Program EIR for Quantification Settlement Agreement. Metropolitan's Board certified the final Program EIR for the QSA in June 2002.[11]

Addendums to the QSA Final Program EIR. Metropolitan's Board adopted the Addendum to the QSA Final Program EIR in December 2002 and a second addendum in September 2003. Metropolitan's Board also adopted the Findings of Fact and Statement of Overriding Considerations, and Mitigation and Monitoring and Reporting Program at that time.

C. Palo Verde Irrigation District Land Management, Crop Rotation and Water Supply Program

Source of Supply

At its May 11, 2004 meeting, Metropolitan's Board authorized a 35-year land management, crop rotation, and water supply program with the PVID. Under the program, participating landowners in PVID are being paid to reduce their water use by not irrigating a portion of their land. A maximum of 29 percent of lands within PVID can be fallowed in any given year. Under the terms of the QSA, water savings within the PVID service area are made available to Metropolitan. PVID has the first priority for Colorado River water under the water delivery contracts with the USBR. Implementation of the program began in January 2005. The agreement also specifies that the participating landowners will fallow land in an amount equal to 25% of the landowner's total maximum fallowing commitment during each year.

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[9] Imperial Irrigation District, *Final EIR, Proposed Water Conservation Program and Initial Water Transfer, Imperial Irrigation District*, October, 1986. SCH Number: 1986012903.

[10] Imperial Irrigation District, *Final EIR for Modified East Lowline and Trifolium Interceptors, and Completion Projects*, May 1994. SCH Number: 1992071061.

[11] Coachella Valley Water District, Imperial Irrigation District, Metropolitan, San Diego County Water Authority, *Final Program EIR, Implementation of the Colorado River Quantification Settlement Agreement*, June 2002, SCH Number 2000061034.

Expected Supply Capability

It is estimated that the PVID/Metropolitan Program would provide up to 133 TAF per year of additional Colorado River water. This water would be available in any year as needed and in accordance with the provisions described in the agreements with Palo Verde Valley landowners and PVID.

Rationale for Expected Supply

Historical Record

Metropolitan and PVID tested the concept of developing a water supply for Metropolitan by entering into an agreement in 1992.[12] Agreements were signed with landowners and lessees in the Palo Verde Valley to forego irrigation for a two-year period from August 1992 to July 1994. Water unused by PVID, in the amount of 186 TAF, was stored in Lake Mead for Metropolitan. Both PVID and Metropolitan signed approved Principles of Agreement in 2001. PVID issued the Final EIR for the Proposed Palo Verde Irrigation District Land Management, Crop Rotation and Water Supply Program in September 2002.[13]

Implementation of the program began in January 2005. In March 2009, Metropolitan and PVID entered into a one-year supplemental fallowing program within PVID that provided for the fallowing of additional acreage, with savings of 24.1 TAF in 2009 and 32.3 TAF in 2010.

Calendar Year	**Volume of Water Saved** (TAF)
2005	108.7
2006	105.0
2007	72.3
2008	94.3
2009	120.2
2010	116.3
2011	122.2
2012	73.7
2013	32.8
2014	43.0
2015	85.0 (estimated)

Written Contracts or Other Proof

Contracts for this program are listed below.

August 2004 Forbearance and Fallowing Program Agreement. This agreement establishes the PVID/Metropolitan Program, which provides for a solicitation of and provisional approval of landowner participation offers, specifies the process for incorporating offers into agreements with landowners, and states the terms and conditions for fallowing, including payments made by Metropolitan.

[12] Presented to Metropolitan's Board at its regular meeting on January 14, 1992.
[13] SCH Number 2001101149.

Landowner Agreements for Fallowing in PVID. These agreements specify an escrow process to consummate the transaction, an easement deed to encumber land for fallowing, a tenant agreement to subordinate a tenant's lease to the agreement and easement, and an encumbrance agreement to subordinate any encumbrance (e.g., a mortgage) to the easement. These agreements also state the landowner's fallowing obligation, payments to be made by Metropolitan, and land management measures to be implemented.

Financing

Metropolitan's annual O&M budget (referenced above) includes the cost of the PVID/Metropolitan Program.

Federal, State and Local Permits

EIR for Program. A Notice of Preparation for the PVID/Metropolitan Program was published on October 29, 2001. PVID issued the Final EIR for the Proposed Palo Verde Irrigation District Land Management, Crop Rotation, and Water Supply Program in September 2002 (see reference above).

D. Management of Metropolitan-Owned Land in Palo Verde

Source of Supply

In 2016, Metropolitan will negotiate new leases on its 20,995 irrigable acres in the Palo Verde valley. Starting in 2017, additional water savings beyond what is achieved by the Land Management, Crop Rotation, and Water Supply Program will be generated on Metropolitan-owned farmland in PVID through a shift to less water-intensive crops, the adoption of more efficient irrigation technologies, and/or precision irrigation practices. Any conserved water created in PVID will flow to Metropolitan's fourth priority Colorado River allocation.

Expected Supply Capability

Metropolitan's lands in PVID already generate 24 – 94 TAF of water savings through the existing PVID Land Management, Crop Rotation and Water Supply Program, depending on the call. Changes in land management through cropping and irrigation practices are expected to generate an additional 15 and 29 TAF annually from 2017 onward. Savings will be small at first but are expected to increase over the first several years as new crops are planted and irrigation systems are upgraded. Because all Metropolitan-owned lands are enrolled in the PVID Land Management, Crop Rotation and Water Supply Program, the savings from agricultural practices will depend on the fallowing call for each year, with a high call resulting in lower savings due to lower baseline usage.

Rationale for Expected Supply

The exact water savings will depend on the details of the land management proposals developed by Metropolitan's lessees. However, Metropolitan's goal is to reduce the current consumptive water use on the lands by at least 1.5 AF per acre per year. This reduction is consistent with a switch from flood-irrigated alfalfa to deficit-irrigated alfalfa or to drip-irrigated vegetables, two possible cropping strategies that have been proposed.

Metropolitan owns 20,995 irrigable acres in the valley, but depending on the fallowing call, which varies from 7 to 35% of eligible acreage, only 13,647–19,525 acres are in production in any given year. If a 1.5 AF per acre reduction were realized on all of the irrigated acres in production in a given year, the resulting savings would be 20–29 TAF per year, depending on the call. Savings in the first few years are likely to be as low as 15 TAF while crops and irrigation systems are transitioned.

Financing

Metropolitan's annual O&M budget includes the cost of the PVID land management program.

Federal, State and Local Permits

This program is not subject to any permits or environmental impact reviews under federal, state, or local laws.

E. All-American and Coachella Canal Lining Projects

Source of Supply

Water is being conserved by the replacement of earthen portions of the Coachella Canal and the All-American Canal with concrete-lined canals. The concrete lining reduces the amount of water lost to seepage from the canals.

Expected Supply Capability

Pursuant to the October 10, 2003 Allocation Agreement, Metropolitan is entitled to delivery of 16 TAF annually until the San Luis Rey Settlement Parties[14] satisfy the conditions described in Section 104 of the San Luis Rey Indian Water Rights Settlement Act (Public Law 100-675 Title 1 as amended). Once the statutory conditions have been met, Metropolitan will provide by exchange water to the United States for use by the Settlement Parties, and San Diego County Water Authority will convey the water for use by the Settlement Parties.

Rationale for Expected Supply

The All-American and Coachella canal lining projects were implemented pursuant to the authorization contained in Title II of Public Law 100-675. The allocation of the water resulting from these projects is provided under the Allocation Agreement. The Allocation Agreement is a QSA-related agreement. The USBR, on behalf of the Secretary of the Interior, has issued interim determinations for the Coachella Canal Lining Project (January 31, 2008) and the All-American Canal Lining Project (December 4, 2009) that result in the annual delivery to Metropolitan of 4.5 TAF and 11.5 TAF, respectively. Delivery of this water for Metropolitan's use continues until conditions described in Section 104 of Public Law 100-675 and the Allocation Agreement are satisfied.

Program Facilities

The Coachella Canal is owned by the United States and is operated by CVWD. The All-American Canal is owned by the United States and is operated by IID. The water is conveyed through existing CRA facilities from Lake Havasu to Metropolitan.

Historical Record

The Coachella Canal Lining Project began conserving water in 2006 and reached its full conservation yield in calendar year 2009. The All-American Canal Lining Project began conserving water in 2008 and reached its full conservation yield in calendar year 2010. Actual annual deliveries to Metropolitan are as follows:

[14] The San Luis Rey Settlement Parties are the La Jolla, Pala, Pauma, Rincon and San Pasqual Bands of Mission Indians, the San Luis Rey Indian Water Authority, and the City of Escondido and Vista Irrigation District.

Calendar Year	Volume Delivered to Metropolitan (AF)
2006	172
2007	4,500
2008	6,013
2009	15,648
2010	16,000
2011	16,000
2012	16,000
2013	16,000
2014	16,000
2015	16,000 (estimated)

Written Contracts or Other Proof

2003 Allocation Agreement. This agreement among the United States, Metropolitan, CVWD, IID, San Diego County Water Authority, and the San Luis Rey Settlement Parties provides for the determination by the Secretary of the Interior of the conserved water yield from the All-American Canal Lining Project and the Coachella Canal Lining Project, the allocation of water as a result of the Projects among IID, SDCWA, Metropolitan, and the Settlement Parties, and the delivery of the allocated amounts to the respective users by the Secretary of the Interior.

Financing

Under the Allocation Agreement, water resulting from the All-American and Coachella Canal lining projects is made available to Metropolitan until the conditions specified in Sections 7.2.1, 7.2.2, and 7.2.4 of the Allocation Agreement have been satisfied. Metropolitan sets aside funding for the portion of the conserved water it receives in trust for the San Luis Rey Indian Water Authority as part of its annual O&M budget.[15]

Federal, State, and Local Permits/Approvals

A comprehensive environmental review process supported implementation.

Program EIR for Quantification Settlement Agreement. Metropolitan's Board certified the final Program EIR for the QSA in June 2002.[16]

Addendums to the QSA Final Program EIR. Metropolitan's Board adopted the Addendum to the QSA Final Program EIR in December 2002 and a second addendum in September 2003. Metropolitan's Board also adopted the Findings of Fact and Statement of Overriding Considerations, and Mitigation and Monitoring and Reporting Program at that time.

EIR/EIS for the All-American Canal Lining Project. USBR approved the Record of Decision for the All American Canal Lining Project on July 29, 1994. IID certified the All-American Canal Lining Project Final EIS/EIR and approved the project on August 16, 1994. USBR released a Supplemental Information Report on the All American Canal Lining Project, dated January 12, 2006.

[15] Payments from Metropolitan for Supplemental Water and Related Power Delivered Prior to Satisfaction of Section 104.

[16] Coachella Valley Water District, Imperial Irrigation District, Metropolitan, San Diego County Water Authority, Final Program EIR, Implementation of the Colorado River Quantification Settlement Agreement, June 2002, SCH Number 2000061034.

EIR/EIS for the Coachella Canal Lining Project. USBR approved the Record of Decision for the Coachella Canal Lining Project on March 27, 2002. CVWD certified the Coachella Canal Lining Project Final EIS/EIR and approved the project on May 15, 2001.

Metropolitan certified that it had reviewed and considered the information contained in those two documents and adopted the Lead Agencies' findings on December 13, 1994, for the All-American Canal Lining Project and on September 11, 2001, for the Coachella Canal Lining Project.

Addendum to EIS/EIR for the Coachella Canal Lining Project. An addendum to the Coachella Canal Lining Project Final EIS/EIR was published on February 27, 2004. CVWD certified the Addendum and approved the project on March 2, 2004.

F. Metropolitan-CVWD Delivery and Exchange Agreement for 35,000 Acre-Feet

Source of Supply

Metropolitan delivers to CVWD up to 35 TAF from Metropolitan's available State Water Project (SWP) Table A supply without condition on the actual Department of Water Resources (DWR) allocation for that year. As CVWD does not have a connection to the SWP, the water is delivered to CVWD by an exchange with Colorado River water. Metropolitan takes delivery of the Table A supply in conjunction with forgoing diversion of an equal volume of its Colorado River supply, effectively leaving this water in the River for diversion by CVWD at Imperial Dam. Exchange deliveries may also be made at the CRA Whitewater service connection or through the Metropolitan-CVWD-Desert Water Agency Advance Delivery Agreement. This program represents a net debit to Metropolitan's supplies.

Expected Capability

Up to 35 TAF of Metropolitan's SWP Table A supply will be delivered annually to CVWD by exchange.

Rationale for the Expected Supply

This program is undertaken pursuant to the Delivery and Exchange Agreement between Metropolitan and Coachella for 35,000 AF dated October 10, 2003, and is a QSA-related agreement.

Program Facilities

Metropolitan takes delivery of the Table A supply from the East Branch of the California Aqueduct at Devil Canyon Afterbay. At Metropolitan's request, the USBR releases a portion of Metropolitan's available Colorado River supply from Lake Mead for diversion by CVWD at Imperial Dam and conveyance through the All-American Canal System.

Historical Record

Since the 2003 execution of the QSA and the Delivery and Exchange Agreement, the following volumes of exchange water were delivered to CVWD at Imperial Dam:

Calendar Year	Volume of Exchange Water (AF)
2003	0
2004	0
2005	0
2006	34,958
2007	0
2008	0
2009	0
2010	10,000
2011	0
2012	0
2013	0
2014	0
2015	313

Written Contracts or Other Proof

2003 Delivery and Exchange Agreement. This agreement between Metropolitan and CVWD provides for the delivery of up to 35,000 AF of Metropolitan SWP Table A supply by exchange with Colorado River water.

Federal, State, and Local Permits/Approvals

Program EIR for Quantification Settlement Agreement. Metropolitan's Board certified the final Program EIR for the QSA in June 2002.[17]

Addendums to the QSA Final Program EIR. Metropolitan's Board adopted the Addendum to the QSA Final Program EIR in December 2002 and a second addendum in September 2003. Metropolitan's Board also adopted the Findings of Fact and Statement of Overriding Considerations, and Mitigation and Monitoring and Reporting Program at that time.

September 2002 Final Program EIR for Coachella Valley Water Management Plan and State Water Project Entitlement Transfer. The final Program EIR for the Coachella Valley Water Management Plan and SWP Entitlement Transfer was certified by the CVWD on October 8, 2002.

[17] Coachella Valley Water District, Imperial Irrigation District, Metropolitan, San Diego County Water Authority, Final Program EIR, Implementation of the Colorado River Quantification Settlement Agreement, June 2002, SCH Number 2000061034.

G. SNWA and Metropolitan Storage and Interstate Release Agreement

Source of Supply

The source of supply is SNWA's unused Nevada apportionment of Colorado River water made available to Metropolitan for diversion and storage. In later years, Metropolitan would return water through reduced diversions of Colorado River water made at the request of SNWA.

Expected Capability

As of January 1, 2015, over 272 TAF had been diverted by Metropolitan since 2004. In 2015, Metropolitan diverted 150 TAF to SNWA.

Returns to SNWA are limited to no more than 30 TAF annually unless Metropolitan agrees to a larger amount. SNWA has agreed to forgo requesting return through 2019 of water stored prior to 2015 unless Metropolitan agrees to the return. In 2020 and 2021, SNWA may request return of an amount equal to the shortage allocated by the Secretary of the Interior to Nevada. If the Secretary of the Interior apportions less than 280 TAF of basic apportionment for use in Nevada, SNWA may request the return of up to 50 TAF, 1 acre-foot for each acre-foot less than the 280 TAF of basic apportionment apportioned for use in Nevada.

Of the amount proposed to be stored in 2015, 125 TAF would be available for return to SNWA.

If less than 75 TAF has been returned, then during each year prior to 2027 for which Lake Mead begins the year at or below elevation 1,045 feet, Metropolitan will create 50 TAF of Intentionally Created Surplus (ICS) in Lake Mead, until the combined sum of ICS and the amount of water stored for SNWA returned equals 75 TAF. Prior to 2027, Metropolitan would be able to request delivery of this ICS during a year in which Lake Mead begins the year at or above elevation 1,080 feet.

Rationale for the Expected Supply

Program Facilities

Water is diverted through the CRA by Metropolitan. To return the water to SNWA, Metropolitan would reduce its CRA diversions, and the Secretary of the Interior would make water available to SNWA at Lake Mead.

Historical Record

The annual volumes of water diverted into the CRA, and the volume of water stored for SNWA by Metropolitan are as follows:

Calendar Year	Volume of Water Diverted (AF)	Volume of Water Stored for SNWA (AF)
2004	10,000	10,000
2005	10,000	10,000
2006	5,000	5,000
2007	0	0
2008	45,000	45,000
2009	0	0
2010	0	0
2011	0	0
2012	62,839	41,892
2013	75,000	50,000
2014	65,000	43,333
2015	150,000	125,000

No water has been returned to SNWA.

Written Contracts or Other Proof

2004 Storage and Interstate Release Agreement. This agreement among Metropolitan, the Colorado River Commission of Nevada, SNWA, and the United States provides for the Secretary of the Interior to make available to Metropolitan for diversion and storage unused Nevada apportionment. In subsequent years, the agreement provides for Metropolitan to make water available to SNWA by forgoing diversion of a portion of its available Colorado River supply.

Operational Agreement. As amended on August 11, 2009, on October 24, 2012, and on October 19, 2015, the Operational Agreement specifies the conditions under which Metropolitan would divert and store unused Nevada apportionment through 2026 and the return of water to SNWA.

H. Lower Colorado Water Supply Project

Source of Supply

Groundwater is pumped by the Lower Colorado Water Supply Project near the All-American Canal and is discharged to the Canal. IID reduces its net diversions of Colorado River water by an amount equal to the amount of Project water discharged into the Canal, permitting entities along the Colorado River that do not have rights or have insufficient rights to divert Colorado River water to obtain a supply of water. In 2007, Metropolitan entered into a contract with the USBR and the City of Needles to utilize the unused Project capacity.

Expected Capability

Metropolitan estimates that it received 5.9 TAF of Lower Colorado Water Supply Project water in 2015.

Rationale for the Expected Supply

Program Facilities

Two Lower Colorado Water Supply Project wells pump water into the All-American Canal. The groundwater level in one of the wells has declined to the point that it cannot operate at capacity with existing equipment. Replacement equipment to restore pumping capacity has been installed. Two new Project wells are expected to become operational in 2016 to augment pumping capacity.

Historical Record

Metropolitan has received the following amounts of Lower Colorado Water Supply Project water:

Calendar Year	**Volume of Water** (AF)
2007	5,011
2008	6,300
2009	2,349
2010	3,872
2011	3,611
2012	3,253
2013	4,208
2014	6,109
2015	5,965 (estimated)

Written Contracts or Other Proof

2007 Lower Colorado Water Supply Project Contract among the United States, the City of Needles, and Metropolitan. This contract as amended in 2010 provides for the United States to deliver Colorado River water to Metropolitan, the availability of which results from the pumping of Lower Colorado Water Supply Project groundwater and the exchange of such water.

Financing

Metropolitan's O&M budget includes the cost associated with receipt of Lower Colorado Water Supply Project water.

I. Lake Mead Storage Program, Drop 2 (Brock) Reservoir Funding, Yuma Desalting Plant Pilot Project, and Binational Intentionally Created Surplus

Source of Supply

Water has been and will be stored in Lake Mead as Intentionally Created Surplus (ICS) through extraordinary conservation measures, such as water saved through the Palo Verde Irrigation District Land Management, Crop Rotation, and Water Supply Program.

Water has been and will be stored in Lake Mead as ICS through system efficiency measures, such as Metropolitan's funding contributions toward construction of the Drop 2 (Brock) Reservoir near the All-American Canal and pilot operation of the Yuma Desalting Plant.

Water will be stored in Lake Mead as Binational ICS through implementation of pilot conservation projects in Mexico.

Expected Capability

Metropolitan may create as much as 400 TAF of Extraordinary Conservation ICS water in a single year less the amount that may be created by IID, which could be as much as 25 TAF.

Upon creation, 5 percent of the Extraordinary Conservation ICS is deducted, resulting in additional system water in storage in Lake Mead and leaving 95 percent of the water available for release to Metropolitan. Each year thereafter, the remaining balance at the end of the year is reduced by three percent to account for evaporation losses.

The amount of Extraordinary Conservation ICS accumulated in Lake Mead for Metropolitan is limited to 1.5 MAF less the amount accumulated by IID which could be as much as 50 TAF.

Metropolitan may take delivery of as much as 400 TAF of Extraordinary Conservation ICS from Lake Mead in a year less the amount delivered to IID, which could be as much as 50 TAF.

Rather than storing Extraordinary Conservation ICS water in Lake Mead, IID may, with the written consent of Metropolitan, have up to 25 TAF of this water delivered to Metropolitan for storage in any one calendar year. Upon request by IID, Metropolitan would return 90 percent of the stored water to IID with the remaining 10 percent left for Metropolitan's use. Also, Metropolitan may make temporary use of IID's Extraordinary Conservation ICS accumulated in Lake Mead.

As of January 1, 2015, Metropolitan has 89 TAF of System Efficiency ICS stored in Lake Mead. There are no evaporation losses charged to stored System Efficiency ICS. Metropolitan may take delivery of as much as 24 TAF of this System Efficiency ICS resulting from pilot operation of the Yuma Desalting Plant and 25 TAF of this System Efficiency ICS resulting from construction of the Drop 2 (Brock) Reservoir beginning in 2015 annually. The USBR may reduce this delivery if it determines a reduction is necessary to avoid a shortage.

Metropolitan will receive 23.75 TAF of Binational ICS in Lake Mead by December 31, 2017.

Rationale for the Expected Supply

Program Facilities

This program makes use of Lake Mead and the CRA.

Historical Record

From 2006 to 2010, Metropolitan created approximately 201.5 TAF of Extraordinary Conservation ICS. From 2008 to 2011, Metropolitan created approximately 124.4 TAF of System Efficiency ICS.

In 2008, the USBR assigned to Metropolitan 100 TAF of water stored in Lake Mead as System Efficiency ICS due to Metropolitan's contributions to the Drop 2 Reservoir project.

In 2010 and 2011, the USBR assigned to Metropolitan 16.75 TAF and 7.647 TAF of water stored in Lake Mead as System Efficiency ICS, respectively, due to Metropolitan's contributions to the Yuma Desalting Plant pilot project.

From 2011 to 2012, Metropolitan created approximately 348.7 TAF of Extraordinary Conservation ICS, and zero System Efficiency ICS.

As of January 1, 2015, Metropolitan's Extraordinary Conservation and System Efficiency ICS volumes in Lake Mead were approximately 61.8 TAF and 89.4 TAF, respectively.

Written Contracts or Other Proof

2007 Lower Colorado River Basin Intentionally Created Surplus Forbearance Agreement among the Arizona Department of Water Resources, PVID, IID, the City of Needles, CVWD, Metropolitan, SNWA, and the Colorado River Commission of Nevada. This agreement sets forth the rules under which ICS water is developed, stored in, and delivered from Lake Mead.

2007 California Agreement for the Creation and Delivery of Extraordinary Conservation Intentionally Created Surplus among Metropolitan, PVID, IID, CVWD, and the City of Needles. This agreement determines the conditions under which California contractors receiving Colorado River water may store and deliver water from Lake Mead.

2007 Agreement among the United States, the Colorado River Commission of Nevada, and the SNWA for the Funding and Construction of the Lower Colorado River Drop 2 Storage Reservoir Project. This agreement provides for: the United States to design and construct the Drop 2 Storage Reservoir Project; SNWA to fund the capital cost of the Project; the United States to credit SNWA's ICS account with 600 TAF of System Efficiency ICS; and allows Metropolitan to become a party to the agreement, requiring that Metropolitan provide funding for a portion of the capital cost.

2007 Delivery Agreement between the United States and Metropolitan. This agreement provides the procedures for creating the ICS water and guarantees delivery of the water to Metropolitan.

2008 Metropolitan Notice of Election to Participate as a Party to the Drop 2 Funding Agreement. This notice requires Metropolitan to provide funding for a portion of the capital cost of the Drop 2 Storage Reservoir Project, and the United States to credit Metropolitan's ICS account with 100 TAF of System Efficiency ICS, reducing the amount of System Efficiency ICS in SNWA's account by an equal amount.

2009 Agreement among the United States, Metropolitan, the Colorado River Commission of Nevada, SNWA, and the Central Arizona Water Conservation District for a Pilot Project for Operation of the Yuma Desalting Plant. This agreement provides for the allocation of the costs for the preparation and pilot operation of the Yuma Desalting Plant.

2010 Yuma Desalting Plant Pilot Project Delivery Agreement between the United States and Metropolitan. This agreement secures delivery of the ICS water created and specifies the manner in which this water will be accounted.

2012 Agreement among the United States, Metropolitan, the Colorado River Commission of Nevada, SNWA, and the Central Arizona Water Conservation District for a Pilot Program for the Conversion of Intentionally Created Mexican Allocation to Intentionally Created Surplus. This agreement provides for the allocation of the costs among the agencies for the implementation of pilot conservation projects within Mexico and the allocation of 95 TAF of conserved water among the non-federal agencies as Binational ICS in Lake Mead.

2012 Interim Operating Agreement for Implementation of Minute No. 319 of the International Boundary and Water Commission. This agreement among the United States, the Upper Basin states, and Lower Basin states' agencies, including Metropolitan, sets forth the rules under which Intentionally Created Mexican Allocation is to be converted to Binational ICS for storage in and delivery from Lake Mead.

2012 Lower Colorado River Basin Forbearance Agreement for Binational Intentionally Created Surplus. This agreement among the state of Arizona, the Colorado River Commission of Nevada and SNWA, and California Colorado River water contractors, including Metropolitan, ensures

that the Binational ICS made available to a contractor that invests in a project in Mexico would not be claimed by another contractor in another state.

2012 Binational ICS Delivery Agreement. This agreement between Metropolitan and the United States secures delivery of the Binational ICS water made available by exchange and specifies the manner in which this water would be accounted.

2013 Agreement between Metropolitan and IID Regarding Binational Intentionally Created Surplus. This agreement allows IID to provide a payment to Metropolitan of up to 50 percent of the financial contribution to be made to the United States by Metropolitan for the implementation of pilot conservation projects within Mexico. As a result of IID's payment, Metropolitan will receive 23.75 TAF and IID will receive 23.75 TAF of Binational ICS by December 31, 2017.

J. Programs Under Development

Expansion of the Palo Verde Irrigation District (PVID) Land Management Program: Additional fallowing agreements may be developed in subsequent years as needed.

Arizona Storage and Interstate Release Agreement: A storage and interstate release program with the Central Arizona Project has been under consideration. In lieu of Arizona storing Colorado River water in groundwater basins, water would be stored with Metropolitan for later return.

Bard Water District Seasonal Fallowing Pilot Program: In January 2016, Metropolitan's Board of Directors authorized the General Manager to enter into a pilot seasonal fallowing program with Bard Water District (Bard). Farmers in Bard have expressed interest in participating in a two-year pilot program to conduct seasonal fallowing on their lands. A number of farmers in Bard grow one or more vegetable crops in the fall and winter followed by a field crop in the spring and summer. This rotation of crops provides an opportunity to fallow land for a four-month period from April to July. Based on the interest expressed by farmers in Bard, staff for Metropolitan and Bard have developed proposed terms for a two-year pilot program that could provide Metropolitan with an estimated 4.6 TAF in both 2016 and 2017. Metropolitan and Bard would enter into a pilot program agreement which would specify that a maximum of 2,000 acres within Bard would be fallowed per season and that Bard would not deliver any water to the fallowed acres from April 1 to July 31, 2016 and 2017. Metropolitan would enter into an agreement with each individual farmer through which the farmer would agree to fallow at least 10 contiguous acres for the four month period. Implementation of a pilot program would provide information that could lead to the development of a longer term land management and fallowing program with Bard.

A.3.2 California Aqueduct Deliveries

A. State Water Project Deliveries

Source of Supply

The State Water Project (SWP) provides imported water to the Metropolitan service area and has provided from 25 to 50 percent of Metropolitan's supplies. In accordance with its contract with the Department of Water Resources (DWR), Metropolitan has a Table A allocation of 1,911,500 AF per year under contract from the SWP. Actual deliveries have never reached this amount because they depend on the availability of supplies as determined by DWR. The availability of SWP supplies for delivery through the California Aqueduct over the next 18 years is estimated according to the historical record of hydrologic conditions, existing system capabilities as may be influenced by environmental permits, requests of the SWC and SWP contract provisions for allocating Table A, Article 21 and other SWP deliveries including San Luis carryover to each contractor. As shown in this 2015 UWMP, the estimates of SWP deliveries to Metropolitan are based on DWR's July 2015 SWP Delivery Capability Report.

As part of its contract with DWR, Metropolitan pays both the fixed costs of financing SWP facilities construction and the variable costs of operations, maintenance, power, and replacement costs for water delivered each year. SWP water is delivered to Metropolitan through the East Branch at Devil Canyon Power Plant afterbay, along the Santa Ana Valley Pipeline, and at Lake Perris. Metropolitan takes delivery from the West Branch at Castaic Lake.

Expected Supply Capability

The Edmund G. Brown California Aqueduct is capable of transporting Metropolitan's full contract amount of 1,911,500 AF per year. However, the quantity of water available for export through the California Aqueduct can vary significantly year to year. The amount of precipitation and runoff in the Sacramento and San Joaquin watersheds, system reservoir storage, regulatory requirements, and contractor demands for SWP supplies impact the quantity of water available to Metropolitan.

Rationale for Expected Supply

Metropolitan and 28 other public entities have contracts with the State of California for SWP water. These contracts require the state, through DWR, to use reasonable efforts to develop and maintain the SWP supply. The state has made significant investment in infrastructure. It has constructed 28 dams and reservoirs, 26 pumping and generation plants, and about 660 miles of aqueducts. More than 25 million California residents benefit from water from the SWP. DWR estimates that with current facilities and regulatory requirements, the project will deliver approximately 2.3 MAF under average hydrology considering impacts attributable to the combined Delta smelt and salmonid species biological opinions.

On a yearly basis, DWR estimates the amount of supplies that are available for that year. Metropolitan uses a forecasting method for SWP deliveries based on historical patterns of precipitation, runoff, and actual deliveries of water.

Further, under the water supply contract, DWR is required to use reasonable efforts to maintain and increase the reliability of service to Metropolitan. As discussed in a subsequent section, DWR is participating in the Bay-Delta process to achieve these requirements.

Historical Record

The historical record shows significant accomplishments by DWR in providing its contractors with SWP water supplies. Through 2013, the SWP has delivered over 90 MAF to its contractors. The maximum annual water supply was delivered in 2005, and totaled 3.75 MAF. In 2006 and 2011 the project delivered 3.7 MAF. DWR has continued to invest in SWP facilities to deliver water to its contractors.

Written Contracts or Other Proof

1960 Contract between the State of California and The Metropolitan Water District of Southern California for a Water Supply. This contract, initially executed in 1960 and amended numerous times since, is the basis for SWP deliveries to Metropolitan. It requires DWR to make reasonable efforts to secure water supplies for Metropolitan and its other contractors. The contract expires in 2035. At that time, Metropolitan has the option to renew the contract under the same basic conditions.

Financing

Metropolitan's payments for its State Water contract obligation are approved each year by its Board of Directors and currently constitute approximately a third of the annual budget.

Federal, State and Local Permit/Approvals

Operation of the SWP. The DWR is responsible for acquiring, maintaining, and complying with numerous federal and state permits for operation of the SWP. Metropolitan has been active in monitoring the issues affecting its contract with DWR.

EIR for the East Branch Enlargement. In April 1984, DWR prepared and finalized an EIR for the Enlargement of the East Branch of the Governor Edmund G. Brown California Aqueduct.

EIR for the Harvey O. Banks Pumping Plant. In January 1986, DWR prepared and finalized an EIR for the additional pumping units at Harvey O. Banks Delta Pumping Plant.

EIR for the Mission Hills Extension. In 1990, DWR prepared and finalized an EIR for the SWP Coastal Branch, Phase II and Mission Hills Extension.

East Branch Extension Project Phase 1. In 1998, DWR completed an EIR to extend the East Branch of the California Aqueduct to provide service to San Gorgonio Pass Water Agency. Phase 1 was completed in 2002.

U.S. Fish and Wildlife Service Biological Opinion. In December 2008, U.S. Fish and Wildlife issued a Biological Opinion for Delta smelt.

National Marine Fisheries Service Biological Opinion. In June 2009, the National Marine Fisheries Service issued a Biological Opinion for salmon.

B. Desert Water Agency/Coachella Valley Water District/Metropolitan Water Exchange and Advance Delivery Programs

Source of Supply

The Desert Water Agency (DWA) and CVWD, both in Riverside County, have rights to SWP deliveries, but do not have any physical connections to the SWP facilities. Both agencies are adjacent to the CRA. For DWA and CVWD to obtain water equal to their SWP allocations, Metropolitan has agreed to exchange an equal quantity of its Colorado River water for DWA and CVWD's SWP water. DWA has a SWP Table A contract right of 55.75 TAF per year, and CVWD has a SWP Table A contract right of 138.35 TAF per year, for a total of 194.1 TAF per year.

Expected Supply Capability

Under the existing agreements, Metropolitan provides water from its CRA to DWA and CVWD in exchange for SWP deliveries. Metropolitan can deliver additional water to its DWA/CVWD service connections, permitting these agencies to store water. When supplies are needed, Metropolitan can then receive its full Colorado River supply, as well as the SWP allocation from the two agencies, while the two agencies can rely on the stored water for meeting their water supply needs. The amount of DWA and CVWD SWP Table A water available to Metropolitan depends on total SWP deliveries and varies from year to year.

In addition to their Table A supplies, DWA and CVWD, subject to Metropolitan's written consent, may take delivery of SWP supplies available under Article 21, the Turn-back Pool Program, and non-SWP water supplies they may acquire and convey through the SWP facilities. These other supplies are delivered to DWA and CVWD by exchange with Metropolitan in the same manner as Table A deliveries. DWA and CVWD are participants in the Yuba Dry Year Water Purchase Program. Additionally, DWA participated in the 2009 Drought Water Bank and the 2015-2016 Multi-Year Water Pool Demonstration Program. CVWD has also purchased non-project supplies from partners in the San Joaquin Valley on an annual basis since 2008. Metropolitan has also consented to:

- 10 TAF of exchange deliveries to CVWD for non-SWP water acquired from the San Joaquin Valley from 2008 through 2010, and
- 36 TAF of exchange deliveries to DWA for non-SWP water acquired from the San Joaquin Valley from 2008 through 2015.

Rationale for Expected Supply

The DWR estimates the amount of supplies that are available each year. Metropolitan uses a forecasting method for SWP deliveries based on historical patterns of precipitation, runoff and actual deliveries of water.

Historical Record

DWA and CVWD Exchange Program is currently in operation. The Advance Delivery Agreement has been in place since 1984. Since 1973, Metropolitan has been taking delivery of these agencies' SWP Table A water and has provided equivalent water to those agencies from Metropolitan's CRA supplies. Metropolitan has also been delivering water in advance of the amount needed under the exchange agreements. With water having been delivered in advance, Metropolitan can reduce deliveries to DWA and CVWD as needed. Indeed, from the end of August 2012 through October 2015, Metropolitan drafted approximately 164 TAF, leaving 207 TAF in the Advance Delivery account.

Written Contracts or Other Proof

1967 and 1983 Water Exchange Contract and Agreements. The DWA and CVWD Program is currently in operation. The DWA and CVWD water exchange contract has been in place since 1967, was amended in 1972, and was modified with execution of additional agreements in 1983.

1984 Advance Delivery Agreement. The Advance Delivery Agreement allows Metropolitan to supply DWA and CVWD with Colorado River water in advance of the time these agencies are entitled to receive water under the exchange agreements. In future years, Metropolitan can recover this water by reducing its deliveries under the exchange agreements.

The 2003 Exchange Agreement. DWA, CVWD, and Metropolitan executed the 2003 Exchange Agreement under which Metropolitan transferred 88,100 AF and 11,900 AF of its SWP Table A water to DWA and CVWD, respectively, reducing Metropolitan's Table A volume from 2,011,500 AF to 1,911,500 AF. The 2003 Exchange Agreement became operational in calendar year 2005 with the execution of letter agreements among DWA, CVWD, and Metropolitan governing its implementation. The exhibits to the November 9, 2004, and November 19, 2007, letter agreements also modify certain provisions of the Water Exchange Contract and Agreements and the Advance Delivery Agreement.

November 2012 Letter Agreement. CVWD and Metropolitan executed the letter agreement to deliver non-SWP water in exchange for Colorado River water under which CVWD arranged for the delivery of up to 16.5 TAF per year of water to Metropolitan provided by Rosedale-Rio Bravo Water Storage District to CVWD. Metropolitan delivers to CVWD an equal amount of Colorado River water.

Financing

The funds for deliveries under this Program are included in Metropolitan's O&M budget and Long-Range Finance Plan (referenced above).

Federal, State, and Local Permits/Approvals

DWR is responsible for acquiring, maintaining, and complying with numerous Federal and State permits for operation of the SWP.

July 26, 1983, CVWD Negative Declaration, Whitewater River Spreading Area expansion Phase 1.

February 1983, DWA Final EIR for the proposed extension of time for utilizing Colorado River water to recharge the upper Coachella Valley groundwater basins to the year 2035, Volume I and II, April 1983, Volume III.

September 2002, Final Program EIR for Coachella Valley Water Management Plan and SWP Entitlement Transfer was certified by CVWD on October 8, 2002.

C. Semitropic Water Banking and Exchange Program

Source of Supply

The agreement between Semitropic Water Storage District (Semitropic) and Metropolitan was executed in February 1994. Semitropic obtains water from the SWP through its contracts with the Kern County Water Agency. SWP supplies irrigate an area of 161,200 acres within Semitropic's service area. When this surface water is not available, these growers withdraw water from the underlying aquifer. The agreement between Semitropic and Metropolitan allows Metropolitan to make use of 350 TAF of storage in Semitropic's groundwater basin. In years of plentiful supply, Metropolitan can deliver available SWP supplies to Semitropic through the California Aqueduct. During dry years, Metropolitan can withdraw this stored water. Five other banking partners participate in this Program and use 650 TAF of storage in Semitropic's groundwater basin.

Expected Supply Capability

The Semitropic-Metropolitan Program provides Metropolitan with the capacity to store up to 350 TAF of water under the current agreement. During dry years, Metropolitan can recover its stored water through a combination of direct pumping of the groundwater and delivery of Semitropic's SWP Table A water in the California Aqueduct. In 2014, Metropolitan amended the program to increase the return yield by an additional 13.2 TAF per year. The minimum

annual yield available to Metropolitan from the program is currently 44.7 TAF, and the maximum annual yield is 236.2 TAF depending on the available unused capacity and the SWP allocation. The average annual supply capability for a single dry year similar to 1977 is 125 TAF or for multiple dry years similar to the period 1990-1992 is 107 TAF.

Rationale for Expected Supply

Historical Record

The Semitropic-Metropolitan Water Banking and Exchange Program has been operational since 1994. With existing agreements, it will continue to operate over the term of 41 years (1994-2035). By the end of 2015, the program had 137 TAF in its storage account.

Written Contracts or Other Proof

1992 Turn-in/out Construction, Operation and Maintenance Agreement. This Agreement was executed in 1992 by DWR and Semitropic to allow construction, operation, and maintenance of the Semitropic California Aqueduct Turn in/out.

1993 Temporary Semitropic-Metropolitan Water Banking Agreement. This Agreement was executed in February 1993 by Semitropic and Metropolitan to allow the storage of available Metropolitan supplies in advance of execution of the long-term agreement.

1994 Semitropic/Metropolitan Water Banking and Exchange Agreement. This Agreement was executed in December 1994 by Semitropic and Metropolitan to implement the program for a 41-year term (1994-2035).

1995 Point of Delivery Agreement. This agreement, with DWR, Kern County Water Agency, and Metropolitan, allows Metropolitan to divert water from the California Aqueduct into Semitropic's service area.

1995 Introduction of Local Water into the California Aqueduct. This agreement, with DWR, Kern County Water Agency, and Semitropic, allows Metropolitan to receive water from the program into the California Aqueduct.

2014 Amendment to Increase Program Yield. The amendment increased Metropolitan's minimum return yield by 13,200 acre-feet per year.

Financing

Metropolitan's O&M budget (referenced above) includes payments for the Semitropic Program.

Federal, State, and Local Permits/Approvals

Final EIR. Semitropic acting as the lead agency under CEQA and Metropolitan acting as a responsible agency jointly completed the EIR for the Program. The EIR was certified by Semitropic in July 1994 and adopted by Metropolitan in August 1994.

Regulatory Approvals. All regulatory approvals are in place, and the program is operational.

D. Arvin-Edison Water Management Program

Source of Supply

The Arvin-Edison Water Storage District (Arvin-Edison) manages the delivery of local groundwater and water imported into its service area from the Central Valley Project's (CVP) Millerton Reservoir via the Friant-Kern Canal. The surface water service area consists of 132,000 acres of predominantly agricultural land, and to a minor degree, municipal and industrial uses. It is situated in Kern County. Arvin-Edison operates its supplies conjunctively, storing water in the underlying aquifer when imported supplies are available and withdrawing

that water when the availability of imported supplies is reduced. In 1997, Metropolitan entered into an agreement with the Arvin-Edison Water Storage District. The agreement allows Metropolitan to store available water in Arvin-Edison's groundwater basin, either through direct spreading operations, or through deliveries to growers in Arvin-Edison's service area. Similar to Arvin-Edison's own usage, this previously stored water could be withdrawn when the availability of imported supplies to Metropolitan is reduced.

Expected Supply Capability

The Arvin-Edison/Metropolitan Program provides Metropolitan with the capacity to store up to 350 TAF of water under the current agreement. During dry years, Metropolitan can recover its stored water either through direct pumping of the groundwater or through exchange. Based on the terms and conditions of the program agreement, the return of water to Metropolitan ranges from a minimum of 40 TAF per year (peak 4-month summer period) up to 110 TAF (over a 12-month period). The average annual supply capability for this program is 75 TAF for either a single dry year similar to 1977 or for each year of a multiple dry year period similar to the period 1990-1992.

Rationale for Expected Supply

Historical Record

The Arvin-Edison/Metropolitan Water Management Program has been operational since 1997. With existing agreements, it will continue to operate over the term of 38 years (1997-2035). By the end of 2015, the program had 124 TAF in its storage account.

Written Contracts or Other Proof

1997 Arvin-Edison/Metropolitan Water Management Agreement. This Agreement was executed in December 1997 by Arvin-Edison and Metropolitan to implement the program for a 30-year term (1997-2027).

1998 Turn-in/out Construction and Maintenance Agreement. This Agreement was executed in 1998 by DWR, Kern County Water Agency, Arvin-Edison, and Metropolitan to allow construction, operation and maintenance of the Arvin-Edison California Aqueduct Turn in/out.

1998-2002 Water Delivery and Return Agreements. These agreements, with DWR, Kern County Water Agency, Arvin-Edison, and Metropolitan, allow Metropolitan to divert water from, and introduce water to, the California Aqueduct.

2004 Point of Delivery Agreement. This agreement, with DWR, Kern County Water Agency, and Metropolitan, allows Metropolitan to divert water from the California Aqueduct into Arvin-Edison's service area.

2004 Introduction of Water into the California Aqueduct. This agreement, with DWR, Kern County Water Agency, and Arvin-Edison, allows Metropolitan to receive water from the program into the California Aqueduct.

2007 First Amended and Restated Agreement Between Arvin-Edison Water Storage District and The Metropolitan Water District of Southern California for a Water Management Program. This amendment increased the maximum storage level to 350 TAF, extended the agreement term to 2035, and provided for the construction of the South Canal Improvement Project. The project increases the reliability of Arvin-Edison returning higher water quality to the California Aqueduct.

Financing

Metropolitan's O&M budget (referenced above) includes payments for the Arvin-Edison Program.

Federal, State, and Local Permits/Approvals

Environmental Status: A Negative Declaration was completed in 1996.

An Addendum to the 1996 Negative Declaration was completed in 2003.

A Negative Declaration for the Arvin-Edison South Canal Improvement Project was completed in 2007.

Regulatory Approvals: All regulatory approvals are in place, and the program is operational.

E. San Bernardino Valley Municipal Water District Program

Source of Supply

The San Bernardino Valley Municipal Water District Program allows Metropolitan to purchase a dependable annual supply, as well as an additional supply for dry year needs. Under this program, Metropolitan purchases water provided to San Bernardino Valley Municipal Water District (Valley District) from its annual State Water Project (SWP) water allocation. Valley District delivers the purchased supplies to Metropolitan's service area through the coordinated use of facilities and interconnections within the water conveyance system of the two districts.

The purchased SWP supply is provided to Metropolitan as direct deliveries of annual SWP water through the California Aqueduct to Metropolitan's service area, as well as through deliveries of recaptured SWP water previously stored in the San Bernardino groundwater basin to Metropolitan's service area. Under this program, Metropolitan purchases a minimum of 20 TAF per year of SWP allocation every year. In addition, Metropolitan has the option to purchase Valley District's additional SWP allocation, if available, and the first right-of-refusal to purchase additional SWP supplies available beyond the minimum and option amounts. In the event that Metropolitan's operational needs do not require all, or a portion of the minimum purchased water, that unused amount may be carried forward up to a total of 50 TAF for later delivery. Finally, the program establishes a critical dry year supply account for Metropolitan that could provide additional amounts of dry year supplies. During any year designated by DWR as a critically dry year, Valley District could deliver from this account up to 50 TAF of recaptured SWP water previously stored in the San Bernardino groundwater basin.

To facilitate the transfer, the program also provides the coordinated use of existing facilities, including the Valley District's Foothill Pipeline and the Inland Feeder, to improve the conveyance capabilities of the delivery of SWP water to the service areas of both districts. The intertie between the Foothill Pipeline and the Inland Feeder has been constructed and was operational as of December 2002. This intertie allows Metropolitan to move SWP water from the East Branch of the California Aqueduct through the Foothill Pipeline and Inland Feeder, into DVL and the CRA. As a result of this intertie, Metropolitan has an alternative conveyance capacity of 260 cfs into Metropolitan's system should an outage occur on the upper section of the Inland Feeder.

Expected Supply Capability

The average annual supply capability for a single dry year similar to 1977 is 70 TAF. For multiple dry years similar to the period 1990-1992, the expected supply capability is 37 TAF.

Rationale for Expected Supply

Historical Record

The San Bernardino Valley Municipal Water District Program began operations in 2001 and is expected to be renewed continually in the future. Since its inception in 2001, this program has delivered 103 TAF to Metropolitan. There was no water remaining in the carryover account in 2009. Deliveries in 2013, 2014, and 2015 have been suspended by mutual agreement.

Written Contracts or Other Proof

Metropolitan's annual and dry-year supplies from the San Bernardino Valley Municipal Water District Program are based on Metropolitan Board actions and agreements.

2000 Board Approval of Coordinated Operating Agreement. In June 2000, Metropolitan's Board authorized entering into a Coordinated Operating Agreement between Metropolitan and Valley District to develop projects that could provide benefits to both districts through the coordinated use of facilities and SWP supplies.

2000 Coordinated Operating Agreement. The Coordinated Operating Agreement between Metropolitan and Valley District was executed in July 2000.

2001 Board Approval of the Coordinated Use Agreement. In April 2001, Metropolitan's Board authorized entering into the Coordinated Use Agreement for Conveyance Facilities and SWP Water Supplies between Metropolitan and Valley District for the purchase of dependable annual and dry year supplies by Metropolitan.

2001 Coordinated Use Agreement. The Coordinated Use Agreement for Conveyance Facilities and SWP Water Supplies between Metropolitan and Valley District for the purchase of dependable annual and dry year supplies by Metropolitan was executed May 2001. The Agreement is effective as of July 1, 2001, for an "evergreen" term (10-years with automatic annual extensions unless otherwise notified).

Financing

Metropolitan's O&M budget (referenced above) includes the funds to purchase Program water.

Federal, State, and Local Permits/Approvals

The Program became effective as of July 1, 2001. An environmental review process and regulatory approval supported implementation.

Final EIR. Final Regional Water Facilities Master Plan EIR dated February 1, 2001, was certified by Valley District, as lead agency, and by Metropolitan, as responsible agency. Notices of determinations were filed by Valley District and Metropolitan on May 29, 2001, and April 18, 2001, respectively.

State Water Contractors' Review. In May 2001, the SWC reviewed and issued a letter supporting the program.

DWR Review. DWR agreed to the program in December 2001.

F. San Gabriel Valley Municipal Water District Program

Source of Supply

The San Gabriel Valley Municipal Water District Program allows Metropolitan to exchange supplies to provide additional water for normal and dry year needs. Under this program, Metropolitan delivers supplies to the City of Sierra Madre, a San Gabriel Valley MWD member agency. In exchange for Metropolitan delivering one acre-foot, San Gabriel Valley MWD returns two acre-feet to Metropolitan in the Main San Gabriel Basin, up to 5 TAF. For any exchange amount less than 5 TAF, Metropolitan purchases the balance of the 5 TAF. The program provides increased reliability to Metropolitan by allowing additional water to be delivered to Metropolitan's member agencies Three Valleys MWD and Upper San Gabriel Valley MWD that rely upon the Main San Gabriel Basin for their supplies.

Expected Supply Capability

The average annual supply capability for a single dry year similar to 1977 is a net 2 TAF. For multiple dry years similar to the period 1990-1992, the expected supply capability is 2 TAF.

Rationale for Expected Supply

Historical Record

The San Gabriel Valley Municipal Water District Program began operations in 2013 and is expected to be renewed continually in the future. Since its inception in 2013, the program has completed the exchange of 10 TAF, with a net increase to Metropolitan's supply by an additional 7.3 TAF.

Written Contracts or Other Proof

Metropolitan's dependable annual and dry-year supplies from the San Gabriel Valley Municipal Water District Program are based on Metropolitan Board action and agreement.

2013 San Gabriel Valley MWD Exchange and Purchase Agreement. The agreement between Metropolitan and San Gabriel Valley MWD was executed in September 2013.

2013 Board Approval of the San Gabriel Valley MWD Exchange and Purchase Agreement. In August 2013, Metropolitan's Board authorized entering into the agreement with San Gabriel Valley MWD.

Financing

Metropolitan's O&M budget (referenced above) includes the funds to purchase water.

Federal, State, and Local Permits/Approvals

The Program became effective as of September 2013. An environmental review process supported implementation.

CEQA Compliance. The proposed action involved an exchange and purchase agreement associated with the leasing, licensing, and operating of existing public water conveyance facilities with negligible or no expansion of use and no possibility of significantly impacting the physical environment.

G. Antelope Valley East Kern Water Agency Exchange and Storage Program

Source of Supply

The Antelope Valley East Kern Water Agency (AVEK) Program allows Metropolitan to both exchange and store SWP supplies to provide additional water for normal and dry year needs.

Under this program, AVEK provides Metropolitan its unused SWP supplies. For every two acre-feet provided by AVEK, Metropolitan will return one acre-foot. The exchange program is expected to deliver 30 TAF over ten years, with 10 TAF available in dry years. Metropolitan will also have a storage capability in the groundwater basin, with a capacity of 30 TAF, and a dry year return capability of 10 TAF.

Expected Supply Capability

The average annual supply capability for a single dry year similar to 1977 is 10 TAF for each program. For multiple dry years similar to the period 1990-1992, the expected supply capability is 3 TAF for each program.

Rationale for Expected Supply

Historical Record

The AVEK Program is projected to provide benefits starting as early as 2016.

Written Contracts or Other Proof

Metropolitan's dependable annual and dry-year supplies from the AVEK Exchange and Storage Program are based on Metropolitan Board action and proposed agreement.

2015 Board Approval of the AVEK Exchange and Storage Agreement. In November 2015, Metropolitan's Board authorized entering into the agreement with AVEK.

Financing

Metropolitan's Board authorized up $16.6 million for the program with additional funds, if needed, from Metropolitan's O&M budget (referenced above).

Federal, State, and Local Permits/Approvals

The Program will become effective once the agreement is executed in 2016. An environmental review process supported implementation.

CEQA Compliance. The proposed action involved an exchange and purchase agreement associated with the leasing, licensing, and operating of existing public water conveyance facilities with negligible or no expansion of use and no possibility of significantly impacting the physical environment.

H. Bay-Delta Improvements

Source of Supply

Improving the water supply reliability of the State Water Project (SWP) is a primary focus of Metropolitan's long-term planning efforts. Metropolitan's strategy is to reduce its dependence on SWP supplies during dry years, when risks to the Bay-Delta ecosystem are greatest, and to maximize its deliveries of available SWP water during wetter years to store in surface reservoirs and groundwater basins for later use during droughts and emergencies.

State and federal resource agencies and various environmental and water user entities are currently engaged in the development of the Bay Delta Conservation Plan (BDCP)/California WaterFix, which is aimed at making physical and operational improvements to the SWP system in the Delta necessary to restore and protect ecosystem health, south-of-Delta SWP and CVP water supplies, and water quality. The goal for the 2015 IRP Update for SWP supplies is to manage flow and export regulations in the near term and ultimately to achieve a long-term Bay-Delta solution. This goal involves continued engagement in collaborative science-based approaches to manage regulations in the near-term and continued participation in the long-

term California WaterFix and the California EcoRestore efforts. This approach targets an average of 984 TAF of SWP supplies in the near-term and an increase of 248 TAF to 1.2 MAF of supplies on average starting in 2030 when the long-term Bay-Delta solution is assumed to be in place. A more detailed description of SWP supplies is included in Section 3.2 of the 2015 UWMP, Section 3.2 and Technical Appendix 10 of the 2015 IRP Update.

The SWP conveys water from the western slope of the Sierra Nevada to water users both north and south of the Bay-Delta. Specifically, SWP water is delivered to Metropolitan's service area through a system of reservoirs, the Bay-Delta, pumping plants, and the California Aqueduct. Owned and operated by the California Department of Water Resources (DWR), the SWP provides municipal and agricultural water to 29 State Water Contractors. Annual deliveries for the SWP average about 2.5 MAF. Municipal uses account for about 60 percent of annual deliveries, with the remaining 40 percent going to agriculture.

SWP supplies are estimated using the 2015 SWP Delivery Capability Report distributed by DWR in July 2015. The 2015 Delivery Capability Report presents the current DWR estimate of the amount of water deliveries for current (2015) conditions and conditions 20 years in the future. These estimates incorporate restrictions on SWP and CVP operations in accordance with the biological opinions of the U.S. Fish and Wildlife Service and National Marine Fisheries Service issued on December 15, 2008, and June 4, 2009, respectively. Under the 2015 Delivery Capability Report with existing conveyance and low outflow requirements scenario, the delivery estimates for the SWP for 2020 conditions as percentage of Table A amounts are 12 percent, equivalent to 257 TAF for Metropolitan, under a single dry-year (1977) condition and 51 percent, equivalent to 976 TAF for Metropolitan, under long-term average conditions.

In dry, below-normal conditions, Metropolitan has increased the supplies received from the California Aqueduct by developing flexible Central Valley/SWP storage and transfer programs. Over the last two years under the pumping restrictions of the SWP, Metropolitan has worked collaboratively with the other contractors to develop numerous voluntary Central Valley/SWP storage and transfer programs. The goal of these storage/transfer programs is to develop additional dry-year supplies that can be conveyed through the available Banks pumping capacity to maximize deliveries through the California Aqueduct during dry hydrologic conditions and regulatory restrictions.

The Bay Delta Conservation Plan

The BDCP was prepared through a collaboration of state, federal, and local water agencies, state and federal fish agencies, environmental organizations, and other interested parties. At the outset of the BDCP process, a planning agreement was developed and executed among the participating parties, and a Steering Committee was formed. The BDCP identified a set of conservation measures including water conveyance improvements and restoration actions to contribute to the recovery of endangered and sensitive species and their habitats in California's Sacramento-San Joaquin Delta. The BDCP was formulated to contribute to the state's co-equal goals of water supply reliability and ecosystem restoration.

Lead agencies for the EIR/EIS were the DWR, the USBR, the United States Fish and Wildlife Service, and National Oceanic and Atmospheric Administration's National Marine Fisheries Service, in cooperation with the California DFW, the USEPA, and the United States Army Corps of Engineers. Metropolitan served on the steering committee. DWR and USBR are the lead agencies for the California WaterFix.

In order to select the most appropriate elements of the final conservation plan, the BDCP considered a range of options for accomplishing these goals using information developed as part of an environmental review process. Potential habitat restoration and water supply

conveyance options included in the BDCP were assessed through an Environmental Impact Report (EIR)/Environmental Impact Statement (EIS). The BDCP planning process and the supporting EIR/EIS process are being funded by state and federal water contractors. The First Administrative Draft BDCP was released in March 2012, a Second Administrative Draft BDCP and EIR/EIS was released in March 2012, and the Public Draft BDCP and EIR/EIS was released December 2013. Each of the above draft documents was released to the public. The official public comment draft was released in December 2013.

A new permitting approach and associated new alternatives to the BDCP were announced in April 2015. The California WaterFix and California EcoRestore would be implemented under a different Endangered Species Act permitting process. This would fulfill the requirement of the 2009 Delta Reform Act to contribute toward meeting the coequal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem.

The new water conveyance facilities included in Alternative 4 (the BDCP) would be constructed and operated under the California WaterFix. Proposed changes to the design of the water conveyance facilities reduce the overall environmental/construction impacts to the environment, minimize disruptions to local communities, and increase long term operational and cost benefits. Some of the improvements would include moving the tunnel alignment away from local communities and environmentally sensitive areas. The elimination of pumping plants, reduction of permanent power lines and power use, and the reconfiguration of intake and pumping facilities sediment basins and reconfiguration/relocation of the construction staging sites in the North Delta will lessen construction and longer term operational impacts. If implemented, these would result in reduced environmental and construction impacts and increase improved long-term operational and cost benefits.

The main objective under the EcoRestore Program is to pursue at least 30,000 acres of Delta habitats over the next five years. These restoration programs would include projects and actions that are in compliance with pre-existing regulatory requirements designed to improve the overall health of the Delta. Other priority restoration projects would also be identified by the Delta Conservancy and other local governments. Funding would be provided through multiple sources including state bonds and other state-mandated funds, SWP/CVP contractors funds as part of existing regulatory obligations, and from various local and federal partners.

As part of the new alternatives and the state's proposed project, the regulatory approach to obtaining state and federal endangered species compliance is shifting from the BDCP Habitat Conservation Plan/Natural Community Conservation Plan strategy to an approach that contemplates a Biological Opinion pursuant to Federal ESA Section 7 and a State 2081 Permit. This approach, as well as the proposed revision to the new water facilities and ecosystem restoration actions, are evaluated in the partially Recirculated Draft EIR/EIS released in July 2015. The deadline for comments was October 2015.

The State Water Resources Control Board (SWRCB) is continuing its phased review and update of the 2006 Water Quality Control Plan (WQCP) for the Bay-Delta. The first phase focuses on the southern Delta salinity objectives for the protection of agriculture, San Joaquin River flow objectives for the protection of fish and wildlife, and a program of implementation for achieving those objectives. The second phase considers the comprehensive review of the other elements of the Bay-Delta WQCP, including but not limited to Sacramento River and Delta outflow objectives. Metropolitan has been collaborating with water users and other stakeholders to develop sound science and technical analyses in support of the WQCP review process, including sharing results in technical forums and publishing findings in peer-reviewed scientific journals. Metropolitan has been meeting with Board members and staff to share

findings as new science and analyses are developed and to encourage close coordination between BDCP and WQCP updates.

Rationale for Expected Supply

Implementation Status

Expected supplies are projected in accordance with the approved implementation plan for CALFED's Bay-Delta Program and with the work plans for the Sacramento Valley Water Management Agreement.

Written Contracts or Other Proof

Metropolitan's projected dependable annual and dry-year supplies from planned Bay-Delta improvements are based on Metropolitan Board actions and agreements.

CALFED's Bay-Delta Program.

Bay-Delta Accord approved in December 1994.

Proposition 204 funds approved by voters in November 1996.

Metropolitan policy direction regarding CALFED's Bay-Delta Program adopted in July 1999. This policy direction established water supply goals.

Proposition 13 funds approved by voters in March 2000.

CALFED Framework announced in June 2000.

Final implementation plans for the first phase of CALFED's Bay-Delta Program approved in August 2000, in conjunction with the approval of the Program and conclusion of the environmental review process.

Proposition 50 funds approved by voters in November 2002.

Proposition 1, approved by the voters in 2014, authorized $7.545 billion in general obligation bonds for state water supply infrastructure projects, including surface and groundwater storage, ecosystem and watershed protection and restoration, and drinking water protection.

Annual Federal appropriations.

Metropolitan's Bay-Delta Policies/Agreements.

Execution of Planning Agreement for BDCP (Planning Agreement) approved in October 2006.

Execution of BDCP Cost-Sharing Agreement approved in November 2006.

Delta Action Plan Framework approved in June 2007.

Delta Conveyance Criteria approved in September 2007.

Delta Governance Principles approved in August 2008.

Execution of Initial Funding Agreement approved in December 2008.

Delta Vision Implementation policies approved in January 2009.

Delta-Related Legislation approved in April 2009.

Execution of Amendments to Planning Agreement approved in December 2009.

Execution of Planning Agreement Amendment (additional funds) approved in July 2010.

Execution of Amendment to Memorandum of Agreement approved in August 2011.

Sacramento Valley Water Management Agreement.

Work plans detailing projects that could provide benefits by the 2002 and 2003 water years were developed in October 2001.

Statement of settlement policy principles recommended in December 2001 by negotiators for approval.

Statement of settlement policy principles approved by Metropolitan's Board in January 2002.

A Sacramento Valley Water Management Agreement was signed and approved by settlement parties in December 2002.

Financing

Funding for BDCP would come from federal, state, and local water supplier sources.

The California WaterFix would be paid for by public water agencies that rely on the supplies.

California EcoRestore is a program separate from California WaterFix. The state would pursue at least 30,000 acres of Delta habitat restoration over the next 5 years, pursuant to pre-existing regulatory requirements such as the 2008 and 2009 Biological Opinions and various enhancements to improve the overall health of the Delta ecosystem. Proposition 1 funds and other state public dollars will be directed exclusively for public benefits unassociated with any regulatory compliance responsibilities.

Federal, State, and Local Permits/Approvals

CALFED's Bay-Delta Program.

Programmatic EIR/EIS finalized in July 2000.

Record of Decision issued in August 2000 for the final Programmatic EIR/EIS regarding the CALFED Bay-Delta Program.

Sacramento Valley Water Management Agreement.

Settlement parties approved Sacramento Valley Management Agreement in December 2002.

I. Kern Delta Water Management Program

Source of Supply

In December 1999, Metropolitan advertised a request for proposals for participation in "The California Aqueduct Dry-year Transfer Program." As a result of this request for proposals, four programs, including one from the Kern Delta Water District (Kern Delta), were selected for further consideration. In 2001, Metropolitan entered into Principles of Agreement with Kern Delta for the development of a dry-year supply program. Kern Delta serves 125,000 acres of actively farmed highly productive farmland located in the San Joaquin Valley portion of southern Kern County. Kern Delta has under contract 180 TAF per year of good quality, highly reliable pre-1914 Kern River water and 25.5 TAF per year of SWP Table A contract right (under contract with Kern County Water Agency).

The dry-year supply program between Kern Delta and Metropolitan involves the storage of water with Kern Delta. In years of plentiful supply, the agreement allows Metropolitan to store water in Kern Delta's groundwater basin, either through direct spreading operations or through deliveries to growers in Kern Delta's service area. Metropolitan has the ability to store up to 250 TAF of water. Agreement provisions may allow for storage beyond this amount. When needed, Metropolitan can recover its stored water either through direct pumping of the groundwater or exchange at a rate of 50 TAF per year. The program duration will be from 2002 to 2027 with provisions that allow the water to be withdrawn until 2033.

Expected Supply Capability

The Kern Delta/Metropolitan Program provides Metropolitan with the capacity to store up to 250 TAF of water at any one time. When needed, Metropolitan can recover its stored water either through direct pumping of the groundwater or exchange at a rate of 50 TAF per year.

Rationale for Expected Supply

Implementation Status

Expected supplies are projected in accordance with accepted detailed groundwater modeling that has been accomplished for the program. In addition, the Kern Delta/Metropolitan Water Management Program was operational and accepting water for storage by fall of 2003. By the end of 2015, the program had 119 TAF in its storage account.

Written Contracts or Other Proof

2001 Kern Delta/Metropolitan Principles of Agreement. Principles of agreement were entered into between Kern Delta and Metropolitan in June 2001, covering program costs, operational aspects, and risks/responsibilities.

2002 Kern Delta and Metropolitan Boards of Directors Approval. These actions approved execution of the long-term agreement, which delineates program operations, costs, and risks/responsibilities

Financing

Metropolitan's O&M budget (referenced above) includes payments for the Kern Delta/ Metropolitan Program.

Federal, State, and Local Permits/Approvals

Kern Delta, acting as lead agency under CEQA, has prepared a full EIR. As part of this EIR, Kern Delta published a Notice of Preparation and held meetings with the general public, interested agencies, and resource agencies. In November 2002, the Final EIR was certified by Kern Delta and adopted by Metropolitan.

J. Central Valley / State Water Project Storage and Water Transfers

Source of Supply

Up to 27 MAF of water (80 percent of California's developed water) is delivered for agricultural use every year. Over half of this water is used in the Central Valley; and much of it is delivered by, or adjacent to, SWP and Central Valley Project (CVP) conveyance facilities. This allows for the voluntary transfer of water to many urban areas, including Metropolitan, via the California Aqueduct.

In recent years, a portion of this agricultural water supply has been secured by Metropolitan through mutually beneficial transfer agreements:

The Governor's Water Bank (Bank) in 1991, 1992, 1994, and 2009 secured 75 to 820 TAF per year of water supply. Further, the DWR's Dry Year Water Purchase Program (Purchase Program) in 2001, 2002, and 2003 secured a total of 162 TAF. DWR established and administered the Bank and the Purchase Program by facilitating purchasing water from willing sellers and transferring the water to those with critical needs using the SWP facilities. Sellers, such as farmers and water districts, made water available for the Bank and Purchase Program by fallowing crops, shifting crops, releasing surplus reservoir storage, and by substituting groundwater for surface supplies.

In 2003, Metropolitan secured options to purchase approximately 145 TAF of water from willing sellers in the Sacramento Valley during the irrigation season. Using these options, Metropolitan purchased approximately 125 TAF of water for delivery to the California Aqueduct.

In 2005, Metropolitan, in partnership with three other SWC, secured options to purchase approximately 130 TAF of water from willing sellers in the Sacramento Valley during the irrigation season, of which Metropolitan's share was 113 TAF. Metropolitan also had the right to assume the other SWC options if they chose not to exercise their options. Due to improved hydrologic conditions, Metropolitan and the other SWC did not exercise these options.

In December 2007, Metropolitan entered into a long-term agreement with DWR providing for Metropolitan's participation in the Yuba Dry Year Water Purchase Program between Yuba County Water Agency and DWR that was approved by the SWRCB as part of the Yuba River Accord. This program provides for transfers of water from the Yuba County Water Agency during dry years through the year 2025, and Metropolitan has purchased approximately 165 TAF to date.

In 2008, Metropolitan, in partnership with eight other SWC, purchased approximately 40 TAF of water from willing sellers in the Sacramento Valley during the irrigation season, of which Metropolitan's share was approximately 27 TAF.

In 2009, Metropolitan participated in the Governor's Water Bank, which purchased approximately 74 TAF, of which Metropolitan's share was approximately 36.9 TAF.

In 2010, Metropolitan in partnership with three other SWC, secured approximately 100 TAF of water from willing sellers in the Sacramento Valley, of which Metropolitan's share was approximately 88 TAF.

In 2010, Metropolitan purchased approximately 18 TAF of water from CVP Contractors located in the San Joaquin Valley. In addition, Metropolitan entered into an unbalanced exchange agreement that resulted in Metropolitan receiving approximately 37 TAF.

In 2015, Metropolitan, in partnership with eight other SWC, secured approximately 20 TAF of water from willing sellers in the Sacramento Valley, of which Metropolitan's share was approximately 12 TAF.

In addition, Metropolitan has secured water transfer supplies under the Multi-Year Water Pool Demonstration Program. In 2013 and 2015, Metropolitan secured 30 TAF and 1.3 TAF, respectively. Unlike the other transfer programs discussed herein, which were derived from agricultural sellers, a portion of these transfer supplies came from urban sellers.

Expected Supply Capability

Metropolitan's recent water transfer activities demonstrate Metropolitan's ability to develop and negotiate water transfer agreements working either directly with the agricultural districts that are selling the water or with DWR acting as an intermediary via a Drought Water Bank. As discussed in the SWP section of this 2015 UWMP, significant restrictions on SWP and Central Valley Project (CVP) Delta pumping required by the biological opinions issued by the U.S. Fish and Wildlife Service (December 2008) and National Marine Fisheries Service (June 2009) will reduce anticipated SWP deliveries and therefore increase Metropolitan's need for Central Valley water transfer supplies. Unfortunately, these biological opinions result in SWP deliveries being shifted to the summer months thereby restricting the ability to pump water transfer supplies through the Delta pumping plants. On average, in dry years when Delta pumping capacity is available, Metropolitan expects to be able to purchase 125 TAF for delivery via the California Aqueduct.

Rationale for Expected Supply

Historical Record

Metropolitan has made rapid progress in developing SWP transfer programs. This progress may be attributed to several factors, including Metropolitan dedicating additional staff to identify, develop, and implement SWP transfer programs; increased willingness of Central Valley agricultural interests to enter into transfer programs with Metropolitan; and Metropolitan staff's ability to work with DWR and USBR staff to facilitate SWP storage and transfer programs. The availability of dry year supplies has been demonstrated by the annual water purchase programs described above. In addition, Metropolitan participates in longer-term programs to secure water like the Yuba Accord and the Multi-Year Water Pool Demonstration Program.

The historical record for purchases from the Bank, Purchase Program, Metropolitan-initiated Central Valley programs, Yuba Accord, and Multi-Year Demonstration Program, as well as the number of sellers and buyers participating in these Programs, are strong indicators that there are significant amounts of water that can be purchased through spot market or long-term water transfers during dry years. This historical record is summarized in Table A.3-1 below.

Approximately 20 percent of these north of the Delta water transfers are dedicated to improving Delta water quality to comply with regulations governing Delta pumping.

Written Contracts or Other Proof

With near record-low precipitation in California in recent years, Governor Edmund G. Brown Jr. issued several executive orders to expedite processing of water transfers within the state:

Executive Order B-21-13 (May 20, 2013): The Department of Water Resources and the State Water Resources Control Board are to "take immediate action to address the dry conditions and water delivery limitations by doing the following: … (1) Expedite processing of one-year water transfers for 2013 and assist water transfer proponents and suppliers as necessary, provided that the transfers will not harm other legal users of water and will not unreasonably affect fish, wildlife, or other in-stream beneficial uses; (2) The SWRCB shall expedite review and processing of water transfer petitions in accordance with the applicable provisions of the Water Code; (3) The DWR shall expedite and facilitate water transfer proposals in accordance with applicable provisions of the Water Code..."

January 1, 2014 Drought Proclamation: "The Department of Water Resources and the State Water Resources Control Board will expedite the processing of water transfers, as called for in Executive Order B-21-13. Voluntary water transfers from one water right holder to another enables water to flow where it is needed most."

April 25, 2014 Drought Proclamation: "The Department of Water Resources and the State Water Resources Control Board will immediately and expeditiously process requests to move water to areas of need, including requests involving voluntary water transfers, forbearance agreements, water exchanges, or other means. If necessary, the Department will request that the Water Board consider changes to water right permits to enable such voluntary movements of water."

Executive Order B-29-15 (April 1, 2015): "The Department shall immediately consider voluntary crop idling water transfer and water exchange proposals of one year or less in duration that are initiated by local public agencies and approved in 2015 by the Department subject to the criteria set forth in Water Code section 1810." [This executive order incorporated by reference the previous drought proclamations.]

Table A.3-1
Historical Record of MWD Central Valley Water Transfers

Program	Purchases (AF per year)		Participants	
	Total	Metropolitan	Sellers	Buyers
1991 Governor's Water Bank	820,000	215,000	351	13
1992 Governor's Water Bank	193,246	10,000	18	16
1994 Governor's Water Bank	220,000	100	6	15
2001 Dry-Year Purchase Program	138,806	80,000	9	8
2003 MWD Water Transfer Program	146,230[1]	126,230	11	1
2005 SWC Water Transfer Program	127,275[2]	0	3	4
2008 SWC Water Transfer Program	39,152	26,621	4	8
2009 Governor's Water Bank	47,505	36,900	10	9
2010 SWC Water Transfer Program	98,959	88,159	11	4
2013 Multi-Year Water Pool Demo	92,232	30,000	4	9
2015 Multi-Year Water Pool Demo	3,000	1,374	1	14
2015 SWC Water Transfer Program	19,686	12,358	5	9

[1] Quantities denote options Metropolitan secured, of which 20,000 AF were not exercised due to improved hydrologic conditions.
[2] Quantities denote options Metropolitan secured, but not exercised due to improved hydrologic conditions.

Agreements Between Sellers and Buyers. Since 1991, Metropolitan has entered into Central Valley water transfer agreements in eleven years with sellers, or DWR acting in an intermediary capacity for the Drought Water Banks. The essential terms and conditions for negotiating purchases, including maximum offering price, quantity of water needed, and the timing of delivery, were established in these agreements.

1999 Board Directive. Metropolitan's Board has authorized water transfers in accordance with the Water Surplus and Drought Management Plan (WSDM Plan) adopted in April 1999. The WSDM Plan is a comprehensive policy guideline for managing Metropolitan's water supply during periodic surplus and shortage conditions. During shortage conditions, the plan specifies the type, priority, and timing of drought actions, including the purchase of transfers on the spot market that could be taken in order to prevent or mitigate negative impacts on retail demands.

Financing

Funds for Central Valley water transfers are included in Metropolitan's O&M budget (referenced above).

Federal, State, and Local Permits/Approvals

Environmental documentation for the Drought Water Banks. In November 1993, DWR prepared and finalized a programmatic EIR for the operation of the drought water banks during future

drought events. In 2009, an emergency CEQA exemption was issued to support the Drought Water Bank.

Individual CEQA and NEPA documents for Metropolitan's 2003, 2005, and 2008 Central Valley water transfer programs. Individual sellers prepared CEQA documentation to support their transfers. In addition, the USBR prepared NEPA documentation for those transfers requiring federal approval.

K. Yuba Accord Dry Year Purchase Program

Source of Supply

As part of a comprehensive settlement of a State Water Resources Control Board (SWRCB) proceeding in which the Yuba County Water Agency (YCWA) is required to increase Yuba River fishery flows, referred to as the "Yuba River Accord" (Accord), YCWA reached agreement with DWR and USBR to sell a portion of the water it would be required to release, plus additional water made available by reoperation of YCWA's storage reservoirs and groundwater substitution. DWR entered into a purchase agreement with YCWA under which one-half of the water available for purchase would be available to SWP contractors that elected to participate in the purchase program.

Under this 25-year program, the price for water is set by the agreement between DWR and the YCWA. There are four categories of water sold, and the price for each type of water depends on hydrology.

Expected Supply Capability

Metropolitan's share of the water made available under the Yuba Accord Dry Year Purchase Program is approximately 25 percent. Should other participating contractors decline to purchase their respective shares, that water is allocated to the remaining interested participating contractors. Metropolitan's likely share of assured YCWA transfer water would be at least 13,750 AF in dry years and up to 35,000 AF or more in other years. These volumes are as provided by YCWA north-of-the-Delta and are subject to conveyance losses through the Delta to the Banks Pumping Plant (approximately 20 percent).

Rationale for Expected Supply

Historical Record

Actual volumes purchased by Metropolitan during the eight years of this program were as follows:

Year	Purchased Volume (AF)
2008	26,430
2009	42,915
2010	67,068
2011	0
2012	0
2013	14,548
2014	10,962
2015	8,192

Written Contracts or Other Proof

DWR-YCWA Purchase Agreement. This December 4, 2007, agreement provides the annual determination of the amount of water to be made available by YCWA and purchased by DWR. The agreement also specifies the costs of various categories of water to be made available under a variety of hydrologic conditions.

DWR-Metropolitan Participation Agreement. This December 21, 2007, agreement provides Metropolitan's election to purchase water made available by YCWA to DWR and the scheduling delivery of the purchased water. The agreement provides for mechanisms for Metropolitan payments to DWR that are due to YCWA under the DWR-YCWA Purchase Agreement.

Amended DWR-Metropolitan Participation Agreement. This December 5, 2014, amendment established prices for surface water transfer supplies between 2016 and 2020 and clarifies YCWA's rights to sell to third parties.

Financing

Funds for purchases of water from the Yuba Accord Dry Year Purchase Program are included in Metropolitan's O&M budget (referenced above).

Federal, State, and Local Permits/Approvals

SWRCB Order WR 2008-0014. Approval of YCWA's petition to modify revised Water Right Decision 1644 related to Water Right Permits 15026, 15027, and 15030 (Applications 5632, 15204, and 15574), and petition for long-term transfer of up to 200,000 AF of water per year from YCWA to the DWR and the USBR under Permit 15026 (Application 5632) - Lower Yuba River in Yuba County.

A.3.3 In-Basin Storage and Supplies

A. Surface Storage

Source of Supply

Surface storage is a critical element of Southern California's water resources strategy. Because California experiences dramatic swings in weather and hydrology, surface storage is important to regulate those swings and mitigate possible supply shortages. Surface storage provides a means of storing water during normal and wet years for later use during dry years, when imported supplies are limited. Since the early twentieth century, DWR and Metropolitan have constructed surface water reservoirs to meet emergency, drought/seasonal, and regulatory water needs for Southern California. These reservoirs include Pyramid Lake, Castaic Lake, Elderberry Forebay, Silverwood Lake, Lake Perris, Lake Skinner, Lake Mathews, Live Oak Reservoir, Garvey Reservoir, Palos Verdes Reservoir, Orange County Reservoir, and Metropolitan's DVL. Some reservoirs such as Live Oak Reservoir, Garvey Reservoir, Palos Verdes Reservoir, and Orange County Reservoir, which have a total combined capacity of about 3,500 AF, are used solely for regulating purposes. The remaining surface reservoirs are primarily used to meet emergency, drought, and seasonal requirements. The total gross storage capacity for these larger remaining reservoirs is 1,768,100 AF. However, not all of the gross storage capacity is available to Metropolitan; dead storage and storage allocated to others reduce the amount of storage that is available to Metropolitan to 1,669,100 AF.

Expected Supply Capability

Surface storage reservoirs are an important tool that allows Metropolitan to meet the water needs of its service area. As discussed in the EIR for the Eastside Reservoir (DVL) Project dated October 1991 and Metropolitan's IRP, the allocation of available surface storage can be divided into two primary components: emergency and drought/seasonal. As specified by Metropolitan's Board of Directors in the Final EIR for DVL, "Metropolitan shall maintain sufficient water reserves within its service area to supplement local production during an emergency or severe water shortage." With DVL in operation, Metropolitan can now re-operate the surface reservoirs and meet the Board's stated objectives.

Updated Emergency Storage Requirements: Metropolitan's criteria for determining emergency storage requirements, which were approved by Metropolitan's Board, were established in the Final EIR for DVL and further discussed in the IRP. Emergency Storage requirements are based on the potential for a major earthquake to damage the CRA, LAA, and both branches of the California Aqueduct that could force the aqueducts out of service for six months. During this period, a mandatory reduction in water use of 25 percent from normal-year demand levels would be instituted, water stored in surface reservoirs and groundwater basins under Metropolitan's interruptible program would be made available, and full local groundwater production would be sustained.

The storage reserved in system reservoirs for emergency purposes is shown in Table A.3-2.

Updated Storage Requirements for Dry-Year Supply and Seasonal Needs: Storage capacity in system reservoirs, including DVL, is also earmarked for dry-year supply and system regulation purposes. Dry-year supply storage within Metropolitan's service area is required to meet the additional water demands that occur during single-year and extended droughts. As specified in the Final EIR for DVL and further discussed in the IRP, this storage requirement is defined as the difference between average-year demand and above average demand during dry years. In addition to dry-year storage, seasonal storage is required to meet seasonal peak demands, which are defined as the difference between average winter demands and average summer demands. The dry-year supply and seasonal storage also provides sufficient reserves to permit approximately five percent downtime for rehabilitation, repair, and maintenance of raw water transmission facilities.

Table A.3-2
Surface Storage Utilization
(acre-feet per year)

Forecast Year	2020	2025	2030	2035	2040
MWD Dry-Year/Seasonal Surface Storage					
DVL, Mathews, Skinner	720,000	720,000	720,000	720,000	720,000
Flexible Storage in Castaic & Perris	219,000	219,000	219,000	219,000	219,000
Subtotal of Dry-Year/Seasonal Storage	***939,000***	***939,000***	***939,000***	***939,000***	***939,000***
MWD Emergency Storage					
DVL, Mathews, Skinner	312,000	312,000	312,000	312,000	312,000
Emergency Storage in DWR Reservoirs	334,000	334,000	334,000	334,000	334,000
Subtotal of Emergency Storage	***646,000***	***646,000***	***646,000***	***646,000***	***646,000***
Total MWD Surface Storage	**1,585,000**	**1,585,000**	**1,585,000**	**1,585,000**	**1,585,000**

Historical Record

Metropolitan has a contract with the DWR that allows use of its terminal reservoirs, such as Castaic Lake on the West Branch and Lake Perris on the East Branch of the California Aqueduct (see Section A.3.3.B for a discussion of Metropolitan's contractual rights to storage in these DWR reservoirs). In addition, Metropolitan owns and operates surface reservoirs such as Lake Skinner, Lake Mathews, and DVL to enhance water supply reliability for its member agencies.

Written Contracts or Other Proof of Usage

The surface reservoirs used by Metropolitan are available either by contract (in the case of the DWR terminal reservoirs) or by construction of its own facilities. The following historical record is provided:

November 1960 Contract between the State of California Department of Water Resources and the Metropolitan Water District of Southern California for a Water Supply. This Contract and its numerous amendments describe Metropolitan's legal access to and obligations for the operation of the SWP for the benefit of its Contractors. Metropolitan has an entitlement to 1,911,500 AF of water each year subject to availability. The terms of this Contract describe Metropolitan's rights to and obligations for the terminal surface reservoirs for water supply purposes.

November 1974 Memorandum of Understanding and Agreement on Operation of Lake Skinner. This MOU and the January 2005 Amendment, signed by Metropolitan and other affected parties, govern Metropolitan's operations of Lake Skinner in Riverside County. The DWR Division of Safety and Dams also reviews monitoring data on the safety of the dam annually.

November 1994 Memorandum of Understanding on Operation of Domenigoni Valley Reservoir (now known as Diamond Valley Lake). This MOU, signed by Metropolitan and other affected parties, governs Metropolitan's operations of DVL in Riverside County. The DWR Division of Safety and Dams also reviews monitoring data on the safety of the dam annually.

Elderberry Forebay Contract for Conditions for Use. Conditions for use of storage are described in the contract between the DWR, State of California, and the Department of Water and Power, City of Los Angeles, for Cooperative Development, West Branch, California Aqueduct; Amendment No. 1, July 3, 1969; and Amendment No. 4, June 27, 1985.

June 2002 Division of Safety of Dams Certificate of Approval. The DWR, Division of Safety of Dams issued the Certificate of Approval for operation of DVL in early 2000, with three conditions. These conditions were: (1) Satisfactory operation of the butterfly valves and emergency gate in the inlet/outlet tower, (2) completion of the Tank Saddle Cutoff remediation, and (3) completion of the Signal Spillway. Metropolitan completed these conditions in 2001, and DVL is currently operational in accordance with the Certificate of Approval.

October 1991 Final EIR for the Eastside Reservoir Project (DVL). The EIR established criteria for integrating the operations of Metropolitan's reservoirs and DWR's southern reservoirs for emergency purposes. These criteria also provided that Metropolitan reservoirs could be expected to withdraw all drought storage water within a two-year period.

B. Flexible Storage Use of Castaic Lake and Lake Perris

Source of Storage

Metropolitan's flexible storage accounts in Castaic Lake and Lake Perris, which are SWP reservoirs, is 153,940 AF and 65,000 AF, respectively. These accounts provide Metropolitan with dry-year supply that is independent of the Table A allocation. Metropolitan can withdraw water from these reservoirs in addition to its allocated supply in any year on an as-needed basis. Withdrawn water must be replaced from supplies available to Metropolitan within five years of each withdrawal. This "flexible storage" is available in Castaic Lake to Metropolitan, Ventura County Flood Control and Water Conservation District, and to the Castaic Lake Water Agency. It is available in Lake Perris to Metropolitan only.

Expected Supply Capability

The dry year supply available to Metropolitan from the flexible storage use of Castaic Lake and Lake Perris totals 218,940 AF, made up of 153,940 AF in Castaic Lake and 65,000 AF in Lake Perris. Table A.3-3 shows the use of this available supply in accordance with Metropolitan's operating criteria.

In 2005, seismic concerns arose regarding the Lake Perris Dam. In response, DWR plans to reduce the storage amount at Lake Perris by half until those concerns can be studied and addressed. In the long-term, the reduction in storage may potentially impact the amount of flexible storage available to Metropolitan from Lake Perris, and also impact the total amount of emergency storage available. However, since 2005, Metropolitan has continued to withdraw and replace water from the reservoir, which is operating at a lower level. In November 2011, DWR issued a Final EIR for the repair of the Dam. Construction began in August 2014 and is anticipated to continue through 2017.

Table A.3-3
Estimated Water Supplies Available for Metropolitan's Use
Under the Flexible Storage Use of
Castaic Lake and Lake Perris *
(TAF per year)

Year	Multiple Dry-Years (1990-1992)	Single Dry Year (1997)
2020	73	219
2025	73	219
2030	73	219
2035	73	219
2040	73	219

* Source: Metropolitan's operating criteria.

Rationale for Expected Supply

Implementation Status
Express provisions related to flexible storage have been incorporated in Metropolitan's SWP contract since 1995. The operating options have been available for use since that time and will continue to be in effect indefinitely as a part of the SWP contracts.

Historical Record
Metropolitan has exercised the flexible storage provision on numerous occasions through and including calendar year 2014. Its use is based on existing contract provisions.

DWR Bulletin 132-94. The use of Castaic Lake and Lake Perris is determined in accordance with the proportionate use factors from Bulletin 132-94, Table B, upon which capital cost repayment obligations are based. Based on its capital repayment obligations, Metropolitan's proportionate use of Castaic Lake is 96.2 percent and of Lake Perris is 100 percent. Per its SWP contract, Metropolitan has express rights to use certain portions of the SWP southern reservoirs independently of DWR to supply water in amounts in addition to approved SWP deliveries.

Metropolitan's SWP Contract. Metropolitan's SWP contract was amended in 1995 to include Article 54, "Usage of Lakes Castaic and Perris." This article provides flexible storage to contractors participating in repayment of the capital costs of Castaic Lake and Lake Perris. Each contractor shall be permitted to withdraw up to a Maximum Allocation from Castaic Lake and Lake Perris. These contractors may withdraw a collective Maximum Allocation up to 160 TAF in Castaic Lake and 65 TAF in Lake Perris, which shall be apportioned among them pursuant to the respective proportionate use factors, as shown in Table A.3-4 below.

Financing

The cost associated with the withdrawal and replacement of water in the flexible storage is included in Metropolitan's annual payments under the State Water Contract.

Federal, State, and Local Permits/Approvals

The flexible storage provision became effective in 1995. DWR has the approval authority to affect changes in the operations and usage of existing SWP facilities, including Castaic Lake and Lake Perris.

Table A.3-4
Flexible Storage Allocations

Participating Contractor	Proportionate Use Factor	Maximum Flexible Storage Allocation (AF)
Castaic Lake		
Metropolitan	.96212388	153,940
Ventura County Flood Control and Water Conservation District	.00860328	1,376
Castaic Lake Water Agency	.02927284	4,684
Total Castaic Lake	1.00000000	160,000
Lake Perris[1]	1.00000000	65,000
Metropolitan		

[1] The 2003 Exchange Agreement among Metropolitan, CVWD, and DWA, among other things, transferred to CVWD and DWA a portion of Metropolitan's capacity in the California Aqueduct and the East Branch including Lake Perris. However, Metropolitan's rights to the full 65,000 AF of Lake Perris flexible storage account was retained by Metropolitan.

C. Metropolitan Surface Reservoirs

Source of Supply

Storage capacity in Metropolitan reservoirs, including Lake Skinner, Lake Mathews, Live Oak Reservoir, Garvey Reservoir, Palos Verdes Reservoir, Orange County Reservoir, and DVL, is earmarked to meet emergency, dry-year/seasonal, and system regulation needs, as these have been defined above.

Expected Supply Capability

The total available storage capacity for all Metropolitan-controlled surface reservoirs (Metropolitan-owned and DWR terminal reservoirs) is 1,585,300 AF. As discussed earlier, approximately 650 TAF has been set aside to meet the emergency storage requirements of the service area. After accounting for emergency storage, the surface storage available in Metropolitan-owned reservoirs to meet dry-year/seasonal requirements is presented in Table A.3-5.

Rationale for Expected Supply

Program Facilities

Major facilities for Lake Mathews include an earthen dam to impound water and a recently completed new outlet tower. Major facilities for Lake Skinner include an earthen dam to impound water, an outlet tower, an inlet from the San Diego Canal to deliver water into the reservoir, a water treatment filtration facility, and recreational facilities consisting of a marina, parks, swimming areas, golf course, and hiking trails. Major facilities at DVL include three earthen dams to impound water, an inlet/outlet tower, a secondary inlet from the Inland Feeder, a large pumping station to deliver water into the reservoir, and power generating facilities. Recreational facilities consisting of a marina, parks, swimming areas, golf course, hiking trails, equestrian trails, and lodging are planned.

Historical Record

The DVL has been operational for more than 15 years. Lake Mathews and Lake Skinner have been in service for over 30 years.

November 1974 Memorandum of Understanding and Agreement on Operation of Lake Skinner. This MOU and the January 2005 Amendment, signed by Metropolitan and other affected parties, govern Metropolitan's operations of Lake Skinner in Riverside County. The DWR Division of Safety and Dams also reviews monitoring data on the safety of the dam annually.

October 1991 Final EIR for the Eastside Reservoir Project (DVL). The EIR established criteria for integrating the operations of Metropolitan's reservoirs and DWR's southern reservoirs for emergency purposes. These criteria also provided that Metropolitan reservoirs could be expected to withdraw all drought storage water within a two-year period.

November 1994 Memorandum of Understanding on Operation of Domenigoni Valley Reservoir (now known as Diamond Valley Lake). This MOU, signed by Metropolitan and other affected parties, governs Metropolitan's operations of DVL in Riverside County. The DWR Division of Safety and Dams also reviews monitoring data on the safety of the dam annually.

June 2002 Division of Safety of Dams Certificate of Approval. The DWR, Division of Safety of Dams issued the Certificate of Approval for operation of DVL in early 2000, with three conditions. These conditions were: (1) satisfactory operation of the butterfly valves and emergency gate in the inlet/outlet tower, (2) completion of the Tank Saddle Cutoff remediation, and (3) completion of the Signal Spillway. Metropolitan completed these conditions in 2001, and DVL is currently operational in accordance with the Certificate of Approval.

Table A.3-5
Estimated Supplies Available from Metropolitan's Surface Storage
Program Capabilities
(acre-feet per year)

Forecast Year	Multiple Dry Years (1990-92)	Single Dry Year (1977)
2020	189,000	566,000
2025	211,000	634,000
2030	234,000	702,000
2035	262,000	788,000
2040	271,000	814,000

Source: Metropolitan analysis

Financing

The capital cost of DVL, Lake Mathews, and Lake Skinner was financed by a combination of revenue bonds and operating revenues. Annual operating costs, including maintenance and pumping, are included in Metropolitan's annual O&M budget (referenced above).

Federal, State, and Local Permits/Approvals

All necessary permits have been obtained. A permit to generate and sell power has been acquired from the Federal Energy Regulatory Commission. No further regulatory permits are required.

D. Groundwater Conjunctive Use Programs

Source of Supply

Metropolitan's IRP established the strategy to store imported water that is most available during wet years in surface reservoirs or groundwater aquifers for later use during droughts and emergencies. In this way, Metropolitan can reduce its reliance on direct deliveries from the SWP and the Colorado River during dry years when competing demands by other users and risks to the watershed ecosystems are greatest.

Groundwater basins in Metropolitan's service area have potential to store more than 4.0 MAF of additional water supplies following depletions that have occurred since 2008 due to continuing extreme dry weather. In 2000, the Association of Ground Water Agencies (AGWA) published "Groundwater and Surface Water in Southern California: A Guide to Conjunctive Use," which estimated a substantial potential for developing dry-year or long term conjunctive use within Metropolitan's service area. In 2007, Metropolitan published the Groundwater Assessment Study which estimated 3.2 MAF of space in groundwater basins available for storage. Based on these studies and recent updates, Metropolitan has implemented a conjunctive use program for imported water storage in groundwater basins within the service area. Additionally, the 2015 Update of the Integrated Water Resources Plan (2015 IRP Update) identified policies and strategies for ensuring sustainable groundwater production in light of a potential for extended multiple-year dry conditions.

Rationale for Expected Supply

Implementation Status:

The status of implementation for the groundwater conjunctive use programs has been described in the body of this report.

Historical Record

The Main San Gabriel Cyclic Storage Agreements. The cyclic agreements allow supplemental imported water to be delivered to the basin in advance of requirement to support groundwater production. This added flexibility allows scheduling to balance imported water supply availability and delivery capacity with available local conveyance and spreading capacity.

The Cyclic Storage Agreement with Upper San Gabriel Valley MWD allows pre-delivery and storage of up to 100 TAF of imported water. The agreement was originally signed in 1975 for a term of five years and has been extended in five year increments through November 2018. The Cyclic Storage Agreement with Three Valleys MWD allows for pre-delivery and storage of up to 40 TAF. This agreement was originally signed in 1991 for a term of five years and has been extended in five year increments. This agreement is currently extended until November 2018. Both agreements are expected to be renewed repeatedly in the future.

Written Contracts or Other Proof

Metropolitan's dry-year supply from the groundwater conjunctive use programs is based on Metropolitan's Board actions and agreements.

Proposition 13 Groundwater Conjunctive Use Programs.

AGWA published "Groundwater and Surface Water in Southern California: A Guide to Conjunctive Use" in 2000 identifying the potential storage capacity for groundwater basins.

Metropolitan Water District published the Groundwater Assessment Study Report in 2007 in collaboration with its member agencies and groundwater basin managers documenting existing use and development of groundwater resources in Metropolitan's service area and estimating additional groundwater basin storage potential.

Principles for groundwater storage adopted by the Metropolitan Board in January 2000.

Resolution for Proposition 13 Funds adopted by the Metropolitan Board in October 2000.

Agreement executed with the DWR for Interim Water Supply Construction Grant Commitment Safe Drinking Water, Clean Water, Watershed Protection and Flood Protection (Proposition 13, Chapter 9, Article 4) providing for Metropolitan to administer $45 million in state Proposition 13 grant funds for groundwater reliability programs; October 2000

Agreement executed for Long Beach Conjunctive Use Project, July 2002

Agreement executed for Live Oak Conjunctive Use Project, October 2002

Agreement executed for Foothill Area Groundwater Storage Project, February 2003

Agreement executed for Chino Basin Programs, June 2003

Agreement executed for Orange County Groundwater Storage Program, June 2003

Agreement executed for Compton Conjunctive Use Program, February 2005

Agreement executed for Long Beach Conjunctive Use Project — Expansion in Lakewood, July 2005

Agreement executed for Upper Claremont Basin Groundwater Storage Program, September 2005

Agreement executed for Elsinore Basin Conjunctive Use Program, May 2008

All of these programs have an initial 25-year term, with provision for renewal or extension after that period.

Financing

Financing has been supplied from multiple sources as discussed below:

Financing from Proposition 13 and Additional Groundwater Storage Programs.

Proposition 13 funds ($45 million) were allocated to Metropolitan by the state in May 2000 for the development of local groundwater storage projects.

Metropolitan has executed groundwater storage funding agreements for nine storage programs, expended $45 million of the Proposition 13 funds, and appropriated over $35 million of Metropolitan capital funds for the storage programs in the Orange County and Chino groundwater basins. All nine storage programs have completed facilities and are on-line. Metropolitan has called for production of stored water beginning in 2007.

Table A.3-6 provides details on groundwater storage programs.

Federal, State, and Local Permits/Approvals

Long Beach Conjunctive-use Storage Project. Environmental documentation for the Long Beach Conjunctive-use Storage Project was certified by the City of Long Beach in August 2001.

Live Oak Basin Conjunctive-use Storage Project. Environmental documentation for the Live Oak Basin Conjunctive-use Storage Project was certified by Three Valleys MWD in January 2002.

Foothill Area Groundwater Storage Project. Environmental documentation for the Foothill Area Groundwater Storage Project was certified by Foothill Municipal Water District in January 2003.

Chino Basin Programs Groundwater Storage Project. Environmental documentation for the Chino Basin Programs Groundwater Storage Project was certified by Inland Empire Utility Agency in December 2002.

Long Beach Conjunctive Use Storage Project — Expansion in Lakewood. Environmental documentation for the project was certified by the City of Lakewood in May 2005.

City of Compton Conjunctive Use Program. Environmental documentation for the project was certified by the City of Compton in December 2004.

Orange County Groundwater Conjunctive Use Program. Environmental documentation for the project was certified by Orange County Water District in March 1999 and in July 2002.

Upper Claremont Basin Groundwater Storage Program. Environmental documentation for the project was certified by Three Valleys MWD in July 2005.

Elsinore Basin Conjunctive Use Program. Environmental documentation for the project was certified by Elsinore Valley MWD in February 2004.

E. Program under Development

Regional Recycled Water Supply Program: Metropolitan is exploring the potential development of a regional recycled water program in partnership with the Sanitation Districts of Los Angeles County. This program would purify and reuse water for the recharge of groundwater basins and augment water supplies within the Southern California region.

F. IRP Development Targets

Colorado River: The 2015 IRP Update calls for developing sufficient base supply programs to ensure that a minimum of 900 TAF of diversions are available when needed and to ensure access to 1.2 MAF of supplies in dry years through flexible programs and storage. This will require an approach that maintains existing base supply availability, minimizes reductions in base supplies from risks and challenges, and augments base supply amounts to increase resilience to any reductions that may occur.

State Water Project: The 2015 IRP Update goal for SWP supplies is to adaptively manage flow and export regulations in the near term and to achieve a long-term Delta solution that addresses ecosystem and water reliability challenges. The goal for SWP supplies in the 2015 IRP Update is an average of 984 TAF of SWP supplies in the near-term and 1.2 MAF on average starting in 2030 when a long-term Delta solution is estimated to be in place. The increase in supply due to Delta improvements is reflected in Table A.3-7 as a program under development for the California Aqueduct.

Conservation and Local Supplies: The 2015 IRP Update identifies that approximately 200 TAF of new local supply and water conservation is needed, in conjunction with stabilizing, protecting, and restoring the region's imported supplies. The approach for water conservation is targeting water-use reductions through aggressive implementation of the state's Model Water Efficient Landscape Ordinance standards. The water conservation approach, if successful, will result in approximately 180 TAF of new water conservation savings. The approach for local supplies is to develop the remaining 20 TAF of additional need through recycling, groundwater recovery, and seawater desalination. These 2015 IRP Update development targets are reflected in Table A.3-7 as programs under development for In-Region Storage and Programs.

Table A.3-6
Metropolitan's In-Region Groundwater Storage Programs

Program	Metropolitan Agreement Partners	Program Term	Max Storage AF	Dry-Year Yield AF/Yr
Long Beach Conjunctive Use Storage Project (Central Basin)	Long Beach	June 2002-2027	13,000	4,300
Foothill Area Groundwater Storage Program (Monkhill/ Raymond Basin)	Foothill MWD	February 2003-2028	9,000	3,000
Orange County Groundwater Conjunctive Use Program	MWDOC OCWD	June 2003-2028	66,000+	22,000
Chino Basin Conjunctive Use Programs	IEUA TVMWD Watermaster	June 2003-2028	100,000	33,000
Live Oak Basin Conjunctive Use Project (Six Basins)	TVMWD City of La Verne	October 2002-2027	3,000	1,000
City of Compton Conjunctive Use Project (Central Basin)	Compton	February 2005-2030	2,289	763
Long Beach Conjunctive Use Program Expansion in Lakewood (Central Basin)	Long Beach	July 2005-2030	3,600	1,200
Upper Claremont Basin Groundwater Storage Program (Six Basins)	TVMWD	Sept. 2005- 2030	3,000	1,000
Elsinore Basin Conjunctive Use Storage Program	Western MWD Elsinore Valley MWD	May 2008- 2033	12,000	4,000
TOTAL			**211,889**	**70,263**

Table A.3-7
Colorado River Aqueduct
Program Capabilities
Year 2020
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
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)	0	0	17,000
PVID Land Management, Crop Rotation, and Water Supply Program	130,000	130,000	130,000
Lower Colorado Water Supply Project	8,000	8,000	8,000
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	(37,000)	(26,000)	(99,000)
DWCV SWP Table A Transfer Callback	19,000	13,000	51,000
DWCV Advance Delivery Account	18,000	13,000	48,000
SNWA Agreement Payback	0	0	0
Subtotal of Current Programs	***1,144,000***	***1,160,000***	***1,177,000***
Programs Under Development			
SNWA Interstate Banking Agreement	75,000	150,000	0
Additional Fallowing Programs	5,000	5,000	5,000
Subtotal of Proposed Programs	***80,000***	***155,000***	***5,000***
Additional Non-Metropolitan CRA Supplies			
SDCWA/IID Transfer	161,000	193,000	193,000
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	***259,000***	***291,000***	***291,000***
Maximum CRA Supply Capability[2]	**1,483,000**	**1,606,000**	**1,473,000**
Less CRA Capacity Constraint (amount above 1.20 MAF)	*(233,000)*	*(356,000)*	*(223,000)*
Maximum Expected CRA Deliveries[3]	**1,200,000**	**1,200,000**	**1,200,000**
Less Non-Metropolitan Supplies[4]	*(259,000)*	*(291,000)*	*(291,000)*
Maximum Metropolitan Supply Capability[5]	**941,000**	**909,000**	**909,000**

[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 CRA 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.

Table A.3-7
Colorado River Aqueduct
Program Capabilities
Year 2025
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
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	31,000
PVID Land Management, Crop Rotation, and Water Supply Program	130,000	130,000	130,000
Lower Colorado Water Supply Project	7,000	7,000	7,000
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	(37,000)	(26,000)	(99,000)
DWCV SWP Table A Transfer Callback	19,000	13,000	51,000
DWCV Advance Delivery Account	18,000	13,000	48,000
SNWA Agreement Payback	0	0	0
Subtotal of Current Programs	***1,393,000***	***1,159,000***	***1,190,000***
Programs Under Development			
SNWA Interstate Banking Agreement	50,000	100,000	0
Additional Fallowing Programs	25,000	25,000	25,000
Subtotal of Proposed Programs	***75,000***	***125,000***	***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]	**1,766,000**	**1,582,000**	**1,513,000**
Less CRA Capacity Constraint (amount above 1.20 MAF)	*(516,000)*	*(332,000)*	*(263,000)*
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 CRA 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.

Table A.3-7
Colorado River Aqueduct
Program Capabilities
Year 2030
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
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	28,000
PVID Land Management, Crop Rotation, and Water Supply Program	130,000	130,000	130,000
Lower Colorado Water Supply Project	6,000	6,000	6,000
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	0
Subtotal of Current Programs	***1,392,000***	***1,158,000***	***1,186,000***
Programs Under Development			
SNWA Interstate Banking Agreement	25,000	50,000	0
Additional Fallowing Programs	25,000	25,000	25,000
Subtotal of Proposed Programs	***50,000***	***75,000***	***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]	**1,740,000**	**1,531,000**	**1,509,000**
Less CRA Capacity Constraint (amount above 1.20 MAF)	*(490,000)*	*(281,000)*	*(259,000)*
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 CRA 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.

Table A.3-7
Colorado River Aqueduct
Program Capabilities
Year 2035
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
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 CRA 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.

Table A.3-7
Colorado River Aqueduct
Program Capabilities
Year 2040
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
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)	167,000	0	16,000
PVID Land Management, Crop Rotation, and Water Supply Program	130,000	130,000	130,000
Lower Colorado Water Supply Project	4,000	4,000	4,000
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	(10,000)
Subtotal of Current Programs	***1,307,000***	***1,156,000***	***1,162,000***
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]	**1,630,000**	**1,479,000**	**1,485,000**
Less CRA Capacity Constraint (amount above 1.20 MAF)	*(380,000)*	*(229,000)*	*(235,000)*
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 CRA 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.
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Table A.3-7
California Aqueduct
Program Capabilities
Year 2020
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
MWD Table A	362,000	257,000	976,000
DWCV Table A	37,000	26,000	99,000
San Luis Carryover [1]	57,000	172,000	172,000
Article 21 Supplies	0	0	8,000
San Bernardino Valley MWD Minimum Purchase	0	0	20,000
San Bernardino Valley MWD Option Purchase	0	0	11,000
San Gabriel Valley MWD Exchange and Purchase	2,000	2,000	2,000
Yuba River Accord Purchase	12,000	14,000	8,000
Central Valley Storage and Transfers			
Semitropic Program	48,000	45,000	65,000
Arvin Edison Program	49,000	75,000	75,000
Mojave Program	0	0	19,000
Kern Delta Program	47,000	50,000	50,000
Transfers and Exchanges	50,000	50,000	50,000
Subtotal of Current Programs	***664,000***	***691,000***	***1,555,000***
Programs Under Development			
Delta Improvements	0	0	0
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	**671,000**	**711,000**	**1,575,000**

[1] Includes DWCV carryover.

Table A.3-7
California Aqueduct
Program Capabilities
Year 2025
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
MWD Table A	362,000	257,000	976,000
DWCV Table A	37,000	26,000	99,000
San Luis Carryover [1]	64,000	193,000	193,000
Article 21 Supplies	0	0	8,000
San Bernardino Valley MWD Minimum Purchase	0	0	20,000
San Bernardino Valley MWD Option Purchase	0	0	11,000
San Gabriel Valley MWD Exchange and Purchase	2,000	2,000	2,000
Yuba River Accord Purchase	12,000	14,000	8,000
Central Valley Storage and Transfers			
Semitropic Program	48,000	45,000	65,000
Arvin Edison Program	60,000	75,000	75,000
Mojave Storage Program	0	0	19,000
Kern Delta Program	47,000	50,000	50,000
Transfers and Exchanges	50,000	50,000	50,000
Subtotal of Current Programs	***682,000***	***712,000***	***1,576,000***
Programs Under Development			
Delta Improvements	0	0	0
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	**689,000**	**732,000**	**1,596,000**

[1] Includes DWCV carryover.

Table A.3-7
California Aqueduct
Program Capabilities
Year 2030
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
MWD Table A	362,000	257,000	976,000
DWCV Table A	37,000	26,000	99,000
San Luis Carryover [1]	71,000	214,000	214,000
Article 21 Supplies	0	0	8,000
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
Yuba River Accord Purchase	0	0	0
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	***687,000***	***723,000***	***1,606,000***
Programs Under Development			
Delta Improvements	87,000	178,000	248,000
Antelope Valley/East Kern Acquisition and Storage	7,000	20,000	20,000
Subtotal of Proposed Programs	***94,000***	***198,000***	***268,000***
Maximum Supply Capability	**781,000**	**921,000**	**1,874,000**

[1] Includes DWCV carryover.

Table A.3-7
California Aqueduct
Program Capabilities
Year 2035
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
MWD Table A	362,000	257,000	976,000
DWCV Table A	37,000	26,000	99,000
San Luis Carryover [1]	80,000	240,000	240,000
Article 21 Supplies	0	0	8,000
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
Yuba River Accord Purchase	0	0	0
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	***696,000***	***749,000***	***1,632,000***
Programs Under Development			
Delta Improvements	87,000	178,000	248,000
Antelope Valley/East Kern Acquisition and Storage	7,000	20,000	20,000
Subtotal of Proposed Programs	***94,000***	***198,000***	***268,000***
Maximum Supply Capability	**790,000**	**947,000**	**1,900,000**

[1] Includes DWCV carryover.

Table A.3-7
California Aqueduct
Program Capabilities
Year 2040
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
MWD Table A	362,000	257,000	976,000
DWCV Table A	37,000	26,000	99,000
San Luis Carryover [1]	80,000	240,000	240,000
Article 21 Supplies	0	0	8,000
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
Yuba River Accord Purchase	0	0	0
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	***696,000***	***749,000***	***1,632,000***
Programs Under Development			
Delta Improvements	87,000	178,000	248,000
Antelope Valley/East Kern Acquisition and Storage	7,000	20,000	20,000
Subtotal of Proposed Programs	***94,000***	***198,000***	***268,000***
Maximum Supply Capability	**790,000**	**947,000**	**1,900,000**

[1] Includes DWCV carryover.

Table A.3-7
In-Region Storage and Programs
Program Capabilities
Year 2020
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
Metropolitan Surface Storage			
(DVL, Mathews, Skinner)	145,000	434,000	434,000
Flexible Storage in Castaic & Perris	44,000	132,000	132,000
Groundwater Storage			
Conjunctive Use	30,000	68,000	68,000
Cyclic Storage	20,000	59,000	59,000
Subtotal of Current Programs	***239,000***	***693,000***	***693,000***
Programs Under Development			
IRP Development Targets			
Conservation	33,000	40,000	40,000
Local Resources	3,000	3,000	3,000
Subtotal of Proposed Programs	***36,000***	***43,000***	***43,000***
Maximum Supply Capability	**275,000**	**736,000**	**736,000**

Table A.3-7
In-Region Storage and Programs
Program Capabilities
Year 2025
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
Metropolitan Surface Storage			
(DVL, Mathews, Skinner)	162,000	486,000	486,000
Flexible Storage in Castaic & Perris	49,000	148,000	148,000
Groundwater Storage			
Conjunctive Use	37,000	68,000	68,000
Cyclic Storage	24,000	72,000	72,000
Subtotal of Current Programs	***272,000***	***774,000***	***774,000***
Programs Under Development			
IRP Development Targets			
Conservation	66,000	72,000	72,000
Local Resources	7,000	8,000	8,000
Subtotal of Proposed Programs	***73,000***	***80,000***	***80,000***
Maximum Supply Capability	**345,000**	**854,000**	**854,000**

Table A.3-7
In-Region Storage and Programs
Program Capabilities
Year 2030
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
Metropolitan Surface Storage			
(DVL, Mathews, Skinner)	179,000	538,000	538,000
Flexible Storage in Castaic & Perris	55,000	164,000	164,000
Groundwater Storage			
Conjunctive Use	42,000	68,000	68,000
Cyclic Storage	27,000	82,000	82,000
Subtotal of Current Programs	***303,000***	***852,000***	***852,000***
Programs Under Development			
IRP Development Targets			
Conservation	99,000	106,000	106,000
Local Resources	11,000	12,000	12,000
Subtotal of Proposed Programs	***110,000***	***118,000***	***118,000***
Maximum Supply Capability	**413,000**	**970,000**	**970,000**

Table A.3-7
In-Region Storage and Programs
Program Capabilities
Year 2035
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
Metropolitan Surface Storage			
(DVL, Mathews, Skinner)	201,000	604,000	604,000
Flexible Storage in Castaic & Perris	61,000	184,000	184,000
Groundwater Storage			
Conjunctive Use	51,000	68,000	68,000
Cyclic Storage	33,000	100,000	100,000
Subtotal of Current Programs	***346,000***	***956,000***	***956,000***
Programs Under Development			
IRP Development Targets			
Conservation	136,000	144,000	144,000
Local Resources	15,000	16,000	16,000
Subtotal of Proposed Programs	***151,000***	***160,000***	***160,000***
Maximum Supply Capability	**497,000**	**1,116,000**	**1,116,000**

Table A.3-7
In-Region Storage and Programs
Program Capabilities
Year 2040
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2012)
Current Programs			
Metropolitan Surface Storage			
(DVL, Mathews, Skinner)	208,000	624,000	624,000
Flexible Storage in Castaic & Perris	63,000	190,000	190,000
Groundwater Storage			
Conjunctive Use	56,000	68,000	68,000
Cyclic Storage	37,000	110,000	110,000
Subtotal of Current Programs	***364,000***	***992,000***	***992,000***
Programs Under Development			
IRP Development Targets			
Conservation	173,000	180,000	180,000
Local Resources	19,000	20,000	20,000
Subtotal of Proposed Programs	***192,000***	***200,000***	***200,000***
Maximum Supply Capability	**556,000**	**1,192,000**	**1,192,000**

Appendix 4

WATER SUPPLY ALLOCATION PLAN

December 2014

Water Supply Allocation Plan

December 2014 Revision

Metropolitan Water District of Southern California

Inside cover: Photo courtesy of Cora Edmonds/ArtXchange for the Healing Planet

Water Supply Allocation Plan

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List of Tables and Figures

List of Acronyms

AF – Acre-feet
CUP – Groundwater Conjunctive Use Program
CWD – County Water District
DWP – Drought Management Plan
IAWP – Interim Agricultural Water Program Reductions and Rates
IICP – Incremental Interruption and Conservation Plan
IRP – Integrated Resources Plan
GPCD – Gallons per Capita per Day
M&I – Municipal and Industrial
MWD – Municipal Water District
RUWMP – Regional Urban Water Management Plan
SWP – State Water Project
WSAP – Water Supply Allocation Plan
WSDM – Water Surplus and Drought Management

Definitions

Extraordinary Supplies- Deliberate actions taken by member agencies to augment the total regional water supply only when Metropolitan is allocating supplies through the WSAP.

Groundwater Recovery- The extraction and treatment of groundwater making it usable for a variety of applications by removing high levels of chemicals and/or salts.

In-lieu deliveries- Metropolitan-supplied water bought to replace water that would otherwise be pumped from the groundwater basins.

Seawater Barrier- The injection of fresh water into wells along the coast to protect coastal groundwater basins from seawater intrusion. The injected fresh water acts like a wall, blocking seawater that would otherwise seep into groundwater basins as a result of pumping.

Section 1: Introduction

Calendar Year 2007 introduced a number of water supply challenges for the Metropolitan Water District of Southern California (Metropolitan) and its service area. Critically dry conditions affected all of Metropolitan's main supply sources. In addition, a ruling in the Federal Courts in August 2007 provided protective measures for the Delta Smelt in the Sacramento-San Joaquin River Delta which brought uncertainty about future pumping operations from the State Water Project. This uncertainty, along with the impacts of dry conditions, raised the possibility that Metropolitan would not have access to the supplies necessary to meet total firm demands[1] and would have to allocate shortages in supplies to the member agencies.[2]

In preparing for this possibility, Metropolitan staff worked jointly with the member agency managers and staff to develop a Water Supply Allocation Plan (WSAP). The WSAP includes the specific formulas for calculating member agency supply allocations and the key implementation elements needed for administering an allocation should a shortage be declared. The WSAP became the foundation for the urban water shortage contingency analysis required under Water Code Section 10632 and was incorporated into Metropolitan's 2010 Regional Urban Water Management Plan (RUWMP).

Section 2: Development Process

Member Agency Input

Between July 2007 and February 2008, Metropolitan staff worked cooperatively with the member agencies through a series of member agency manager meetings and workgroups to develop a formula and implementation plan to allocate supplies in case of shortage. These workgroups provided an arena for in-depth discussion of the objectives, mechanics, and policy aspects of the different parts of the WSAP. Metropolitan staff also met individually with fifteen member agencies for detailed discussions of the elements of the recommended proposal. Metropolitan introduced the elements of the proposal to many nonmember retail agencies in its service area by providing presentations and feedback to a number of member agency caucuses, working groups, and governing boards. The discussions, suggestions, and comments expressed by the member agencies during this process contributed significantly to the development of this WSAP.

Board of Directors Input

Throughout the development process Metropolitan's Board of Directors was provided with regular progress reports on the status of this WSAP, with oral reports in September, October, and December 2007, an Information Board of Directors Letter with a draft of the WSAP in November 2007, and a Board of Directors Report with staff recommendations in January 2008. Based on Water Planning and Stewardship Committee discussion of the staff recommendations and further review of the report by

[1] Firm demands are also referred to as uninterruptable demands; likewise non-firm demands are also called interruptible demands.

[2] See Appendix A: Metropolitan Member Agencies.

the member agencies, refinements were incorporated into the WSAP for final consideration and action in February 2008. The WSAP was adopted at the February 12, 2008 Board of Directors meeting.[3]

The 12-Month Review Process

When the Board adopted the WSAP in February 2008, the decision specified a formal revisit of the WSAP commencing in February 2010. The scheduled revisit was meant to ensure the opportunity for Metropolitan staff and the member agencies to re-evaluate the WSAP and recommend appropriate changes to the Board of Directors.

In April 2009, the Board voted to implement the WSAP for the first time. The WSAP was implemented at a Level 2 allocation level, and was in effect for the period of July 1, 2009, through June 30, 2010. Since implementation of the 2009/10 WSAP began in July 2009, a number of practical issues relating to the WSAP were identified by staff and the member agencies for further consideration during the 12-Month Review Process. Metropolitan staff engaged with the member agencies in a formal review of the WSAP from January through May 2010. During the review process the member agency managers participated in a series of six workshops. The focus of these workshops was to facilitate in-depth discussion on WSAP-related issues and lessons learned since the WSAP was implemented in July 2009. The proposed adjustments to the WSAP developed during the review process were adopted at the August 17, 2010 Board of Directors meeting[4].

The Three-Year Review Process

The Board action to adopt of the WSAP in February 2008 also directed staff to review the WSAP formula three years after the February 2008 adoption. February 2011 marked the three-year anniversary since the adoption of the WSAP. Similar to the 12-Month Review Process, the purpose of the Three-Year Review Process was to provide an opportunity for Metropolitan staff and the member agencies to re-evaluate the plan and recommend appropriate changes for board consideration.

Metropolitan staff met with the member agencies in a formal review of the WSAP from February through August 2011. Staff and member agency managers participated in a series of eleven workshops. Proposed adjustments to the WSAP developed during the process were adopted at the September 13, 2011 Board of Directors meeting.[5]

[3] A complete listing of member agency meetings and Board of Directors reporting activities is contained in Appendix B: Water Supply Allocation Plan Process Timeline.

[4] A complete listing of member agency meetings and Board of Directors reporting activities is contained in Appendix C: 12-Month Review Process and Results.

[5] A complete listing of member agency meetings and Board of Directors reporting activities is contained in Appendix D: Three-Year Review Process and Results.

2014 Review Process

In 2014, California was challenged with a third year of severe drought.[6] Metropolitan managed its operations through significant use of regional storage reserves. It was anticipated that end of year total dry storage reserves would approach levels similar to those when the WSAP was last implemented in 2009.

Following discussion at the June 2014 Water Planning and Stewardship Committee, Metropolitan staff convened a member agency working group to revisit the WSAP. The purpose of the working group was to collaborate with member agencies to identify potential revisions to the WSAP in preparation for mandatory supply allocations in 2015. There were eight working group meetings and three discussions at the monthly Member Agency Managers' Meetings.

The process focused on three areas of the WSAP: the Base Period, the Allocation Formula, and the Allocation enforcement mechanism. Proposed adjustments to the WSAP developed during the process were adopted at the December 9, 2014 Board of Directors meeting. [7]

[6] The Governor of California proclaimed a State of Emergency due to drought conditions on January 17, 2014 and, on April 24, 2014 issued an Executive Order proclaiming a continued State of Emergency noting drought conditions have persisted for the last three years and authorizing adoption and implementation of emergency regulations.

[7] A complete listing of member agency meetings and Board of Directors reporting activities is contained in Appendix E: 2014 Review Process and Results.

Section 3: Review of Historical Shortage Plans[8]

The WSAP incorporates key features and principles from the following historical shortage allocation plans but will supersede them as the primary and overarching decision tool for water shortage allocation.

Interruptible Water Service Program

As part of the new rate structure implemented in 1981, Metropolitan's Board of Directors adopted the Interruptible Water Service Program (Interruptible Program) which was designed to address short-term shortages of imported supplies. Under the Interruptible Program, Metropolitan delivered water for particular types of use to its member agencies at a discounted rate. In return for this discounted rate, Metropolitan reserved the right to interrupt delivery of this Interruptible Program water so that available supplies could be used to meet municipal and industrial demands.

Incremental Interruption and Conservation Plan

The ability to interrupt specific deliveries was an important element of Metropolitan's strategy for addressing shortage conditions when it adopted the Incremental Interruption and Conservation Plan (IICP) in December 1990. Reductions in IICP deliveries were used in concert with specific objectives for conservation savings to meet needs during shortages. The IICP reduced Interruptible Service deliveries in stages and provided a pricing incentive program to insure that reasonable conservation measures were implemented.

1995 Drought Management Plan

The 1995 Drought Management Plan (DMP) was a water management and allocation strategy designed to match supply and demand in the event that available imported water supplies were less than projected demands. Adopted by the Metropolitan Board of Directors in November 1994, the 1995 DMP was a short-term plan designed to provide for the 1995 calendar year only. The primary objective of the 1995 DMP was to identify methods to avoid implementation of mandatory reductions. The 1995 DMP included various phases and a step-by-step strategy for evaluating supply and demand conditions and utilizing Metropolitan's available options, with the final phase being implementation of the revised IICP.

1999 Water Surplus and Drought Management Plan

Metropolitan staff began work on the Water Surplus and Drought Management (WSDM) Plan in March 1997 as part of the Integrated Water Resources Plan (IRP), which was adopted by Metropolitan's Board of Directors in January 1996. The IRP established regional water resource targets, identifying the need for developing resource management policy to guide annual operations. The WSDM Plan defined Metropolitan's resource management policy by establishing priorities for the use of regional resources to achieve the region's reliability goal identified in the IRP. In April 1999, Metropolitan's Board of Directors adopted the WSDM Plan.

[8] A summary of the key elements in the following allocation plan is found in Appendix F: Summary of Historical Shortage Plans.

The WSDM Plan also included a set of principles and considerations for staff to address when developing specific allocation methods. The WSDM Plan stated the following guiding principle to be followed in developing any future allocation scheme:

> *"Metropolitan will encourage storage of water during periods of surplus and work jointly with its member agencies to minimize the impacts of water shortages on the region's retail consumers and economy during periods of shortage."*[9]

This principle reflects a central desire for allocation methods that are both equitable and minimize regional hardship to retail water consumers. The specific considerations postulated by the WSDM Plan to accomplish this principle include the following:[10]

- The impact on retail customers and the economy
- Allowance for population and growth
- Change and/or loss of local supply
- Reclamation/Recycling
- Conservation
- Investment in local resources
- Participation in Metropolitan's interruptible programs
- Investment in Metropolitan's facilities.

Section 4: Water Supply Allocation Formula

Based on the guiding principle and considerations described in the WSDM Plan, Metropolitan staff and the member agencies developed a specific formula for allocating water supplies in times of shortage. The formula seeks to balance the impacts of a shortage at the retail level while maintaining equity on the wholesale level, and takes into account growth, local investments, changes in supply conditions and the demand hardening[11] aspects of non-potable recycled water use and the implementation of conservation savings programs. The formula, described below, is calculated in three steps: base period calculations, allocation year calculations, and supply allocation calculations.[12] The first two steps involve standard computations, while the third section contains specific methodology developed for this WSAP.

Base Period Calculations

The first step in calculating a water supply allocation is to estimate water supply and demand using a historical base 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 fiscal years (July through June) ending 2013 and 2014.[13]

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[9] WSDM Plan, p. 1. Emphasis added.
[10] WSDM Plan, p. 2.
[11] Demand hardening is the effect that occurs when all low-cost methods of decreasing overall water demand have been applied (e.g., low-flow toilets, water recycling) and the remaining options to further decrease demand become increasingly expensive and difficult to implement.
[12] Detailed operational elements of these objectives and a numerical example are discussed in Appendix G: Water Supply Allocation Formula Example.
[13] Exceptions to this methodology are noted in the descriptions of base period calculations.

Base Period Local Supplies: Local supplies for the base period are calculated using a two-year average of groundwater production, groundwater recovery, Los Angeles Aqueduct supply, surface water production, and other imported supplies. Non-potable recycling production is not included in this calculation due to its demand hardening effect.

Base Period Wholesale Demands: Demands on Metropolitan for the base period are calculated using a two-year average of firm purchases and in-lieu deliveries to long-term groundwater replenishment, conjunctive use, cyclic, and supplemental storage programs.

Base Period Retail Demands: Total retail-level municipal and industrial (M&I) demands for the base period are calculated by adding the Base Period Wholesale Demands and the Base Period Local Supplies. This estimates an average total demand for water from each agency.

Base Period Mandatory Conservation Credit: Metropolitan allows a consultation process that enables member agencies to describe mandatory water use restrictions and/or rationing restrictions that were in place within their service areas during the Base Period. Restrictions may vary among agencies but include restricted water uses, fines, and water budget or penalty based rate structures that are enacted by the governing body of the member agency or retail agency. Following the consultation process, Metropolitan staff will recommend adjustments based on evidence of reduced GPCD. To qualify for an adjustment, GPCD reductions would have to be observed that are beyond those expected from the agency's ongoing conservation efforts and trends.

Allocation Year Calculations

The next step in calculating the 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 or economic growth and changes in local supplies.

Allocation Year Retail Demands: Total retail M&I demands for the allocation year are calculated by adjusting the Base Period Retail Demands for baseline inflation and growth.

Baseline Inflation Adjustment: Baseline inflation occurs when non-potable recycling or conservation is developed after the Base Period. The development of these supplies reduces actual demands for water in the Allocation Year. Because non-potable-recycling and conservation are excluded from the WSAP formula, the actual need for water in the Allocation year is overestimated. The Baseline Inflation Adjustment removes increases in non-potable recycling and conservation annually from the Base Period forward to better reflect the true need for water in the Allocation Year.

Growth Adjustment: The growth adjustment is calculated using the estimated actual annual rate of population growth at the county level, as generated by the California Department of Finance, whenever possible. For years without complete data, the growth rate is calculated using an average of the three most recent years available. Growth will be allocated based on historical per capita water use during the Base Period, with a cap equal to Metropolitan's IRP Target for Water Use Efficiency. For

allocation years up to and including 2014, the cap will be 163 GPCD, and for allocation years 2015-2020 the cap will reduce linearly from 163 to 145 GPCD. On an appeals basis, member agencies may request that their adjustment be calculated using member agency level population growth. A weighted combination of actual population and actual employment growth rates may also be requested.

Allocation Year Local Supplies: Allocation Year Local Supplies include groundwater production, groundwater recovery, Los Angeles Aqueduct supply, surface water production, seawater desalination, and other imported supplies. Estimates of Allocation Year Local Supplies are provided by the member agencies upon implementation of a WSAP. If estimates are not provided, Metropolitan will use the sum of the Base Period Local Supplies and Base Period In-Lieu Deliveries as a default. Agencies may provide updated estimates at any time during the Allocation Year to more accurately reflect their demand for Metropolitan supplies.

Extraordinary Supplies: Under the WSAP formula, local supply production in the Allocation Year can either be designated as a "planned" supply, or as an "extraordinary" supply.[14] This is an important designation for a member agency because the two types of supplies are accounted for differently in the WSAP formula. Local supplies classified at Extraordinary Supply are only partially included (scaled depending on the WSAP Level) as local supplies. This has the effect of providing significantly more benefit to the member agency in terms of total water supply that is available to the retail customer.[15]

Allocation Year Wholesale Demands: Demands on Metropolitan for the allocation year are calculated by subtracting the Allocation Year Local Supplies from the Allocation Year Retail Demands.

Water 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. The following table displays the elements that form the basis for calculating the supply allocation. Each element and its application in the allocation formula are discussed below.

Table 1: Shortage Allocation Index

(a) Regional Shortage Level	(b) Wholesale Minimum Percentage	(c) Maximum Retail Impact Adjustment Percentage
1	92.5%	2.5%
2	85.0%	5.0%
3	77.5%	7.5%
4	70.0%	10.0%

[14] Appendix H: Board Policy Principles on Determining the Status of Extraordinary Supply lists the key Board principles used in determining if a supply qualifies as an Extraordinary Supply.

[15] See Appendix G: Water Supply Allocation Formula Example for specific allocation formulae.

5	62.5%	12.5%
6	55.0%	15.0%
7	47.5%	17.5%
8	40.0%	20.0%
9	32.5%	22.5%
10	25.0%	25.0%

Regional Shortage Level: The WSAP formula allocates shortages of Metropolitan supplies over ten levels.

Wholesale Minimum Allocation: The Wholesale Minimum Allocation ensures a minimum level of Metropolitan supplied wholesale water service to each member agency.

Maximum Retail Impact Adjustment: The purpose of this adjustment is to ensure that agencies with a high level of dependence on Metropolitan do not experience disparate shortages at the retail level compared to other agencies when faced with a reduction in wholesale water supplies. The Maximum Retail Impact Percentage is prorated on a linear scale based on each member agency's dependence on Metropolitan at the retail level. This percentage is then multiplied by the agency's Allocation Year Wholesale Demand to determine an additional allocation.

Conservation Demand Hardening Credit: The Conservation Demand Hardening Credit addresses the increased difficulty in achieving additional water savings at the retail level that comes as a result of successful implementation of water conserving devices and conservation savings programs. To estimate conservation savings, each member agency will establish a historical baseline Gallons Per Person Per Day (GPCD) calculated in a manner consistent with California Senate Bill SBx7-7.[16] Reductions from the baseline GPCD to the Allocation Year are used to calculate the equivalent conservation savings in acre-feet. The Conservation Demand Hardening Credit is based on an initial 10 percent of the GPCD-based Conservation savings plus an additional 5 percent for each level of Regional Shortage set by the Board during implementation of the WSAP. The credit will also be adjusted for:

- The overall percentage reduction in retail water demand
- The member agency's dependence on Metropolitan

The credit is calculated using the following formula:

Conservation Demand Harding Credit = Conservation Savings x (10% + Regional Shortage Level Percentage) x (1 +((Baseline GPCD – Allocation Year GPCD)/Baseline GCPD)) x Dependence on MWD Percentage

[16] California Department of Water Resources, February 2011, "Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use. Available at: http://www.water.ca.gov/wateruseefficiency/sb7/docs/MethodologiesCalculatingBaseline_Final_03_01_2011.pdf

This provides a base demand hardening credit equal to 10 percent of conservation savings and increases the credit as deeper shortages occur, which is when conservation demand hardening has a bigger impact on the retail consumer. The credit also increases based on the percentage of an agency's demand that was reduced through conservation. This accounts for increased hardening that occurs as increasing amounts of conservation are implemented. Lastly, the credit is scaled to the member agency's dependence on Metropolitan to ensure that credits are being applied to the proportion of water demand that is being affected by reductions in Metropolitan supply.

Minimum Per-Capita Water Use Credit: This adjustment creates a minimum per capita water use threshold. Member agencies' retail-level water use is compared to two different thresholds. The proposed minimum thresholds are based upon compliance guidelines established under Senate Bill X7-7.

- 100 GPCD total water use
- 55 GPCD residential water use

Agencies that fall below either threshold under the WSAP will receive additional allocation from Metropolitan to bring them up to the minimum GPCD water use level. If an agency qualifies under both thresholds, the one resulting in the maximum allocation adjustment will be given.[17] To qualify for this credit, member agencies must provide documentation of the total agency level population and the percent of retail level demands that are residential; no appeal is necessary.

Total WSAP Allocation: The allocation to an agency for its M&I retail demand is the sum of the Wholesale Minimum Allocation, the Retail Impact Adjustment, the Conservation Demand Hardening Credit, and the Minimum Per-Capita Water Use Credit.[18]

Total Metropolitan Supply Allocations: In addition to the WSAP Allocation described above, agencies may also receive separate allocations of supplies for and seawater barrier and groundwater replenishment demands. Allocations of supplies to meet seawater barrier demands are to be determined by the Board of Directors independently but in conjunction with the WSAP. Separating the seawater barrier allocation from the WSAP allocation allows the Board to consider actual barrier requirements in the Allocation Year and address the demand hardening issues associated with cutting seawater barrier deliveries. According to the principles outlined for allocating seawater barrier demands, allocations should be no deeper than the WSAP Wholesale Minimum Percentage implemented at that time.

The WSAP also provides a limited allocation for drought-impacted groundwater basins based on the following framework:[19]

[17] See Appendix J: Per Capita Water Use Minimum Example for specific minimum per-capita water use credit formulae and example.
[18] See Appendix G: Water Supply Allocation Formula Example for specific allocation formulae.
[19] See Appendix L: Groundwater Replenishment Allocation for more information.

1. Metropolitan staff will hold a consultation with the requesting member agency and the appropriate groundwater basin manager to document whether the basin is in one of the following conditions:
    a. Groundwater basin overdraft conditions that will result in water levels being outside normal operating ranges during the WSAP allocation period; or
    b. Violations of groundwater basin water quality and/or regulatory parameters that would occur without imported deliveries
2. An allocation is provided based on the verified need for groundwater replenishment. The allocation would start with a member agency's ten-year average purchases of imported groundwater replenishment supplies (excluding years in which deliveries were curtailed). The amount would then be reduced by the declared WSAP Regional Shortage Level.

Section 5: WSAP Implementation

The WSAP will take effect if a regional shortage is declared by the Board of Directors. The following implementation elements are necessary for administering the WSAP during a time of shortage. These elements cover the processes needed to declare a regional shortage level as well as provide information pertaining to the allocation surcharge.

Allocation Period

The allocation period covers twelve consecutive months, from July of a given year through the following June. This period was selected to minimize the impacts of varying State Water Project (SWP) allocations and to provide member agencies with sufficient time to implement their outreach strategies and rate modifications.

Setting the Regional Shortage Level

Metropolitan staff is responsible for recommending a Regional Shortage Level for the Board of Directors' consideration. The recommendation shall be based on water supply availability, and the implementation of Metropolitan's water management actions as outlined in the WSDM Plan. Metropolitan staff will keep the Board of Directors apprised to the status of water supply conditions and management actions through monthly reports to the Water Planning and Stewardship Committee. To further facilitate staff in the development of a recommended regional shortage level, member agency requests for local supply adjustments shall be submitted by April 1st.

Metropolitan's Board of Directors, through the Water Planning and Stewardship Committee, is responsible for approving the final Regional Shortage Level at its April meeting. By the April meeting, the majority of the winter snowfall accumulation period will have passed and will allow staff to make an allocation based on more stable water supply estimates. Barring unforeseen large-scale circumstances, the Regional Shortage Level will be set for the entire allocation period, which will provide the member agencies an established water supply level for their planning.

Exit Strategy

While the Board ultimately has discretion to implement or lift and allocation at any point of time during the year; the WSAP includes a two-part exit strategy that is meant to streamline the WSAP implementation decision making process.

- If the Board decides to implement the WSAP, then any current WSAP allocation would remain in place until the end of the Allocation Year.
- If the Board decides not to implement the WSAP, then any current WSAP allocation would be terminated concurrent with the Board decision.

Allocation Appeals Process

An appeals process is necessary for the administration of any changes or corrections to an agency's allocation. Metropolitan's General Manager will designate, subsequent to a declaration of an allocation by the Board of Directors, an Appeals Liaison as the official point of contact for all information and inquiries regarding appeals. All member agency General Managers will be notified in writing of the name and contact information of the Appeals Liaison. Only appeals that are made through the Appeals Liaison and in accordance with the provisions outlined in Appendix N: Allocation Appeals Process will be evaluated. Basis for appeals claims can include but are not limited to:

- Adjusting erroneous historical data used in base period calculations
- Adjusting for population growth rates
- Determining if a local supply qualifies as Extraordinary Supply

Additional details and a checklist for the appeals process are available in Appendix N: Allocation Appeals Process and Appendix O: Appeals Submittal Checklist.

Allocation Surcharge

Member agency allocations are supported by an Allocation Surcharge. The Allocation Surcharge is charged to water use above the Member Agency allocation and is charged in addition to Metropolitan's standard rates for water service. Allocation Surcharges will only be assessed to the extent that an agency's total annual usage exceeds its total annual allocation. Any revenues collected through the Allocation Surcharge will be applied towards Metropolitan's Water Management Fund, which is used to in part to fund expenditures in dry-year conservation. No billing or assessment of allocation surcharges rates will take place until the end of the twelve-month allocation period.

Allocation Surcharge: The application of the Allocation Surcharge structure is a two tier structure that provides a lower level of Allocation Surcharge for minor overuse of allocations and a higher level of Allocation Surcharge for major overuse of allocations. The structure and applicable Allocation Surcharges are listed in Table 2.

Table 2: Allocation Surcharge			
Water Use	**Base Water Rate[20]**	**Allocation Surcharge[21]**	**Total Rate**
100% of Allocation	Tier 1	0	Tier 1
Between 100% and 115%	Tier 1	$1,480	Tier 1 + ($1,480)
Greater than 115%	Tier 1	$2,960	Tier 1 + ($2,960)

Qualifying Income-Based Rate Allocation Surcharge Adjustment:[22] Any Allocation Surcharges incurred by a member agency under the WSAP will be adjusted to reflect the extent to which retail customers within a member agency's service area are served under a "lifeline" or similar qualified discounted rate program based on income or ability to pay ("Income-Based Rate").

Any member agency who is assessed Allocation Surcharges under the WSAP may submit an acre-foot equivalent of water used by retail customers served under a qualifying Income-Based Rate.[23] This amount of water use would be multiplied by the percentage of retail-level reduction in allocation year demand necessary for that member agency to avoid exceeding its WSAP allocation. The monetary amounts resulting from these acre feet are subtracted from the total monetary amounts incurred by an agency for exceeding its allocation. In the case that the monetary amounts associated with the Income-Based Rate are greater than the total Allocation Surcharges an agency incurs, no Allocation Surcharges will be incurred. The end result of this adjustment is that the member agency will not be subject to Allocation Surcharges for the use of water by their retail customers served under a qualifying Income-Based Rate.

Growth Rate Allocation Surcharge Adjustment": In recognition of member agency differences in geography and climate, a Growth Rate Allocation Surcharge Adjustment will be given to any agency that exceeds its WSAP Allocation. The Allocation Surcharge reduction will be based on the difference in acre-feet between the Growth Adjustment applied at Metropolitan's IRP planning goal rate, and the greater of the following:

- The IRP planning goal rate adjusted for the member agency's ETo, or
- The member agency's certified and documented 20x2020 targeted GPCD

If both of these alternatives result in a lower growth adjustment than the IRP planning goal, no Allocation Surcharge reduction will be made.

[20] The base water rate shall be the applicable water rate for the water being purchased. In most cases, it will be the Tier 1 rate (plus Treatment Surcharge for treated water deliveries). However, it is possible that the water being purchased would be in the amount that would put an agency beyond its Tier 1 limit. In that case, the base water rate will be the Tier 2 rate (plus Treatment Surcharge for treated water deliveries).

[21] Allocation Surcharge is applied to water use in excess of an agency's WSAP allocation.

[22] See Appendix K: Qualifying Income-Based Rate Allocation Surcharge Adjustment Example for specific penalty adjustment formulae and example.

[23] Appropriate documentation and certification will be required.

Tracking and Reporting

Subsequent to a declared regional shortage by the Board of Directors, Metropolitan staff will produce monthly reports of each member agency's water use compared to its allocations based on monthly delivery patterns to be submitted by the member agency. In order to produce these reports, member agencies are requested to submit their local supply use on a monthly basis and certify end of allocation year local supply use. These reports and comparisons are to be used for the purposes of tracking and communicating potential underage/overage of an agency's annual allocations.

Key Dates for Water Supply Allocation Implementation

The timeline for implementation of an allocation is shown in Table 3. A brief description of this timeline follows:

January to March: Water Surplus and Drought Management reporting occurs at Metropolitan's Water Planning and Stewardship Committee meetings. These reports will provide updated information on storage reserve levels and projected supply and demand conditions.

April: Member agencies report their projected local supplies for the coming allocation year. This information is incorporated in staff analysis of storage reserves and projected supply and demand conditions in order to provide an allocation recommendation to the Board. Metropolitan's Board will consider whether an allocation is needed. A declaration of an allocation will include the level of allocation to be in effect for the allocation year. Likewise, member agencies will report their projected demands and local supplies needed to meet seawater barrier and groundwater replenishment requirements for the allocation year. Metropolitan's Board will consider whether allocations for seawater barrier demands and groundwater replenishment demands are needed independently from the WSAP allocation decision.**July 1st**: If the Board declared an allocation in April, then it will be effective starting July 1st. The allocation level will be held through June 30th, barring unforeseen circumstances. Member agencies will now be requested to submit their local supply use on a monthly basis and certify end of allocation year local supply use. Local production data must be reported to Metropolitan by the end of the month following the month of use (use in July must be reported by the end of August). This information will be combined with Metropolitan sales information in order to track retail water use throughout Metropolitan's service area. Each month Metropolitan will report on member agency water sales compared to their allocation amounts.

June 30th: The allocation year is complete.

July: Member agency local supplies must be certified for the month of June, the last month of the previous allocation year.

August: Metropolitan will calculate each member agency's total potable water use based on local supply certifications and actual sales data for the allocation year of July through June. Allocation surcharges will be assessed for usage above a given member agency's final adjusted allocation (reflecting the actual local supply and imported water use that occurred in the allocation year).

Table 3: Board Adopted Allocation Timeline					
Year	**Month**	**Year 1 Board Decision**	**Year 1 Allocation Year**	**Year 2 Board Decision**	**Year 2 Allocation Year**
Year 1	January				
	February				
	March				
	April	Declaration *			
	May				
	June				
	July		**Effective Period** Continuous Tracking of Member Agency Local Supply and Imported Water Use		
	August				
	September				
	October				
	November				
	December				
Year 2	January				
	February				
	March				
	April			Declaration *	
	May				
	June				
	July				
	August		Assess		
	September				
	October				
	November				
	December				
Year 3	January				**Effective Period** Continuous Tracking of Member Agency Local Supply and Imported Water Use
	February				
	March				
	April				
	May				
	June				

*Member agency projections of local supplies are due on April 1st to assist Metropolitan staff in determining the need for an allocation in the coming allocation year.

Appendix A: Metropolitan Member Agencies

Table 4: Member Agencies		
City of Anaheim	City of Glendale	City of San Marino
City of Beverly Hills	Inland Empire Utilities Agency	City of Santa Ana
City of Burbank	Las Virgenes MWD	City of Santa Monica
Calleguas MWD	City of Long Beach	Three Valleys MWD
Central Basin MWD	City of Los Angeles	City of Torrance
City of Compton	MWD of Orange County	Upper San Gabriel MWD
Eastern MWD	City of Pasadena	West Basin MWD
Foothill MWD	San Diego CWA	Western MWD
City of Fullerton	City of San Fernando	

Source: http://mwdh2o.com/WhoWeAre/Member-Agencies/

Appendix B: Water Supply Allocation Plan Process Timeline

July 2007

- City of Long Beach Water Department staff briefing
- Member Agency Managers/Member Agency Workgroup meeting
- Northern Managers Group meeting
    - Foothill MWD, City of Pasadena, City of Long Beach, Calleguas MWD, City of Los Angeles, West Basin MWD, City of Burbank, Three Valleys MWD, City of Glendale, Upper San Gabriel MWD

August 2007

- Central Basin MWD staff briefing
- Eastern MWD staff briefing
- San Diego CWA staff briefing
- Member Agency Managers/Member Agency Workgroup meeting
- Western MWD staff briefing
- City of Beverly Hills staff briefing

September 2007

- Member Agency Subgroup meetings
    - MWD of Orange County, San Diego CWA, West Basin MWD, Central Basin MWD
- MWD of Orange County staff briefing
- Member Agency Workgroup meeting
- Member Agency Workgroup meeting
- MWD Board of Directors Oral Report

October 2007

- Inland Empire Utilities Agency staff briefing
- Central Basin MWD Caucus Meeting (included sub-agencies)
- Three Valleys MWD staff briefing
- MWD of Orange County staff briefing
- West Basin MWD staff briefing
- MWD Board of Directors Oral Report

November 2007

- West Basin MWD Caucus Meeting (included sub-agencies)
- West Basin Water Users Association presentation
- Walnut Valley MWD staff briefing (sub-agency of Three Valleys MWD)
- Foothill MWD Managers Meeting (included sub-agencies)
- Central Basin MWD staff briefing
- City of Claremont City Council (sub-agency of Three Valleys MWD)
- MWD Board of Directors Information Letter with Draft Proposal

December 2007

- Northern Managers Group Meeting
- California Department of Public Health staff briefing
- City of Long Beach Water Department staff briefing
- Santa Ana River Watershed Project Authority presentation
- Foothill MWD Managers Meeting (included sub-agencies)
- MWD Board of Directors Oral Report

January 2008

- Northern Managers Group Meeting
- Water Replenishment District Board of Directors presentation
- Three Valleys MWD staff briefing
- Member Agency Conservation Coordinator's Group presentation
- Member Agency Managers/Member Agency Workgroup meeting
- City of Chino Hills presentation (sub-agency of IEUA)
- Member Agency Workgroup meeting
- Hemet/San Jacinto Exchange Club presentation
- MWD Board of Directors Report with Staff Recommended Water Supply Allocation Plan

February 2008

- MWD of Orange County and Irvine Ranch WD staff briefing
- MWD Board of Directors Action Item
- San Gabriel Valley Water Association Meeting
- Orange County Water Policy Meeting
- SCAG Water Policy Task Force Meeting

Appendix C: 12-Month Review Process and Results

January 2010

- WSAP 12-Month Review Process workshop #1
    - Focused discussion of WSAP issues identified by Metropolitan staff and by member agencies since the July 2009 implementation began.

February 2010

- WSAP 12-Month Review Process workshop #2
    - Continuation of focused discussion
- WSAP 12-Month Review Process workshop #3
    - Continuation of focused discussion

March 2010

- WSAP 12-Month Review Process workshop #4
    - Continuation of focused discussion
- MWD Board of Directors information item
    - Review of potential modifications to the WSAP definition of Extraordinary Supply

April 2010

- WSAP 12-Month Review Process workshop #5
    - Recap of identified issues and discussion of Metropolitan staff proposals for adjustments to the WSAP
- Member Agency Managers Meeting
    - Update on the 12-Month Review Process
- WSAP 12-Month Review Process workshop #6
    - Discussion of WSAP issues related to groundwater replenishment
- Member Agency Managers conference call
    - Clarification of WSAP definition for Extraordinary Supply

May 2010

- Member Agency Managers Meeting
    - Discussion of proposed Extraordinary Supply policy principles and WSAP Local Supply certification process.
- Member Agency Managers conference call
    - Discussion of proposed Extraordinary Supply policy principles

June 2010

- MWD Board of Directors action item

July 2010

- MWD Board of Directors information item
    - Review of proposed adjustments to the WSAP developed in the 12-Month Review Process

August 2010

- MWD Board of Directors action item

Resulting Changes

- Removed references to Gains and Losses of Local Supply
    - Removed references in the WSAP to "gains and losses of local supplies" in order to better facilitate the accounting of historical base year and allocation year local supplies. This change did not affect the WSAP formula or allocations.
- Removed references to the Regional Shortage Percentage
    - Removed references to the "Regional Shortage Percentage" in the WSAP to reduce unintended confusion between calculation factors and shortage amounts. This change did not affect the WSAP formula or allocations.
- Included the Retail Impact Adjustment in all shortage levels
    - Included the Retail Impact Adjustment for Regional Shortage Levels 1 and 2. This change results in additional allocations to Metropolitan-dependent agencies under Level 1 and Level 2 regional shortages.
- Revised the accounting of Extraordinary Supplies
    - Revised the methodology for accounting of Extraordinary Supply in the WSAP formula by:
        - Removing the Base Period Local Supply threshold provision,
        - Removing the sliding-scale sharing mechanism from the formula, and
        - Including the full amount of the Extraordinary Supply in the calculation of the Retail Impact Adjustment.
- Included a Minimum Per Capita Water Use Threshold
    - Developed a minimum water use credit based on two GPCD water use thresholds. Member agencies would receive additional Metropolitan allocation for an acre-foot equivalent of GPCD below the minimum threshold. Member agency water use, on a gallon per capita per day (GPCD) basis, is compared to the following minimum thresholds established under Senate Bill X7-7 (Water Conservation Act of 2009)
        - 100 GPCD total use or
        - 55 GPCD residential indoor use
- Excluded Seawater Barrier from the WSAP Formula
    - Excluded seawater barrier supplies from the WSAP Base Period and Allocation Year local supply calculations. This allows the Board to determine allocations for seawater barrier demands separately from the WSAP.

Appendix D: Three-Year Review Process and Results

February 2011

- WSAP 3-Year Review Process workshop #1
    - Review of the existing WSAP policy formula; review of the process timeline; and focused discussion of WSAP issues identified by Metropolitan staff and by member agencies since the WSAP's adoption in February 2008

March 2011

- WSAP 3-Year Review Process workshop #2
    - Discussion of issues related to local supplies and baseline inflation due to adjustments for recycling in the WSAP formula
- WSAP 3-Year Review Process workshop #3
    - Continuation of prior workshop

April 2011

- WSAP 3-Year Review Process workshop #4
    - Discussion of issues and alternatives related to base period selection and baseline inflation in the WSAP formula
- WSAP 3-Year Review Process workshop #5
    - Discussion of recommendations to address baseline inflation in the WSAP formula

May 2011

- WSAP 3-Year Review Process workshop #6
    - Discussion of issues and alternatives for the growth adjustment methodology in the WSAP formula
- WSAP 3-Year Review Process workshop #7
    - Continuation of prior workshop

June 2011

- WSAP 3-Year Review Process workshop #8
    - Continuation of prior workshop, discussion of WSAP implementation exit strategy
- WSAP 3-Year Review Process workshop #9
    - Continuation of exit strategy discussion, discussion of baseline inflation due to conservation and related conservation demand hardening issues

July 2011

- WSAP 3-Year Review Process workshop #9
    - Continued discussion of baseline inflation and conservation issues, and discussion of sharing allocations between agencies with common local resources

August 2011

- WSAP 3-Year Review Process workshop #10
    - Discussion of WSAP Allocation Year timing vs. Tier 1-Tier 2 rate cycle timing, discussion of approaches for encouraging completion of WSAP local supply certifications
- Review WSAP at Member Agency Managers Meeting
    - Discussion of proposed WSAP adjustments to address baseline inflation issues, revise the growth adjustment methodology, and establish a WSAP exit strategy

September 2011

- MWD Board of Directors action item

Resulting Changes

- Baseline Inflation Adjustment
    - Removed non-potable recycling and conservation from the WSAP baseline
        - Increases in recycling and conservation will be subtracted annually from the Base Period forward
        - The annual population growth rate will be applied after deducting the annual increases in recycling and conservation
        - If an agency ends up in allocation penalty, a penalty reduction will be applied in an amount equal to the Code-Based and rate Structure conservation savings that were removed from the WSAP baseline
- Changed the Growth Adjustment methodology
    - Growth will be allocated at historical per capita rate capped at the 2010 Integrated Water Resource Plan (IRP) Target for Water Use Efficiency
        - For years up to and including 2014, the cap will be 163 GPCD
        - For years 2015-2020, the cap will reduce linearly from 163 to 145 GPCD
    - If an agency exceeds its allocation, a penalty reduction will be applied based on either:
        - The differential Evapotranspiration (ETo) of its service area compared to the MWD average, or
        - Certified and documented 20 x 2020 targeted GPCD
- Exit Strategy
    - Clarified the course of action for an existing WSAP allocation when Metropolitan's Board makes a declaration decision for the following WSAP year
        - If there is an allocation for the next year, then the current allocation stays in place
        - If there is no allocation for the next year, then the current allocation is lifted concurrent with the April decision

Appendix E: 2014 Review Process and Results

July 2014

- WSAP Workgroup Meeting #1
  - First meeting of the 2014 WSAP Review process; review of the existing WSAP policy and formula; review of the process timeline; began discussion of issues related to base period selection
- WSAP Workgroup Meeting #2
  - Discussion of base period selection

August 2014

- WSAP Workgroup Meeting #3
  - Continuation of prior workshop discussion; comparison of base period alternatives

September 2014

- WSAP Workgroup Meeting #4
  - Discussion of a base period proposal; discussion of replenishment issues in the WSAP; discussion of 2015 water supply scenarios
- Review WSAP at Member Agency Managers Meeting
  - Review of WSAP workgroup process; discussion on issues related to base period, demand hardening, and local resources development
- WSAP Workgroup Meeting #5
  - Review of base period recommendation; discussion of issues regarding agencies in mandatory conservation during a base period; discussion on replenishment in the WSAP

October 2014

- WSAP Workgroup Meeting #6
  - Continuation of prior workshop discussion; discussion of alternative methods for conservation demand hardening credit; discussion of new and existing local supplies
- Review WSAP at Member Agency Managers Meeting
  - Review of WSAP workgroup process; discussion of issues related to base period and demand hardening

November 2014

- WSAP Workgroup Meeting #7
  - Review and discussion of issues and potential methods for base period selection and adjustment, replenishment allocation, and conservation demand hardening credit; review of estimated effects of potential WSAP changes at the regional level
- WSAP Workgroup Meeting #8
  - Review of proposed recommendations for the WSAP based on workgroup discussion
- Review WSAP at Member Agency Managers Meeting
  - Review of proposed recommendations for the WSAP based on workgroup discussion

Resulting Changes

- Base Period Update to FY2013 and FY2014
    - Changed the WSAP Base Period from calendar years 2004-2006 to fiscal years ending July 2013 and 2014
    - Mandatory Conservation Adjustment
        - Agencies with mandatory conservation in effect during the base period (FY 2013 and/or FY 2014) may qualify for a demand hardening adjustment, adjustment is subject to a consultation process that includes consideration historical demand and GPCD information

- Modify Conservation Demand Hardening Credit
    - Replaced device calculation-based estimates of conservation savings with a GPCD-based method
        - Conservation savings are calculated by comparing GPCD from a historical baseline to the Allocation Year; the difference is converted to acre-feet using the Allocation Year population.
            - Baseline GCPD is 10-year average ending between 2004 and 2010, with gross water, using gross water use minus non-potable recycled water production and documented historical population
    - Replaced formula for calculating the credit for each Regional Shortage Level
    - Conservation Demand hardening credit will be based on an initial 10 percent of GPCD-based conservation savings plus an additional 5 percent for each level of Regional Shortage; the credit will also be adjusted for the overall percentage reduction in retail water demand and the member agency's dependence on Metropolitan.
- Allocation Surcharge
    - Replaced the WSAP Penalty Rate with an Allocation Surcharge based on the estimated cost of Turf Replacement conservation programs

Appendix F: Summary of Historical Shortage Plans

These five elements incorporated into the WSAP have, in four out of five instances, been used in previous shortage plans. Both the IICP and the 1995 DMP used a historical base period calculation, adjusted for growth, made local supply adjustments, and used conservation hardening credits in their formulations. The retail impact adjustment is the only feature of the WSAP that has not been used historically.

Table 5: Historical Shortage Plan Overview

Plan Element	1991 IICP	1995 DMP	WSAP
Historical Base Period	√	√	√
Growth Adjustment	√	√	√
Local Supply Adjustment	√	√	√
Conservation Hardening Credit	√	√	√
Retail Impact Adjustment			√

Appendix G: Water Supply Allocation Formula Example

The following example gives a step-by-step description of how the formula would be used to calculate an allocation of Metropolitan supplies for a hypothetical member agency. All numbers are hypothetical for the purpose of the example and do not reflect any specific member agency.

Step 1: Calculate Base Period Retail Demand

Base Period Local Supplies: Calculated using a two-year average of groundwater (gw), groundwater recovery (gwr), Los Angeles Aqueduct supply (laa), surface water (sw), seawater desalination (sd), and other non-Metropolitan imported supplies (os). For the purpose of this example, assume that the two year average is 59,000 af.

$$[(gw1+gwr1+laa1+sw1+sd1+os1) + (gw2+gwr2+laa2+sw2+sd2+os2)] \div 2 = 59{,}000 \text{ af}$$

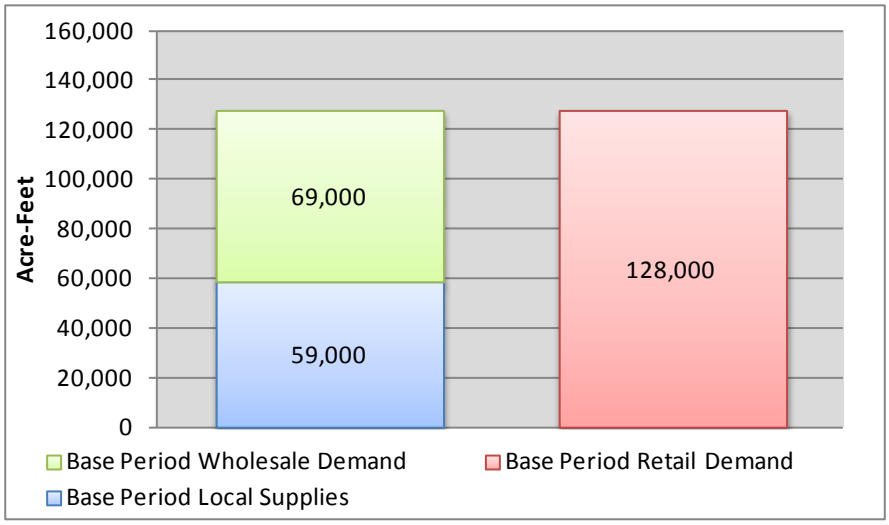
Base Period Wholesale Demands: Calculated using the same two-year time period as the Base Period Local Supplies. The Base Period Wholesale Demands include firm purchases (fp) and in-lieu deliveries to long-term groundwater replenishment (il), conjunctive use (cup), cyclic (cyc), and supplemental storage programs (ss). For the purpose of this example, assume that the two year average is 69,000 af.

$$[(fp^1{+}{+}il^1{+}cup^1{+}cyc^1{+}ss^1) + (fp^2{+}il^2{+}cup^2{+}cyc^2{+}ss^2)] \div 2 = 69{,}000 \text{ af}$$

Base Period Retail Demands: Calculated as the sum of the Base Period Local Supplies and Base Period Wholesale Demand.

$$59{,}000 + 69{,}000 = 128{,}000 \text{ af}$$

Figure 1: Base Period Retail Demand Calculation



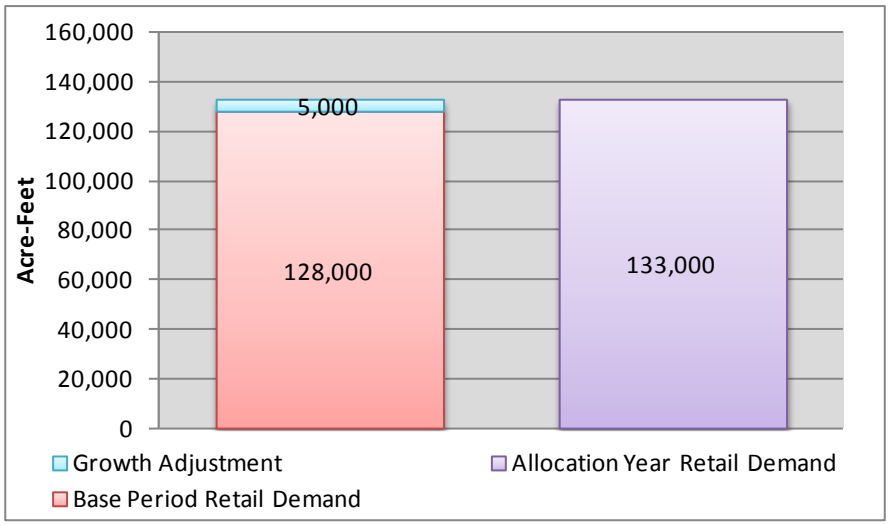
Calculate Adjustment for Base Period Mandatory Rationing (if applicable): The hypothetical agency used in this example is assumed not to qualify for the Base Period Mandatory Rationing Adjustment. A detailed discussion of the adjustment methodology can be found in Appendix I: Base Period Rationing Adjustment Example.

Step 2: Calculate Allocation Year Retail Demand

Allocation Year Retail Demand: Calculated by adjusting the Base Period Retail Demand for any baseline inflation and growth that occurred since the Base Period.

128,000 af + 5,000 af (net adjustment to retail demand) = 133,000 af

Figure 2: Allocation Year Retail Demand Calculation



Step 3: Calculate Allocation Year Wholesale Demand

Allocation Year Local Supplies: Estimates of Allocation Year Local Supplies are provided by the member agencies upon implementation of a WSAP. If estimates are not provided, Metropolitan will use the sum of the Base Period Local Supplies and Base Period In-Lieu Deliveries as a default. Agencies may provide updated estimates at any time during the Allocation Year to more accurately reflect their demand for Metropolitan supplies. For this example assume that the Allocation Year Local Supplies total 65,000 acre-feet.

Allocation Year Local Supplies = 65,000 af

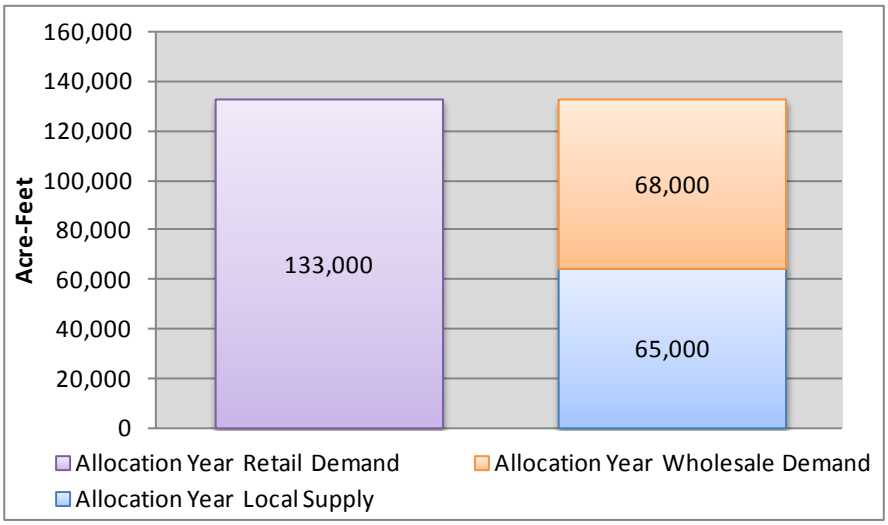
For this example assume also that this agency has an additional 5,000 acre-feet of supplies that meet the determinations for Extraordinary Supply. These supplies are withheld from the allocation formula except for in calculating the Retail Impact Adjustment Allocation.

Extraordinary Local Supplies = 5,000 af

Allocation Year Wholesale Demands: Calculated by subtracting the Allocation Year Local Supplies (65,000 af) from the Allocation Year Retail Demands (133,000 af).

133,000 af - 65,000 af = 68,000 af

Figure 3: Allocation Year Wholesale Demand Calculation



Step 4: Calculate the Wholesale Minimum Allocation

Wholesale Minimum Percentage: Calculate from Table 1 for Regional Shortage Level 4.

Table 1: Shortage Allocation Index		
(a) Regional Shortage Level	(b) Wholesale Minimum Percentage	(c) Maximum Retail Impact Adjustment Percentage
4	70.0%	10.0%

Wholesale Minimum Allocation: Calculated by multiplying the agency's Allocation Year Wholesale Demand (68,000 af) by the Wholesale Minimum Percentage (70%) from the Table 1 for Regional Shortage Level 4.

68,000 af * 70% = 47,600 af

Step 5: Calculate the Retail Impact Adjustment Allocation

Maximum Retail Impact Adjustment Percentage: Calculate from Table 1 for Regional Shortage Level 4.

Retail Impact Adjustment Allocation: Calculated first by determining the agency's dependence on Metropolitan by dividing the Allocation Year Wholesale Demand (68,000 af) minus the Extraordinary Supply (5,000 af) by the Allocation Year Retail Demand (133,000 af) and multiplying by 100.

[(68,000 af - 5,000 af)/ 133,000 af] * 100 = 47%

Next, this percentage dependence on Metropolitan (47%) is multiplied by the Maximum Retail Impact Percentage for Shortage Level 4 (10%).

47% * 10% = 4.7%

This percentage is now multiplied by the Allocation Year Wholesale Demand (68,000 af) for the Retail Impact Adjustment Allocation.

68,000 af * 4.7% = 3,221 af

Step 7: Calculate the Conservation Demand Hardening Adjustment

Calculate Baseline GPCD: To estimate conservation savings, each member agency will establish a historical baseline GPCD calculated in a manner consistent with California Senate Bill SBx7-7, using a 10 or 15-year average ending between 2004 and 2010, using gross water use minus non-potable recycle water production and documented historical population. For this example assume that the Baseline GPCD is 154 GPCD

Baseline GPCD = 154 GPCD

Calculate Allocation Year GPCD: Next, calculate the allocation year GPCD by converting the Allocation Year Retail Demand to GPCD and dividing by the Allocation Year Population from the WSAP. For this example the Allocation Year Retail Demand is 133,000 AF (see Step 2 above) and assume the Allocation Year Population is 905,000 persons. The resulting GPCD is 131 GPCD.

Allocation Year GPCD = 133,000 af/year * 325,851 gallons/af ÷ 365 days/year ÷ 905,000 persons = 131 GPCD

Calculate Reduction in GPCD: Subtract Allocation Year GPCD from Baseline GPCD to determine the GPCD Reduction.

GPCD Reduction = 154 GPCD – 131 GPCD = 23 GPCD

Calculate Conservation Savings: Convert the GPCD Reduction to the equivalent annual conservation savings in acre-feet, using the Allocation Year Population.

$$\text{Conservation Savings} = \frac{(\text{GPCD Reduction}) \times 365 \text{ days/yr} \times \text{Population}}{325{,}851 \text{ gallons/af}}$$

Conservation Savings = 23 x 365 x 905,000 ÷ 325,851 = 23,316 af

Multiply by Regional Shortage Level Percentage: Multiply the Conservation Savings by 10 percent plus an additional 5 percent for each level of Regional Shortage (see Step 4 above). This example assumes a Regional Shortage Level of 4. This scales the hardening credit by the level of regional shortage, thereby increasing the credit as deeper shortages occur when demand hardening has a larger impact on the retail consumer.

23,316 af x (10% + (4 x 5%) = 6,995 af

Multiply by Conservation Savings Percentage: Next, multiply by the percentage of an agency's demand that was reduced through conservation. This scales the hardening by the total percentage reduction to recognize that increased hardening occurs as increasing amounts of conservation are implemented.

Conservation Savings Percentage = 1 + ((Baseline GPCD – Allocation Year GPCD)/Baseline GPCD)

Conservation Savings Percentage = 1+ ((154 GPCD – 131 GPCD)/154 GPCD) = 115%

6,995 af x 115% = 8,044 af

Multiply by Dependence on MWD: Next, multiply by the agency's percentage dependence on MWD as shown in Step 5 above. This scales the credit to the member agency's dependence on MWD to ensure that credits are being applied to the proportion of water demand that is being affected by reductions in MWD's supply. For this example, dependence on MWD is 47%.

8.044 af x 47% = 3,781 af

Summary: The Conservation Demand Hardening Adjustment calculation is summarized by the following formula:

Conservation Demand Hardening Adjustment = Conservation Savings x (10% + Regional Shortage Level %) x (1+Conservation%) x Dependence on MWD %

Conservation Demand Hardening Adjustment = 23,316 af x (10% + (4 x 5%)) x (115%) x (47%) = 3,781 af

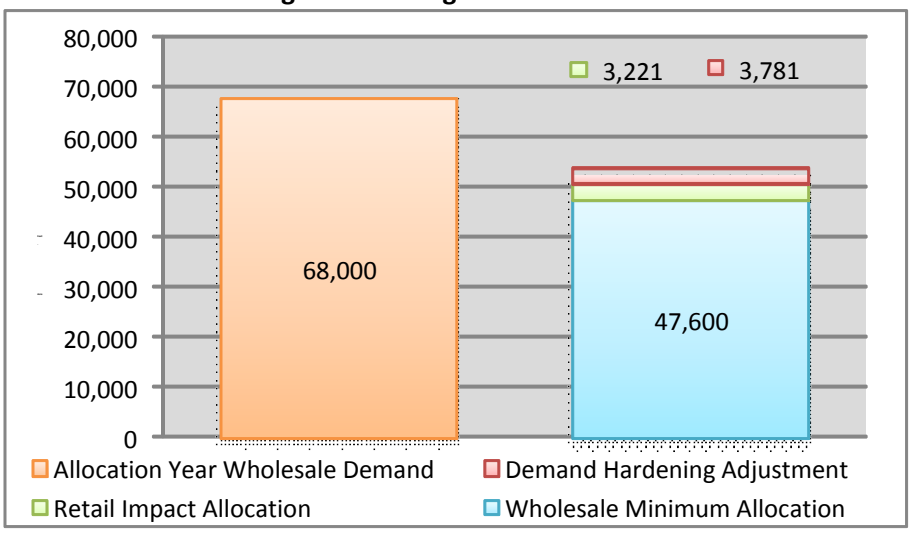
Step 8: Calculate the Low Per-Capita Adjustment Allocation: The hypothetical agency used in this example is assumed not to qualify for the Low Per-Capita Adjustment. A detailed discussion and example of the Low Per-Capita Adjustment calculation can be found in Appendix J: Per Capita Water Use Minimum Example.

Step 9: Calculate the total WSAP Allocation

WSAP Allocation: Calculated by adding the Wholesale Minimum Allocation (47,600 af), the Maximum Retail Impact Adjustment (3,221 af), the Demand Hardening Adjustment (3,781 af), and the Low Per-Capita Adjustment (0 af).

47,600 af + 3,221 af + 3,781 af + 0 af = 54,602 af

Figure 4: WSAP Allocation Regional Shortage Level 4



Step 10: Calculate total retail level reliability

Retail level reliability: Calculated by adding the WSAP Allocation (54,602 af), the Allocation Year Local Supply (65,000 af) and the Extraordinary Local Supply (5,000 af) and dividing by the Allocation Year Retail Demand (133,000 af).

(54,602 af + 65,000 af + 5,000 af) ÷ 133,000 af = 93.7%

Total Metropolitan Supply Allocations: In addition to the WSAP Allocation described above, agencies may also receive separate allocations of supplies for groundwater replenishment and seawater barrier demands. More information on the groundwater replenishment allocation is located in Appendix L: Groundwater Replenishment Allocation.

Appendix H: Board Policy Principles on Determining the Status of Extraordinary Supply

At the June 8, 2010 Water Planning and Stewardship Committee meeting Metropolitan's Board of Directors adopted the following policy principles to guide staff in determining the Extraordinary Supply status of future member agency supply programs.

No Negative Impacts to Other Member Agencies

A potential Extraordinary Supply for a member agency should not decrease the amount of Metropolitan water supply that would be available to the other member agencies in a WSAP. Programs that utilize Metropolitan supplies as a primary or in-lieu source or as a means of payback or future replenishment may have the effect of decreasing supplies, available to other agencies, if designated as Extraordinary Supply.

Provides Supply in Addition to Existing Regional Supplies

A potential Extraordinary Supply should provide a water supply that increases the overall water supplies that are available to the region in a WSAP. A program that is designed to move existing regional supplies from year to year would not qualify.

Specifically Designed Program or Supply Action

A potential Extraordinary Supply must be intentionally created and operated to provide additional supply yield. Normal variations in existing and planned local supply programs would not qualify.

Intended for Consumptive Use in a WSAP

A potential Extraordinary Supply should be designed with the primary intention to deliver water supply to a member agency only at a time when Metropolitan is allocating supplies. Programs designed to deliver water on a regular basis would not qualify. Exceptions for reasonable use of a supply program for emergency or other extenuating local circumstances should be considered.

Fully Documented Resource Management Actions

A potential Extraordinary Supply should have a full description as to the source, transmission, distribution, storage, and delivery of the water supply.

These principles are intended to identify deliberate actions taken by member agencies to augment supplies only when Metropolitan is allocating supplies through the WSAP. Production from existing local supplies, programs that are operated on an ongoing basis, and incidental increases in water supply would not qualify as Extraordinary Supply. The intent of the Extraordinary Supply designation is to recognize programs and actions that are additive to the total regional water supply as the region continues to confront the water supply challenges from drought and regulatory conditions. To that end, any supply actions taken after the initial implementation of the WSAP in July 2009 that utilize Metropolitan supplies either as a primary source, or to refill or replenish an incurred obligation or deficit at a future date would not qualify as Extraordinary Supply.

Appendix I: Base Period Mandatory Rationing Adjustment

Agencies that were under mandatory water use restrictions during the Base Period may have water use that is lower due to the mandatory actions already taken. Without adjusting for this, those agencies could be required to enforce even higher levels of restrictions under an allocation than those agencies that had not started mandatory restrictions.

To qualify for a Base Period Mandatory Rationing Adjustment, the member agency must provide Metropolitan staff with the following information:

- Time period when the mandatory conservation was in effect; it must be in effect during the Base Period
- A statement, with documentation, of how drought restrictions comply with the following Mandatory Conservation qualifications:
    - Governing Body-authorized or enacted
    - Includes mandatory demand reduction actions, restrictions or usage limitations including penalty-backed water budgets
    - Enforced by assessing penalties, fines, or rates based upon violating restrictions or exceeding usage limitations
- If the agency in question is a retail subagency, then the retailer's base period water demands during the Base Period in order to determine proportion to the member agency's total demand
- Historical data to construct GPCD base and trend for the consultation

Calculating the Base Period Rationing Adjustment involves following steps:

- Use the Baseline GPCD 10 or 15-year period selected by member agency for the Conservation Demand Hardening Adjustment calculation.
- Interpolate from the GPCD value of the midpoint of the Baseline GPCD period to the average GPCD of the two years preceding the agency's mandatory conservation
- Extrapolate to the WSAP Base Period (FY2013 and FY2014)
- Calculate the difference between estimated and observed GPCD for FY2013 and FY2014
- Convert to Acre-Feet and add to the member agency's Base Period Retail Demands

Appendix J: Per-Capita Water Use Minimum Example

This adjustment creates a minimum per capita water use threshold. Member agencies' retail-level water use under the WSAP is compared to two different thresholds. The minimum water use levels are based on compliance guidelines for total and residential water use established under Senate Bill X7-7.

Total Retail Level Use: 100 GPCD
Residential Retail Level Use: 55 GPCD

Agencies that fall below either threshold under the WSAP would receive additional allocation from Metropolitan to bring them up to the minimum GPCD water use level. To qualify for this credit, member agencies must provide documentation of the total agency level population and the percent of retail level demands that are residential; no appeal is necessary.

The following example gives a step-by-step description of how the Low Per-Capita Water Use Adjustment would be calculated for a hypothetical member agency. All numbers are hypothetical for the purpose of the example and do not reflect any specific member agency. This example was calculated using the following assumptions:

Allocation Year Retail Demand: 50,000 acre-feet
Allocation Year Local Supplies: 25,000 acre-feet;
Allocation Year Wholesale Demand: 25,000 acre-feet
Base Period Conservation: 5,000 acre-feet
Agency Population: 375,000
Percent of Retail Demands that are Residential: 60%

Step 1: Calculate Total Retail-Level Allocation Year Supplies

Table 6 shows the Allocation Year Local Supply, WSAP Allocation, and the total Allocation Year Supplies for the example agency at each Regional Shortage Level. The WSAP Allocation was calculated using the methodology detailed in Appendix G: Water Supply Allocation Formula Example and the assumptions listed above.

Table 6: Total Retail Level Allocation Year Supplies			
Regional Shortage Level	**Allocation Year Local Supply**	**WSAP Allocation**	**Total Allocation Year Supply**
1	25,000	23,594	48,594
2	25,000	22,188	47,188
3	25,000	20,781	45,781
4	25,000	19,375	44,375
5	25,000	17,969	42,969
6	25,000	16,563	41,563
7	25,000	15,156	40,156
8	25,000	13,750	38,750
9	25,000	12,344	37,344
10	25,000	10,938	35,938

Step 2: Calculate the Equivalent Total and Residential GPCD

The next step is to calculate the equivalent water use in gallons per capita per day (GPCD) for the Total Allocation Year Supply. The following equation shows the GPCD calculation under Regional Shortage Level 10.

35,938 af * 325,851 gallons ÷ 375,000 people ÷ 365 days = 85.6 GPCD

The residential per-capita water use is calculated in the same manner. Based on the assumption that 60% of the agency demands are residential, the following equation shows the residential GPCD calculation under Regional Shortage Level 10.

35,938 af * 60% * 325,851 gallons ÷ 375,000 people ÷ 365 days = 51.3 GPCD

Step 3: Compare the Total and Residential GPCD to the Minimum Water Use Thresholds

The next step is to compare the total GPCD water use to the 100 GPCD total water use threshold. In a Regional Shortage Level 10, the WSAP results in an allocation that is 14.4 GPCD below the minimum threshold.

100 GPCD – 85.6 GPCD = 14.4 GPCD

Likewise the residential GPCD water use is compared to the 55 GPCD residential water use threshold.

55 GPCD – 51.3 GPCD = 3.7 GPCD

Step 4: Determine the Allocation Adjustment in Acre-Feet

The final step is to calculate the acre-foot equivalent of the GPCD that fell below the minimum threshold. In a Regional Shortage Level 10, the adjustment provides 6,068 acre-feet of additional allocation to the agency; the results for Shortage Levels 1-10 are shown in Table 7.

14.4 GPCD ÷ 325,851 gallons * 375,000 people * 365 days = 6,068 acre-feet

Table 7: Total Per-Capita Water Use Adjustment				
Regional Shortage Level	**Allocation Year Supply**	**Equivalent GPCD**	**GPCD Below Threshold**	**Allocation Adjustment**
1	48,594	115.7	0	0
2	47,188	112.3	0	0
3	45,781	109.0	0	0
4	44,375	105.6	0	0
5	42,969	102.3	0	0
6	41,563	98.9	1.1	443
7	40,156	95.6	4.4	1,849
8	38,750	92.3	7.7	3,255
9	37,344	88.9	11.1	4,662
10	35,938	85.6	14.4	6,068

Again, this step is repeated for the residential water use. In a Regional Shortage Level 10, the adjustment provides 1,540 acre-feet of additional allocation to the agency; the residential water use results for Regional Shortage Levels 1-10 are shown in Table 8.

3.7 GPCD ÷ 325,851 gallons * 375,000 people * 365 days = 1,540 acre-feet

Table 8: Residential Per-Capita Water Use Adjustment				
Regional Shortage Level	**Allocation Year Supply**	**Equivalent GPCD**	**GPCD Below Threshold**	**Allocation Adjustment**
1	29,156	69.4	0	0
2	28,313	67.4	0	0
3	27,469	65.4	0	0
4	26,625	63.4	0	0
5	25,781	61.4	0	0
6	24,938	59.4	0	0
7	24,094	57.4	0	0
8	23,250	55.4	0	0
9	22,406	53.3	1.7	697
10	21,563	51.3	3.7	1,540

Agencies that fall below either threshold under the WSAP would receive additional allocation from Metropolitan to bring them up to the minimum GPCD water use level. If an agency qualifies under both thresholds, the one resulting in the maximum allocation adjustment would be given. Under this example the agency would receive 6,068 acre-feet of additional allocation in a Regional Shortage Level 10.

Appendix K: Qualifying Income-Based Rate Allocation Surcharge Adjustment Example

The following example provides a step by step description of how the qualifying income-based rate allocation surcharge adjustment is calculated. To qualify for this adjustment, member agencies must provide documentation showing the amount of retail demands that are covered by a qualifying income-based rate; no appeal is necessary.

The following list summarizes the allocation year demands, local supplies, and allocation as calculated in Appendix G: Water Supply Allocation Formula Example for a hypothetical agency under a Level 4 Regional Shortage. For detailed instructions on how to calculate these figures, reference Appendix G: Water Supply Allocation Formula Example.

Allocation Year Retail Demand: 133,000 acre-feet
Allocation Year Local Supplies: 68,000 acre-feet;
Level 4 WSAP Allocation: 52,735 acre-feet

Step 1: Allocation Surcharge Calculation

(a) **Water Use above Allocation:** The first step in calculating the income-based rate Allocation Surcharge adjustment is to calculate the agency's total Allocation Surcharge under the WSAP. If the agency did not incur any Allocation Surcharge from the allocation year, the income-based rate allocation surcharge adjustment would not apply. For the purpose of this example, the agency used 61,000 acre-feet of MWD supplies in the allocation year. This represents 8,265 acre-feet of use above the water supply allocation.

WSAP Allocation	52,735 af
Actual MWD Water Use	61,000 af
Use Above WSAP Allocation	8,265 af

(b) **Total Allocation Surcharge:** In this example the agency used 115.7% of its water supply allocation. 7,910 of the 8,265 acre-feet of use above the allocation would be assessed the Allocation Surcharge at an amount of $1,480 per acre-foot and 354 of the 8,265 acre-feet of use above the allocation would be assessed the Allocation Surcharge at an amount of $2,960.

Between 100% and 115% of Allocation	7,910 af	$1,480/af	$11,706,800
Greater than 115% of Allocation	354 af	$2,960/af	$1,047,840
Total	8,265 af		$12,754,640

Step 2: Effective Income-Based Rate Cutback

(a) **Calculate Retail Cutback:** The second step in calculating the income-based rate allocation surcharge adjustment is to calculate the amount of supply cutback that would have been expected from qualifying income-based rate customers under the WSAP. Using the water supply allocation that was calculated above, the total retail level impact on the agency can be

determined. In this example the agency receives a retail level cutback of 15,265 acre-feet, or 11.5% of their retail level demand.

WSAP Allocation + Allocation Year Local Supplies	117,735 af
Allocation Year Retail Demand	133,000 af
Effective Cutback	**15,265 af (11.5%)**

(b) Income-based Rate Customer Retail Cutback: To calculate the effective income-based rate cutback, the amount of demand covered by a qualifying income-based rate is multiplied by the effective retail level cutback. For this example assume that the agency has 10,000 acre-feet of qualifying demands.

Qualifying Income-Based Rate Demand	10,000 af
Effective Cutback Percentage	11.5%
Effective Income-Based Rate Cutback	**1,148 af**

(c) Income-based Rate Cutback Allocation Surcharge: Once the effective cutback has been calculated, the amount of Allocation Surcharge that is associated with qualifying income-based rate customers can be determined.

Between 100% and 115% of Allocation	794 af	$1,480/af	$1,175,120
Greater than 115% of Allocation	354 af	$2,960/af	$1,047,840
Total	**1,148 af**		**$2,222,960**

(d) Adjusted Allocation Surcharge Calculation: Finally, the Allocation Surcharge attributable to qualifying income-based rate customers is subtracted from the total Allocation Surcharge that was calculated above to determine the qualifying income-based rate adjusted allocation surcharge. In the case that the monetary amounts associated with the Income-Based Rate are greater than the total amounts an agency incurs, no Allocation Surcharge will be incurred.

Total Allocation Surcharge	$12,754,640
Qualifying Income-Based Rate Allocation Surcharge	$2,222,960
Qualifying Income-Based Rate Adjusted Allocation	**$10,531,680**

Appendix L: Groundwater Replenishment Allocation

Groundwater basins help provide vital local supplies that can buffer the region from short-term drought impacts. Longer droughts can result in reductions to the many sources of water that replenish groundwater basins, resulting in lower basin levels and potential impacts to the overlying consumptive demands. Limited imported deliveries under these conditions may help avoid impacts to the basins that may be drawn out of their normal operating range or subject to water quality or regulatory impacts. To this end, Metropolitan provides a limited allocation for drought impacted groundwater basins based on the following framework:

a) Staff hold a consultation with qualifying member agencies who have taken groundwater replenishment deliveries since 2010 and the appropriate groundwater basin managers to document whether their basins are in one of the following conditions:
    i. Groundwater basin overdraft conditions that will result in water levels being outside normal operating ranges during the WSAP allocation period; or
    ii. Violations of groundwater basin water quality and/or regulatory parameters that would occur without imported deliveries.

b) Provide an allocation based on the verified need for groundwater replenishment. The allocation would start with a member agency's ten-year average purchases of imported groundwater replenishment supplies (excluding years in which deliveries were curtailed). The amount would then be reduced by the declared WSAP Regional Shortage Level (5 percent for each Regional Shortage Level).

c) Any allocation provided under this provision for drought impacted groundwater basins is intended to help support and maintain groundwater production for consumptive use. As such, a member agency receiving an allocation under this provision will be expected to maintain groundwater production levels equivalent to the average pumping in the Base Period. Any adjustments to a member agency's M&I allocation due to lower groundwater production would be reduced by deliveries made under this provision.

d) Agencies for which this allocation does not provide sufficient supplies for the needs of the groundwater basin may use the WSAP Appeals Process to request additional supply (subject to Board approval). The appeal should include a Groundwater Management Plan that documents the need for additional supplies according to the following tenets:
    i. Maintenance of groundwater production levels;
    ii. Maintenance of, or reducing the further decline of, groundwater levels;
    iii. Maintenance of key water quality factors/indicators;
    iv. Avoidance of permanent impacts to groundwater infrastructure or geologic features; and
    v. Consideration of severe and/or inequitable financial impacts.

Final amounts and allocations will be determined following the consultations with groundwater basin managers and member agencies.

Appendix M: Water Rates, Charges, and Definitions

Table 9: Water Rates and Charges Dollars per acre-foot (except where noted)			
Rate	**Effective 1/1/2014**	**Effective 1/1/2015**	**Effective 1/1/2016**
Tier 1 Supply Rate	$148	$158	$156
Tier 2 Supply Rate	$290	$290	$290
System Access Rate	$243	$257	$259
Water Stewardship Rate	$41	$41	$41
System Power Rate	161	$126	$138
Tier 1	$593	$582	$594
Tier 2	$735	$714	$728
Treatment Surcharge	$297	$341	$348
Full Service Treated Volumetric Cost			
Tier 1	$890	$923	$942
Tier 2	$1,032	$1,055	$1,076
Readiness-to-Serve Charge (millions of dollars)	$166	$158	$153
Capacity Charge (dollars per cubic foot second)	$8,600	$11,100	$10,900

Definitions:

(1) **Tier 1 Supply Rate -** recovers the cost of maintaining a reliable amount of supply.

(2) **Tier 2 Supply Rate** - set at Metropolitan's cost of developing additional supply to encourage efficient use of local resources**.**

(3) **System Access Rate** – recovers a portion of the costs associated with the delivery of supplies.

(4) **System Power Rate** – recovers Metropolitan's power costs for pumping supplies to Southern California.

(5) **Water Stewardship Rate** – recovers the cost of Metropolitan's financial commitment to conservation, water recycling, groundwater clean-up and other local resource management programs.

(6) **Treatment Surcharge** – recovers the costs of treating imported water.

(7) **Readiness-to-Serve Charge -** a fixed charge that recovers the cost of the portion of system capacity that is on standby to provide emergency service and operational flexibility.

(8) **Capacity Charge** – the capacity charge recovers the cost of providing peak capacity within the distribution system.

Source: http://www.mwdh2o.com/WhoWeAre/Management/Financial-Information

Appendix N: Allocation Appeals Process

Step 1: Appeals Submittal

All appeals shall be submitted to the Appeals Liaison in the form of a written letter signed by the member agency General Manager. Each appeal must be submitted as a separate request, submittals with more than one appeal will not be considered. The appeal request is to include:

- A designated member agency staff person to serve as point of contact.
- The type of appeal (erroneous baseline data, loss of local supply, etc.).
- The quantity (in acre-feet) of the appeal.
- A justification for the appeal which includes supporting documentation.

A minimum of 60 days are required to coordinate the appeals process with Metropolitan's Board process.

Step 2: Notification of Response and Start of Appeals Process

The Appeals Liaison will phone the designated member agency staff contact within 3 business days of receiving the appeal to provide an initial receipt notification, and schedule an appeals conference. Subsequent to the phone call, the Liaison will send an e-mail to the Agency General Manager and designated staff contact documenting the conversation. An official notification letter confirming both receipt of the appeal submittal, and the date of the appeals conference, will be mailed within 2 business days following the phone contact

Step 3: Appeals Conference

All practical efforts will be made to hold an appeals conference between Metropolitan staff and member agency staff at Metropolitan's Union Station Headquarters within 15 business days of receiving the appeal submittal. The appeals conference will serve as a forum to review the submittal materials and ensure that there is consensus understanding as to the spirit of the appeal. Metropolitan staff will provide an initial determination of the size of the appeal (small or large) and review the corresponding steps and timeline for completing the appeals process.

Steps 4-7 of the appeals process differ depending upon the size of the appeal

Small Appeals

Small appeals are defined as those that would change an agency's allocation by less than 10 percent, or are less than 5,000 acre-feet in quantity. Small appeals are evaluated and approved or denied by Metropolitan staff.

Step 4: Preliminary Decision

Metropolitan staff will provide a preliminary notice of decision to the member agency within 10 business days of the appeals conference. The preliminary decision timeline may be extended to accommodate requests for additional information, data, and documentation. The Appeals Liaison will mail a written letter to the member agency staff contact and General Manager, stating the preliminary decision and the rationale for approving or denying the appeal.

Step 5: Clarification Conference

Following the preliminary decision the Appeals Liaison will schedule a clarification conference. The member agency may choose to decline the clarification conference if they are satisfied with the preliminary decision. Declining the clarification conference serves as acceptance of the preliminary decision, and the decision becomes final upon approval by Metropolitan's executive staff.

Step 6: Final Decision

Metropolitan staff will provide a final notice of decision to the member agency within 10 business days of the clarification conference, pending review by Metropolitan's executive staff. The Appeals Liaison will mail a written letter to the member agency staff contact and General Manager, stating the final decision and the rationale for the decision. A copy of the letter will also be provided to Metropolitan executive staff.

Step 6a: Board Resolution of Small Appeal Claims

Member agencies may request to forward appeals that are denied by Metropolitan staff to the Board of Directors through the Water Planning and Stewardship Committee for final resolution. The request for Board resolution shall be submitted to the Appeals Liaison in the form of a written letter signed by the member agency General Manager. This request will be administered according to Steps 6 and 7 of the large appeals process.

Step 7: Board Notification

Metropolitan staff will provide a report to the Board of Directors, through the Water Planning and Stewardship Committee, on all submitted appeals including the basis for determination of the outcome of the appeal.

Large Appeals

Large appeals are defined as those that would change an agency's allocation by more than 10 percent, and are larger than 5,000 acre-feet. Large appeals are evaluated and approved or denied by the Board of Directors.

Step 4: Preliminary Recommendation

Metropolitan staff will provide a preliminary notice of recommendation to the member agency within 10 business days of the appeals conference. The preliminary decision timeline may be extended to accommodate requests for additional information, data, and documentation. The Appeals Liaison will mail a written letter to the member agency staff contact and General Manager, stating the preliminary recommendation and the rationale for the recommendation. A copy of the draft recommendation will also be provided to Metropolitan executive staff.

Step 5: Clarification Conference

Following the preliminary recommendation the Appeals Liaison will schedule a clarification conference. The member agency may choose to decline the clarification conference if the satisfied with preliminary recommendation. Declining the clarification conference signifies acceptance of the preliminary recommendation, and the recommendation becomes final upon approval by Metropolitan's executive staff.

Step 6: Final recommendation

Metropolitan staff will provide a final notice of recommendation to the member agency within 10 business days of the clarification conference, pending review by Metropolitan executive staff. The Appeals Liaison will mail a written letter to the member agency staff contact and General Manager, stating the final recommendation and the rationale for the recommendation. A copy of the final recommendation will also be provided for Metropolitan executive review.

Step 7: Board Action

Metropolitan staff shall refer the appeal to the Board of Directors through the Water Planning and Stewardship Committee for approval.

Appendix O: Appeals Submittal Checklist

Appeal Submittal

- ☐ Written letter (E-mail or other electronic formats will not be accepted)
- ☐ Signed by the Agency General Manager

Mailed to the appointed Metropolitan Appeals Liaison

Contact Information

- ☐ Designated staff contact
  - o Name
  - o Address
  - o Phone Number
  - o E-mail Address
- ☐ General Manager
  - o Name
  - o Address
  - o Phone Number
  - o E-mail Address

Type of Appeal

- ☐ State the type of appeal
  - o Erroneous historical data used in base period calculations
    - Metropolitan Deliveries
    - Local Production
    - Growth adjustment
    - Conservation savings
  - o Exclusion of physically isolated areas
  - o Extraordinary supply designation
  - o Groundwater Replenishment Allocation
  - o Base Period Mandatory Rationing Adjustment
  - o Other

Quantity of Appeal

- ☐ State the quantity in acre-feet of the appeal

Justification and Supporting Documentation

- ☐ State the rationale for the appeal
- ☐ Provide verifiable documentation to support the stated rationale
  - o Examples of verifiable documentation Include, but are not limited to:
    - Billing Statements
    - Invoices for conservation device installations
    - Basin Groundwater/Watermaster Reports
    - California Department of Finance economic or population data
    - California Department of Public Health reports

Appendix 5

LOCAL PROJECTS

(From 2015 IRP local supply project survey April and July 2015)

Table A.5-1
Recycled Water Projects

Existing Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
City of Anaheim		
Anaheim Water Recycling Demonstration Project	110	2012
OCWD Groundwater Replenishment System - Anaheim Canyon Power Plant	200	2011
OCWD Groundwater Replenishment System - Anaheim Regional Transportation Intermodal Center	10	2014
City of Burbank		
Burbank Recycled Water System Expansion Phase 2 Project	960	2009
Burbank Reclaimed Water System Expansion Project	850	1995
BWP Power Plant	1,500	1985
Calleguas Municipal Water District		
Oxnard Advanced Water Purification Facility Ph. 1	2,310	2011
Camrosa Water District Recycling System	1,230	2005
Camrosa Water District Recycling System	450	1990
Lake Sherwood Reclaimed Water System	400	1997
VCWWD No. 1 WWTP Recycled Water Distribution System	2,200	2003
VCWWD No. 8 Recycled Water Distribution System	1,100	2001
Central Basin Municipal Water District		
Century/Rio Hondo Reclamation Program	10,500	1992
Montebello Forebay	50,000	1990
Cerritos Reclaimed Water Project	4,000	1993
Eastern Municipal Water District		
Eastern Reach 1, Phase II Water Reclamation Project	1,700	2000
Eastern Regional Reclaimed Water System Reach 3 Reach 7	4,830	2013
Eastern Recycled Water Expansion Project	5,000	2013
Recycled Water Pipeline Reach 16 Project	820	2006
Rancho California Reclamation Expansion Project	6,000	1993
Rancho California Reclamation	4,950	1993
Eastern Regional Reclaimed Water System (Non-LRP)	21,200	1989
Eastern Regional Reclaimed Water System (Non-LRP)	22,400	1975
Foothill Municipal Water District		
La Canada-Flintridge Country Club	90	1962
City of Glendale		
Glendale Water Reclamation Expansion Project	500	1992
Glendale Verdugo-Scholl Canyon Brand Park Reclaimed Water Project	2,225	1995
Glendale Grayson Power Plant Project	460	1986
Glendale Water Reclamation Expansion Project	100	2013

Inland Empire Utilities Agency		
IEUA Regional Recycling Water Distribution System	3,500	1998
IEUA Regional Recycling Water Distribution System	13,500	1998
IEUA Regional Recycled Water Distribution System (Non-LRP)	7,550	2007
IEUA Regional Recycled Water Distribution System (Non-LRP)	15,000	1997
IEUA Regional Recycled Water Distribution System (Non-LRP) (IPR)	13,850	2005
Las Virgenes Municipal Water District		
Calabasas Reclaimed Water System	4,000	1997
Las Virgenes Valley Reclaimed Water System	500	1997
City of Long Beach		
Alamitos Barrier Recycled Water Expansion Project	3,475	2013
Alamitos Barrier Reclaimed Water Project	3,025	2005
Long Beach Reclaimed Water Master Plan, Phase I System Expansion	2,750	1986
Long Beach Reclamation Project (Non-LRP Floor)	2,100	2004
THUMS	1,429	1981
City of Los Angeles		
Hansen Area Water Recycling Project, Phase 1	2,115	2008
Hansen Dam Golf Course Water Recycling Project	500	2015
Harbor Water Recycling Project	50	2005
Harbor Water Recycling Project	4,950	2005
Sepulveda Basin Water Recycling Project Phase IV	550	2009
Los Angeles Taylor Yard Park Water Recycling Project	150	2009
Van Nuys Area Water Recycling Project	150	2009
Griffith Park	900	1997
MCA/Universal	300	1997
Municipal Water District of Orange County		
El Toro Recycled Water System Expansion	1,175	2015
Green Acres Reclamation Project - Coastal	320	1991
San Clemente Water Reclamation Project	500	1990
Trabuco Canyon Reclamation Expansion Project	800	1992
Green Acres Reclamation Project - Orange County	2,160	1991
Capistrano Valley Non Domestic Water System Expansion	2,360	2006
(SMWD Chiquita) Development Of Non-Domestic Water System Expansion in Ladera Ranch & Talega Valley.	2,772	2005
Michelson – Los Alisos WRP Upgrades	8,500	2007
Moulton Niguel Water Reclamation Project/Moulton Niguel Phase 4 Reclamation System Expansion	9,276	2006
OCWD Groundwater Replenishment System Seawater Barrier Project	35,000	2008
OCWD Groundwater Replenishment System Spreading Project	35,000	2008
South Coast WD South Laguna Reclamation Project	1,450	2004
IRWD Michelson Reclamation Project	8,200	1997
OCWD Groundwater Replenishment System Spreading Project, Phase II	30,000	2015

Trabuco Canyon Reclamation Expansion Project (Non-LRP Floor)	280	1992
SMWD purchase from IRWD	321	2001
Trabuco Canyon Reclamation Expansion Project (Non-LRP)	350	1992
MNWD Moulton Niguel Water Reclamation Project (Non-LRP Floor)	470	2006
El Toro WD Recycling	500	1997
San Clemente Water Reclamation Project (Non-LRP)	500	1997
SJC Capistrano Valley Non-Domestic Water System Expansion (Non-LRP)	565	1999
IRWD Los Alisos Water Reclamation Plant	1,500	1997
OCWD Groundwater Replenishment System Spreading Project	2,500	2008
OCWD Groundwater Replenishment System Seawater Barrier Project (Non-LRP Floor/old Water Factory 21)	5,000	1975
City of Santa Ana		
Green Acres Reclamation Project - Santa Ana	320	1991
City of Santa Monica		
Dry Weather Runoff Reclamation Facility (SMURRF)	280	2005
San Diego County Water Authority		
Oceanside Water Reclamation Project	200	1992
Santa Maria Water Reclamation Project	400	1999
San Elijo Water Reclamation System	640	2000
Escondido Regional Reclaimed Water Project	650	2004
Padre Dam Reclaimed Water System, Phase 1	850	1998
San Elijo Water Reclamation System	960	2000
Fallbrook Public Utility District Water Reclamation Project	1,200	1990
Olivenhain Recycled Project – Southeast Quadrant (4S Ranch WRF)	1,788	2003
Encina Basin Water Reclamation Program - Phase I and II	5,000	2005
Otay Water Reclamation Project, Phase I/Otay Recycled Water System	7,500	2005
North City Water Reclamation Project	11,000	1998
Camp Pendleton	680	1997
Camp Pendleton	1,020	1997
Fairbanks Ranch	308	1997
North City Water Reclamation Project - City of Poway	750	2009
Olivenhain Northwest Quadrant Recycled Water Project (Meadowlark WRF) (Vallecitos)	1,000	2009
Olivenhain Recycled Project (SE Quad) - RG San Diego	1,000	2009
Olivenhain Southeast Quadrant Recycled Water Project (Non-LRP) (Santa Fe Valley WRF)	100	2005
Padre Dam MWD Recycled Water System (Non-LRP Floor)	65	1998
San Vincente Water Recycling Project (Non-LRP)	235	2003
San Vincente Water Recycling Project (Non-LRP)	350	1996
Rancho Santa Fe Water Pollution Control Facility	500	1997
Rincon del Diablo MWD Recycled Water Program (Non-LRP)	3,426	2006
San Diego Wild Animal Park	168	1997
South Bay Water Reclamation Project	1,520	2006

Valley Center - Lower Moosa Canyon	493	1974
Valley Center MWD - Woods Valley Ranch	84	2005
Whispering Palms	179	1997
Whispering Palms	269	1997
Three Valleys Municipal Water District		
City of Industry Regional Recycled Water Project - Suburban (7%)	228	2012
City of Industry Regional Recycled Water Project - Rowland	1,536	2012
City of Industry Regional Recycled Water Project - Walnut Valley	2,531	2008
Pomona Reclamation Project	9,320	1975
Pomona Reclamation Project - Cal-Poly Pomona	1,500	1997
Rowland Reclamation Project	2,000	1997
Fairway, Grand Crossing, Industry & Lycoming Wells into Reclamation System	1,184	1997
Walnut Valley Reclamation Project	2,550	1985
City of Torrance		
Edward C. Little Water Recycling Facility (ELWRF) Treatment Facility, Phase I-IV	7,800	1995
Upper San Gabriel Valley Municipal Water District		
Direct Reuse Project Phase IIA	2,258	2006
City of Industry Regional Recycled Water Project - Suburban (93%)	3,032	2011
Direct Reuse, Phase I	1,000	2003
Direct Reuse, Phase IIA Expansion/Rosemead Extension Project	720	2012
Direct Reuse, Phase IIB - Industry (Package 2)	360	2012
Direct Reuse, Phase IIB - Industry (Package 3)	310	2012
Direct Reuse, Phase IIB - Industry (Package 4)	210	2012
Los Angeles County Sanitation District Projects	4,375	1985
Norman's Nursery	100	1997
West Basin Municipal Water District		
West Basin Water Recycling Phase V Expansion Project	8,000	2013
Edward C. Little Water Recycling Facility (ELWRF) Treatment Facility, Phase I-IV	10,500	1995
Edward C. Little Water Recycling Facility (ELWRF) Treatment Facility, Phase I-IV	25,556	1995
Western Municipal Water District of Riverside County		
Elsinore Valley (Wildomar) Recycled Water System - Phase I Project	300	2013
City of Corona Reclaimed Water Distribution System	16,800	1968
Elsinore Valley/Horse Thief Reclamation	560	1997
Elsinore Valley/ Railroad Canyon Reclamation	1,050	1997
March Air Reserve Base Reclamation Project	896	1997
Rancho California Reclamation	4,950	1997

Under Construction Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
City of Glendale		
Glendale Public Works Yard	80	2016
City of Los Angeles		
South Griffith Park Recycled Water Project	370	2017
Harbor Industrial Recycled Water Project	9,300	2015
North Atwater, Chevy Chase Park, Los Feliz Water Recycling Project	50	2015
Municipal Water District of Orange County		
San Clemente Water Reclamation Project Expansion	1,000	2017
San Diego County Water Authority		
Olivenhain Northwest Quadrant Recycled Water Project, Phase B	300	2016
Valley Center MWD - Wood Valley Water Recycling Facility Phase II Expansion	196	2020
Escondido Regional Reclaimed Water Project (Easterly Ag Distribution & MFRO with Mains and Brine)/Primary	1,258	2019
Western Municipal Water District of Riverside County		
March Air Reserve Base Reclamation Project Expansion	448	2012

Full Design & Appropriated Funds Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
City of Los Angeles		
Terminal Island Expansion Project	7,880	2018
San Diego County Water Authority		
Encina Basin Water Reclamation Program - Phase III	3,314	2016
City of San Diego PURE Water - Phase 1 North City	33,630	2022
Escondido Regional Reclaimed Water Project (HARRF Upgrades)/Primary	2,492	2019
Upper San Gabriel Valley Municipal Water District		
Direct Reuse, Future Extensions of the Recycled Water Program	130	2016
Direct Reuse, Phase I - Rose Hills Expansion	600	2016
Indirect Reuse Replenishment Project (IRRP)	10,000	2018
Western Municipal Water District of Riverside County		
Elsinore Valley/Tuscany, Phase IA	1,225	2017

Advanced Planning (EIR/EIS Certified) Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
Calleguas Municipal Water District		
VCWWD No. 8 Recycled Water Distribution System	1,250	2020
Central Basin Municipal Water District		
West San Gabriel Recycled Water Expansion Project	500	2018
East Los Angeles Recycled Water Expansion Project	1,000	2021

Foothill Municipal Water District		
Recycled Water Scalping Plant	300	2018
Inland Empire Utilities Agency		
IEUA Regional Recycled Water Distribution System/IEUA Regional Recycled Water Distribution System (Non-LRP)	20,000	2020
City of Long Beach		
Long Beach Reclamation Project Expansion, Phase II Boeing/Douglas Park	450	2020
City of Los Angeles		
Downtown Water Recycling Project	2,350	2020
Sepulveda Basin Water Recycling Project Phase IV Expansion	250	2017
Municipal Water District of Orange County		
SMWD Chiquita Development of Non-Domestic Water System Expansion I	3,360	2018
SMWD Chiquita Development of Non-Domestic Water System Expansion II	5,600	2018
City of Pasadena		
Pasadena Non-Potable Water Project	3,056	2019
San Diego County Water Authority		
Escondido Regional Potable Reuse Project	5,000	2025
Live Oak WRF	42	2020
North District Recycled Water System	1,200	2020
Western Municipal Water District of Riverside County		
Elsinore Valley/Summerly	1,380	2020

Feasibility Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
City of Anaheim		
OCWD Groundwater Replenishment System - Anaheim Resort and Platinum Triangle	1,100	2017
Calleguas Municipal Water District		
Oxnard Advanced Water Purification Facility Ph. 2	5,000	2020
Eastern Municipal Water District		
EMWD Indirect Potable Reuse (IPR)	15,000	2020
Rancho Indirect Potable Reuse	9,070	2020
Las Virgenes Municipal Water District		
Woodland Hills Golf Course Extension	324	2018
City of Los Angeles		
San Pedro Waterfront Water Recycling Project	100	2022
Water Recycling Small Pipeline Extension Projects	1,000	2020
Woodland Hills Water Recycling Project	290	2019
Tillman Groundwater Replenishment System	30,000	2022
Los Angeles Greenbelt Project Extension	250	2018
LA Zoo Water Recycling Project	85	2020
LAX Cooling Towers	240	2021
Elysian Park Tank & Pumping Station Water Recycling Project	400	2022
Garber Street Tank Water Recycling Project	500	2018

Municipal Water District of Orange County		
South Coast WD J.B. Latham AWT Joint project	7,841	2020
San Diego County Water Authority		
Oceanside IPR Project	2,500	2020
Olivenhain Joint RW Transmission Project with SFID and OMWD	1,200	2020
Otay WD - North District Recycled Water System	4,400	2025
Padre Dam Phase 1 East County, 2.2 mgd Potable Reuse	2,464	2019
Padre Dam Phase 1 East County, T22 Expansion from 2 to 6 mgd	1,008	2019
Padre Dam Phase 2 East County,11.6 mgd Potable Reuse	12,992	2022
Santa Maria Water Reclamation Project	3,000	2020
Santa Fe ID Eastern Service Area Recycled Water Project	689	2025
Santa Fe ID Western Service Area Recycled Water System Expansion Project	111	2020
Upper San Gabriel Valley Municipal Water District		
Miller Coors Direct Reuse and Groundwater Recharge Project	1,000	2020
West Basin Municipal Water District		
Carson Regional Water Recycling Facility (CRWRF) Phase III Expansion Project - BP Expansion	2,100	2018
Western Municipal Water District of Riverside County		
Rancho California Reclamation Expansion/demineralization Western AG	13,800	2018

Conceptual Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
City of Burbank		
Direct potable reuse of recycled water	4,000	2025
Foothill Municipal Water District		
Verdugo Basin Project	560	2020
City of Los Angeles		
Natural Advanced Treatment Concept	19,000	2025
Encino Reservoir Recycled Water Storage Concept	1,550	2025
LA Westside Title 22	5,500	2030
Harbor Area Water Recycling Expansion and Storage	12,220	2022
Municipal Water District of Orange County		
IRWD Michelson Reclamation Project Expansion, Phase II	2,300	2025
OCWD Groundwater Replenishment System Spreading Project, Phase III	30,000	2025
LBCWD Laguna Canyon Recycling Project	200	2025
El Toro WD Recycling/El Toro Recycled Water System Expansion II	225	2025
San Diego County Water Authority		
City of San Diego PURE Water - Phase 2 Central Area	42,598	2035
City of San Diego PURE Water - Phase 3 South Bay	16,815	2035
Lake Turner Non-Potable Distribution System	440	2025
Lakeside Riverview Well Field Groundwater Recovery	500	2020

Olivenhain Wanket Reservoir RW Conversion	200	2020
Santa Fe ID Advanced Water Purification Project	1,100	2030
Valley Center MWD - Welk WRF	84	2025
Valley Center MWD - Lilac Ranch WRF	140	2020
Lower Moosa Canyon WRF - AWT Upgrade	280	2020
Valley Center MWD - Woods Valley Ranch WRF Phase 3 Expansion	179	2020
City of Torrance		
Joint Water Pollution Control Plant (JWPCP)	5,000	2020
Upper San Gabriel Valley Municipal Water District		
Direct Reuse, Phase II - Satellite Treatment Plant	500	2020
Western Municipal Water District of Riverside County		
City of Riverside Recycled Water Program	2,270	2025
City of Riverside Recycled Water Program Expansion	19,130	2025
City of Riverside Recycled Water Program Expansion	20,000	2025

Table A.5-2
Groundwater Recovery Projects

Existing Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
City of Beverly Hills		
Beverly Hills Desalter Project	3,120	2003
City of Burbank		
Burbank Operable Unit/Lockheed Valley Plant	11,000	1996
Calleguas Municipal Water District		
Round Mountain Water Treatment Plant	1,000	2013
Tapo Canyon Water Treatment Plant	1,445	2010
Central Basin Municipal Water District		
Water Quality Protection Project	5,807	2004
Eastern Municipal Water District		
Menifee Basin Desalter Project	4,032	2002
Perris Desalter	4,500	2006
Foothill Municipal Water District		
Glenwood Nitrate Water Reclamation Project	150	2003
City of Glendale		
San Fernando Wells Basin - Glendale Operable Units	8,469	2001
Verdugo Basin Wells A & B	2,750	1997
Inland Empire Utilities Agency		
Chino Basin Desalination Program, Phase I / Inland Empire	17,500	2000
Municipal Water District of Orange County		
Capistrano Beach Desalter Project	1,560	2007
Tustin Desalter Project (17th St.)	3,840	1996
San Juan Basin Desalter Project	5,760	2004
IRWD Wells 21 & 22	6,400	2013
Irvine Desalter Project	6,700	2007
Colored Water Treatment Facility Project	11,300	2001
IRWD DATS Project	8,300	2001
Tustin Main Street Nitrate	2,000	1997
Well 28	4,300	1997
San Diego County Water Authority		
Lower Sweetwater River Basin Groundwater Demineralization Project, Phase I	3,600	2000
Oceanside Desalter Project/Oceanside (Mission Basin) Desalter Expansion Project	7,800	2003
San Vicente & El Capitan Seepage Recovery	500	2015

Three Valleys Municipal Water District		
Cal-Poly Pomona Water Treatment Plant	250	2013
Pomona Well #37 – Harrison Well Groundwater Treatment Project	1,000	2006
City of Pomona VOC Plant	4,678	1997
Pomona Well #37 – Harrison Well Groundwater Treatment Project (Non-LRP)	1,200	2011
City of Torrance		
Madrona Desalination Facility (Goldsworthy Desalter)	2,880	2002
Western Municipal Water District of Riverside County		
Temescal Basin Desalting Facility Project	10,000	2001
Chino Basin Desalination Program, Phase I / Western	17,500	2000
Temescal Basin Desalting Facility Project (Non-LRP)	5,600	2001
Under Construction Projects	**Ultimate Yield/Capacity (Acre-Feet)**	**Online Date**
Eastern Municipal Water District		
Moreno Valley Groundwater Development Program	2,000	2018
City of Glendale		
Verdugo Basin Rockhaven Well	500	2016
San Diego County Water Authority		
Lower Sweetwater Desalter, Phase II	5,200	2017
Full Design & Appropriated Funds Projects	**Ultimate Yield/Capacity (Acre-Feet)**	**Online Date**
Eastern Municipal Water District		
Brackish Wells 94, 95, and 96	2,250	2018
Perris Desalter II	4,000	2020
San Diego County Water Authority		
Rancho del Rey Well Desalination	400	2025
City of Torrance		
Madrona Desalter (Goldsworthy) Expansion	2,400	2017
Advanced Planning (EIR/EIS Certified) Projects	**Ultimate Yield/Capacity (Acre-Feet)**	**Online Date**
Calleguas Municipal Water District		
North Pleasant Valley Desalter	7,300	2020
City of Los Angeles		
Tujunga Well Treatment	24,000	2020
Municipal Water District of Orange County		
SJC San Juan Desalter Project Expansion	2,000	2020
Tustin Legacy Well # 1	2,200	2020

Feasibility Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
City of Beverly Hills		
Groundwater Development	2,000	2023
Calleguas Municipal Water District		
Moorpark/South Las Posas Desalter Phase 1	5,000	2020
West Simi Desalter (District 8)	2,800	2025
Eastern Municipal Water District		
Perris Groundwater Development (Well and Pipeline)	1,000	2018
Municipal Water District of Orange County		
IRWD Wells 51, 52 & 53 Potable (Non-exempt)	2,400	2020
City of San Marino		
San Marino GWR Project	2,500	2018
San Diego County Water Authority		
Middle Sweetwater River Basin Groundwater Well System (Otay WD)	1,500	2025
Mission Valley Brackish Groundwater Recovery Project (City of San Diego)	1,680	2025
Oceanside Mission Basin Desalter Expansion/Seawater Recovery and Treatment	5,600	2025
Otay Mesa Lot 7 Well Desalination (Otay WD)	400	2025
San Diego Formation / Diamond BID Pilot Production Well	1,600	2025
San Paqual Brackish Groundwater Recovery Project (City of San Diego)	1,619	2020
Sweetwater Authority/Otay WD San Diego Formation Recovery	3,900	2025

Conceptual Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
City of Beverly Hills		
Shallow Groundwater Development	500	2020
Calleguas Municipal Water District		
Camrosa Santa Rosa Basin Desalter	1,000	2022
Municipal Water District of Orange County		
LBCWD Groundwater Facility	2,025	2025
Mesa Colored Water Treatment Facility Project, Phase II	5,650	2018
South Coast WD Capistrano Beach Desalter Expansion	1,200	2025
San Diego County Water Authority		
San Dieguito River Basin Brackish GW Recovery and Treatment	1,500	2025
Western Municipal Water District of Riverside County		
Arlington Basin Groundwater Desalter Project Expansion	2,000	2020
Arlington Basin Groundwater Desalter Project Expansion Advanced Brine Treatment	1,900	2020
Arlington Basin Groundwater Desalter Project Expansion Biological Denitrification	4,100	2020

Table A.5-3
Seawater Desalination Projects

Existing Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
San Diego County Water Authority		
Carlsbad Seawater Desalination Project	56,000	2015

Advanced Planning (EIR/EIS Certified) Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
Municipal Water District of Orange County		
Huntington Beach Seawater Desalination Project	56,000	2017

Feasibility Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
San Diego County Water Authority		
Rosarito Beach Seawater Desalination Feasibility Study (Otay WD)	28,000	2025
West Basin Municipal Water District		
West Basin Seawater Desalination Project	22,400	2022

Conceptual Projects	Ultimate Yield/Capacity (Acre-Feet)	Online Date
Municipal Water District of Orange County		
South Orange (Dana Point) Coastal Ocean Desalination Project	16,800	2020
San Diego County Water Authority		
Camp Pendleton Seawater Desalination Project	56,000	2035

Appendix 6

CONSERVATION ESTIMATES AND WATER SAVINGS FROM CODES, STANDARDS, AND ORDINANCES

Appendix 6
CONSERVATION ESTIMATES AND WATER SAVINGS FROM CODES, STANDARDS, AND ORDINANCES

Background

Unlike traditional water supplies, which can be directly measured, conservation reduces water demand in ways that are quantified indirectly. Demand is reduced through changes in consumer behavior and savings from water-efficient fixtures. There are numerous approaches for estimating and projecting conservation savings, and many of them are utility-specific to meet the unique needs of different water agencies. Metropolitan estimates savings from the extensive existing conservation programs that it funds, as well as savings produced by plumbing codes. Metropolitan also incorporates the savings due to the impacts of price on consumers in its demand forecasts. These conservation savings estimates are incorporated into Metropolitan's long-term planning such as the Integrated Water Resources Plan (IRP) and included in its Urban Water Management Plan (UWMP).

Conservation savings are commonly estimated from a base-year water-use profile. Beginning with the 1996 IRP, Metropolitan identified 1980 as the base year for estimating conservation because it marked the effective date of a new plumbing code in California requiring toilets in new construction to be rated at 3.5 gallons per flush or less. Between 1980 and 1990, the Metropolitan service area saved an estimated 250 TAF per year as the result of this 1980 plumbing code and unrelated water rate increases. Within Metropolitan's planning framework, these savings are referred to as "pre-1990 savings." Metropolitan's conservation accounting combines pre-1990 savings and estimates of more recently achieved savings from the following sources of conservation:

- Active Conservation – Water saved directly as a result of conservation programs by water agencies, including implementation of Best Management Practices by the California Urban Water Conservation Council (CUWCC). Active conservation is unlikely to occur without agency action.
- Code-Based Conservation – Water saved as a result of changes in water efficiency requirements for plumbing fixtures in plumbing codes. Sometimes referred to as "passive conservation," this form of conservation would occur as a matter for course without any additional action from water agencies.
- Price-Effect Conservation – Water saved by retail customers attributable to the effect of changes in the real (inflation-adjusted) price of water. Because water has a positive price elasticity of demand, increases in water price will decrease the quantity demanded.

Metropolitan's Conservation Estimate

In September 19, 2014, Governor Brown signed SB 1420 (Wolk, D-Davis), which added Section 10631(e)(4) to the Water Code. This Section provides that "water use projections may display and account for the water savings estimated to result from adopted codes, standards,

ordinances, or transportation and land use plans" if that information is available and applicable to an urban water supplier.

Metropolitan's conservation estimate involves a comprehensive representation of Metropolitan's active conservation activities, which utilizes a combination of: (1) fixture/program savings rates based on CUWCC reports and other sources, and (2) a measurement of code-based plumbing code conservation from a 1990 base year. In addition, the price-effect savings is also calculated using Metropolitan's MWD-EDM, a statistical model used for forecasting retail water demands. Potential savings from public outreach and education programs are not included in Metropolitan's conservation estimate.

Distinguishing between active, code-based, and price-effect conservation can be complex when, for example, active programs for fixtures are concurrent with conservation-related plumbing codes. Metropolitan's conservation estimate combines active, code-based, and price-effect conservation savings using methods that avoid double counting. Currently, there are 74 devices and programs accounted for in estimating active conservation. These devices are aggregated into residential, landscape, commercial, industrial, and institutional sectors. There are eight fixtures tied to Code-based conservation estimate. Metropolitan's conservation estimate is developed in cooperation with its 26 member agencies and is categorized into:

- Single-family residential (SFR),
- Multi-family residential (MFR), and
- Commercial, industrial, and institutional (CII).

Active Conservation

The estimated savings from active conservation take into account programs administered by Metropolitan and its member agencies since 1990. The savings are calculated by combining counts of active program activity – numbers of devices and/or program implementations – with device-related savings factors. The factors include:

- Savings per device/implementation
- Device life expressed in years
- Decay rate expressed as percent decay per year

Device savings estimates are determined by key assumptions described above. Devices may be represented more than once due to different implementation methods or savings factors. Assumptions are periodically reviewed to ensure they represent the best savings estimates available. Device savings are limited by decay rates, or device life, but not both at the same time. For example, a residential high-efficiency toilet (HET) saves about 38 gallons per day over a lifetime of 20 years with no assumed decay rate.

Code-Based Conservation

Code-Based conservation accounts for water saved as a result of changes in water efficiency requirements for plumbing fixtures in plumbing codes. Plumbing code conservation is the impact of plumbing codes and other ordinances on water demand. Metropolitan's Code-Based conservation estimate represents plumbing code conservation with demographically-driven stock models. The stock models are device- or fixture- specific and are based on the same demographic data used in Metropolitan's retail demand projection. Each stock model tracks the stocks and flows of conserving and non-conserving water devices, allowing it to estimate the impacts of plumbing codes on device saturation and overall savings.

The Metropolitan's Code-Based conservation estimate accounts for the following:

- New Construction: Water fixtures installed due to new construction are assumed to be in compliance with the plumbing codes in effect when the new construction occurs. For instance, a house built in 1997 would meet the efficiency standards set by California's 1992 plumbing code. Therefore, new construction is assumed to result in measurable savings from 1990, which is the baseline for conservation savings calculations. Estimates and projections of the number of fixtures added through new housing units and offices are based on growth in housing units or employment.
- Natural Replacement: Natural replacement accounts for the savings that accrue when fixtures are replaced with more efficient models due to remodeling, failure, or other reasons. Metropolitan's savings estimate represents this effect with a "natural replacement rate" that is expressed as a percentage of existing fixtures that are replaced in a given year. Natural replacement rates vary by device and are linked to the expected life of the device. Devices with short lifespans will be replaced more frequently and thus have higher natural replacement rates. A simple percentage is used to account for this natural turn-over in non-conserving fixtures because it is difficult to back-calculate the age of the fixtures in pre-1990 construction.
- Fixtures Up for Renewal: As water-conserving fixtures reach their useful lives and become defective or inefficient, they may be replaced with water conserving fixtures due to plumbing codes. The water savings from the device is then considered "renewed" savings, which is tracked in Metropolitan's savings estimate. For example, a fixture that was installed through an active conservation program provides water savings that otherwise would not have been realized without plumbing codes. However, subsequent adoption of efficient plumbing codes means that when the fixture reaches the end of its life, it will be replaced by the same or more water-efficient model.

Stock Models

The number of efficient fixtures for each stock model is the sum of fixtures from active programs, new construction, natural replacement, and fixtures up for renewal. Table A.6-1 below shows the fixtures and devices that are assigned stock models based on existing plumbing codes.

Table A.6-1
Stock Models

Residential	CII
Toilets	Toilets
Showerheads	Urinals
Faucet Aerators	Pre-Rinse Spray Heads
Washing Machines	Washing Machines

The Stock Models generate separate annual estimates of devices and fixtures for tracking active conservation savings, while also accounting for the impacts of active programs on the overall device saturation rate. As a result, increased levels of active conservation lead to lower levels of plumbing code conservation. This helps avoid double counting in Metropolitan's conservation savings estimate.

Plumbing Code Assumptions

Plumbing code savings are determined by the device-specific assumptions used in the stock models, presented in Table A.6-2. The stock models are driven by projections of housing and employment consistent with the demand projections. Initial device counts and growth in the number of devices are determined by the demographics combined with the following assumptions:

- Devices per Household or Per Employee: This factor represents the average number of devices per household or per employee and is multiplied by the demographic projections to develop estimates of total number of devices or "stock." Devices per household and employee can vary by agency and change over time.
- Plumbing Code Compliance Rate: The plumbing code compliance rate is expressed as a percent and serves two purposes: (1) it indicates the presence of a plumbing code in a specific year, and (2) it determines the overall compliance rate with the plumbing code. This allows plumbing code effects to be phased in over several years.
- Natural Replacement Rate: This represents the rate at which existing non-conserving devices are converted to conserving devices due to remodeling or device failure. It has a strong impact on the saturation rate of devices that existed prior to plumbing codes, such as pre-1992 toilets.
- Device Life: The stock models also account for device life for water-efficient devices installed after 1990. This allows the stock model to track devices installed through active conservation as they reach the end of their life and are replaced due to plumbing codes. The stock models use the same device life specified in the savings assumptions.

Table A.6-2
Plumbing Code Assumptions

Stock Model	Device per Household/ Employee	Compliance Rate	Natural Replacement Rate	Plumbing Code Year
Res. Toilets	2	99%	2%	1992/2014
Res. Shower Heads	1.8	95%	10%	1992
Res. Aerators	3.5	90%	33%	1992
Res. Washing Machine	0.74	100%	6.7%	2007
CII Toilets	0.27*	100%	2%	1992/2014
CII Urinals	0.06	100%	4%	1992
CII Pre-Rinse Spray Heads	0.0055*	95%	16.7%	2006
CII Washing Machine	0.0073*	100%	5%	2007

* Varies over time and by agency (based on CUWCC BMPs savings factors)

These assumptions are derived from CUWCC conservation reports, American Water Works Association Research Foundation's 1999 end use study, Metropolitan's Orange County Saturation Study, and other sources. In the residential sector, devices per household combine single family and multifamily trends.

Model Water Efficient Landscape Ordinance

The California Water Commission adopted an updated Model Water Efficient Landscape Ordinance (MWELO) on July 15, 2015. The MWELO promotes efficient landscapes in new developments and retrofitted landscapes. The MWELO increases water efficiency standards for new and retrofitted landscapes through more efficient irrigation systems, greywater usage, onsite storm water capture, and by limiting the portion of landscapes that can be covered in turf. Local agencies had until December 1, 2015 to adopt the MWELO or to adopt a Local Ordinance which must be at least as effective in conserving water as MWELO. Local agencies working together to develop a Regional Ordinance had until February 1, 2016 to adopt, but they are still subject to the December 2015 reporting requirements. Local agencies were required to report on the implementation and enforcement of local ordinances by December 31, 2015.

Metropolitan's modeling of code-based conservation includes a calculation of savings that would result from 50 percent of new households having efficient outdoor water use consistent with MWELO. The 50 percent compliance rate for new households is a conservative estimate based on an assessment of the efficacy of the current MWELO ordinance.

Metropolitan's 2015 IRP Update includes a regional target for additional conservation development. This target is based on estimates calculated from the potential savings that could result from increasing MWELO compliance from 50 percent to 100 percent of new households, and on the potential savings that could result from one percent per year of all existing households reducing outdoor water use in a manner consistent with MWELO. Because MWELO does not apply to existing households, it is anticipated that achieving the equivalent MWELO efficient water savings will require a combination of approaches that can target reductions in outdoor water use.

Price Savings Assumptions

Price-effect savings are calculated by comparing MWD-EDM demand projections with price increases to demand projections with constant 1990 water rates. The difference is the price-effect savings measured from a 1990 base. Price-effect savings increase as prices rise over time; they also increase as the household and employment base grow. A price increase applied to 1,000 households will generate more water savings than the same price increase applied to 500 households.

Un-metered Water Use Savings

A final category of savings tracked by Metropolitan is a product of other conservation efforts. MWD-EDM projects un-metered water use as a fixed percentage of total retail M&I demand. As conservation savings lowers residential and CII demands, it lowers un-metered use by the same percent. For instance, if conservation reduces M&I demands by 10 percent in 2020 (compared to demands before conservation), un-metered water use is also reduced 10 percent. This reduction is based on the assumption that un-metered use varies according to overall demand and that reducing overall use also reduces un-metered use. The reduction in un-metered water use is captured in the MWD-EDM model and included as a conservation source.

The total passive savings are shown in Table A.6-3 below.

Table A.6-3
Passive Savings[1]
(Acre-feet)

	2010	2015	2020	2025	2030	2035	2040
Total	701,000	765,000	846,000	931,000	1,016,000	1,097,000	1,180,000

[1] Passive savings are accounted for in water use projections in Section 2.

Appendix 7

DISTRIBUTION SYSTEM WATER LOSSES

Appendix 7
DISTRIBUTION SYSTEM WATER LOSSES

Metropolitan followed the American Water Works Association (AWWA) Water Audit methodology to track all sources of water and uses of water within its system. The AWWA Audit methodology quantifies real and apparent water system losses in an agency's distribution system. Section 10631(e)(3)(A) of the California Water Code requires that the 2015 Urban Water Management Plan quantify distribution system water losses for the most recent 12-month period available.

For the distribution system water losses assessment, Metropolitan is including its water balance audit for calendar years 2014 and 2013, as presented in tables A.7-1 and A.7-2, respectively. In addition, this appendix also includes a memorandum entitled "Metropolitan Water District – Water Balance Validation & Component Analysis Feasibility Study" dated January 16, 2013. This memorandum discusses the water balance assessment for year 2012. The 2014 and 2013 assessments were updated using the methods and worksheets developed in the 2012 assessment, and results were submitted as part of Metropolitan's CUWCC filings included in Appendix 8.

In addition to the distribution system losses described in the AWWA tables, Metropolitan estimates that 37 TAF was lost from reservoir evaporation occurring in Lake Mathews, Lake Skinner, and Diamond Valley Lake during calendar year 2014.

Table A.7-1
Metropolitan's Distribution
System Water Loss (AF)
Calendar Year 2014

AWWA Free Water Audit Software: Water Balance

WAS v5.0

Water Audit Report for:	Metropolitan Water District of Southern California
Reporting Year:	2014 (1/2014 - 12/2014)
Data Validity Score:	89

Own Sources (Adjusted for known errors) 898,936.768	System Input 898,936.768	Water Exported 0.000			Billed Water Exported	Revenue Water 0.000
		Water Supplied 898,936.768	Authorized Consumption 892,528.150	Billed Authorized Consumption 891,638.200	Billed Metered Consumption (water exported is removed) 891,638.200	Revenue Water 891,638.200
					Billed Unmetered Consumption 0.000	
				Unbilled Authorized Consumption 889.950	Unbilled Metered Consumption 0.000	Non-Revenue Water (NRW) 7,298.568
					Unbilled Unmetered Consumption 889.950	
			Water Losses 6,408.618	Apparent Losses 1,394.466	Unauthorized Consumption 5.000	
					Customer Metering Inaccuracies 1,339.466	
					Systematic Data Handling Errors 50.000	
Water Imported 0.000				Real Losses 5,014.151	Leakage on Transmission and/or Distribution Mains Not broken down	
					Leakage and Overflows at Utility's Storage Tanks Not broken down	
					Leakage on Service Connections Not broken down	

Table A.7-2
Metropolitan's Distribution
System Water Loss (AF)
Calendar Year 2013

AWWA Free Water Audit Software: Water Balance

WAS v5.0

Water Audit Report for:	Metropolitan Water District of Southern California
Reporting Year:	2013 (1/2013 - 12/2013)
Data Validity Score:	89

Own Sources (Adjusted for known errors) 920,659.900	System Input 920,659.900	Water Exported 0.000			Billed Water Exported	Revenue Water 0.000
			Authorized Consumption 919,186.960	Billed Authorized Consumption 918,266.300	Billed Metered Consumption (water exported is removed) 918,266.300	Revenue Water 918,266.300
					Billed Unmetered Consumption 0.000	
				Unbilled Authorized Consumption 920.660	Unbilled Metered Consumption 0.000	Non-Revenue Water (NRW) 2,393.600
					Unbilled Unmetered Consumption 920.660	
		Water Supplied 920,659.900	Water Losses 1,472.940	Apparent Losses 1,379.489	Unauthorized Consumption 0.010	
					Customer Metering Inaccuracies 1,379.469	
					Systematic Data Handling Errors 0.010	
Water Imported 0.000				Real Losses 93.451	Leakage on Transmission and/or Distribution Mains Not broken down	
					Leakage and Overflows at Utility's Storage Tanks Not broken down	
					Leakage on Service Connections Not broken down	

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San Francisco, CA 94103
(415) 538 8641

WSO

TO: **Mark Graham, Keith Nobriga, Timothy Schaadt**
FROM: **WSO**
DATE: **January 16, 2013**
RE: **Metropolitan Water District – Water Balance Validation & Component Analysis Feasibility Study**

I. Introduction

Water loss assessment is the focus of the Best Management Practice (BMP) 1.2 in the California Urban Water Conservation Council (CUWCC)'s Memorandum of Understanding (MOU). As a signee of this MOU, the Metropolitan Water District (MWD) is required to submit standard water balances annually and complete a component analysis of real losses every four years. Beyond compliance with the CUWCC BMP 1.2 requirements, regularly assessing water loss provides an opportunity for MWD to realize efficiency improvements and water savings.

Water Systems Optimization (WSO) was hired to validate MWD's water balance and investigate the feasibility of a component analysis of real losses for a transmission system. The standards used in the water balance and component analysis assumptions are geared toward distribution systems with significantly smaller pipe sizes and lower pressures; it is important to evaluate whether this methodology can provide useful insight for a transmission system.

II. Treated Water Balance Findings

The following outlines the findings from the water loss assessment and highlights important assumptions applied to present a realistic water balance for MWD.

For the treated water system, WSO compiled a basic water balance for the calendar year of 2012. First, the inputs into the treated water system were totaled from MWD's master meter data. Next WSO inventoried all of the treated water service connections. Reviewed and confirmed by MWD staff, WSO tabulated the total volume of water deliveries – or authorized consumption – for the potable water system. Non-revenue water is the difference between these two volumes (Total Water Supplied minus Billed Metered Consumption).

Table 1 presents the non-revenue water determination for the treated water system.

Table 1: Non-Revenue Water Determination for Treated Water System

TOTAL WATER SUPPLIED (A)	891,434.20	AF
BILLED CONSUMPTION (B)	886,370.10	AF
NON-REVENUE WATER (A-B)	5,064.10	AF
NON-REVENUE WATER *as a % of supply*	0.57%	

The non-revenue water determination shows that MWD successfully delivered and generated revenue for nearly all of the treated water it produced in CY 2012.

To satisfy the AWWA Water Balance requirements, non-revenue water must be broken down into its three components: 1) Unbilled Consumption, 2) Apparent Losses consisting of meter under-registration and water theft and 3) Real Losses - physical water losses from infrastructure failures.

The assumptions outlined in Table 2 were applied to address these volume of non-revenue water for MWD. It is important to note that many of the AWWA Free Water Audit Software's suggested default values were changed to account for the unique nature of MWD's transmission-only system.

Table 2: Assumptions Used in Treated Water Balance

Non-Revenue Water	**Value Used for MWD**	**Notes on Assumption**
Unbilled Unmetered Consumption	0.1% of Water Supplied	*This is the volume of water used for operational purposes throughout the year (neither billed nor metered). Though the default value for distribution systems is 1.25% of Water Supplied, a much lower value is applied here.*
Meter Under-Registration	0.25% Meter Under-Registration	*This is the assumed inaccuracy of customer meters. Though Venturi meters are quoted at +/-0.75% accuracy, a lower under-registration is applied to accommodate for the low total of non-revenue water.*
Unauthorized Use (Theft)	Zero	*MWD staff reported that water theft in the system is negligible if it exists at all.*

With these assumptions, a complete water balance – including the real loss volume estimation - was produced. Table 3 presents the finalized water balance for the MWD treated water system

(additionally, the free AWWA Water Audit Software which outlines the same volumes is included in Appendix A).

Table 3: Water Balance for MWD Treated Water CY 2012

WATER BALANCE COMPONENT	CY 2012 VOLUME
	(AF)
WATER SUPPLIED	**891,434.20**
Billed Metered Authorized Consumption	886,370.10
Billed Un-metered Authorized Consumption	NA
BILLED AUTHORIZED CONSUMPTION	**886,370.10**
Un-billed Metered Authorized Consumption	NA
Un-billed Un-metered Authorized Consumption	891.43
UN-BILLED AUTHORIZED CONSUMPTION	**891.43**
AUTHORIZED CONSUMPTION	**887,261.53**
WATER LOSSES	**4,172.67**
Unauthorized Consumption	NA
Meter Error	2,215.93
APPARENT LOSSES	**2,215.93**
REAL LOSSES	**1,956.74**

It is expected for a system exclusively composed of transmission lines to experience low losses: a large diameter pipe network with low service connection density has few points of infrastructural vulnerability.

Non-Revenue Water by Zone

To take a closer look at the treated water system, WSO divided MWD's treated water system into five zones. Examining separate water balances for each of these zones allowed for a more detailed picture of water loss throughout the system. Table 4 describes the parameters for each zone's boundaries.

It is important to note that a number of these zones are overlapping. The combination of Zone A and Zone D capture the total treated water system. Zones, B, C, and E are all within the bigger Zone A.

Table 4: Zone Boundary Designations

ZONE	BOUNDARY DETAILS
A	The total treated water zone, excluding the portion off of Skinner Lake
B	Exclusively the Allan McColloch Pipeline ("AMP")
C	Exclusively the West Valley Feeder #2 and the Calabasas Feeder
D	Treated water off of Skinner Lake
E	"Los Angeles Central Zone" refers to the the zone where different sources of treated water overlap, boundaries defined as: *Inputs into the Los Angeles Central Zone:* • PVF-0 serves as one of the northern boundaries • MF-1 serves as one of eastern boundaries • 2LF-4W serves as one of the eastern boundaries • MFBP-0 serves as one of the eastern boundaries • WC-0 serves as one of the eastern boundaries • LF-2W serves as one of the eastern boundaries • SC-OS serves as one of the eastern boundaries • SF-V serves as the western boundary *Outputs from the Los Angeles Central Zone (distinct from customers):* • LF-2E serves as an outlet on the eastern boundary • 2LF-3E serves as an outlet on the eastern boundary • 2LF/WOCS serves as an outlet on the eastern boundary • SC-ON serves as an outlet on the eastern boundary

For each zone, WSO determined the non-revenue water volume for the calendar year of 2012. First, the inputs into each zone - metered by one or many of the MWD's master meters – were totaled. Next WSO inventoried all of the service connections by zone. Reviewed and confirmed by MWD staff, WSO tabulated the total volume of water deliveries – or authorized consumption – for each zone. Non-revenue water is the difference between these two volumes (Total Water Supplied minus Billed Metered Consumption).

Table 5 presents the non-revenue determinations for MWD's treated system by zone alongside the number of service connections and mileage for each zone.

Table 5: Non-Revenue Water Determinations by Zone

ZONE		A	B	C	D	E
Mileage	(miles)	485.29	22.96	17.95	42.08	152.09
Service Connections		284	28	4	12	117
TOTAL WATER SUPPLIED:	(AF)		99,722.30	124,294.60	153,329.70	231,175.50
BILLED CONSUMPTION	(AF)		100,590.60	123,618.20	152,790.60	232,513.80
NON-REVENUE WATER:	(AF)	4,525.00	(868.30)	676.40	539.10	(1,338.30)
NON-REVENUE WATER *as a % of supply*		0.61%	-0.87%	0.54%	0.35%	-0.58%

Examining the non-revenue water determinations by zone confirms that MWD experiences very low water loss levels across its treated water system. The calculations in Zones B and E show that more consumption was billed than entered the particular zone. This implausible scenario likely suggests the impact of meter inaccuracy in the master meter, the customer meters, or both. It is important to note that when non-revenue water is so low, any metering inaccuracy will have significant impacts in the water balance.

III. Recommendations for Improved Water Loss Assessment

For future water balances, it is recommended to replace any assumptions applied here with documentation of use specific to MWD's practices. Going forward it will be useful to keep track or actively estimate the following volumes:

- Unbilled Unmetered Authorized Consumption: all operational uses for flushing, maintenance, etc.
- Unauthorized Consumption: documentation of any water theft

It is also recommended to calculate non-revenue water for the whole treated water system – and by zone – on a frequent basis. After inventorying the appropriate inputs and outputs, the designation of zones will serve to highlight smaller areas of attention if the non-revenue water determinations vary. Ongoing attention to the trends of non-revenue water throughout the year will allow for further investigation if it increases and presents a larger problem.

Lastly, it is recommended to continue the current maintenance and testing schedule of all input meters and wholesale customer meters.

IV. Component Analysis Feasibility and Results

Transmission mains have long been a challenging component to address effectively in water network audits and modelling of real losses. The lack of reliable methods for assessing this component of real water loss has forced the use of educated guesses and assumptions (Laven and Lambert, 2012).

It is important to note that The Bursts and Background Estimates (BABE) Concept was developed for component analysis of Real Losses on distribution systems (Lambert, 1994; Lambert and Morrison, 1995). It classifies leakage events into three different categories – undetectable background leakage, unreported bursts and reported bursts – each with different characteristics in terms of typical frequencies, flow rates and run-times. Because of this methodology's focus on distribution systems, it becomes challenging to use it to produce a reliable real loss component analysis for a transmission system. The results need to be interpreted in the context of the limitations of conducting a real loss component analysis for a transmission system. A Real Loss component analysis separates the leak and break volumes of real loss into the following categories (see Figure 1).

- **Reported leaks**: those leaks that are called in during the normal course of the day. Reported leaks may be called in by the public, meter readers or by other utility personnel.
- **Unreported leaks**: are those leaks that are not called in and have to be located by proactive leak detection methods.
- **Background Leakage:** the collective weeps and seeps in pipe joints and connections. They have flow rates that are typically too small (1gpm or less) to be detected by conventional acoustic leak detection equipment. They run continuously until they gradually worsen to the point when they can be detected. The only ways of reducing background leakage is through pressure management or infrastructure replacement.

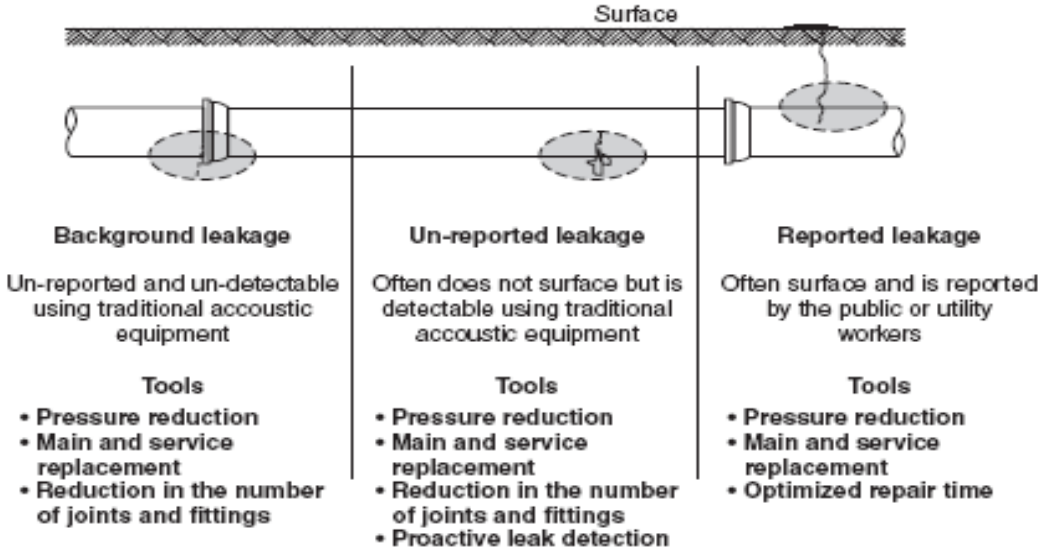


Figure 1: Components of Real Losses and Tools for Intervention

IV. a – Background Leakage

The total volume of estimated background leakage on MWD's treated water transmission system was calculated using an Infrastructure Condition Factor (ICF) of 1.5, which assumes that background leakage is 1.5 times higher than the technical minimum. This assumption was informed by the transmission's high operating pressure and the generally very good condition of the infrastructure. Under this assumption, the total volume of background losses for MWD's treated water transmission system was calculated to be 1,318 AF. This background losses volume accounts for about 67% of the total volume of real losses calculated for CY 2012 (see Figure 2 for the calculation details). Given the high average pressure in the transmission system and the nature of the transmission system infrastructure it appears reasonable that two thirds of the total real loss volume is caused by background leakage, which comprises of weeps and seeps in pipe joints and connections.

Step 2: BACKGROUND LEAKAGE ON MAINS AND SERVICES

Instructions: The background leakage volume from mains and service connections will be automatically calculated after selecting one of the default Infrastructure Condition Factors (ICF) based on infrastructure age or after a utility specific ICF has been selected and entered in cell P43. The level of background leakage tends to increase with infrastructure age and is higher for systems with higher pressure. The volume of background losses is generally a significant component of the total real loss volume, at times up to 50% of the total volume of real losses. Overestimating (ICF used in model is too high) or underestimating (ICF used in model is too low) the background leakage volume might lead to a real loss control strategy that is not truly optimized. Selecting the ICF based on general age of the distribution network should only be seen as a starting point. It is strongly recommended that over time a utility specific ICF is assessed and confirmed through field tests using one of the recommended approaches outlined in the AWWA M36 manual.

						Pressure Corrected Calculation	
System Component	Units	Quantity	Component UARL Values (g/unit/d/psi)	Infrastructure Condition Factor	Average Pressure (psi)	N1 (Leakage-Pressure Exponent) Value	Annual Volume Acre-feet
Mains	miles	527.4	2.87	1.5	261.6	1.5	1,289.68
Services - Main to Curb-Stop	number	296	0.112	1.5	261.6	1.5	28.25
Services - Curb-Stop to Meter	miles	-	4.78	1.5	261.6	1.5	-
					Total Background Leakage on Mains and Services		**1,317.93**

Select Infrastructure Condition Factor (ICF) based on age of distribution network

○ ICF 1 for System Age <50 years	1.0
◉ ICF 1.5 for System Age 50 - 70 years	1.5
○ ICF 2.5 for System Age >70 years	2.5
OR	
○ Enter ICF values assessed through implementing the approaches outlined in the AWWA M36 manual	

Figure 2: Calculation of Background Leakage for MWD Treated Water Transmission System

IV. b – Reported Leakage/Failures

There were no reported leaks/failures during CY 2012. Therefore the total volume from reported leakage for 2012 is zero.

IV. c – Un-Reported Leakage/Failures

There were no un-reported leaks/failures during CY2012 identified through proactive leak detection efforts. Therefore the total volume from un-reported leakage for 2012 is zero.

IV. d – Real Loss Component Analysis Summary

Figure 3 provides a summary of the real loss component analysis for MWD's treated water transmission system. As mentioned in the introduction to this section the results need to be interpreted in the context of the limitations of conducting a real loss component analysis for a transmission system. The results would indicate that about two thirds of the total real loss volume are due to background leakage, which can only be reduced through pressure reduction or infrastructure replacement. The component analysis model indicates that about 639AF are

due to unreported leaks that are currently running undetected and could possibly be detected by utilizing in-line leak detection technologies. However, given the cost for in-line leak detection services there does not appear to be an economic incentive for MWD to change their current leakage control strategy.

SUMMARY: REAL LOSS COMPONENT ANALYSIS				
System Component	Background Leakage (Acre-feet)	Reported Failures (Acre-feet)	Unreported Failures (Acre-feet)	Total (Acre-feet)
Reservoirs	-	-	-	-
Mains and Appurtenances	1,289.68	-	-	**1,289.68**
Service Connections	28.25	-	-	**28.25**
Total Annual Real Loss	**1,317.93**	-	-	**1,317.93**
Real Losses as Calculated by Water Audit				**1,956.74**
Hidden Losses/Unreported Leakage Currently Running Undetected				**638.81**

Figure 3: Real Loss Component Analysis Results

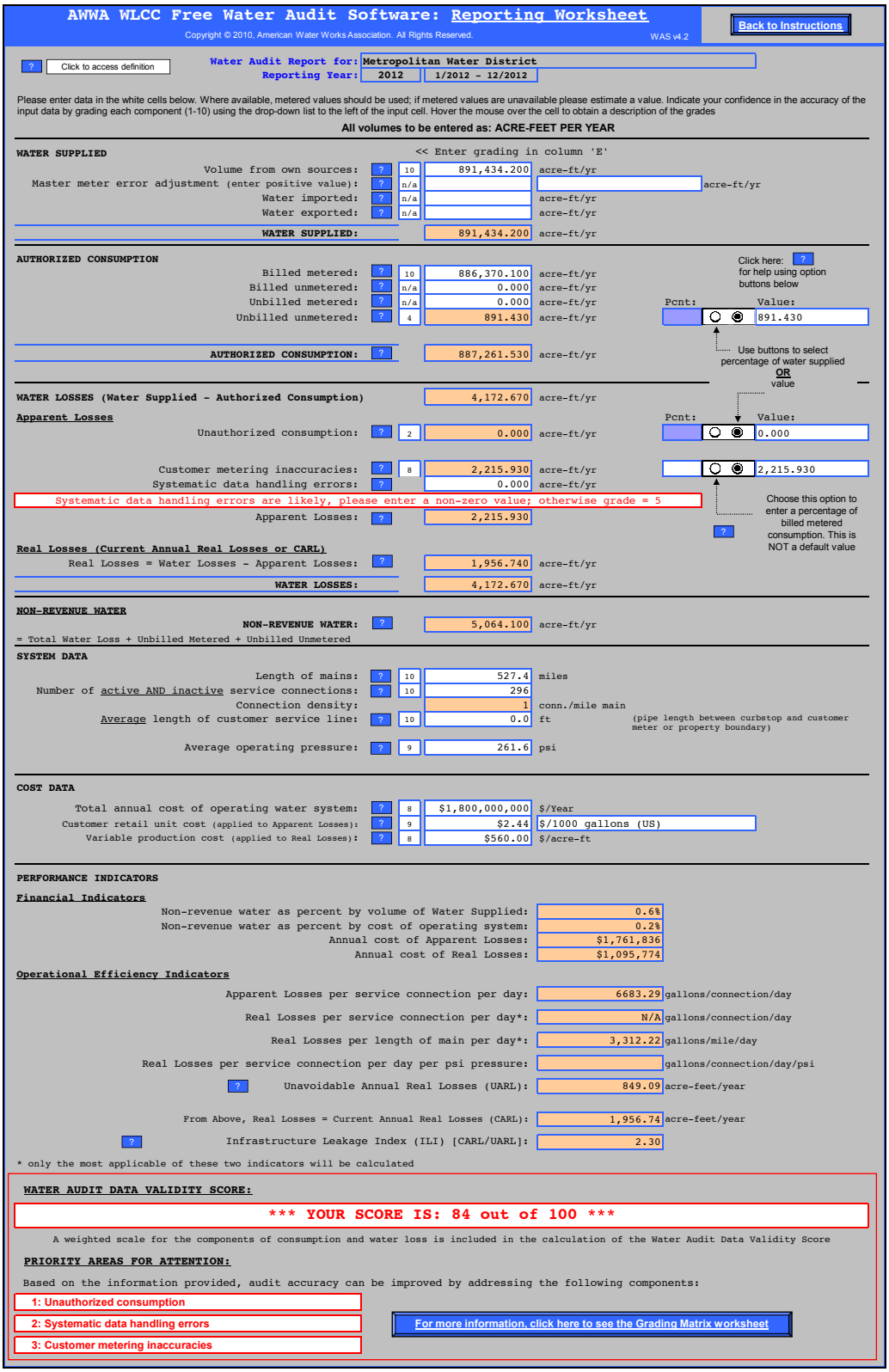
References

Laven, K. and A.O. Lambert. 2012. What Do We Know About Real Losses on Transmission Mains? Presented at IWA Water Loss Conference, Manila, Philippines, February 22 – 26, 2012.

Lambert (1994). Accounting for Losses: The Bursts and Background Concept. Journal of the Institution of Water and Environmental Management, 1994, Volume 8 (2), pp 205-214.

Lambert, A.O and J.A.E Morrison (1996). Recent Developments in Application of 'Bursts and Background Estimates' Concepts of Leakage Management. J.CIWEM, 1996, 10, April, 100-104

APPENDIX A: AWWA Free Water Audit Software



AWWA WLCC Free Water Audit Software: Reporting Worksheet

WAS v4.2

Back to Instructions

Click to access definition

Water Audit Report for: Metropolitan Water District
Reporting Year: 2012 (1/2012 - 12/2012)

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: ACRE-FEET PER YEAR

WATER SUPPLIED		<< Enter grading in column 'E'		
Volume from own sources:	10	891,434.200	acre-ft/yr	
Master meter error adjustment (enter positive value):	n/a		acre-ft/yr	
Water imported:	n/a		acre-ft/yr	
Water exported:	n/a		acre-ft/yr	
WATER SUPPLIED:		891,434.200	acre-ft/yr	
AUTHORIZED CONSUMPTION				
Billed metered:	10	886,370.100	acre-ft/yr	
Billed unmetered:	n/a	0.000	acre-ft/yr	
Unbilled metered:	n/a	0.000	acre-ft/yr	
Unbilled unmetered:	4	891.430	acre-ft/yr	Pcnt: Value: 891.430
AUTHORIZED CONSUMPTION:		887,261.530	acre-ft/yr	
WATER LOSSES (Water Supplied - Authorized Consumption)		4,172.670	acre-ft/yr	
Apparent Losses				Pcnt: Value:
Unauthorized consumption:	2	0.000	acre-ft/yr	0.000
Customer metering inaccuracies:	8	2,215.930	acre-ft/yr	2,215.930
Systematic data handling errors:		0.000	acre-ft/yr	
Systematic data handling errors are likely, please enter a non-zero value; otherwise grade = 5				
Apparent Losses:		2,215.930		
Real Losses (Current Annual Real Losses or CARL)				
Real Losses = Water Losses - Apparent Losses:		1,956.740	acre-ft/yr	
WATER LOSSES:		4,172.670	acre-ft/yr	
NON-REVENUE WATER				
NON-REVENUE WATER:		5,064.100	acre-ft/yr	
= Total Water Loss + Unbilled Metered + Unbilled Unmetered				
SYSTEM DATA				
Length of mains:	10	527.4	miles	
Number of active AND inactive service connections:	10	296		
Connection density:		1	conn./mile main	
Average length of customer service line:	10	0.0	ft	(pipe length between curbstop and customer meter or property boundary)
Average operating pressure:	9	261.6	psi	
COST DATA				
Total annual cost of operating water system:	8	$1,800,000,000	$/Year	
Customer retail unit cost (applied to Apparent Losses):	9	$2.44	$/1000 gallons (US)	
Variable production cost (applied to Real Losses):	8	$560.00	$/acre-ft	

Click here: for help using option buttons below

Use buttons to select percentage of water supplied **OR** value

Choose this option to enter a percentage of billed metered consumption. This is NOT a default value

PERFORMANCE INDICATORS

Financial Indicators

Non-revenue water as percent by volume of Water Supplied:	0.6%
Non-revenue water as percent by cost of operating system:	0.2%
Annual cost of Apparent Losses:	$1,761,836
Annual cost of Real Losses:	$1,095,774

Operational Efficiency Indicators

Apparent Losses per service connection per day:	6683.29	gallons/connection/day
Real Losses per service connection per day*:	N/A	gallons/connection/day
Real Losses per length of main per day*:	3,312.22	gallons/mile/day
Real Losses per service connection per day per psi pressure:		gallons/connection/day/psi
Unavoidable Annual Real Losses (UARL):	849.09	acre-feet/year
From Above, Real Losses = Current Annual Real Losses (CARL):	1,956.74	acre-feet/year
Infrastructure Leakage Index (ILI) [CARL/UARL]:	2.30	

* only the most applicable of these two indicators will be calculated

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 84 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Unauthorized consumption
2: Systematic data handling errors
3: Customer metering inaccuracies

For more information, click here to see the Grading Matrix worksheet

Appendix 8

RECENT CUWCC FILINGS

Enter District ID No.	161	Data File Name	BASE Year	2009WBMP1.1	2010 WBMP1.1	2009 BMP 1.2	2010 BMP 1.2	2009 BMP 1.3	2010 BMP 1.3

CUWCC BMP COVERAGE REPORT FOR WHOLESALE AGENCIES

Foundation Best Management Practices for Urban Water Efficiency

Agency: Metropolitan Water District of SC **District Name:** Metropolitan Water District of SC **CUWCC Unit #:** 161

Primary Contact Alice Webb-Cole **Email:** awebb@mwdh2o.com

Base Year: Calendar or FiscalYear Reporting Report Date: 27-May-11

Foundational BMPs

BMP 1.1.3 Wholesale Agency Assistance Programs

Date of 2009 Data Download July 5, 2011

Date of 2010 Data Download July 5, 2011

a) Financial investments and building partnerships Value of resources provided to retailers for: 2009	2009 Monetary Amount for Financial Incentives	2009 Monetary Amount for Equivalent Resources
BMP 3 Residential	$ 22,503,457	no data
BMP 4 CII	$ 9,367,212	no data
BMP 5 Landscape	$ 12,695,902	no data
Total Value of Resources	$ 44,566,571	$ -
	On Track	

a) Financial investments and building partnerships Value of resources provided to retailers for: 2010	2010 Monetary Amount for Financial Incentives	2010 Monetary Amount for Equivalent Resources
BMP 3 Residential	$ 20,631,899	no data
BMP 4 CII	$ 8,303,652	no data
BMP 5 Landscape	$ 7,776,340	no data
Total Value of Resources	$ 36,711,891	$ -
	On Track	

"On Track" if Retailer accepted offer and Wholesaler provided resources. "Not on Track" if Retailer accepted offer and Wholesaler did not provde resources.

Agency: Metropolitan Water District of SC **District Name:** Metropolitan Water District of SC **CUWCC Unit #:** 161

	2009 Technical Support Description	2010 Technical Support Description	
b) Technical Support	Posted results from Innovative Conservation Program on bewaterwise.com Host monthly meetings with member and retail water agenices that include research and new technology. 10.5 FTE working on developing and administering conservation programs.	In December 2009, Metropolitan completed an online survey of Residential customers that determined approximate saturation of 1.6 gpf (or lesser) toilets. Posted results from Innovative Conservation Program on bewaterwise.com. Hosted monthly meetings with member and retail agencies that inlcude research and new technology when appropriate.10.5 FTEs working on developing and administering conservation programs.	" On Track" if Retailer accepted and Wholesaler provided and described Technical Support
	On Track	On Track	

	2009		2010		
c) Retail Agency	Programs Managed for Retailers	c) Retail Agency	Programs Managed for Retailers		
26 members&300 retailer	Regional Incentive Programs (RES and CII)	26 member&300 retailers	Regional Incentive Programs		" On Track" if Retailer accepted and Wholesaler provided and lists programs managed for retailers
	On Track		On Track		

	2009		2010	
d) Water Shortage Allocation				
Has Water shortage plan or policy been adopted?	2/12/2008	Adoption Date File Name	2/12/2008	"OnTrack" if plan /policy adopted and document provided. "Not on Track" if no water shortage plan or policy adopted or document not provided.
	On Track			
e) Non signatory Reporting of BMP implementation by non-signatory agencies	MWDSC Allocation Plan.pdf		MWDSC Allocation Plan.pdf	Report if possible

	List Efforts to recruit retailers		
f) Encourage CUWCC Membership List Efforts to recruit retailers	Metropolitan pays half dues for all agencies within Metropolitan's service area;	Quarterly meetings hosted by MWDSC covering CUWCC topics, Annexations into MWDSC service area are required to be signatories to the CUWCC	"On Track" if efforts listed or dues paid.
	On Track	On Track	

Agency: Metropolitan Water District of SC **District Name:** Metropolitan Water District of SC **CUWCC Unit #:** 161

BMP 1.2 Water Loss Control

Date of 2009 Data Submittal: #N/A
Date of 2010 Data Submittal: July 5, 2011

	2009	
Complete a prescreening Audit	No	On Track if Yes
Metered Sales AF	2,045,104	Metered sales to retail agencies
Verifiable Other Uses AF	9,582	
Total Supply AF	211,998	Into wholesale system
(Metered Sales + System uses)/ Total Supply >0.89	9.69	On Track if =>.89, Not on Track if No
If ratio is less than 0.9, complete a full scale Audit in 2009?	Off	On Track if Yes
Verify Data with Records on File?	Yes	On Track if Yes
Operate a system Leak Detection Program?	Yes	On Track if Yes
	On Track	

Comments

Metropolitan's system is monitored by 10+ patrols including staff collecting water quality samples, If evidence of leaking is detected near any of our facilite pilots flying the CRA and SWP pipeline staff during the normal course of operations.
If evidence of leaking is detected near any of our facilite

For wholesalers AWWA methodology applies to supplies to wholesalers, sales to retail agencies or sub wholesalers, and pipelines operated by wholesalers. End use retail customers are not considered in this

	2010	
Compile Standard Water Audit using AWWA Software?	No	On Track if Yes, Not on Track if No
AWWA file provided to CUWCC?	No	On Track if Yes, Not on Track if No
AWWA Water Audit Validity Score?	no data	Info only until 2012
Completed Training in AWWA Audit Method?	no	Info only until 2012
Completed Training in Component Analysis Process?	No	Info only until 2012
Complete Component Analysis?	no	Info only until 2012
Repaired all leaks and breaks to the extent cost effective?	Yes	On Track if Yes, Not on Track if No
Locate and repair unreported leaks to the extent cost effective.	Yes	On Track if Yes, Not on Track if No
Maintain a record-keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.		Info only until 2012

Provided 7 types of Water Loss Control Info

Leaks Repaire	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost Interventions	Water Lost from Leaks AF
no data	$ -	$ -	0	No	$ -	no data

info only until 2012

Agency: Metropolitan Water District of SC **District Name:** Metropolitan Water District of SC **CUWCC Unit #:** 161

Not On Track

1.3 METERING WITH COMMODITY RATES FOR ALL NEW CONNECTIONS AND RETROFIT OF EXISTING CONNECTIONS

Date of 2009 Data Submittal: July 5, 2011
Date of 2010 Data Submittal: July 5, 2011

	2009	2010	
Exemption requested?	No	No	
At least as Effective As Requested?	No	No	
Does Agency have Unmetered Deliveries to Retail Agencies or Other Wholesalers?	No	No	
Metered Accounts billed by volume of use	Yes	Yes	Volumetric billing required for all connections on same schedule as metering
Completed a written plan, policy or program to test, repair and replace meters	No	No	On Track if Yes, Not on Track if No
	Not On Track	Not On Track	

Enter District ID No.	161

Agency Row #	50	50	55	161
Data File Name	2009 BMP2.1	2010 BMP2.1	2009 BMP2.2	2010 BMP2.2

CUWCC BMP COVERAGE REPORT FOR WHOLESALE AGENCIES

Foundation Best Management Practices for Urban Water Efficiency

Agency: Metropolitan Water District of SC
WHOLESALE Water Supplier

District Name: Metropolitan Water District of SC **CUWCC Unit #:** 161

Coverage Report Date: May 19, 2011

Primary Contact Alice Webb-Cole **Email:** awebb@mwdh2o.com

BMP 2. EDUCATION PROGRAMS

date 2009 datafile downloaded: July 5, 2011
date 2010 datafile downloaded: July 5, 2011

BMP 2.1 Public Outreach Actions Implemented and Reported to CUWCC

	2009	2010
1) Contacts with the public (minimum = 4 times per year)	22,000	88,000
2) Water supplier contacts with media (minimum = 4 times per year, i.e., at least quarterly).	10	9
3) An actively maintained website that is updated regularly (minimum = 4 times per year, i.e., at least quarterly).	Yes	Yes
4) Description of materials used to meet minimum requirement.	Newsletter articles on conservation Newsletter articles on conservation Website Newspaper contacts Television contacts News releases Radio contacts	Newsletter articles on conservation Newsletter articles on conservation Website Newspaper contacts News releases Television contacts Radio contacts
5) Annual budget for public outreach program.	$ 5,450,000	$ 4,405,796
6) Description of all other outreach programs	Conservation messaging including Television, Radio, and Online.	Conservation messaging including Television, Radio, and Online.
	On Track	On Track

All 6 action types implemented and reported to CUWCC to be 'On Track')

Agency: Metropolitan Water District of SC
WHOLESALE Water Supplier

District Name: Metropolitan Water District of SC

CUWCC Unit #: 161

Coverage Report Date: May 19, 2011
date 2009 datafile downloaded: July 5, 2011
date 2010 datafile downloaded: May 26, 2011

2.2 School Education Programs Implemented and Reported to CUWCC

	2009	2010
Does this wholesale agency implement School Education Programs for Sub Wholesalers or Retail unility's benefit?	Yes	Yes
Names of Sub Wholesale and Retail Agencies benefiting from Program?	Metropolitan provides public outreach to its 26 member agencies throughout parts of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura	Metropolitan provides public outreach to its 26 member agencies throughout parts of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties.
1) Curriculum materials developed and/or provided by wholesale agency	All of our developed curriculum units include formal linkages. In addition, all supplements, activities and programs address CA. standards and frameworks.	All of our developed curriculum units include formal framework linkages. In addition, all supplements, activities and programs address CA. standards and frameworks.
2) Materials meet state education framework requirements and are grade-level appropriate?	Yes	Yes
3) Materials Distributed to K-6?	Yes	Yes
Describe K-6 Materials	Little Splash: K-3 Activity/Coloring Book, All About Water (K-3), Admiral Splash (gr. 4), Water Ways (gr. 5) and Water Times (gr. 6)	Channing Bete Co., Inc.- "Let's Learn about Using Water Wisely", "Let's Learn about Water", "My Book About Water", "Water Conservation" and Activity Materials Created In-house related to own brand marketing program
Materials distributed to 7-12 students?	Yes	No
4) Annual budget for school education program.	$ 476,000	$ 7,500
5) Description of all other water supplier education programs	An array of supplemental materials and activities that can be ordered from Metropolitan's Education Website.	"Team Green Kids Club" -The club offers the opportunity for young stewards to exchange ideas and information on how to work together to recycle, conserve and preserve the natural resources of our community.
	On Track	**On Track**

All 5 actions types implemented and reported to CUWCC to be 'On Track'

Describe materials to meet minimum requirements

Info Only

CUWCC BMP Wholesale Coverage Report 2011

Foundational Best Managemant Practices for Urban Water Efficiency

BMP 1.1 Wholesale Agency Assistance Programs

ON TRACK

161 **Metropolitan Water District of SC**

Name: Mark Graham Email: mgraham@mwdh2o.com

a) Financial Investments and Building Partnerships

BMP Section	Monetary Amount for Financial Incentives	Monetary Amount for Equivalent Resources	
BMP 3 Residential	10541446	0	
BMP 4 CII	5001703	0	
BMP 5 Landscape	543269	0	

b) Technical Support

c) Retail Agency

d) Water Shortage Allocation

Adoption Date: 2/12/2008

File Name:

e) Non signatory Reporting of BMP implementation by non-signatory Agencies

f) Encourage CUWCC Membership List Efforts to Recuit Retailers

Conduct quarterly state wide meetings with California water agencies on conservation issues affecting the state.

197187.14

At Least As effective As No

Exemption No 0

Comments:

CUWCC BMP Coverage Report 2011

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.2 Water Loss Control **On Track**

161 Metropolitan Water District of SC

Completed Standard Water Audit Using AWWA Software?	No
AWWA File provided to CUWCC?	No
AWWA Water Audit Validity Score?	
Complete Training in AWWA Audit Method	No
Complete Training in Component Analysis Process?	No
Component Analysis?	No
Repaired all leaks and breaks to the extent cost effective?	Yes
Locate and Repar unreported leaks to the extent cost effective?	Yes
Maintain a record keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.	No

Provided 7 Types of Water Loss Control Info

Leaks Repairs	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost Of Interventions	Water Saved (AF)

At Least As effective As No

Exemption No 0

Comments:

CUWCC BMP Coverage Report 2011

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.3 Metering With Commodity

ON TRACK

161 Metropolitan Water District of SC

Numbered Unmetered Accounts	No
Metered Accounts billed by volume of use	Yes
Number of CII Accounts with Mixed Use Meters	0
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	No
Feasibility Study provided to CUWCC?	No

Date: 12:00:00 AM

Uploaded file name:

Completed a written plan, policy or program to test, repair and replace meters	No

At Least As effective As	No	
Exemption	No	0

Comments:

Metropolitan as a wholesale agency only provides water to other water agencies.

CUWCC BMP Coverage Report 2011

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

161 Metropolitan Water District of SC **Wholesale Only**

Does your agency perform Public Outreach programs? Yes

The list of retail agencies your agency assists with public outreach

Metropolitan provides public outreach to its 26 member agencies throughout parts of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties.

The name of agency, contact name and email address if not CUWCC Group 1 members

Did at least one contact take place during each quater of the reporting year? Yes

Public Outreach Program List	Number
Website	394909
Landscape water conservation media campaigns	17660022
Flyers and/or brochures (total copies), bill stuffers, messages printed on bill, information packets	290754
Newsletter articles on conservation	89904
Total	**18435589**

Did at least one contact take place during each quater of the reporting year? Yes

Number Media Contacts	Number
Newspaper contacts	17
Written editorials	8
News releases	6
Radio contacts	3
Television contacts	2
Articles or stories resulting from outreach	4
Total	**40**

Did at least one website update take place during each quater of the reporting year? Yes

Public Information Program Annual Budget

Annual Budget Category	Annual Budget Amount
Advertising	1200000
CPP	150000

CUWCC BMP Coverage Report 2011

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

Annual Budget Category	Annual Budget Amount
CFLT	105000
Total Amount:	**1455000**

Public Outreah Additional Programs
Advertising Campaign/Google Search Media Buy
Speakers Bureau
Community Partnering Program
California Friendly Landscape Training Program

Description of all other Public Outreach programs

Comments:

At Least As effective As	No	
Exemption	No	0

CUWCC BMP Coverage Report 2011

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs — ON TRACK

161 Metropolitan Water District of SC — **Wholesale Only**

Does your agency implement School Education programs? Yes

The list of retail agencies your agency assists with public outreach

Metropolitan provides public outreach to its 26 member agencies throughout parts of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties.

Materials meet state education framework requirements? Yes

All of our developed curriculum units include formal linkages. In addition, all supplements, activities and programs address CA standards and frameworks.

Materials distributed to K-6? Yes

Little Splash: K-3 Activity/Coloring Book, All About Water (K-3), Admiral Splash (gr. 4), Water Ways (gr. 5) and Water Times (gr. 6)

Materials distributed to 7-12 students? Yes (Info Only)

Water Quality: The Qualities and Science of Water and Water Works: School to Career Curriculum

Annual budget for school education program: 480000.00

Description of all other water supplier education programs

All of our developed curriculum units include formal linkages. In addition, all supplements, activities and programs address CA standards and frameworks. Little Splash: K-3 Activity/Coloring Book, All About Water (K-3), Admiral Splash (gr. 4), Water Ways (gr. 5) and Water Times (gr. 6) An array of supplemental materials and activities that can be ordered from Metropolitan's Education Website. N/A Student Art Contest for 2011
Calendar. 36 artists selected from 143 submitted by 24 agencies. Solar Cup 2011; a seven-month program, worked with 40 high school teams, 1100 students toward May event at Metropolitan's Lake Skinner.

Comments:

At Least As effective As No

Exemption No 0

CUWCC BMP Wholesale Coverage Report 2012

Foundational Best Management Practices for Urban Water Efficiency

BMP 1.1 Wholesale Agency Assistance Programs

ON TRACK

161 **Metropolitan Water District of SC**

Name: Mark Graham Email: mgraham@mwdh2o.com

a) Financial Investments and Building Partnerships

BMP Section	Monetary Amount for Financial Incentives	Monetary Amount for Equivalent Resources	
BMP 4 CII	4395825		
BMP 5 Landscape	881228		
BMP 3 Residential	7585882		

b) Technical Support

c) Retail Agency

d) Water Shortage Allocation

Adoption Date: 2/12/2008

File Name:

e) Non signatory Reporting of BMP implementation by non-signatory Agencies

f) Encourage CUWCC Membership List Efforts to Recuit Retailers

Conduct quarterly state wide meetings with California water agencies on conservation issues affecting the state.

216930.20

At Least As effective As No

Exemption No 0

Comments:

CUWCC BMP Coverage Report 2012

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.2 Water Loss Control **On Track**

161 Metropolitan Water District of SC

Completed Standard Water Audit Using AWWA Software?	Yes
AWWA File provided to CUWCC?	Yes
Copy of AWWA_WATER_AUDIT_SOFTWARE_4 2 PC ONLY _ MWD 2012.xls	
AWWA Water Audit Validity Score?	84
Complete Training in AWWA Audit Method	No
Complete Training in Component Analysis Process?	No
Component Analysis?	No
Repaired all leaks and breaks to the extent cost effective?	Yes
Locate and Repar unreported leaks to the extent cost effective?	Yes
Maintain a record keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.	Yes

Provided 7 Types of Water Loss Control Info

Leaks Repairs	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost Of Interventions	Water Saved (AF)

At Least As effective As No

Exemption No 0

Comments:

CUWCC BMP Coverage Report 2012

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.3 Metering With Commodity

ON TRACK

161 Metropolitan Water District of SC

Numbered Unmetered Accounts	No
Metered Accounts billed by volume of use	Yes
Number of CII Accounts with Mixed Use Meters	0
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	No
Feasibility Study provided to CUWCC?	No
Date: 12:00:00 AM	
Uploaded file name:	
Completed a written plan, policy or program to test, repair and replace meters	No

At Least As effective As No

Exemption No 0

Comments:

Metropolitan as a wholesale agency only provides water to other water agencies.

CUWCC BMP Coverage Report 2012

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

161 **Metropolitan Water District of SC** **Wholesale Only**

Does your agency perform Public Outreach programs? Yes

The list of retail agencies your agency assists with public outreach

Metropolitan provides public outreach to its 26 member agencies throughout parts of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties.

The name of agency, contact name and email address if not CUWCC Group 1 members

Did at least one contact take place during each quater of the reporting year? Yes

Public Outreach Program List	Number
Newsletter articles on conservation	142052
Flyers and/or brochures (total copies), bill stuffers, messages printed on bill, information packets	319027
Landscape water conservation media campaigns	31030433
Website	403631
Total	**31895143**

Did at least one contact take place during each quater of the reporting year? Yes

Number Media Contacts	Number
Newspaper contacts	6
News releases	1
Television contacts	3
Articles or stories resulting from outreach	5
Total	**15**

Did at least one website update take place during each quater of the reporting year? Yes

Public Information Program Annual Budget

Annual Budget Category	Annual Budget Amount
Advertising	1200000
CPP	150000
Total Amount:	**1350000**

Public Outreah Additional Programs
Advertising Campaign/Google Search Media Buy

CUWCC BMP Coverage Report 2012

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach **ON TRACK**

Public Outreah Additional Programs
Speakers Bureau
Community Partnering Program
Online Training

Description of all other Public Outreach programs

Comments:

At Least As effective As	No	
Exemption	No	0

CUWCC BMP Coverage Report 2012

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs — ON TRACK

161 Metropolitan Water District of SC — **Wholesale Only**

Does your agency implement School Education programs? No

The list of retail agencies your agency assists with public outreach

Materials meet state education framework requirements? Yes

All of our developed curriculum units include formal linkages. In addition, all supplements, activities and programs address CA standards and frameworks.

Materials distributed to K-6? Yes

Little Splash: K-3 Activity/Coloring Book, All About Water (K-3), Admiral Splash (gr. 4), Water Ways (gr. 5) and Water Times (gr. 6)

Materials distributed to 7-12 students? Yes (Info Only)

Water Quality: The Qualities and Science of Water and Water Works: School to Career Curriculum

Annual budget for school education program: 480000.00

Description of all other water supplier education programs

All of our developed curriculum units include formal linkages. In addition, all supplements, activities and programs address CA standards and frameworks. Little Splash: K-3 Activity/Coloring Book, All About Water (K-3), Admiral Splash (gr. 4), Water Ways (gr. 5) and Water Times (gr. 6) An array of supplemental materials and activities that can be ordered from Metropolitan's Education Website. Student Art Contest for 2012 Calendar. 36 artists selected from 120 submitted by 19 agencies. Solar Cup 2012, a seven-month program, worked with 39 high school teams and approxmiately 1200 students towards May event at Metropolitan's Lake Skinner.

Comments:

At Least As effective As No

Exemption No 0

CUWCC BMP Wholesale Coverage Report 2013

Foundational Best Management Practices for Urban Water Efficiency

BMP 1.1 Wholesale Agency Assistance Programs

ON TRACK

161 **Metropolitan Water District of SC**

Name: Mark Graham Email: mgraham@mwdh2o.com

a) Financial Investments and Building Partnerships

BMP Section	Monetary Amount for Financial Incentives	Monetary Amount for Equivalent Resources	
BMP 3 Residential	13347068		
BMP 4 CII	1376957		
BMP 5 Landscape	4696061		

b) Technical Support

c) Retail Agency

d) Water Shortage Allocation

Adoption Date: 2/12/2008

File Name: http://edmsidm.mwdh2o.com/idmweb/cache/MWD%20EDMS/003724356-1.pdf

e) Non signatory Reporting of BMP implementation by non-signatory Agencies

f) Encourage CUWCC Membership List Efforts to Recuit Retailers

Metropolitan serves on the Board, chairs the R&E Committee, serves on various committees and relays that information to its member agencies at its monthly conservation coordinators meetings. Metropolitan encourages membership and hosts CUWCC speakers

0.00

At Least As effective As No

Exemption No

Comments:

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.2 Water Loss Control **ON TRACK**

161 Metropolitan Water District of SC

Completed Standard Water Audit Using AWWA Software?	Yes
AWWA File provided to CUWCC?	Yes
Copy_of_2013_AWWA-WAS-v5-09152014.xls	
AWWA Water Audit Validity Score?	89
Complete Training in AWWA Audit Method	Yes
Complete Training in Component Analysis Process?	Yes
Component Analysis?	Yes
Repaired all leaks and breaks to the extent cost effective?	Yes
Locate and Repar unreported leaks to the extent cost effective?	Yes
Maintain a record keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.	Yes

Provided 7 Types of Water Loss Control Info

Leaks Repairs	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost Of Interventions	Water Saved (AF)
0	18223	269100	527	False	250000	150

At Least As effective As No

Exemption No

Comments:

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.3 Metering With Commodity

ON TRACK

161 Metropolitan Water District of SC

Numbered Unmetered Accounts	No
Metered Accounts billed by volume of use	Yes
Number of CII Accounts with Mixed Use Meters	
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	No
Feasibility Study provided to CUWCC?	No
Date:	
Uploaded file name:	
Completed a written plan, policy or program to test, repair and replace meters	Yes
At Least As effective As	No
Exemption	No

Comments:

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

161 Metropolitan Water District of SC **Wholesale**

Does your agency perform Public Outreach programs? Yes

The list of retail agencies your agency assists with public outreach

City of Anaheim, PUD,City of Beverly Hills,City of Burbank, PSD,City of Compton, Water Dept.,City of Fullerton,City of Glendale, Water and Power,City of Pasadena,City of San Fernando,City of Santa Ana,City of Santa Monica,City of Torrance, Water Division,Las Virgenes Municipal Water District,Long Beach Water Department,Los Angeles Dept. of Water and Power,Western MWD of Riverside County - Retail

Metropolitan provides public outreach to its 26 member agencies throughout parts of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties.

Agency Name	ID number
City of Anaheim, PUD	45
City of Beverly Hills	6972
City of Burbank, PSD	48
City of Compton, Water Dept.	52
City of Fullerton	59
City of Glendale, Water and Power	61
City of Pasadena	72
City of San Fernando	83
City of Santa Ana	258
City of Santa Monica	89
City of Torrance, Water Division	93
Las Virgenes Municipal Water District	147
Long Beach Water Department	66
Los Angeles Dept. of Water and Power	152
Western MWD of Riverside County - Retail	1006

The name of agency, contact name and email address if not CUWCC Group 1 members

Did at least one contact take place during each quater of the reporting year? Yes

Public Outreach Program List	Number
Newsletter articles on conservation	10417
Flyers and/or brochures (total copies), bill stuffers, messages printed on bill, information packets	174253
General water conservation information	16546797
Website	186770
Total	**16918237**

Did at least one contact take place during each quater of the reporting year? Yes

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

Number Media Contacts	Number
Newspaper contacts	520
News releases	17
Television contacts	105
Articles or stories resulting from outreach	120
Total	**762**

Did at least one website update take place during each quater of the reporting year? Yes

Public Information Program Annual Budget

Annual Budget Category	Annual Budget Amount
Advertising	1986300
CPP	100000
Total Amount:	**2086300**

Public Outreah Additional Programs
Mulit-lingual Advertising Campaign/Google Search Media Buy
Website, Social Media, Online Outreach
Community Partnering Program
Speaking Events and Speakers Bureau

Description of all other Public Outreach programs

Comments:

At Least As effective As No

Exemption No 0

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs

ON TRACK

161 Metropolitan Water District of SC **Wholesale**

Does your agency implement School Education programs? Yes

The list of retail agencies your agency assists with public outreach

City of Anaheim, PUD,City of Beverly Hills,City of Burbank, PSD,City of Compton, Water Dept.,City of Fullerton,City of Glendale, Water and Power,City of Pasadena,City of San Fernando,City of Santa Ana,City of Santa Monica,City of Torrance, Water Division,Las Virgenes Municipal Water District,Long Beach Water Department,Los Angeles Dept. of Water and Power,Western MWD of Riverside County - Retail

Agencies Name	ID number
City of Anaheim, PUD	45
City of Beverly Hills	6972
City of Burbank, PSD	48
City of Compton, Water Dept.	52
City of Fullerton	59
City of Glendale, Water and Power	61
City of Pasadena	72
City of San Fernando	83
City of Santa Ana	258
City of Santa Monica	89
City of Torrance, Water Division	93
Las Virgenes Municipal Water District	147
Long Beach Water Department	66
Los Angeles Dept. of Water and Power	152
Western MWD of Riverside County - Retail	1006

Materials meet state education framework requirements? Yes

All of our developed curriculum units include formal linkages. In addition, all supplements, activities and programs address CA standards and frameworks including Common Core and Next Generation Science Standards.

Materials distributed to K-6? Yes

Little Splash: K-3 Activity/Coloring Book, All About Water (K-3), Admiral Splash (gr. 4), Water Ways (gr. 5) and Water Times (gr. 6)

Materials distributed to 7-12 students? Yes (Info Only)

Water Quality: The Qualities and Science of Water, Conservation Connection and Water Works: School to Career Curriculum

Annual budget for school education program: 490000.00

Description of all other water supplier education programs

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs **ON TRACK**

An array of supplemental materials and activities that can be ordered from Metropolitan's Education Website: www.mwdh2o.com/education

Comments:

At Least As effective As	No	
Exemption	No	0

CUWCC BMP Wholesale Coverage Report 2014

Foundational Best Management Practices for Urban Water Efficiency

BMP 1.1 Wholesale Agency Assistance Programs

ON TRACK

161 **Metropolitan Water District of SC**

Name: Mark Graham Email: mgraham@mwdh2o.com

a) Financial Investments and Building Partnerships

BMP Section	Monetary Amount for Financial Incentives	Monetary Amount for Equivalent Resources	
BMP 3 Residential	16843175		
BMP 4 CII	1241465		
BMP 5 Landscape	21564361		

b) Technical Support

c) Retail Agency

d) Water Shortage Allocation

Adoption Date: 2/12/2008

File Name: http://edmsidm.mwdh2o.com/idmweb/cache/MWD%20EDMS/003724356-1.pdf

e) Non signatory Reporting of BMP implementation by non-signatory Agencies

f) Encourage CUWCC Membership List Efforts to Recuit Retailers

Metropolitan serves on the Board, chairs the R&E Committee, serves on various committees and relays that information to its member agencies at its monthly conservation coordinators meetings. Metropolitan encourages membership and hosts CUWCC speakers

At Least As effective As No

Exemption No

Comments:

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.2 Water Loss Control **ON TRACK**

161 Metropolitan Water District of SC

Completed Standard Water Audit Using AWWA Software?	Yes
AWWA File provided to CUWCC?	Yes
AWWA-MWD-2014.xls	
AWWA Water Audit Validity Score?	89
Complete Training in AWWA Audit Method	Yes
Complete Training in Component Analysis Process?	Yes
Component Analysis?	Yes
Repaired all leaks and breaks to the extent cost effective?	Yes
Locate and Repar unreported leaks to the extent cost effective?	Yes
Maintain a record keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.	Yes

Provided 7 Types of Water Loss Control Info

Leaks Repairs	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost Of Interventions	Water Saved (AF)
0	975000	272000	527	False	250000	150

At Least As effective As No

Exemption No

Comments:

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.3 Metering With Commodity

ON TRACK

161 Metropolitan Water District of SC

Numbered Unmetered Accounts	No
Metered Accounts billed by volume of use	Yes
Number of CII Accounts with Mixed Use Meters	
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	No
Feasibility Study provided to CUWCC?	No
Date:	
Uploaded file name:	
Completed a written plan, policy or program to test, repair and replace meters	Yes

At Least As effective As No

Exemption No

Comments:

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

161 Metropolitan Water District of SC **Wholesale**

Does your agency perform Public Outreach programs? Yes

The list of retail agencies your agency assists with public outreach

City of Anaheim, PUD,City of Beverly Hills,City of Burbank, PSD,City of Compton, Water Dept.,City of Fullerton,City of Glendale, Water and Power,City of Pasadena,City of San Fernando,City of Santa Ana,City of Santa Monica,City of Torrance, Water Division,Las Virgenes Municipal Water District,Long Beach Water Department,Los Angeles Dept. of Water and Power,Western MWD of Riverside County - Retail

Metropolitan provides public outreach to its 26 member agencies throughout parts of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties.

Agency Name	ID number
City of Anaheim, PUD	45
City of Beverly Hills	6972
City of Burbank, PSD	48
City of Compton, Water Dept.	52
City of Fullerton	59
City of Glendale, Water and Power	61
City of Pasadena	72
City of San Fernando	83
City of Santa Ana	258
City of Santa Monica	89
City of Torrance, Water Division	93
Las Virgenes Municipal Water District	147
Long Beach Water Department	66
Los Angeles Dept. of Water and Power	152
Western MWD of Riverside County - Retail	1006

The name of agency, contact name and email address if not CUWCC Group 1 members

Did at least one contact take place during each quater of the reporting year? Yes

Public Outreach Program List	Number
Newsletter articles on conservation	12061
Flyers and/or brochures (total copies), bill stuffers, messages printed on bill, information packets	364276
General water conservation information	12773042
Website	522006
Total	**13671385**

Did at least one contact take place during each quater of the reporting year? Yes

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

Number Media Contacts	Number
Newspaper contacts	520
News releases	40
Television contacts	104
Articles or stories resulting from outreach	120
Total	**784**

Did at least one website update take place during each quater of the reporting year? Yes

Public Information Program Annual Budget

Annual Budget Category	Annual Budget Amount
Advertising	2214600
CPP	100000
Total Amount:	**2314600**

Public Outreah Additional Programs
Advertising Campaign/Google Search Media Buy
Speakers Bureau
Community Partnering Program
Website

Description of all other Public Outreach programs

Comments:

At Least As effective As No

Exemption No 0

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs

ON TRACK

161 Metropolitan Water District of SC **Wholesale**

Does your agency implement School Education programs? Yes

The list of retail agencies your agency assists with public outreach

City of Anaheim, PUD,City of Beverly Hills,City of Burbank, PSD,City of Compton, Water Dept.,City of Fullerton,City of Pasadena,City of San Fernando,City of Santa Ana,City of Santa Monica,City of Torrance, Water Division,Las Virgenes Municipal Water District,Long Beach Water Department,Los Angeles Dept. of Water and Power,Western MWD of Riverside County - Retail

Agencies Name	ID number
City of Anaheim, PUD	45
City of Beverly Hills	6972
City of Burbank, PSD	48
City of Compton, Water Dept.	52
City of Fullerton	59
City of Pasadena	72
City of San Fernando	83
City of Santa Ana	258
City of Santa Monica	89
City of Torrance, Water Division	93
Las Virgenes Municipal Water District	147
Long Beach Water Department	66
Los Angeles Dept. of Water and Power	152
Western MWD of Riverside County - Retail	1006

Materials meet state education framework requirements? Yes

All of our developed curriculum units include formal linkages. In addition, all supplements, activities and programs address CA standards and frameworks including Common Core and Next Generation Science Standards.

Materials distributed to K-6? Yes

Little Splash: K-3 Activity/Coloring Book, All About Water (K-3), Admiral Splash (gr. 4), Water Ways (gr. 5) and Water Times (gr. 6)

Materials distributed to 7-12 students? Yes (Info Only)

Water Quality: The Qualities and Science of Water, Conservation Connection and Water Works: School to Career Curriculum

Annual budget for school education program: 450000.00

Description of all other water supplier education programs

An array of supplemental materials and activities that can be ordered from Metropolitan's Education Website: www.mwdh2o.com/education

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs **ON TRACK**

Comments:

At Least As effective As	No	
Exemption	No	0

Appendix 9

METROPOLITAN'S ENERGY INTENSITY CALCULATIONS, INCLUDING CONVEYANCE AND DISTRIBUTION GENERATION

Appendix 9
METROPOLITAN'S ENERGY INTENSITY CALCULATIONS, INCLUDING CONVEYANCE AND DISTRIBUTION GENERATION

Introduction

The Metropolitan Water District of Southern California is a wholesale water agency that distributes water to its 26 Member Agencies. These agencies receive treated and untreated water through Metropolitan's 830 miles of interconnected pipelines. There are over 400 service connections to the 26 Member Agencies located throughout Metropolitan's 5200 square mile service area.

Water-Related Energy Use in California

Water supply by its nature is energy intensive, and it is widely reported that California's "Water Sector" uses 19 percent of the state's electricity and 32 percent of the state's natural gas not used for power generation. However, these facts are often misinterpreted by attributing the entire water-related energy use to urban water agencies such Metropolitan and the Department of Water Resources.

The original source for these figures is the California Energy Commission's 2005 "California's Water – Energy Relationship" report (CEC-700-2005-011-SF, Nov. 2005), which analyzed water-related energy use data for 2001. Based on the information in the report, approximately 3 percent of the electrical use is associated with urban water agency conveyance, treatment, and distribution. Of the remaining 16 percent, 0.8 percent is attributed to wastewater treatment, 4.2 percent is associated with agricultural use, and 11 percent is due to urban end uses – including the heating and cooling of water by customers. For non-power plant natural gas, over 99 percent of use is attributed to urban end uses, while 0.14 percent is used for urban water supply. Table A.9-1 presents the water related energy use in California and is adapted from the 2005 CEC report.

The 3 percent of electricity associated with urban water supply represents the "embedded energy" in water, whereas the 11 percent of electricity and 31 percent of natural gas attributed to end uses represent a direct use of energy by consumers.

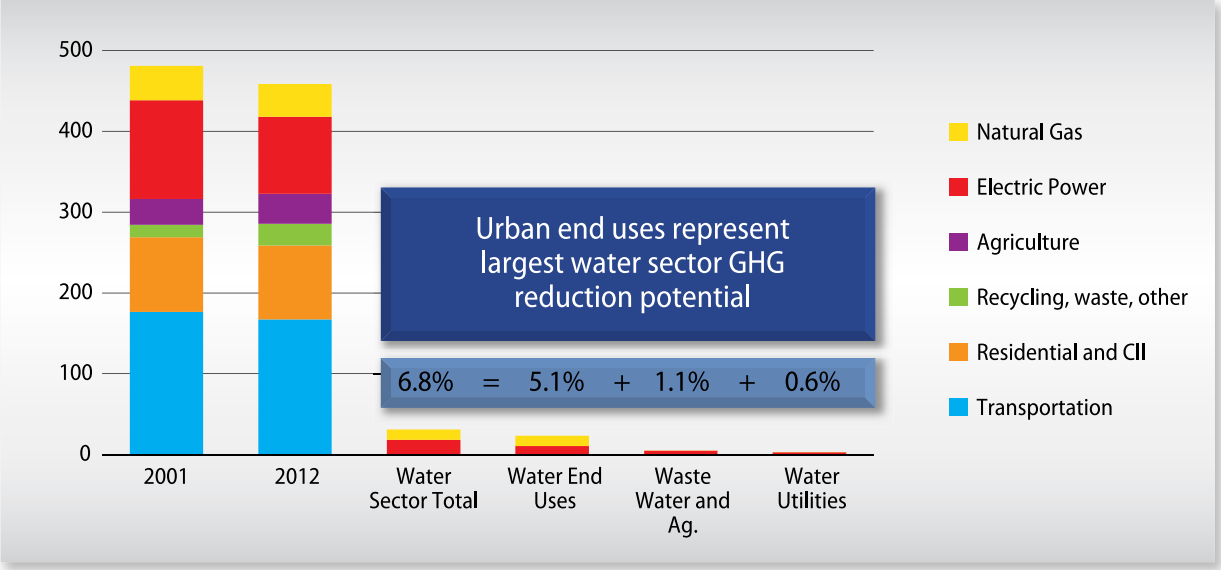
This distinction is essential for state policy issues currently under consideration related to energy use and GHG emissions in the water sector. When the results from the CEC study are compared to California's overall GHG emissions from all sectors, it becomes clear that the greatest potential for reducing water-related GHG emissions lies with consumer end uses. Figure A-9.1 shows that while the water sector contributes about 6.8 percent of the State's measured GHG emissions, water utilities contribute just 0.6% of the total. By comparison, water end uses – again, including the heating and cooling of water – account for 5.1 percent.

Table A.9-1
Water Related Energy Use in California

	Electricity (Gigawatt-hour)	Natural Gas (Million Therms)
Urban Water Supply	**7,554**	**19**
Waste Water Treatment	2,012	27
Urban End Users	27,887	4,220
Agricultural Total	10,560	18
Total Water Sector Use	**48,013**	**4,284**
Total California Use	**250,494**	**13,571**
Urban Water Supply	**3.0%**	**0.1%**
Waste Water Treatment	0.8%	0.2%
Urban End Users	11.1%	31.1%
Agricultural Total	4.2%	0.1%
Total Water Sector Use	**19.2%**	**31.6%**

Energy has always been a key factor in the development of California's water supply infrastructure. Most water projects in the state are designed to minimize energy use and maximize energy recovery. In response to California's GHG emission goals, Metropolitan and many other water utilities are proactively taking steps to reduce water-related energy use. This includes increasing energy recovery in conveyance and distribution systems, developing renewable energy projects, performing energy studies, auditing facility energy usage, and other related actions. Additionally, the conservation programs administered by Metropolitan and the member agencies save embedded energy, as well as the energy associated with consumer end uses.

Figure A.9-1 Greenhouse Gas Emissions in California
Metric Tonnes of CO_2 Equivalent



Note: Based on the Air Resources Board GHG inventory from 2000 to 2012 data;
http://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_00-12_2014-03-24.pdf;
Percentages for the water sector are based on CEC's 2005 Energy Intensity Report: CEC-700-2005-011-SF, Nov. 2005

Voluntary Energy Use Reporting

SB 1036 (Pavley 2014) added Section 10631.2 to the Water Code, which states that water agencies may voluntarily provide information on estimated energy usage in their Urban Water Management Plans. This Appendix explains how Metropolitan will provide that information. Due to the mixing of water supplies before and after treatment, and the large number of service connections, Metropolitan will provide system-wide Energy Intensity values. In addition, it should be noted that as water supply, water quality, and operational conditions change, including Member Agencies' demands, the annual values for energy use and energy intensity will vary from year to year.

Metropolitan's Energy Intensity for the water it provides to its Member Agencies is broken down into the following functions:

- Source
- Conveyance
- Treatment
- Distribution
- Storage

Source

The water Metropolitan receives comes from two sources; (1) the California Department of Water Resources' (DWR) State Water Project (SWP), and (2) the Colorado River. The water flows naturally into these sources and does not require energy for extraction or diversion. Therefore, there is no energy used to extract or divert water from these sources.

Conveyance

To estimate the amount of energy used to convey water supplies to Metropolitan's water treatment plants and distribution system, the energy requirements from the two conveyance systems supplying Metropolitan's water have been combined, along with the volume of water delivered, into a single weighted energy intensity value for conveyance. As the blend of water from the SWP and the Colorado River changes each year due to availability, water quality, and demands, the total energy consumption and energy intensity for the conveyance function vary year to year.

State Water Project

Metropolitan is a contractor for water from DWR's SWP. The SWP uses a combination of natural and man-made systems to move water from Lake Oroville on the Feather River in northern California, through the Sacramento/San Joaquin River Delta (Delta), and into the California Aqueduct for delivery to central and southern California. DWR conveys water through the California Aqueduct using a series of pumps and hydro generators. Metropolitan receives water from DWR through the West Branch of the California Aqueduct at Castaic Lake and from the East Branch of the California Aqueduct at several locations in San Bernardino and Riverside Counties.

The California Aqueduct's net Energy Intensity for the water received from the West Branch is 2,580 kWh/AF and for the East branch it is 3,236 kWh/AF. These values are the nominal pumping requirements of the SWP pumps (Banks, Dos Amigos, Buena Vista, Wheeler Ridge, Wind Gap, Edmonston, Oso, and Pear Blossom) less the nominal generation values from the West and East Branch recovery generating plants (Warne, Castaic, Alamo, Mojave, and Devil Canyon). These values do not incorporate any pumping or generating at the San Luis Gianelli Plant.

The SWP also produces power at its Hyatt/Thermalito complex (HTC) near Lake Oroville and the Feather River in northern California. DWR releases water from Lake Oroville that flows through the HTC hydro generators and produces power for the SWP. Given water operations in the Delta and interactions between the Central Valley Project and the SWP, there is not a direct link from HTC power generation and SWP deliveries; however, the contractors for State Project water, including Metropolitan, pay for the HTC based on their share of the SWP's Variable Operation, Maintenance, Power and Replacement (OMP&R) Component of the Transportation Charge. To determine the benefit Metropolitan receives from the HTC generation in calculating the Energy Intensity of SWP conveyance, this same OMP&R share (percentage) has been used with the total generation from the HTC. From 2004 through 2013, Metropolitan's share of the HTC costs has ranged from 60.2% to 74.3%. A multi-year average percentage has been used to reduce the year-to-year volatility of this factor.

The SWP contract has specific provisions on how and when to account for various water deliveries and the associated costs. This will result in differences between the SWP billing values and the amount of water delivered to Metropolitan from the SWP.

Colorado River

Metropolitan conveys water from the Colorado River through its Colorado River Aqueduct (CRA). The water is pumped through five pumping plants to reach Metropolitan's service area. The nominal Energy Intensity of water conveyed through the CRA is 2000 kWh/AF.

There are no recovery generating plants along the CRA, however, the water that Metropolitan pumps from the Colorado River has been released from Lake Mead through the Hoover Dam generators. Metropolitan receives 28.5% of the energy produced at Hoover. This energy is

used exclusively to power the CRA pumps. The production rate (kWh/AF) is dependent on several factors, including the elevation of Lake Mead. The USBR updates this value monthly. Metropolitan has used its share of the energy produced at Hoover from its water releases in the calculation of the CRA conveyance energy requirement. This calculation utilizes the volume of water delivered into Metropolitan's service territory.

2013 Conveyance Total:	Energy used	3,627,553,292 kWh
	Water Delivered	1,945,801 AF
	Energy Intensity	1,864 kWh/AF
2014 Conveyance Total:	Energy used	3,448,714,628 kWh
	Water Delivered	1,768,121 AF
	Energy Intensity	1,951 kWh/AF

Treatment

Metropolitan has five treatment plants to provide potable water to its Member Agencies. The estimated amount of energy used to treat water supplies has been calculated by dividing the annual amount of energy consumed at the plant sites by the amount of water treated.

2013 Treatment Total:	Energy used	46,914,223 kWh
	Water Treated	1,072,870 AF
	Energy Intensity	44 kWh/AF
2014 Treatment Total:	Energy used	46,695,775 kWh
	Water Treated	1,016,046 AF
	Energy Intensity	46 kWh/AF

Distribution

Due to the high elevation at which Metropolitan receives water from the SWP and CRA, very little pumping (and electricity use) is needed to distribute treated and untreated water to its Member Agencies. Instead, gravity, not electricity, is primarily used to deliver water supplies through Metropolitan's distribution system.

In addition, Metropolitan has 16 recovery hydroelectric generating plants in its distribution system that produce greater amounts of power than is consumed from distribution pumping. These generators are on distribution pipelines located throughout Metropolitan's service area. The generators produce electricity from the water flowing through the pipelines. Without the hydrogenerators, the energy in the water would be reduced at facilities called pressure control structures and the potential for greenhouse gas free electricity lost. The energy used in the pumping plants and produced by the generators has been netted, with the result divided by the water delivered to the Member Agencies to calculate the distribution Energy Intensity.

2013 Distribution Total:	Energy used	-239,069,895 kWh (net generation)
	Water Delivered	1,959,867
	Energy Intensity	-122 kWh/AF
2014 Distribution Total:	Energy used	-118,895,649 kWh (net generation)
	Water Delivered	2,015,911 AF
	Energy Intensity	-59 kWh/AF

Storage

Metropolitan does not use any energy for its internal storage programs. Water is delivered by gravity flow. External water storage and recovery is managed by other parties and is often transacted through exchange arrangements. Any water delivered to Metropolitan from storage programs would be accounted for in the conveyance deliveries. Therefore, there is no energy used for placing water into storage.

Metropolitan's Annual Energy and Energy Intensity

Energy and Energy Intensity values are provided for each of the non-zero functions listed above: Conveyance; Treatment; and Distribution. As noted previously, these values vary from year to year due to operational changes and differences in source use due to changes in water supply availability and other factors. An estimated overall Energy Intensity is provided for untreated water deliveries and treated water deliveries.

2013

Estimated Delivered Untreated Water Energy Intensity:	1,742 kWh/AF
Estimated Delivered Treated Water Energy Intensity:	1,786 kWh/AF

2014

Estimated Delivered Untreated Water Energy Intensity:	1,892 kWh/AF
Estimated Delivered Treated Water Energy Intensity:	1,938 kWh/AF

Water Energy Tables

Provided in Tables A.9-2 and A.9-3 are the Water Energy Tables for CY 2013 and 2014 using the Water Supply Process Approach in Table O-1A from the 2015 UWMP Guidebook Appendix O.

Table A.9-2 (Table O-1A for Year 2013): Water Supply Process Approach

Reporting Date: CY 2013	**Urban Water Wholesale Supplies Includes SWP Embedded Energy and Non-Consequential Generation**							
	Water Management Process						Non-Consequential	
	Extract	**Storage**	**Conveyance[1]**	**Treatment**	**Distribution**	**Total**	**Hydro**	**Net**
Volume (AF)	-	-	1,945,801	1,072,870	1,959,867	-	[2]	[2]
Energy (kWh)	-	-	3,627,553,292	46,914,223	-239,069,895	-	[2]	[2]
Energy Intensity	-	-	**1,864**	**44**	**-122**	-	-	-
Treated Energy Intensity (kWh/AF)						**1,786**	-	-
Untreated Energy Intensity (kWh/AF)						**1,742**	-	-

Non Hydropower Self Generated Energy

Metropolitan generated 2,239,621 kWh at its Skinner treatment plant solar facility in CY2013.

Data Quality Narative

[1] Includes SWP deliveries of 973,943 AF at 2,780,057,816 kWhs

[2] Conveyance accounts for hydropower genergation from Hyatt Thermalito Complex at 976,000,000 kWhs, and Hoover Dam generation at 119,770,224 kWhs

Narative

See above section on Voluntary Energy Reporting.

Table A.9-3 (Table O-1A for Year 2014): Water Supply Process Approach

Reporting Date: CY 2014	**Urban Water Wholesaler: MWD Operational Control (Includes SWP Embedded Energy and Non-Consequential Generation)**							
	Water Management Process						Non-Consequential	
	Extract	**Storage**	**Conveyance[3]**	**Treatment**	**Distribution**	**Total**	**Hydro**	**Net**
Volume (AF)	-	-	1,768,121	1,016,046	2,015,911	-	[4]	[4]
Energy (kWh)	-	-	3,448,714,628	46,695,775	-118,895,649	-	[4]	[4]
Energy Intensity	-	-	**1,951**	**46**	**-59**	-	-	-
Treated Energy Intensity (kWh/AF)						**1,938**	-	-
Untreated Energy Intensity (kWh/AF)						**1,892**	-	-

Non Hydropower Self Generated Energy

Metropolitan generated 2,330,246 kWh at its Skinner treatment plant solar facility in CY2014.

Data Quality Narative

[3] Includes SWP deliveries of 607,344 AF at 1,683,268,784 kWhs

[4] Conveyance accounts for hydropower genergation from Hyatt Thermalito Complex at 423,752,000 kWhs, and Hoover Dam generation at 132,339,396 kWhs

Narative

See above section on Voluntary Energy Reporting.

Appendix 10

DWR's STANDARDIZED TABLES

Appendix 10
DWR's STANDARDIZED TABLES

In fulfillment of CA Water Code § 10621(d) and § 10644(a)(1) and (2), Metropolitan's Final 2015 UWMP was electronically submitted to the State of California through DWR's the WUE data website https://wuedata.water.ca.gov/secure/ in June 2016. This appendix contains the mandatory DWR tables that were uploaded to the WUE data website.

Table 2-2: Plan Identification			
Select Only One	**Type of Plan**		**Name of RUWMP or Regional Alliance** *if applicable* *drop down list*
☑	**Individual UWMP**		
	☐	Water Supplier is also a member of a RUWMP	
	☐	Water Supplier is also a member of a Regional Alliance	
☐	**Regional Urban Water Management Plan (RUWMP)**		
NOTES:			

Table 2-3: 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)	
Units of Measure Used in UWMP (select from Drop down)	
Unit	AF
NOTES:	

Table 2-4 Wholesale: Water Supplier Information Exchange (select one)	
☑	Supplier has informed more than 10 other water suppliers of water supplies available in accordance with CWC 10631. Completion of the table below is optional. If not completed include a list of the water suppliers that were informed.
2015 UWMP Section 5 Table 5-3	**Provide page number for location of the list.**
☐	Supplier has informed 10 or fewer other water suppliers of water supplies available in accordance with CWC 10631. **Complete the table below.**
Water Supplier Name *(Add additional rows as needed)*	
NOTES: See 2015 UWMP Sections 2 and 5 for discussion on Metropolitan's planning coordination, outreach, and notification (list provided in Table 5-3).	

Table 3-1 Wholesale: Population - Current and Projected						
Population Served	2015	2020	2025	2030	2035	2040*(opt)*
	18,740,000	19,355,000	20,017,000	20,639,000	21,206,000	21,791,000
NOTES: See 2015 UWMP Appendix 1 Table A.1-2.						

Table 4-1 Wholesale: Demands for Potable and Raw Water - Actual			
Use Type *(Add additional rows as needed)*	2015 Actual		
Drop down list *May select each use multiple times These are the only use types that will be recognized by the WUE data online submittal tool*	Additional Description *(as needed)*	Level of Treatment When Delivered *Drop down list*	Volume
Sales to other agencies		Drinking Water	815,431
Sales to other agencies		Raw Water	944,248
Losses			44,049
		TOTAL	1,803,728

NOTES: Sales to other agecies include Metropolitan deliveries to member and non-member agencies and deliveries from conjunctive use programs. Some of these deliveries are not revenue producing nor sales.
Losses include evaporation losses from storage reservoirs, distribution system losses (2014 estimate), and water within Metropolitan's distribution system and regulating reservoirs. Water losses are both drinking and raw water.

Table 4-2 Wholesale: Demands for Potable and Raw Water - Projected						
Use Type *(Add additional rows as needed)* ***Drop down list*** *May select each use multiple times* *These are the only Use Types that will be recognized by the WUEdata online submittal tool.*	Additional Description *(as needed)*	Projected Water Use *Report To the Extent that Records are Available* 2020	2025	2030	2035	2040 *(opt)*
Other		1,586,000	1,636,000	1,677,000	1,726,000	1,765,000
Transfers to other agencies		274,000	282,000	282,000	282,000	282,000
TOTAL		1,860,000	1,918,000	1,959,000	2,008,000	2,047,000
NOTES: See 2015 UWMP detailed discussion in Section 2, Metropolitan's Regional Water Demands Table 2-3 for Average Year, and Supply Capability and Projected Demands Table 2-6 for Average Year (average of 1922-2012 hydrologies).						

Table 4-3 Wholesale: Total Water Demands						
	2015	2020	2025	2030	2035	2040*(opt)*
Potable and Raw Water *From Tables 4-1 and 4-2*	1,803,728	1,860,000	1,918,000	1,959,000	2,008,000	2,047,000
Recycled Water Demand* *From Table 6-4*	0	0	0	0	0	0
TOTAL WATER DEMAND	1,803,728	1,860,000	1,918,000	1,959,000	2,008,000	2,047,000
**Recycled water demand fields will be blank until Table 6-4 is complete.*						
NOTES:						

Table 4-4 Wholesale: 12 Month Water Loss Audit Reporting	
Reporting Period Start Date (mm/yyyy)	Volume of Water Loss*
01/2014	6,409 AF
** Taken from the field "Water Losses" (a combination of apparent losses and real losses) from the AWWA worksheet.*	
NOTES: See 2015 UWMP discussions in Section 2.6 and Appendix 7, and summary of 2014 distribution system losses in Table A.7-1.	

Table 6-1 Wholesale: Groundwater Volume Pumped						
☑	Supplier does not pump groundwater. The supplier will not complete the table below.					
Groundwater Type *Drop Down List May use each category multiple times*	Location or Basin Name	2011	2012	2013	2014	2015
	TOTAL	0	0	0	0	0
NOTES:						

Table 6-3 Wholesale: Wastewater Treatment and Discharge Within Service Area in 2015										
☑	Wholesale supplier neither distributes nor provides supplemental treatment to recycled water. The supplier will not complete the table below.									
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number *(optional)*	Method of Disposal *Drop down list*	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level *Drop down list*	2015 volumes			
							Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area
Add additional rows as needed										
						Total	0	0	0	0
NOTES:										

Table 6-4 Wholesale: Current and Projected Retailers Provided Recycled Water Within Service Area							
☑	Recycled water is not directly treated or distributed by the supplier. The supplier will not complete the table below.						
Name of Receiving Supplier or Direct Use by Wholesaler	Level of Treatment *Drop down list*	2015	2020	2025	2030	2035	2040 *(opt)*
Add additional rows as needed							
	Total	0	0	0	0	0	0
NOTES:							

Table 6-5 Wholesale: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual		
☑	Recycled water was not used or distributed by the supplier in 2010, nor projected for use or distribution in 2015. The wholesale supplier will not complete the table below.	
Name of Receiving Supplier or Direct Use by Wholesaler	2010 Projection for 2015	2015 actual use
Add additional rows as needed		
Total	0	0

NOTES: The 2010 RUWMP Table 2-8 included projection for recycled water use in 2015 of 404 TAF under average hydrology. In 2015, the actual recycled water use (regional total within Metropolitan service area) is estimated at 414 TAF, as discussed in this 2015 UWMP Section 3.5 on Table 3-12, page 3-62, and Appendix 2, page A.2-8. Regional total represents the projected production of existing and underconstruction projects by Metropolitan member agencies. Additional recycled production may materialize from the local resources target under Metropolitan's IRP (see 2015 IRP Update Section 2.1).

Table 6-7 Wholesale: Expected Future Water Supply Projects or Programs						
☐	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.					
☑	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format.					
2015 UWMP Section 3 and Appendix 3	Provide page location of narrative in the UWMP					
Name of Future Projects or Programs	Joint Project with other agencies?		Description *(if needed)*	Planned Implementation Year	Planned for Use in Year Type *Drop Down list*	Expected Increase in Water Supply to Agency
	Drop Down Menu	*If Yes, Agency Name*				
Add additional rows as needed						

NOTES: See 2015 UWMP Section 3 description of resources and program development for the CRA, SWP, Central Valley/SWP storage and transfers programs, conservation, LRP (groundwater recovery, recycling, desalination), and groundwater. Also see Appendix 3 detailed discussion on all supply programs and justifications for supply projections.

Table 6-8 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*	Total Right or Safe Yield *(optional)*
Add additional rows as needed				
Purchased or Imported Water		1,318,925	Raw Water	
Supply from Storage		317,289	Raw Water	
Transfers		17,514	Raw Water	
Exchanges		150,000	Raw Water	
	Total	1,803,728		0
NOTES:				

Table 6-9 Wholesale: Water Supplies — Projected											
Water Supply	Additional Detail on Water Supply	Projected Water Supply *Report To the Extent Practicable*									
		2020		2025		2030		2035		2040 *(opt)*	
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		Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*
Add additional rows as needed											
Other		3,511,000		3,650,000		4,044,000		4,216,000		4,292,000	
Total		3,511,000	0	3,650,000	0	4,044,000	0	4,216,000	0	4,292,000	0
NOTES: See 2015 UWMP detailed discussion in Section 2 and Supply Capability and Projected Demands Table 2-6 for Average Year (average of 1922-2012 hydrologies).											

Table 7-1 Wholesale: Basis of Water Year Data			
Year Type	**Base Year** *If not using a calendar year, type in the last year of the fiscal or water year, 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: 2015 UWMP Section 2 Tables 2-4, 2-5, 2-6, and Appendix 3.
		☐	Quantification of available supplies is provided in this table as either volume only, percent only, or both.
		Volume Available	**% of Average Supply**
Average Year	1922-2012		100%
Single-Dry Year	1977		
Multiple-Dry Years 1st Year	1990		
Multiple-Dry Years 2nd Year	1991		
Multiple-Dry Years 3rd Year	1992		
Multiple-Dry Years 4th Year *Optional*			
Multiple-Dry Years 5th Year *Optional*			
Multiple-Dry Years 6th Year *Optional*			
Agency may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If an agency uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.			
NOTES: See 2015 UWMP Section 2.3 discussion of sources of supply and water supply reliability assessment under average year, single-dry year, and multiple-dry year hydrologies (summarized in Tables 2-4, 2-5, and 2-6). Also see Appendix 3 for a detailed discussion on all supply programs and justifications for supply projections.			

Table 7-2 Wholesale: Normal Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040 *(Opt)*
Supply totals *(autofill from Table 6-9)*	3,511,000	3,650,000	4,044,000	4,216,000	4,292,000
Demand totals *(autofill fm Table 4-3)*	1,860,000	1,918,000	1,959,000	2,008,000	2,047,000
Difference	1,651,000	1,732,000	2,085,000	2,208,000	2,245,000
NOTES: See 2015 UWMP detailed discussion in Section 2 and Supply Capabilities in Table 2-6 for Average Year hydrology.					

Table 7-3 Wholesale: Single Dry Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040 (Opt)
Supply totals	2,647,000	2,786,000	3,091,000	3,263,000	3,339,000
Demand totals	2,005,000	2,066,000	2,108,000	2,160,000	2,201,000
Difference	642,000	720,000	983,000	1,103,000	1,138,000
NOTES: See 2015 UWMP detailed discussion in Section 2 and Supply Capabilities in Table 2-4 for Single Dry-Year condition (repeat of 1977 hydrology).					

Table 7-4 Wholesale: Multiple Dry Years Supply and Demand Comparison						
		2020	2025	2030	2035	2040 (Opt)
First year	Supply totals	2,146,000	2,234,000	2,394,000	2,487,000	2,546,000
	Demand totals	2,001,000	2,118,000	2,171,000	2,216,000	2,258,000
	Difference	145,000	116,000	223,000	271,000	288,000
Second year	Supply totals	2,146,000	2,234,000	2,394,000	2,487,000	2,546,000
	Demand totals	2,001,000	2,118,000	2,171,000	2,216,000	2,258,000
	Difference	145,000	116,000	223,000	271,000	288,000
Third year	Supply totals	2,146,000	2,234,000	2,394,000	2,487,000	2,546,000
	Demand totals	2,001,000	2,118,000	2,171,000	2,216,000	2,258,000
	Difference	145,000	116,000	223,000	271,000	288,000
Fourth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Fifth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Sixth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
NOTES: See 2015 UWMP detailed discussion in Section 2 and Supply Capabilities in Table 2-5 for Multiple Dry-Year condition (repeat of 1990-1992 hydrology).						

Table 8-1 Wholesale Stages of Water Shortage Contingency Plan		
Stage	Complete Both	
	Supply Reduction[1]	Water Supply Condition (*Narrative description*)
Add additional rows as needed		
Baseline Water Use Efficiency	Long-term conservation	Ongoing conservation, outreach, and recycling programs to achieve permanent reductions in water use and build storage reserves.
Condition 1: Water Supply Watch	Variable	Local agency voluntary dry-year conservation measures and use of regional storage reserves.
Condition 2: Water Supply Alert	Variable	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	5% - 50%	Implement Metropolitan's Water Supply Allocation Plan.
[1] *One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.*		
NOTES: See 2015 UWMP Section 2.4 discussion on Water Shortage Contingency Analysis, Water Surplus and Drought Management Plan, Water Supply Allocation Plan, and Water Supply Condition Framework (specifically Table 2-7). As part of Catastrophic Supply Interruption Planning in Section 2.5, Metropolitan's Emergency Storage Requirements discuss planning based on a 100% reduction in imported supplies for a period of 6 months, which is greater than the 50% shortage required by the Act. In addition, the WSAP (included in Appendix 4) includes a Level 10 Regional Shortage Level that addresses regional shortage percentage of 50%.		

Table 8-4 Wholesale: Minimum Supply Next Three Years			
	2016	2017	2018
Available Water Supply	1,935,371	1,636,530	1,798,633
NOTES: See 2015 UWMP Section 1 discussion of Metropolitan's Short-term Supply Outlook and Supply Capability summarized in Table 1-7.			

Table 10-1 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.**	
2015 UWMP Section 5 Table 5-3	Provide the page or location of this list in the UWMP.	
☐	Supplier has notified 10 or fewer cities or counties. **Complete the table below.**	
City Name	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
	☐	☐
	☐	☐
	☐	☐
County Name *Drop Down List*	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
	☐	☐
	☐	☐
NOTES: See 2015 UWMP Section 5 discussion on Metropolitan's notification to cities and counties (list provided in Table 5-3).		

Appendix E

Cadiz, Inc., Fenner Valley Mutual Water Company, and Santa Margarita Water District, Water Purchase and Sale Agreement

WATER PURCHASE AND SALE AGREEMENT

This Water Purchase and Sale Agreement ("Agreement") is made and entered into as of July 31, 2012 ("Effective Date"), by and between Cadiz, Inc., a Delaware corporation, and its affiliate Cadiz Real Estate LLC, a Delaware limited liability company (as appropriate, each entity or both together being "Cadiz"), Fenner Valley Mutual Water Company, a California nonprofit mutual benefit corporation ("FVMWC"), and Santa Margarita Water District, a California Water District ("SMWD"). Cadiz, FVMWC and SMWD are each a "party" and collectively the "parties."

RECITALS

A. Cadiz is the owner of approximately forty-five thousand (45,000) acres of land in eastern San Bernardino County, most of which overlies the Fenner Valley Aquifer System ("Property"). Cadiz has proposed, and SMWD has decided, in its discretion, to carry out the Project.

B. Cadiz will grant to FVMWC the right to take Project Water from the Property and to use the Property for Project Storage in accordance with the terms set forth herein, with SMWD acquiring a first priority right to Project Water in the amount of the SMWD Base Allotment, as well as certain rights to Project Storage.

C. Cadiz will develop, construct and finance all Project Facilities necessary for the production and delivery of Project Water and will transfer a possessory interest in the Project Facilities to the Fenner Valley Water Authority ("FVWA").

D. Cadiz has formed FVMWC, a nonprofit entity that will operate and manage the Project and whose members will be solely comprised of entities which have contracted to receive Project Water, including SMWD, other public water systems and the Arizona California Railroad Company. Cadiz will not be a member of FVMWC.

E. SMWD is a California Water District in Orange County, a local agency of the State of California with broad powers under the California Water District Act, Cal. Water Code §§ 34000 *et seq.*, who will carry out and be primarily responsible for the Project, and is the lead agency for the Project EIR.

F. On or about August 16, 2010, Cadiz and SMWD entered into that certain Option Agreement (the "Option Agreement"), pursuant to which SMWD has timely and effectively exercised its right to acquire the SMWD Base Allotment and SMWD Option Capacity, with this Agreement being a further refinement of the Option Agreement.

G. SMWD and FVMWC will execute a Joint Exercise of Powers Agreement as contemplated herein to form and operate the FVWA, with SMWD serving as managing member of FVWA and the "designated entity" of FVWA under Government Code Section 6509.

H. FVWA, under the management of SMWD, will review and approve the design and construction of the Project Facilities by Cadiz in accordance with the Project EIR, GMMMP, SMWD standards and specifications, and such other covenants, agreements and documents as may be applicable.

I. Cadiz, or a special purpose entity formed by Cadiz, intends to arrange financing from private or public sources to fund the design and construction costs of the Project and Project Facilities (all such financing referred to as "Third Party Financing"). Cadiz will repay and secure Third Party Financing from the revenues that are generated by the Project.

J. The parties desire to enter into this Agreement to provide the material terms and conditions for carrying out the Project, including the acquisition, construction and operation of Project Facilities, the sale and conveyance to SMWD of the SMWD Base Allotment and SMWD Option Capacity and certain other matters.

AGREEMENT

NOW THEREFORE, in consideration of the foregoing recitals, which are incorporated into the operative provisions of this Agreement by this reference, and for all the good and valuable consideration herein, the parties hereto agree as follows:

1. Definitions.

The following terms have the following meanings for purposes of this Agreement:

1.1. "Administrative Costs" means the administrative costs associated with the operation and management of the Project by FVMWC following the Commencement Date, calculated in accordance with generally accepted accounting principles, which shall include costs related to insurance, taxes (if any), and professional service providers such as accountants, attorneys and engineers; provided, however, that Administrative Costs shall not include any Retained Costs of Cadiz.

1.2. "Agreement" has the meaning assigned thereto in the preamble.

1.3. "Annual Storage Management Fee" has the meaning assigned thereto in Section 5.4.

1.4. "Cadiz" has the meaning assigned thereto in the preamble.

1.5. "Capital Investment" means any and all capital costs incurred by Cadiz to develop and build the Project, including design, permitting, construction and financing costs related to Project Facilities. For the purposes of this definition, construction costs shall include the costs of inspecting and performance testing the Project Facilities and preparing them for operation through the Commencement Date.

1.6. "Capital Recovery Charge" means the charge payable in connection with the purchase of Project Water as described in Section 9.2.2 to allow for the recovery of the Capital Investment by Cadiz and to permit Cadiz to make timely payment of all Debt Service.

1.7. "Carry-Over Account" has the meaning assigned thereto in Section 5.4.

1.8. "CEQA" means the California Environmental Quality Act.

1.9. "Commencement Date" means the date on which FVMWC first delivers water to the CRA.

1.10. "County" means the County of San Bernardino.

1.11. "County MOU" means that certain Memorandum of Understanding By and Among The Santa Margarita Water District, Cadiz, Inc., Fenner Valley Mutual Water Company, and the County of San Bernardino (Related to County Ordinance for Desert Groundwater Management) dated May 11, 2012.

1.12. "CRA" means the Colorado River Aqueduct.

1.13. "Debt Service" means all amounts necessary for Cadiz to repay when due all interest, principal and other charges payable by Cadiz under any Third Party Financing.

1.14. "Effective Date" has the meaning assigned thereto in the Preamble.

1.15. "Facility Lease" has the meaning assigned thereto in Section 4.2.

1.16. "Facility Operation Agreement" means that agreement between FVMWC and FVWA pursuant to which the extraction, conveyance and delivery of water from the Project shall be governed. The terms of the Facility Operation Agreement shall include: (i) the responsibility of FVMWC for paying or reimbursing costs incurred by FVWA, County and SMWD for overseeing compliance with the GMMMP on a time and materials basis; (ii) permitting FVWA and FVMWC to contract with third parties, including another Project Participant, another local public agency, other person or entity, to provide for the day-to-day operation and maintenance of the Project, as well as bookkeeping and administration duties; (iii) the responsibility of FVMWC for all day-to-day operations; (iv) the responsibility of FVMWC for the collection of proceeds from the sale of water to SMWD and other Project Participants; and (v) the proper allocation and payment of all costs and charges related to the operation of the Project, including payment due and payable to Cadiz, as described in Section 9.2.

1.17. "Fenner Valley Aquifer System" has the meaning assigned thereto in Section 1.30.

1.18. "Fixed O&M Costs" means all Project Operation and Maintenance Expenses which do not vary with the amount of water extracted, conveyed and delivered during the applicable time period.

1.19. "FVMWC" has the meaning assigned thereto in the preamble.

1.20. "FVMWC Members" means SMWD and other Project Participants who own membership shares in FVMWC.

1.21. "FVWA" has the meaning assigned in Recital C.

1.22. "GMMMP" means the Groundwater Management, Monitoring, and Mitigation Plan for the Project as generally set forth in the Project EIR and as it may be subsequently amended and approved by and between SMWD, FVMWC and the County.

1.23. "Initial Term" has the meaning assigned thereto in Section 14.4.

1.24. "Joint Exercise of Powers Agreement" has the meaning set forth in Recital G.

1.25. "Material Increase in Financial Risk to SMWD" means any circumstance that causes SMWD to be obligated, either directly or indirectly, to assume greater financial obligations of any kind, including any increase in the cost to SMWD of Project Water or Project Storage, by virtue of an agreement between Cadiz and another Project Participant.

1.26. "MWD" means The Metropolitan Water District of Southern California.

1.27. "MWD Fees" has the meaning assigned thereto in Section 9.3.4.

1.28. "MWDOC" means the Municipal Water District of Orange County.

1.29. "Option Agreement" has the meaning assigned thereto in Recital F.

1.30. "Project" means the Cadiz Valley Water Conservation, Recovery and Storage Project designed to appropriate groundwater from wells on the Property overlying the Orange Blossom Wash, Cadiz, Bristol and Fenner Valley aquifers (collectively, such aquifers being the "Fenner Valley Aquifer System"), and to deliver that groundwater for reasonable and beneficial uses via the CRA and other facilities necessary to deliver the groundwater to Project Participants. For purposes of this Agreement, the "Project" includes the right to carry-over from one Year to a subsequent Year up to one hundred fifty thousand (150,000) AF, but does not include the Imported Water Storage component as described in the Project EIR.

1.31. "Project EIR" means the Environmental Impact Report for the Project, for which SMWD is the lead agency.

1.32. "Project Facilities" means any and all facilities deemed necessary, advisable or appropriate to extract, convey or deliver Project water to Project Participants, including facilities associated with the Groundwater Conservation and Recovery Component phase of the Project, as described in the Project EIR, *viz.*, a wellfield located on the Property, manifold, 43-mile conveyance pipeline between the wellfield and CRA, and interconnection between the conveyance pipeline and the CRA.

1.33. "Project Operation and Maintenance Expenses" means:

(a) Following the Commencement Date, the actual costs spent or incurred for labor, materials, services or utilities related to the operation, maintenance and repair of the Project and Project Facilities (including costs of FVWA under the Facility Operation Agreement), calculated in accordance with generally accepted accounting principles and Section 9 hereof, including: (i) the cost of all scheduled and unscheduled maintenance of the Project Facilities as necessary to preserve the Project in good repair and working order; (ii) following the Commencement Date, the cost of providing field staff, data collection and reporting as necessary for compliance with the GMMMP; and (iii) all costs payable to FVWA, SMWD and the County to oversee compliance with the GMMMP; and

(b) The current cost of funding adequate reserves for (i) operations; and (ii) capital repairs, replacements or improvements which are necessary to keep the Project Facilities in good repair and working order over the term of the Project (excluding any capital improvements related to the Imported Water Storage Component phase of the Project);

(c) But excluding in all cases: (i) depreciation, replacement and obsolescence charges or reserves therefor; (ii) amortization of intangibles or other bookkeeping entries of a similar nature; and (iii) Administrative Costs.

1.34. "Project Participant" means each entity listed in Exhibit A, who are identified in the Project EIR as "Project Participants," and as the context dictates shall include SMWD. The parties acknowledge that the attached list is not final and that no party shall be considered a Project Participant until it has executed a water purchase agreement with Cadiz.

1.35. "Project Storage" means the right to carry-over and store up to one hundred fifty thousand (150,000) acre-feet ("AF") of Project Water.

1.36. "Project Water" means the right to produce and deliver fifty thousand (50,000) acre-feet per year ("AFY") of groundwater from the Fenner Valley Aquifer System over the Initial Term, aggregating two million, five hundred thousand (2,500,000) AF of such groundwater cumulatively over the life of the Project. The parties acknowledge that the right to Project Water is a contractual right pursuant to the Water Lease and that no transfer of the water rights of Cadiz in the Property or the Fenner Valley Aquifer System is intended by this Agreement.

1.37. "Property" has the meaning assigned thereto in Recital A.

1.38. "Reimbursement Agreements" means that certain Environmental Processing and Cost Sharing Agreement as of June 23, 2010, between Cadiz and SMWD, that certain Escrow Agreement dated January 25, 2012 between Cadiz and SMWD, and that certain Joint Defense and Confidentiality Agreement dated as of May 25, 2012 between Cadiz, SMWD, FVMWC and the County, as amended.

1.39. "Retained Costs" means costs that will remain the responsibility of Cadiz under the various agreements to implement the Project, including the Facility Lease and the Water Lease, which will not be recovered by Cadiz from SMWD or FVMWC, including:

(a) All professional fees and costs associated with any private or regulatory challenge to the Project or the right of Cadiz to convey, transfer or lease the Project Water, Project Storage or Project Facilities in connection with the Project, including the indemnity obligations of Cadiz and FVMWC under the Reimbursement Agreements;

(b) All costs of implementing mitigation measures required in connection with the Project during the entire Project term, including the implementation of the GMMMP and any agreement or settlement entered into between Cadiz and any third party;

(c) Prior to the Commencement Date, (i) the cost of funding an escrow account for FVMWC to provide field staff, data collection and reporting as necessary for compliance with the GMMMP, as well as the costs incurred by FVWA, SMWD and the County to oversee compliance with the Project EIR and the GMMMP as contemplated in this Agreement and the Reimbursement Agreements; and (ii) all administrative costs and expenses incurred by SMWD in connection with carrying out its responsibilities in connection with the Project (including a reasonable allocation and reimbursement for the time of SMWD staff), whether or not such costs are expressly subject to reimbursement under the Reimbursement Agreements;

(d) A proportional share of the Capital Recovery Charge and the Fixed O&M Costs to the extent that the Total Annual Project Allotment of Project Water is reduced or curtailed for any reason, including reduced deliveries as a result of mitigation requirements, it being understood that SMWD and the Project Participants are agreeing to pay the Capital Recovery Charge and the Fixed O&M Costs on an AF basis spread over the entire 50,000 AF of Project Water with Cadiz responsible for the per AF cost with respect to the total amount of any reduction or curtailment;

(e) Cadiz's responsibility for SMWD's portion of the Fixed O&M Costs which are related to capital repair and replacement during the first ten (10) years of the Facility Lease, pursuant to Section 9.3.1; and

(f) Any increase in Administrative Costs of FVMWC as a direct result of regulatory or reporting requirements of Cadiz as a public company.

1.40. "SMWD" has the meaning assigned thereto in the preamble.

1.41. "SMWD Base Allotment" has the meaning assigned thereto in Section 5.2.

1.42. "SMWD Base Payment" has the meaning assigned thereto in Section 9.2.1.

1.43. "SMWD Option Capacity" has the meaning assigned thereto in Section 5.3.

1.44. "SMWD Water System" means the system of physical infrastructure owned and used by SMWD for the acquisition, treatment, reclamation, transmission, distribution and sale of water.

1.45. "Third Party Financing" has the meaning assigned thereto in Recital I.

1.46. "Total Annual Project Allotment" means 50,000 AFY.

1.47. "Variable O&M Costs" means all Project Operation and Maintenance Expenses which vary with the amount of water extracted, conveyed and delivered during the applicable time period.

1.48. "Water Lease" has the meaning assigned thereto in Section 4.1.

1.49. "Water Storage Account" has the meaning assigned thereto in Section 5.5.

1.50. "Year" means a calendar year during the Initial Term.

2. Purpose.

The purpose of this Agreement is to: (a) define the rights and obligations of the parties and the contractual documents that will govern the development, design, acquisition, construction, finance, operation, repair and replacement of the Project and Project Facilities and the compliance of the Project with the mitigation measures adopted by SMWD for the Project and the GMMMP; (b) identify the rights to ownership, possession and responsibility for the assets of the Project; (c) identify the mechanism for the allocation and delivery of Project Water and Project Storage; and (d) define the separate rights of SMWD in the Project Water, Project Storage and its easement for priority use of the Project Facilities. A flow chart showing the structure of the Project and the contractual relationships between the various parties is attached hereto as Exhibit B and incorporated herein by this reference. The parties acknowledge that this Agreement is unique due to the role of SMWD in carrying out the Project and its management and oversight role with FVWA and FVMWC, and that the water purchase agreements between Cadiz, FVMWC and other Project Participants may contain terms for the purchase of Project Water and Project Storage that vary from the terms granted to SMWD hereunder; provided, however, that no such agreements with Project Participants shall alter the responsibilities of the parties with respect to the Project as set forth in this Agreement.

3. Construction, Operation and Financing: Roles and Responsibilities.

3.1. Intent. The parties will use their best efforts to cause or accomplish the development, construction, finance and operation of the Project and the Project Facilities, the obtaining of all necessary authority and rights, consents and approvals, and the performance of all things necessary and convenient therefor, subject to compliance with all necessary federal and state laws, including CEQA, the terms and conditions of the permits and licenses relating to the Project, and all other agreements relating thereto.

3.2. Creation, Governance and Responsibilities of FVWA.

3.2.1. The Joint Exercise of Powers Agreement for FVWA will be prepared consistent with the authority granted under Government Code §§ 6500 *et seq*., within one hundred eighty (180) days of the execution of this Agreement, in a form which is consistent with this Agreement and mutually acceptable to the parties. SMWD will serve as the "designated entity" of FVWA pursuant to Government Code § 6509. The purpose of FVWA will be to lease and eventually own the Project Facilities for the extraction, conveyance and delivery of water by the Project and in connection therewith, to coordinate with Cadiz in securing permits and regulatory approvals required to operate and maintain such Project Facilities. In the event that SMWD does not approve the execution of the Joint Exercise of Powers Agreement and the formation of FVWA for any reason, then SMWD and Cadiz will agree on a mutually acceptable amendment to this Agreement whereby SMWD will directly assume the rights and obligations of FVWA.

3.2.2. The governance of FVWA shall be as set forth in the Joint Exercise of Powers Agreement, which shall provide SMWD with full management and operational control of FVWA during the term of the Project. SMWD and FVMWC shall be the founding members of FVWA and other Project Participants may become members of FVWA under terms to be agreed upon between SMWD and such other Project Participants.

3.2.3. FVWA responsibilities will include: (i) reviewing and approving Project designs and specifications in coordination with SMWD; (ii) managing and providing oversight of the operation of the Project Facilities in coordination with FVMWC pursuant to the terms of the Facility Operation Agreement; and (iii) overseeing compliance of the Project with the GMMMP in coordination with SMWD.

3.3. Responsibilities of FVMWC. FVMWC responsibilities will include:

3.3.1. Carrying out its obligations in connection with the operation and maintenance of Project Facilities as set forth in the Facility Operation Agreement;

3.3.2. Collecting all payments received from the sale of water and allocating such payments to: (i) Project operation and compliance costs incurred by FVMWC and FVWA; (ii) Capital Recovery Charges due to Cadiz for the Capital Investment; and (iii) payments due to Cadiz for making available the Project Water as negotiated in this Agreement, the Water Lease and the water purchase agreements with other Project Participants, subject to offset by FVMWC for any Retained Costs of Cadiz that are paid by FVMWC;

3.3.3. Complying with all regulatory requirements for the operation of a public water system, including the requirements of the

California Department of Public Health under the direction of FVWA and SMWD as set forth in the Facility Operation Agreement;

3.3.4. Carrying out the day-to-day implementation of mitigation measures adopted by SMWD as part of its approval of the Project, and the protective measures contained within the GMMMP under the review of FVWA pursuant to the Facility Operation Agreement;

3.3.5. Enforcing mitigation measures contained in the Project EIR as directed or delegated by SMWD as the lead agency;

3.3.6. Providing regular and routine updates to Cadiz, FVWA, SMWD and the County concerning compliance with the GMMMP; and

3.3.7. Coordinating the extraction, conveyance and delivery of the Total Annual Project Allotment received under the Water Lease pursuant to the Facility Operation Agreement.

3.4. Implementation of the GMMMP.

3.4.1. After the Effective Date and upon certification of the Project EIR, SMWD and the County will provide annual time and materials budget estimates to review data, establish procedures and appoint representatives to the Technical Review Panel (as defined in the GMMMP). Cadiz will deposit adequate funding to cover these costs in its escrow account established under the Reimbursement Agreements for the benefit of SMWD on behalf of FVWA and the County in advance of their performance of the duties reasonably budgeted as anticipated to be incurred by SMWD and the County, in quarterly installments commencing within 30 days of receipt of the initial budgets and at the start of each subsequent SMWD and County fiscal year.

3.4.2. The obligation set forth in Section 3.4.1 is separate and independent from Cadiz's agreement to reimburse SMWD in full for all costs reasonably incurred by SMWD in connection with its independent review and analysis of the Project EIR and GMMMP pursuant to the Reimbursement Agreements. Notwithstanding the terms set forth in the Reimbursement Agreements, Cadiz agrees that it shall reimburse SMWD (i) for all costs incurred by SMWD, including costs that are subject to reimbursement pursuant to the Reimbursement Agreements, as of the Effective Date in connection with the Project, including all environmental review and litigation costs, within five (5) business days of the submission of an invoice from SMWD setting forth such amounts in reasonable detail. Cadiz may elect to make such payment directly or through a release of funds currently held in escrow or both at the election of Cadiz; and (ii) all Retained Costs described in Section 1.39(c)(ii).

3.4.3. Between the Effective Date and the Commencment Date, Cadiz will be responsible for providing field staff, data collection and reporting to the satisfaction of SMWD and the County. Furthermore, Cadiz and SMWD agree that the execution of this Agreement will trigger the annual reporting requirement under Section 9.1 of the GMMMP, provided, however, that until the Commencement Date, Cadiz will be responsible for the preparation of the annual reports required by Section 9.2.1 of the GMMMP and the ongoing monitoring and collection of data necessary to prepare such reports. The first annual report under Section 9.2.1 of the GMMMP will be due within twelve months of the Effective Date. The reporting and monitoring requirements contemplated in this Section 3.4 and the GMMMP shall be conducted on a continuous basis following the Effective Date notwithstanding any tolling of the deadlines or other requirements of this Agreement due to litigation as contemplated in Section 14.2, subject to the order of any court or regulatory authority requiring Cadiz to suspend such activities.

3.4.4. SMWD will establish a community advisory committee to provide a mechanism for local input on issues related to SMWD's oversight of the monitoring of the Project as contemplated in the GMMMP. Cadiz shall cooperate with SMWD's requests for resources in connection with the committee, including without limitation, providing SMWD with access to Cadiz monitoring data, advisors and expertise and hosting visits by the committee to the Project site.

3.4.5. On and after the Commencement Date, FVMWC will be responsible for providing field staff, data collection and reporting under the supervision of SMWD and to the satisfaction of the County. All costs associated with these activities will be components of Fixed O&M Costs and recovered through the sale of water to SMWD and other Project Participants.

3.4.6. FVMWC shall retain responsibility for compliance with the GMMMP during the term of the Facility Lease, and annually, SMWD and the County will provide a budget for their respective costs for review and enforcement for the next SMWD and County fiscal year by May of the then-fiscal year to Cadiz.

3.4.7. Notwithstanding anything to the contrary herein, any responsibility of FVMWC, SMWD or FVWA with respect to the implementation of the GMMMP shall not relieve Cadiz of its financial obligations and responsibilities as set forth in this Agreement, it being the intent that Cadiz shall retain responsibility for all costs and liability associated with corrective measures and compliance with the GMMMP except for those costs included in Fixed O&M Costs pursuant to Section 3.4.4.

3.5. Responsibilities of Cadiz.

3.5.1. Cadiz will be responsible for the development, design, acquisition and construction of the Project Facilities, subject to the review and approval of FVWA and SMWD.

3.5.2. Cadiz will be responsible for obtaining all Third Party Financing necessary to provide the Capital Investment for the Project. FVMWC and SMWD acknowledge that Cadiz may be required to provide a pledge of all Project revenues payable to Cadiz, as well as a collateral assignment of the Facility Lease and the Water Lease as security for the Third Party Financing. FVMWC and SMWD agree to cooperate with Cadiz with respect to such assignment; provided, however, that the terms of the Third Party Financing shall not vary the terms of this Agreement or any other Project contracts described herein without the express written consent of FVMWC, FVWA and SMWD, and the Facility Lease and the Water Lease shall provide that any collateral assignee of such documents shall assume all obligations of Cadiz thereunder.

3.5.3. Cadiz will be responsible for obtaining all permits and approvals required for the Project in coordination with FVWA and SMWD.

3.5.4. Cadiz will be responsible for all Retained Costs and to the extent that Retained Costs include allocations of Fixed O&M Costs or other expenses as a result of any reduction or curtailment of Project Water below the Total Annual Project Allotment, then Cadiz agrees that FVMWC has the right to offset such Retained Costs against any amounts payable to Cadiz under this Agreement.

3.5.5. Cadiz will reimburse SMWD, FVMWC and the County for all costs reasonably incurred prior to the Commencement Date as set forth in this Agreement and the Reimbursement Agreements. At SMWD's sole discretion, Cadiz may be requested for quarterly deposits for SMWD's costs incurred prior to the Commencement Date, including but not limited to, plan review, inspection, construction management, legal services and administration.

3.6. SMWD Financing. SMWD reserves the right, but has no obligation, to obtain independent financing to repay the Cadiz Capital Investment (including any costs of Third Party Financing that are due and payable at the time or are related to repayment, such as penalties for prepayment), after which repayment SMWD shall have no obligation to pay any Capital Recovery Charge as set forth in Section 9.2.2. SMWD may exercise its financing right at any time; provided, that such exercise does not materially impede or delay construction or operation of the Project and subject to the reasonable terms of any Third Party Financing of the Capital

Investment (it being understood that there may be time period limitations or penalties for prepayment).

4. Interests.

4.1. Lease of Project Water and Project Storage. Cadiz will enter into a long term lease with FVMWC which gives FVMWC a possessory interest and right to take the Total Annual Project Allotment of Project Water from the Property and the Fenner Valley Aquifer System for the Initial Term of fifty (50) years ("Water Lease"). In consideration of the Water Lease, FVMWC shall collect and deliver to Cadiz all charges and payments which are negotiated between Cadiz and the Project Participants, subject to an offset for Retained Costs payable by Cadiz as set forth in Section 9.2.1. FVMWC shall retain payments made by the Project Participants for Fixed O&M Costs and Variable O&M Costs, as well as any other Project costs that are paid directly by FVMWC pursuant to the Water Lease (such as MWD Fees) as set forth in Section 9.3. FVMWC's right to take the full Total Annual Project Allotment will be subject to the mitigation measures set forth in the Project EIR and the requirements of the GMMMP; provided, however, that for the purpose of calculating the Capital Recovery Charge and the Fixed O&M Costs, such costs shall always be calculated on the full 50,000 AF, with Cadiz taking all risk in connection with the loss of such charges and costs with respect to the total number of AF subject to a reduction or curtailment. The Water Lease shall recognize the priority right of SMWD to the SMWD Base Allotment pursuant to Section 5.2. The Water Lease shall further provide for the provision of Project Storage within the subsurface of the Property and the Fenner Valley Aquifer System and the delivery of water that is held in Project Storage. The terms of the Water Lease will be consistent with the terms set forth in this Agreement and will be subject to the approval of FVMWC and SMWD. Cadiz will deliver a draft of the Water Lease for review and approval by FVMWC and SMWD within ninety (90) days of the execution of this Agreement. The effectiveness of the Water Lease shall be contingent upon the satisfaction of the conditions set forth in Section 14 and shall terminate in the event of an event of early termination in accordance with this Agreement. The Water Lease will be recorded against the Property.

4.2. Lease of Project Facilities. Cadiz will enter into a long term lease with FVWA which gives FVWA a possessory interest in the Project Facilities for the Initial Term of fifty (50) years or until the Capital Investment has been paid in full, whichever is shorter ("Facility Lease"). The use of the Project Facilities to produce and deliver Project Water shall be governed by the Facility Operation Agreement between FVWA and FVMWC. At the end of the term of the Facility Lease, the Project Facilities shall become the property of FVWA, but shall continue to be operated and maintained for the duration of the Water Lease in accordance with the terms of the Facility Operation Agreement. In consideration of the Facility Lease, Cadiz shall be entitled to the payment of the Capital Recovery Charge, which shall be collected and paid to Cadiz by FVMWC on behalf of FVWA as set forth in Section 9.2.2. The terms of the Facility Lease will be consistent with the terms set forth in this Agreement and will be subject to the approval of FVWA, FVMWC and SMWD. Cadiz will deliver a draft of the Facility Lease for review and approval by the parties within ninety (90) days of the execution of this Agreement. The effectiveness of the Facility Lease shall be contingent upon the satisfaction of the conditions set forth in Section 14 and shall terminate in the event of an event of early termination in accordance with this Agreement. The Facility Lease will be recorded against the Property.

4.3. Issuance of Membership Shares; FVMWC Rules and Regulations. Within thirty (30) days of the Effective Date of this Agreement, FVMWC will issue to SMWD 5,000 membership shares in FVMWC, which shares shall represent the right to delivery of water from FVMWC pursuant to the terms and conditions of this Agreement. Within ninety (90) days of the Effective Date of this Agreement, Cadiz shall deliver to SMWD for review and approval a draft set of Bylaws and the proposed rules and regulations for Project operations by FVMWC as described in Section 5.1. The form of Bylaws and rules and regulations shall be customary for mutual water companies, subject to the unique aspects of the Project.

4.4. Facilities Easement for SMWD. Following the construction of the Project Facilities and prior to the execution of the Facility Lease, Cadiz will record an easement in favor of SMWD over the Project Facilities which grants to SMWD the priority right to use the Project Facilities in order to take the SMWD Base Allotment in accordance with the terms of this Agreement. Such easement shall include the right to make use of any right of way in which the Project Facilities are located. The easement shall provide for subordination to any security interest granted in connection with any Third Party Financing subject to the execution of a non-disturbance agreement with the lender acceptable to SMWD. SMWD shall deliver a draft of the form of easement to Cadiz within ninety (90) days of the Effective Date for Cadiz's review and approval.

5. Delivery of Water.

5.1. Delivery Schedule. FVMWC, in consultation with SMWD, will establish rules and regulations regarding the process and schedule for delivering water to its members, including SMWD, which schedule shall be adopted on an annual basis for each Year. Such rules and regulations will include the date for members submitting delivery orders for the following Year, including member orders for delivery of water from storage, the date for FVMWC releasing a delivery schedule, the scheduling of delivery interruptions due to regular maintenance, repair and replacement activities, and other matters as deemed necessary or appropriate by FVMWC. The primary objective will be for FVMWC to meet all delivery requests of its members, consistent with operation of the Project in accordance with the Project EIR, all Project permits and the GMMMP. To the extent that all delivery requests cannot be met, FVMWC will establish deliveries consistent with the priorities set forth in this Agreement and similar agreements executed with other members of FVMWC.

5.2. SMWD First Priority Right. SMWD shall have the right to delivery of the first five thousand (5,000) AFY of Project Water ("SMWD Base Allotment"), including the priority right to use of capacity in the Project Facilities for delivery of the SMWD Base Allotment. This right will have priority pursuant to the Water Lease with FVMWC over deliveries to the other Project Participants and shall not be subject to reduction or curtailment. The SMWD Base Allotment shall further have priority over any delivery of water to the County pursuant to the County MOU, it being understood that the "availability of capacity" in the Project Facilities for the delivery of water to the County is determined after taking into account the priority rights of SMWD.

5.3. SMWD Second Priority Right. In addition to the water described in Section 5.2, SMWD shall have an option to purchase an additional ten thousand (10,000) AFY on the same

priority as the other Project Participants ("SMWD Option Capacity") and subject to any reduction or curtailment in the Total Annual Project Allotment on a *pari passu* basis with the other Project Participants. SMWD shall have the right to exercise its option for the SMWD Option Capacity, or any portion thereof, at any time on purchase terms mutually agreed to by SMWD and Cadiz; provided, that (i) at any such time as the Project only has ten thousand (10,000) AFY of excess capacity remaining, FVMWC shall give SMWD notice of any proposed acquisition of capacity by any other Project Participant, and SMWD shall be required to either exercise its option for such capacity within sixty (60) days of such notice, or the failure by SMWD to provide notice to Cadiz of such exercise shall constitute a release of said capacity from the option so that FVMWC can sell the water to such other Project Participant, and (ii) the purchase price for the SMWD Option Capacity shall be subject to agreement between Cadiz and SMWD at the time of exercise of the option, but SMWD shall have the right at all times to benefit from the most favorable terms of water purchase that are negotiated by Cadiz with any other Project Participant, whether before or after the exercise of the SMWD Option Capacity. Further, to the extent that there is unused capacity in the Project, SMWD shall have the right to make use of its SMWD Option Capacity on an as-needed annual basis without any long term commitment upon giving notice to FVMWC and paying all applicable charges for such water.

5.4. Carry-Over Account. SMWD may instruct FVMWC to carry over any portion of the SMWD Base Allotment or the SMWD Option Capacity which is not taken by SMWD for delivery in a given Year as a credit to SMWD's Carry-Over Account with an equal amount of water; provided, that SMWD's Carry-Over Account shall be limited to a balance of fifteen thousand (15,000) AF. In no event shall SMWD be required to take a credit for Project Water that is not delivered by FVMWC as a result of any reduction or curtailment in the Total Annual Project Allotment, it being understood that SMWD has no obligation to purchase such Project Water. If SMWD elects to carry over water that is purchased by SMWD rather than take delivery of such water, then SMWD shall pay an annual management fee for the amount of water which it has in storage at the rate of twenty dollars ($20.00) per AF per Year ("Annual Storage Management Fee") for each acre-foot of water actually held in SMWD's Carry-Over Account, which fee shall be subject to annual escalation on July 1 of each Year in accordance with any increase in the Consumer Price Index - All Items for Los Angeles, Orange and Riverside Counties (or such similar index approved by the parties in the event that this CPI index is no longer available at any time during the Initial Term). If SMWD possesses water in its Carry-Over Account, FVMWC will deliver water to SMWD from its Carry-Over Account pursuant to the delivery process set forth in Section 5.1. This water shall be delivered as the third priority for water delivered by the Project, which priority may be shared with other FVMWC Members.

5.5. Water Storage Account. SMWD shall be entitled to fifteen thousand (15,000) AF of water in storage in the Fenner Valley Aquifer System as of the Effective Date, at no cost to SMWD, to be accounted for by FVMWC in a Water Storage Account. SMWD shall have the right to take delivery of such stored water at any time, subject to capacity in the Project Facilities. The exercise of this storage right shall be at SMWD's sole discretion, subject to availability, and in no event shall SMWD be required to purchase and store water as a result of the inability of the Project to deliver such water to SMWD. Furthermore, subject to further environmental review as deemed necessary or required by the parties, SMWD, in its sole discretion, may elect to use such storage right for the storage of imported water. If SMWD possesses water in its Water Storage Account, FVMWC will deliver water to SMWD from its

Water Storage Account pursuant to the delivery process set forth in Section 5.1. This water shall be delivered as the third priority for water delivered by the Project, which priority may be shared with other FVMWC Members. SMWD shall not pay any delivery or Annual Storage Management Fee in connection with the original 15,000 AF of water held in storage; provided, however, that such fees shall be payable to the extent that SMWD makes use of such storage capacity following delivery of the original 15,000 AF for the storage of other water.

5.6. Points of Delivery; Flow Rate. FVMWC will deliver to the CRA for the account of SMWD the amount of water specified in each request at a maximum flow rate as may be conditioned by MWD and otherwise agreed by FVMWC and SMWD.

5.7. Right of First Refusal. SMWD shall have a right of first refusal to participate in any future water storage project developed in connection with the Property on terms mutually agreed to by SMWD and Cadiz in good faith.

5.8. Water Accounting. FVMWC shall maintain, and update on at least a monthly basis, a detailed accounting of the water delivery rights of SMWD and other FVMWC Members, including the Carry-Over Account and Water Storage Account of SMWD and similar accounts that may be possessed by such other FVMWC Members.

6. Curtailment of Deliveries.

6.1. FVMWC May Curtail Deliveries. FVMWC may temporarily discontinue or reduce the delivery of water to SMWD hereunder for the purposes of necessary investigation, inspection, maintenance, repair or replacement of any of the Project Facilities necessary for the delivery of water to SMWD and other FVMWC Members. FVMWC shall notify SMWD as far in advance as possible of any such discontinuance or reduction, except in cases of emergency, in which case notice shall be given as soon thereafter as possible.

6.2. SMWD May Receive Later Delivery of Water Not Delivered. In the event of any discontinuance or reduction of delivery of water pursuant to Section 6.1, SMWD may elect to receive the amount of water which otherwise would have been delivered to it during such period under the water delivery schedule for that Year, to the extent that such water is then available and with respect to the SMWD Option Capacity, such election is consistent with FVMWC's overall delivery ability, considering the then-current delivery schedules of all FVMWC Members. The schedule for the delivery of SMWD Base Allotment shall always have priority. If SMWD elects not to receive such water, FVMWC shall add such water to the SMWD Carry-Over Account for use in subsequent Years.

6.3. Reduction or Curtailment Due to Corrective Measures. In the event that a determination is made by FVWA and FVMWC that a reduction or curtailment of the Total Annual Project Allotment will be necessary for the current or upcoming Year due to the imposition of corrective measures under the GMMMP, FVMWC shall reduce the allotment of each Project Participant on a *pari passu* basis by the percentage reduction in available Project Water for the then current or upcoming Year. FVMWC shall use its best efforts to make any such determination prior to the commencement of each Year so as to avoid an unscheduled interruption or reduction of water deliveries. Upon declaring a reduction or curtailment of the

Total Annual Project Allotment pursuant to this Section 6.3, FVMWC shall notify Cadiz of the total number of AF subject to such reduction or curtailment and the corresponding amount of Fixed O&M Costs that will be payable by Cadiz as a Retained Cost, as well as the Capital Recovery Charges that will not be payable to Cadiz during such Year.

7. Measurement of Water Delivered.

FVMWC shall measure, or cause to be measured, all water delivered to SMWD and shall keep and maintain accurate and complete records thereof. For this purpose and in accordance with Section 4 hereof, FVMWC shall install, operate, and maintain, or cause to be installed, operated and maintained, at all delivery structures for delivery of water to SMWD at the point of delivery determined in accordance with Section 5.6 such measuring devices and equipment as are satisfactory and acceptable to the parties. Said devices and equipment shall be examined, tested, and serviced by FVMWC regularly to insure their accuracy. At any time or times, SMWD may inspect such measuring devices and equipment, and the measurements and records taken therefrom.

8. Responsibility for Delivery and Distribution of Water.

8.1. Responsibility Prior to Delivery.

8.1.1. Cadiz shall indemnify and hold harmless FVMWC and the Project Participants and their respective officers, agents and employees from any damages or claims of damages, including property damage, personal injury or death, arising out of or connected with the existence of any contaminant or hazardous material that is present in the Project Water taken by FVMWC pursuant to the Water Lease in excess of the levels allowed for water to be conveyed in the CRA, as long as FVMWC has conducted monitoring of water quality sufficient to determine the presence of such contaminant or hazardous material and provided Cadiz with notice and an opportunity to cure.

8.1.2. FVMWC shall indemnify and hold harmless the Project Participants and their respective officers, agents and employees from any damages or claims of damages, including property damage, personal injury or death, arising out of or connected with the improper carriage, handling, use, disposal or distribution of Project Water following production and prior to such water passing from the well head to the designated points of delivery and including attorney fees and other costs of defense in connection therewith. Notwithstanding the foregoing, nothing contained herein shall relieve Cadiz of its obligations under Section 8.1.1 if FVMWC can demonstrate that any contaminant in the Project Water that is delivered by FVMWC was present in the Project Water pumped from the Property.

8.2. Responsibility After Delivery. Neither Cadiz nor FVMWC nor any affiliate nor any of their respective directors, officers, agents or employees shall be liable for the control, carriage, handling, use, disposal, or distribution of water delivered by FVMWC to SMWD after

such water has passed the points of delivery established by the rules and regulations of FVMWC; nor for claim of damage of any nature whatsoever, including property damage, personal injury or death, arising out of or connected with the control, carriage, handling, use, disposal or distribution of such water beyond said points of delivery and including attorney fees and other costs of defense in connection therewith. Notwithstanding the foregoing, nothing contained herein shall relieve Cadiz or FVMWC of their respective obligations under Sections 8.1.1 and 8.1.2 if SMWD can demonstrate that any contaminant in the Project Water that is delivered by FVMWC was present in the Project Water prior to delivery to the point of delivery specified in Section 5.6. SMWD shall indemnify and hold harmless FVMWC, Cadiz and their respective directors, officers, agents and employees from any such damages or claims of damages to the extent that the claim arises following delivery of Project Water to the SMWD Water System.

8.3. Responsibility for Corrective Measures. Each water purchase agreement entered into between Cadiz and a Project Participant shall contain a waiver and limitation of liability for any damages arising as a result of a determination that the Total Annual Project Allotment must be reduced or curtailed in connection with implementation of the corrective measures in the GMMMP. In no event shall FVMWC, FVWA or SMWD have any liability to any Project Participant for the loss of Project Water arising as a result of any such corrective measures or any action taken by FVMWC, FVWA or SMWD in connection with the enforcement of the GMMMP and Cadiz shall indemnify, defend and hold harmless, FVMWC, FVWA and SMWD from any claim by a Project Participant or other third party that it has been damaged as a result of enforcement of any corrective measure or a challenge to the determination by FVMWC, FVWA or SMWD that such enforcement is not required under the GMMMP.

9. Purchase Price.

9.1. Price Goal. It is the goal of the parties for the Project to produce water at a cost to SMWD between $639 and $1,089 per AF (in 2012 dollars), including the SMWD Base Payment, the Capital Recovery Charge, Fixed O&M Costs, Variable O&M Costs, Administrative Costs and MWD Fees, but excluding any treatment that may be required. A table showing the various components of the purchase price for Project Water is attached hereto as Exhibit C and incorporated herein by this reference.

9.2. Payments to Cadiz. The following charges shall be paid by SMWD to FVMWC, which FVMWC will then aggregate with similar charges paid by other Project Participants and pay to Cadiz:

9.2.1. Water Supply Payment. SMWD shall pay Cadiz the lesser of $150 per AF or the MWD Tier 1 Supply Rate for each AF of SMWD Base Allotment delivered to SMWD ("SMWD Base Payment"). In addition to the SMWD Base Payment, Cadiz shall be entitled to any revenue generated from Intentionally Created Surplus ("ICS") as a result of water delivered to SMWD, up to a maximum water supply payment (including the SMWD Base Payment) of $500 per AF for the SMWD Base Allotment delivered to SMWD. Any ICS earned by Cadiz on the SMWD Base Allotment that causes the total water supply payment to exceed $500 per AF shall be rebated to SMWD. On the first anniversary of the Commencement Date and each year

thereafter, the SMWD Base Payment shall be adjusted annually (upward or downward) by an amount equal to the percentage increase or decrease in the MWD Tier 1 Supply Rate or if such rate is no longer available, such similar rate that provides a benchmark for changes in water supply costs within the MWD service area which is reasonably acceptable to SMWD and Cadiz. The annual adjustment (increase or decrease) will in no event exceed four percent (4%) of the then current SMWD Base Payment instead of the 5% previously agreed to provide further consideration to SMWD for the services provided under this Agreement. This provision regarding the calculation of the water supply payment shall apply only to the SMWD Base Allotment, and it shall have no application to the terms applicable to the sale by Cadiz of the remaining 45,000 AF of Total Annual Project Allotment to SMWD or any other Project Participant.

9.2.2. Capital Recovery Charge. Cadiz shall receive the Capital Recovery Charge under the Facility Lease for each AF of water delivered to SMWD. The Capital Recovery Charge shall be calculated by amortizing the total Capital Investment of Cadiz over a term of thirty (30) years at a maximum interest rate of six and one-half percent (6.5%) and then dividing the annual repayment amount by the Total Annual Project Allotment of 50,000 AFY. It is understood and agreed that Cadiz is solely at risk for less than the entire Total Annual Project Allotment being delivered, and that the Capital Recovery Charge shall not be subject to adjustment or increase on a per AF basis during any given Year as a result of any shortfall. Notwithstanding the foregoing, to the extent of any shortfall, the annual amortization amount as calculated above shall continue to be payable following the 30-year repayment period and for the remainder of the Facility Lease, until the Capital Investment has been paid to Cadiz in full. In the event that SMWD provides for alternative financing of the Project that repays Cadiz its Capital Investment in full, then the Capital Recovery Charge shall cease to exist, and SMWD, FVMWC and the other Project Participants will agree among themselves regarding the manner of repaying the SMWD alternative financing. Cadiz shall have the right to negotiate its recovery of Capital Investment from other Project Participants on terms agreeable to Cadiz and such other Project Participant; provided, however, that such other capital recovery terms do not create a Material Increase in Financial Risk to SMWD.

9.3. Payments to FVMWC. The following charges shall be paid by SMWD to FVMWC, which FVMWC will then use to pay its own expenses:

9.3.1. Fixed O&M Costs. SMWD and each other Project Participant shall pay to FVMWC a charge per AF to cover Fixed O&M Costs. To the extent that Cadiz is unable to deliver all or a portion of the Total Annual Project Allotment, including reduction pursuant to Section 6.3, then Cadiz (and not SMWD and the other Project Participants) shall be responsible for paying to FVMWC the fixed cost charges associated with the total amount of AF that was not delivered. Cadiz shall further be responsible for SMWD's

portion of the Fixed O&M Cost which is related to capital repair and replacement during the first ten (10) years of the Facility Lease. During the remainder of the term of the Facility Lease, SMWD shall share in the cost of capital repair and replacement with the other Project Participants as a component of Fixed O&M Costs.

9.3.2. Variable O&M Costs. SMWD and each other Project Participant shall pay to FVMWC a charge per AF to cover Variable O&M Costs. Such costs shall be estimated on an annual basis pursuant to a budget to be prepared by FVMWC under SMWD supervision and shall be charged on a per AF basis, subject to reconciliation to actual costs at the end of each Year.

9.3.3. Administrative Costs. SMWD and each other Project Participant shall pay to FVMWC a charge per AF to cover Administrative Costs. Such costs shall be estimated on an annual basis pursuant to a budget to be prepared by FVMWC under SMWD supervision and shall be charged on a per AF basis, subject to reconciliation to actual costs at the end of each Year.

9.3.4. MWD Fees. SMWD and each other Project Participant (as applicable) shall pay a per AF charge in connection with MWD and MWDOC rates, fees and charges incurred by FVMWC ("MWD Fees"), whatever they may be, provided that water is available from the Project. Any MWD or MWDOC charges incurred when water is unavailable from the Project will be the responsibility of Cadiz. The parties acknowledge that Cadiz, in its discretion, may make available benefits to MWD and MWDOC that result in a reduction of the MWD and MWDOC rates, fees and charges or other off-setting benefits. The parties will negotiate in good faith as to how such benefits and/or reductions (if any) should be fairly distributed between Cadiz, SMWD and the other Project Participants. The parties' failure to reach agreement on the distribution of such benefits and/or reductions prior to the Commencement Date shall result in an early termination of this Agreement.

9.4. Payment Schedule. In preparing the rules and regulations of FVMWC as provided in Sections 4.3 and 5.1, Cadiz, FVMWC and SMWD agree to coordinate the payment schedule for water in a manner that is consistent with the cash flows necessary for the timely payment of Debt Service by Cadiz.

10. Obligation in the Event of Default.

10.1. Event of Default. A party shall be in default under this Agreement in the event that such party: (a) fails to make any payment in full when due; or (b) fails to perform any other obligation hereunder, and such failure: (i) continues for a period of thirty (30) days following written notice of the default from the non-defaulting party if the default occurs prior to the Commencement Date; or (ii) ninety (90) days following written notice from the defaulting party if the default occurs following the Commencement Date; provided, however, that if Cadiz is the

defaulting party, SMWD shall provide the lender under any Third Party Financing with an additional cure period equal to the original cure period in which to cure the default. If a default cannot be remedied within the applicable cure period, but the defaulting party commences remedial action within such period, such failure shall not constitute a default hereunder. Notice of any default shall be provided to the other parties and all of the Project Participants.

10.2. Suspension of Water Delivery; Termination. FVMWC shall have the right to suspend water delivery to SMWD during any period in which SMWD is in default of its payment obligations under this Agreement and to sell the Project Water that would otherwise have been deliverable to SMWD during such period of suspension to another Project Participant. If a suspension continues for a period of one (1) Year or more, then FVMWC may give notice of termination of the provisions of this Agreement insofar as the same entitle SMWD to the SMWD Base Allotment and the SMWD Option Capacity, which notice shall be effective within thirty (30) days thereof unless such termination shall be enjoined, stayed or otherwise delayed by judicial action. Any such termination shall result in the forfeiture of SMWD's membership shares in FVMWC. Notwithstanding the foregoing, to the extent that SMWD has already purchased water that is reflected in its Carry-Over Account or its Water Storage Account, then in no event shall SMWD forfeit any such purchased water as a result of the termination of this Agreement; provided, however, that SMWD shall be responsible to pay any Annual Storage Management Fees or delivery charges in connection with the delivery of such stored water.

10.3. Enforcement of Remedies. In addition to the remedies set forth in this Section, upon the occurrence of an event of default as defined herein, Cadiz, FVMWC or SMWD, as the case may be, shall be entitled to proceed to protect and enforce the rights vested in such party by this Agreement by such appropriate judicial proceeding as such party shall deem most effectual, either by suit in equity or by action at law, whether for the specific performance of any covenant or agreement contained herein or to enforce any other legal or equitable right vested in such party by this Agreement or by law. The provisions of this Agreement and the duties of each party hereof, their respective boards, officers or employees shall be enforceable by the other parties hereto by mandamus or other appropriate suit, action or proceeding in any court of competent jurisdiction, with the losing party or parties paying all costs and attorney fees.

11. Transfers, Sales and Assignments of Project Allotment.

SMWD has the right to make transfers, sales, leases, assignments and exchanges (collectively "transfers") of the SMWD Base Allotment, the SMWD Option Capacity or its storage rights in the Project; provided, however, that it shall properly register any such transfer or lease in accordance with the policies and procedures established by FVMWC. Notwithstanding the foregoing, SMWD shall have the right to transfer either or both of the SMWD Base Allotment and the SMWD Option Capacity or its storage rights in the Project on an annual or long-term basis without the payment of any additional fee or charge to FVMWC.

12. Additional Covenants of Cadiz and FVMWC.

12.1. Insurance. FVMWC shall procure and maintain or cause to be procured and maintained insurance on the Project Facilities with responsible insurers so long as such insurance is available from reputable insurance companies, or, alternatively, shall establish a program of

self-insurance, covering such risks, in such amounts and with such deductibles as shall be required pursuant to the Facility Lease.

12.2. Construction Indemnity. Cadiz shall indemnify, defend and hold harmless FVMWC, FVWA and SMWD from any liability for personal injury or property damage resulting from any accident or occurrence arising out of or in any way related to the construction of the Project Facilities.

12.3. Compliance with Law. Cadiz will comply with all local, state and federal laws applicable to the construction of the Project, and FVMWC shall comply with all local, state and federal laws applicable to the operation of the Project.

12.4. Against Sale or Other Disposition of Project. The Water Lease and the Facility Lease shall provide that neither FVMWC, nor FVWA will assign their respective rights or obligations under the Water Lease or the Facility Lease or any part thereof without the prior written consent of Cadiz.

13. Additional Covenants of SMWD.

13.1. Engineering Oversight. Subject to the payment obligations of Cadiz, as the designated entity for FVWA, SMWD will exercise good faith and best efforts in overseeing the permitting, design and construction of the Project and Project Facilities. All plans for the Project and Project Facilities will be consistent with SMWD standards. Cadiz will timely submit all engineering plans to SMWD for approval.

13.2. Transportation Agreements. Consistent with Section 9.3.4, SMWD will cooperate with Cadiz to secure authorization from MWD and MWDOC for the delivery and conveyance of Project Water by the CRA to SMWD and other Project Participants.

13.3. Monitoring and Mitigation. SMWD will carry out its responsibilities for monitoring and mitigation as provided in the Project EIR and its responsibilities pursuant to the GMMMP.

14. Early Termination; Term.

14.1. The Agreement shall be subject to early termination by written notice by any of the parties upon the occurrence of any of the following conditions subsequent:

14.1.1. Failure of Cadiz and FVMWC to execute agreements for the purchase of at least thirty thousand (30,000) AFY of delivery entitlements from the Project within forty-eight (48) months following the Effective Date;

14.1.2. Failure to obtain an agreement on terms acceptable to the parties for the conveyance of water from the Project to SMWD via the CRA and associated conveyance facilities owned by MWD and MWDOC within twenty-four (24) months following the Effective Date unless extended by mutual agreement of the parties;

14.1.3. Failure to secure all required permits and licenses for the construction and operation of the Project, including all regulatory permits for production of raw water, within forty-eight (48) months following the Effective Date unless extended by mutual agreement of the parties;

14.1.4. Failure to obtain financing in an amount sufficient and on terms acceptable to the parties to result in the construction of the Project Facilities and the production and delivery of water from the Project to SMWD and the other Project Participants within twenty-four (24) months following the Effective Date; or

14.1.5. Failure of the parties to reach an agreement on the distribution of benefits or reductions accruing from a reduction of the MWD Fees prior to the Commencement Date.

14.2. The time periods set forth in Section 14.1 shall be tolled by any litigation that challenges the authorization of the Project or the parties' respective legal authorities to proceed with the Project, including actions brought pursuant to CEQA.

14.3. Upon termination pursuant to this Section 14, no party shall have any further rights or obligations hereunder with respect to any other party; provided, however, that Cadiz shall remain solely responsible for all Retained Costs and all obligations under the County MOU and the Reimbursement Agreements.

14.4. The term of this Agreement shall be from the Effective Date through fifty (50) years from the Commencement Date (the "Initial Term"); provided, however, that subject to compliance with all then-applicable laws, including County permitting as defined in the County MOU and CEQA, SMWD may elect, in its discretion, to extend the Initial Term for an additional 40-year term and for whatever additional future extensions may be authorized under then applicable laws, on terms and conditions as are mutually agreeable to the parties.

15. Assignment.

Except as otherwise expressly set forth herein, no party may assign their rights, responsibilities and obligations hereunder without the consent of all other parties, which shall not be unreasonably withheld or delayed. This Agreement shall be binding on and shall inure to the benefit of the parties and their respective, permitted successors and assigns.

16. Amendments.

Except as otherwise provided in this Agreement, this Agreement may only be amended, modified, changed or rescinded in a writing signed by each of the parties hereto.

17. Miscellaneous.

17.1. Interpretation. The provisions of this Agreement should be liberally interpreted to effectuate its purposes. The language of this Agreement shall be construed simply according to its plain meaning and shall not be construed for or against any party, as each party has

participated in the drafting of this Agreement and had the opportunity to have its counsel review it. Whenever the context and construction so requires, all words used in the singular shall be deemed to be used in the plural, all masculine shall include the feminine and neuter, and vice versa. The word "including" means without limitation, and the word "or" is not exclusive. Unless the context otherwise requires, references herein: (i) to Sections and Exhibits mean the Sections of and the Exhibits attached to this Agreement; and (ii) to an agreement, instrument or other document means such agreement, instrument or other document as amended, supplemented and modified from time to time to the extent permitted by the provisions thereof and by this Agreement.

17.2. Headings. The headings of the sections hereof are inserted for convenience only and shall not be deemed a part of this Agreement.

17.3. Partial Invalidity. If any one or more of the covenants or agreements provided in this Agreement to be performed should be determined to be invalid or contrary to law, such covenant or agreement shall be deemed and construed to be severable from the remaining covenants and agreements herein contained and shall in no way affect the validity of the remaining provisions of this Agreement.

17.4. Counterparts. This Agreement may be executed in several counterparts, all or any of which shall be regarded for all purposes as one original and shall constitute and be but one and the same instrument.

17.5. Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the State of California.

17.6. Notices. Any notices required or permitted to be given hereunder shall be given in writing and shall be delivered: (a) in person; or (b) by Federal Express or another reputable commercial overnight courier that guarantees next day delivery and provides a receipt; and such notices shall be addressed as follows:

If to SMWD: Santa Margarita Water District
26111 Antonio Parkway
Rancho Santa Margarita, CA 92688
Attn: General Manager

If to Cadiz: Cadiz, Inc.
550 South Hope Street, Suite 2850
Los Angeles, CA 90017
Attn: President

If to FVMWC: Fenner Valley Mutual Water Company
550 South Hope Street, Suite 2850
Los Angeles, CA 90017
Attn: President

or to such other address a party may from time to time specify in writing to the other parties. Any notice shall be deemed delivered when actually delivered.

17.7. Merger of Prior Agreements. Except for Reimbursement Agreements (as modified by the provisions hereof), this Agreement and the exhibits hereto constitute the entire agreement between the parties and supersede all prior agreements and understandings between the parties relating to the subject matter hereof (including the Option Agreement). This Agreement is intended to implement, and should be interpreted consistently with, the County MOU and the GMMMP.

17.8. Attorney Fees. If any legal action or any arbitration or other proceeding is brought for the enforcement of this Agreement, or because of an alleged dispute, breach, default or misrepresentation in connection with any of the provisions of this Agreement, the successful or prevailing party shall be entitled to recover reasonable attorney fees and other costs incurred in that action or proceeding, in addition to any other relief to which it or they may be entitled.

17.9. Dispute Resolution. The parties shall seek to resolve any dispute concerning the interpretation or implementation of this Agreement through good faith negotiation, involving, as and when appropriate, the general manager or chief executive officer of each of the parties. Any dispute that remains unresolved thirty (30) days after notice of the dispute is made to the parties, shall be resolved by a single arbitrator with substantial experience on the matter or matters in dispute, conducted in accordance with JAMS. If the parties cannot agree on a single arbitrator within ten (10) days of the written election to submit the matter to arbitration, any party may request JAMS to appoint a single, neutral arbitrator. The parties shall use their reasonable best efforts to have the arbitration proceeding concluded within ninety (90) business days of selection of the arbitrator. In rendering the award, the arbitrator shall determine the rights and obligations of the parties according to the substantive and procedural laws of California. All discovery shall be governed by the California Code of Civil Procedure with all applicable time periods for notice and scheduling provided therein being reduced by one-half. The arbitrator may establish other discovery limitations or rules. The arbitrator shall have the authority to grant provisional remedies and all other remedies at law or in equity, but shall not have the power to award punitive or consequential damages. The decision of the arbitrator shall be final, conclusive and binding upon the parties, and any party shall be entitled to the entry of judgment in a court of competent jurisdiction based upon such decision. The losing party shall pay all costs and expenses of the arbitration; provided, however, if no party is clearly the losing party, then the arbitrator shall allocate the arbitration costs between the parties in an equitable manner, as the arbitrator may determine in his or her sole discretion.

17.10. Recordation. Cadiz will cause the recordation of this Agreement in the chain of title for the Property.

[signature page follows]

IN WITNESS WHEREOF, SMWD has executed this Agreement with the approval of its governing body, and caused its official seal to be affixed, and each of the Cadiz parties has executed this Agreement in accordance with the authorization of its respective Board of Directors.

SANTA MARGARITA WATER DISTRICT

By: _____
President

Attest:

By: _____
Secretary

CADIZ, INC.

By: _____
President

Attest:

By: _____
Secretary

FENNER VALLEY MUTUAL WATER COMPANY

By: _____
President

Attest:

By: _____
Secretary

IN WITNESS WHEREOF, SMWD has executed this Agreement with the approval of its governing body, and caused its official seal to be affixed, and each of the Cadiz parties has executed this Agreement in accordance with the authorization of its respective Board of Directors.

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By: _____
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By: _____
Secretary

CADIZ, INC.

By: _____
President

Attest:

By: _____
Secretary

FENNER VALLEY MUTUAL WATER COMPANY

By: _____
President

Attest:

By: _____
Secretary

EXHIBIT A

Schedule of Project Allotments

Project Participant	Project Allotment (acre-feet per year)
Santa Margarita Water District	15,000
Three Valleys Municipal Water District	5,000
Golden State Water Company	5,000
Suburban Water Systems	5,000
Jurupa Community Services District	5,000
Arizona California Railroad	100
California Water Service Company	5,000
Total Project Allotment Subscribed	40,100
Project Allotment Available	9,900
Total Annual Project Allotment	50,000

EXHIBIT "B"
PROJECT STRUCTURE

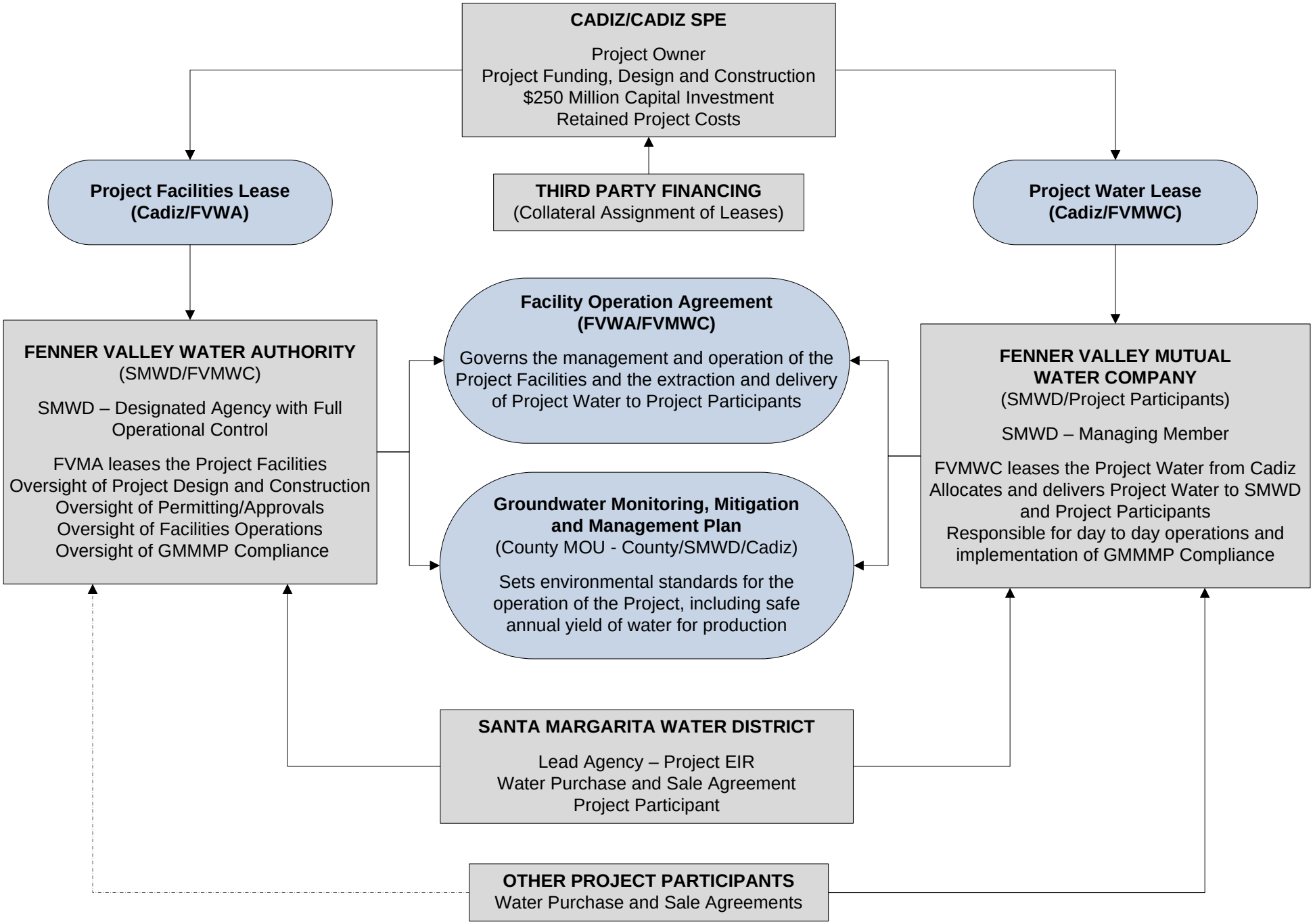

EXHIBIT C
EXAMPLES OF PRICE COMPONENTS FOR SMWD BASE ALLOCATION

Note: The following examples only present the price components for SMWD Base Allocation and do not reflect other value provided to SMWD in the Water Purchase and Sale Agreement. For example, the figures below do not include the right to 15,000 AF of water in storage that will be provided to SMWD free of charge, with a fair maket value exceeding $12 million. Thus, the cost of water shown below does not reflect the overall cost or value of the transaction to SMWD.

Example No. 1

	Annual Cost	Total AF Project Water	SMWD Cost per AF	Cadiz Revenue Per AF
Cadiz Components				
Water Supply Payment			$150	$150
- Escalation - 4%				
Intentionally Created Surplus Credits			-$50	$350
Capital Recovery Charge	$11,000,000	50,000	$220	$0
- Total Capital Investment - $212 Million				
- Amortized over 30 Years				
- Interest Rate - 6%				
Total Cadiz Components			**$320**	**$500**
Operating Costs				
Project Operation and Maintenance Expenses	$3,750,000	50,000	$75	
- Fixed O&M Costs				
- Variable O&M Costs				
Administrative Costs	$900,000	50,000	$18	
Total Operating Cost Components			**$93**	
MWD Fees				
CRA/MWD/MWDOC Transportation Fees			$366	
Local Resource Program Credits			-$250	
Total MWD Fees			**$116**	
Treatment Costs Per AF (MWD)			**$298**	
SMWD Cost of Water (Untreated)			**$529**	
SMWD Cost of Water (Treated)			**$827**	

EXHIBIT C
EXAMPLES OF PRICE COMPONENTS FOR SMWD BASE ALLOCATION

Example No. 2

	Annual Cost	Total AF Project Water	SMWD Cost per AF	Cadiz Revenue Per AF
Cadiz Components				
Water Supply Payment			$150	$150
- Escalation - 4%				
Intentionally Created Surplus Credits			$0	$0
Capital Recovery Charge	$11,000,000	50,000	$220	$0
- Total Capital Investment - $212 Million				
- Amortized over 30 Years				
- Interest Rate - 6%				
Total Cadiz Components			**$370**	**$150**
Operating Costs				
Project Operation and Maintenance Expenses	$3,750,000	50,000	$75	
- Fixed O&M Costs				
- Variable O&M Costs				
Administrative Costs	$900,000	50,000	$18	
Total Operating Cost Components			**$93**	
MWD Fees				
CRA/MWD/MWDOC Transportation Fees			$366	
Local Resource Program Credits			$0	
Total MWD Fees			**$366**	
Treatment Costs Per AF (MWD)			**$298**	
SMWD Cost of Water (Untreated)			**$829**	
SMWD Cost of Water (Treated)			**$1,127**	

Appendix F

Cucamonga Valley Water District and Santa Margarita Water District, Water Supply Contract

04/915/00

WATER SUPPLY CONTRACT

Cucamonga Valley Water District / Santa Margarita Water District

THIS WATER SUPPLY CONTRACT ("**Contract**") is entered into as of March 22, 2006 (the "**Effective Date**"), by and between CUCAMONGA VALLEY WATER DISTRICT, an independent public corporation organized and operating under the provisions of California Water code Section 30000 et seq. ("**CVWD**"), and SANTA MARGARITA WATER DISTRICT, a special district organized and operating under the provisions of California Water Code Section 34000 et seq. ("**SMWD**").

RECITALS

A. CVWD owns, operates and maintains a series of water supply, treatment and distribution resources in San Bernardino County, California.

B. CVWD possesses and holds adjudicated water rights ("**Groundwater**") from the Chino Groundwater Basin (the "**Chino Basin**"), which is governed by a management oversight body ("**Watermaster**") under and pursuant to the Chino Basin Judgment (*Chino Basin Municipal Water District v. City of Chino, et al.*, San Bernardino Superior Court No. 164327) and promulgating agreements, procedures, programs, and rules and regulations adopted by Watermaster and approved by the Court pursuant to the Judgment. CVWD's adjudicated water rights in the Chino Basin ensure a sufficient quantity of safe yield allocation to meet the requirements of this Contract.

C. The parties to the Chino Basin Judgment entered into a Peace Agreement on June 29, 2000 for the purpose of adopting the goals and plans of the Optimum Basin Management Plant ("**OBMP**"), which had been developed by Watermaster for the ongoing administration and management of the Chino Basin; and Watermaster subsequently approved and adopted the Peace Agreement and OBMP.

D. In addition to its Groundwater, CVWD obtains imported contract water ("**Imported Water**") supplied by the Metropolitan Water District of Southern California ("**Metropolitan**"), a regional water wholesaler, through the Inland Empire Utilities Agency ("**IEUA**"), one of Metropolitan's member agencies.

E. CVWD owns, operates, maintains and/or has access to adequate capital facilities to produce, treat and deliver the water supplies necessary to fulfill all of the current demands within its service area. Furthermore, the water resources held, controlled and managed by CVWD are sufficient to generate an excess supply that is available for export, exchange, sale or use outside of CVWD's service area.

F. SMWD provides domestic water services for the benefit of approximately 62,674 acres located in southeastern Orange County, California.

G. SMWD is currently evaluating the projected water demands for a planned community project (the "**Ranch Plan**" proposed by Rancho Mission Viejo, LLC ("**RVM**") within SMWD's service area. The Ranch Plan project would result in the development, over approximately 30 years, of up to 14,000 dwelling units, 130 acres of urban activity center uses, 258 acres of business park uses, 39 acres of neighborhood retail uses, up to four golf courses, a proposed 1,079-acre regional park, and open space areas totaling approximately 13,161 acres.

H. In order to ensure the provision of an adequate water supply for the Ranch Plan, and to mitigate against any future challenges concerning the ability of SMWD to provide a sufficient water supply to meet the needs for the Ranch Plan and other users, SMWD is desirous of securing additional water rights to supplement those water resources that otherwise are (or may hereafter become) available to SMWD.

I. In furtherance of its water supply planning for the Ranch Plan, SMWD is desirous of acquiring certain rights to water from CVWD that will supplement and/or augment SMWD's Tier I and Tier II water deliveries from Metropolitan (as determined from time to time). Specifically, and for the exclusive benefit of the Ranch Plan, SMWD desires the right to purchase up to 4,250 acre-feet per year of firm water supply from CVWD for a period of not less than twenty-five (25) years.

J. Subject to the terms and conditions hereof, CVWD is willing and able to reserve for SMWD's account (with a first priority option to purchase) the water supplies desired by SMWD for the benefit of the Ranch Plan.

NOW, THEREFORE, in consideration of the foregoing recitals and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. Purpose of Contract; Limitations. As set forth in Recitals H and I, above, SMWD is desirous of augmenting those water resources available (presently and prospectively) to serve the Ranch Plan. Although SMWD currently anticipates that its local and imported water resources/rights will be sufficient to accommodate full development of the Ranch Plan, SMWD wishes to expand its array of available water supplies to (i) further ensure that approval and development of the Ranch Plan will not jeopardize or otherwise compromise SMWD's ability to serve all domestic water users within SMWD's service area and (ii) eliminate or otherwise mitigate any further challenges (whether judicial or otherwise) concerning the ability of SMWD to provide a sufficient water supply to meet the needs of the Ranch Plan and other users. SMWD desires to reserve a finite amount of water (see Section 3, below) and to call upon said water (see Section 4, below) if and when SMWD's local water rights and Tier I and Tier II supplies from Metropolitan appear, in any given year, to be insufficient to

accommodate both the Ranch Plan and SMWD's other customers. During any such period of insufficiency, SMWD shall exercise its rights hereunder and call upon CVWD to deliver that amount of water (up to 4,250 acre-feet per annum) necessary to eliminate any shortfall in SMWD's aggregate water supplies that are available to serve the Ranch Plan.

2. Term of the Contract.

a. Initial Term. The initial term of this contract ("**Initial Term**") shall commence upon the Effective Date and shall (unless otherwise earlier terminated in accordance with the provisions of Section 2.c., below) end on the twenty-fifth (25th) anniversary of the Effective Date.

b. Extension of the Contract. At the end of the Initial Term, unless earlier terminated in accordance with the provisions of Section 2.c., below, SMWD shall have the right to extend the term of this Contract for an additional period of twenty-five (25) years (the "**Extension Period**") SUBJECT TO the following terms and conditions: SMWD shall provide written notice to CVWD of its intent to extend the term of the Contract not less than ninety (90) days prior to the expiration of the Initial Term. Following CVWD's receipt of the notice of intent to extend, and prior to the expiration of the Initial Term, the parties shall meet in good faith to negotiate and agree upon the additional/modified terms and conditions (if any) that will govern the parties' relationship hereunder during the Extension Period. In the event that the parties are unable to negotiate and agree upon the additional/modified terms and conditions that will govern the parties during the Extension Period, this Contract shall automatically terminate on the expiration of the Initial Term.

c. Termination of the Contract. Notwithstanding any provision herein to the contrary, the term of this Contract shall expire upon the earlier to occur of the following events:

(1) Upon SMWD's delivery to CVWD of (a) written notice advising that SMWD is terminating the Contract effective as of the date specified in the notice and (b) a document executed by RMV signifying RMV's consent to the proposed termination;

(2) Upon mutual agreement of the parties (SUBJECT TO the prior written consent of RMV); or

(3) Upon breach of this Contract by either party, and the decision of the non-breaching party to terminate this Contract following expiration of any applicable cure period(s).

(i) In the event of a breach by SMWD, CVWD shall notify RMV concerning the alleged breach and shall provide RMV with an opportunity to cure said breach in accordance with the provisions of this Contract.

3. Reservation of Water. Commencing on the Effective Date, and during the Initial Term and any renewal or extension thereof, CVWD shall reserve for SMWD's account, with a first priority option to purchase pursuant to Section 4, below, a firm supply of four thousand two hundred fifty (4,250) acre-feet of Groundwater on an annual basis (the "**Reserved Water Supply**").

a. Substitution of Reserved Water Supply. During the Initial Term of this Contract (including any renewal or extension hereof), CVWD shall have the right to substitute or combine new or additional lawful sources of water to replace (for its own account) the Reserved Water Supply held and maintained for the benefit of SMWD; provided, however, that any such substitutions shall not (i) compromise, jeopardize, impair or adversely affect SMWD's rights and entitlements under this Contract or (ii) increase or enlarge SMWD's financial obligations or exposure with respect to achieving SMWD's purposes set forth in Section 1, above.

4. First Priority Option. CVWD hereby grants to SMWD a first priority option ("Water Option") to purchase all (or any portion of) the Reserved Water Supply set aside by CVWD during each year of the Contract.

a. Preservation of Priority Rights. CVWD covenants and agrees that during the Initial Term of this Contract (including any renewal or extension hereof), CVWD will not enter into any transaction(s), entertain any discussion(s), or execute any agreement(s) that will (or may) compromise, jeopardize or negatively affect SMWD's annual priority rights to the Reserved Water Supply. CVWD further agrees to execute, or otherwise arrange for the execution of, any and all documents requested by SMWD that demonstrate (i) SMWD's annual priority rights with respect to the Reserved Water Supply and (ii) the subordination of any and all third-party agreements, documents, negotiations and/or understandings to SMWD's priority rights vis-à-vis the Reserved Water Supply. CVWD shall immediately notify SMWD concerning the existence or occurrence of any agreements, documents, negotiations and/or discussions that may impact, compromise or otherwise affect SMWD's annual priority rights to the Reserved Water Supply. Furthermore, CVWD shall defend, at its sole cost and expense, the annual priority rights afforded to SMWD hereunder and shall take all steps necessary to ensure that the annual priority rights (and the underlying Reserved Water Supply) are preserved, protected and maintained for the benefit of SMWD.

b. Exercise of Water Option. During the Initial Term of this Contract (including any renewal or extension hereof), SMWD shall have the annual recurring right to exercise the Water Option by complying with the following procedures: On or before March 15 of each calendar year, SMWD shall deliver written notice to CVWD (the "**Call**") declaring SMWD's intention to exercise its priority option rights during the immediate calendar year. The Call shall specify the amount of the Reserved Water Supply that SMWD will purchase from CVWD pursuant to the provisions of Section 6, below. Furthermore, the Call shall identify a definitive delivery schedule for the water supplies thus requested. In no event, however, shall the

water delivery schedule identify a water delivery date (whether for all or part of the Reserved Water supply) that is less than thirty (30) days from the date of the Call.

c. Limitations on Call. Consistent with the provisions of Section 1, above, SMWD shall be entitled to submit a Call and receive the requested water from CVWD only if SMWD's available Tier I and Tier II water supplies/deliveries are insufficient to accommodate the water demands of the Ranch Plan.

5. Delivery of Requested Water; Exchange Program and Individual Party Responsibilities. Upon receipt of a Call from SMWD, CVWD shall deliver to SMWD the amount of Reserved Water Supply identified and requested in the Call.

a. Exchange Program. CVWD shall accomplish its water delivery obligations hereunder through the use of an exchange program (the "**Exchange**") whereby the amount of the Reserved Water Supply identified and requested in the Call shall be exchanged for Imported Water (the "**Exchange Water**"). The Exchange Water shall be made available to SMWD for collection and use at a point/location within Metropolitan's water delivery system (the "**Delivery Location**"). No actual Groundwater from within the Chino Basin shall be physically transferred to SMWD pursuant to this Contract; accordingly, the parties do not anticipate that any additional connections to or additional capacity within Metropolitan's system shall be required in order to accomplish CVWD's water delivery obligations hereunder.

b. CVWD's Responsibilities. CVWD shall make all arrangements and accomplish all tasks necessary for ensuring that a firm, reliable water supply is made available for SMWD at the Delivery Location upon the dates/times specified in the Call. Said obligations include, but are not limited to, coordinating and contracting with Metropolitan and IEUA concerning the Exchange Water, and ensuring that any necessary arrangements for backup exchange and/or source supplies or transportation capacity in Metropolitan's water delivery system are complete and readily available. Furthermore, CVWD shall be responsible for any and all costs, fees and expenses associated with the local production, treatment and delivery of any water utilized by CVWD for its own account to replace the Exchange Water delivered to SMWD (including, but not limited to, the design, construction, operation and maintenance of new capital facilities necessary for making the replacement water available).

(1) Losses. CVWD shall assume all losses (whether arising from storage, delivery or otherwise) with respect to any and all water to be supplied and/or exchanged hereunder, with no recourse to SMWD for such losses.

c. SMWD's Responsibilities. Consistent with the provisions of Section 6, below, SMWD shall pay all costs, fees and expenses charged or otherwise assessed by Metropolitan to accomplish any Exchange contemplated and completed hereunder. Furthermore, SMWD, at its sole cost and expense, shall be

responsible for arranging with Metropolitan and/or the Municipal Water District of Orange County for the delivery of any and all Exchange Water from the Delivery Location to SMWD's service area.

6. Payments; Expense Obligations.

a. Annual Reservation Fee. Commencing on the Effective Date, and continuing thereafter on each successive anniversary of the Effective Date hereof during the term of this Contract, SMWD shall be obligated to pay to CVWD an annual water reservation fee ("**Annual Reservation Fee**") for the water supply reserved hereunder for the benefit of SMWD. The Annual Reservation Fee shall be equal to Three Hundred Eighteen Thousand Seven Hundred Fifty and No/100 Dollars ($318,750.00), calculated as follows:

Annual Reserved Water Supply (i.e., 4,250 acre-feet) –TIMES-
Seventy-Five and No/100 dollars ($75.00) per acre-foot.

Each Annual Reservation Fee due to CVWD hereunder shall be payable by SMWD within thirty (30) days following SMWD's receipt of written invoice from CVWD requesting payment.

(1) Annual Fee Adjustment. Beginning on the first anniversary of the Effective Date, and continuing thereafter on each successive anniversary of this Contract during the term hereof, the Annual Reservation Fee shall be increased by a factor equal to three percent (3%).

b. Exchange Fees. SMWD shall reimburse CVWD for all reasonable fees, costs and expenses ("**Exchange Fees**") assessed or otherwise charged by Metropolitan and/or IEUA as a result of each Exchange contemplated and completed pursuant to the terms of this Contract. CVWD shall invoice SMWD on a monthly basis for any Exchange Fees related to Exchange Water delivered during the previous month. Each Exchange Fee invoice shall be payable by SMWD within thirty (30) days following SMWD's receipt of the relevant invoice.

c. Early Termination Fee. Upon SMWD's early termination of this Contract pursuant to Section 2.c.(1), above, SMWD shall pay to CVWD a termination fee ("**Early Termination Fee**") equal to three (3) years of the then-current Annual Reservation Fee. Notwithstanding the foregoing, in the event that SMWD elects to voluntarily terminate this contract at any time during the final two (2) years of the Initial Term (including any renewal or extension thereof), the Early Termination Fee shall be equal to the remaining number of years in the Contract term (as modified)-TIMES- the then current Annual Reservation Fee.

7. Remarketing of Unclaimed Water. In any year when SMWD does not submit a Call for delivery of all or any portion of the Reserved Water Supply (as more specifically defined in Section 4.b., above), CVWD, in its sole discretion,

shall have the right to sell, transfer, remarket or produce for its own account, any portion of the Reserved Water Supply not claimed or otherwise requested by SMWD in the Call. CVWD shall be entitled to retain any and all proceeds derived from the sale, transfer, remarketing or production of this excess water supply not specifically claimed or requested by SMWD.

8. Supplemental Obligations of CVWD.

a. Cooperation and Assistance. At all times during the Initial Term (including any extension or renewal thereof), CVWD shall cooperate with and assist SMWD in implementing the water supply purchase and exchange transaction that is the subject of this Contract. In thus assisting SMWD, CVWD shall deliver or otherwise make available to SMWD, free of charge, all documents, plans, maps, studies, reports, records, permits, licenses, contracts and other information that (i) pertain to the Reserved Water Supply that is available for exchange and/or transfer pursuant to the terms of this Contract and (ii) demonstrates CVWD's ability to perform its obligations under this Contract. Furthermore, CVWD shall provide SMWD and its representatives with prompt and reasonable access to key employees, consultants, contractors and other individuals who are in possession of information concerning CVWD's operations, the Reserved Water Supply, and CVWD's ability to perform under this Contract.

b. Exclusive Dealing; Defense of Water Rights. During the Initial Term (including any extension or renewal thereof), CVWD will not discuss, negotiate or enter into any agreement with any other water district, corporation, government entity or other person concerning the ownership, operation, rights or use of the Reserved Water Supply that would in any way interfere with, impede, prejudice or compromise SMWD's rights with respect to (or otherwise arising under) the Reserved Water Supply and/or this Contract. Furthermore, CVWD shall, at its sole cost and expense, undertake all actions necessary to (i) defend, preserve and protect the Reserved Water Supply from physical, legal and/or other challenge and (ii) ensure the availability of the Reserved Water Supply for exchange and/or transfer to SMWD pursuant to the terms of this Contract. CVWD's shall also cooperate with and assist SMWD in the defense of any and all challenges concerning the viability and/or enforceability of this Contract (excluding challenges regarding the sufficiency of the Contract and the Reserved Water Supply to satisfy the evidentiary requirements of SB 221 (Kuehl) and/or SB 610 (Costa)). In performing its obligations hereunder, CVWD shall make all of its personnel and information resources reasonably available to SMWD (including testimonial support before all boards, commissions, courts and other venues).

c. Supplemental Documentation. Upon the request of SMWD, CVWD shall prepare, execute and deliver (or, as appropriate shall arrange for the preparation, execution and delivery) of such additional documentation as SMWD may deem necessary, important or essential for purposes of protecting its rights under this Contract and preserving its entitlement to the Reserved Water Supply.

9. Representations and Warranties

a. CVWD. In addition to any express agreements of CVWD contained herein, and in order to induce SMWD to enter into this Contract and to perform its obligations hereunder, the following constitute representations, warranties and covenants of CVWD that are true and correct as of the Effective Date and shall be true and correct throughout the Initial Term (and any renewal or extension thereof):

(1) CVWD is duly formed, validly existing and in good standing under the laws of the State of California and has full power and authority to conduct its business as presently conducted and to enter into and carry out the transactions contemplated herein and in the Contract.

(2) The individuals executing this Contract on behalf of CVWD have the legal power, right and authority to enter into this Contract and the instruments referenced herein and to bind CVWD to the terms and conditions herein.

(3) All requisite action (corporate and otherwise) has been taken by CVWD in connection with the entering into of this Contract and the consummation of the transactions contemplated hereby. CVWD has obtained all necessary third-party and government consents (including all certificates, permits and approvals) required in connection with executing this Contract and making available the Reserved Water Supply pursuant to the express terms hereof.

(4) The execution, delivery and performance of this Contract: (i) will not violate any provision of law; (ii) will not conflict with or result in any breach of any of the terms, conditions or provisions of, or constitute (with or without notice or lapse of time, or both) a default under or a violation of, (A) CVWD's charger or other governing documents, (B) any indenture, loan or credit agreement, note agreement, deed of trust, mortgage, security agreement or other agreement, lease or other instrument, commitment or arrangement to which CVWD is a party or by which any of its properties, assets or rights are bound or affected, (C) any decree, judgment, order, statute, rule or regulation applicable to CVWD, including, but not limited to, governmental pronouncements and requirements dealing with or regulating the quality of water delivered and the location of any facilities or other assets of CVWD; and (iii) will not result in the imposition of any lien or other encumbrance on any property, asset or right held by CVWD or any environmental laws, rules or regulations. CVWD is not in violation of, or (with or without notice or lapse of time or both) in default under, any term or provision of any indenture, loan or credit agreement, note agreement, deed of rust, or arrangement to which CVWD is not a party or by which any of the properties, assets or rights are bound or affected that would have a material adverse effect upon the transaction contemplated in this Contract.

(5) CVWD is the owner of and has good and marketable title to the Reserved Water Supply free and clear of all debts, liens, claims,

mortgages, encumbrances, and any other contractual or legal restrictions. No mortgage, trust deed, financing statement or other instrument similar in effect filed or permitted to be filed by CVWD covering the Reserved Water Supply with respect thereto shall be on file in any recording office except as such may be filed in favor of SMWD or its assignees in accordance with this Contract.

(6) CVWD has not sold, transferred, assigned, licensed or subjected to any lien or other encumbrance, the Reserved Water Supply or any interest therein.

(7) No litigation, including any arbitration, audit, investigation or other proceeding of or before any court, arbitrator or governmental or regulatory authority, is pending (or, to the best knowledge of CVWD, is threatened), involving the Reserved Water Supply, and CVWD is not aware of any likely basis for any such litigation, arbitration, audit, investigation or proceeding. With the exception of the Chino Basin Judgment, CVWD is not a party to or subject to the provision of any judgment, order, writ, injunction, decree or award of any court, arbitrator or governmental or regulatory official, body or authority relative to the Reserved Water Supply.

(8) No statement by CVWD contained in this Contract and no written statement furnished by CVWD or any officer, employee, director, counsel or other agent of CVWD to SMWD or any officer, director, employee, counsel or other agent of SMWD pursuant to or in connection with this Contract contains or will contain any untrue statement of a material fact or omits or will omit to state a material fact necessary in order to make the statements therein contained not misleading. There is no fact that adversely affects, or in the future might reasonably be expected to adversely affect the condition (financial or otherwise), operations (present or prospective), business (present or prospective), properties, assets or liabilities of CVWD relating to the Reserved Water Supply in any material respect that is not set forth in this Contract.

(9) CVWD shall maintain adequate facilities, personnel and resources, including maintenance, service and support personnel, to meet its obligations under this Contract.

b. SMWD. In addition to any express agreements of SMWD contained herein, and in order to induce CVWD to enter into this Contract and to perform its obligations hereunder, the following constitute representations, warranties and covenants of SMWD that are true and correct as of the Effective Date and shall be true and correct throughout the Initial Term (and any renewal or extension thereof):

(1) SMWD is duly formed, validly existing and in good standing under the laws of the State of California and has full power and authority to conduct its business as presently conducted and to enter into and carry out the transactions contemplated herein and in the Contract.

(2) The individuals executing this Contract on behalf of SMWD have the legal power, right and authority to enter into this Contract and the instruments referenced herein and to bind SMWD to the terms and conditions herein.

(3) All requisite action (corporate and otherwise) has been taken by SMWD in connection with the entering into of this Contract and the consummation of the transactions contemplated hereby.

10. Default and Remedies. In the event that either party is in material default of this Contract, the non-defaulting party shall provide written notice to the defaulting party, identifying with reasonable specificity the nature of the claimed default. If the defaulting party has not cured the event(s) of material default which is (are) identified in the notice required by the previous sentence of this Section 10 within ten (10) business days of receipt of such written notice, then the non-defaulting party shall be entitled to any and all remedies which may be available to it at law or in equity. Furthermore, in the event of a material breach by CVWD wherein CVWD fails or otherwise refuses to deliver the Reserved Water Supply in accordance with the provisions hereof, SMWD shall be entitled to the remedy of specific performance against CVWD. Specifically CVWD shall be obligated to perform its obligations hereunder and to provide SMWD (from any and all sources, and irrespective of cost, provider or other terms) the Reserved Water Supply, for a period of not less than 25 years, in exchange for the consideration specified in Section 6, above.

11. Authorized Assignment by SMWD. If, in the exclusive judgment of SMWD, it shall become necessary for SMWD to assign this Contract to the Third Party Beneficiaries (as identified in Section 14(e), below) or a mutual water company (or other entity) designated by the Third Party Beneficiaries (collectively, an "Assignee") in order to accomplish the delivery of any Exchange Water or to otherwise obtain or preserve the benefits accruing to SMWD hereunder, SMWD shall have the unconditional right to assign this Contract (or any portion hereof) to an Assignee. Upon any such assignment, the Assignee shall assume all of the portion hereof) to an Assignee. Upon any such assignment, the Assignee shall assume all of the rights set forth in this Contract and shall be bound according to the terms and conditions hereof.

12. Division of Risk.

a. Indemnity. Each party ("**Indemnitor**") agrees to fully indemnify the other ("**Indemnitee**"), and to hold Indemnitee, its officers, directors, employees, agents, successors and assigns, completely free and harmless from and against any and all liabilities, claims, demands, litigation, or any other claims of whatever kind or nature resulting from pertaining to, or occasioned by (i) Indemnitor's breach of this Contract and (ii) the actual or alleged negligence or willful misconduct of the Indemnitor and/or its agents in performing or attempting to perform any of Indemnitor's obligations under this Contract. The parties' respective obligations hereunder shall survive the expiration or earlier termination of this Contract.

Furthermore, the parties shall provide each other with prompt notice of any such claim(s) as provided for in subpart (f) of this Section 12.

b. Third Party Claims. CVWD will indemnify, defend and hold SMWD harmless from and against any and all liabilities and losses in connection with any claim(s) brought by or on behalf of a third party, arising out of or in any way relating to the water to be reserved or supplied by CVWD to SMWD under this Contract. This duty shall include, but not be limited to, liability or losses because the water deviated from exportability or reliability specifications as set forth herein. CVWD's obligation hereunder shall survive the expiration or earlier termination of this Contract. CVWD shall provide SMWD with prompt notice of any third party claims as provided for in subpart (f) of this Section 12.

c. Condemnation by Third Party. CVWD shall oppose any attempt by a third party to condemn all or any part of the Reserved Water Supply. If the whole of the Reserved Water Supply or so much thereof as to render the balance unusable for Exchange pursuant to Section 5 shall be taken under power of eminent domain, or is sold, transferred or conveyed in lieu thereof, this Contract shall automatically terminate as of the date of such condemnation, or as of the date possession is taken by the condemning authority, at SMWD's option. In the event of total or partial condemnation, though the award shall be paid to CVWD, SMWD shall be entitled to claim and receive from CVWD, in SMWD's sole and absolute discretion, and CVWD hereby assigns to SMWD, from such award: (i) a sum attributable to the then fair market value of the volume of Reserved Water Supply condemned; or (b) a sum equal to the value of the volume of Reserved Water Supply identified and set aside under this Agreement as of the date of condemnation. The parties expect that the total award will fully compensate both parties for their respective losses, and they agree to cooperate in all ways practicable to maximize the total award. If, however, the total award shall not be adequate to compensate both parties fully for their respective losses, then CVWD shall bear the burden of the inadequacy of the award and the award shall be apportioned in a manner that fully compensates SMWD for SMWD's loss. CVWD shall provide SMWD with prompt notice of any third party condemnation attempt as provided for in subpart (f) of this Section 12.

d. Condemnation by CVWD. CVWD shall not use its powers of condemnation or eminent domain to take all or any part of the Reserved Water Supply from SMWD.

e. Force Majeure. CVWD's obligation to deliver water at the Delivery Location shall be temporarily suspended in the event of a disruption of delivery to the Delivery Location resulting from an unexpected event (e.g., earthquake or other natural disaster), other acts of God, or war. During such suspension, SMWD's payment obligations hereunder shall be discharged and waived. CVWD shall use reasonable best efforts to find a deliverable replacement supply and/or implement a cure to the disruption event. Hydrologic conditions (including drought) and/or unexpected events that disrupt CVWD's recharge and/or extraction facilities in the

Chino Basin are expressly excluded as force majeure events and shall not entitle CVWD to disrupt or otherwise suspend deliveries to the Delivery Location. CVWD shall provide SMWD with prompt notice of any force majeure event as provided for in subpart (f) of this Section 12.

f. Notice of Claims. The parties shall promptly notify each other within ten (10) days of becoming aware of: (i) any claims or suits brought against CVWD or SMWD for which they seek indemnification from the other party; (ii) any third-party claims; (iii) any condemnation attempt by a third-party; and (iv) any force majeure event. Any such notice shall conform to the requirements specified in Section 13.

13. Notices. All notices, requests and demands hereunder must be in writing to be effective. All notices required to be given hereunder or by operation of law in connection with the performance or enforcement hereof shall be deemed given upon delivery if delivered personally (which includes notices delivered by messenger, telecopy/facsimile or overnight courier) or, if delivered by mail, shall be deemed given after being deposited by certified mail in any duly authorized United States mail depository, postage prepaid. All such notices shall be addressed as follows or to such other address or addresses as the parties may from time to time specify in writing:

If to CVWD:
Cucamonga Valley Water District
10440 Ashford Street
Rancho Cucamonga, CA 91730-3057
Attn: Robert A. DeLoach, General Manager/CEO
Fax No.: (909) 476-8032

If to SMWD:
Santa Margarita Water District
26111 Antonio Parkway
Las Flores, CA 92688-1993
Attn: John J. Schatz/General Manager
Fax No.; (949) 459-6463

If to RMV:
Rancho Mission Viejo, LLC
P.O. Box 9
San Juan Capistrano, CA 92693
Attn: Vice President of Planning and Entitlement
Fax No.: (949) 248-1763

14. Miscellaneous.

a. Successors and Assigns. This Contract and the rights and obligations of the parties hereunder shall inure to the benefit of, and be binding upon, the parties' respective successors, permitted assigns and legal representatives.

b. Governing Law. This Contract shall be governed by and constructed under the laws of the State of California, as such laws apply to agreements among California residents made and to be performed entirely within the State of California, without giving effect to the choice of law or conflict of law provisions (whether of the State of California or any other jurisdiction) that would cause the application of the laws of any other jurisdiction other than the State of California.

c. Entire Agreement. This writing constitutes the entire agreement among the parties, and no modification of this Contract shall be valid unless executed in writing by the parties hereto. Further, none of the parties to this Contract shall be bound by any representations, warranties, promises, statements, or information unless expressly set forth herein.

d. Change of Control. This Contract shall survive and SMWD shall continue to have the right to call upon and purchase/receive the Reserved Water Supply (or any portion thereof), as set forth herein, upon any change in ownership or control of CVWD.

e. Third-Party Beneficiaries. SMWD and CVWD specifically acknowledge and agree that Rancho Mission Viejo, LLC, and its parent, subsidiary and affiliated entities (collectively, "RMV") are the direct, intended and sole third party creditor beneficiaries of this Contract and the rights and privileges afforded to SMWD hereunder ("Third Party Beneficiaries"). Absent the prior written consent and approval of RMV, any amendment, change or other modification to this Agreement shall be deemed void and unenforceable vis-à-vis the rights, privileges and entitlements accruing to RMV hereunder.

f. No Waiver. The failure of any party to enforce against the other a provision of this Contract shall not constitute a waiver of that party's right to enforce such a provision at a later time.

g. Captions. The captions of the various Sections in this Contract are for convenience and organization only, and are not intended to be any part of the body of this Contract, nor are they intended to be referred to in construing the provisions of this Contract.

h. Counterparts. This Contract may be executed in one or more counterparts, and all the counterparts shall constitute but one and the same agreement, notwithstanding that all parties hereto are not signatories to the same or original counterpart.

i. Attorneys' Fees. In the event of litigation involving this Contract, the prevailing party in any such action or proceeding shall be entitled to recover its costs and expenses incurred in such action from the other party including, without limitation, the cost of reasonable attorneys' fees.

j. Brokerage Fees. The parties expressly acknowledge that Optimal Water, Inc. has performed certain services in relation to the negotiation, execution and delivery of this Contract. However, Optimal Water, Inc. is not owed any compensation or remuneration from either SMWD or CVWD in connection with the services thus provided. Furthermore, CVWD warrants that it has not dealt with any other broker in connection with this transaction, and SMWD warrants that it has not dealt with any other broker in connection with this transaction. If any person or entity shall assert a claim to a finder's fee, brokerage commission or other compensation on account of alleged employment as a finder or broker or performance of services as a finder or broker in connection with this transaction, the party under whom the finder or broker is claiming shall indemnify and hold the other party harmless for, from and against any such claim and all costs, expenses and liabilities incurred in connection with such claim or any action proceeding brought on such claim, including, but not limited to, counsel and witness fees and court costs in defending against such claim. This indemnity shall survive the expiration or earlier termination of this Contract.

k. Public Announcement. All press releases and public announcements, if any, relating to this Contract and the transaction contemplated hereby shall be agreed to and prepared jointly by the parties.

l. Time. Time is of the essence with respect to this Agreement and the rights, obligation, conditions and entitlements set forth herein.

IN WITNESS WHEREOF, the parties have entered into this Contract as of the Effective Date hereof.

"CVWD"

CUCAMONGA VALLEY WATER DISTRICT

By _____

Its General Manager/CEO

"SMWD"

By _____

Its General Manager

Appendix G

Southern California Water Company and Santa Margarita Water District, Water Sale and Purchase Agreement

04/902/08
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WATER SALE AND PURCHASE AGREEMENT

This Water Sale and Purchase Agreement ("Agreement"), entered into as of the latest date shown opposite the signatures of the Parties to this Agreement (the "Effective Date"), is made by and between Southern California Water Company ("SCWC"), a California Corporation, and Santa Margarita Water District (the "District"), a California Water District, (SCWC and the District sometimes hereinafter are referred to collectively as the "Parties" and individually as a "Party"), with respect to the following.

RECITALS

A. The District is located in South Orange County and is virtually completely dependent on The Metropolitan Water District of Southern California ("MWD") through MWD's member agency, Municipal Water District of Orange County ("MWDOC"), for importing potable water supplies to serve customers and lands within the District.

B. The District desires to diversify its potable water supply for purposes of ensuring sufficient water is available during dry-years to augment imported water provided by MWD/MWDOC as may be necessary or advisable with respect to the recent enactment of land use/water supply legislation requiring, among other things, sufficient water supplies in connection with the approval of new development.

C. The District desires to purchase groundwater in storage owned by SCWC located in the Chino Groundwater Basin (the "Chino Basin"), to which SCWC is an Appropriator and the holder of certain rights pursuant to the Judgment in Chino Basin Municipal Water District v. City of Chino, et al.

D. SCWC owns non-native water in storage in the Chino Basin that it has the right to sell to the District for use within the District's service area.

OPERATIVE PROVISIONS

1. **Sale and Purchase**. Subject to the terms hereof, SCWC shall sell, without covenant or warranty except as expressly stated herein, two thousand (2,000) acre feet of non-native water, and the District shall purchase and accept delivery of such water.

2. **Price and Payment**. On the Effective Date of this Agreement, the District shall pay to SCWC the amount of $220/acre foot, or a total of $440,000, via wire transfer or other suitable means as may be agreed upon by the Parties.

3. **Delivery**. Upon payment as provided in Section 2, herein, the District shall take ownership of, together with all the rights and responsibilities appertaining thereto, and thereafter

may take delivery at any time determined by the District of all or a portion of the 2,000 acre feet of water. Delivery and all associated costs shall be the complete and sole responsibility of the District. It is understood by the Parties, however, that, upon mutual agreement of the Parties and on a case-by-case basis, delivery or deliveries may be accomplished by SCWC producing the water in storage which is the subject of this Agreement in-lieu of receiving, directly or indirectly, water from another source either within or outside of the Chino Basin, with the District paying the actual cost of producing such water at the time of production along with any and all other costs, including, without limitation, transportation/access charges which may be imposed by MWD, MWDOC and/or any other entities/agencies in connection with the delivery of such water. In this case, actual cost of producing such water shall be limited to the cost of energy required to produce the water for delivery to SCWC's water distribution system and any related costs of treating such water.

4. **MWD Cooperation**. The delivery of water to the District pursuant to this Agreement contemplates the use of MWD's water system. The Parties shall cooperate and exercise best efforts, without offset or reimbursement of internal administrative costs, with respect to developing agreements, understandings or other means with MWD and/or other necessary entities or persons as required in order to enable the delivery of water to the District. The District shall be responsible for any and all out-of-pocket costs of the Parties associated with obtaining such agreements.

5. **Watermaster Requirements**. The Parties agree to cooperate in complying with any requirements of the Chino Basin Watermaster, which may include, but is not limited to, the filing of forms, the provision of notice(s) and any related Watermaster procedures, in connection with this Agreement.

6. **Right of Reimbursement**. In the event SCWC is barred from selling the water subject to this Agreement to the District for reasons limited to a meritorious challenge(s) by suit of SCWC's i) ownership of and/or ii) right to sell the water for purposes of this Agreement, the District shall be entitled to full reimbursement of the payment provided for in Section 2 herein one (1) year from the date of service of such suit; provided, however, that such suit must be served upon SCWC within one (1) year of the Effective Date of this Agreement and provided further that the District has not taken delivery of or otherwise sold, leased, transferred or in any other manner disposed of the water. Upon any such reimbursement, all right, title and interest in the water subject to this Agreement shall automatically revert to SCWC.

7. **Representations and Warranties of District**. The District makes the following representations, warranties and covenants to SCWC, as of the date this Agreement is fully executed:

A. **Organization**. The District is a California Water District organized and operating under the provisions of Division 13 of the California Water Code.

B. **Power and Authority to Execute and Perform this Agreement**. The District has the right, power and authority to enter into this Agreement and to perform its obligations hereunder, and the person(s) executing this Agreement on behalf of District has (have) the right, power and authority to do so.

C. **Enforceability**. This Agreement constitutes the legal, valid and binding obligation of the District enforceable against the District in accordance with its terms.

D. **No Litigation**. There is no suit, action or arbitration or legal, administrative or other proceeding, formal or informal, pending or threatened, which adversely affects District's ability to purchase water from SCWC and accept delivery thereof, or to make full payment thereof, or to make full payment therefore, all as contemplated by this Agreement.

E. **No Conflict**. The execution and performance of this Agreement by the District does not breach or constitute a default by the District under any law, regulation, ruling, court order, agreement, indenture, or undertaking or other instrument to which District is a party or by which District is a party or by which District or any of its property may be bound or affected.

8. **Representations and Warranties of SCWC**. SCWC makes the following representations, warranties and covenants to the District, as of the date this Agreement is fully executed.

A. **Organization**. SCWC is a corporation duly organized, validly existing and in good standing under the laws of the State of California, and is qualified to do and is doing business in the State of California.

B. **Power and Authority to Execute and Perform this Agreement**. SCWC has the right, power and authority under this Agreement to perform its obligations hereunder, and the person(s) executing this Agreement on behalf of SCWC has (have) the right, power and authority to do so.

C. **Enforceability**. This Agreement constitutes a legal, valid and binding obligation of SCWC, enforceable against SCWC in accordance with its terms.

D. **No Litigation**. There is no suit, action or arbitration or legal, administrative or other proceeding, formal or informal, pending or threatened, which adversely affects the ability of SCWC to sell and deliver water to the District as contemplated by this Agreement.

E. **Ownership**. SCWC is the owner of the water that is the subject of this Agreement and has the right to sell the water for delivery to the District as provided for herein.

9. **Litigation and Attorneys' Fees**. In the event of litigation arising out of or related to this Agreement by one Party against the other Party, the prevailing Party shall be entitled to an award of reasonable attorneys' fees incurred in connection therewith. In the event either or both Parties are sued or otherwise challenged in connection with this Agreement, each shall pay its own attorneys' fees and costs, except in the case of a meritorious suit challenging SCWC's i) ownership of and/or ii) right to sell the water for purposes of this Agreement, served pursuant to the provisions of Section 6 herein, in which event SCWC shall also pay any reasonable actual attorneys' fees incurred by the District in defending such suit or challenge and hold harmless and indemnify the District from any other reasonable costs which may be incurred in connection therewith.

10. **Indemnification**. Except as specifically provided elsewhere in this Agreement, SCWC agrees to indemnify, defend and hold harmless the District, its directors, officers, agents and employees, and the District agrees to indemnify, defend and hold harmless SCWC, its directors, officers, agents and employees, from and against any and all claims, losses, expenses, litigation, liability, damages, recoveries and deficiencies of any nature whatsoever that the District or SCWC may incur or suffer that arises out of, results from or relates to SCWC's or the District's breach of any of term, provision, covenant, condition, representation or warranty contained in this Agreement.

11. **Amendment**. This Agreement may be amended only in writing signed by duly authorized representatives of the Parties hereto.

12. **Entire Agreement**. This Agreement constitutes the entire agreement between the Parties concerning the subject matter of this Agreement and, upon its effectiveness, supersedes any prior representations, agreements and understandings in connection therewith.

13. **Notices**. All notices, demands and other communications under this Agreement shall be in writing and be deemed to have been duly given on the date of service if served personally on the party to whom notice is to be given, or on the second day after mailing, if mailed to the Party to whom notice is given, by first-class mail, registered or certified, return receipt requested, postage prepaid and properly addressed as follows:

SCWC:
James B. Gallagher, Vice President
Customer Service, Region III
Southern California Water Company
2143 Convention Center Way, Suite 110
Ontario, CA 91764

District:
John J. Schatz, General Manager
Santa Margarita Water District
26111 Antonio Parkway, Suite A
Las Flores, CA 92688

Any Party may change their address for purposes of this section by giving the other Party written notice of their new address in the manner set forth above.

14. **Severability**. If any term, provision, covenant or condition of this Agreement shall become illegal, null, void or against public policy, or is determined by a court of competent jurisdiction to be invalid, void, or unenforceable, the provision shall be deemed to be severable from the remainder of this Agreement, and the remainder of the provisions hereof shall remain in full force and effect and shall in no way be affected, impaired, or invalidated thereby. The term , provision, covenant or condition that is so invalidated, voided or held to be unenforceable, shall be modified or changed by the Parties to the extent possible to carry out the intentions and directives contained in this Agreement.

15. **Applicable Law**. This Agreement shall be governed by, and construed in accordance with, the laws of the State of California.

IN WITNESS WHEREOF, the Parties have executed this Agreement as of the latest date shown opposite the signatures below.

SOUTHERN CALIFORNIA
WATER COMPANY

By: James B. Gallagher Date: 12/28/01

Title: Vice President-Customer Service
Region III

SANTA MARGARITA
WATER DISTRICT

By: [signature] Date: December 14, 2001

Title: President, Board of Directors

Appendix H

California Silica Products Company and State of California - State Water Resources Control Board, License for Diversion and Use of Water

STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER RIGHTS

License for Diversion and Use of Water

APPLICATION 24490 PERMIT 16656 LICENSE 12220
Page 1 of 3

THIS IS TO CERTIFY, *That* California Silica Products Company
P.O. Box 249
San Juan Capistrano, California 92693

has *made proof as of* September 28, 1982 *(the date of inspection)* *to the satisfaction of the State Water Resources Control Board of a right to the use of the water of* Trampas Canyon in Orange County

tributary to San Juan Creek thence Pacific Ocean

for the purpose of Mining use

under Permit 16656 *of the Board and that the right to the use of this water has been perfected in accordance with the laws of California, the Regulations of the Board and the permit terms; that the priority of this right dates from* October 11, 1973 *and that the amount of water to which this right is entitled and hereby confirmed is limited to the amount actually beneficially used for the stated purposes and shall not exceed* five hundred seventy-five (575) acre-feet per annum to be collected from September 1 of each year to April 30 of the succeeding year.

Water is pumped from the reservoir to the mill site and returned to the reservoir (with waste material) for recycling.

This license does not authorize collection of water to storage outside of the specified season to offset evaporation and seepage losses or for any other purpose. (0000005)

THE POINT OF DIVERSION OF SUCH WATER IS LOCATED:

Trampas Canyon Dam - By California Coordinates, Zone 6, North 487,420 and East 1,592,870, being within SW¼ of SW¼ of Section 2, T8S, R7W, SBB&M.

A DESCRIPTION OF THE LANDS OR THE PLACE WHERE
SUCH WATER IS PUT TO BENEFICIAL USE IS AS FOLLOWS:

At Mission Viejo Sand Plant within NE¼ of SW¼ of Section 2, T8S, R7W, SBB&M, as shown on map filed with State Water Resources Control Board.

In order to prevent degradation of the quality of water, licensee shall comply with any waste discharge requirements imposed by the California Regional Water Quality Control Board, San Diego Region, or by the State Water Resources Control Board. (0000100)

In order to mitigate adverse impacts on wildlife and vegetation from its project, licensee shall implement a program, as approved by the Board in consultation with the State Department of Fish and Game and Orange County, of vegetation management, revegetation, and other measures to preserve, restore, and improve wildlife habitat and other natural values on the 1,172-acre parcel presently zoned for sand and gravel operation. Any such program approved by the Board shall be consistent with any revegetation plan required by Orange County. The status of the implementation of each program event scheduled in the approved conceptual plan shall be submitted to the Board as part of licensee's triennial reports. (0400500)

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Licensee shall allow representatives of the Board and other parties, as may be authorized from time to time by the Board, reasonable access to project works to determine compliance with the terms of this license.

The quantity of water diverted under this license is subject to modification by the State Water Resources Control Board if, after notice to the licensee and an opportunity for hearing, the Board finds that such modification is necessary to meet water quality objectives in water quality control plans which have been or hereafter may be established or modified pursuant to Division 7 of the Water Code. No action will be taken pursuant to this paragraph unless the Board finds that (1) adequate waste discharge requirements have been prescribed and are in effect with respect to all waste discharges which have any substantial effect upon water quality in the area involved, and (2) the water quality objectives cannot be achieved solely through the control of waste discharges.

Pursuant to California Water Code Sections 100 and 275 and the public trust doctrine, all rights and privileges under this license, including method of diversion, method of use, and quantity of water diverted, are subject to the continuing authority of the State Water Resources Control Board in accordance with law and in the interest of the public welfare to protect public trust uses, prevent waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion of said water.

This continuing authority of the Board may be exercised by imposing specific requirements over and above those contained in this license with a view to minimizing waste of water and to meeting the reasonable water requirements of licensee without unreasonable draft on the source. Licensee may be required to implement such programs as (1) reusing or reclaiming the water allocated; (2) using water reclaimed by another entity instead of all or part of the water allocated; (3) restricting diversions so as to eliminate agricultural tailwater or to reduce return flow; (4) suppressing evaporation losses from water surfaces; (5) controlling phreatophytic growth; and (6) installing, maintaining, and operating efficient water measuring devices to assure compliance with the quantity limitations of this license and to determine accurately water use as against reasonable water requirements for the authorized project. No action will be taken pursuant to this paragraph unless the Board determines, after notice to affected parties and opportunity for hearing, that such specific requirements are physically and financially feasible and are appropriate to the particular situation.

The continuing authority of the board also may be exercised by imposing further limitations on the diversion and use of water by the licensee in order to protect public trust uses. No action will be taken pursuant to this paragraph unless the board determines, after notice to affected parties and opportunity for hearing, that such action takes into account the public interest and is necessary to protect public trust uses. All such actions shall conform to the standard of reasonableness contained in Article X, Section 2 of the California Constitution.

Reports shall be filed promptly by licensee on appropriate forms which will be provided for the purpose from time to time by the Board.

The right hereby confirmed to the diversion and use of water is restricted to the point or points of diversion herein specified and to the lands or place of use herein described.

This license is granted and licensee accepts all rights herein confirmed subject to the following provisions of the Water Code:

Section 1625. Each license shall be in such form and contain such terms as may be prescribed by the Board.

Section 1626. All licenses shall be under the terms and conditions of this division (of the Water Code).

Section 1627. A license shall be effective for such time as the water actually appropriated under it is used for a useful and beneficial purpose in conformity with this division (of the Water Code) but no longer.

Section 1628. Every license shall include the enumeration of conditions therein which in substance shall include all of the provisions of this article and the statement that any appropriator of water to whom a license is issued takes the license subject to the conditions therein expressed.

Section 1629. Every licensee, if he accepts a license does so under the conditions precedent that no value whatsoever in excess of the actual amount paid to the State therefor shall at any time be assigned to or claimed for any license granted or issued under the provisions of this division (of the Water Code), or for any rights granted or acquired under the provisions of this division (of the Water Code), in respect to the regulation by any competent public authority of the services or the price of the services to be rendered by any licensee or by the holder of any rights granted or acquired under the provisions of this division (of the Water Code) or in respect to any valuation for purposes of sale to or purchase, whether through condemnation proceedings or otherwise, by the State or any city, city and county, municipal water district, irrigation district, lighting district, or any political subdivision of the State, of the rights and property of any licensee, or the possessor of any rights granted, issued, or acquired under the provisions of this division (of the Water Code).

Section 1630. At any time after the expiration of twenty years after the granting of a license, the State or any city, city and county, municipal water district, irrigation district, lighting district, or any political subdivision of the State shall have the right to purchase the works and property occupied and used under the license and the works built or constructed for the enjoyment of the rights granted under the license.

Section 1631. In the event that the State, or any city, city and county, municipal water district, irrigation district, lighting district, or political subdivision of the State so desiring to purchase and the owner of the works and property cannot agree upon the purchase price, the price shall be determined in such manner as is now or may hereafter be provided by law for determining the value of property taken in eminent domain proceedings.

Dated: JANUARY 29 1988

STATE WATER RESOURCES CONTROL BOARD

Walter G. Pettit

Chief, Division of Water Rights

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Appendix I

State of California - State Water Resources Control Board, Division of Water Rights Order: Order Approving a New Development Schedule

STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD

DIVISION OF WATER RIGHTS

ORDER

Application 25557 Permit 17489 License _____

ORDER APPROVING A NEW DEVELOPMENT SCHEDULE

WHEREAS:

1. Permit 17489 was issued to Santa Margarita Water District on December 19, 1978 pursuant to Application 25557.

2. A petition for an extension of time within which to develop the project and apply the water to the proposed use has been filed with the State Water Resources Control Board.

3. The permittee has proceeded with diligence and good cause has been shown for said extension of time.

NOW, THEREFORE, IT IS ORDERED THAT:

1. Condition 8 of the permit be amended to read:

   COMPLETE APPLICATION OF THE
   WATER TO THE PROPOSED USE
   SHALL BE MADE ON OR BEFORE December 31, 1999

(0000009)

Dated: OCTOBER 7 1994

Roger K. Mann

Edward C. Anton, Chief
Division of Water Rights

STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD

DIVISION OF WATER RIGHTS

ORDER

APPLICATION 25557 PERMIT 17489 LICENSE _____

ORDER APPROVING A NEW DEVELOPMENT SCHEDULE, AND AMENDING THE PERMIT

1. Permit 17489 was issued to Santa Margarita Water District on December 10, 1978 pursuant to Application 25557.

2. Petition for an extension of time within which to develop the project and apply the water to the proposed has been filed with the State Water Resources Control Board.

3. The Permittee has proceeded with diligence and good cause has been shown for the extension of time.

4. Permit Condition 11 pertaining to the continuing authority of the Board should be updated to conform to Standard Permit Term 12 as contained in Section 780(a), Title 23 of the California Code of Regulations.

5. Condition 7 of the permit be amended to read:

CONSTRUCTION WORK SHALL BE COMPLETED ON OR BEFORE	December 31, 1992	(0000008)

6. Condition 8 of the permit be amended to read:

COMPLETE APPLICATION OF THE WATER TO THE PROPOSED USE SHALL BE MADE ON OR BEFORE	December 31, 1993	(0000009)

7. Condition 11 of this permit be amended to read:

Pursuant to California Water Code Sections 100 and 275, and the common law public trust doctrine, all rights and privileges under this permit and under any license issued pursuant thereto, including method of diversion, method of use, and quantity of water diverted, are subject to the continuing authority of the State Water Resources Control Board in accordance with law and in the interest of the public welfare to protect public trust uses and to prevent waste, unreasonable use, unreasonable method of use or unreasonable method of diversion of said water.

The continuing authority of the Board may be exercised by imposing specific requirements over and above those contained in this permit with a view to eliminating waste of water and to meeting the reasonable water requirements of permittee without unreasonable draft on the source. Permittee may be required to implement a water conservation plan, features of which may include but not necessarily be limited to: (1) reusing or reclaiming the water allocated; (2) using water reclaimed by another entity instead of all or part of the water allocated; (3) restricting diversions so as to eliminate agricultural tailwater or to reduce return flow; (4) suppressing evaporation losses from water surfaces; (5) controlling phreatophytic growth; and (6) installing, maintaining, and operating efficient water measuring devices to assure compliance with the

quantity limitations of this permit and to determine accurately water use as against reasonable water requirements for the authorized project. No action will be taken pursuant to this paragraph unless the Board determines, after notice to affected parties and opportunity for hearing, that such specific requirements are physically and financially feasible and are appropriate to the particular situation.

The continuing authority of the Board also may be exercised by imposing further limitations on the diversion and use of water by the permittee in order to protect public trust uses. No action will be taken pursuant to this paragraph unless the Board determines, after notice to affected parties and opportunity for hearing, that such action is consistent with California Constitution Article X, Section 2; is consistent with the public interest and is necessary to preserve or restore the uses protected by the public trust. (0000012)

Dated: APRIL 2 6 1989

Walter G. Pettit, Chief
Division of Water Rights

STATE OF CALIFORNIA

STATE WATER RESOURCES CONTROL BOARD

DIVISION OF WATER RIGHTS

ORDER

APPLICATION 25557 PERMIT 17489 LICENSE

ORDER APPROVING A NEW DEVELOPMENT SCHEDULE AND AMENDING THE PERMIT

WHEREAS:

1. A petition for extension of time within which to develop the project and apply the water to the proposed use has been filed with the State Water Resources Control Board.

2. The permittee has proceeded with diligence and good cause has been shown for extension of time.

NOW, THEREFORE, IT IS ORDERED THAT:

1. Paragraph 7 of the permit is amended to read as follows:

   CONSTRUCTION WORK SHALL BE COMPLETED ON OR BEFORE December 1, 1985 (0000008)

2. Paragraph 8 of the permit is amended to read as follows:

   COMPLETE APPLICATION OF THE WATER TO THE PROPOSED USE SHALL BE MADE ON OR BEFORE December 1, 1987 (0000009)

3. Paragraph 11 of this permit is deleted. A new Paragraph 11 is added as follows:

   Pursuant to California Water Code Sections 100 and 275, and the public trust doctrine, all rights and privileges under this permit and under any license issued pursuant thereto, including method of diversion, method of use, and quantity of water diverted, are subject to the continuing authority of the State Water Resources Control Board in accordance with law and in the interest of the public welfare to protect public trust uses, prevent waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion of said water.

   The continuing authority of the Board may be exercised by imposing specific requirements over and above those contained in this permit with a view to minimizing waste of water and to meeting the reasonable water requirements of permittee without unreasonable draft on the source. Permittee may be required to implement such programs as (1) reusing or reclaiming the water allocated; (2) using water reclaimed by another entity instead of all or part of the water allocated; (3) restricting diversions so as to eliminate agricultural tailwater or to reduce return flow; (4) suppressing evaporation losses from water surfaces; (5) controlling phreatophytic growth; and (6) to installing, maintaining, and operating

efficient water measuring devices to assure compliance with the quantity limitations of this permit and to determine accurately water use as against reasonable water requirements for the authorized project. No action will be taken pursuant to this paragraph unless the Board determines, after notice to affected parties and opportunity for hearing, that such specific requirements are physically and financially feasible and are appropriate to the particular situation.

The continuing authority of the Board also may be exercised by imposing further limitations on the diversion and use of water by the permittee in order to protect public trust uses. No action will be taken pursuant to this paragraph unless the Board determines, after notice to affected parties and opportunity for hearing, that such action takes into account the public interest and is necessary to protect public trust uses. All such actions shall conform to the standard of reasonableness contained in Article X, Section 2 of the California Constitution.

(000012)

Dated: AUGUST 3 1984

Raymond Walsh

Raymond Walsh, Chief
Division of Water Rights

STATE OF CALIFORNIA
THE RESOURCES AGENCY
STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER RIGHTS

PERMIT FOR DIVERSION AND USE OF WATER

PERMIT 17489

Application 25557 of Santa Margarita Water District

25571 Marguerite Parkway, Mission Viejo, California 92675

filed on November 9, 1977, has been approved by the State Water Resources Control Board SUBJECT TO VESTED RIGHTS and to the limitations and conditions of this Permit.

Permittee is hereby authorized to divert and use water as follows:

1. Source:

Oso Creek

Tributary to:

Arroyo Trabuco thence
San Juan Creek thence
Pacific Ocean

2. Location of point of diversion:	40-acre subdivision of public land survey or projection thereof	Section	Township	Range	Base and Meridan
N71°39'W, 1938 feet from SE Corner of Section 8	SW¼ of SE¼	8	6S	7W	SB

County of Orange

3. Purpose of use:	4. Place of use:	Section	Township	Range	Base and Meridan	Acres
Irrigation	A net area of 1777 acres within the boundaries of the Santa Margarita Water District within T6S, R7 & 8W and T7S, R7 & 8W, MDB&M					

The place of use is shown on map filed with the State Water Resources Control Board.

27962-983 10-74 2M ⓘ OSP

PERMIT **17489**

5. THE WATER APPROPRIATED SHALL BE LIMITED TO THE QUANTITY WHICH CAN BE BENEFICIALLY USED AND SHALL NOT EXCEED 611 ACRE-FEET PER ANNUM TO BE COLLECTED FROM NOVEMBER 1 OF EACH YEAR TO APRIL 30 OF THE SUCCEEDING YEAR.

THIS PERMIT DOES NOT AUTHORIZE COLLECTION OF WATER TO STORAGE OUTSIDE OF THE SPECIFIED SEASON TO OFFSET EVAPORATION AND SEEPAGE LOSSES OR FOR ANY OTHER PURPOSE. (0000005)

6. THE AMOUNT AUTHORIZED FOR APPROPRIATION MAY BE REDUCED IN THE LICENSE IF INVESTIGATION WARRANTS. (0000006)

7. SAID CONSTRUCTION WORK SHALL BE COMPLETED ON OR BEFORE DECEMBER 1, 1981 (0000008)

8. COMPLETE APPLICATION OF THE WATER TO THE PROPOSED USE SHALL BE MADE ON OR BEFORE DECEMBER 1, 1982. (0000009)

9. PROGRESS REPORTS SHALL BE SUBMITTED PROMPTLY BY PERMITTEE WHEN REQUESTED BY THE STATE WATER RESOURCES CONTROL BOARD UNTIL LICENSE IS ISSUED. (0000010)

10. PERMITTEE SHALL ALLOW REPRESENTATIVES OF THE STATE WATER RESOURCES CONTROL BOARD AND OTHER PARTIES AS MAY BE AUTHORIZED FROM TIME TO TIME BY SAID BOARD, REASONABLE ACCESS TO PROJECT WORKS TO DETERMINE COMPLIANCE WITH THE TERMS OF THIS PERMIT. (0000011)

11. PURSUANT TO CALIFORNIA WATER CODE SECTION 100, ALL RIGHTS AND PRIVILEGES UNDER THIS PERMIT AND UNDER ANY LICENSE ISSUED PURSUANT THERETO, INCLUDING METHOD OF DIVERSION, METHOD OF USE, AND QUANTITY OF WATER DIVERTED, ARE SUBJECT TO THE CONTINUING AUTHORITY OF THE STATE WATER RESOURCES CONTROL BOARD IN ACCORDANCE WITH LAW AND IN THE INTEREST OF THE PUBLIC WELFARE TO PREVENT WASTE, UNREASONABLE USE, UNREASONABLE METHOD OF USE, OR UNREASONABLE METHOD OF DIVERSION OF SAID WATER.

THIS CONTINUING AUTHORITY OF THE BOARD MAY BE EXERCISED BY IMPOSING SPECIFIC REQUIREMENTS OVER AND ABOVE THOSE CONTAINED IN THIS PERMIT WITH A VIEW TO MINIMIZING WASTE OF WATER AND TO MEETING THE REASONABLE WATER REQUIREMENTS OF PERMITTEE WITHOUT UNREASONABLE DRAFT ON THE SOURCE. PERMITTEE MAY BE REQUIRED TO IMPLEMENT SUCH PROGRAMS AS (1) REUSING OR RECLAIMING THE WATER ALLOCATED; (2) RESTRICTING DIVERSIONS SO AS TO ELIMINATE AGRICULTURAL TAILWATER OR TO REDUCE RETURN FLOW; (3) SUPPRESSING EVAPORATION LOSSES FROM WATER SURFACES; (4) CONTROLLING PHREATOPHYTIC GROWTH; AND (5) INSTALLING, MAINTAINING, AND OPERATING EFFICIENT WATER MEASURING DEVICES TO ASSURE COMPLIANCE WITH THE QUANTITY LIMITATIONS OF THIS PERMIT AND TO DETERMINE ACCURATELY WATER USE AS AGAINST REASONABLE WATER REQUIREMENTS FOR THE AUTHORIZED PROJECT. NO ACTION WILL BE TAKEN PURSUANT TO THIS PARAGRAPH UNLESS THE BOARD DETERMINES, AFTER NOTICE TO AFFECTED PARTIES AND OPPORTUNITY FOR HEARING, THAT SUCH SPECIFIC REQUIREMENTS ARE PHYSICALLY AND FINANCIALLY FEASIBLE AND ARE APPROPRIATE TO THE PARTICULAR SITUATION. (0000012)

12. THE QUANTITY OF WATER DIVERTED UNDER THIS PERMIT AND UNDER ANY LICENSE ISSUED PURSUANT THERETO IS SUBJECT TO MODIFICATION BY THE STATE WATER RESOURCES CONTROL BOARD IF, AFTER NOTICE TO THE PERMITTEE AND AN OPPORTUNITY FOR HEARING, THE BOARD FINDS THAT SUCH MODIFICATION IS NECESSARY TO MEET WATER QUALITY OBJECTIVES IN WATER QUALITY CONTROL PLANS WHICH HAVE BEEN OR HEREAFTER MAY BE ESTABLISHED OR MODIFIED PURSUANT TO DIVISION 7 OF THE WATER CODE. NO ACTION WILL BE TAKEN PURSUANT TO THIS PARAGRAPH UNLESS THE BOARD FINDS THAT (1) ADEQUATE WASTE DISCHARGE REQUIREMENTS HAVE BEEN PRESCRIBED AND ARE IN EFFECT WITH RESPECT TO ALL WASTE DISCHARGES WHICH HAVE ANY SUBSTANTIAL EFFECT UPON WATER QUALITY IN THE AREA INVOLVED, AND (2) THE WATER QUALITY OBJECTIVES CANNOT BE ACHIEVED SOLELY THROUGH THE CONTROL OF WASTE DISCHARGES. (0000013)

13. PERMITTEE SHALL INSTALL AND MAINTAIN AN OUTLET PIPE OF ADEQUATE CAPACITY IN HIS DAM AS NEAR AS PRACTICABLE TO THE BOTTOM OF THE NATURAL STREAM CHANNEL, OR PROVIDE OTHER MEANS SATISFACTORY TO THE STATE WATER RESOURCES CONTROL BOARD, IN ORDER THAT WATER ENTERING THE RESERVOIR WHICH IS NOT AUTHORIZED FOR APPROPRIATION UNDER THIS PERMIT MAY BE RELEASED. (0050048)

14. CONSTRUCTION OF THE STORAGE DAM SHALL NOT BE COMMENCED UNTIL THE DEPARTMENT OF WATER RESOURCES HAS APPROVED PLANS AND SPECIFICATIONS. (0130049)

15. IN ACCORDANCE WITH THE REQUIREMENTS OF WATER CODE SECTION 1393, PERMITTEE SHALL CLEAR THE SITE OF THE PROPOSED RESERVOIR OF ALL STRUCTURES, TREES AND OTHER VEGETATION WHICH WOULD INTERFERE WITH THE USE OF THE RESERVOIR FOR WATER STORAGE AND RECREATIONAL PURPOSES. (0120050)

16. NO WATER SHALL BE USED UNDER THIS PERMIT UNTIL THE PERMITTEE HAS FILED A REPORT OF WASTE DISCHARGE WITH THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, SAN DIEGO REGION, PURSUANT TO WATER CODE SECTION 13260, AND THE REGIONAL BOARD OR STATE WATER RESOURCES CONTROL BOARD HAS PRESCRIBED WASTE DISCHARGE REQUIREMENTS OR HAS INDICATED THAT WASTE DISCHARGE REQUIREMENTS ARE NOT REQUIRED. THEREAFTER, WATER MAY BE DIVERTED ONLY DURING SUCH TIMES AS ALL REQUIREMENTS PRESCRIBED BY THE REGIONAL BOARD OR STATE BOARD ARE BEING MET. NO DISCHARGES OF WASTE TO SURFACE WATER SHALL BE MADE UNLESS WASTE DISCHARGE REQUIREMENTS ARE ISSUED BY A REGIONAL BOARD OR THE STATE BOARD. A DISCHARGE TO GROUND WATER WITHOUT ISSUANCE OF A WASTE DISCHARGE REQUIREMENT MAY BE ALLOWED IF AFTER FILING THE REPORT PURSUANT TO SECTION 13260:

(1) THE REGIONAL BOARD ISSUES A WAIVER PURSUANT TO SECTION 13269, OR
(2) THE REGIONAL BOARD FAILS TO ACT WITHIN 120 DAYS OF THE FILING OF THE REPORT.

NO REPORT OF WASTE DISCHARGE PURSUANT TO SECTION 13260 OF THE WATER CODE SHALL BE REQUIRED FOR PERCOLATION TO THE GROUND WATER OF WATER RESULTING FROM THE IRRIGATION OF CROPS. (0290101)

This permit is issued and permittee takes it **subject to the following provisions of the Water Code:**

Section 1390. A permit shall be effective for such time as the water actually appropriated under it is used for a useful and beneficial purpose in conformity with this division (of the Water Code), but no longer.

Section 1391. Every permit shall include the enumeration of conditions therein which in substance shall include all of the provisions of this article and the statement that any appropriator of water to whom a permit is issued takes it subject to the conditions therein expressed.

Section 1392. Every permittee, if he accepts a permit, does so under the conditions precedent that no value whatsoever in excess of the actual amount paid to the State therefor shall at any time be assigned to or claimed for any permit granted or issued under the provisions of this division (of the Water Code), or for any rights granted or acquired under the provisions of this division (of the Water Code), in respect to the regulation by any competent public authority of the services or the price of the services to be rendered by any permittee or by the holder of any rights granted or acquired under the provisions of this division (of the Water Code) or in respect to any valuation for purposes of sale to or purchase, whether through condemnation proceedings or otherwise, by the State or any city, city and county, municipal water district, irrigation district, lighting district, or any political subdivision of the State, of the rights and property of any permittee, or the possessor of any rights granted, issued, or acquired under the provisions of this division (of the Water Code).

Dated: DECEMBER 19 1978

STATE WATER RESOURCES CONTROL BOARD

EXECUTIVE DIRECTOR, WATER RIGHTS & ADMINISTRATION

~~Chief, Division of Water Rights~~

Appendix J

California Integrated Water Quality System, e-WRIMS Public Summary Page – Santa Margarita Water District

e-WRIMS Public Summary Page

[Return to Water Right Search] [Return to Water Right Search Results]

Application ID:	A032195	**Water Right Type:**	Appropriative
Permit ID:	None	**Water Rights Status:**	Pending (09/16/2013)
License ID:	None	**Primary Owner:**	SANTA MARGARITA WATER DISTRICT

Current Parties	Relationship	Effective Date
SANTA MARGARITA WATER DISTRICT	Primary Owner	09/16/2013
Need to report a change of ownership or agent? Click Here		

Historical Parties

Record Summary	
Application Acceptance Date	
Permit Issuance Date	
License Issuance Date	
Face Value Amount	800.0
Subtypes (Statements Only)	

Name(s) of Sources of Water	County Location	Parcel Number	Diversion Site Name	Lat/Long Coordinates
GOBERNADORA CREEK	Orange			33.5587 ; -117.5871
GOBERNADORA CREEK	Orange			33.5597 ; -117.5887
GOBERNADORA CREEK	Orange			33.5583 ; -117.5886
				Map It

Beneficial Uses	Acres	Direct Diversion Season	Collection to Storage Season
Irrigation	0.0	1/1 **to** 12/31	1/1

Electronic Reports				
Year	**Revision**	**Report Type**	**Date Received**	**View Report PDF**
no reports submitted				

***For reports submitted prior to 2009, please contact our records room.**

Water Rights Associated with Primary Owner		
Application ID	**Water Right Type**	**Water Right Status**
A032195	Appropriative	Pending
A025733	Appropriative	Permitted
A025557	Appropriative	Permitted

A024490	Appropriative	Licensed
T032520	Temporary Permit	Cancelled
T032231	Temporary Permit	Revoked
T032197	Temporary Permit	Revoked
T032358	Temporary Permit	Revoked

Associated Decisions/Orders			
Decision/Order Number	**Date**	**Description**	**View Document**

Appendix K

RMV San Juan Watershed, LLC, et. al., Agreement for Lease of Supplemental Water and Provision of Service

C-1764

Agreement No. 04/1021/04

AGREEMENT FOR LEASE OF SUPPLEMENTAL WATER AND PROVISION OF SERVICE

THIS AGREEMENT FOR LEASE OF SUPPLEMENTAL WATER AND PROVISION OF SERVICE ("Agreement") is entered into as of April 23, 2012 (the "Effective Date"), by and between RMV SAN JUAN WATERSHED, LLC, a California limited liability company ("**SJ Watershed**"), DMB SAN JUAN INVESTMENT NORTH, L.L.C., a Delaware limited liability company ("**DMBSJIN**"), RMV MC INVESTMENT, LLC, a California limited liability company ("**MC Investment**"), RMV MIDDLE CHIQUITA, LLC, a California limited liability company ("**Middle Chiquita**"), RMV RANCH HOUSE, LLC, a California limited liability company ("**Ranch House**"), RMV COMMUNITY DEVELOPMENT, LLC, a California limited liability company ("**Community Development**"), RMV HEADQUARTERS, LLC, a California limited liability company ("**HQ**") (SJ Watershed, DMBSJIN, MC Investment, Middle Chiquita, Ranch House, Community Development and HQ are collectively referred to herein as the "**Landowners**"), RANCHO MISSION VIEJO MUTUAL WATER COMPANY, a California nonprofit mutual benefit corporation ("MWC") and SANTA MARGARITA WATER DISTRICT, a special district organized and operating under the provisions of California Water Code Section 34000 *et seq.* ("SMWD").

RECITALS

A. SMWD is responsible for providing domestic and non-domestic water services for the benefit of approximately 62,674 acres (the "SMWD Service Area") located in southeastern Orange County, California.

B. Rancho Mission Viejo, L.L.C., a Delaware limited liability company ("RMV") is the agent and manager for the Landowners, who own certain land in the San Juan Creek Watershed in southeastern Orange County, California (the "SJC Watershed") shown on Exhibit A attached hereto, which land is a portion of the historic Rancho Mission Viejo (the "Ranch") and which is located within the SMWD Service Area.

C. RMV is implementing a comprehensive open space preservation, management, and development plan for the Ranch. This plan, which was approved by the Orange County Board of Supervisors in November of 2004, is commonly referred to as the "Ranch Plan." As the land is developed pursuant to the Ranch Plan, water use on portions of the Ranch and subsequent Ranch Plan development areas will change from existing agricultural irrigation use to non-domestic municipal irrigation use. The first area of the Ranch Plan which will be developed is referred to as Planning Area 1 ("PA-1"). Subsequent planning areas to be developed within the SJC Watershed portion of the Ranch Plan include PA-2, PA-3, PA-4 and PA-5, although not necessarily in that order.

D. The Landowners have riparian water rights through their ownership of riparian land in the SJC Watershed. Based on these rights, the Landowners historically have diverted and used an average of (and sometimes more than) three thousand five hundred (3,500) acre-feet of water per year (the "Water"). The quantity of future diversions and usage depends upon the hydrology in the watershed. Since the Water is riparian, the Landowners can divert

and/or pump in excess of 3,500 acre-feet per year as long as the Water is reasonably and beneficially used on riparian lands within the SJC Watershed.

E. RMV, as agent for the Landowners, has formed the MWC so as to protect and maintain their right to use the Water following the subdivision of riparian lands in the SJC Watershed. The MWC holds the riparian water rights of the Landowners, and the Landowners as members of the MWC have an absolute right to take their proportionate share of the Water. Landowner members of the MWC have the right to take Water for their own use or to assign their allocation of Water for use on riparian lands within the SJC Watershed.

F. The Landowner members of the MWC have appointed RMV to manage their allocation of Water from the MWC, and RMV will act as their agent with the MWC and potential users of the Water. RMV will manage the infrastructure and operations of the MWC pursuant to a separate management agreement. The benefit of both arrangements is that RMV is the single source of contact in connection with the Water.

G. As they are developed, the Ranch Plan planning areas will contain common areas that will be owned by one or more homeowners associations ("HOAs"), and certain investment properties which will continue to be owned by Ranch-related entities. The parcels owned by the HOAs (the "HOA Parcels") and the investment properties ("the Investment Properties") will require water service from SMWD for non-domestic municipal use and it is expected that the Water can be used as supplemental water to offset in part the new water demand generated by the HOA Parcels and Investment Properties. It is mutually beneficial to SMWD, the Ranch and the HOAs for SMWD to lease a portion of the Water as supplemental water to provide such service. As a result, SMWD may defer the Chiquita Water Treatment Plant ("CWTRP") tertiary capacity until an expansion of the secondary capacity is required.

H. Landowners are willing to lease a portion of the Water to SMWD and SMWD is willing to commit to use the leased Water in providing non domestic municipal water service to the HOA Parcels and to the Investment Properties.

I. The anticipated delivery and use of the Water pursuant to this Agreement (i.e., in amounts within the range of historical patterns of water use) is consistent with the Ranch Plan in that riparian water rights will not be severed from those lands to remain as open space, and the habitat and other natural resource values associated with the open space lands will not be adversely affected.

NOW, THEREFORE, in consideration of the foregoing recitals and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. Lease of Water. Landowner members of the MWC agree to lease allocations of Water from the Landowner members of the MWC to SMWD for use as supplemental water to offset in part the new water demand generated by the HOA Parcels and Investment Properties. RMV initially seeks to deliver, and SMWD desires to receive, a minimum of four hundred (400) acre-feet of Water annually to meet the projected need for PA-1. The minimum quantity of Water to be delivered would be increased as development of other planning areas in the SJC

Watershed occurs. The minimum quantity to be delivered for each planning area will generally be as set forth in Exhibit B attached hereto. The actual minimum quantity of Water to be provided each year (the "Yearly Minimum Quantity") would be determined through the process identified in Section 7 below. For purposes of this Agreement, a "year" shall be considered as a fiscal year and shall be for that period of July 1 – June 30.

2. Delivery of Water. (a) The Water shall be delivered to SMWD at certain mutually agreed upon locations (the "RMV Service Locations") as follows: (i) in or along future Cow Camp Road between Antonio Parkway and Ortega Highway, which are near SMWD transmission facilities and RMV delivery facilities and at the SMWD hydraulic grade line for pressure zone B, as defined in the SMWD Plan of Works, pending for approval in 2011; or (ii) in other locations as the parties may mutually agree to, with appropriate adjustments in the price of the Water to account for any material differences in delivery costs (see Section 5(b) below). The RMV Service Locations along Cow Camp Road are shown on Exhibit C attached hereto. (b) Any capital improvements necessary for delivery and metering of the Water to the RMV Service Locations described above shall be at the MWC's expense. All costs, engineering and capital improvements necessary for SMWD to receive, transfer and deliver the Water from RMV Service Locations to the HOA Parcels and Investment Properties shall be the responsibility of SMWD. (c) The Water will be delivered to SMWD "as is" and RMV will not warrant or guarantee the quality of the Water except that SMWD will not be obligated to take delivery of any Water that has an iron or manganese content of more than 0.2 ppm. The parties commit to work together in good faith and to take such actions as may be reasonably necessary to achieve the foregoing threshold for iron and manganese content. (d) The parties commit to work together in good faith and to take such actions that may be reasonably necessary to meet any future regulatory requirements associated with delivering the Water to the RMV Service Locations. To the extent that the costs of delivering the Water are increased due to such regulatory requirements, the parties shall meet and attempt to agree on a mutually satisfactory cost adjustment. If the parties are unable to agree, SMWD shall have the right to terminate its use of the Water and its obligations hereunder, and RMV shall have the right to terminate its obligations hereunder. (e) The timing of delivery of the Water shall be at the discretion of SMWD as identified in Section 7 below, up to the maximum quantity to be delivered pursuant to this Agreement, so long as SMWD fulfills its obligations under this Agreement. SMWD shall accept the Water in full or partial compliance for non-domestic water requirements for applicable portions of the Ranch Plan as necessary for issuing will-serve letters for recycled water; provided all other applicable requirements for the issuance of will-serve letters are satisfied.

3. Provision of Water Service. SMWD shall use the Water as supplemental water to meet the non-domestic municipal water supply needs for the HOA Parcels and Investment Properties within PA-1 and subsequent planning areas. SMWD shall provide the Water to the HOA Parcels and Investment Properties at such time as service is requested by the owners of said parcels subject to owners meeting all rules and regulations of SMWD for provision of service. The owners of said parcels shall pay for the services based on metered use of water on the parcels at the same rates charged similar users throughout SMWD's service area.

4. Term. This Agreement shall commence on the Effective Date and shall be for a term of 25-years plus two consecutive ten-year extensions (the "Term"); provided, however, that the extensions shall only be effective if they are agreed to in writing by the parties.

5. Payments. (a) SMWD will utilize the Water as a source of nondomestic water for irrigation purposes on the HOA Parcels and Investment Properties during such periods that recycled water is not available due to the construction schedule for facilities or for other reasons. . The amount to be paid for Water to be delivered during an upcoming year shall be $701.75 per acre foot subject to an annual adjustment on July 1st commencing July 1, 2013 based on Consumer Price Index changes (CPI Adjustment) as reported in the US Department of Labor-Bureau of Labor Statistics Los Angeles-Riverside-Orange County Region-All Urban Consumers, not seasonally adjusted report. Said CPI adjustment is capped to a maximum of six percent in any annual period. [Note: If the Water is delivered to SMWD at RMV Service locations other than those in or along future Cow Camp Road (see Section 2(a) above), the applicable Water rate may be adjusted as mutually agreed upon to account for material differences in delivery costs (for additional energy, operations, etc.) to said locations and/or water pressure.] (b) Prior to July 1 of each year, SMWD shall determine its demand for Water and provide written notice to RMV of its desire for delivery of that amount of Water (the "SMWD Yearly Notice"). It is expected that the quantity of Water specified in the SMWD Yearly Notice will be equal to the Yearly Minimum Quantity specified for that year but, even if less than that quantity, the payment due shall be based on the Yearly Minimum Quantity because of the "Take or Pay" provision set forth in Section 7 below. Any request by SMWD for Water in excess of the Yearly Minimum Quantity shall be subject to Section 8 below. (c) Subject to the Take or Pay provision, payment for Water will be calculated based on the amount of Water to be purchased at the annual rate. (d) RMV shall divide each yearly payment into equal quarterly installments which shall be due and payable on the last day of September, December, March and June of each year.

6. Alternative Payments; Credits. (a) Alternative methods of payment could include a lump sum payment or payment amounts that are offset with infrastructure improvements provided by SMWD. The parties shall agree on any alternative method of payment and shall approve any proposed offsets or credits for infrastructure so as not to impact Community Facilities District ("CFD") capacities or revenues. (b) To the extent that SMWD elects not to seek reimbursement from RMV or any related or affiliated entity for payments made by SMWD to the Cucamonga Valley Water District ("CVWD") pursuant to (i) Section 2 of the "Agreement" entered into by DMB San Juan Investment North, LLC, and SMWD in March 2003 concerning the provision of a supplemental water supply for the Ranch Plan development, and (ii) parallel provisions of the associated "Water Supply Contract" subsequently entered into by SMWD and the CVWD (that Agreement and Water Supply Contract are collectively referred to hereinafter as the "Cucamonga Water Agreement"), all such payments made by SMWD and not reimbursed by RMV may be used by SMWD as a credit against its payment obligations under Section 5 above. Such credits may be accumulated by SMWD during such period of time as the Cucamonga Water Agreement continues in effect and payments are made by SMWD thereunder. (c) SMWD would also be entitled to a one-time credit against its payment obligations under Section 5 above in an amount equal to the value of the easement that exists for the Chiquita Well for services to the Chiquita Water Treatment Plant (a value to be set mutually by the parties) upon termination of that easement..

7. Minimum Quantity.

(a) As noted in Exhibit B, RMV expects to lease and deliver up to 2,500 acre-feet per year during the Term.

(b) The parties agree that the quantity shown in Exhibit B for each planning area represents the estimated amount required for build out of that planning area and that the amount shown will likely be provided in increments corresponding to the various development phases for the planning area over the development period, until the total amount shown in Exhibit B for that planning area is reached. Parties agree to review the estimated amount for build-out periodically and revise the quantities in Exhibit B to account for actual water requirements of the developments. For its part, RMV commits that the capacities of the respective portions of its delivery system will be adequate to provide the flows required to supply the specified amounts of Water.

(c) The actual Yearly Minimum Quantity which RMV is obligated to deliver to SMWD in a given SMWD fiscal year (July 1 to June 30), and which SMWD is obligated to purchase, will be agreed on by RMV and SMWD through their execution of the form attached hereto as Exhibit D ("the Yearly Notice) by May 30th of the previous fiscal year; provided, however, that the Yearly Minimum Quantity identified in a Yearly Notice for each active planning area in the year of its build-out and in each succeeding year shall be no less than the water supply quantity shown in Exhibit B for that planning area or proportionate areas thereof (unless otherwise agreed to in writing by RMV). The Yearly Notice will identify the date of commencement of development for a planning area (the "Commencement Date"), and specify the Yearly Minimum Quantities of Water for each active planning area. The Yearly Minimum Quantity for each active planning area shall be stated in a Yearly Notice for each year going forward, beginning with the year that water service for the planning area commences and continue through the Term of this Agreement. The Yearly Minimum Quantity is a reserved amount of water for SMWD. At the beginning of each fiscal year, SMWD shall identify the desired time for delivery of water by RMV to the locations identified in Section 2 above. Irrespective of SMWD accepting all, a portion, or none of the Water, SMWD shall pay for the specified Yearly Minimum Quantity each year as a "Take-or-Pay" obligation in return for RMV's reservation of that amount of water. Any amount of the Yearly Minimum Quantity not taken by SMWD shall be forfeited and shall not roll over to the next year. In the event that a Yearly Notice has not been executed by SMWD for a planning area, the Yearly Minimum Quantity for that planning area in the year of its build-out and in each succeeding year shall be the water supply amount of that planning area set forth in Exhibit B.

(d) The Yearly Minimum Quantity for any given planning area and/or development phase within a planning area may be adjusted by RMV to reflect changes in RMV's specific development plans and phasing for that planning area or phase, so long as (i) RMV provides notice to SMWD of the adjustment by May 30th of the previous fiscal year that the adjusted Yearly Minimum Quantity is to be effective, and (ii) the cumulative quantity for the combined planning areas is not exceeded.

(e) Although the minimum quantities of Water to be delivered to SMWD under this Agreement are considered reliable given RMV's historical usage, RMV shall have no liability if a force majeure event (i.e., unforeseeable causes beyond the reasonable control of and without the fault or negligence of RMV including, but not limited to, riot, earthquake or other acts of God, etc.), or seasonality effects on delivery of water (such as an extended drought that reduces the available riparian water resource below levels needed to both maintain riparian habitat values and provide all of the water required to be delivered pursuant to this Agreement), prevents the Yearly Minimum Quantity from being delivered in any given year

and, in that event, SMWD shall only be obligated to take the amount of the Yearly Minimum Quantity available for delivery in that year as determined by RMV.

(f) As noted above, the MWC holds the riparian water rights of the Landowners and the Landowners have appointed RMV as their agent regarding their allocations of Water from the MWC. The amounts of Water to be delivered to SMWD under this Agreement will be from these assigned allocations of Water and SMWD shall have the first priority to such water, subject to the provisions of subsection (e) above.

8. Maximum Quantity. In any given year, if stated in the SMWD Yearly Notice, SMWD may request an additional amount of Water above the Yearly Minimum Quantity identified in Section 7 above and RMV shall thereafter determine, in its sole discretion, whether such amount (or other amount) is available for lease. For each acre-foot of Water delivered above the Yearly Minimum Quantity, SMWD shall pay a Rate that is mutually agreed upon.

9. Legal Title to Water. SMWD acknowledges the Landowners' legal riparian right to the Water, and that SMWD has no right or claim to the Water, or any portion thereof, except as would be expressly granted pursuant to this Agreement.

10. MWC Issues. The parties acknowledge (a) that the MWC will not provide any water service to new water users (including the HOAs) created by development within the SMWD service area, (b) that water rights associated with residential and commercial parcels created within the SJC Watershed and not owned by members of the MWC will be severed from those parcels and retained by the MWC on behalf of the Landowners, (c) that the owners of these parcels from which riparian water rights have been severed will not be members of the MWC, and (d) that the MWC will not provide water to any parcel that has a will-serve letter from SMWD.

11. Remedies.

(a) Available Remedies in the Event of a Breach. Except as otherwise expressly provided in this Agreement, in the event of a material breach under this Agreement, and following exhaustion of the process set forth in Section 11(b) below, the non-breaching party shall be entitled to any and all remedies available at law or in equity, including, but not limited to (i) enforcing, by specific performance, the obligations hereunder of the breaching party; (ii) securing an appropriate injunction or other equitable relief to ensure compliance with the terms of this Agreement; (iii) seeking damages; or (iv) exercising any other rights or remedies specifically set forth herein. No party shall be required or compelled to take any action, or refrain from taking any action, other than those actions required by this Agreement.

(b) Process in the Event of Breach.

(i) Notice of Breach. Prior to commencing any lawsuit asserting a material breach of one or more obligations under this Agreement, a party shall notify the other party of the nature of the alleged breach(es) in writing and provide a written explanation of the basis for its determination.

(ii) Response to Notice of Breach. Within fifteen (15) business days of its receipt of the notice set forth in Section 11(b)(i) above, the party receiving said notice shall provide a written response to the notifying party indicating its concurrence with, or

rejection of, the determination of breach, or indicating that the alleged breach has no bearing on that party's obligations under this Agreement, as the case may be. The party receiving the notice shall also state any counterclaims that it may have against the other party.

(iii) Meet and Confer Obligation. Should the parties disagree with respect to the determination of breach of this Agreement, or the remedy necessary to cure any alleged breach, as soon as is reasonably practicable, but in no event later than ten (10) days after the receipt by the party claiming the breach of all responses by the alleged breaching party, or other mutually agreeable date, the parties shall meet and confer in good faith in an attempt to resolve any differences. Unless such delay would prejudice or otherwise harm the party claiming breach, the party shall not file a lawsuit until at least fifteen (15) days after the meet and confer process pursuant to this Section 11(b)(iii) commences.

12. Assignment. SMWD shall not assign its leasehold interest in the Water, nor any of its obligations under this Agreement, to any other party without the express written consent of RMV. RMV shall not assign its obligations under this Agreement, except to a related or affiliated entity, without SMWD's express written consent.

13. Regulatory and Other Fees and Costs. SMWD shall be responsible for obtaining and administering all regulatory and environmental approvals related to the lease and use of the Water pursuant to this Agreement, and shall assume all responsibilities for litigation activities related thereto. RMV shall assume responsibility for litigation directly challenging the formation of the MWC.

14. Pre-Existing Agreements. This Agreement shall have no effect on those letter agreements and letters of understanding previously entered into between RMV and SMWD (the "Pre-Existing Agreements") whereby certain quantities of water are provided to and/or exchanged between those parties for various uses including but not limited to Ranch agricultural operations. The Pre-Existing Agreements shall continue in effect until terminated in accordance with their respective terms.

15. Notices. All notices, requests and demands hereunder must be in writing to be effective. All notices required to be given hereunder or by operation of law in connection with the performance or enforcement hereof shall be deemed given upon delivery if delivered personally (which includes notices delivered by messenger, telecopy/facsimile [with hard copy to immediately follow] or overnight courier) or, if delivered by mail, shall be deemed given after being deposited by certified mail in any duly authorized United States mail depository, postage prepaid. All such notices shall be addressed as follows, or to such other address or addresses as the parties may from time to time specify in writing:

If to SMWD:	Santa Margarita Water District 26111 Antonio Parkway Rancho Santa Margarita, CA 92688-1993 Attn: General Manager Fax No.: (949) 459-6463
If to Landowners, RMV or MWC:	Rancho Mission Viejo, LLC 28811 Ortega Highway P.O. Box 9

San Juan Capistrano, CA 92693
Attn: Senior Vice President, Planning and Entitlement
Fax No.: (949) 248-1763

16. Miscellaneous.

(a) Successors and Assigns. This Agreement and the rights and obligations of the parties hereunder shall inure to the benefit of, and be binding upon, the parties' respective successors, permitted assigns and legal representatives.

(b) Governing Law. This Agreement shall be governed by and construed under the laws of the State of California, as such laws apply to agreements among California residents made and to be performed entirely within the State of California, without giving effect to the choice of law or conflict of law provisions (whether of the State of California or any other jurisdiction) that would cause the application of the laws of any other jurisdiction other than the State of California.

(c) No Third-Party Rights. This Agreement is entered into for the sole benefit and protection of RMV, the MWC, the Landowners and SMWD. Nothing in this Agreement shall be deemed or otherwise construed as granting any rights, benefits or interests to any other individual, entity or body.

(d) Authority and Requisite Action. The individuals executing this Agreement (the "Signatories") covenant that they have the legal power, right and authority to enter into this Agreement and the instruments referenced herein and to bind their respective principals/entities to the terms and conditions set forth herein. Furthermore, the Signatories covenant that all requisite action has been taken by their respective principals/entities in connection with the entering into of this Agreement and the instruments referenced herein, and the consummation of the transactions contemplated hereby.

(e) Entire Agreement. This writing constitutes the entire agreement among the parties, and no modification of this Agreement shall be valid unless executed in writing by the parties hereto. Further, none of the parties to this Agreement shall be bound by any representations, warranties, promises, statements, or information unless expressly set forth herein.

(f) No Waiver. The failure of any party to enforce against the other a provision of this Agreement shall not constitute a waiver of that party's right to enforce such a provision at a later time.

(g) Captions. The captions of the various Sections in this Agreement are for convenience and organization only, and are not intended to be any part of the body of this Agreement, nor are they intended to be referred to in construing the provisions of this Contract.

(h) Counterparts. This Agreement may be executed in one or more counterparts, and all the counterparts shall constitute but one and the same agreement, notwithstanding that all parties hereto are not signatories to the same or original counterpart.

(i) Attorneys' Fees. Except as otherwise provided herein, in the event of litigation involving this Agreement, the prevailing party in any such action or proceeding shall

be entitled to recover its costs and expenses incurred in such action from the other party including, without limitation, the cost of reasonable attorneys' fees.

(j) Time. Time is of the essence with respect to this Agreement and the rights, obligations, conditions and entitlements set forth herein.

(k) Exhibits. All exhibits attached to this Agreement are hereby incorporated herein.

[remainder of page intentionally blank]

IN WITNESS WHEREOF, the parties have entered into this Agreement as of the Effective Date hereof.

"LANDOWNERS"

DMB SAN JUAN INVESTMENT NORTH, L.L.C., a Delaware limited liability company

By: Rancho Mission Viejo, L.L.C., a Delaware limited liability company, as authorized agent and manager

By: _____
Anthony R. Moiso
Chief Executive Officer

By: _____
Donald L. Vodra
Chief Operating Officer

RMV MIDDLE CHIQUITA, LLC, a California limited liability company

By: Rancho Mission Viejo, L.L.C., a Delaware limited liability company, as authorized agent and manager

By: _____
Anthony R. Moiso
Chief Executive Officer

By: _____
Donald L. Vodra
Chief Operating Officer

RMV RANCH HOUSE, LLC,
a California limited liability company

By: Rancho Mission Viejo, L.L.C.,
a Delaware limited liability company,
as authorized agent and manager

By: _____
Anthony R. Moiso
Chief Executive Officer

By: _____
Donald L. Vodra
Chief Operating Officer

RMV MC INVESTMENT, LLC,
a California limited liability company

By: Rancho Mission Viejo, L.L.C.,
a Delaware limited liability company,
as authorized agent and manager

By: _____
Anthony R. Moiso
Chief Executive Officer

By: _____
Donald L. Vodra
Chief Operating Officer

RMV SAN JUAN WATERSHED, LLC,
a California limited liability company

By: Rancho Mission Viejo, L.L.C.,
a Delaware limited liability company,
as authorized agent and manager

By: _____
Anthony R. Moiso
Chief Executive Officer

By: _____
Donald L. Vodra
Chief Operating Officer

RMV COMMUNITY DEVELOPMENT, LLC,
a California limited liability company

By: Rancho Mission Viejo, L.L.C.,
a Delaware limited liability company,
as authorized agent and manager

By: _____
Anthony R. Moiso
Chief Executive Officer

By: _____
Donald L. Vodra
Chief Operating Officer

RMV HEADQUARTERS, LLC,
a California limited liability company

By: Rancho Mission Viejo, L.L.C.,
a Delaware limited liability company,
as authorized agent and manager

By: _____
Anthony R. Moiso
Chief Executive Officer

By: _____
Donald L. Vodra
Chief Operating Officer

"MWC"

RANCHO MISSION VIEJO MUTUAL WATER COMPANY, a California nonprofit mutual benefit corporation

By: Rancho Mission Viejo, L.L.C.,
a Delaware limited liability company,
as authorized agent and manager

By: _____
Anthony R. Moiso
Chief Executive Officer

By: _____
Donald L. Vodra
Chief Operating Officer

"SMWD"

SANTA MARGARITA WATER DISTRICT,
a California special district

By: _____
General Manager

Exhibit A

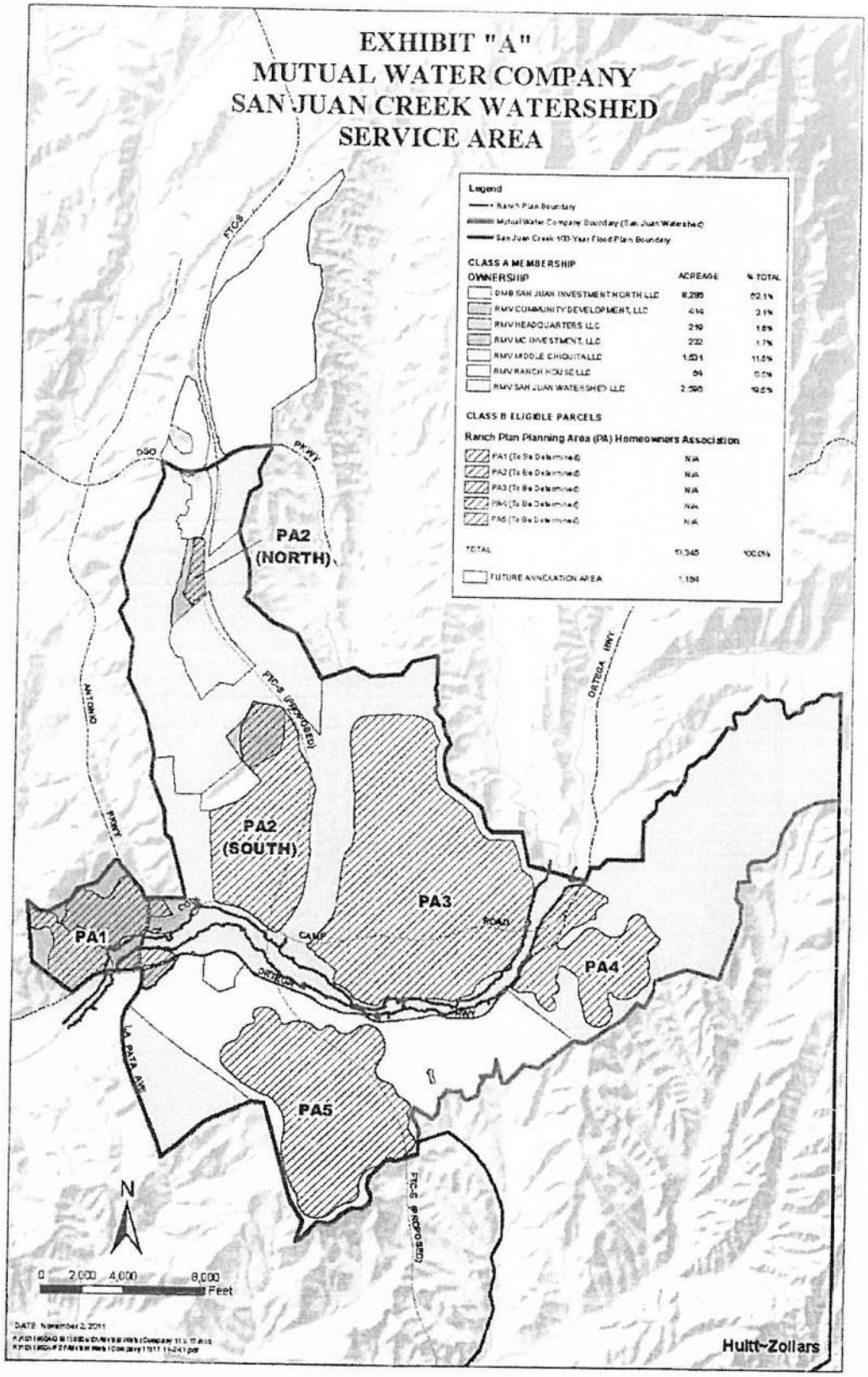
EXHIBIT "A"
MUTUAL WATER COMPANY
SAN JUAN CREEK WATERSHED
SERVICE AREA
Legend
Ranch Plan Boundary
Mutual Water Company Boundary (San Juan Watershed)
San Juan Creek 100-Year Flood Plain Boundary
CLASS A MEMBERSHIP
OWNERSHIP
ACREAGE
% TOTAL
DMB SAN JUAN INVESTMENT NORTH, LLC
8,295
62.1%
RMV COMMUNITY DEVELOPMENT, LLC
414
3.1%
RMV HEADQUARTERS LLC
210
1.6%
RMV MC INVESTMENT, LLC
232
1.7%
RMV MOULE CHIQUITA LLC
1,531
11.5%
RMV RANCH HOUSE LLC
84
0.6%
RMV SAN JUAN WATERSHED, LLC
2,596
19.5%
CLASS B ELIGIBLE PARCELS
Ranch Plan Planning Area (PA) Homeowners Association
PA1 (To Be Determined)
N/A
PA2 (To Be Determined)
N/A
PA3 (To Be Determined)
N/A
PA4 (To Be Determined)
N/A
PA5 (To Be Determined)
N/A
*TOTAL
13,345
100.0%
FUTURE ANNEXATION AREA
1,194
PA1
PA2 (NORTH)
PA2 (SOUTH)
PA3
PA4
PA5
PKWY
ANTONIO
ORTEGA HWY
CAMP
ROAD
LA PATA AVE
PTC-5 (PROPOSED)
N
0
2,000
4,000
8,000
Feet
DATE: November 2, 2011
Hultt-Zollars

Lease Amount of Supplemental Water (Riparian) by RMV for SMWD

Planning Area	Gross Development Area (Acres	Water Supply (acft/year)* ***
1**	577	400
2	895	416
3 & 4	2,721	1,131
5	1,191	553
Total:	**5,384**	**2,500**

Notes:

** Volume of water is determined by prorating 2,500 acft over the Planning Area totals for PA-1 through 5. See Exhibit A for map of MWC boundaries for SJC Watershed. Also, the proportionment of PA-4 is added to PA-3.*

*** PA-1 volume was increased by 132 acft above the prorated amount based on Planning Area total. As a result PA-3 was decreased by 132 acft from the prorated amount.*

**** Allocations of water are made on fiscal year basis. Provision of water shall be no more than 12 hours per day over minimum duration of 90 calendar days.*

Exhibit C

RMV SERVICE LOCATIONS

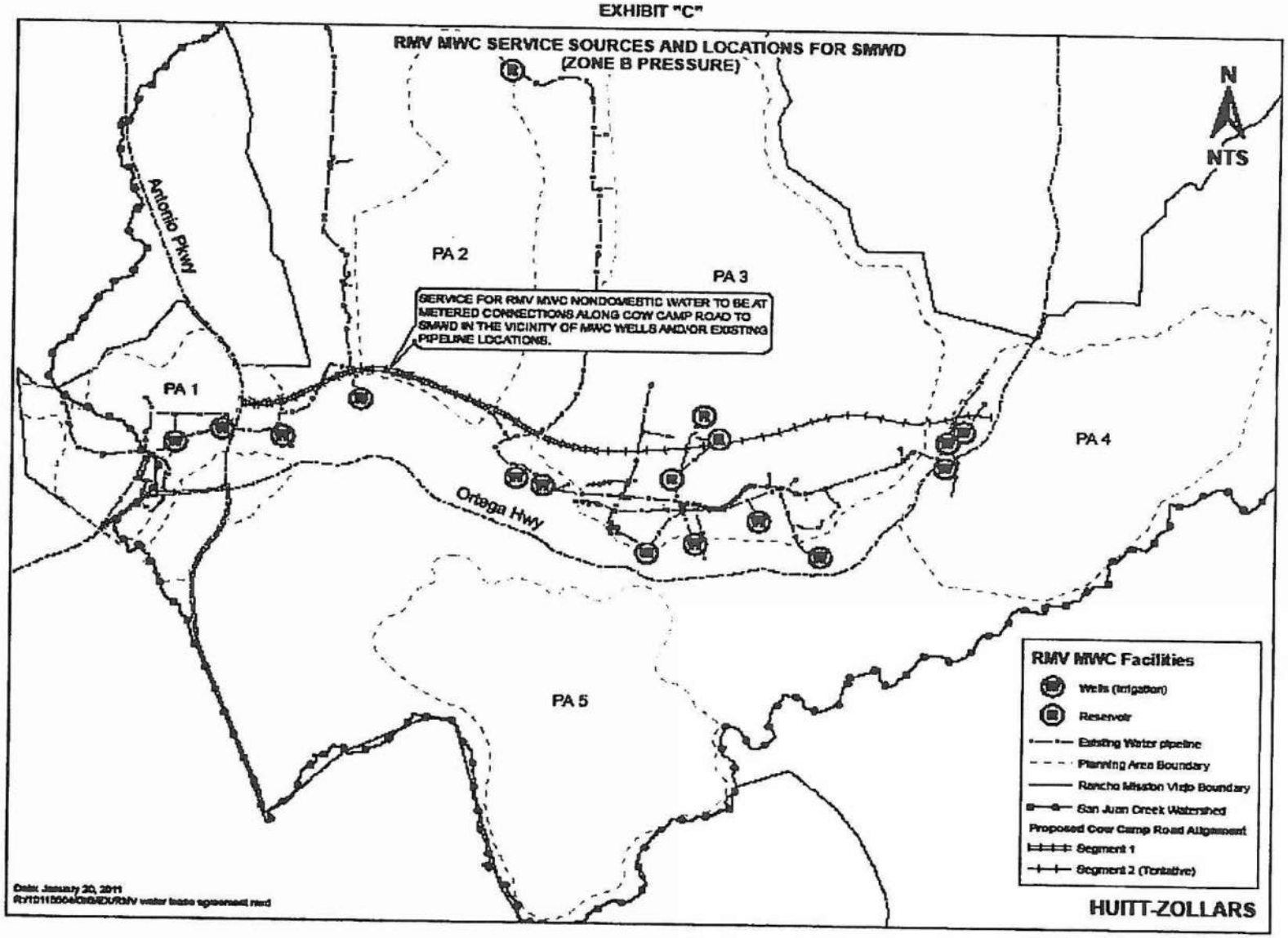

Exhibit D

[Form of Yearly Notice]

Yearly Minimum Quantity of Supplemental Water (Riparian) to be Provided by RMV for SMWD For Fiscal Year 20xx-20xx

Planning Area	Gross Development Area (Acres	Commencement Date	Water Supply (acft/year)
PA-1	577		x.xx
2	895		x.xx
3 & 4	2,721		x.xx
5	1,191		x.xx
Total:	**5,384**		**x.xx**

"RMV"

RANCHO MISSION VIEJO LLC., a Delaware limited liability company

By: _____

By: _____

"SMWD"

SANTA MARGARITA WATER DISTRICT, a California special district

By: _____