June 2021

2020 Urban Water Management Plan

2020 URBAN WATER MANAGEMENT PLAN

Prepared for:

Municipal Water District of Orange County

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Date:

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Sarina Sriboonlue, PE
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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 (MET), 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 Al Nederhood

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

Division 2 Larry D. Dick

Garden Grove, Orange, Tustin and Villa Park, and unincorporated North Tustin.

Division 3 Robert R. McVicker

Cypress, Fountain Valley, Los Alamitos, Stanton, Westminster, the western portion of Garden Grove, and nearby portions of unincorporated Orange County

Division 4 Karl W. Seckel, P.E.

Huntington Beach, Seal Beach, and portions of Costa Mesa, Irvine and Newport Beach.

Division 5 Sat Tamaribuchi

Newport Beach, Laguna Woods, portions of Irvine, Lake Forest, Laguna Hills, Aliso Viejo, and parts of Mission Viejo.

Division 6 Jeffery M. Thomas

Tustin and Rancho Santa Margarita, portions of Irvine, Lake Forest, Mission Viejo, San Juan Capistrano, and San Clemente.

Division 7 Megan Yoo Schneider, P.E.

Aliso Viejo, Dana Point, Laguna Beach, Laguna Hills, Laguna Niguel, Mission Viejo, San Clemente, and San Juan Capistrano.

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."

CONTENTS

TABLES

FIGURES

APPENDICES

Appendix A. UWMP Water Code Checklist
Appendix B. DWR Standardized Tables
B1. UWMP Submittal Tables
B2. SBx7-7 Verification and Compliance Forms
Appendix C. MWDOC's Reduced Delta Reliance Reporting
Appendix D. 2017 Basin 8-1 Alternative
Appendix E. San Juan Basin Groundwater and Facilities Management Plan
Appendix F. 2020 Adaptive Pumping Management Plan Technical Memorandum
Appendix G. Amended Main San Gabriel Basin Judgment
Appendix H. 2021 OC Water Demand Forecast for MWDOC and OCWD Technical Memorandum
Appendix I. MWDOC's 2020 Water Shortage Contingency Plan
Appendix J. Water Use Efficiency Implementation Report
Appendix K. MWDOC's Demand Management Measures
Appendix L. Notice of Public Hearing
Appendix M. Adopted UWMP and WSCP Resolutions

ACRONYMS AND ABBREVIATIONS

%	Percent
20x2020	20% water use reduction in GPCD by year 2020
ACWRF	Aliso Creek Water Reclamation Facility
ADU	Accessory Dwelling Unit
AF	Acre-Feet
AFY	Acre-Feet per Year
AVEK	Antelope Valley-East Kern
AWTP	Advanced Water Treatment Plant
AWWA	American Water Works Association
Base	Marine Corps Base, Camp Pendleton
Basin 8-1	Orange County Grounwater Basin
BEA	Basin Equity Assessment
Biops	Biological Opinions
BMP	Best Management Practice
BPP	Basin Production Percentage
BPOU	Baldwin Park Operable Unit
CDR	Center for Demographic Research
CDWC	California Domestic Water Company
CLWUE	Comprehensive Landscape Water Use Efficiency
CII	Commercial/Industrial/Institutional
COA	Coordinated Operation Agreement
CRA	Colorado River Aqueduct
CTP	Coastal Treatment Plant
CUP	Conjunctive Use Program
CVP	Central Valley Project
CWRP	Chiquita Water Reclamation Plant
DATS	Deep Aquifer Treatment System
DDW	Division of Drinking Water
Delta	Sacramento-San Joaquin River Delta
DLR	Detection Limit for Purposes of Reporting
DMM	Demand Management Measure
DOF	Department of Finance
DRA	Drought Risk Assessment
DPR	Direct Potable Reuse
DVL	Diamond Valley Lake
DWR	California Department of Water Resources
EBSD	Emerald Bay Services District
EIR	Environmental Impact Report

EOCWD	East Orange County Water District
ESA	Endangered Species Act
ET	Evapotranspiration
ETWD	El Toro Water District
FIRO	Forecast Informed Reservoir Operations
FY	Fiscal Year
GAC	Granular Activated Carbon
GAP	Green Acres Project
GIS	Geographic Information System
GPCD	Gallons per Capita per Day
GPD	Gallons per Day
GRF	Groundwater Recovery Facility
GRP	Groundwater Reliability Plan
GSA	Groundwater Sustainabiltiy Agency
GSP	Groundwater Sustainability Plan
GSWC	Golden State Water Company
GWRP	Groundwater Recovery Plant
GWRS	Groundwater Replenishment System
GWRSFE	Groundwater Replenishment System Final Expansion
HEN	High Efficiency Sprinkler Nozzle
HET	High Efficiency Toilet
ICS	Intentionally Created Surplus
IPR	Indirect Potable Reuse
IRP	Integrated Water Resources Plan
IRWD	Irvine Ranch Water District
ITP	Incidental Take Permit
JADU	Junior Accessory Dwelling Unit
LAWRP	Los Alisos Water Recycling Plant
LBCWD	Laguna Beach County Water District
LRP	Local Resources Program
M&I	Municipal and industrial
MAF	Million Acre-Feet
MAF	Million Acre-Feet per Year
MCL	Maximum Contaminant Level
Mesa Water	Mesa Water District
MET	Metropolitan Water District of Southern California
MF	Microfiltration
MGD	Million Gallons per Day
MNWD	Moulton Niguel Water District
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
OC Basin	Orange County Groundwater Basin
OC San	Orange County Sanitation District
OCWD	Orange County Water District
OCWRP	Oso Creek Water Reclamation Plant
OSY	Operating Safe Yield
PFAS	Per- and Polyfluoroalkyl Substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
Plan	Urban Water Management Plan
Poseidon	Poseidon Resources LLC
PPCP	Pharmaceuticals and Personal Care Product
PPB	Parts per Billion
PPT	Parts Per Trillion
RA	Replenishment Assessment
RDA	Resource Development Assessment
RHNA	Regional Housing Needs Assessment
RO	Reverse Osmosis
RoC on LTO	Reinitiation of Consultation for Long-Term Operations
RRWTP	Robinson Ranch Wastewater Treatment Plant
RTP	Regional Treatment Plant
RWQCB	Regional Water Quality Control Board
SARCCUP	Santa Ana River Conservation and Conjunctive Use Program
SBx7-7	Senate Bill 7 as part of the Seventh Extraordinary Session, Water Conservation Act of 2009
SCAB	South Coast Air Basin
SCAG	Southern California Associations of Governments
SCWD	South Coast Water District
SDCWA	San Diego County Water Authority
SDP	Seawater Desalination Program
Serrano	Serrano Water District
SJBA	San Juan Basin Authority
SMWD	Santa Margarita Water District
SNWA	Southern Nevada Water Authority
SOCWA	South Orange County Wastewater Authority
SWP	State Water Project
SWRCB	California State Water Resources Control Board

TAZ	Traffic Analysis Zone
TCWD	Trabuco Canyon Water District
TDS	Total Dissolved Solids
TVMWD	Three Valleys Municipal Water District
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USGVMWD	Upper San Gabriel Valley Municipal Water District
UV	Ultraviolet
UWMP	Urban Water Management Plan
UWMP Act	Urban Water Management Planning Act of 1983
VOC	Volatile Organic Compounds
WRD	Water Replenishment District of Southern California
WRF	Water Research Foundation
WRP	Water Recycling Plant
WSAP	Water Supply Allocation Plan
WSCP	Water Shortage Contingency Plan
YLWD	Yorba Linda Water District

EXECUTIVE SUMMARY

INTRODUCTION AND UWMP OVERVIEW

The Municipal Water District of Orange County (MWDOC) prepared this 2020 Urban Water Management Plan (UWMP) to submit to the California Department of Water Resources (DWR) to satisfy the UWMP Act of 1983 (UWMP Act or Act) and subsequent California Water Code (Water Code) requirements. MWDOC is a wholesale water supplier that provides water to 28 retail water suppliers in Orange County using imported water supplies obtained from its regional wholesaler, Metropolitan Water District of Southern California (MET).

UWMPs are comprehensive documents that present an evaluation of a water supplier's reliability over a long-term (20-25 year) horizon. This 2020 UWMP provides an assessment of the present and future water supply sources and demands within the MWDOC's service area. It presents an update to the 2015 UWMP on the MWDOC's water resource needs, water use efficiency programs, water reliability assessment and strategies to mitigate water shortage conditions. It also presents a new 2020 Water Shortage Contingency Plan (WSCP) designed to prepare for and respond to water shortages. This 2020 UWMP contains all elements to meet compliance of the new requirements of the Act as amended since 2015.

UWMP PREPARATION

MWDOC coordinated the preparation of this 2020 UWMP with other key entities, including MET (regional wholesaler for Southern California and the direct supplier of imported water to MWDOC), Orange County Water District (OCWD) (Orange County Groundwater Basin [OC Basin] manager and provider of recycled water in north Orange County), and retail water suppliers in Orange County which include MWDOC's 28 member agencies and the three cities which are direct members of MET – Anaheim, Fullerton, and Santa Ana. MWDOC also coordinated with other entities which provided valuable data for the analyses prepared in this UWMP, such as the Center for Demographic Research (CDR) at California State University Fullerton for population projections.

SYSTEM DESCRIPTION

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. Governed by an elected seven-member Board of Directors, MWDOC is MET's third largest member agency based on assessed valuation. Today, MWDOC manages all of Orange County's imported water supply except for water imported to the cities of Anaheim, Fullerton, and Santa Ana. MWDOC is committed to ensuring water reliability for more than 2.34 million residents in its 600-square-mile service area. Although MWDOC does not own water facilities and does not have jurisdiction over local supplies, it works to ensure the delivery of reliable water supplies to the region. MWDOC focuses on sound planning and appropriate investments in water supply, water use efficiency, regional delivery infrastructure, and emergency preparedness.

WATER USE CHARACTERIZATION

MWDOC is the wholesale provider of treated and untreated imported water from MET for municipal and industrial (M&I) uses (i.e., direct uses) and non-M&I (indirect uses e.g., groundwater recharge) within its service area.

MWDOC's service area M&I water use has consistently exceeded 400,000 acre-feet per year (AFY) until recently. Since fiscal year (FY) 2013-14, as a result of drought, retail water usage (including recycled water) began to trend downward. FY 2015-16 was the first year that water use in the MWDOC's service area dropped below 400,000 AF due to large-scale water efficiency efforts undertaken by MWDOC and member agencies.

25-year Water Use Projection

MWDOC's total service area water demands are expected to gradually increase between now and 2023 due to projected growth in M&I demands. The bulk of the increases between 2023 and 2025 are due to indirect imported demands for groundwater replenishment returning in those years 2024 and 2025. The current regulatory impacts of PFAS in the OC Basin has reduced the need for purchasing any imported groundwater replenishment water, due to reductions in groundwater pumping expected to last until 2023. Over the next 25 years, total water demands within the MWDOC service area are projected to increase by about 17% from approximately 428,000 acre-feet (AF) in 2020 to approximately 501,000 AF by 2045. This demand projection considers such factors as current and future demographics, future conservation measures, and ground and surface water needs.

CONSERVATION TARGET COMPLIANCE

MWDOC in collaboration with all its retail member agencies as well as the Cities of Anaheim, Fullerton, and Santa Ana, created the Orange County 20x2020 Regional Alliance to assist retail agencies in complying with the requirements of Water Conservation Act of 2009, also known as SBx7-7 (Senate Bill 7 as part of the Seventh Extraordinary Session). Signed into law on February 3, 2010, it requires the State of California to reduce urban water use by 20% by 2020.

Retail water suppliers are required to comply with SBx7-7 individually or as a region in collaboration with other retail water suppliers, in order to be eligible for water related state grants and loans. As a wholesale water supplier, MWDOC is not required to establish a baseline or set targets for daily per capita water use itself. Orange County, as a region, had a 2020 target water use of 159 gallons per capita per day (GPCD). The actual water use in 2020 was 109 GPCD which is well below its target. This is indicative of the collective efforts of MWDOC and retail agencies in reducing water use in the region.

WATER SUPPLY CHARACTERIZATION

Imported water from MET accounts for about 33% of MWDOC's service area water use. The other 67% is from various other sources, including groundwater from the OC Basin, groundwater from other smaller groundwater basins such as the Main San Gabriel Basin, and recycled water. The Orange County Sanitation District (OC San) and South Orange County Wastewater Authority (SOCWA) are the wastewater providers of North county and South county agencies, respectively. A few MWDOC member agencies produce their own recycled water.

WATER SERVICE RELIABILITY AND DROUGHT RISK ASSESSMENT

Every urban water supplier is required to assess the reliability of their water service to its customers under a normal year, a single dry year, and multiple dry water years. The water service reliability assessment compares projected supply to projected demand for three long-term hydrological conditions: a normal year, a single dry year, and a drought period lasting five consecutive years. MWDOC as an imported water provider relies on its wholesaler's water reliability assessments which concluded that it will be able to meet MWDOC's service area demands for imported water under normal, single-dry, and five-year consecutive dry conditions over the next 25 years (2020 – 2045).

Overall, MWDOC's service area depends on a combination of imported and local supplies to meet its service area water demands. MWDOC 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. The water supplies available to the MWDOC service area are projected to meet full-service demands based on the findings by MET in its 2020 UWMP starting 2021 through 2045 during normal years, single dry year, and five consecutively dry years.

WATER SHORTAGE CONTINGENCY PLANNING

Water shortage contingency planning is a strategic planning process that MWDOC engages to prepare for and respond to water shortages. A water shortage, when water supply available is insufficient to meet the normally expected customer water use at a given point in time, may occur due to a number of reasons, such as water supply quality changes, climate change, drought, and catastrophic events (e.g., earthquake). The MWDOC WSCP provides a water supply availability assessment and structured steps designed to respond to actual conditions. This level of detailed planning and preparation will help maintain reliable supplies and reduce the impacts of supply interruptions.

The WSCP serves as the operating manual that MWDOC will use to prevent catastrophic service disruptions through proactive, rather than reactive, mitigation of water shortages. The WSCP contains the processes and procedures that will be deployed when shortage conditions arise so that the MWDOC governing body, its staff, and its retail agencies can easily identify and efficiently implement pre-determined steps to mitigate a water shortage to the level appropriate to the degree of water shortfall anticipated.

DEMAND MANAGEMENT MEASURES

MWDOC has demonstrated its commitment to water use efficiency through multi-faceted and holistic water use efficiency programs. As a wholesaler, MWDOC facilitates implementation of DMM throughout Orange County. MWDOC's efforts focus on the following three areas: Regional Program Implementation, Local Program Assistance, and Research and Evaluation. MWDOC develops, obtains funding for, and implements regional water savings 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, maintains a consistent message to the public to use water efficiently, and provides support to retail water agencies by acting as program administrators for the region. MWDOC provides assistance on a variety of local programs including, but not limited to Water Loss Control and Management Program, Public Outreach, and Choice K-12 School Programs.

INTRODUCTION AND UWMP OVERVIEW

MWDOC prepared this 2020 UWMP to submit to the California Department of Water Resources (DWR) to satisfy the UWMP Act of 1983 (UWMP Act or Act) and subsequent California Water Code (Water Code) requirements. MWDOC is a wholesale water supplier that provides water to 28 water suppliers in Orange County using imported water supplies obtained from its regional wholesaler, Metropolitan Water District of Southern California (MET). MWDOC, as one of MET's 26 member agencies, has prepared this 2020 UWMP in collaboration with MET and its own member agencies.

UWMPs are comprehensive documents that present an evaluation of a water supplier's reliability over a long-term (20-25 year) horizon. In response to the changing climatic conditions and regulatory updates since the 2015 UWMP, MWDOC has been assisting its member agencies to manage both their water supplies and demands. The water loss audit program, water conservation measures, and efforts for increased self-reliance in order to reduce dependency on imported water from the Sacramento-San Joaquin Delta (the "Delta") are some of the water management actions that MWDOC has taken to maintain the reliability of water supply for its service area.

This 2020 UWMP provides an assessment of the present and future water supply sources and demands within the MWDOC's service area. It presents an update to the 2015 UWMP on the MWDOC's water resource needs, water use efficiency programs, water reliability assessment and strategies to mitigate water shortage conditions. It also presents a new 2020 Water Shortage Contingency Plan (WSCP) designed to prepare for and respond to water shortages. This 2020 UWMP contains all elements to meet compliance of the new requirements of the Act as amended since 2015.

1.1 Overview of Urban Water Management Plan Requirements

The UWMP Act enacted by California legislature requires every urban water supplier (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 UWMP with the DWR every five years in the years ending in six and one.

For this 2020 UWMP cycle, DWR placed emphasis on achieving improvements for long term reliability and resilience to drought and climate change in California. Legislation related to water supply planning in California has evolved to address these issues, namely Making Conservation a Way of Life [Assembly Bill (AB) 1668 and Senate Bill (SB) 606] and Water Loss Performance Standards - SB 555. New UWMP requirements in 2020 are a direct result of these new water regulations. Two complementary components were added to the 2020 UWMP. First is the WSCP to assess the Supplier's near term 5-year drought risk assessment (DRA) and provide a structured guide for the Supplier to deal with water shortages. Second is the Annual Water Supply Demand Assessment (WSDA) to assess the current year plus one dry year i.e., short-term demand/supply outlook. Analyses over near- and long-term horizons together will provide a more complete picture of Supplier's reliability and will serve to inform appropriate actions it needs to take to build up capacity over the long term.

The various key new additions in the 2020 UWMP included as a result of the most recent water regulations are:

- **Water Shortage Contingency Plan (WSCP) –** WSCP helps a Supplier to better prepare for drought conditions and provides the steps and water use efficiency measures to be taken in times of water shortage conditions. WSCP now has more prescriptive elements, including an analysis of water supply reliability; the water use efficiency measures for each of the six standard water shortage levels that correspond to water shortage percentages ranging from 0 – 10 percent to greater than 50 pecrcent; an estimate of potential to close supply gap for each measure; protocols and procedures to communicate identified actions for any current or predicted water shortage conditions; procedures for an annual water supply and demand assessment; monitoring and reporting requirements to determine customer compliance; and reevaluation and improvement procedures for evaluating the WSCP.
- **Drought Risk Assessment –** Suppliers are now required to compare their total water use and supply projections and conduct a reliability assessment of all their sources for a consecutive five-year drought period beginning 2021.
- **Five Consecutive Dry-Year Water Reliability Assessment** - The three-year multiple dry year reliability assessment in previous UWMPs has now been extended from three to five consecutive dry years to include a more comprehensive assessment of the reliability of the water sources to improve preparedness of Suppliers for extended drought conditions.
- **Seismic Risk –** The UWMP now includes a seismic risk assessment of the water supply infrastructure and a plan to mitigate any seismic risks on the water supply assets.
- **Groundwater Supplies Coordination –** The UWMP should be in accordance with the Sustainable Groundwater Management Act of 2014 and consistent with the Groundwater Sustainability Plans (GSPs), wherever applicable.
- **Lay Description** – To provide a better understanding of the UWMP to the general public, a lay description of the UWMP is included, especially summarizing the Supplier's detailed water service reliability assessment and the planned management steps and actions to mitigate any possible shortage scenarios.

1.2 UWMP Organization

This UWMP is organized into 10 main sections aligned with the DWR Guidebook recommendations. The subsections are customized to tell MWDOC's story of water supply reliability and plans to overcome any water shortages over a planning horizon of the next 25 years.

Section 1 Introduction and UWMP Overview gives an overview of the UWMP fundamentals and briefly describes the new additional requirements passed by the Legislature for 2020 UWMP.

Section 2 UWMP Preparation identifies this UWMP as an individual planning effort of MWDOC, lists the type of year and units of measure used and introduces the coordination and outreach activities conducted by MWDOC to develop this UWMP.

Section 3 System Description gives a background on MWDOC and its climate characteristics, population projections, demographics, socioeconomics, and predominant current and projected land uses of its service area.

Section 4 Water Use Characterization provides historical, current, and projected water use by customer category for the next 25 years for MWDOC and the projection methodology used by MWDOC to develop the 25-year projections**.**

Section 5 Conservation Target Compliance reports data of the Orange County Regional Alliance, which is administered by MWDOC to track the SB X7-7 water use conservation target compliance of all the retail agencies in Orange County, i.e., the member agencies of MWDOC and the cities of Anaheim, Fullerton, and Santa Ana.

Section 6 Water Supply Characterization describes the current water supply portfolio of MWDOC as well as the planned and potential water supply projects and water exchange and transfer opportunities.

Section 7 Water Service Reliability and Drought Risk Assessment assesses the reliability of MWDOC's water supply service to its customers for a normal year, single dry year and five consecutive dry years scenarios. This section also includes a DRA of all the supply sources for a consecutive five-year drought period beginning 2021.

Section 8 Water Shortage Contingency Planning is a brief summary of the standalone WSCP document which provides a structured guide for MWDOC to deal with water shortages, incorporating prescriptive information and standardized action levels, lists the appropriate actions and water use efficiency measures to be taken to ensure water supply reliability in times of water shortage conditions, along with implementation actions in the event of a catastrophic supply interruption.

Section 9 Demand Management Measures provides a description of the MWDOC's current and planned measures and programs to help the retail customers in its service area comply with their SB X7-7 water use conservation targets.

Section 10 Plan Adoption, Submittal, and Implementation provides a record of the process MWDOC followed to adopt and implement its UWMP.

UWMP PREPARATION

MWDOC's 2020 UWMP is an individual UWMP for MWDOC to meet the California Water Code (Water Code) compliance as a wholesale water supplier. While MWDOC opted to prepare its own UWMP and meet Water Code compliance individually, the development of this UWMP involved close coordination with its member agencies, its wholesale supplier MET, along with other key entities within the region.

2.1 Individual Planning and Compliance

MWDOC opted to prepare its own UWMP (Table 2-1) and comply with the Water Code individually, while closely coordinating with MET and various key entities as discussed in Section 2.2 to ensure regional integration. The UWMP Checklist was completed to confirm the compliance of this UWMP with the Water Code (Appendix A). All of DWR standardized tables are provided in Appendix B.

Generally, MWDOC and the majority of its retail member agencies selected to report demands and supplies using fiscal year as the basis (Table 2-2).

Table 2-1: Plan Identification

DWR Submittal Table 2-2: 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 2-2: Supplier Identification

DWR Submittal Table 2-3: Supplier Identification	
Type of Supplier (select one or both)	
☑	Supplier is a wholesaler
☐	Supplier 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 *	
Unit	AF
**** Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.*	
NOTES: The energy intensity data is reported in calendar year consistent with the Greenhouse Gas Protocol.	

2.2 Coordination and Outreach

2.2.1 Integration with Other Planning Efforts

MWDOC, as the wholesale water supplier, coordinated this UWMP preparation with other key entities, including MET (regional wholesaler for Southern California and the direct supplier of imported water to MWDOC), Orange County Water District (OCWD) (OC Groundwater Basin [OC Basin or Basin 8-1] manager and provider of recycled water in north OC), and retail water suppliers in OC which include MWDOC's 28 member agencies and the three cities which are direct members of MET – Anaheim, Fullerton, and Santa Ana. MWDOC also coordinated with other entities which provided valuable data for the analyses prepared in this UWMP, such as the Center for Demographic Research (CDR) at California State University Fullerton for population projections.

Some of the key planning and reporting documents that were used to develop this UWMP are:

- **MET's 2020 Integrated Water Resources Plan (IRP)** (In progress) is a long-term planning document to ensure water supply availability in Southern California and provides a basis for water supply reliability in Orange County.
- **MET's 2020 UWMP** was developed as a part of the 2020 IRP planning process and was used by MWDOC as another basis for the projections of supply capability of the imported water received from MET.
- **MET's 2020 WSCP** provides a water supply availability assessment and guide for MET's intended actions during water shortage conditions, which determine MWDOC's shortage conditions.
- **MWDOC's 2020 WSCP** provides a water supply availability assessment and structured steps designed to respond to actual conditions that will help maintain reliable supplies and reduce the impacts of supply interruptions.
- **2021 OC Water Demand Forecast for MWDOC and OCWD Technical Memorandum (Demand Forecast TM)** provides the basis for water demand projections for the MWDOC's service area.
- **OCWD's Groundwater Reliability Plan (GRP)** (to be finalized after July 2021) provides the latest information on groundwater management and supply projection for the OC Basin, the primary source of groundwater for 19 retail water suppliers in OC.
- **OCWD's 2019-20 Engineer's Report** provides information on the groundwater conditions and basin utilization of the OC Basin.
- **2017 Basin 8-1 Alternative** is an alternative to the GSP for the OC Basin and provides significant information related to sustainable management of the basin in the past and hydrogeology of the basin, including groundwater quality and basin characteristics.
- **Hazard Mitigation Plan** provides the basis for the seismic risk analysis of the water system facilities.
- **Orange County Local Agency Formation Commission's 2020 Municipal Service Review for MWDOC Report** provides comprehensive review of the municipal services provided by MWDOC.
- **Water Master Plans and Sewer Master Plans** of the cities and counties serving within the MWDOC's service area provide information on water infrastructure planning projects and plans to address any required water system improvements.
- **Groundwater Management Plans** provide the groundwater sustainability goals for the basins in the MWDOC's service area and the programs, actions, and strategies activities that support those goals.

Statewide Water Planning

In addition to regional coordination with various agencies described above, MWDOC as a MET member agency is currently a part of MET's statewide planning effort to reduce reliance on the water imported from the Delta.

It is the policy of the State of California 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. This policy is codified through the Delta Stewardship Council's Delta Plan Policy WR P1 and is measured through Supplier reporting in each Urban Water Management Planning cycle. WR P1 is relevant to water suppliers that plan to participate in multi-year water transfers, conveyance facilities, or new diversions in the Delta.

Through significant local and regional 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, MWDOC has demonstrated a reduction in Delta reliance and a subsequent improvement in regional self-reliance. For a detailed description and documentation of MWDOC's consistency with Delta Plan Policy WR P1 see Section 7.4 and Appendix C.

2.2.2 Wholesale and Retail Coordination

All MWDOC retail member agencies developed their UWMPs in conjunction with MWDOC's UWMP. Per the Water Code requirements to help its retail customers develop their own UWMPs, MWDOC facilitated the projections of the water demand by retail agency and supply that will be available from MWDOC over the next 25 years. Table 2-3 lists these retail water suppliers.

As the local wholesale supplier of imported water, MWDOC represents the interests of all but three OC retail water suppliers at MET and administers various regional programs and measures to help its retail customers meet various State requirement compliance, such as the OC Regional Alliance for SB x7-7 compliance, regional water loss program for SB 555 compliance, and regional water use efficiency programs. Sections 5 and 9 provide detailed information on these programs. While MWDOC assists retail member agencies in meeting requirements, the agencies also administer and operate their own programs to meet State requirement compliance, with more detail on these programs to be found in their respective UWMPs.

Table 2-3: Wholesale: Water Supplier Information Exchange

DWR Submittal Table 2-4 Wholesale: Water Supplier Information Exchange	
☑	Supplier has informed more than 10 other water suppliers of water supplies available in accordance with Water Code Section 10631. Completion of the table below is optional. If not completed, include a list of the water suppliers that were informed.
Section 3-2 (Page 3-5)	**Provide page number for location of the list.**
☐	Supplier has informed 10 or fewer other water suppliers of water supplies available in accordance with Water Code Section 10631. **Complete the table below.**
NOTES:	

2.2.3 Public Participation

For further coordination with other key agencies and to encourage public participation in the review and update of this Plan, MWDOC held a public hearing and notified key entities and the public per the Water Code requirements. Sections 10.2 and 10.3 describe these efforts in detail. In addition, due to the diverse population that MWDOC serves, there was a Spanish translator available at the public hearing to assist any members of the public wishing to participate in the public hearing process that may need that service.

SYSTEM DESCRIPTION

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. Governed by an elected seven-member Board of Directors, MWDOC is MET's third largest member agency based on assessed valuation.

MWDOC is a regional water wholesaler and resource planning agency, managing all of OC's imported water supply except for water imported to the cities of Anaheim, Fullerton, and Santa Ana. MWDOC is committed to ensuring water reliability for more than 2.34 million residents in its 600-square-mile service area. To that end, MWDOC focuses on sound planning and appropriate investments in water supply, water use efficiency, regional delivery infrastructure, and emergency preparedness.

Lying in the South Coast Air Basin (SCAB), its climate is characterized by southern California's "Mediterranean" climate with mild winters, warm summers and moderate rainfall. In terms of land use, MWDOC's service area in the North OC is almost built out with predominantly residential units with pockets dedicated to commercial, institutional, governmental uses and open space and parks and the existing vacant lots in South OC are gradually transitioning to residential and commercial mixed-use areas. The current population of 2,342,740 is projected to increase by 8% over the next 25 years.

3.1 Agency Overview

This section provides information on the formation and history of MWDOC, its organizational structure, roles, and objectives.

3.1.1 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 MET. 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.

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

3.1.2 MWDOC Board of Directors

MWDOC is governed by an elected seven-member Board of Directors, with each board member elected from 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 3-1.

Each director is a member of at least one of the following standing committees: Planning and Operations; Administration and Finance; and Executive. 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 MET issues the first Wednesday of the month.

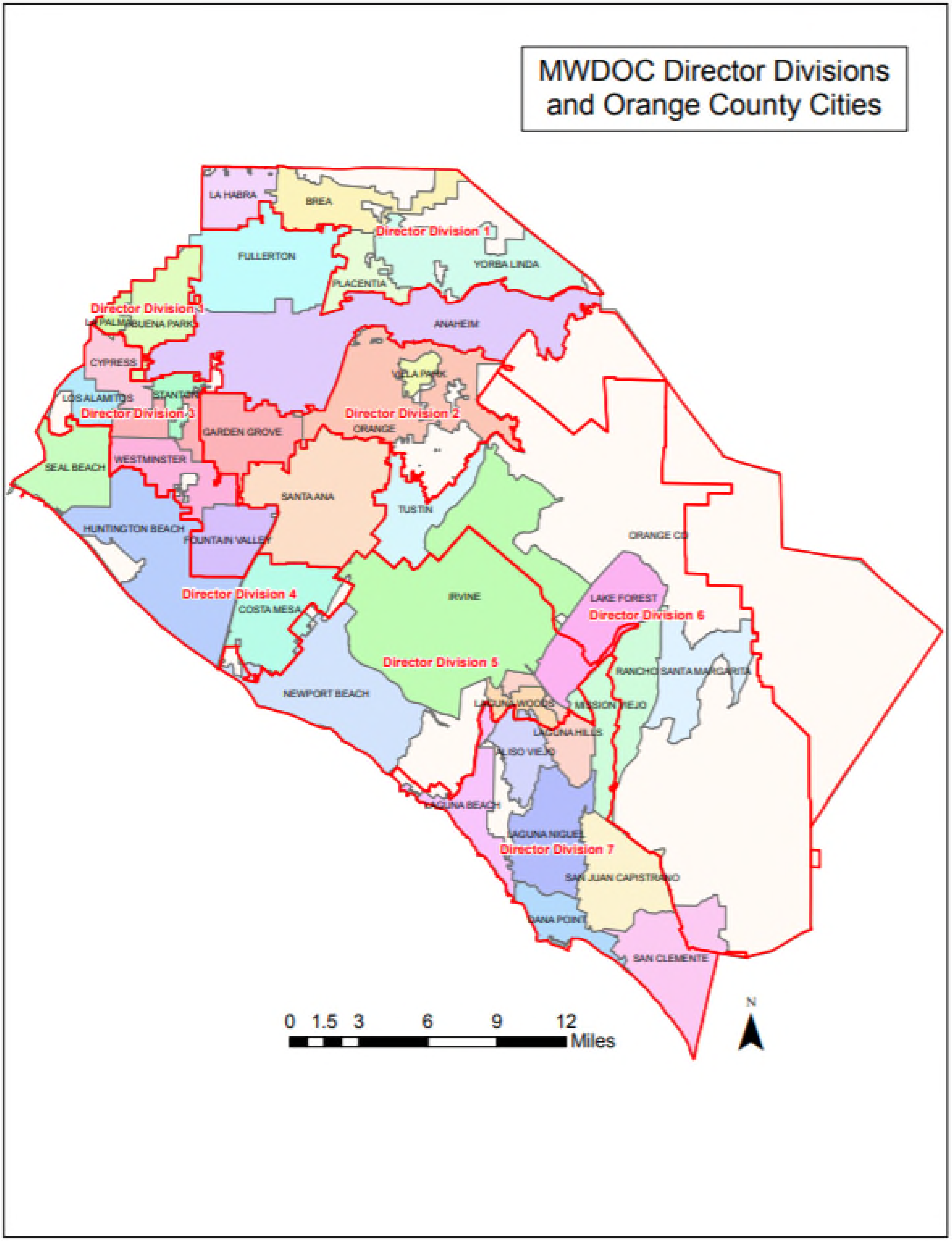


Figure 3-1: MWDOC Board of Directors Map, by Director Division

3.1.3 Relationship to MET

MWDOC became a member agency of MET in 1951 to bring supplemental imported water supplies to parts of Orange County. MET 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. MET's two main sources of supply are the Colorado River and the 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 MET and sells the water to its 28 member agencies, which provide retail water services to the public.

3.1.4 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 MET;
- Inform its directors and its retail agencies about MET issues;
- Collaborate with MET in its planning efforts and act as a resource of information and advocate for our retail agencies;
- Purchase water from MET and represent the interest of our service area at MET;
- 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 at an economy-of-scale that the retail agencies cannot reasonably provide as single entities.

Since 1991, MWDOC has offered educational classes, water use surveys, and a variety of consumer incentives for indoor and outdoor water-efficient devices for all residents and businesses throughout Orange County. Through the program, MWDOC provides a wide variety of water saving rebates and programs to residential, commercial, industrial, and institutional customers. MWDOC's programs have resulted in the conservation of more than 17.1 billion gallons of water each year.

For nearly five decades, MWDOC's Water Education programs have reached millions of Orange County K-12 students. The programs are offered on behalf of and in coordination with MWDOC's retail agencies, designed to increase the public's understanding of current water issues and challenges, opportunities, and associated costs involved in securing a reliable supply of high-quality water. Additionally, as part of its multi-faceted public education effort, MWDOC sponsors the Orange County Boy Scout Council's Soil & Water Conservation Merit Badge and Orange County Girl Scouts Water Resources and Conservation Patch. These two programs, designed and hosted by MWDOC Public Affairs staff, are presented as hands-on educational clinics, reaching hundreds of children each year with impactful water-centric education.

MWDOC also develops and coordinates a substantial number of public information, education, and outreach programs and activities for adults to elevate stakeholders' awareness of current water issues that affect the region's water supply's health and reliability. These programs emphasize and encourage efficient water use and water-saving practices and offer insight into proposed policy and water reliability investments in the region's best interest.

3.2 Water Service Area

MWDOC serves more than 2.34 million residents in a 600-square-mile service area (Figure 3-2). Although MWDOC does not have its own water facilities and does not have jurisdiction over local supplies, it works to ensure the delivery of reliable water supplies to the region.

MWDOC serves imported water in Orange County to 28 water agencies. These entities, comprised of cities and water districts, are referred to as MWDOC member agencies and provide water to approximately 2.34 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
- 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)

- City of Seal Beach
- City of Tustin
- City of Westminster
- South Coast Water District (SCWD)
- Trabuco Canyon Water District (TCWD)
- Yorba Linda Water District (YLWD)

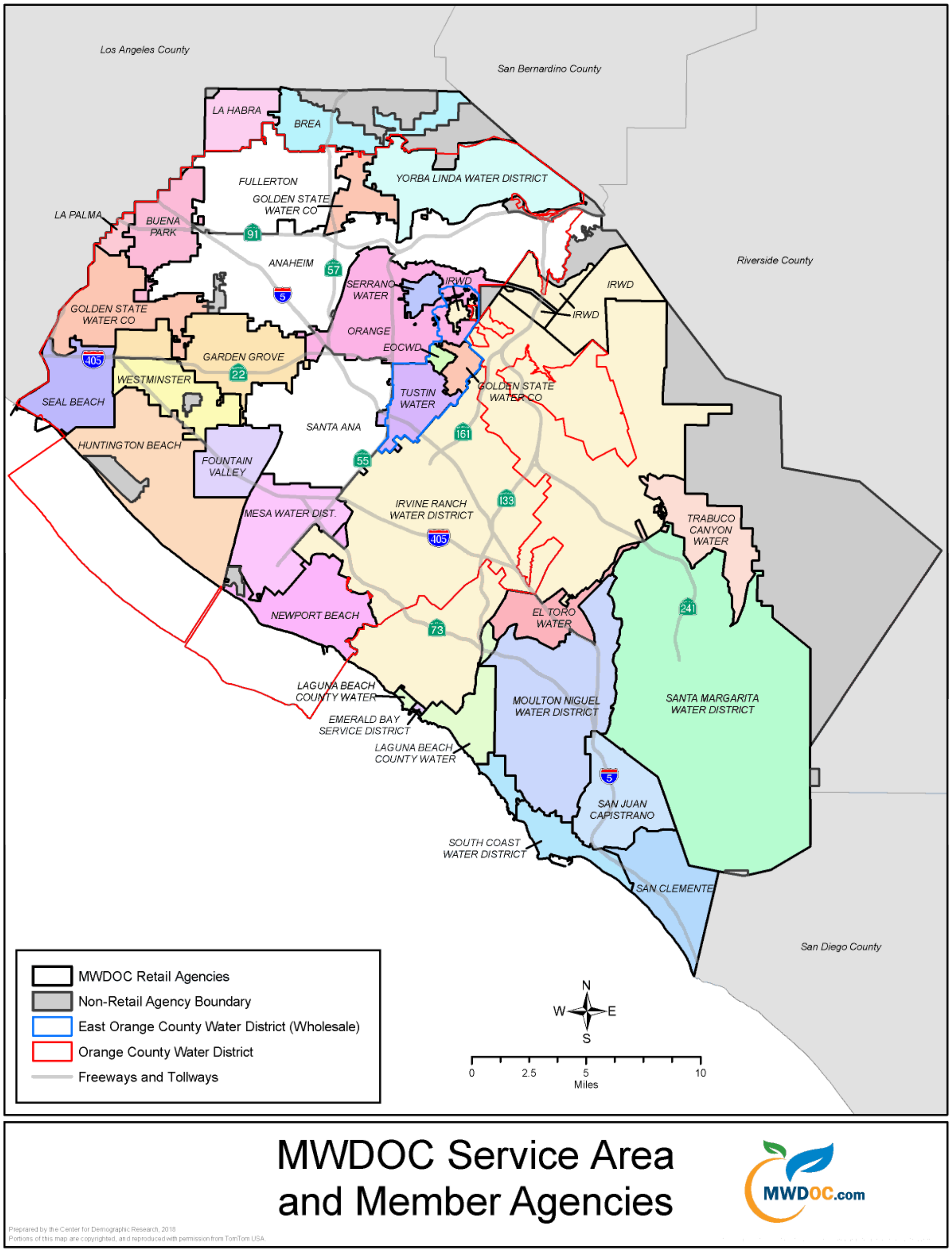


Figure 3-2: MWDOC's Water Service Area by Retail Agency

3.3 Climate

MWDOC's service area is located within the SCAB that encompasses all of OC, 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 moderate rainfall.

Local rainfall and temperature greatly influence water usage in the service area. The biggest variation in annual water demand is due to changes in rainfall and temperature. In Orange County, the average daily temperatures range from 58.2 ˚F in December and January to 75.2 ˚F in August (Table 3-1). The average annual precipitation is 13.1 inches, although the region is subject to significant variations in annual precipitation (Table 3-2). The average evapotranspiration (ET_0) is above 40 inches per year (Table 3-3) which is greater than three times the annual average rainfall.

Table 3-1: OC 30-Year Average Temperature

Orange County 30-Year Average (1991-2020) Temperature													
Orange County Temperature (°F)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Average Daily High Temperature	70.3	70.3	72.2	74.2	75.7	78.6	83.6	85.5	84.7	80.4	75.1	69.2	76.6
Average Daily Temperature	59.2	59.5	61.7	63.9	66.6	69.7	73.9	75.2	74.1	69.7	63.7	58.2	66.3
Average Daily Low Temperature	48.2	48.9	51.3	53.6	57.6	60.8	64.2	64.8	63.5	58.9	52.2	47.3	55.9
Source: NOAA Weather Station (Santa Ana Fire Station #135)													

Table 3-2: OC 30-Year Average Precipitation Orange County 30-Year Average Precipitation

Orange County 30-Year Average (1991-2020) Precipitation													
Orange County Average Precipitation (Inches)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Central Orange County	3.1	3.2	1.8	0.7	0.3	0.1	0.0	0.0	0.1	0.6	0.8	2.3	13.1
Source: County of Orange Santa Ana Rainfall Station #121 (Santa Ana Crime Lab)													

Table 3-3: OC Evapotranspiration

Orange County Evapotranspiration													
Orange County ET_o	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Laguna Beach	2.2	2.7	3.4	3.8	4.6	4.6	4.9	4.9	4.4	3.4	2.4	2.0	43.3
Irvine	2.2	2.5	3.7	4.7	5.2	5.9	6.3	6.2	4.6	3.7	2.6	2.3	49.9
NOTE: ET_o values are from Model Water Efficient Landscape Ordinance, September 10, 2009, Appendix A: Reference ET_o Table													

Although service area demands are influenced by local rainfall and temperature, the imported water supply that MWDOC provides to its member agencies is not. It should also be noted that MET's core water supplies from the SWP and the CRA are largely influenced by climate conditions in northern California and the Colorado River Basin, respectively. Both regions have variable hydrologic conditions that can significantly impact MET's water supplies. This past decade we have seen dramatic swings in annual precipitation and temperatures on the SWP. In 2014, California saw the lowest ever "Table A" State Project Water Allocation of contract supplies and two years later in 2017, experienced the highest SWP allocation since 2006. In a similar way the Colorado River Basin also experienced annual swings in hydrology; however, the multi-year drought conditions due to record low precipitation has largely been mitigated through the large volume of water Basin States have been storing in Lake Mead to maintain the system.

3.4 Population, Demographics, and Socioeconomics

3.4.1 Service Area Population

MWDOC serves a 2020 population of 2,342,740 according to CDR. MWDOC's population is composed of the sum of its 28 member agencies populations. Overall, the population is projected to increase 8 percent by 2045. Table 3-4 shows the population projections in five-year increments out to the year 2045 within MWDOC's service area.

Table 3-4: Wholesale: Population - Current and Projected

DWR Submittal Table 3-1 Wholesale: Population - Current and Projected						
Population Served	2020	2025	2030	2035	2040	2045
	2,342,740	2,411,727	2,473,392	2,518,117	2,532,393	2,530,621
NOTES: Source - Center for Demographic Research at California State University, Fullerton, 2020						

3.4.2 Demographics and Socioeconomics

Generally, housing within MWDOC's service area is becoming denser with addition of new 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. As shown below in Table 3-5, the total number of dwelling units in the MWDOC service area is expected to increase by 7.4 percent in the next 25 years from 870,800 in 2020 to 934,984 in 2045.

Table 3-5: MWDOC Service Area Dwelling Units by Type

MWDOC Service Area Dwelling Units by Type						
Dwelling Units	2020	2025	2030	2035	2040	2045
Total	**870,800**	**894,953**	**906,206**	**921,751**	**927,884**	**934,984**
Single Family	435,011	438,288	440,878	444,562	445,293	445,872
All Other*	435,789	456,665	465,328	477,189	482,591	489,112
Source: Center for Demographic Research at California State University, Fullerton, 2020 *Includes duplex, triplex, apartment, condo, townhouse, mobile home, etc. Yachts, houseboats, recreational vehicles, vans, etc. are included if is primary place of residence. Does not include group quartered units, cars, railroad box cars, etc.						

In addition to the types and proportions of dwelling units, various socio-economic factors such as age distribution, education levels, general health status, income and poverty levels affect MWDOC's water management and planning. Based on the U.S. Census Bureau's QuickFacts, OC has about 15.3 percent of population of 65 years and over, 21.7 percent under the age of 18 years and 5.8 percent under the age of 5 years. 85.5 percent of the OC's population with an age of more than 25 years has a minimum of high school graduate and 40.6 percent of this age group has at least a bachelor's degree.

3.4.3 CDR Projection Methodology

MWDOC contracts with CDR to update the historic population estimates for 2010 to the current year and provide an annual estimate of population served by each of its retail water suppliers within its service area. CDR uses geographic information system (GIS) mapping and data from the 2000 and 2010 U.S. Decennial Censuses, State Department of Finance (DOF) population estimates, and the CDR annual population estimates. These annual estimates incorporate annual revisions to the DOF annual population estimates, often for every year back to the most recent Decennial Census. As a result, all previous estimates were set aside and replaced with the most current set of annual estimates. Annexations and boundary changes for water suppliers are incorporated into these annual estimates.

In the summer of 2020, projections by water supplier for population and dwelling units by type were estimated using the 2018 Orange County Projections dataset. Growth for each of the five-year increments was allocated using GIS and a review of the traffic analysis zones (TAZ) with a 2019 aerial photo. The growth was added to the 2020 estimates by water supplier.

3.5 Land Uses

3.5.1 Current Land Uses

Land use within the service area of MWDOC is primarily residential. Based on the zoning designation collected and aggregated by Southern California Association of Governments (SCAG) in 2018 the current land use within the MWDOC's service area can be categorized as follows:

- Single family residential – 23.6%
- Multi-family residential – 7.3%
- Agriculture – 1.6%
- Commercial – 5.6%
- Industrial – 4.1%
- Institutional/Governmental – 7.1%
- Open space and parks – 32.6%
- Other – 17.2% (e.g., Undevelopable or Protected Land, Water, and Vacant)
- No land use designations – 0.9%

3.5.2 Projected Land Uses

Land uses in North OC and South OC are both predominantly residential. North OC is substantially built out, with a majority residential land uses with some mixed-use areas dedicated to commercial, institutional, and governmental uses. Future developments planned in North OC are mainly redevelopment and infill projects. South OC has a greater potential for development, with vacant areas gradually transitioning to residential and commercial mixed-use areas.

Moving forward, the following requirements and changes in laws will impact the future land use in OC:

- **Regional Housing Needs Assessment (RHNA)** - State law requires jurisdictions to provide their share of the RHNA allocation. SCAG determines the housing growth needs by income for local jurisdictions through RHNA. The cities will continue planning to meet their RHNA allocation requirements.
- **Accessory Dwelling Units (ADUs)** – ADUs are separate small dwellings embedded within residential properties. There has been an increase in the construction of ADUs in California in response to the rise in interest to provide affordable housing supply. The Legislature updated the ADU law effective January 1, 2020 to clarify and improve various provisions to promote the development of ADUs. (AB-881, "Accessory dwelling units," and AB-68, "Land use: accessory dwelling units") These include:
    - allowing ADUs and Junior Accessory Dwelling Units (JADUs) to be built concurrently with a single-family dwelling. JADUs max size is 500 sf.
    - opening areas where ADUs can be created to include all zoning districts that allow single-family and multi-family uses
    - maximum size cannot be less than 850 sf for a one-bedroom ADU or 1,000 sf for more than one bedroom (California Department of Housing and Community Development, 2020)

About 92% of the ADUs in California are being built in the single-family zoned parcels (University of California Berkeley, 2020). The increase in ADUs implies an increase in number of people per dwelling unit which translates to higher water demand.

WATER USE CHARACTERIZATION

4.1 Water Use Overview

One of the main objectives of this UWMP is to provide an insight into MWDOC's service area's future water demands. This section describes MWDOC's service area's current and future water demands (direct and indirect), factors that influence demands, and the methodology used to forecast of future water demands over the next 25 years.

As shown in Figure 4-1 and Table 4-1, MWDOC's service area's total water use was 427,701AF in Fiscal Year (FY) 2019-20. MWDOC is the wholesale provider of imported water that provides treated and untreated water from MET for municipal and industrial (M&I) (direct uses) and non-M&I (indirect uses) within its service area. MWDOC member agencies also use water from various other sources, including the OC Basin (managed by OCWD) and other smaller groundwater basins such as the Main San Gabriel Basin. OC San and South Orange County Wastewater Authority (SOCWA) are the wastewater providers of North county and South county agencies, respectively. A few MWDOC member agencies produce their own recycled water.

4.2 Past and Current Water Use

As shown below, MWDOC's service area's retail M&I total water usage has consistently exceeded 400,000 AFY until recently (Figure 4-1). Since FY 2013-14, retail water usage (including recycled water) has begun to trend downward, and FY 2015-16 was the first year that water use dropped below 400,000 AF. Nevertheless, MWDOC's service area population has continued to grow over the past 30 years (Figure 4-1). This trend is likely due to large-scale water efficiency efforts undertaken by MWDOC and its member agencies.

Note that FYs 2011-12 to 2015-16 represent the driest five-consecutive year historic sequence for MWDOC's service area water supply. This period included the driest four-year statewide precipitation on record (2012-15) and the smallest Sierra-Cascades snowpack on record (2015, with 5 percent of average). It was marked by extraordinary heat: 2014, 2015 and 2016 were California's first, second and third warmest year in terms of statewide average temperatures. Locally, Orange County rainfall for the five-year period totaled 36 inches, the driest on record. As a result, State mandated conservation goals were issued to retail water agencies throughout the state with the aim of reducing statewide water use by 25% as compared to the FY 2013-14 baseline.

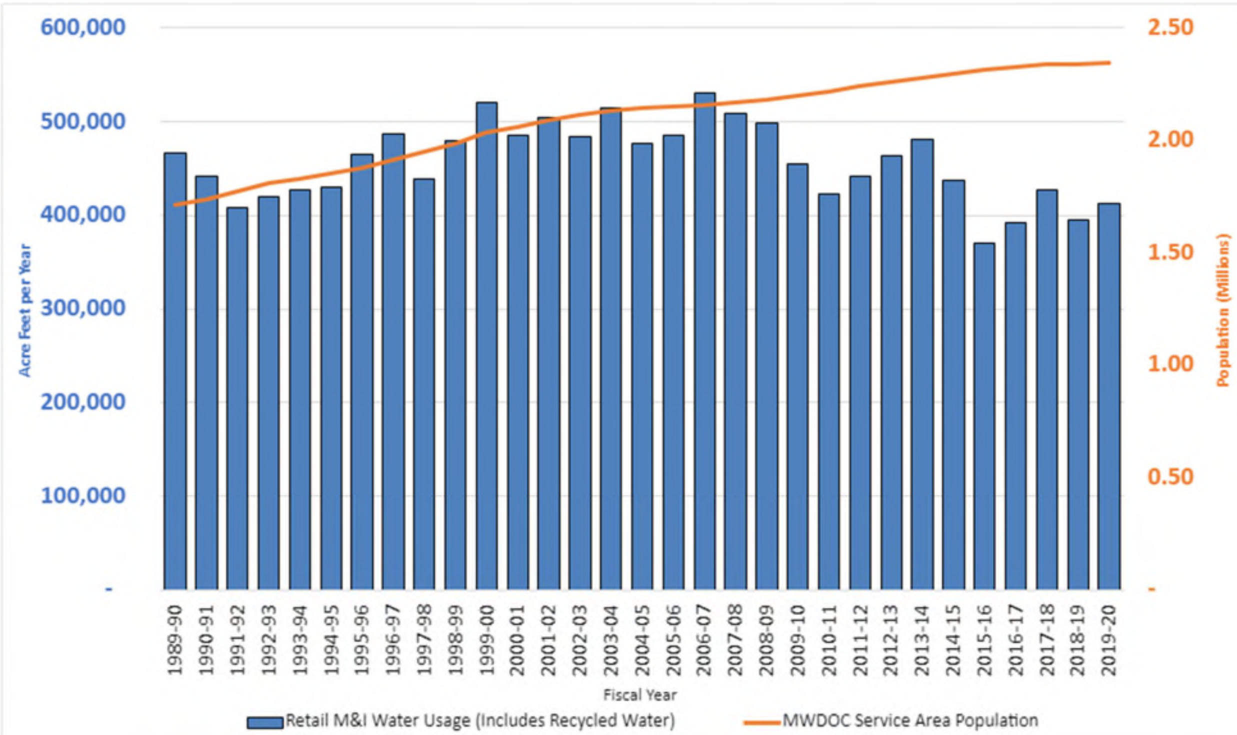


Figure 4-1: MWDOC's Service Area Historical Water Use and Population

Integrating M&I (direct) and non-M&I (indirect) 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. Table 4-1 presents MWDOC's service area existing and future water use by source for these two types of uses separately. MWDOC's service area total water usage in FY 2019-20 was 427,701 AF; direct (M&I) usage accounted for 409,025 AF of that total (95.6%), while indirect (non M&I) uses accounted for the remainder (Table 4-1). The total usage was met through a combination of groundwater, imported water, surface water, and recycled water (Table 4-1**).** In FY 2019-20, about 45% of the total demand was met through OC Basin ground water.

Of note, while total water usage of all water sources is important to understand, MWDOC is the wholesale provider of only imported (untreated & treated) water from MET. In FY 2019-20, 161,555 AF of the total water demand was water from MET used for either direct or indirect uses (Table 4-2).

M&I treated and untreated imported water accounts for 33.4% of MWDOC's service area's total water use. 9.9% of total water use is recycled (non-potable) water that retail agencies use directly for M&I uses. Non M&I applications of MET water include groundwater replenishment (18,027 AF in FY 2019-20) and Irvine Lake fill (649 AF in FY 2019-20). Remaining contributions are detailed in Table 4-1.

Based on the Demand Forecast TM (Appendix H) methodology, MWDOC's service area's total water demands (by source) for the next 25 years are also shown in Table 4-1. By 2045, total water demand is projected to be 501,394 AF, a 17.2% increase (as compared to 2020 actuals). OC Basin groundwater is expected to continue providing a notable percentage of total water demand between 2020 and 2045 (roughly 47.1% in 2045).

Table 4-1: MWDOC's Service Area Existing and Future Water Use by Source

MWDOC Service Area Water Supply Projections (AF)						
Water Source	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
OCWD Basin GW[1]	192,652	231,936	236,430	236,506	236,280	236,274
Non-OCWD GW[1]	21,267	22,734	24,747	24,763	24,740	24,890
Recycled Water[1]	42,330	52,017	53,891	56,926	57,043	57,094
Surface Water[1]	9,897	4,700	4,700	4,700	4,700	4,700
MET (Retail M&I)[2]	142,879	119,743	120,573	123,502	123,107	122,819
Total M&I Demand	**409,025**	**431,130**	**440,341**	**446,397**	**445,870**	**445,777**
MET Irvine Lake Fill (Non-M&I)[2]	649	4,017	4,017	4,017	4,017	4,017
MET GW Replenishment (Non-M&I)[2,3]	18,027	51,600	51,600	51,600	51,600	51,600
Total non- M&I Demand	**18,676**	**55,617**	**55,617**	**55,617**	**55,617**	**55,617**
Total Water Demand	**427,701**	**486,747**	**495,958**	**502,014**	**501,487**	**501,394**

NOTES:

[1] Agency usage from various sources including OC Basin (managed by OCWD) and other smaller groundwater basins. OCWD and South Orange County Wastewater Authority (SOCWA) are the wastewater providers of North county and South county agencies, respectively. A few MWDOC member agencies produce their own recycled water.

[2] MWDOC is the wholesale provider of imported water that provides treated and untreated water from MET for M&I (direct) and non-M&I (indirect) uses within its service area.

[3] Includes indirect use which are Cyclic Program, Groundwater replenishment, and seawater barrier water.

MWDOC's wholesale demands for potable and non-potable water in 2020 totaled 161,555 AF (Table 4-2). Sales to agencies (treated and untreated imported water) comprised 88.4% of the total volume. Untreated imported water for groundwater recharge comprised 11.2%, and untreated import water for surface storage comprised 0.4% (Table 4-2). This table only includes water (potable and non-potable) that is purchased from MET and sold by MWDOC to their retail agencies and OCWD.

Table 4-2 Wholesale: Demands for Potable and Non-Potable Water – Actual

DWR Submittal Table 4-1 Wholesale: Demands for Potable and Non-Potable Water - Actual			
Use Type	2020 Actual		
	Additional Description	Level of Treatment When Delivered	Volume (AF)*
Sales to other agencies	MWD Treated and Untreated Imported Water	Drinking Water	142,879
Groundwater recharge	Untreated Import Water for Groundwater Recharge + Sea Water Barrier	Raw Water	18,027
Other Potable	Untreated Import Water for Surface Storage	Raw Water	649
		TOTAL:	161,555
**** Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.*			
NOTES:			

4.2.1 Direct (M&I) Use – Municipal/Industrial and Agricultural Demands

Direct water use in Orange County includes municipal, industrial, and agricultural use. It represents, based on a 10-year average, approximately 81 percent of MWDOC's service area 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.

4.2.2 Indirect (non-M&I) Use – Replenishment/Barrier and Surface Water Demands

Indirect water use in Orange County includes water to replenish groundwater basins and to serve as a barrier against seawater intrusion. It represents, based on a 10-year average, 19 percent of MWDOC's total demands. Most, if not all of the indirect water use delivered is for managing and replenishing the OC Basin. This water is purchased by OCWD, a special district created by the state and governed by a ten-member Board of Directors to protect, manage, and replenish the OC 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 MET; 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 purposes and water storage. Imported water delivered into Irvine Lake can be held for short or long periods of time to be later delivered for consumptive use. Based on a 10-year average, surface water supplies total 4,000 acre-feet per year (AFY) in Irvine Lake.

Figure 4-2 shows the historical demand of imported water for indirect consumption in MWDOC's service area. Since 2011, groundwater replenishment comprised much of the indirect water demands.
In FY 2019-20, this trend changed due to lower demands for groundwater, and thereby replenishment, primarily due to contamination of the groundwater basin from PFAS. In FY 2017-18, total demand for indirect imported water was higher than average due to an increase in in-lieu water deliveries because of the significant amount of imported water MET received due to the historical amounts of rainfall/snowfall in Northern California.

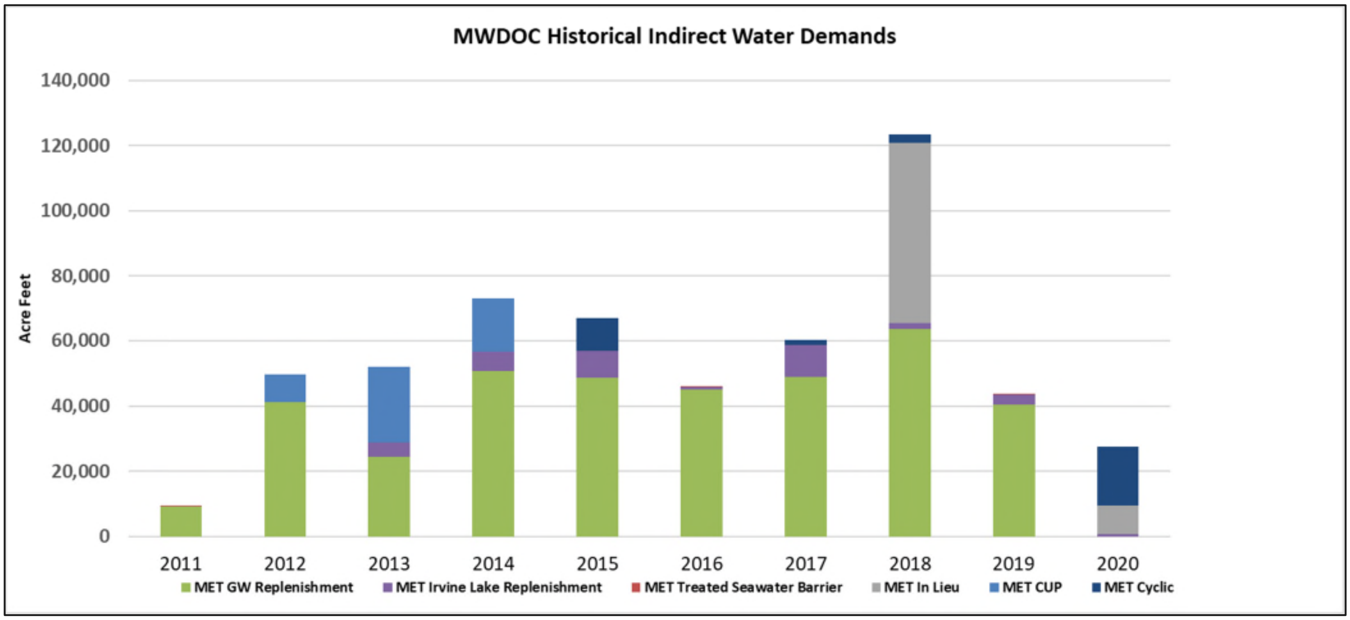


Figure 4-2: MWDOC's Historical Imported Water Use for Indirect Consumption

4.3 Water Use Projections

4.3.1 Water Use Projection Methodology

In 2021, MWDOC and OCWD, in collaboration with their member agencies, led the effort to update water demand projections originally done as part of the 2021 OC Water Demand Forecast for MWDOC and OCWD. The updated demand projections, prepared by CDM Smith, were for the Orange County region as a whole, and provided retail agency specific demands. The projections span the years of 2025-2050 and are based upon information surveyed from each Orange County water agency. Appendix H presents details of the projection methodology.

The forecast methodology began with a retail water agency survey that asked for FY 2017-18, FY 2018-19 and FY 2019-20 water use by major sector, including number of accounts. If a member agency provided recycled water to customers that information was also requested. Given that FY 2017-18 was a slightly above-normal demand year (warmer/drier than average) and FY 2018-19 was a slightly below-normal demand year (cooler/wetter than average), water use from these two years were averaged to represent an average-year base water demand.

For the residential sectors (single-family and multifamily) the base year water demand was divided by households in order to get a total per unit water use (gallons per home per day). In order to split household water use into indoor and outdoor uses, three sources of information were used, along with CDM Smith's expertise. The sources of information included: (1) *the Residential End Uses of Water* (Water Research Foundation, 2016); (2) California's plumbing codes and landscape ordinances; and (3) CA DWR's Model Water Efficient Landscape Ordinance (MWELO) calculator.

Three different periods of residential end uses of water were analyzed as follows:

- **Pre-2010 efficiency levels** – Has an average indoor water use that is considered to be moderately efficient, also does not include the most recent requirements for MWELO.
- **High-efficiency levels** – Includes the most recent plumbing codes that are considered to be highly efficient, and also includes the most recent requirements for MWELO.
- **Current average efficiency levels** – Represents the weighted average between pre-2010 efficiency and high efficiency levels, based on average age of homes for each retail water agency.

For outdoor residential water use, the indoor per capita total was multiplied by each member agency-specific persons per household in order to get an indoor residential household water use (gallons per day per home), and then was subtracted from the base year total household water use for single-family and multifamily for each agency based on actual water use as reported by the agency surveys.

For existing residential homes, the current average indoor and outdoor water use for each member agency were used for the year 2020. It was assumed that indoor water uses would reach the high efficiency level by 2040. Based on current age of homes, replacement/remodeling rates, and water utility rebate programs it is believed this assumption is very achievable. It was also assumed that current outdoor water use would be reduced by 5% by 2050.

For new homes, the indoor high efficiency level was assumed for the years 2025 through 2050. Outdoor uses for new homes were assumed to be 25% and 30% lower than current household water use for single-family and multifamily homes, respectively. This methodology is illustrated in Figure 4-3 below.

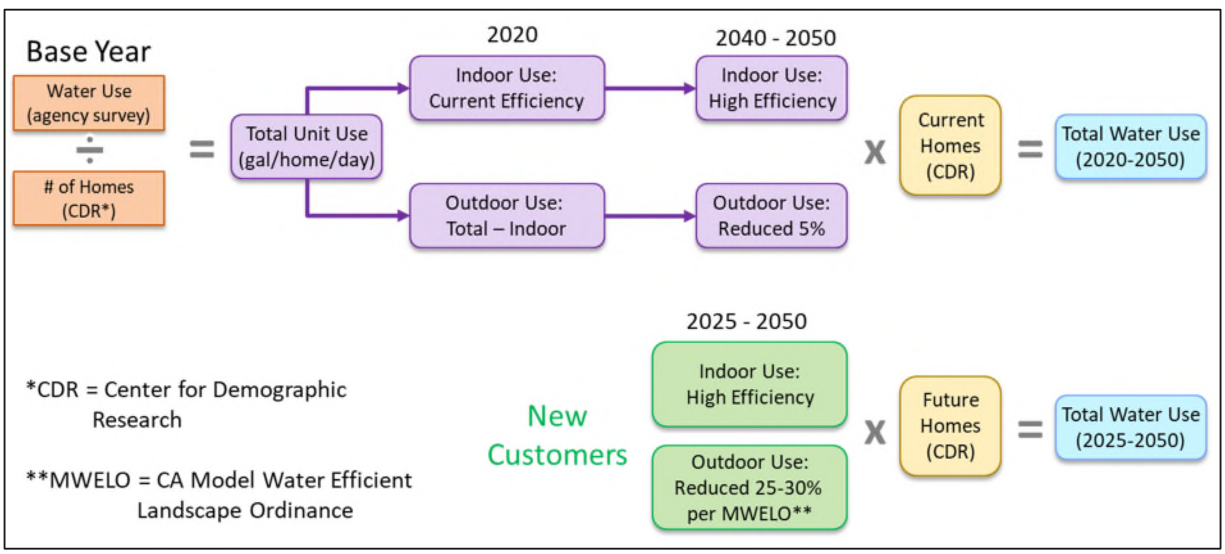


Figure 4-3 Water Use Projection Methodology Diagram

Existing and projected population, single-family and multifamily households for each retail water agency were provided by CDR under contract by MWDOC and OCWD. CDR provides historical and future demographics by census tracts for all of Orange County (Section 3.4). Census tract data is then clipped to retail water agency service boundaries in order to produce historical and projected demographic data by agency.

For the CII water demands, which have been fairly stable from a unit use perspective (gallons/account/day), it was assumed that the unit demand in FY 2019-20 would remain the same from 2020-2025 to represent COVID-19 impacts. Reviewing agency water use data from FY 2017-18 through FY2019-20 revealed that residential water use increased slightly in FY 2019-20 while CII demands decreased slightly as a result of COVID-19. From 2030 to 2050, the average CII unit use from FY 2017-18 and 2018-19 was used. These unit use factors were then multiplied by an assumed growth of CII accounts under three broad scenarios:

- Low Scenario – assuming no growth in CII accounts
- Mid Scenario – assuming 0.5% annual growth in CII accounts
- High Scenario – assuming 1.5% annual growth in CII accounts

For most retail agencies, the Mid Scenario of CII account growth was used, but for those retail agencies that have had faster historical growth the High Scenario was used. For those retail agencies that have had relatively stable CII water demand, the Low Scenario was used.

For those agencies that supply recycled water for non-potable demands, we used agency-specified growth assumptions. Most agencies have already maximized their recycled water and thus are not expecting for this category of demand to grow. However, a few agencies in South Orange County do expect moderate growth in recycled water customers.

For large landscape customers served currently by potable water use, we assumed these demands to be constant through 2050, except for agencies that have growing recycled water demands. For the agencies that have growing recycled water demands, large landscape demands served by potable water were reduced accordingly. For non-revenue water, which represents the difference in total water production less all water billed to customers, this percentage constant through 2050.

A member agency's water use demand projection is the summation of their residential water demand, CII demands, large landscape and recycled water demands, and water losses all projected over the 25-year time horizon. These demands were provided to each of the Orange County water agencies for their review, feedback, and revision before being finalized.

The MWDOC regional water demand projection was collaboratively developed between MWDOC and its member agencies. This collaboration involved the projection model developed by CDM Smith as well as specific assumptions provided by MWDOC's member agencies. There were also some specific retail agency projections that were utilized in the MWDOC regional demand projections. Each MWDOC Member Agency water demand projections, analyses, methodologies, and assumptions can be found in their respective UWMPs.

4.3.1.1 Weather Variability and Long-Term Climate Change Impacts

In any given year water demands can vary substantially due to weather. In addition, long-term climate change can have an impact on water demands into the future. For the 2014 OC Water Reliability Study, CDM Smith developed a statistical model of total water monthly production from 1990 to 2014 from a sample of retail water agencies. This model removed impacts from population growth, the economy and drought restrictions in order to estimate the impact on water use from temperature and precipitation.

The results of this statistical analysis are:

- Hot/dry weather demands will be 5.5% greater than current average weather demands
- Cooler/wet weather demands will be 6% lower than current average weather demands
- Climate change impacts will increase current average weather demands by:
  - 2% in 2030
  - 4% in 2040
  - 6% in 2050

4.3.2 25-Year Water Use Projection

4.3.2.1 Water Use Projections for 2021-2025

Total demands (direct and indirect) are met through imported water (treated and untreated), groundwater, local surface water, and recycled water. MWDOC utilizes total demands to incorporate the best available planning information when projecting the imported water demands of its service area. As shown in Table 4-3 below, MWDOC's total service area water demands are expected to gradually increase in the first three years (2021 to 2023) due to projected growth in the service area's M&I demands; however, the bulk of the increase in demands are projected in the last two years, as a result of indirect imported demands for groundwater replenishment returning in the years 2024 and 2025.

The current regulatory impacts of PFAS in the OC Basin has reduced the need for purchasing any imported groundwater replenishment water, due to reductions in groundwater pumping. This is expected to last over the next three years (2021 to 2023), under normal hydrological conditions. However, with groundwater treatment anticipated to be online for a number of retail agencies in the years 2023 and 2024, groundwater production is expected to increase. Thus, OCWD estimates a gradual need of imported replenishment water in years 2024 and 2025. With the final expansion of OCWD's Groundwater Replenishment System (GWRS) online in 2023, the future need of imported replenishment water is expected to average 51,600 AF per year.

Table 4-3: MWDOC's Service Area Total Potable and Non-Potable Demand Projections for 2021-2025

Total Water Demand					
Fiscal Year Ending	2021	2022	2023	2024	2025
Total Water Demand (AF)	431,539	435,377	439,215	461,948	486,747
NOTES: This assumes no replenishment water in 2021, 2022, and 2023 due impacts from PFAS.					

4.3.2.2 Water Use Projections for 2025-2045

Under normal conditions, total direct and indirect water demands are projected to increase to 501,394 AF by the year 2045, an increase of about 3% between 2025 and 2045 (Table 4-4). This demand projection comes from MWDOC's Demand Forecast TM update done in 2021, that considered such factors as current and future demographics, future conservation measures, and ground & surface water needs. Section 4.3.1 offers a description of the methodology used to calculated MWDOC's demand projections.

Table 4-4: MWDOC's Service Area Total Potable and Non-Potable Demand Projections for 2025-2045

Total Water Demand					
Fiscal Year Ending	2025	2030	2035	2040	2045
Total Water Demand (AF)	486,747	495,958	502,014	501,487	501,394
NOTES:					

Table 4-5 presents 2025-2045 demand projections for water (potable and non-potable) that is purchased from MET and sold by MWDOC to their retail agencies and OCWD. Projections for groundwater recharge and other potable uses (i.e., Irvine Lake fill) are expected to remain constant between 2025 and 2045. Sales to other agencies is expected to rise by about 2.5% (comparing 2025 values to 2045 values).

Table 4-5: Wholesale: Use for Potable and Raw Water – Projected

DWR Submittal Table 4-2 Wholesale: Use for Potable and Raw Water - Projected						
Use Type	Additional Description	Projected Water Use (AF) *				
		2025	2030	2035	2040	2045 (opt)
Sales to other agencies	MWD (Retail M&I)	119,743	120,573	123,502	123,107	122,819
Groundwater recharge	MWD GW Replenishment (Non-M&I)	51,600	51,600	51,600	51,600	51,600
Other Potable	MWD Irvine Lake Fill (Non-M&I)	4,017	4,017	4,017	4,017	4,017
	TOTAL:	175,360	176,190	179,119	178,724	178,436
**** Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*						
NOTES:						

A comparison of actual (2020) and projected (2025-2045) wholesale total water use is presented in Table 4-6 below.

Table 4-6: Wholesale: Total Water Use (Potable and Non-Potable)

DWR Submittal Table 4-3 Wholesale: Total Water Use (Potable and Non-Potable)						
	2020	2025	2030	2035	2040	2045 (opt)
Potable and Raw Water From Tables 4-1W and 4-2W	161,555	175,360	176,190	179,119	178,724	178,436
Recycled Water Demand* From Table 6-4W	0	0	0	0	0	0
TOTAL WATER DEMAND:	161,555	175,360	176,190	179,119	178,724	178,436
NOTES: Volumes in AF.						

4.4 Water Loss

MWDOC is a recognized industry leader in Water Loss programs and activities. While MWDOC does not own or operate any transmission or distribution system themselves, MWDOC helps member agencies evaluate and reduce their distribution systems' real and apparent losses through comprehensive Water Loss Control Programs. In 2015, the MWDOC Board of Directors authorized staff to begin implementing a Water Loss Control Technical Assistance Program (TAP) to support member agency compliance with Senate Bills 1420 and 555, both of which address distribution system Water Loss. The TAP program established a menu of technical assistance that water retailers can elect to participate in. These programs connect water retailers with industry experts who provide one on one technical assistance through data analysis, agency specific advising, and assessment. The TAP services offered by MWDOC include Water Balance Compilation, Component Analysis of Real and Apparent Losses, Source/Production Meter Accuracy Testing, Billing Data Chain Assessment, and Internal Water Loss Committee Planning. MWDOC's Water Loss Control TAP has a very positive impact on building knowledge of water loss recovery strategies by all retail water agencies in the County and implementation of those strategies. To date MWDOC has hosted 30 Water Loss Work Group Meetings with approximately 35 agency representatives' attending each meeting. A total of 137 Annual Water Balances have been compiled and validated over the last five years, vastly improving water agency understanding of volumes of real and apparent losses, strategies to recovery losses and value of losses.

Due to the success of the TAP program, MWDOC began to consider other services that would assist in controlling water loss. In 2019, the MWDOC Board authorized the implementation of a Water Loss Control Shared Services Business Plan (Business Plan) based on the needs outlined in the survey and the direction of the Water Loss Control Performance Standards currently in development. Services provided under the program available to MWDOC member agencies include Water Balance Validation, Customer Meter Accuracy Testing, Distribution System Pressure Surveys, Distribution System Leak

Detection, Suspected Leak Investigations, and No Discharge Distribution System Flushing (No-DES). Since the start of the shared services program in August 2019, more than 780 miles of distribution system leak detection has been completed, which resulted in discovery of 373 hidden leaks that have been repaired or are in the process of being repaired. These leak repairs result in recovering more than 84.5 million gallons of water valued at more than $300,000 per year. A total of 1,439 water meter accuracy tests have been completed by 6 agencies improving agency knowledge of meter performance and accuracy of water balance results. A total of thirty-two sites have been monitored during pressure surveys for three agencies that were used to calculate average system pressure, calibrate hydraulic models and investigate pressure anomalies. And lastly, 12 miles of distribution system mains have been flushed resulting in improved water quality for consumers and recovery of 176,200 gallons of water that was filtered and returned to the distribution system for beneficial use.

CONSERVATION TARGET COMPLIANCE

The Water Conservation Act of 2009, also known as SBx7-7 (Senate Bill 7 as part of the Seventh Extraordinary Session), signed into law on February 3, 2010, requires the State of California to reduce urban water use by 20 percent by the year 2020 (20x2020). 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.

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 9 – Demand Management Measures of this UWMP.

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 GWRS, recycled water, and water conservation programs. The members of the Orange County 20x2020 Regional Alliance are shown in Table 5-1.

Table 5-1: Members of Orange County 20x2020 Regional Alliance

Orange County 20x2020 Regional Alliance	
Anaheim	MNWD
Brea	Newport Beach
Buena Park	Orange
EOCWD	San Clemente
ETWD	San Juan Capistrano
Fountain Valley	Santa Ana
Fullerton	Santa Margarita Water District
Garden Grove	Seal Beach
GSWC	Serrano
Huntington Beach	SCWD
IRWD	TCWD
La Habra	Tustin
La Palma	Westminster
LBCWD	YLWD
Mesa Water	

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.

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.

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 with the exception of having changes to the distribution service area.

5.2.2 Regional Targets Calculation and 2020 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 (Appendix B1). 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 5-2. Column (1) and (2) show the 2015 and 2020 population for each individual supplier. The individual targets, including appropriate deductions for recycled water, for each supplier is provided in column (3) for the 2015 interim targets, and column (4) for the 2020 final 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 2015 interim targets and in column (5) for the 2020 final 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 2020 population is 45,317. By multiplying this 2020 target by the population, the result is a weighted average of 10,003,978. The sum of the weighted averages for all members of the Orange County 20x2020 Regional Alliance is 505,077,088. By dividing this weighted total by the regional population of 3,185,461, the resulting regional 2020 water use target is 159 GPCD.

The source of the information in Table 5-2, including the population figures, is from within the individual 2020 UWMPs for each water supplier in the Orange County 20x2020 Regional Alliance.

Table 5-2: 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) 2020 Population	(3) Individual Targets 2015	(4) Weighted Total 2015	(5) Individual Targets 2020	(6) Weighted Total 2020
Brea	42,943	45,317	248	10,664,892	221	10,003,978
Buena Park	82,495	82,023	178	14,687,524	158	12,980,878
EOCWD RZ	3,252	3,210	261	850,233	232	746,002
ETWD	48,579	47,911	183	8,905,378	163	7,807,042
Fountain Valley	57,768	56,747	157	9,049,547	142	8,032,538
Garden Grove	176,666	176,635	152	26,922,535	142	25,002,684
GSWC	169,213	168,108	157	26,567,284	142	23,795,687
Huntington Beach	197,787	201,327	151	29,937,195	142	28,497,837
IRWD	378,245	418,163	192	72,503,652	170	71,249,163
La Habra	61,913	61,923	151	9,353,551	150	9,304,086
La Palma	15,921	15,567	149	2,371,281	140	2,179,079

Calculation of Regional Compliance Daily Per Capita Water Use						
Orange County 20x2020 Regional Alliance	(1) 2015 Population	(2) 2020 Population	(3) Individual Targets 2015	(4) Weighted Total 2015	(5) Individual Targets 2020	(6) Weighted Total 2020
LBCWD	20,103	19,468	183	3,684,178	163	3,171,382
Mesa Water	109,542	111,051	163	17,814,705	145	16,053,433
MNWD	168,999	170,236	194	32,829,113	173	29,395,029
Newport Beach	63,229	61,916	228	14,407,217	203	12,540,480
Orange	138,647	138,995	203	28,156,956	181	25,091,226
San Clemente	51,280	51,065	172	8,817,256	153	7,804,701
San Juan Capistrano	37,987	38,301	206	7,832,864	183	7,020,098
Santa Margarita WD	156,469	161,264	190	29,688,827	169	27,198,793
Seal Beach	24,001	24,000	149	3,570,691	142	3,397,200
Serrano WD	6,421	6,263	434	2,785,481	386	2,415,057
South Coast WD	34,993	34,232	169	5,916,823	150	5,145,021
Trabuco Canyon WD	12,747	12,921	233	2,973,383	200	2,581,514
Tustin	67,611	66,421	170	11,500,554	151	10,042,788
Westminster	94,394	94,068	137	12,900,652	130	12,232,790
Yorba Linda WD	74,741	75,608	266	19,899,036	237	17,893,214
Anaheim	361,290	365,987	183	65,977,152	162	59,408,797
Fullerton	140,672	141,648	201	28,253,525	179	25,288,490
Santa Ana	338,336	335,086	123	41,538,549	116	38,731,637
Regional Alliance Total	3,136,244	3,185,461	**173**	550,360,035	**159**	505,010,624

Table 5-3 provides the regional urban water use targets for the Orange County 20x2020 Regional Alliance -the 2015 target is 173 GPCD and the 2020 target is 159 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 (IPR) as detailed below.

Table 5-3: Urban Water Use Target and Actual GPCD for Orange County 20x2020 Regional Alliance

	2020 Target GPCD	2020 Actual GPCD
Orange County 20X2020 Regional Alliance	159	109

5.2.3 Deducting Recycled Water Used for IPR

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 OC Basin have the option of choosing this deduction to account for the recharge of recycled water into the OC 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 IPR in their individual targets. This calculation is applied as a deduction from the water supplier's calculation of Gross Water Use. Table 5-4 provides the calculation to deduct recycled water for IPR for OC 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 IPR is expressed as a percentage of the total volume of water extracted from the OC 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 OC 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 OC Basin in FY 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.

The deductible amount of indirect recycled water increased from 66,152 AF in 2015 to approximately 94,235 AF in 2020 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 145,600 AF, or 130 million gallons per day (MGD).

Table 5-4: Calculation of Annual Deductible Volume of Indirect Recycled Water Entering Distribution System

Deduct Recycled Water Used for IPR [1]						
Fiscal Year Ending	Total Groundwater Recharge	(1) 5-Year Average Recharge (AF)	(2) Loss Factor for Recharge & Recovery	(1) x (2) = (3) Volume Entering Distribution System (AF)	Total Basin Production (AF)	(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%

Deduct Recycled Water Used for IPR [1]						
Fiscal Year Ending	Total Groundwater Recharge	(1) 5-Year Average Recharge (AF)	(2) Loss Factor for Recharge & Recovery	(1) x (2) = (3) Volume Entering Distribution System (AF)	Total Basin Production (AF)	(4) Percent of Total Basin Production
2011	66,083	28,461	96.5%	27,465	251,622	10.92%
2012	71,678	40,861	96.5%	39,431	235,222	16.76%
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	293,903	22.51%
2016	100,347	70,670	96.5%	68,197	262,795	25.95%
2017	94,081	77,523	96.5%	74,810	282,257	26.50%
2018	103,990	82,004	96.5%	79,134	228,146	34.69%
2019	93,399	88,226	96.5%	85,138	290,749	29.28%
2020	94,235	93,673	96.5%	90,394	271,263	33.32%

NOTES:

[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.

WATER SUPPLY CHARACTERIZATION

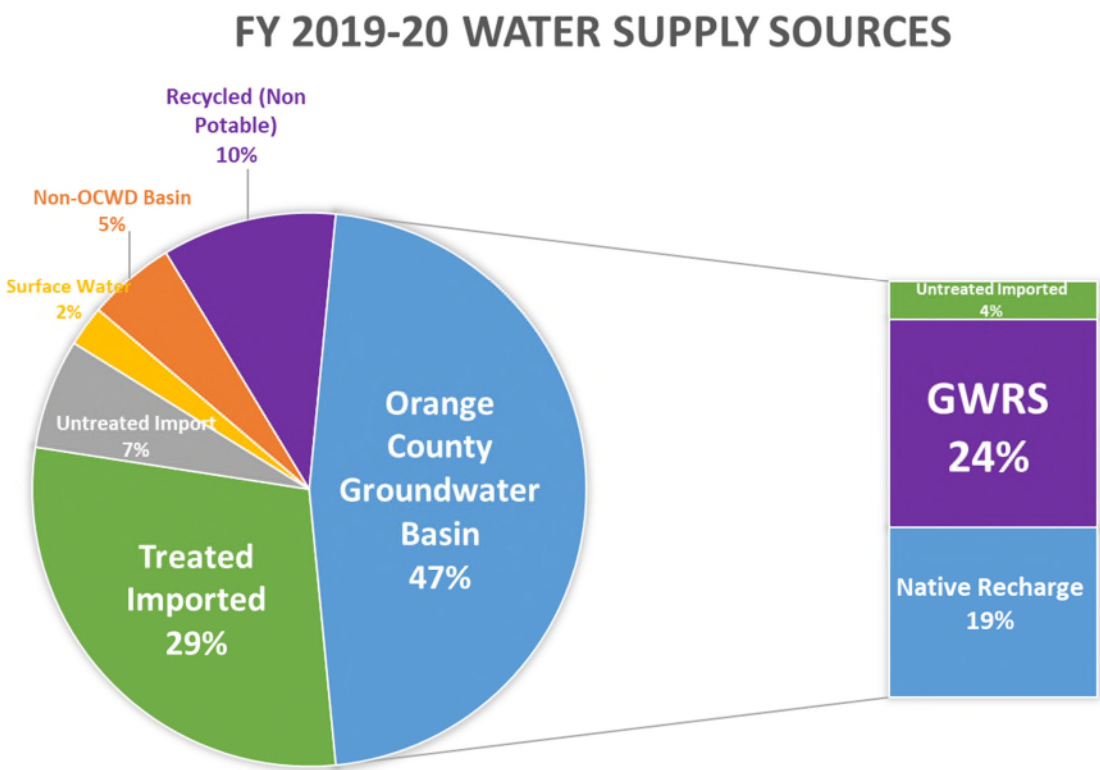
As a counterpart to Section 4's Water Use Characterization, this section characterizes MWDOC's water supply along with a description of the groundwater, wastewater and recycled water provided by other agencies. This section includes identification and quantification of water supply sources through 2045, descriptions of each water supply source and their management, opportunities for exchanges and transfers, and discussion regarding any planned future water supply projects. This section also includes the energy intensity of the water service, a new UWMP requirement.

6.1 Water Supply Overview

Water supplies within MWDOC's service area are from local and imported sources. MWDOC is the regional wholesaler of imported water purchased from MET, which is sourced from the CRA and SWP. Local retail agencies and one local wholesale agency purchase imported water through MWDOC to supplement their local supplies. In FY 2019-20, MWDOC supplied approximately 142,879 AFY of treated and untreated imported water to its retail agencies for M&I purposes and 18,675 AFY for groundwater replenishment (Cyclic Storage) and surface water purposes. In FY 2019-20, imported water represented 36 percent of total water supply in the MWDOC service area. However, imported water volume varies vary year to year; over the last 10 years, it has represented 39 percent of total M&I water supply.

Local supplies developed by other entities and retail agencies include groundwater, recycled water, and surface water. Local sources presently account for 65 percent of the service area's water supplies, whereby groundwater is the major source of local supply. The primary groundwater basin, OC Basin, is located in the northern portion of MWDOC's service area and is managed by OCWD. OCWD also provides advanced treatment to secondary treated wastewater from Orange County Sanitation District (OC San) to produce recycled water for various water agencies in north Orange County. In south Orange County, there are a number of water agencies that provide their own wastewater treatment, to produce recycled water. A relatively minimal amount of MWDOC's water supply portfolio – approximately two percent in FY 2019-20 – is attributed to surface water.

Figure 6-1 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.

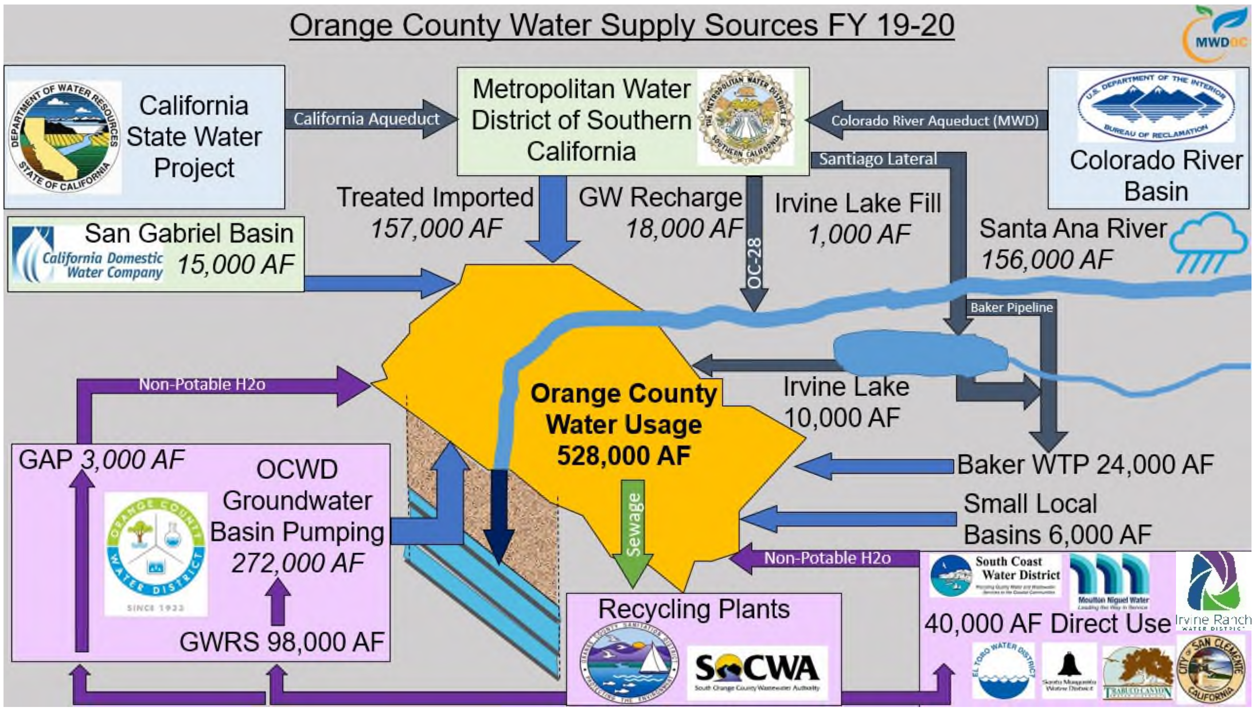


Note: Supplies are specific to the MWDOC Service Area. The Orange County Water Basin water supply can further be broken down by the sources of supply on the right and are intented to add up to the total 47% of water supplies that the Orange County Groundwater Basin represents.

Figure 6-1: FY 2019-20 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, implementing water use efficiency efforts, and expanding local projects. MWDOC also works in collaboration with two primary agencies – MET and OCWD – to ensure a safe and high-quality water supply to Orange County.

Figure 6-2 illustrates the different water sources in MWDOC's service area and for all of Orange County.



Note: Supplies are for Orange County, which include MWDOC member agencies as well as the cities of Anaheim, Fullerton, and Santa Ana.

Figure 6-2: Orange County Water Supply Sources

Although MWDOC supports the various water supply sources for agencies within MWDOC's service area, MWDOC supplies only imported water. In FY 2019-20, MWDOC used its imported water supplies for M&I uses, groundwater recharge, and surface storage (Table 6-1).

MWDOC's projected water supply sources from MET for M&I are expected to increase through 2045, with the imported water for groundwater recharge and surface storage projected to remain the same (Table 6-2). The following subsections will provide a detailed discussion of the water supply sources in MWDOC's service area, as well as evaluate MWDOC's projected supply for the next 25 years.

Table 6-1: Wholesale: Water Supplies - Actual

DWR Submittal Table 6-8 Wholesale: Water Supplies — Actual			
Water Supply	Additional Detail on Water Supply	2020	
		Actual Volume (AF)	Water Quality
Purchased or Imported Water	From MET for Municipal & Industrial	142,879	Drinking Water
Purchased or Imported Water	From MET for Groundwater Recharge	18,027	Other Non-Potable Water
Purchased or Imported Water	From MET for Surface Storage	649	Other Non-Potable Water
	Total:	161,555	
NOTES: Source: MWDOC UWMP Supply Projections, 2021			

Table 6-2: Wholesale: Water Supplies -Projected

DWR Submittal Table 6-9 Wholesale: Water Supplies — Projected						
Water Supply	Additional Detail on Water Supply	**Projected Water Supply (AF)**				
		2025	**2030**	**2035**	**2040**	**2045**
		Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume
Purchased or Imported Water	From MET for Municipal & Industrial	119,743	120,573	123,502	123,107	122,819
Purchased or Imported Water	From MET for Groundwater Recharge	51,600	51,600	51,600	51,600	51,600
Purchased or Imported Water	From MET for Surface Storage	4,017	4,017	4,017	4,017	4,017
	Total:	175,360	176,190	179,119	178,724	178,436
NOTES: Source: MWDOC UWMP Supply Projections and OCWD, 2021						

6.2 Imported Water

In FY 2019-20, 36 percent of MWDOC's water supply portfolio was attributed to treated and untreated imported water. MWDOC purchases water from MET and distributes this water to its 28 member agencies to supplement local supplies. MET's two principal sources of water are the Colorado River and the SWP. MET receives water from the Colorado River through the CRA and from the SWP through the California Aqueduct. For Orange County, the water obtained from these sources is treated at the Robert B. Diemer Filtration Plant located in Yorba Linda. Typically, the Diemer Filtration Plant receives a blend of Colorado River water from Lake Mathews through the MET Lower Feeder and SWP water through the Yorba Linda Feeder.

6.2.1 Metropolitan Water District of Southern California

MET is the largest water wholesaler for domestic and municipal uses in California, serving approximately 19 million customers. MET 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 these counties reside within MET's boundaries.

MET is governed by a Board of Directors comprised of 38 appointed individuals with a minimum of one representative from each of MET's 26 member agencies. The allocation of directors and voting rights are determined by each agency's assessed valuation. Each member of the Board is 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. 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 MET for their service (The Metropolitan Water District Act, 1969).

MET 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 6-3. Member agencies receive water from MET 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 MET annually in April regarding the amount of water they anticipate they will need to meet their demands for the next five years.

In Orange County, MWDOC and the cities of Anaheim, Fullerton, and Santa Ana are MET member agencies that purchase imported water directly from MET. Furthermore, MWDOC purchases both treated potable and untreated water from MET to supplement its retail agencies' local supplies. Figure 6-4 illustrates the MET feeders and major transmission pipelines that deliver water within Orange County.

Figure 6-3: Major Aqueducts that Supply Water to Southern California

Figure 6-4: MET Feeders and Transmission Mains that Serve Orange County

6.2.1.1 MET's 2020 Urban Water Management Plan

MET's 2020 UWMP reports on its water reliability and identifies projected supplies to meet the long-term demand within its service area. The MET 2020 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, 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. MET's 2020 UWMP also presents MET's supply capacities from 2025 through 2045 for average year, single dry-year, five consecutive dry-year, and more frequent and severe droughts, as specified in the UWMP Act.

Information concerning MET's UWMP, including the background, associated challenges, and long-term development of programs for each of MET's supply sources and capacities have been summarized and included in the following subsections. Additional information on MET can be found directly in MET's 2020 UWMP.

6.2.1.2 Colorado River Aqueduct

Background

The Colorado River was MET's original source of water after MET's establishment in 1928. The CRA, which is owned and operated by MET, transports water from the Colorado River to its terminus Lake Mathews, in Riverside County. The actual amount of water per year that may be conveyed through the CRA to MET's member agencies is subject to the availability of Colorado River water. 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. The CRA includes supplies from the implementation of the Quantification Settlement Agreement and its 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, in order to stabilize water supplies and reduce the state's demand on the river to its 4.4 million acre-feet (MAF) entitlement. Colorado River transactions are potentially available to supply additional water up to the CRA capacity of 1.25 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, Wyoming, and 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. MET 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 (MET, 2021):

- Water is unused by the California holders of priorities 1 through 3
- Water is 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 of the following:
  - Surplus water
  - Colorado River water that is apportioned to but unused by Arizona and/or Nevada.

Current Conditions and Supply

MET 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. Analysis of historical records suggests a potential change in the relationship between precipitation and runoff in the Colorado River Basin. The past 21 years (1999-2020) have seen an overall drying trend, even though the period included several wet or average years. The river basin has substantial storage capacity, but the significant reduction in system reservoir storage in the last two decades is great enough to consider the period a drought (DWR, 2020a). At the close of 2020, system storage was at or near its lowest since 2000, so there is very little buffer to avoid a shortage from any future period of reduced precipitation and runoff (MET, 2021). Looking ahead, the long-term imbalance in the Colorado River Basin's future supply and demand is projected to be approximately 3.2 MAF by the year 2060 (USBR, 2012).

In light of declining reservoir levels, the Lower Basin Drought Contingency Plan (DCP) was signed in 2019. This agreement incentivizes storage in Lake Mead and requires certain volumes of water be stored in Lake Mead under certain Lake Mead elevation levels through 2026. MET is to store certain volumes of water in Lake Mead as DCP ICS once Lake Mead is below elevation 1,045 feet. This agreement also increases MET's flexibility to take delivery of water stored as ICS at Lake Mead elevations below 1,075 feet. The goal of this agreement is to keep Lake Mead above critical elevations, and overall it increases MET's flexibility to store water in Lake Mead in greater volumes and to take delivery of stored water to fill the CRA as needed.

Over the years, MET has helped fund and implement various programs to improve Colorado River supply reliability and help resolve the imbalance between supply and demand. Implementation of such programs have contributed to achievements like achieving a record low diversion of the Colorado River in 2019, a level not seen since the 1950s. Colorado River water management programs include:

- **Imperial Irrigation District / MET Conservation Program** – Under agreements executed in 1988 and 1989, this program allows MET to fund water efficiency improvements within Imperial Irrigation District's service area in return for the right to divert the water conserved by those investments. An average of 105,000 AFY of water has been conserved since the program's implementation.
- **Palo Verde Land Management, Crop Rotation, and Water Supply Program** – Authorized in 2004, this 35-year program allows MET to pay participating farmers to reduce their water use, and for MET to receive the saved water. Over the life of the program, an average of 84,500 AFY has been saved and made available to MET.
- **Bard Seasonal Fallowing Program** – Authorized in 2019, this program allows MET to pay participating farmers in Bard to reduce their water use between the late spring and summer months of selected years, which provides up to 6,000 AF of water to be available to MET in certain years.
- **Management of MET-Owned Land in Palo Verde** – Since 2001, MET has acquired approximately 21,000 acres of irrigable farmland that are leased to growers, with incentives to grow low water-using crops and experiment with low water-consumption practices. If long-term

water savings are realized, MET may explore ways to formally account them for Colorado River supplies.

- **Southern Nevada Water Authority (SNWA) and MET Storage and Interstate Release Agreement** – Entered in 2004, this agreement allows SNWA to store its unused, conserved water with MET, in exchange for MET to receive additional Colorado River water supply. MET has relied on the additional water during dry years, especially during the 2011-2016 California drought, and SNWA is not expected to call upon MET to return water until after 2026.
- **Lower Colorado Water Supply Projects** – Authorized in 1980s, this project provides up to 10,000 AFY of water to certain entities that do not have or have insufficient rights to use Colorado River water. A contract executed in 2007 allowed MET to receive project water left unused by the project contractors along the River – nearly 10,000 AF was received by MET in 2019 and is estimated for 2020.
- **Exchange Programs** – MET is involved in separate exchange programs with the United States Bureau of Reclamation, which takes place at the Colorado River Intake and with San Diego County Water Authority (SDCWA), which exchanges conserved Colorado River water.
- **Lake Mead Storage Program** – Executed in 2006, this program allows MET to leave excessively conserved water in Lake Mead, for exclusive use by MET in later years.
- **Quagga Mussel Control Program** – Developed in 2007, this program introduced surveillance activities and control measures to combat quagga mussels, an invasive species that impact the Colorado River's water quality.
- **Lower Basin Drought Contingency Plan** – Signed in 2019, this agreement incentivizes storage in Lake Mead through 2026 and overall, it increases MET's flexibility to fill the CRA as needed (MET, 2021).

Future Programs / Plans

The Colorado River faces long-term challenges of water demands exceeding available supply with additional uncertainties due to climate change. Climate change impacts expected in the Colorado River Basin include the following:

- More frequent, more intense, and longer lasting droughts, which will result in water deficits
- Continued dryness in the Colorado River Basin, which will increase the likelihood of triggering a first-ever shortage in the Lower Basin
- Increased temperatures, which will affect the percentage of precipitation that falls as rain or snow, as well as the amount and timing of mountain snowpack (DWR, 2020b)

Acknowledging the various uncertainties regarding reliability, MET plans to continue ongoing programs, such as those listed earlier in this section. Additionally, MET supports increasing water recycling in the Colorado River Basin and is in the process of developing additional transfer programs for the future (MET, 2021).

6.2.1.3 State Water Project

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. Water from the SWP originates at Lake Oroville, which is located on the Feather River in Northern California. Much of the SWP water supply passes through the Delta. 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 (MET, 2021).

The 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.

Current Conditions and Supply

"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 million acre-feet per year (MAFY). Of this amount, 4.13 MAFY is the maximum Table A water available for delivery from the Delta. On average, deliveries are approximately 60% of the maximum Table A amount (DWR, 2020b).

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 a 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 MET 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 who have 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 federal biological opinions (Biops). The Biops protect species listed as threatened or endangered under the federal and state Endangered Species Acts (ESAs) and affect the SWP's water delivery capability because they restrict SWP exports in the Delta and include Delta outflow requirements during certain times of the year, thus reducing the available supply for export or storage.

Before being updated by the 2019 Long-Term Operations Plan, the prior 2008 and 2009 Biops resulted in an estimated reduction in SWP deliveries of 0.3 MAF during critically dry years to 1.3 MAF in above normal water years as compared to the previous baseline. However, the 2019 Long-Term Operations Plan and Biops are expected to increase SWP deliveries by an annual average of 20,000 acre-feet as compared to the previous Biops (MET, 2021). Average Table A deliveries decreased in the 2019 SWP Final Delivery Capability Report compared to 2017, mainly due to the 2018 Coordinated Operation Agreement (COA) Addendum and the increase in the end of September storage target for Lake Oroville. Other factors that also affected deliveries included changes in regulations associated with the Incidental Take Permit (ITP) and the Reinitiation of Consultation for Long-Term Operations (RoC on LTO), a shift in Table A to Article 21 deliveries which occurred due to higher storage in SWP San Luis, and other operational updates to the SWP and federal Central Valley Project (CVP) (DWR, 2020b). Since 2005, there are similar decreasing trends for both the average annual Delta exports and the average annual Table A deliveries (Table 6-3).

Table 6-3: MET SWP Program Capabilities

Year	Average Annual Delta Exports (MAF)	Average Annual Table A Deliveries (MAF)
2005	2.96	2.82
2013	2.61	2.55
2019	2.52	2.41
Percent Change*	-14.8%	-14.3%

*Percent change is between the years 2019 and 2005.

Ongoing regulatory restrictions, such as those imposed by the Biops on the effects of SWP and the CVP operations on certain marine life, also contribute to the challenge of determining the SWP's water delivery reliability. In dry, below-normal conditions, MET 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 are to access additional supplies to maximize deliveries 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. The following factors affect the ability to estimate existing and future water delivery reliability:

- **Water availability at the source:** Availability can be highly variable and 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. Fisheries issues can also restrict the operations of the export pumps even when water supplies are available.

- **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. Furthermore, water quality may be adversely affected due to the anticipated increase in wildfires. Rising sea levels may result in potential pumping cutbacks on the SWP and CVP.
- **Regulatory restrictions on SWP Delta exports:** The Biops protect special-status species such as delta smelt and spring- and winter-run Chinook salmon and imposed substantial constraints on Delta water supply operations through requirements for Delta inflow and outflow and export pumping restrictions. 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 (DWR, 2020b).
- **Ongoing environmental and policy planning efforts:** Governor Gavin Newsom ended California WaterFix in May 2019 and announced a new approach to modernize Delta Conveyance through a single tunnel alternative. The EcoRestore Program aims to restore at least 30,000 acres of Delta habitat, with the near-term goal of making significant strides toward that objective by 2020 (DWR, 2020b).
- **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.

Operational constraints will likely continue until a long-term solution to the problems in the Delta is identified and implemented. New Biops 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.

Future Programs / Plans

MET'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, MET is working towards addressing four elements: Delta ecosystem restoration, water supply conveyance, flood control protection, and storage development.

In May 2019, Governor Newsom ended California WaterFix, announced a new approach to modernize Delta Conveyance through a single tunnel alternative, and released Executive Order 10-19 that directed state agencies to inventory and assess new planning for the project. DWR then withdrew all project approvals and permit applications for California WaterFix, effectively ending the project. The purpose of the Delta Conveyance Project (DCP) gives rise to several project objectives (MET, 2021). In proposing to make physical improvements to the SWP Delta conveyance system, the project objectives are:

- To address anticipated rising sea levels and other reasonably foreseeable consequences of climate change and extreme weather events.
- To minimize the potential for public health and safety impacts from reduced quantity and quality of SWP water deliveries, and potentially CVP water deliveries, south of the Delta resulting from a major earthquake that causes breaching of Delta levees and the inundation of brackish water into the areas in which existing pumping plants operate.
- To protect the ability of the SWP, and potentially the CVP, to deliver water when hydrologic conditions result in the availability of sufficient amounts, consistent with the requirements of state and federal law.
- To provide operational flexibility to improve aquatic conditions in the Delta and better manage risks of further regulatory constraints on project operations.

6.2.1.4 Central Valley / State Water Project Storage and Transfer Programs

Storage is a major component of MET's dry year resource management strategy. MET'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. Due to the pattern of generally drier hydrology, the groundwater basins and local reservoirs have dropped to low operating levels and remain below healthy storage levels. For example, the Colorado River Basin's system storage at the close of 2020, was at or near its lowest since 2000, so there is very little buffer to avoid a shortage from any future period of reduced precipitation and runoff (MET, 2021).

MET stores water in both DWR and MET surface water reservoirs. MET's surface water reservoirs are Lake Mathews, Lake Skinner, and Diamond Valley Lake, which have a combined storage capacity of over 1 MAF. Approximately 650,000 AF are stored for seasonal, regulatory, and drought use, while approximately 370,000 AF are stored for emergency use.

MET also has contractual rights to DWR surface Reservoirs, such as 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) that provides MET with additional options for managing SWP deliveries to maximize the yield from the project. This storage can provide MET with up to 44 TAF of additional supply over multiple dry years, or up to 219 TAF to Southern California in a single dry year (MET, 2021).

MET endeavors to increase the reliability of water supplies through the development of flexible storage and transfer programs including groundwater storage (MET, 2021). These include:

- **Lake Mead Storage Program:** Executed in 2006, this program allows MET to leave excessively conserved water in Lake Mead, for exclusive use by MET in later years. MET created "Intentionally Created Surplus" (ICS) water in 2006-2007, 2009-2012, and 2016-2019, and withdrew ICS water in 2008 and 2013-2015. As of January 1, 2021, MET had a total of 1.3 MAF of Extraordinary Conservation ICS water.
- **Semitropic Storage Program:** The maximum storage capacity of the program is 350 TAF, and the minimum and maximum annual yields available to MET are 34.7 TAF and 236.2 TAF, respectively. The specific amount of water MET can expect to store in and subsequently receive from the program depends on hydrologic conditions, any regulatory requirements restricting MET's ability to export water for storage and demands placed by other program participants. During wet years, MET has the discretion to use the program to store portions of its SWP supplies which are in excess, and during dry years, the Semitropic Water Storage District returns MET's previously stored water to MET by direct groundwater pump-in or by exchange of surface water supplies.
- **Arvin-Edison Storage Program:** The storage program is estimated to deliver 75 TAF, and the specific amount of water MET can expect to store in and subsequently receive from the program depends on hydrologic conditions and any regulatory requirements restricting MET's ability to export water for storage. During wet years, MET has the discretion to use to program to store portions of its SWP supplies which are in excess, and during dry years, the Arvin-Edison Water Storage District returns MET's previously stored water to MET by direct groundwater pump-in or by exchange of surface water supplies.
- **Antelope Valley-East Kern (AVEK) Water Agency Exchange and Storage Program:** Under the exchange program, for every two AF MET receives, MET returns 1 AF back to AVEK, and MET 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.
- **High Desert Water Bank Program:** Under this program, MET will have the ability to store up to 280 TAF of its SWP Table A or other supplies in the Antelope Valley groundwater basin, and in exchange will provide funding for the construction of monitoring and production wells, turnouts from the California Aqueduct, pipelines, recharge basins, water storage, and booster pump facilities. The project is anticipated to be in operation by 2025.
- **Kern-Delta Water District Storage Program:** This groundwater storage program has 250 TAF of storage capacity, and water for storage can either be directly recharged into the groundwater basin or delivered to Kern-Delta Water District farmers in lieu of pumping groundwater. During dry years, the Kern-Delta Water District returns MET's previously stored water to MET by direct groundwater pump-in return or by exchange of surface water supplies.
- **Mojave Storage Program:** MET entered into a groundwater banking and exchange transfer agreement with Mojave Water Agency that allows for the cumulative storage of up to 390 TAF. The agreement allows for MET to store water in an exchange account for later return.

6.2.1.5 Untreated Imported Water - Baker Treatment Plant

The Baker Treatment Plant is a 28.1 MGD drinking water treatment plant at the site of the former Baker Filtration Plant in Lake Forest. The plant was a joint regional project by five South Orange County water districts: ETWD, IRWD, MNWD, SMWD, and TCWD, which have capacity rights of 3.2 MGD, 6.8 MGD, 8.4 MGD, 8.4 MGD, and 1.3 MGD, respectively. The project went online in early 2017 and is managed and run by IRWD.

The plant has multiple water supply sources that increase water supply reliability, including imported untreated water from MET through the Santiago Lateral and local surface water from Irvine Lake. It provides a reliable local drinking water supply during emergencies or extended facility shutdowns on the MET delivery system and increases operational flexibility by creating redundancy within the water conveyance system.

6.2.2 Supply Reliability Within MET

6.2.2.1 MET's Water Service Reliability Assessment Results

In MET's 2020 UWMP, MET evaluated supply reliability by projecting supply and demand under a normal year, single-dry year, and five-year consecutive dry years, based on conditions affecting the SWP (MET's largest and most variable supply). For this supply source, the average of historic years 1922-2017 most closely represents water supply conditions in a normal water year, the single driest year was 1977 and the five-year dry period was 1988-1992. The analyses also include Colorado River supplies under the same hydrological variations.

MET also incorporated the SWP and Colorado River's reliability factors, such as water quality objectives set by the SWRCB, Biops, and amendments to the COA for the SWP and Quantification Settlement Agreements for the Colorado River into their assessment.

MET has concluded that the region can provide reliable water supplies under normal, single-dry, and five-year consecutive dry conditions (Table 6-4, Table 6-5, Table 6-6, respectively). MWDOC is a MET member agency, and MET's projections take into account the imported demands from Orange County. As so, MET's water reliability assessments are used to determine that demands within MWDOC can be met for all three hydrological conditions.

Table 6-4: METs Projected Supply Capability and Demands through 2045 for a Normal Year

Normal Water Year
Supply Capability[1] and Projected Demands
Average of 1922-2017 Hydrologies
(Acre-feet per year)

Forecast Year	2025	2030	2035	2040	2045
Current Programs					
In-Region Supplies and Programs	875,000	876,000	875,000	875,000	872,000
California Aqueduct[2]	1,774,000	1,766,000	1,763,000	1,762,000	1,761,000
Colorado River Aqueduct					
Total Supply Available[3]	1,214,000	1,290,000	1,283,000	1,230,000	1,250,000
Aqueduct Capacity Limit[4]	*1,250,000*	*1,250,000*	*1,250,000*	*1,250,000*	*1,250,000*
Colorado River Aqueduct Capability	1,214,000	1,250,000	1,250,000	1,230,000	1,250,000
Capability of Current Programs	**3,863,000**	**3,892,000**	**3,888,000**	**3,867,000**	**3,883,000**
Demands					
Total Demands on Metropolitan	1,191,000	1,142,000	1,101,000	1,116,000	1,140,000
Exchange with SDCWA	278,000	278,000	278,000	278,000	278,000
Total Metropolitan Deliveries[5]	**1,469,000**	**1,420,000**	**1,379,000**	**1,394,000**	**1,418,000**
Surplus	**2,394,000**	**2,472,000**	**2,509,000**	**2,473,000**	**2,465,000**
Programs Under Development					
In-Region Supplies and Programs	0	0	0	0	0
California Aqueduct	13,000	13,000	13,000	13,000	13,000
Colorado River Aqueduct					
Total Supply Available[3]	0	0	0	0	0
Aqueduct Capacity Limit[4]	*36,000*	*0*	*0*	*20,000*	*0*
Colorado River Aqueduct Capability	0	0	0	0	0
Capability of Proposed Programs	**13,000**	**13,000**	**13,000**	**13,000**	**13,000**
Potential Surplus	**2,407,000**	**2,485,000**	**2,522,000**	**2,486,000**	**2,478,000**

[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 and Exchange with SDCWA conveyed by the aqueduct.

[4] Maximum CRA deliveries limited to 1.25 MAF including Exchange with SDCWA.

[5] Total demands are adjusted to include Exchange with SDCWA.

Table 6-5: METs Projected Supply Capability and Demands through 2045 for a Single Dry Year

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

Forecast Year	2025	2030	2035	2040	2045
Current Programs					
In-Region Supplies and Programs	875,000	876,000	875,000	875,000	872,000
California Aqueduct[2]	647,000	634,000	633,000	634,000	633,000
Colorado River Aqueduct					
Total Supply Available[3]	1,174,000	1,403,500	927,500	1,327,500	974,500
Aqueduct Capacity Limit[4]	*1,250,000*	*1,250,000*	*1,250,000*	*1,250,000*	*1,250,000*
Colorado River Aqueduct Capability	1,174,000	1,250,000	927,500	1,250,000	974,500
Capability of Current Programs	**2,696,000**	**2,760,000**	**2,435,500**	**2,759,000**	**2,479,500**
Demands					
Total Demands on Metropolitan	1,319,000	1,270,000	1,227,000	1,246,000	1,273,000
Exchange with SDCWA	278,000	278,000	278,000	278,000	278,000
Total Metropolitan Deliveries[5]	**1,597,000**	**1,548,000**	**1,505,000**	**1,524,000**	**1,551,000**
Surplus	**1,099,000**	**1,212,000**	**930,500**	**1,235,000**	**928,500**
Programs Under Development					
In-Region Supplies and Programs	0	0	0	0	0
California Aqueduct	0	0	0	0	0
Colorado River Aqueduct					
Total Supply Available[3]	0	0	0	0	0
Aqueduct Capacity Limit[4]	*76,000*	*0*	*322,500*	*0*	*275,500*
Colorado River Aqueduct Capability	0	0	0	0	0
Capability of Proposed Programs	**0**	**0**	**0**	**0**	**0**
Potential Surplus	**1,099,000**	**1,212,000**	**930,500**	**1,235,000**	**928,500**

[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 and Exchange with SDCWA conveyed by the aqueduct.
[4] Maximum CRA deliveries limited to 1.25 MAF including Exchange with SDCWA.
[5] Total demands are adjusted to include Exchange with SDCWA.

Table 6-6: METs Projected Supply Capability and Demands through 2045 for a Normal Water Year

Drought Lasting Five Consecutive Water Years
Supply Capability[1] and Projected Demands
Repeat of 1988-1992 Hydrology
(Acre-feet per year)

Forecast Year	2025	2030	2035	2040	2045
Current Programs					
In-Region Supplies and Programs	191,000	196,000	197,000	197,000	197,000
California Aqueduct[2]	730,800	768,000	789,000	812,000	792,000
Colorado River Aqueduct					
Total Supply Available[3]	1,240,000	1,466,000	1,466,000	1,415,000	1,437,000
Aqueduct Capacity Limit[4]	*1,250,000*	*1,250,000*	*1,250,000*	*1,250,000*	*1,250,000*
Colorado River Aqueduct Capability	1,240,000	1,250,000	1,250,000	1,250,000	1,250,000
Capability of Current Programs	**2,161,800**	**2,214,000**	**2,236,000**	**2,259,000**	**2,239,000**
Demands					
Total Demands on Metropolitan	1,351,000	1,332,000	1,297,000	1,290,000	1,313,000
Exchange with SDCWA	278,000	278,000	278,000	278,000	278,000
Total Metropolitan Deliveries[5]	**1,629,000**	**1,610,000**	**1,575,000**	**1,568,000**	**1,591,000**
Surplus	**532,800**	**604,000**	**661,000**	**691,000**	**648,000**
Programs Under Development					
In-Region Supplies and Programs	0	0	0	0	0
California Aqueduct	0	0	0	0	0
Colorado River Aqueduct					
Total Supply Available[3]	0	0	0	0	0
Aqueduct Capacity Limit[4]	*10,000*	*0*	*0*	*0*	*0*
Colorado River Aqueduct Capability	*0*	*0*	*0*	*0*	*0*
Capability of Proposed Programs	**0**	**0**	**0**	**0**	**0**
Potential Surplus	**532,800**	**604,000**	**661,000**	**691,000**	**648,000**

[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 and Exchange with SDCWA conveyed by the aqueduct.
[4] Maximum CRA deliveries limited to 1.25 MAF including Exchange with SDCWA.
[5] Total demands are adjusted to include Exchange with SDCWA.

6.2.2.2 MET's Drought Risk Assessment Results

For its DRA, MET assessed the reliability of each individual water supply source over the five consecutive year drought through a modeling method using the same historical hydrologic conditions as the water service reliability assessment: 1922 to 2017. MET used the five-consecutive years of 1988 to 1992 to complete its DRA, because this represents the driest five-consecutive year historic sequence for MET's supply. Even without activating WSCP actions, according to MET's UWMP Table 2-7, MET's water supply from the SWP and CRA can reliably meet the demands of a five-year drought from FY 2020-21 through FY 2024-25 (Table 6-7).

Table 6-7: MET's Projected Supply Capability and Demands during a Five-Year Drought

Metropolitan's Drought Risk Assessment
Water Use, Supply, and Risk Assessment for 2021 – 2025
(also included as Appendix 12 DWR Submittal Table 7-5)

Based on DWR DRA Optional Planning Tool (Annual totals in AF)

Water Use Worksheet	
Historic and Actual	
2016	1,663,599
2017	1,449,015
2018	1,560,487
2019	1,327,928
Customer Water Use Subtotal	1,394,261
Losses[1]	48,520
2020 Total Gross Water Use	**1,442,781**
Five Consecutive Water Years	
Change from 2020	186,219
2021 Gross Water Use	**1,629,000**
Change from 2021	68,000
2022 Gross Water Use	**1,697,000**
Change from 2022	23,000
2023 Gross Water Use	**1,720,000**
Change from 2023	(192,000)
2024 Gross Water Use	**1,528,000**
Change from 2024	101,000
2025 Gross Water Use	**1,629,000**

[1] Losses include treated system losses and surface reservoir evaporation.

Supply Worksheet[1]	
2021 (1st year)	**1,499,000**
2022 (2nd year)	**2,297,000**
2023 (3rd year)	**1,563,000**
2024 (4th year)	**1,731,000**
2025 (5th year)	**1,636,000**
Supply 1 - Colorado River Aqueduct supplies[2]	
2021 (1st year)	1,250,000
2022 (2nd year)	1,250,000
2023 (3rd year)	1,250,000
2024 (4th year)	1,250,000
2025 (5th year)	1,250,000
Supply 2 - State Water Project supplies	
2021 (1st year)	249,000
2022 (2nd year)	1,047,000
2023 (3rd year)	313,000
2024 (4th year)	481,000
2025 (5th year)	386,000
Supply 3 - In-Region supplies	
2021 (1st year)	0
2022 (2nd year)	0
2023 (3rd year)	0
2024 (4th year)	0
2025 (5th year)	0

DRAFT Submittal Table 7-5: Five-Year Drought Risk Assessment Tables to address Water Code Section 10635(b)

2021	Total
Gross Water Use	**1,629,000**
Total Supplies	**1,499,000**
Surplus/Shortfall w/o WSCP Action	**(130,000)**
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	130,000
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	**0%**

2022	Total
Gross Water Use [Use Worksheet]	**1,697,000**
Total Supplies [Supply Worksheet]	**2,297,000**
Surplus/Shortfall w/o WSCP Action	**600,000**
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	600,000
Resulting % Use Reduction from WSCP action	**0%**

2023	Total
Gross Water Use [Use Worksheet]	**1,720,000**
Total Supplies [Supply Worksheet]	**1,563,000**
Surplus/Shortfall w/o WSCP Action	**(157,000)**
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	157,000
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	**0%**

2024	Total
Gross Water Use [Use Worksheet]	**1,528,000**
Total Supplies [Supply Worksheet]	**1,731,000**
Surplus/Shortfall w/o WSCP Action	**203,000**
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	203,000
Resulting % Use Reduction from WSCP action	**0%**

2025	Total
Gross Water Use [Use Worksheet]	**1,629,000**
Total Supplies [Supply Worksheet]	**1,636,000**
Surplus/Shortfall w/o WSCP Action	**7,000**
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	7,000
Resulting % Use Reduction from WSCP action	**0%**

1. Includes Metropolitan's core supplies as defined in WSCP in Appendix 4. Detailed Supply Worksheets are included in Appendix 3 Table A.3-8.
2. Maximum CRA deliveries limited to 1.25 MAF, including Exchange with SDCWA and IID.

6.2.3 Planned Future Sources

Beyond the programs highlighted in Sections 6.2.1, MET continues to invest in efforts to meet its goal of long-term regional water supply reliability, focusing on the following:

- Continuing water conservation
- Developing water supply management programs outside of the region
- Developing storage programs related to the Colorado River and the SWP
- Developing storage and groundwater management programs within the Southern California region
- Increasing water recycling, groundwater recovery, stormwater and seawater desalination
- Pursuing long-term solutions for the ecosystem, regulatory and water supply issues in the California Bay-Delta (MET, 2021)

6.3 Groundwater

Among all local supplies available to MWDOC's service area, groundwater supplies make up the majority. The water supply resources within MWDOC's service area are enhanced by the existence of 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.

MWDOC does not provide nor sell any groundwater to its retail agencies. However, its retail agencies do extract groundwater locally to diversify their portfolio. Table 6-8 shows a breakdown of historical groundwater production by the retail agencies from all groundwater basins within MWDOC's service area.

This section describes the five groundwater basins used by MWDOC's retail agencies and provides a 25-year projection of the service area's groundwater supply.

Table 6-8: Groundwater pumped in the Past 5 Years within MWDOC's Service Area (AF)

Groundwater Basin	Fiscal Year Ending				
	2016	2017	2018	2019	2020
OC Basin[1]	195,319	205,262	155,658	204,989	192,652
San Juan Basin	1,640	1,661	2,817	2,395	3,010
La Habra Basin	3,540	3,296	2,921	2,183	2,751
Main San Gabriel Basin	11,753	12,434	14,059	14,790	14,870
San Mateo Basin	433	462	620	411	390
Total Groundwater[2]:	**212,595**	**223,116**	**176,076**	**224,769**	**213,674**
NOTES: [1] Includes only the MWDOC member agencies' groundwater production. Does not include the groundwater production of Anaheim, Fullerton, and Santa Ana. [2] Total volumes are +/- 1 AF due to rounding					

6.3.1 Orange County Groundwater Basin

This section describes the medium-priority OC Basin and the management measures taken by OCWD, the basin manager to optimize local supply and minimize overdraft.

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 OC Basin. This legislation is found in the State of California Statutes, Water –Uncodified Acts, Act 5683, as amended. The OC Basin is managed by OCWD under the Act, which functions as a statutorily-imposed physical solution. The OCWD Management Area includes approximately 89 percent of the land area of the OC Basin, and 98 percent of all groundwater production occurs within the area. Approximately 2.5 million residents live within OCWD's boundaries and rely upon the basin for their primary water supply. OCWD manages water resource monitoring programs, land use elements related to basin management, groundwater elevation, groundwater quality, and coastal area monitoring through a number of monitoring programs. OCWD monitors the basin by collecting groundwater elevation and quality data from approximately 400 District-owned wells and manages an electronic database that stores water elevation, water quality, production, recharge, and other data on over 2,000 wells and facilities within and outside OCWD boundaries (City of La Habra et al., 2017). For detailed monitoring programs and management information, refer to the 2017 Basin 8-1 Alternative (Appendix D).

Groundwater levels are managed within a safe basin operating range to protect the long-term sustainability of the OC Basin and to protect against land subsidence. OCWD regulates groundwater levels in the OC Basin by regulating the annual amount of pumping and setting the Basin Production Percentage (BPP) for the water year. As defined in the District Act, the BPP is the ratio of water produced from groundwater supplies within the OCWD service area to all water produced within the area from both supplemental sources and groundwater within the OCWD (OCWD, 2020a).

6.3.1.1 Basin Characteristics

The OC Basin underlies the northern half of Orange County beneath broad lowlands. The OC Basin, managed by OCWD, covers an area of approximately 350 square miles, bordered by the Coyote and Chino Hills to the north, the Santa Ana Mountains to the northeast, and the Pacific Ocean to the southwest. The OC Basin boundary extends to the Orange County-Los Angeles Line to the northwest, where groundwater flows across the county line into the Central Groundwater Basin of Los Angeles County. A map of the OC Basin is shown on Figure 6-5. The total thickness of sedimentary rocks in the OC Basin is over 20,000 feet, with only the upper 2,000 to 4,000 feet containing fresh water. The OC Basin's full volume is approximately 66 MAF.

There are three major aquifer systems that have been subdivided by OCWD, the Shallow Aquifer System, the Principal Aquifer System, and the Deep Aquifer System. These three aquifer systems are hydraulically connected as groundwater is able to flow between each other through intervening aquitards or discontinuities in the aquitards. The Shallow Aquifer system occurs from the surface to approximately 250 feet below ground surface. Most of the groundwater from this aquifer system is pumped by small water systems for industrial and agricultural use. The Principal Aquifer system occurs at depths between 200 and 1,300 feet below ground surface. Over 90 percent of groundwater production is from wells that are screened within the Principal Aquifer system. Only a minor amount of groundwater is pumped from the Deep Aquifer system, which underlies the Principal Aquifer system and is up to 2,000 feet deep in the center of the OC Basin.

Per- and polyfluoroalkyl substances (PFAS) are a group of thousands of manmade chemicals that includes perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS). PFAS compounds were once commonly used in many products including, among many others, stain- and water-repellent fabrics, nonstick products (e.g., Teflon), polishes, waxes, paints, cleaning products, and fire-fighting foams. Beginning in the summer of 2019, the California State Division of Drinking Water (DDW) began requiring testing for PFAS compounds in some groundwater production wells in the OCWD area.

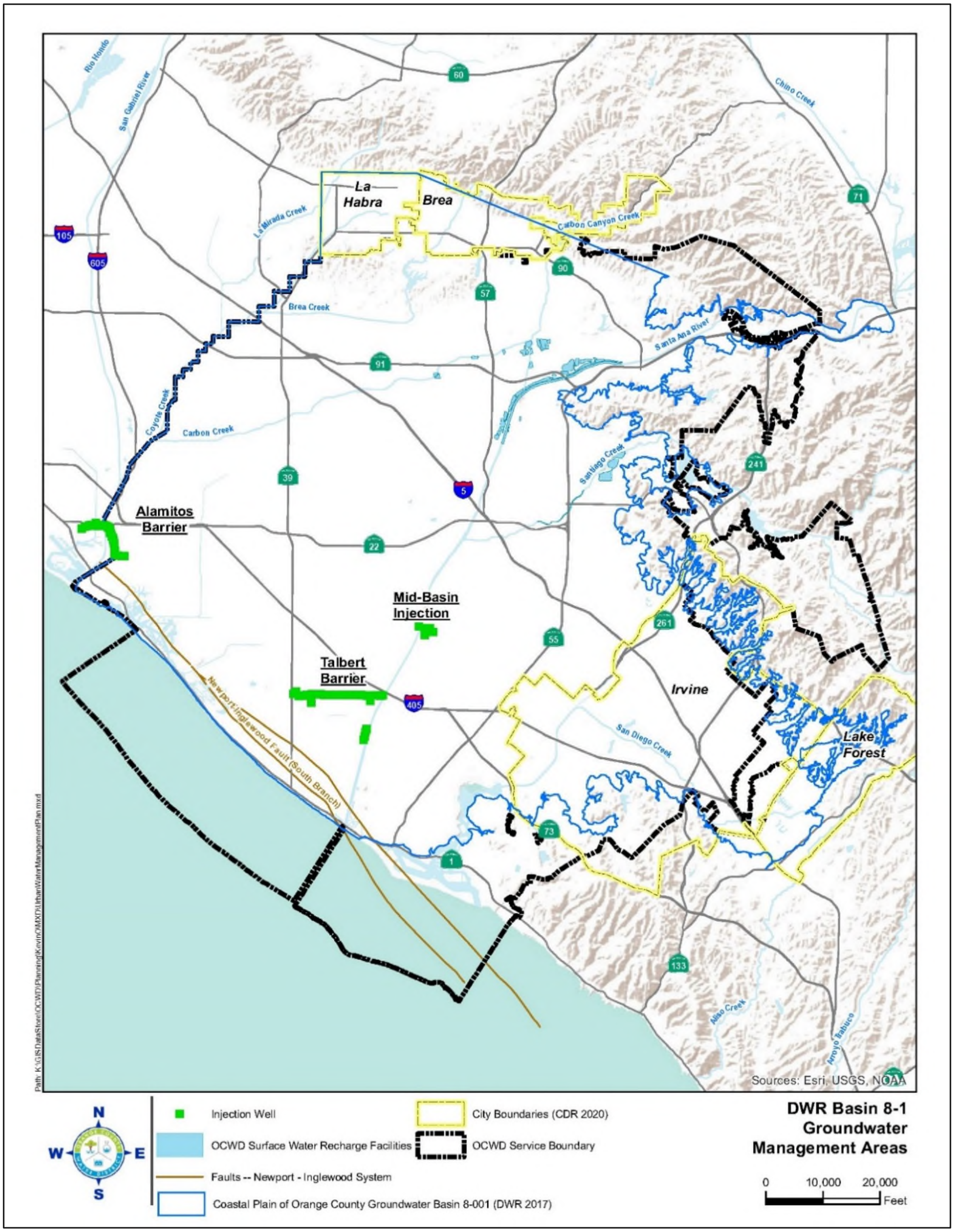


Figure 6-5: Map of the OC Basin

Groundwater production in FY 2019-20 was expected to be approximately 325,000 acre-feet but declined to 286,550 acre-feet primarily due to PFAS impacted wells being turned off around February 2020. OCWD expects groundwater production to be in the area of 245,000 acre-feet in FY 2020-21 due to the currently idled wells and additional wells being impacted by PFAS and turned off. As PFAS treatment systems are constructed, OCWD expects total annual groundwater production to slowly increase back to normal levels (310,000 to 330,000 acre-feet) (OCWD, 2020a).

6.3.1.2 Sustainable Groundwater Management Act

In 2014, the State of California adopted the Sustainable Groundwater Management Act (SGMA) to help manage its groundwater sustainably, and limit adverse effects such as significant groundwater-level declines, land subsidence, and water quality degradation. SGMA requires all high- and medium-priority basins, as designated by DWR, be sustainably managed. DWR designated the Coastal Plain of OC Basin as a medium-priority basin, primarily due to heavy reliance on the OC Basin's groundwater as a source of water supply. Compliance with SGMA can be achieved in one of two ways (City of La Habra et al., 2017):

1. A Groundwater Sustainability Agency (GSA) is formed and a GSP is adopted, or
2. Special Act Districts created by statute, such as OCWD, and other agencies may prepare and submit an Alternative to a GSP

Led by OCWD, the agencies within Basin 8-1, including La Habra, collaborated to submit an Alternative to a GSP in 2017, titled the "Basin 8-1 Alternative" to meet SGMA compliance. This document will be updated every five years. The current (2017) version is included in Appendix D.

6.3.1.3 Basin Production Percentage

Background

The OC Basin is not adjudicated and as such, pumping from the OC Basin is managed through a process that uses financial incentives to encourage groundwater producers to pump a sustainable amount of water. The framework for the financial incentives is based on establishing the BPP, the percentage of each Producer's total water supply that comes from groundwater pumped from the OC Basin. Groundwater production at or below the BPP is assessed the Replenishment Assessment (RA). While there is no legal limit as to how much an agency pumps from the OC Basin, there is a financial disincentive to pump above the BPP. The BPP is set uniformly for all Producers by OCWD on an annual basis. Agencies that pump above the BPP are charged the RA plus the Basin Equity Assessment (BEA). The BEA is presently calculated so that the cost of groundwater production is equivalent to the cost of importing potable water supplies. This approach serves to discourage, but not eliminate, production above the BPP, and the BEA can be increased to discourage production above the BPP if necessary.

The BPP is set based on groundwater conditions, availability of imported water supplies, and Basin management objectives. The supplies available for recharge must be estimated for a given year. The supplies of recharge water that are estimated are: 1) Santa Ana River stormflow, 2) Natural incidental recharge, 3) Santa Ana River baseflow, 4) GWRS supplies, and 5) other supplies such as imported water and recycled water purchased for the Alamitos Barrier. The BPP is a major factor in determining the cost of groundwater production from the OC Basin for that year. The BPP set for Water Year 2021-22 is 77%.

BPP Adjustments for Basin Management

OCWD has established management guidelines that are used to establish future BPPs, as seen in Table 6-9. Raising or lowering the BPP allows OCWD to manage the amount of pumping from the basin. OCWD has a policy to manage the groundwater basin within a sustainable range to avoid adverse impacts to the basin. OCWD seeks to maintain some available storage space in the basin to maximize surface water recharge when such supplies are available, especially in relatively wet years. By keeping the basin relatively full during wet years, and for as long as possible in years with near-normal recharge, the maximum amount of groundwater could be maintained in storage to support pumping in future drought conditions. During dry hydrologic years when less water would be available for recharge, the BPP could be lowered to maintain groundwater storage levels. A component of OCWD's BPP policy is to manage the groundwater basin so that the BPP will not fluctuate more that 5 percent from year to year.

Based on most recent modeling of water supplies available for groundwater recharge and water demand forecasts, OCWD anticipates being able to sustain the BPP at 85% starting in 2025. The primary reasons for the higher BPP are the expected completion of the GWRS Final Expansion (GWRSFE) in 2023 and the relatively low water demands of approximately 400,000 afy.

Modeling and forecasts generate estimates based on historical averages. Consequently, forecasts use average hydrologic conditions which smooth the dynamic and unpredictable local hydrology. Variations in local hydrology are the most significant impact to supplies of water available to recharge the groundwater basin. The BPP projection of 85% is provided based upon average annual rainfall weather patterns. If OCWD were to experience a relatively dry period, the BPP could be reduced to maintain water storage levels, by as much as five percent.

Table 6-9: Management Actions Based on Changes in Groundwater Storage

Available Storage Space (amount below full basin condition, AF)	Basin Management Action to Consider
Less than 100,000	Raise BPP
100,000 to 300,000	Maintain and / or raise BPP towards 75% goal
300,000 to 350,000	Seek additional supplies to refill basin and / or lower the BPP
Greater than 350,000	Seek additional supplies to refill basin and lower the BPP

BPP Exemptions

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 promote beneficial uses of poor-quality groundwater and reduce or prevent the spread of poor-quality groundwater into non-degraded aquifer zones. 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, which typically include capital, interest and operations and maintenance costs for treatment facilities. (City of La Habra et al., 2017). Similarly, for proactive water quality management, OCWD exempts a portion of the BEA for their Coastal Pumping Transfer Program

(CPTP). The CPTP encourages inland groundwater producers to increase pumping and coastal producers to decrease pumping in order to reduce the groundwater basin drawdown at the coast and protect against seawater intrusion. Inland pumpers can pump above the BPP without having to pay the full BEA for the amount pumped above the BPP (OCWD, 2015). Coastal pumpers receive BEA revenue from OCWD to assist in offsetting their additional water supply cost from taking less groundwater.

6.3.1.3.1 OCWD Groundwater Reliability Plan

In order to adapt to the substantial growth in water demands in OCWD's management area, it is paramount to anticipate and understand future water demands and develop projects to increase future water supplies proactively to match demands. The GRP is a continuation of these planning efforts that estimates the OC Basin's sustainable average annual production and extrapolates water needs of the OC Basin by combining recently completed water demand projections and modeling of Santa Ana River flows available for recharge. These data will be used to evaluate future water supply projects and guide management of the OC Basin. OCWD is currently developing the GRP, and the first public draft is expected to be available May 2021.

Current water demand projections show a relatively slow increase over the 25-year planning horizon, which is generally of similar magnitude as the additional production from the GWRSFE in early 2023. Once complete, the GWRSFE will increase capacity from 100,000 to 134,000 AFY of high-quality recycled water. This locally controlled, drought proof supply of water reduces the region's dependance on imported water.

Historically, the Santa Ana River has served as the primary source of water to recharge the OC Basin. To determine the availability of future Santa Ana River flows, OCWD utilized surface water flow modeling of the upper watershed. Modeling was developed to predict the impacts future stormwater capture and wastewater recycling projects in the upper watershed would have on future Santa Ana River flow rates at Prado Dam. Santa Ana River base flows are expected to decrease as more water recycling projects are built in the upper watershed. OCWD continues to work closely with the US Army Corps of Engineers to temporarily impound and slowly release up to approximately 20,000 AF of stormwater in the Prado Dam Conservation Pool. To some extent, the losses in baseflow are partially offset through the capture of additional stormwater held in the Prado Dam Conservation Pool. When available, OCWD will continue to augment groundwater recharge through the purchase of imported water through MET. OCWD will diligently monitor and evaluate future water supply projects to sustainably manage and protect the OC Basin for future generations.

6.3.1.3.2 OCWD Engineer's Report

The OCWD Engineer's Report reports on the groundwater conditions and investigates information related to water supply and groundwater basin usage within OCWD's service area.

The overall BPP achieved in the 2019 to 2020 water year within OCWD for non-irrigation use was 75.9 percent. The achieved pumping was less than the BPP established for the 2019 to 2020 water year primarily due to the water quality impacts of PFAS. A BPP of 77 percent will be used for water year 2021-22. Analysis of the OC Basin's projected accumulated overdraft, the available supplies to the OC Basin (assuming average hydrology) and the projected pumping demands indicate that this level of pumping can be sustained for 2021-22 without detriment to the OC Basin (OCWD, 2021).

In FY 2021-22 additional production of approximately 22,000 AF above the BPP will be undertaken by the City of Tustin, City of Garden Grove, City of Huntington Beach, Mesa Water, and IRWD. These agencies use the additional pumping allowance in order to accommodate groundwater quality improvement projects. As in prior years, production above the BPP from these projects would be partially or fully exempt from the BEA as a result of the benefit provided to the OC Basin by removing poor-quality groundwater and treating it for beneficial use (OCWD, 2021).

6.3.1.4 Recharge Management

Recharging water into the OC Basin through natural and artificial means is essential to support pumping from the OC Basin. Active recharge of groundwater began in 1949, in response to increasing drawdown of the OC Basin and, consequently, the threat of seawater intrusion. The OC 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, recycled water, and imported water. Natural recharge consists of subsurface inflow from local hills and mountains, infiltration of precipitation and irrigation water, recharge in small flood control channels, and groundwater underflow to and from Los Angeles County and the ocean.

Recycled water for the OC Basin recharge is from two sources. The main source of recycled water is from the GWRS, which is injected into the Talbert Seawater Barrier and recharged in the Kraemer, Miller, Miraloma and La Palma Basins (City of La Habra et al., 2017). The second source of recycled water is water purified at the Water Replenishment District's Leo J. Vander Lans Treatment Facility, which supplies water to the Alamitos Seawater Barrier (owned and operated by the Los Angeles County Department of Public Works). OCWD's share of the Alamitos Barrier injection total for water year 2018-19 was less than half of the total injection, based on barrier wells located within Orange County. The Water Replenishment District of Southern California (WRD) also works closely with OCWD to ensure that the water demands at the Alamitos Barrier are fulfilled through the use of recycled water as opposed to imported water, however the recycled portion was less than 33 percent for the last six years due to operational issues and wastewater supply interruptions (OCWD, 2020a). Injection of recycled water into these barriers is an effort by OCWD to control seawater intrusion into the OC Basin. Operation of the injection wells forms a hydraulic barrier to seawater intrusion.

OCWD purchases imported water for recharge from MWDOC. Untreated imported water can be used to recharge the OC Basin through the surface water recharge system in multiple locations, such as Anaheim Lake, Santa Ana River, Irvine Lake, and San Antonio Creek. Treated imported water can be used for in-lieu recharge, as was performed extensively from 1977 to 2007 (City of La Habra et al., 2017). For detailed recharge management efforts from OCWD, refer to OCWD's 2017 Basin 8-1 Alternative (Appendix D).

6.3.1.5 MET Imported Water for Groundwater Replenishment

In the past OCWD, MWDOC, and MET have coordinated water management to increase storage in the OC Basin when imported supplies are available for this purpose. MET's groundwater replenishment program was discontinued on January 1, 2013, and currently MET via MWDOC sells replenishment water to OCWD at the full-service untreated MET rate. Figure 6-6 shows MWDOC's imported water sales to OCWD since FY 1990-91, which averages approximately 31,200 AF per year. Recently, due to low Santa

Ana River flows as a result of low precipitation and increased use along the river, OCWD has needed to purchase more imported replenishment water per year than the average of 31,200 AFY over the last 25 years (this does not include water amounts from MET's Conjunctive Use Program (CUP) or its Cyclic Storage Account). However, with the emergence of PFAS affecting groundwater production, the need of purchasing imported water has been temporary suspended. Until PFAS treatment is in place for most groundwater producers, imported replenishment water will be significantly reduced.

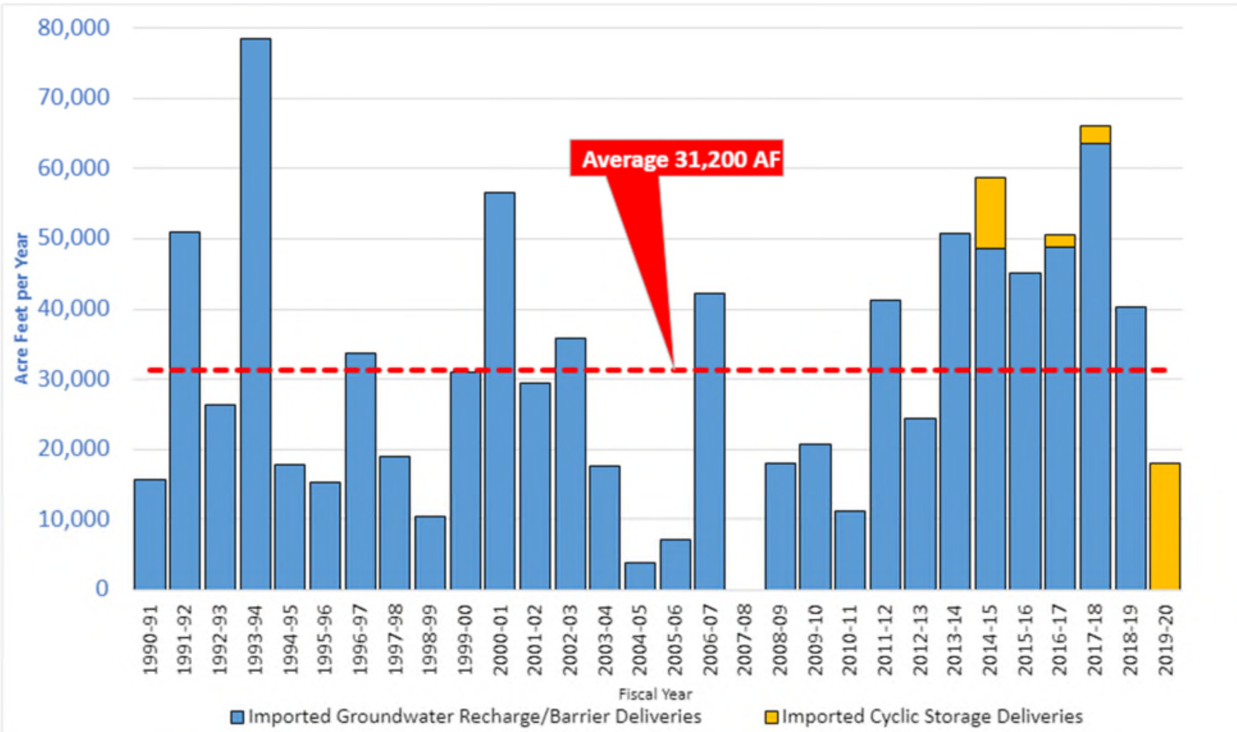


Figure 6-6: MWDOC Imported Water Sales for Groundwater Replenishment

6.3.1.6 MET Conjunctive Use/Cyclic Storage Program with OCWD

Since 2004, OCWD, MWDOC, and certain groundwater producers have participated in MET's CUP. This program allows for the storage of MET water in the OC Basin. The existing MET program provides storage of up to 66,000 AF of water in the OC Basin to be pumped by participating producers in place of receiving imported supplies during dry years or water shortage events. In exchange, MET contributed to improvements in basin management facilities and to an annual administrative fee. These improvements included 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 MET such that it can be withdrawn over a three-year time period (OCWD, 2020a).

The CUP account was filled in the wet years of 2007 & 2013 and withdrawn to near-zero during the dry-years of 2010 & 2016. MET has not stored water in the CUP account since 2014, and the CUP account has been withdrawn to zero and is projected to remain at 0 AF by the end of 2021. The CUP contract with MET ends in 2028.

As so, the values in Figure 6-7 from 2015 onwards, represent only volumes from the MET Cyclic Storage Agreement. The Cyclic Storage account is an alternative storage account with MET. However, unlike the CUP program, OCWD controls when the water is used. The Cyclic Water Storage Program allows MET to store water in a local groundwater basin during surplus conditions, where MET has limited space in its regional storage locations. Once the water is stored via direct delivery or In-lieu the groundwater agency has the ability to purchase this water at a future date or over a 5-year period.

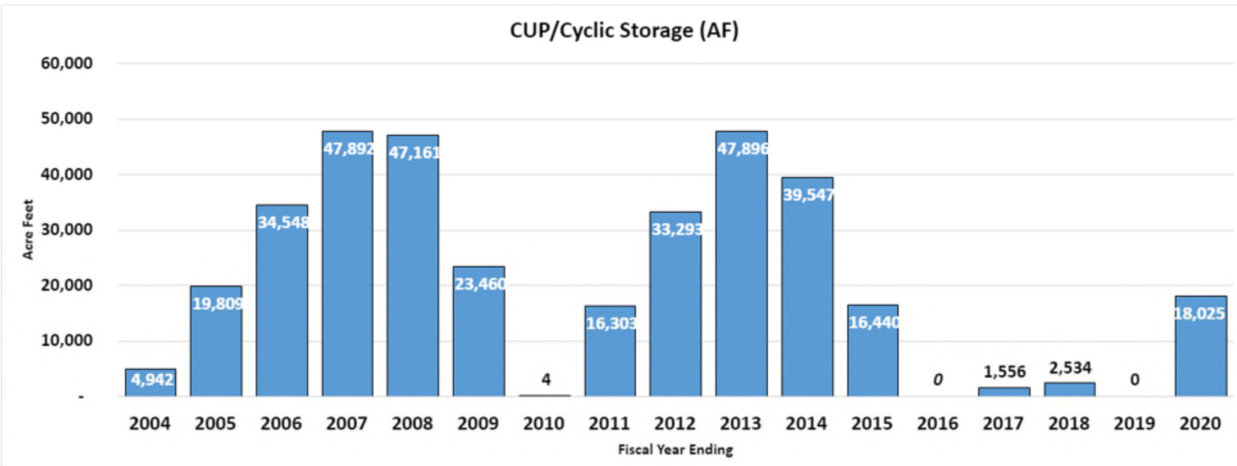


Figure 6-7: MWDOC Conjunctive Use Program Historical Storage Balance

6.3.2 Other Groundwater Basins

6.3.2.1 San Juan Groundwater Basin

Basin Characteristics

Per DWR's designation, the San Juan Basin is a non-adjudicated, very low-priority basin (DWR, 2019). 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. A map of the four principal groundwater basins is shown in Figure 6-8. 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 Basin consists of a heterogeneous mixture of sand, silts, and gravel.

Water quality in the San Juan Basin ranges from good to poor, as the deep lower basins contain brackish water that requires treatment, while the shallower upper subbasin has lower total dissolved solids (TDS) concentration. Groundwater production occurs primarily within the Lower Arroyo Trabuco, the Middle Basin, and the Lower Basin due to lack of storage and production capacity in the Upper Basin. Groundwater production within the San Juan Basin faces additional challenges including shallow bedrock conditions, elevated dissolved solids content of the water, riparian habitat constraints on groundwater level drawdown, permit limits, and climate changes or drought conditions.

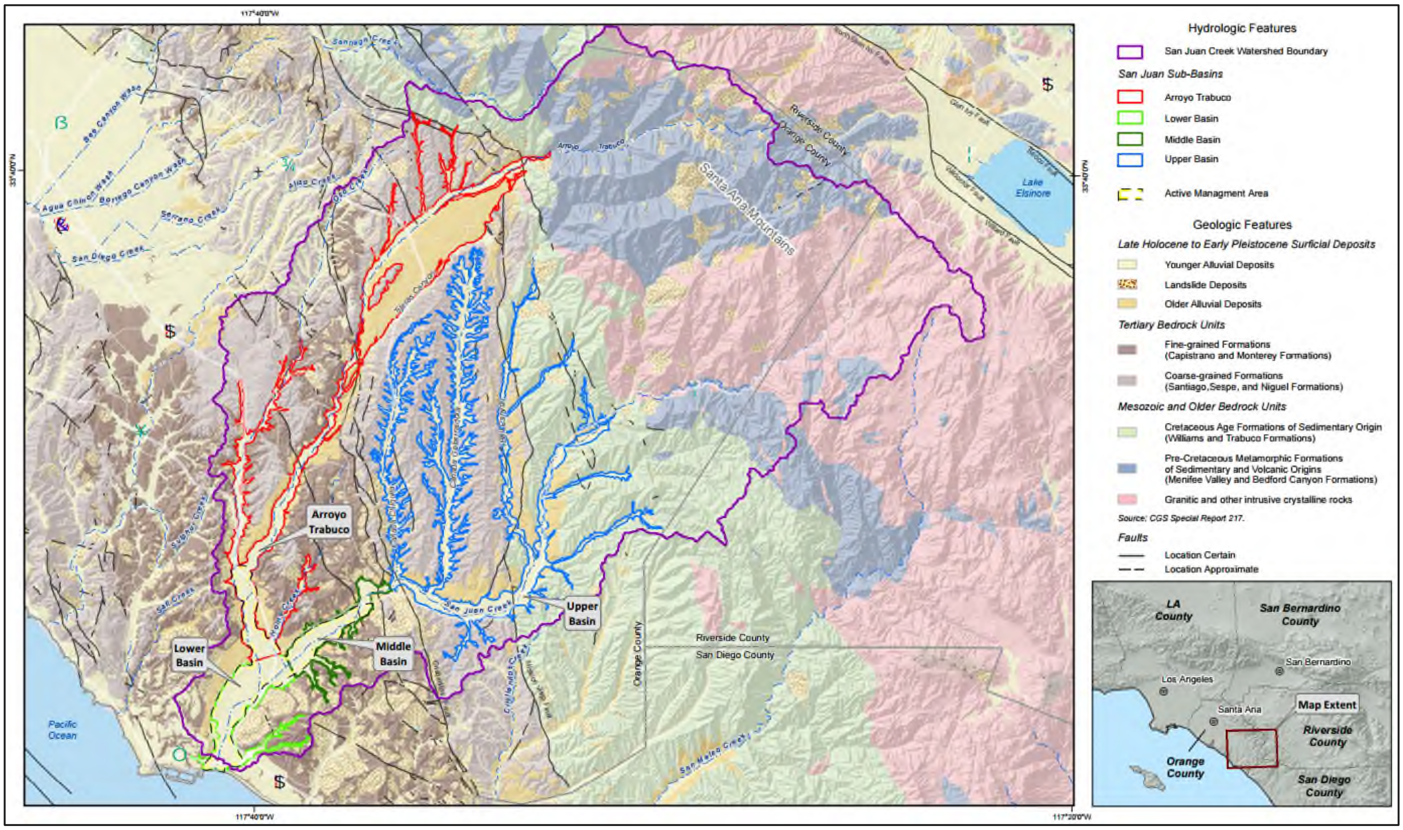


Figure 6-8: Principal Groundwater Basins for the San Juan Groundwater Basin

The physical boundaries of the San Juan 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 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.
- 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
- Outflow to Pacific Ocean

Currently, three agencies, have groundwater rights to the San Juan Basin and use this water for either municipal purposes or for irrigation. The agencies with groundwater rights to the Basin and their 2020 pumping allocations are listed below (Wildermuth Environmental, Inc., 2020):

- South Coast Water District: 1,300 AFY
- San Juan Basin Authority (SJBA): 12,500 AFY
- City of San Juan Capistrano: 6,150 AFY of SJBA's water rights, including 5,800 AFY at the Alipaz well field and Tirador well and up to 350 AFY for the San Juan Hills Golf Club

Basin Management

The SWRCB has determined that the San Juan Creek watershed is not a groundwater basin but is rather a surface and underground flowing stream. Therefore, it is subject to SWRCB jurisdiction and its processes with respect to the appropriation and use of waters within the watershed. The SJBA is a joint powers agency comprised of representatives from four local jurisdictions formed in 1971 to manage the watershed. Member agencies include SCWD, City of San Juan Capistrano, MNWD, and SMWD. Both the SJBA and SCWD have their own SWRCB Permit for Diversion and Use of Water: Permit No. 21074 and Permit No. 21138, respectively (Wildermuth Environmental, Inc., 2020).

The San Juan Basin differs from many 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 SJBA adopted the concept of "adaptive management" of the Basin to vary pumping from year to year based on actual basin conditions derived from monitoring efforts, with the groundwater management implication that during dry periods groundwater pumping will be lower than in wet periods. SJBA serves as the "Basin Manager" responsible for annually determining the amounts of adapted "available safe yield" so that SJBA and SCWD can pump pursuant to their water rights, so that 80% of water available for pumping goes to SJBA (up to a maximum of 12,500 AFY), and 20% goes to SCWD (up to a maximum of 1,300 AFY) (Wildermuth Environmental, Inc., 2020).

Following the recommendations of the San Juan Basin Groundwater and Facilities Management Plan (Appendix E), SJBA began developing adaptive pumping management (APM) plans to annually determine the water available for pumping. The first APM plan was the 2016 plan and the most current at the time of this writing is the 2020 plan. The plans are updated each April, after most of the rainy season has passed, to define and initial pumping allocation for the subsequent 12-month period (May to April) based on current Basin conditions. Adjustments to the initial allocation are made as appropriate. Based on climate conditions and groundwater levels in the Inland and Stonehill management zones, the Basin is near full, indicating that the initial 2020 pumping allocations may be set at the maximum limits (Wildermuth Environmental, Inc., 2020).

The APM plan also discusses the various efforts SJBA leads in order to support the continued sustainable production from the Basin. Examples of such efforts include aquifer testing to better understand Basin characteristics and monthly water quality and water level monitoring programs (Wildermuth Environmental, Inc., 2020). For the full text of the 2020 APM plan, refer to Appendix F.

The storage in the groundwater basin is small, at an estimated 41,400 AF, relative to recharge and production. The range of natural yield of the San Juan Basin is 7,000 AFY to 11,000 AFY. Instream recharge along both San Juan Creek and Arroyo Trabuco Creek is the only viable largescale recharge method for the San Juan Basin due to the lack of suitable off-stream sites for stormwater storage and recharge, and the inability of the basin to accept large amounts of recharge at a specific site (SJBA, 2016).

6.3.2.2 La Habra Groundwater Basin

Basin Characteristics

The unadjudicated La Habra Groundwater Basin covers parts of Los Angeles County and Orange County and is part of both the Central Basin, and the OC Basin, which are both medium-priority basins. The Basin lies entirely within the Coyote Creek Watershed and the La Habra Basin area is shown on Figure 6-9. A portion of the La Habra Basin is located within Central Basin as well as the northern tip of the OC Basin.

The City of La Habra has been deemed the exclusive GSA under SGMA for the La Habra-Brea Management Area. This management area is part of Basin 8-1 but is hydrogeologically distinct from the OCWD Management Area and is not under the jurisdiction of OCWD. La Habra adopted a resolution to establish the La Habra Basin as a separate basin from Basin 8-1. OCWD adopted a resolution to support the City's request to DWR for an internal jurisdictional boundary modification in the OC Basin that follows the city limits of La Habra and Brea as it is outside of the OCWD's jurisdictional boundary.

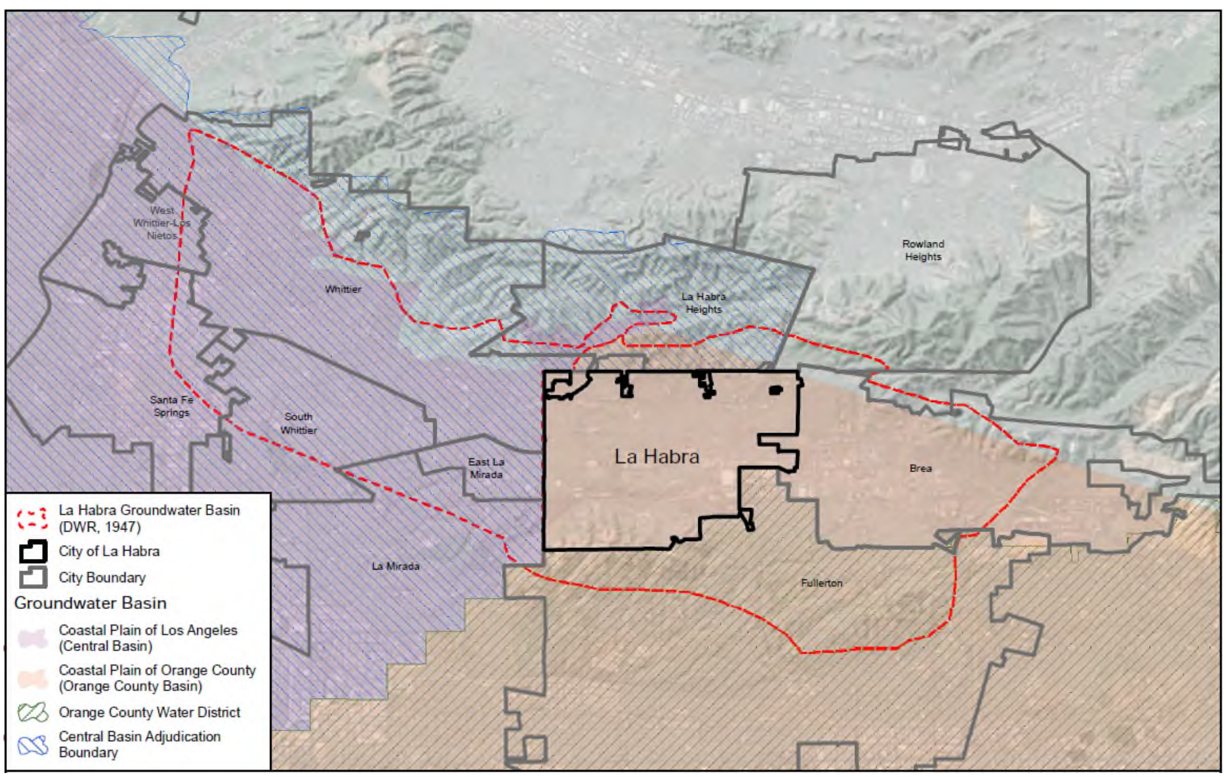


Figure 6-9: La Habra Groundwater Basin

From a structural geological standpoint, the La Habra Basin area is dominated by the northwest trending La Habra Syncline (a U-shaped down-fold) which is bounded on the north by the Puente Hills and on the south by the Coyote Hills. The fold is a naturally occurring trough, or valley, where significant quantities of groundwater have accumulated over the past 150,000 years. The La Habra Basin consists of three water-bearing zones: 1) the Alluvium, 2) the La Habra Formation (including the Coyote Hills Formation), and 3) the San Pedro Formation.

The Alluvium is comprised of young and old alluvium. The deposits are found along the surface stream courses and is composed of unconsolidated silt, clay, sand, and gravel. Alluvium thickness ranges from a few feet to over 100 feet. Generally, the La Habra Formation lies below the Alluvium, consisting of the La Habra and Coyote Hills Formations. However, in the Coyote Hill and Puente Hills, the Alluvium is uplifted and exposed. The La Habra Formation consists of non-marine mudstone, siltstone, sandstone, and conglomerate. It ranges in thickness from 300 to nearly 1,200 feet. Water levels of wells in the La Habra Formation have been measured between 100 and 200 feet below ground surface across the Basin.

Underneath the La Habra Formation lies the San Pedro Formation. As the deepest water bearing unit, the San Pedro Formation is comprised of sand, gravel, sandstone, conglomerate, and shale. The San Pedro Formation ranges between 200 and 400 feet in thickness and produces the best quality groundwater of all the water bearing zones. Pressure levels of confined groundwater in wells of the San Pedro aquifer zone range from about 100 to 200 feet below ground surface (La Habra, Groundwater Study, August 2014).

Basin Management and Safe Yield

As stated in Section 6.3.1.1, the agencies within Basin 8-1, such as the City of La Habra, collaborated to submit an Alternative to a GSP in 2017, titled the "Basin 8-1 Alternative" to meet SGMA compliance. This document supersedes the Groundwater Management Plan from 2014 and will be updated every five years. The current (2017) version of the SGMA-compliant document is included in Appendix D.

The La Habra Basin is not adjudicated. Instead, the City of La Habra follows a "safe yield" which is used for the management and future planning of the La Habra Basin for sustained beneficial use. The safe yield is the volume of groundwater that can be pumped without depleting the aquifer to a point where it cannot recover through natural recharge over a reasonable period of time.

The safe yield for the La Habra Basin was estimated to be approximately 4,500 AFY. This safe yield was determined through an average from two separate studies that took into account natural groundwater recharge and natural groundwater discharge. The La Habra Basin continues to be managed sustainably by maintaining and coordinating groundwater production within the estimated safe yield. The City of La Habra is also evaluating its existing monitoring program with the intent to develop a more robust groundwater elevation and water quality monitoring program (La Habra, 2020).

Historical and Current Groundwater Extraction

From 1922 to the early 1940's water levels in the La Habra Basin declined markedly because of increased water extraction and deficient rainfall. Water levels rose in the mid 1940's and then declined again in the late 1940's reaching the lowest recorded levels in the middle to late 1950's. From 1960 to 1977, water levels increased in elevation because of a significant decrease in water extraction. Based upon recorded stream runoff yields, it is estimated that approximately 2,100 AF of water would percolate during the average year. For direct percolation of rainfall and resulting runoff within the valley itself, it is estimated that an average of 1,600 AFY would percolate. Thus, the groundwater recharge is estimated at approximately 3,700 AFY. Subsurface flow estimates are about 5,500 AFY. Therefore, it is estimated that the average long-term supply that can be extracted without severe or sustained changes in the amount of groundwater in storage, is approximately 4,500 AFY (an average of the two values).

The City of La Habra pumps local groundwater from the La Habra Basin from three production wells for drinking water purposes and one non-potable groundwater well used for irrigation. Groundwater production in the La Habra Basin has ranged from 3,295 AF in FY 2016-17 to 2,245 AF in FY 2018-19 (La Habra, 2020).

6.3.2.3 Main San Gabriel Groundwater Basin

California Domestic Water Company (CDWC) has water rights, production, treatment and conveyance facilities in the adjudicated 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. Based on the ten-year average from FY 2010-11 through 2019-20, Brea and La Habra purchase approximately 13,261 AFY of Main San Gabriel Groundwater Basin groundwater from CDWC, but this volume varies from year to year.

There is not a limit or cap on the amount of water CDWC can produce from the basin. CDWC owns approximately 12,363 AF of prescriptive pumping rights in the Main San Gabriel Basin. Prescriptive pumping rights are adjusted based on the determination of the Operating Safe Yield (OSY) annually. Based on the FY 2020-21 OSY set at 150,000 AF, CDWC's prescriptive pumping rights total 9,383.24 AF. Currently, this is the amount of groundwater CDWC can produce from the basin before incurring replacement water assessments, further described in Section 6.3.2.3.1.

The Main San Gabriel Basin and its operations are described below.

Basin Characteristics

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, 2020a).

Figure 6-10 depicts the boundaries of the Main San Gabriel Basin.

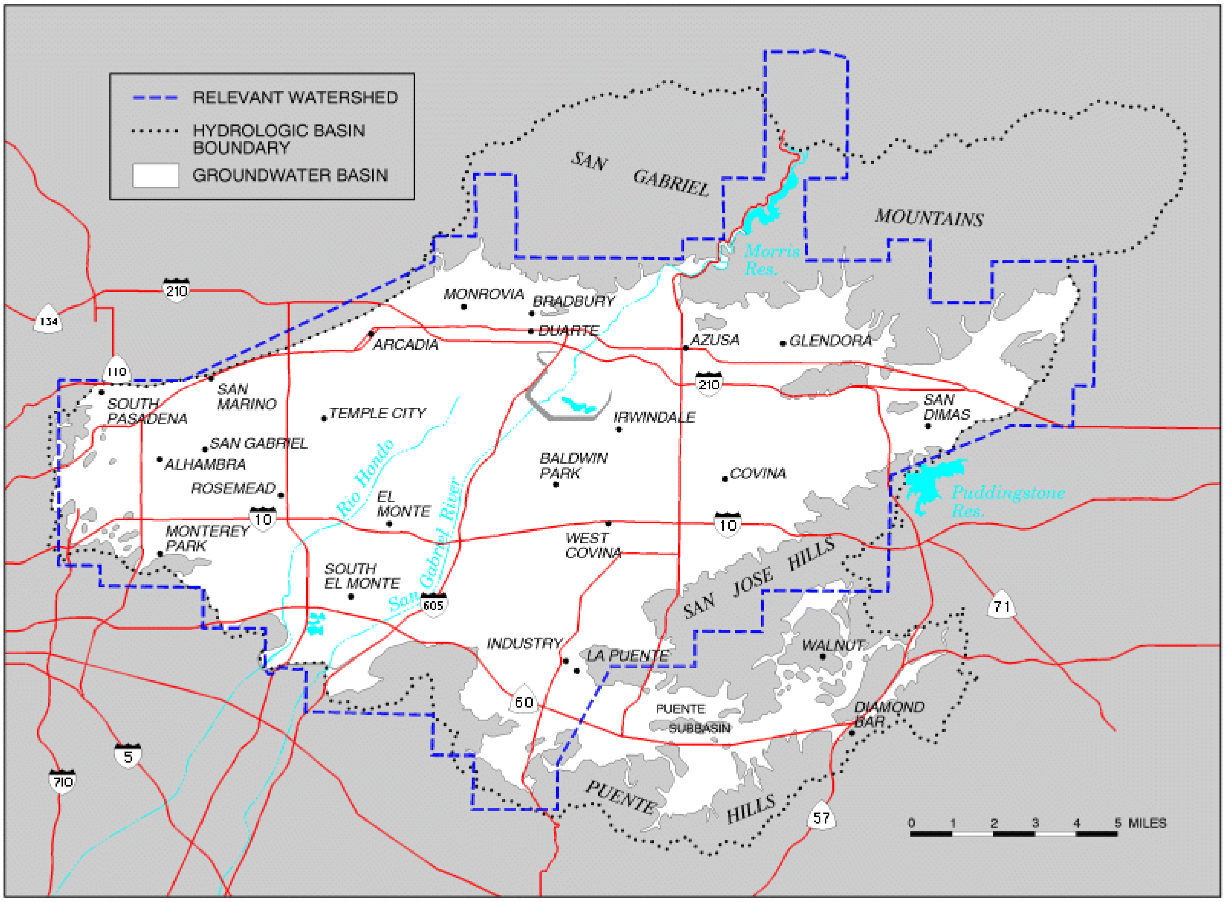


Figure 6-10: Main San Gabriel Groundwater Basin

6.3.2.3.1 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 OSY for the Main Basin that is then used to allocate to each agency its portion of the OSY that can be produced free of a Replacement Water Assessment. If a producer extracts water in excess of his right under the annual OSY, 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 OSY is set at 150,000 AF for FY 2020-21.

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, 2020a).

The Main Basin Watermaster has entered into a Cyclic Storage Agreement with three municipal water districts, MET, Three Valleys Municipal Water District (TVMWD), and Upper San Gabriel Valley Municipal Water District (USGVMWD). The first agreement with MET and USGVMWD permits MET 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 MET to deliver and store 40,000 AF for future Replacement Water use. The third is with San Gabriel Valley Municipal Water District. The Amended Main San Gabriel Basin Judgment contains more detailed information on the agreements and management of water rights to the basin (Appendix G).

The Main San Gabriel Basin is currently in an extended period of drought-like conditions, with 18 out of the most recent 25 years having below-average rainfall, as well as minimal runoff and limited recharge. As a result, Basin recovery is dependent on the Main Basin Watermaster's management actions. Long-term water demand has fallen steadily over the last decade, and in FY 2019-20, the demand was approximately 30% below the peak in 2006. The Key Well also rose 6.3 feet in FY 2019-20 due to increases in Cyclic Storage and local and Resource Development Assessment (RDA) water.

6.3.2.4 San Mateo Valley Groundwater Basin

Basin Characteristics

Per DWR's designation, the San Mateo Valley Basin is a non-adjudicated, very low-priority basin located to the south of the Orange County boundary, within the boundary of the Marine Corps Base (Base), Camp Pendleton, in San Diego County. The basin covers an area of 4.7 square miles (DWR, 2019a). Historically, the Base utilized groundwater from the 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.

Marine terrace deposits characterized as predominantly fine to coarse sand and gravel in the southern part of San Clemente are underlain by the San Mateo and Capistrano Formations. These deposits are in direct hydraulic contact with the ocean and are subject to seawater intrusion. The San Mateo Formation consists of marine sands and conglomerates, while the Capistrano Formation that underlies it consists of interbedded sandstone and shale zones, with nested turbidite-filled channels that are conducive to groundwater production (Dudek, 2015).

Confined groundwater in the San Mateo Valley Basin is produced from a deep-lying series of semi-consolidated sandstone beds with numerous coarse gravel lenses. The majority of the soils have slow or very slow infiltration rates. The usable surface area of the Basin was identified to be 107 acres with a hypothetical usable depth ranging from 10 to 110 feet (Boyle Engineering Corporation, 1987).

San Clemente operates two water supply wells, Well 6 and Well 8, to augment it's water supply.

Basin Management

Due to the unadjudicated, very low-priority designation of the San Mateo Valley Basin, a formal management plan does not exist.

The Basin has recharge areas along San Mateo Creek, downgradient from drinking water supply wells (DWR, 2019b).

6.3.2.5 Impaired Groundwater

The combined yield from the seven projects described below, was 25,443 AF in FY 2019-20. 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.

Huntington Beach Well 9: This project would restore the 3,000 gpm well capacity by removing nuisance odor from dissolved Hydrogen Sulfide. The City is pursuing assistance from OCWD to help fund both capital and operational costs for this project. Upon completion of the treatment system, Well 9 will be able to produce high quality water at full design capacity (Psomas, 2016).

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. The Main Street Desalter reduces nitrate levels from the groundwater produced by Tustin's Main Street wells. The untreated groundwater undergoes either Reverse Osmosis (RO) 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 TDS concentrations from the groundwater pumped by Tustin's 17 th Street wells. The 17th Street Desalter plant uses two RO membrane trains to treat the groundwater.

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

IRWD Deep Aquifer Treatment System – IRWD's Deep Aquifer Treatment System (DATS) purifies drinking water from the lower aquifer of the OC 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 Wells 21 & 22 Desalter Treatment plant - The Wells 21 and 22 Rehabilitation, Pipelines and Water Treatment Plant project recovers and treats local groundwater to remove nitrates using reverse osmosis. The treated water is used in the potable water system. Adding this new source of drinking water helps to satisfy increasing demand for water and provides a sustainable infrastructure with long-term benefits. The Wells 21 and 22 project will produce approximately 6,300 acre-feet per year of drinking water for the IRWD service area.

IRWD Irvine Desalter Project - The Irvine Desalter Project was completed in 2006 and purifies water found in the Irvine sub-basin of the larger OC 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 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 TDS using RO 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.

6.3.3 Planned Future Sources

The agencies that manage the OC, Main San Gabriel, La Habra, and San Juan basins regularly evaluate potential projects and conduct studies to review the feasibility of new projects or sources. A few groundwater basin-related projects that are planned or in progress are described below.

OC Basin

GWRSFE **–** The final expansion of the GWRS is currently underway and is the third and final phase of the project. When the Final Expansion is completed in early 2023, the plant's treatment capacity will increase from 100 to 130 MGD. To produce 130 MGD, additional treated wastewater from OC San's Treatment Plant 2 is required. This recycled water represents a high quality, drought-proof source of water to protect and enhance the OC Basin. The Final Expansion project will include expanding the existing GWRS treatment facilities, constructing new conveyance facilities at OC San Plant 2, and rehabilitating an existing pipeline between OC San Plant 2 and the GWRS. Once completed, the GWRS plant will recycle 100% of OC San's reclaimable sources and produce enough water to meet the needs of over one million people.

Forecast Informed Reservoir Operations (FIRO) at Prado Dam – Stormwater represents a significant source of water used by OCWD to recharge the OC Basin. Much of this recharge is made possible by the capture of Santa Ana River stormflows behind Prado Dam in the Conservation Pool. FIRO represents the next generation of operating water reservoirs using the best available technology. Advances in weather and stormwater runoff forecasting hold promise to allow USACE to safety impound more stormwater while maintaining equivalent flood risk management capability behind Prado Dam. Preliminary modeling show that by expanding the Conservation Pool from elevation 505 to 512 ft msl, annual recharge to the groundwater basin could increase by as much as 4,500 to 7,000 AFY.

Main San Gabriel Groundwater Basin

Involvement in MET's Regional Recycled Water Project – The Main San Gabriel Basin is listed in Phase I of this project, which is expected to deliver approximately 40,000 AF of recharge water to the basin for spreading and groundwater replenishment. The Main San Gabriel Basin Watermaster Board of Directors authorized a letter of intent that was provided to MET expressing the basin's intent to continue cooperating and working with MET on the project.

San Juan Basin

San Juan Watershed Project – The San Juan Watershed Project is a multi-phase project proposed by SMWD and project partners. If implemented, this project would enhance water reliability by capturing local stormwater runoff as well as directing recycled water into temporary storage and using it to recharge the San Juan Creek Watershed. A final Environmental Impact Report (EIR) was submitted by SMWD in 2019 (SMWD, 2021a)

6.4 Surface Water

In FY 2019-20, two percent of MWDOC's water supply portfolio was attributed to surface water captured in local reservoirs. The largest surface water reservoir in Orange County is Santiago Reservoir (Irvine Lake), which is further discussed in Section 6.4.1. In other areas, surface water runoff percolates into alluvial materials or groundwater basins. IRWD, SMWD, and SCWD capture and manage surface water supplies at certain locations. Surface water is managed by MWDOC's member agencies (Orange County Local Agency Formation Commission, 2020).

6.4.1 Irvine Lake

Santiago Reservoir, or Irvine Lake, is the largest surface water reservoir in Orange County. Irvine Lake was built in 1931 and captures runoff from the upper Santiago Creek Watershed, as well as stores imported water (Orange County Local Agency Formation Commission, 2020). The 700-acre Irvine Lake is co-owned by IRWD and Serrano Water. The lake holds more than 9 billion gallons of water and is contained by the 810-foot-tall Santiago Dam. IRWD uses water from Irvine Lake as a source of water for non-drinking purposes such as irrigation and as a source of water for the Baker Treatment Plant (Section 6.2.1.5). Serrano Water District (Serrano) also uses Irvine Lake to provide treated drinking water to its customers in the City of Villa Park and parts of the City of Orange. Both agencies balance the benefits of storing water in Irvine Lake with minimizing evaporation and preserving the ability to capture rainwater from the surrounding hills. During years with less rainfall, IRWD and Serrano also add imported water from MET to the lake (IRWD, 2021a).

6.5 Stormwater

MWDOC does not own or operate stormwater facilities. This section describes existing and planned stormwater sources in the region that benefit Orange County.

6.5.1 Existing Sources

Costly and limited imported water availability from the CRA and SWP has heightened the need to enhance water supply by increasing local stormwater capture. The Prado Dam in Riverside, California captures approximately 52 TAF of stormwater annually, on average, for recharge in Orange County. During times of minimal flood threat, the dam can be regulated to control runoff in order to supply water to OCWD. The current agreement between the US Army Corps of Engineers and OCWD allows for the capture of stormwater up to an elevation of 498 feet above sea level during flood season and up to 505 feet above sea level during non-flood season behind Prado Dam (OCWD, 2016).

6.5.2 Planned Future Sources

The Prado Basin Feasibility Study evaluates the alternatives to restore environmental resources within the Prado Basin and Santa Ana River and increase the existing volume of water conservation potential. Increasing stormwater capture by an additional 7 feet during the flood season, to 505 ft above sea level, can provide up to an additional 30 TAFY of water (OCWD, 2016). The proposed Water Conservation Plan includes re-operation of the Prado Dam for controlled release of water for reduced discharge rates from the Prado Dam and reducing sediment deposition in the Basin to increase the effective yield of water from the Santa Ana River for diversion and infiltration at OCWD's facilities downstream of the dam. The final EIR was published in 2021 and OCWD anticipates that the Prado Dam Water Control Manual will be updated by the US Army Corps of Engineers in 2021 to include stormwater capture to elevation 505 feet year-round (OCWD, 2021).

6.6 Wastewater and Recycled Water

MWDOC is not directly involved in wastewater services and does not own or operate the wastewater collection system in its service area. Additionally, MWDOC does not own or operate wastewater treatment facilities. 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 wastewater.

MWDOC is indirectly involved in recycled water production, through its supply to systems whose wastewater is sent for IPR. 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 often have overlapping jurisdictional boundaries. As imported water supplies have become increasingly 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. The following sections expand on the existing agency collaboration involved in these efforts as well as MWDOC's member agencies projected recycled water use over the next 25 years.

6.6.1 Agency Coordination

MWDOC does not own or operate wastewater treatment facilities and the individual agencies that MWDOC supplies often send collected wastewater to either OC San in North County or SOCWA in South County for treatment and disposal. OCWD is the manager of the OC Basin and strives to maintain and increase the reliability of the OC Basin through replenishment with imported water, stormwater, and advanced treated wastewater.

6.6.1.1 Orange County Sanitation District

OC San collects wastewater from residential, commercial, and industrial customers in 21 cities, three special districts, and portions of unincorporated Orange County, totaling 479 square miles that serves 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.

OC San 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. OC San 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 OC San's National Pollutant Discharge Elimination System (NPDES) 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. OC San'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.

OC San 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.

OC San 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.

6.6.1.2 Orange County Water District

OCWD is the manager of the OC Basin and provides water to 19 municipal water agencies and special districts. A full description of the OC Basin is available in Section 6.3.1. OCWD and OC San have jointly constructed and expanded two water recycling projects that include: 1) OCWD GAP and 2) OCWD GWRS.

OCWD GAP

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

OCWD GWRS

OCWD's GWRS allows southern California to decrease its dependency on imported water and creates a local and reliable source of water. OCWD's GWRS purifies secondary treated wastewater from OC San to levels that meet and exceed 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 MF, RO (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 treatment process is described on OCWD's website. (OCWD, GWRS, 2020).

The GWRS first began operating in 2008 producing 70 million gallons of water per day (MGD) and in 2015, it underwent a 30 MGD expansion. Approximately 39,200 AFY of the highly purified water is pumped into the injection wells and 72,900 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 OC Basin provides approximately 77 percent of the potable water supply for north and central Orange County. The design and construction of the first phase (78,500 AFY) of the GWRS project was jointly funded by OCWD and OC San; Phase 2 expansion (33,600 AFY) was funded solely by OCWD.

The Final Expansion of the GWRS is currently underway and is the third and final phase of the project. When the Final Expansion is completed in 2023, the plant will produce 130 MGD. To produce 130 MGD, additional treated wastewater from OC San is required. This additional water will come from OC San's Treatment Plant 2, which is in the City of Huntington Beach approximately 3.5 miles south of the GWRS. The Final Expansion project will include expanding the existing GWRS treatment facilities, constructing new conveyance facilities at OC San Plant 2 and rehabilitating an existing pipeline between OC San Plant 2 and the GWRS. Once completed, the GWRS plant will recycle 100 percent of OC San's reclaimable sources and produce enough water to meet the needs of over one million people.

6.6.1.3 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 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.

6.6.2 Current Recycled Water Uses

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. A list of agencies that provide wholesale or retail recycled water within MWDOC's service area are below.

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. For information on OCWD's GAP and GWRS, refer to Section 6.6.1.2.

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 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.

IRWD UCI's Cooling Towers - IRWD partnered with the University of California, Irvine (UCI) by constructing approximately 3,000 feet of pipeline to bring recycled water to the campus's central plant where recycled water is used as make-up water in the cooling towers. This project conserves more than 250 acre-feet of potable water each year and helps UCI achieve its sustainability goals.

IRWD Great Park Ice and Five Point Arena - In 2017, the Irvine Ice Foundation constructed the Great Park Ice and Five Point Arena. This 280,000 square foot facility located at the Great Park in Irvine is considered the largest ice facility in California and one of the largest in the United States. This facility also serves as the official practice facility of the National Hockey League's Anaheim Ducks. IRWD provides the facility's recycled water which is used to make and maintain the ice at the four indoor ice rinks.

IRWD Dual Plumbed Buildings Initiative - IRWD was the first agency to work with a customer to construct a dual plumbed commercial building to use recycled water for flushing toilets and urinals in 1991. Today IRWD serves 127 dual plumbed commercial buildings ranging from a restroom at a park to 20-story high-rise office buildings. From 2015 to 2020, IRWD added 65 commercial buildings to its customer roles and more are on the way.

IRWD Dual Plumbed Hyatt House - This seven-story hotel is fully dual plumbed, using recycled water in all the restrooms including the 149 guest rooms. It is the first fully dual plumbed hotel in the United States.

IRWD Irvine Lake Pipeline (ILP) Conversion Project - The Irvine Lake Pipeline (ILP) Conversion Project was designed to convert the northern section of the ILP from an untreated water system to a recycled water system. This conversion was designed to provide recycled water to approximately 80 landscape and agricultural irrigation customers, offsetting imported water demands and reducing evaporation losses at Irvine Lake. Prior to the recycled water conversion, the ILP delivered imported untreated water that IRWD purchased from MET and stored in Irvine Lake, with subsequent conveyance to irrigation sites. By constructing the ILP Conversion Project, existing irrigation demands that once relied on imported water were converted to recycled water, reducing imported water needs, eliminating evaporation losses, and enhancing water supply reliability. The ILP North Conversion Project includes capacity for both existing and future planned recycled water demands.

TCWD Robinson Ranch Water Reclamation Plant - TCWD owns and operates the Robinson Ranch Wastewater Treatment Plant (RRWTP) 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 gallons per day (GPD) and the creek water is treated using ultrafiltration and RO 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.

6.6.3 Projected Recycled Water Uses

As of April 2019, the State of California amended its recycled water policy to expand its numeric goal 2.5 million AFY by 2030 and added annual required reporting requirements for wastewater and recycled water. Specific to the MWDOC's service area, most agencies within the service area have already maximized their recycled water use. Most are projecting a consistent use through to 2045 and are not expecting for recycled water use to grow. However, a few agencies in South Orange County do expect moderate growth in recycled water production and customers. Collectively, the MWDOC's service area is projected to see an increase in recycled water uses grow from 42,330 AF in 2020 to 57,094 in 2045 (see Section 4).

6.6.4 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.

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.

6.6.5 Optimization Plan

MET 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 the 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 MET and others (such as the National Water Research Institute) will have the benefit of reducing risks for MWDOC's member 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 and supporting its member agencies in obtaining Local Resources Program (LRP) incentives from MET;

- Assisting and supporting member agencies in applications made for bond funds such as Proposition 84;
- Encouraging MET to participate in studies that will benefit recycled water production in the service area;
- Supporting MET in deriving solutions to regulatory issues;
- Participating in regional plan such as the South Orange County IRWMP;
- Working cooperatively with retail agencies, MET 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;
- Assisting and supporting its member agencies to participate in MET's Future Supply Program, which provides funding for research and studies needed to set the state standards for Direct Potable Reuse (DPR) on American Water Works Association's (AWWA) research Foundation Project.

The MWDOC public education and Choice School Programs have reached millions of residents, businesses, and students with valuable, trusted water-centric information and education. One of the topics covered includes an introduction to water quality and water recycling as a critical component to the health and reliability of a more extensive Orange County water supply portfolio. MWDOC's multi-agency approach to public information includes collaboration with education, environmental, and utility agencies throughout the county. MWDOC reaches the public with essential information regarding present and future water supplies, the importance of sufficient quantity and quality of water – including recycled water – and the significance of implementing water use efficiency practices in daily life. Through MWDOC, water education programs have reached millions of residents, businesses, and students with information and education on recycled water.

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.

6.7 Desalination Opportunities

In 2001, MET developed a Seawater Desalination Program (SDP) to provide incentives for developing new seawater desalination projects in MET's service area. In 2014, MET 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 MET's imported water supplies. In return, MET offers three incentive formulas under the program:

- Sliding scale incentive up to $340 per AF for a 25-year agreement term, depending on the unit cost of seawater produced compared to the cost of MET supplies.
- Sliding scale incentive up to $475 per AF for a 15-year agreement term, depending on the unit cost of seawater produced compared to the cost of MET supplies.
- Fixed incentive up to $305 per AF for a 25-year agreement term.

Developing local supplies within MET'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 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, MET's imported water deliveries to Orange County could be reduced. These projects include the Huntington Beach Seawater Desalination Project and the Doheny Desalination Project.

6.7.1 Ocean Water Desalination

6.7.1.1 Huntington Beach Seawater Desalination Plant

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. Three general distribution options have been discussed with the 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 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 Basin. Currently, a combination of these options could be pursued.

The Huntington Beach Seawater Desalination project plant capacity of 56,000 AFY would be 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 Basin by augmenting supplies into the Talbert Seawater Barrier to prevent seawater intrusion.

In May 2015, OCWD and Poseidon entered into a non-binding Term Sheet that provided the overall partner structure in order to advance the project. Based on the initial Term Sheet, which was updated in 2018, 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 regulatory permit approval process with the Regional Water Quality Control Board and the California Coastal Commission. Once all of the required permits are approved, Poseidon will then work with OCWD and interested member agencies in developing a plan to distribute the water. Subsequent to the regulatory permit approval process, and agreement with interested parties, Poseidon estimates that the project could be online as early as 2027.

Under guidance provided by DWR, the Huntington Beach Seawater Desalination Plant's projected water supplies are not considered in either Table 4-1 or Table 6-2 due to its current status within the criteria established by State guidelines (DWR, 2020c).

6.7.1.2 Doheny Desalination Plant

SCWD is proposing to develop an ocean water desalination facility in Dana Point. SCWD intends to construct a facility with an initial capacity of up to 5 million gallons per day (MGD). The initial up to 5 MGD capacity would be available for SCWD and potential partnering water agencies to provide a high quality, locally-controlled, drought-proof water supply. The desalination facility would also provide emergency backup water supplies, should an earthquake, system shutdown, or other event disrupt the delivery of imported water to the area. The Project would consist of a subsurface slant well intake system (constructed within Doheny Beach State Park), raw (sea) water conveyance to the desalination facility site (located on SCWD owned property), a seawater reverse osmosis (SWRO) desalination facility, brine disposal through an existing wastewater ocean outfall, solids handling facilities, storage, and potable water conveyance interties to adjacent local and regional distribution infrastructure.

The Doheny Ocean Desalination Project has been determined as the best water supply option to meet reliability needs of SCWD and south Orange County. SCWD is pursuing the Project to ensure it meets the water use needs of its customers and the region by providing a drought-proof potable water supply, which diversifies SCWD's supply portfolio and protects against long-term imported water emergency outages and supply shortfalls that could have significant impact to our coastal communities, public health, and local economy. Phase I of the Project (aka, the "Local" Project) will provide SCWD and the region with up to 5 MGD of critical potable water supply that, together with recycled water, groundwater, and conservation, will provide the majority of SCWD's water supply through local reliable sources. An up to 15 MGD capacity project has been identified as a potential future "regional" project that could be phased incrementally, depending on regional needs.

On June 27, 2019, SCWD certified the final EIR and approved the Project. The Final EIR included considerable additional information provided at the request of the Coastal Commission and the Regional Board, including an updated coastal hazard analysis, updated brine discharge modeling, and updated groundwater modeling, updated hydrology analysis. The approval of the Project also included a commitment to 100 percent carbon neutrality through a 100 percent offset of emissions through the expansion of Project mitigation and use of renewable energy sources. SCWD is currently in the permitting process and finalizing additional due diligence studies. If implemented, SCWD anticipates an online date of 2025.

Under guidance provided by DWR, the Doheny Seawater Desalination Project's projected water supplies are not considered in either Table 4-1 or Table 6-2 due to its current status within the criteria established by State guidelines (DWR, 2020c).

6.7.2 Groundwater Desalination

In an effort to improve groundwater production, MET provides financial incentives to local agencies to treat brackish groundwater which has been impaired from either natural causes or from agricultural drainage. Through MET's LRP, the goal is 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 LRP contracts with MET.

MWRF Expansion - The MWRF, owned and operated by Mesa Water, pumps colored water from a deep colored water aquifer and removes the color MF. Due to increased color and bromide in the source water, Mesa Water upgraded the facility to include Nano filtration membrane treatment. In 2012, the MWRF's capacity was increased from 5.8 MGD to 8.6 MGD.

SCWD Capistrano Beach GRF Expansion - SCWD constructed a 1 MGD 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 (MCL) 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 GWRP 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 (GAC) Filter 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 RO and ion exchange treatment processes. The second facility is the Tustin Seventeenth Street Desalter, operating since 1996 to reduce high nitrate and TDS concentration from groundwater produced by Wells No. 2 and 4 and the Newport well using RO (OCWD, 2015 Groundwater Management Plan, June 2015).

6.8 Water Exchanges and Transfers

6.8.1 Existing Exchanges and Transfers

A few MWDOC member agencies have expressed interests in pursuing exchanges and/or transfers of water from outside of the region. MWDOC will continue to help its member agencies in developing these opportunities to enhance their reliability. In fulfilling this role, MWDOC will help its member agencies navigate the operational and administrative issues of wheeling or exchanging water through the MET 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 MET system. At present, the future of such transfers as a reliable and cost-effective means of providing the basic supply remain uncertain. However, transfer with specific purposes, such as supplementing dry year supplies can be effective. SMWD continues to explore opportunities for water transfers and exchanges as an alternative water supply and has worked with MWDOC and other agencies to investigate possible transfers. 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 Water Banking Program - IRWD developed their Water Banking Program in Kern County and initiated the first delivery of water under the program to their service territory of 1,000 AF in June 2015 as a demonstration effort. The delivered water was determined by MET to meet the definition of an "extraordinary supply", meaning that IRWD received full credit for the water and that it counts essentially 1:1 during a drought/water shortage condition under MET's WSAP. The banking program has been implemented via agreements with MET to wheel the water through their system, when requested. IRWD has also entered into a 30-year water banking partnership with the Rosedale-Rio Bravo Water Storage District in Kern County in which IRWD can store up to 126,000 AF in the water bank and recover up to approximately 29,000 AF in any single year. IRWD has purchased high quality groundwater recharge land and constructed more than 700 acres of groundwater recharge ponds to allow available surface water to percolate into the basin for later use, in which IRWD has priority rights when Rosedale is not recharging Kern River floodwaters (IRWD, 2021b). There is an approved coordinated operating and exchange agreement between IRWD, MET and MWDOC that will facilitate the recovery and delivery of State Water Project water from the water bank in Kern County into IRWD's service area in Orange County (IRWD, 2021b).

6.8.2 Planned and Potential Exchanges and Transfers

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 long-term emergency 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.

IRWD Water Banking Program – As noted in Section 6.9.1, IRWD has developed its Water Banking Program and it has about 50,000 AF stored for IRWD's benefit.

IRWD and Rosedale were conditionally awarded funds by the California Water Commission (CWC) to develop a regional water bank, the Kern Fan Groundwater Storage Project, to store and capture unallocated Article 21 water from the SWP during periods when surface water is abundant, and they are now completing additional requirements outlined in the program regulations to receive funds.

IRWD is also pursuing various additional sources of water supply for the water bank, including long term agreements with Antelope Valley-East Kern Water Agency and Buena Vista Water Storage District that can provide water supplies for banking and the acquisition of the Jackson Ranch in the Dudley Ridge Water District in Kings County.

During wet years, water surplus to the Jackson Ranch farming operations will be banked in the Strand Ranch Project for future use in IRWD (IRWD, 2021b).

In addition, IRWD and MWDOC have entered into discussions to provide a portion of this banked water to other MWDOC member agencies during shortages. A proposed pilot program between IRWD and MWDOC would allow for up to 5,000 AFY of water in Strand Ranch to be delivered to MWDOC as extraordinary supply with varying reservation costs. MWDOC is currently studying the terms and conditions to determine if this pilot program meets the needs of its agencies (CDM Smith, 2019).

Santa Margarita Water District – 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 MET's CRA. 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 CRA into southern California. The water would have to be wheeled through the MET system.

Santa Ana River Conservation and Conjunctive Use Project (SARCCUP) – The Santa Ana River Conservation and Conjunctive Use Project (SARCCUP) is a joint project established by five regional water agencies within the Santa Ana River Watershed (Eastern Municipal Water District, Inland Empire Utilities Agency, Western Municipal Water District, OCWD, and San Bernardino Valley Municipal Water District.

In 2016, SARCCUP was successful in receiving $55 million in grant funds from Proposition 84 through DWR. The overall SARCCUP program awarded by Proposition 84, consists of three main program elements:

- Watershed-Scale Cooperative Water Banking Program
- Water Use Efficiency: Landscape Design and Irrigation Improvements and Water Budget Assistance for Agencies
- Habitat Creation and *Arundo Donax* Removal from the Santa Ana River

The Watershed-Scale Cooperative Water Banking Program is the largest component of SARCCUP and since 2016, Valley, MET, and the four SARCCUP-MWD Member Agencies, with MWDOC representing

OCWD, have been discussing terms and conditions for the ability to purchase surplus water from Valley to be stored in the Santa Ana River watershed. With the Valley and MET surplus water purchase agreement due for renewal, it was the desire of Valley to establish a new agreement with MET that allows a portion of its surplus water to be stored within the Santa Ana River watershed.

An agreement between MET and four SARCCUP-MWD Member Agencies was approved earlier this year that gives the SARCCUP agencies the ability to purchase a portion (up to 50%) of the surplus water that San Bernardino Valley Municipal Water District (Valley), a SWP Contractor, sells to MET. Such water will be stored in local groundwater basins throughout the Santa Ana River watershed and extract during dry years to reduce the impacts from multiyear droughts. In Orange County, 36,000 AF can be stored in the OC Basin for use during dry years. More importantly, this stored SARCCUP water can be categorized as "extraordinary supplies" if used during a MET allocation, and can enhance a participating agencies' reliability during a drought. Moreover, if excess water is available MWDOC can purchase additional water for its service area.

Further details remain to be developed between OCWD, retail agencies, and MWDOC in how the water will be distributed in Orange County and who participates.

6.9 Future Water Projects

MWDOC has identified the following future regional projects (CDM Smith, 2019):

Poseidon Huntington Beach Ocean Desalination Project – Poseidon proposes to construct and operate the Huntington Beach Ocean Desalination Plant on a 12-acre parcel adjacent to the AES Huntington Beach Generating Station. The facility would have a capacity of 50 MGD and 56,000 AFY, with its main components consisting of a water intake system, a desalination facility, a concentrate disposal system, and a product water storage tank. This project would provide both system and supply reliability benefits to the SOC, the OC Basin, and Huntington Beach. The capital cost in the initial year for the plant is $1.22 billion.

Doheny Ocean Desalination Project – SCWD is proposing to construct an ocean water desalination facility in Dana Point at Doheny State Beach. The facility would have an initial up to 5 MGD capacity, with the potential for future expansions up to 15 MGD. The project's main components are a subsurface water intake system, a raw ocean water conveyance pipeline, a desalination facility, a seawater reverse osmosis (SWRO) desalination facility, a brine disposal system, and a product water storage tank.

San Juan Watershed Project – SMWD and other project partners have proposed a multi-phased project within the San Juan Creek Watershed to capture local stormwater and develop, convey, and recharge recycled water into the San Juan Groundwater Basin and treat the water upon pumping it out of the basin. The first phase includes the installation of three rubber dams within San Juan Creek to promote in-stream recharge of the basin, with an anticipated production of 700 AFY on average. The second phase would develop additional surface water and groundwater management practices by using stormwater and introducing recycled water for infiltration into the basin and has an anticipated production of 2,660 to 4,920 AFY. The third phase will introduce recycled water directly into San Juan Creek through live stream recharge, with an anticipated production of up to 2,660 AFY (SMWD, 2021b).

Cadiz Water Bank – SMWD and Cadiz, Inc. are developing this project to create a new water supply by conserving groundwater that is currently being lost to evaporation and recovering the conserved water by pumping it out of the Fenner Valley Groundwater Basin to convey to MET's CRA. The project consists of a groundwater pumping component that includes an average of 50 TAFY of groundwater that can be pumped from the basin over a 50-year period, and a water storage component that allows participants to send surplus water supplies to be recharged in spreading basins and held in storage.

South Orange County Emergency Interconnection Expansion – MWDOC has been working with the South Orange County (SOC) agencies on improvements for system reliability primarily due to the risk of earthquakes causing outages of the MET imported water system as well as extended grid outages. Existing regional interconnection agreements between IRWD and SOC agencies provides for the delivery of water through the IRWD system to participating SOC agencies in times of emergency. MWDOC and IRWD are currently studying an expansion of the program, including the potential East Orange County Feeder No. 2 pipeline and an expanded and scalable emergency groundwater program, with a capital cost of $867,451.

SARCCUP Water Storage Program – SARCCUP is a joint project established between MET, MWDOC, Eastern MWD, Western MWD, Inland Empire Utilities Agency, and OCWD that can provide significant benefits in the form of additional supplies during dry years for Orange County. Surplus SWP water from San Bernardino Valley Water District (SBVMWD) can be purchased and stored for use during dry years. This water can even be considered an extraordinary supply under MET allocation Plan, if qualified under MET's extraordinary supply guidelines. OCWD has the ability to store 36,000 AF of SARCCUP water and if excess water is available MWDOC has the ability to purchase additional water. Further details remain to be developed between OCWD, retail agencies, and MWDOC in how the water will be distributed in Orange County and who participates.

MNWD/OCWD Pilot Storage Program - OCWD entered into an agreement with MNWD to develop a pilot program to explore the opportunity to store water in the OC Basin. The purpose of such a storage account would provide MNWD water during emergencies and/or provide additional water during dry periods. As part of the agreement, OCWD hired consultants to evaluate where and how to extract groundwater from the OC Basin with several options to pump the water to MNWD via the East Orange County Feeder No. 2; as well as a review of existing banking/exchange programs in California to determine what compensation methodologies could OCWD assess for a storage/banking program.

6.10 Energy Intensity

As discussed throughout this report, MWDOC is a wholesale agency that provides imported water to coastal and inland areas of Orange County. MWDOC does not own or operate any water, wastewater, or recycled water facilities. As such, it does not have operational control over the upstream portion of the water system. After water has been delivered to member agencies, these agencies are responsible for final treatment, delivery, and any pumping needed to extract groundwater in their service area.

Although MWDOC does not have operational control over the downstream portions of the water system, the energy efficiency of these systems is important to MWDOC's focus on sound planning and appropriate investments in water supply, water use efficiency, regional delivery infrastructure and emergency preparedness. To this end, awareness of the energy intensity of retail agencies helps with planning for future system needs. By setting a baseline, agencies can better understand and manage their operational expenditures. Several factors will affect the energy intensity of water delivery over time and agencies should be aware of these factors. A decrease in water demand in a service area may create a situation where the energy intensity of each AF delivered actually increases as agencies operate the same pumps and water treatment facilities as before. When tracking energy intensity over time, agencies should keep factors such as these in mind and focus on the efficiency of each facility they operate.

Each agency has a unique geography and customer set that they serve so energy intensities of different agencies can be compared for informational purposes, but operational needs and constraints should be considered. For example, agencies with hills in their service area will inherently have higher pumping energy demands than agencies without hills. Additionally, some agencies have water treatment within their operational control while others deliver already treated water -leading to wide ranges in the energy demand among different agencies. Therefore, each agency should come up with their own energy management plan based on their unique needs and challenges. By tracking energy use as a whole, MWDOC can help member agencies prepare for the future and maintain reliability. Overall, from a subset of 19 MWDOC member agencies together with the cities of Fullerton and Santa Ana, the energy intensity for water operations range between 5.5 and 1681 kilowatt hour per AF (kWH/AF). For North OC agencies within the OC Basin, the energy intensity for water operations range from 5.5 to 1681 kWh/AF. For South OC agencies which rely predominantly on imported water for potable use, the energy intensity for water operations range from 177 to 1336 kWh/AF.

WATER SERVICE RELIABILITY AND DROUGHT RISK ASSESSMENT

Building upon the water supply identified and projected in Section 6, this key section of the UWMP examines MWDOC's water supplies, water uses, and the resulting water supply reliability. Water service reliability reflects MWDOC's ability to meet the water needs of its customers under varying conditions. For the UWMP, water supply reliability is evaluated in two assessments: 1) the Water Service Reliability Assessment and 2) the DRA. The Water Service reliability assessment compares projected supply to projected demand for three long-term hydrological conditions: a normal year, a single dry year, and a drought period lasting five consecutive years. The DRA, a new UWMP requirement, assesses water supply reliability under a severe drought period lasting for the next five consecutive years, from 2021 to 2025. Factors affecting reliability, such as climate change and regulatory impacts, are considered to prepare more realistic assessments.

7.1 Water Service Reliability Overview

Every urban water supplier is required to assess the reliability of their water service to its customers under a normal year, a single dry year, 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 MWDOC 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 MET in its 2020 UWMP starting 2025 through 2045 during normal years, single dry year, and five consecutively dry years.

MWDOC is a MET member agency, and MET's projections take into account the imported demands from Orange County. As so, MET's water reliability assessments are used to determine that demands within MWDOC can be met for all three hydrological conditions. As summarized in Section 6.2.2, MET's 2020 UWMP concludes that MET's water supply is able to meet projected demands under normal, single-dry, and five-year consecutive dry conditions.

MET's 2020 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 2025 through 2045. The foundation of MET'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.

Table 7-1 shows the basis of water year data used to predict drought supply availability. The average (normal) hydrologic condition for the MWDOC service area is represented by FY 2017-18 and FY 2018-19 and the single-dry year hydrologic condition by FY 2013-14. The five consecutive years of

FY 2011-12 to FY 2015-16 represent the driest five-consecutive year historic sequence for MWDOC's service area. Locally, Orange County rainfall for the five-year period totaled 36 inches, the driest on record.

Table 7-1: Wholesale: Basis of Water Year Data (Reliability Assessment)

DWR Submittal Table 7-1 Wholesale: Basis of Water Year Data (Reliability Assessment)			
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 (AF)	**% of Average Supply**
Average Year	2018-2019	-	100%
Single-Dry Year	2014	-	106%
Consecutive Dry Years 1st Year	2012	-	106%
Consecutive Dry Years 2nd Year	2013	-	106%
Consecutive Dry Years 3rd Year	2014	-	106%
Consecutive Dry Years 4th Year	2015	-	106%
Consecutive Dry Years 5th Year	2016	-	106%

NOTES:
Assumes an increase of six percent above average year demands in dry and multiple dry years based on the Demand Forecast TM (CDM Smith, 2021). 106% represents the percent of average supply needed to meet demands of a single-dry and multiple-dry years. Since all of MWDOC's supply comes from MET, the percent of average supply value reported is equivalent to the percent of average demand under the corresponding hydrologic condition.

7.2 Factors Affecting Reliability

In order to prepare realistic water supply reliability assessments, various factors affecting reliability were considered. These include climate change and environmental requirements, regulatory changes, water quality impacts, and locally applicable criteria.

7.2.1 Climate Change and the Environment

Changing climate patterns are expected to shift precipitation patterns and affect water supply availability. Unpredictable weather patterns will make water supply planning more challenging. Although climate change impacts are associated with exact timing, magnitude, and regional impacts of these temperature and precipitation changes, researchers have identified several areas of concern for California water planners (MET, 2021). These areas include:

- A reduction in Sierra Nevada Mountain snowpack.
- Increased intensity and frequency of extreme weather events.
- Prolonged drought periods.
- Water quality issues associated with increase in wildfires.
- Changes in runoff pattern and amount.
- 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.
    - Potential pumping cutbacks to the SWP and 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.
- Increased evapotranspiration from higher temperatures.
- Impacts to human health from water-borne pathogens and water quality degradation.
- Declines in ecosystem health and function.
- Alterations to power generation and pumping regime.
- Increases in ocean algal blooms affected seawater desalination supplies.

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 emphasis on storage is needed in California.

In addition, the Colorado River Basin supplies have been inconsistent since about the year 2000, with precipitation near normal while runoff has been less than average in two out of every three years. Climate models are predicting a continuation of this pattern whereby hotter and drier weather conditions will result in continuing lower runoff, pushing the system toward a drying trend that is often characterized as long-term drought.

Dramatic swings in annual hydrologic conditions have impacted water supplies available from the SWP over the last decade. The declining ecosystem in the Delta has also led to a reduction in water supply deliveries, and operational constraints will likely continue until a long-term solution to these problems is identified and implemented (MET, 2021).

Legal, environmental, and water quality issues may have impacts on MET 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 (MET, 2021).

7.2.2 Regulatory and Legal

Ongoing regulatory restrictions, such as those imposed by the Biops on the effects of SWP and the federal CVP operations on certain marine life, also contributes to the challenge of determining water delivery reliability. Endangered species protection and conveyance needs in the Delta have resulted in operational constraints that are particularly important because pumping restrictions impact many water resources programs – SWP supplies and additional voluntary transfers, Central Valley storage and transfers, and in-region groundwater and surface water storage. Biops protect special-status species listed as threatened or endangered under the ESAs and imposed substantial constraints on Delta water supply operations through requirements for Delta inflow and outflow and export pumping restrictions.

In addition, the 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. SWRCB plans to fully implement the new Lower San Joaquin River (LSJR) flow objectives from the Phase 1 Delta Plan amendments through adjudicatory (water rights) and regulatory (water quality) processes by 2022. These LSJR flow objectives are estimated to reduce water available for human consumptive use. New litigation, listings of additional species under the ESAs, or 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.

The difficulty and implications of environmental review, documentation, and permitting pose challenges for multi-year transfer agreements, recycled water projects, and seawater desalination plants. The timeline and roadmap for getting a permit for recycled water projects are challenging and inconsistently implemented in different regions of the state. IPR projects face regulatory restraints such as treatment, blend water, retention time, and Basin Plan Objectives, which may limit how much recycled water can feasibly be recharged into the groundwater basins. New regulations and permitting uncertainty are also barriers to seawater desalination supplies, including updated Ocean Plan Regulations, Marine Life Protected Areas, and Once-Through Cooling Regulations (MET, 2021).

7.2.3 Water Quality

The following sub-sections include narratives on water quality issues experienced in various water supplies, and the measures being taken to improve the water quality of these sources.

7.2.3.1 Imported Water

MET is responsible for providing high quality potable water throughout its service area. Over 300,000 water quality tests are performed per year on MET's water to test for regulated contaminants and additional contaminants of concern to ensure the safety of its waters. MET'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 MET's service area.

MET'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, MET blends CRA and SWP supplies and has upgraded all of its treatment facilities to include ozone treatment processes. In addition, MET 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 the following emerging contaminants: N-nitrosodimethylamine (NDMA), pharmaceuticals and personal care products (PPCP), microplastics, PFAS, and 1,4-dioxane (MET, 2021). While unforeseeable water quality issues could alter reliability, MET's current strategies ensure the delivery 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 forms massive colonies in short periods of time, disrupting ecosystems and blocking water intakes. They can cause significant disruption and damage to water distribution systems. MET has had success in controlling the spread and impacts of the quagga mussels within the CRA, however the future could require more extensive maintenance and reduced operational flexibility than current operations allow. It also resulted in MET eliminating deliveries of CRA water into Diamond Valley Lake (DVL) to keep the reservoir free from quagga mussels (MET, 2021).

7.2.3.2 Groundwater

7.2.3.2.1 OCWD

OCWD is responsible for managing the OC Basin. To maintain groundwater quality, OCWD conducts an extensive monitoring program that serves to manage the OC 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 samples each month to monitor Basin water quality. The total number of water samples analyzed varies year-to-year due to regulatory requirements, conditions in the basin, and applied research and/or special study demands. These samples are collected and tested according to approved federal and state procedures as well as industry-recognized quality assurance and control protocols (City of La Habra et al., 2017).

PFAS are of particular concern for groundwater quality, and since the summer of 2019, DDW requires testing for PFAS compounds in some groundwater production wells in the OCWD area. In February 2020, the DDW lowered its Response Levels (RL) for PFOA and PFOS to 10 and 40 parts per trillion (ppt) respectively. The DDW recommends Producers not serve any water exceeding the RL – effectively making the RL an interim MCL while DDW undertakes administrative action to set a MCL. In response to DDW's issuance of the revised RL, as of December 2020, approximately 45 wells in the OCWD service area have been temporarily turned off until treatment systems can be constructed. As additional wells are tested, OCWD expects this figure may increase to at least 70 to 80 wells. The state has begun the process of establishing MCLs for PFOA and PFOS and anticipates these MCLs to be in effect by the Fall of 2023. OCWD anticipates the MCLs will be set at or below the RLs.

In April 2020, OCWD as the groundwater basin manager, executed an agreement with the impacted Producers to fund and construct the necessary treatment systems for production wells impacted by PFAS compounds. The PFAS treatment projects includes the design, permitting, construction, and operation of PFAS removal systems for impacted Producer production wells. Each well treatment system will be evaluated for use with either GAC or ion exchange (IX) for the removal of PFAS compounds. These treatment systems utilize vessels in a lead-lag configuration to remove PFOA and PFOS to less than 2 ppt (the current non-detect limit). Use of these PFAS treatment systems are designed to ensure the groundwater supplied by Producer wells can be served in compliance with current and future PFAS regulations. With financial assistance from OCWD, the Producers will operate and maintain the new treatment systems once they are constructed.

To minimize expenses and provide maximum protection to the public water supply, OCWD initiated design, permitting, and construction of the PFAS treatment projects on a schedule that allows rapid deployment of treatment systems. Construction contracts were awarded for treatment systems for production wells in the City of Fullerton and Serrano in Year 2020. Additional construction contracts will likely be awarded in the first and second quarters of 2021. OCWD expects the treatment systems to be constructed for most of the initial 45 wells above the RL within the next 2 to 3 years.

As additional data are collected and new wells experience PFAS detections at or near the current RL, and/or above a future MCL, and are turned off, OCWD will continue to partner with the affected Producers and take action to design and construct necessary treatment systems to bring the impacted wells back online as quickly as possible.

Groundwater production in FY 2019-20 was expected to be approximately 325,000 acre-feet but declined to 286,550 acre-feet primarily due to PFAS impacted wells being turned off around February 2020. OCWD expects groundwater production to be in the area of 245,000 acre-feet in FY 2020-21 due to the currently idled wells and additional wells being impacted by PFAS and turned off. As PFAS treatment systems are constructed, OCWD expects total annual groundwater production to slowly increase back to normal levels (310,000 to 330,000 acre-feet) (OCWD, 2020a).

Salinity is a significant water quality problem in many parts of southern California, including Orange County. Salinity is a measure of the dissolved minerals in water including both TDS and nitrates.

OCWD continuously monitors the levels of TDS in wells throughout the OC Basin. TDS currently has a California Secondary MCL of 500 mg/L. The portions of the OC Basin with the highest levels are generally located in the cities of Irvine, Tustin, Yorba Linda, Anaheim, and Fullerton. There is also a broad area in the central portion of the OC Basin where TDS ranges from 500 to 700 mg/L. Sources of TDS include the water supplies used to recharge the OC Basin and from onsite wastewater treatment systems, also known as septic systems. The TDS concentration in the OC Basin is expected to decrease over time as the TDS concentration of GWRS water used to recharge the OC Basin is approximately 50 mg/L (City of La Habra et al., 2017).

Nitrates are one of the most common and widespread contaminants in groundwater supplies, originating from fertilizer use, animal feedlots, wastewater disposal systems, and other sources. The MCL for nitrate in drinking water is set at 10 mg/L. OCWD regularly monitors nitrate levels in groundwater and works with producers to treat wells that have exceeded safe levels of nitrate concentrations. OCWD manages the nitrate concentration of water recharged by its facilities to reduce nitrate concentrations in groundwater. This includes the operation of the Prado Wetlands, which was designed to remove nitrogen and other pollutants from the Santa Ana River before the water is diverted to be percolated into OCWD's surface water recharge system.

Although water from the Deep Aquifer System is of very high quality, it is amber-colored and contains a sulfuric odor due to buried natural organic material. These negative aesthetic qualities require treatment before use as a source of drinking water. The total volume of the amber-colored groundwater is estimated to be approximately 1 MAF.

There are other potential contaminants that are of concern to and are monitored by OCWD. These include:

- **MTBE –** MTBE is an additive to gasoline that increases octane ratings but became a widespread contaminant in groundwater supplies. The greatest source of MTBE contamination comes from underground fuel tank releases. The primary MCL for MTBE in drinking water is 13 µg/L.
- **Volatile Organic Compounds (VOC) –** VOCs come from a variety of sources including industrial degreasers, paint thinners, and dry-cleaning solvents. Locations of VOC contamination within the OC Basin include the former El Toro marine Corps Air Station, the Shallow Aquifer System, and portions of the Principal Aquifer System in the Cities of Fullerton and Anaheim.
- **NDMA –** NDMA is a compound that can occur in wastewater that contains its precursors and is disinfected via chlorination and/or chloramination. It is also found in food products such as cured meat, fish, beer, milk, and tobacco smoke. The California Notification Level for NDMA is 10 ng/L and the Response Level is 300 ng/L. In the past, NDMA has been found in groundwater near the Talbert Barrier, which was traced to industrial wastewater dischargers.
- **1,4-Dioxane –** 1,4-Dioxane is a suspected human carcinogen. It is used as a solvent in various industrial processes such as the manufacture of adhesive products and membranes.
- **Constituents of Emerging Concern (CEC) –** CECs are either synthetic or naturally occurring substances that are not currently regulated in water supplies or wastewater discharged but can be detected using very sensitive analytical techniques. The newest group of CECs include pharmaceuticals, personal care products, and endocrine disruptors. OCWD's laboratory is one of a few in the state of California that continuously develops capabilities to analyze for new compounds (City of La Habra et al., 2017).

7.2.3.2.2 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. SJBA performs monthly water quality tests to ensure the safety of the water.

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 maximum contaminant level (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 (Wildermuth Environmental, Inc., 2013).

Chloride concentration levels vary across the basin. As of March 2020, concentrations at 220 mg/L, which is at the bottom of the range of observed concentrations since water quality returned to pre-seawater intrusion conditions in 2017 whereas others have concentrations at 1,600 mg/L, which is higher than the maximum observed chloride concentration of 1,200 mg/L at the seawater intrusion event in 2014. Based on available information, it is not possible to know if the high chloride concentrations currently observed are from a prior seawater intrusion event or representative of an active occurrence of seawater intrusion following adifferent preferential path than was observed in 2014. (Wildermuth Environmental, Inc., 2020).

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 (Wildermuth Environmental, Inc., 2013).

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 (Wildermuth Environmental, Inc., 2013).

7.2.3.2.3 La Habra Groundwater Basin

TDS, hydrogen sulfide, iron, and manganese impair La Habra Groundwater's water supply. Investigations of water quality within the La Habra Basin have determined that the quality is extremely variable. Shallow regions within the central portion of the basin and areas recharged by surface water along the basin boundary are of a bicarbonate and chloride character. Historically, TDS concentrations have remained relatively stable, and in 2017, TDS concentration in La Habra wells was approximately 960 mg/L (City of La Habra et al., 2017).

The La Habra Basin has water quality concerns that require treatment or blending with higher quality water to meet the State's health standards. 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, Groundwater Study, 2014).

7.2.3.2.4 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 2019-20, 30 treatment plants treated approximately 75,000 AF of VOC-contaminated water from the Main San Gabriel Basin. Although VOC contamination is substantial, it is centered in just a few areas, leaving a large portion of the Main San Gabriel Basin unaffected.

The 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 2019-20. In April 2020, DDW issued a Notice of Proposed Rulemaking to consider lowering the perchlorate Detection Limit for Purposes of Reporting (DLR) to 2 ppb, and in anticipation of this possible revision, Watermaster coordinated with Producers to conduct "low-level" detection sampling at a level of 0.1 ppb.

During 1998, eight local wells within the Main San Gabriel Basin had levels of NDMA above the notification level of 2 ppt at the time. Five of the wells with measurable levels of NDMA had already been taken out of service for other reasons, and the other three were taken offline 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 2019-20.

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 GAC. Facilities to treat 1,2,3-TCP were operational during FY 2019-20.

The DDW required specific water systems to conduct water quality tests for PFAS and PFOS during 2019 and established the notification level at 5.1 ppt and 6.5 ppt for PFOA and PFOS, respectively. Watermaster is conducting PFAS sampling and monitoring as required by the SWRCB and working with the DDW to characterize the extent of PFAS in the Main San Gabriel Basin (Main San Gabriel Basin Watermaster, 2020b).

7.2.4 Locally Applicable Criteria

Within Orange County, there are no significant local applicable criteria that directly affect reliability. Through the years, the water agencies in Orange County have made tremendous efforts to integrate their systems to provide flexibility to interchange with different sources of supplies. There are emergency agreements in place to ensure all parts of the County have an adequate supply of water. In the northern part of the County, agencies have the ability to meet a majority of their demands through groundwater with very little limitation, except for the OCWD BPP. For the agencies in southern Orange County, most of their demands are met with imported water where their limitation is based on the capacity of their system, which is very robust.

However, if a major earthquake on the San Andreas Fault occurs, it will be damaging to all three key regional water aqueducts and disrupt imported supplies for up to six months. The region would likely impose a water use reduction ranging from 10-25% until the system is repaired. However, MET has taken proactive steps to handle such disruption, such as constructing DVL, which mitigates potential impacts. DVL, along with other local reservoirs, can store a six to twelve-month supply of emergency water (MET, 2021).

7.3 Water Service Reliability Assessment

This Section assesses the reliability of MWDOC's water service to its customers. This is completed by comparing the projected long-term water demand (Section 4), to the projected water supply sources available to MWDOC (Section 6), in five-year increments, for a normal water year, a single dry water year, and a drought lasting five consecutive water years.

7.3.1 Normal Year Reliability

The water demand forecasting model developed for the Demand Forecast TM (described in Section 4.3.1), 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 FY 2017-18 and FY 2018-19 (CDM Smith, 2021).

MWDOC is 100 percent reliable for normal year demands from 2025 through 2045. MWDOC receives imported water from MET via connection to MET's regional distribution system. Although pipeline and connection capacity rights do not guarantee the availability of water, they do guarantee the ability to convey water into the local system when it is available to the MET distribution system.

A comparison between the supply and demand for projected years between 2025 and 2045 is shown in Table 7-2. As stated above, the available supply will meet projected demands due to a diversified supply and conservation measures limiting and reducing imported demands in the later years.

Table 7-2: Wholesale: Normal Year Supply and Demand Comparison

DWR Submittal Table 7-2 Wholesale: Normal Year Supply and Demand Comparison					
	2025	2030	2035	2040	2045
Supply totals	175,360	176,190	179,119	178,724	178,436
Demand totals	175,360	176,190	179,119	178,724	178,436
Difference	0	0	0	0	0
NOTES: Includes treated and untreated water from MET for M&I and non-M&I demands.					

7.3.2 Single Dry Year Reliability

A single dry year is defined as a single year of minimal to no rainfall within a period where average precipitation is expected to occur. The water demand forecasting model developed for the Demand Forecast TM (described in Section 4.3.1), 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 normal year condition (average of FY 2017-18 and FY 2018-19). For a single dry year condition (FY 2013-14), the model projects a six percent increase in demand for the MWDOC's service area (CDM Smith, 2021). Detailed information of the model is included in Appendix H.

MWDOC has documented that it is 100 percent reliable for single dry year demands from 2025 through 2045 with a demand increase of six percent from normal demand with significant reserves held by MET and conservation. A comparison between the supply and the demand in a single dry year is shown in Table 7-3.

Table 7-3: Wholesale: Single Dry Year Supply and Demand Comparison

DWR Submittal Table 7-3 Wholesale: Single Dry Year Supply and Demand Comparison					
	2025	2030	2035	2040	2045
Supply totals (AF)	182,545	183,425	186,530	186,110	185,806
Demand totals (AF)	182,545	183,425	186,530	186,110	185,806
Difference	0	0	0	0	0
NOTES: Includes treated and untreated water from MET for M&I and non-M&I demands. The single dry year projections estimate a 6% increase on imported M&I demand. Non-M&I demand (Irvine Lake and groundwater storage and replenishment) remain constant at 55,617AFY for all years because					

7.3.3 Multiple Dry Years Reliability

Multiple dry years are defined as five or more consecutive dry years with minimal rainfall within a period of average precipitation. The water demand forecasting model developed for the Demand Forecast TM (described in Section 4.3.1) 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 normal year condition (average of FY2017-18 and FY2018-19). 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, 2021). It is conservatively assumed that a five-year multi dry year scenario is a repeat of the single dry year over five consecutive years.

Even assuming a conservative demand increase of six percent each year for five consecutive years, MWDOC is capable of meeting all customers' demands from 2025 through 2045 (Table 7-4), with significant reserves held by MET and conservation.

Table 7-4: Wholesale: Multiple Dry Years Supply and Demand Comparison

DWR Submittal Table 7-4 Wholesale: Multiple Dry Years Supply and Demand Comparison (AF)						
		2025	2030	2035	2040	2045
First year	Supply totals	172,611	176,121	177,446	179,846	179,449
	Demand totals	172,611	176,121	177,446	179,846	179,449
	Difference	0	0	0	0	0
Second year	Supply totals	175,094	176,297	178,067	179,762	179,389
	Demand totals	175,094	176,297	178,067	179,762	179,389
	Difference	0	0	0	0	0
Third year	Supply totals	177,578	176,473	178,688	179,678	179,328
	Demand totals	177,578	176,473	178,688	179,678	179,328
	Difference	0	0	0	0	0
Fourth year	Supply totals	180,061	176,649	179,309	179,594	179,267
	Demand totals	180,061	176,649	179,309	179,594	179,267
	Difference	0	0	0	0	0
Fifth year	Supply totals	182,545	183,425	186,530	186,110	185,806
	Demand totals	182,545	183,425	186,530	186,110	185,806
	Difference	0	0	0	0	0

NOTES:
Includes treated and untreated water from MET for M&I and non-M&I demands. The multiple dry-year projections estimate a six percent increase on imported M&I demand. Non-M&I demand (Irvine Lake and groundwater storage and replenishment) remain constant at 55,617AFY because these demands are not affected by changes in hydrological conditions. The 2025 column assesses supply and demand for FY 2020-21 through FY 2024-25; the 2030 column assesses FY 2025-26 through FY 2029-30 and so forth, in order to end the water service reliability assessment in FY 2044-45.

7.4 Management Tools and Options

Existing and planned water management tools and options that seek to maximize local resources and results in minimizing the need to import water are described below.

- **Reduced Delta Reliance:** Both MWDOC and MET have demonstrated consistency with Reduced Reliance on the Delta Through Improved Regional Water Self-Reliance (Delta Plan policy WR P1) by reporting the expected outcomes for measurable reductions in supplies from the Delta. MET has improved its self-reliance through methods including water use efficiency, water recycling, stormwater capture and reuse, advanced water technologies, conjunctive use projects, local and regional water supply and storage programs, and other programs and projects. Similarly, MWDOC and its member agencies have further invested in water use efficiency, local water supply projects, and advanced water technologies to increase regional self-reliance. In 2020, MET had a 602,000 AF change in supplies contributing to regional-self-reliance, corresponding to a 15.3 percent change, and this amount is projected to increase through 2045 (MET, 2021). In 2020, MWDOC had a nearly 200,000 AF change in supplies contributing to regional-self-reliance, which represents a 30% change since the 2010 baseline. For detailed information on the Delta Plan Policy WR P1, refer to Appendix C.

- **The continued and planned use of groundwater:** The water supply resources within MWDOC's service area are enhanced by the existence of groundwater basins that account for the majority of local supplies available and are used as reservoirs to store water during wet years and draw from storage during dry years, subsequently minimizing MWDOC service area's reliance on imported water. Groundwater basins are managed within a safe basin operating range so that groundwater wells are only pumped as needed to meet water use. Although MWDOC does not manage any of the service area's groundwater basins, MWDOC supports and partners in efforts to maintain the health of the local basins through local groundwater recharge efforts such OCWD's GWRS program.

- **Groundwater storage and transfer programs:** MWDOC and OCWD's involvement in SARCCUP includes participation in a conjunctive use program that improves water supply resiliency and increases available dry-year yield from local groundwater basins. The groundwater bank has 137,000 AF of storage (OCWD, 2020b). MET has numerous groundwater storage and transfer programs in which MET endeavors to increase the reliability of water supplies, including the AVEK Waster Agency Exchange and Storage Program and the High Desert Water Bank Program. The IRWD Strand Ranch Water Banking Program has approximately 23,000 AF stored for IRWD's benefit, and by agreement, the water is defined to be an "Extraordinary Supply" by MET and counts essentially 1:1 during a drought/water shortage condition under MET's and MWDOC's WSAP. In addition, MET has encouraged storage through its cyclic and conjunctive use programs that allow MET to deliver water into a groundwater basin in advance of agency demands, such as the Cyclic Storage Agreements under the Main San Gabriel Basin Judgement.

- **Water Loss Program:** The water loss audit program reduces MWDOC's dependency on imported water from the Delta by implementing water loss control technologies after assessing audit data and leak detection.

- **Increased use of recycled water:** MWDOC partners with local agencies in recycled water efforts, including OCWD to identify opportunities for the use of recycled water for irrigation purposes, groundwater recharge and some non-irrigation applications. OCWD's GWRS and GAP allow southern California to decrease its dependency on imported water and create a local and reliable source of water that meet or exceed all federal and state drinking level standards. Expansion of the GWRS is currently underway to increase the plant's production to 130 MGD, and further reduce reliance on imported water.

- **Implementation of demand management measures during dry periods:** During dry periods, water reduction methods to be applied to the public through the retail agencies, will in turn reduce MWDOC's overall demands on MET and reliance on imported water. MWDOC assisted its retail agencies by leading the coordination of the 20% by 2020 Orange County Regional Alliance for all of the retail agencies in Orange County. MWDOC assisted each retail water supplier in Orange County in analyzing the requirements of and establishing their baseline and target water use, as guided by DWR.

7.5 Drought Risk Assessment

CWC Section 10635(b) requires every urban water supplier include, as part of its UWMP, a DRA for its water service as part of information considered in developing its demand management measures and water supply projects and programs. The DRA is a specific planning action that assumes MWDOC is experiencing a drought over the next five years and addresses MWDOC's water supply reliability in the context of presumed drought conditions. Together, the water service reliability assessment, DRA, and WSCP allow MWDOC to have a comprehensive picture of its short-term and long-term water service reliability and to identify the tools to address any perceived or actual shortage conditions.

CWC Section 10612 requires the DRA to be based on the driest five-year historic sequence for MWDOC's water supply. However, CWC Section 10635 also requires that the analysis consider plausible changes on projected supplies and demands due to climate change, anticipated regulatory changes, and other locally applicable criteria.

The following sections describe the methodology and results from MWDOC's DRA.

7.5.1 Methodology

The water demand forecasting model developed for the Demand Forecast TM (described in Section 4.3.1) 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 (average of FY 2017-18 and FY 2018-19). For a single dry year condition (FY 2013-14), the model projects a six percent increase in demand for the MWDOC's service area (CDM Smith, 2021).

For MWDOC, the five consecutive years of FY 2011-12 to FY 2015-16 represent the driest five -consecutive year historic sequence for MWDOC's service area water supply. This period that spanned water years 2012 through 2016 included the driest four-year statewide precipitation on record (2012-2015) and the smallest Sierra-Cascades snowpack on record (2015, with five percent of average). It was marked by extraordinary heat: 2014, 2015 and 2016 were California's first, second and third warmest year in terms of statewide average temperatures. Locally, Orange County rainfall for the five-year period totaled 36 inches, the driest on record.

Water Demand Characterization

All of MWDOC's water supplies are purchased from MET, regardless of hydrologic conditions. As described in Section 6.2.1, MET's supplies are from the Colorado River, SWP, and in -region storage. In their 2020 UWMP, both MET's DRA concluded that even without activating WSCP actions, MET can reliably provide water to all of their member agencies, including MWDOC, through 2045, assuming a five -year drought from FY 2020-21 through FY 2024-25. Beyond this, MET's DRA indicated a surplus of supplies that would be available to all of its member agencies, including MWDOC, should the need arise. Therefore, any increase in demand that is experienced in MWDOC's service area will be met by MET's water supplies.

Based on MWDOC's Demand Forecast TM, in a single dry year, demand is expected to increase by six percent above a normal year. MWDOC's projected normal water use is presented annually for the next five years in Table 7-5. MWDOC's DRA conservatively assumes a drought from FY 2020-21 through FY 2024-25 is a repeat of the single dry year over five consecutive years.

MWDOC developed its demand forecast in a number of steps. First, MWDOC estimated total retail demands for its service area. This was based on estimated future demands using historical water use trends, future expected water use efficiency measures, additional projected land-use development, and changes in population. Next, MWDOC estimated the projections of local supplies derived from current and expected local supply programs from MWDOC member agencies. Finally, MWDOC used its demand model to calculate the difference between total forecasted demands and local supply projections. The resulting difference between total demands net of savings from conservation and local supplies is the expected regional demands on MWDOC. The sum of the 1) M&I demand estimated from the model and the 2) non-M&I water for surface water storage and groundwater replenishment, equate MWDOC's demand, which is supplied by MET.

Table 7-5: MWDOC's Projected Normal M&I and Non-M&I Water Demand

MWDOC's Projected Normal M&I and Non-M&I Water Demand					
	2021	2022	2023	2024	2025
Water Use (AF)	164,316	167,077	169,838	172,599	175,360
NOTES: Source – Linearly interpolated from MWDOC Service Area Water Supply Projections					

Water Supply Characterization

MWDOC's assumptions for its supply capabilities are discussed and presented in 5-year increments under its water reliability assessment in Section 7.3. For MWDOC's DRA, these supply capabilities are further refined and presented annually for the years 2021 to 2025 by assuming a repeat of historic conditions from FY 2011-12 to FY 2015-16. For its DRA, MWDOC assessed the reliability of supplies available to MWDOC through MET using historical supply availability under dry-year conditions. MET's supply sources under the CR, SWP, and In-Region supply categories are individually listed and discussed in detail in MET's UWMP. Future supply capabilities for each of these supply sources are also individually tabulated in Appendix 3 of MET's UWMP, with consideration for plausible changes on projected supplies under climate change conditions, anticipated regulatory changes, and other factors. For simplicity, the supply capabilities presented in Table 7-6 constitute the total of MWDOC's water supplies made available by MET. MWDOC's supplies are used to meet consumptive use, surface water and groundwater recharge needs that are in excess of locally available supplies. In addition, MWDOC has access to supply augmentation actions through MET. MET may exercise these actions based on regional need, and in accordance with their WSCP, and may include the use of supplies and storage programs within the Colorado River, SWP, and in-region storage.

7.5.2 Total Water Supply and Use Comparison

MWDOC's anticipated total water use and supply under a five-year drought from FY 2020-21 through FY 2024-25, are compared in Table 7-6. MWDOC's assessment reveals that its supply capabilities are expected to balance with its projected water use for the next five years, from 2021 to 2025, under a repeat of a five consecutive-year drought.

Table 7-6: Five-Year Drought Risk Assessment Tables to Address Water Code Section 10635(b)

DWR Submittal Table 7-5: Five-Year Drought Risk Assessment Tables to address Water Code Section 10635(b)	
2021	**Total**
Total Water Use	172,611
Total Supplies	172,611
Surplus/Shortfall w/o WSCP Action	0
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	0%
2022	**Total**
Total Water Use	175,094
Total Supplies	175,094
Surplus/Shortfall w/o WSCP Action	0
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	0%
2023	**Total**
Total Water Use	177,578
Total Supplies	177,578
Surplus/Shortfall w/o WSCP Action	0
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0

DWR Submittal Table 7-5: Five-Year Drought Risk Assessment Tables to address Water Code Section 10635(b)	
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	0%
2024	**Total**
Total Water Use	180,061
Total Supplies	180,061
Surplus/Shortfall w/o WSCP Action	0
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	0%
2025	**Total**
Total Water Use	182,545
Total Supplies	182,545
Surplus/Shortfall w/o WSCP Action	0
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	0%

7.5.3 Water Source Reliability

As detailed in Section 8, MWDOC has in place a robust WSCP and comprehensive shortage response planning efforts that include demand reduction measures and supply augmentation actions. However, since MWDOC's DRA shows a balance, no water service reliability concern is anticipated, and no shortfall mitigation measures are expected to be exercised over the next five years. Additionally, while a balance of supplies and demands are shown in the previously displayed Table 7-6, it is important to note that MET's DRA shows a surplus of supplies that would be available all of its Member Agencies, including MWDOC, should the need for additional supplies arise. MWDOC will periodically revisit its representation of both individual supply sources and of the gross water use estimated for each year and will revise its DRA if needed.

WATER SHORTAGE CONTINGENCY PLANNING

8.1 Layperson's Description

Water shortage contingency planning is a strategic planning process that MWDOC engages to prepare for and respond to water shortages. A water shortage, when water supply available is insufficient to meet the normally expected customer water use at a given point in time, may occur due to a number of reasons, such as water supply quality changes, climate change, drought, and catastrophic events (e.g., earthquake). The MWDOC WSCP provides a water supply availability assessment and structured steps designed to respond to actual conditions. This level of detailed planning and preparation will help maintain reliable supplies and reduce the impacts of supply interruptions.

The Water Code Section 10632 requires that every urban water supplier that serves more than 3,000 acre-feet per year or have more than 3,000 connections prepared and adopt a standalone WSCP as part of its UWMP. The WSCP is required to plan for a greater than 50% supply shortage. This WSCP due to be updated based on new requirements every five years and will be adopted as a current update for submission to DWR by July 1, 2021.

8.2 Overview of the Water Shortage Contingency Plan

The WSCP serves as the operating manual that MWDOC will use to prevent catastrophic service disruptions through proactive, rather than reactive, mitigation of water shortages. The WSCP contains the processes and procedures that will be deployed when shortage conditions arise so that the MWDOC governing body, its staff, and its retail agencies can easily identify and efficiently implement pre-determined steps to mitigate a water shortage to the level appropriate to the degree of water shortfall anticipated.

A copy of the MWDOC WSCP is provided in Appendix I and includes the steps to assess if a water shortage is occurring, and what level of demand reduction actions to trigger the most appropriate response to the water shortage conditions. MWDOC, as a wholesaler of MET's treated water supply, has an interdependent relationship with MET documents related to planning for, and responding to, water shortage; therefore, the MWDOC WSCP includes the MET Water Supply Allocation Plan[1] (WSAP). The MET WSAP outlines how MET will determine and implement each of its wholesale and retail agencies' allocation during a time of shortage. MWDOC also has its own version of a WSAP the outlines how MWDOC will determine and implement each of its retail agency's allocation during a time of shortage.

Figure 8-1 illustrates the interdependent relationship between the MET and MWDOC procedural documents related to planning for and responding to water shortages.

[1] MET's Water Shortage Contingency Plan, which includes Water Surplus and Drought Management Plan and WSAP, Appendix 4 of the 2020 UWMP

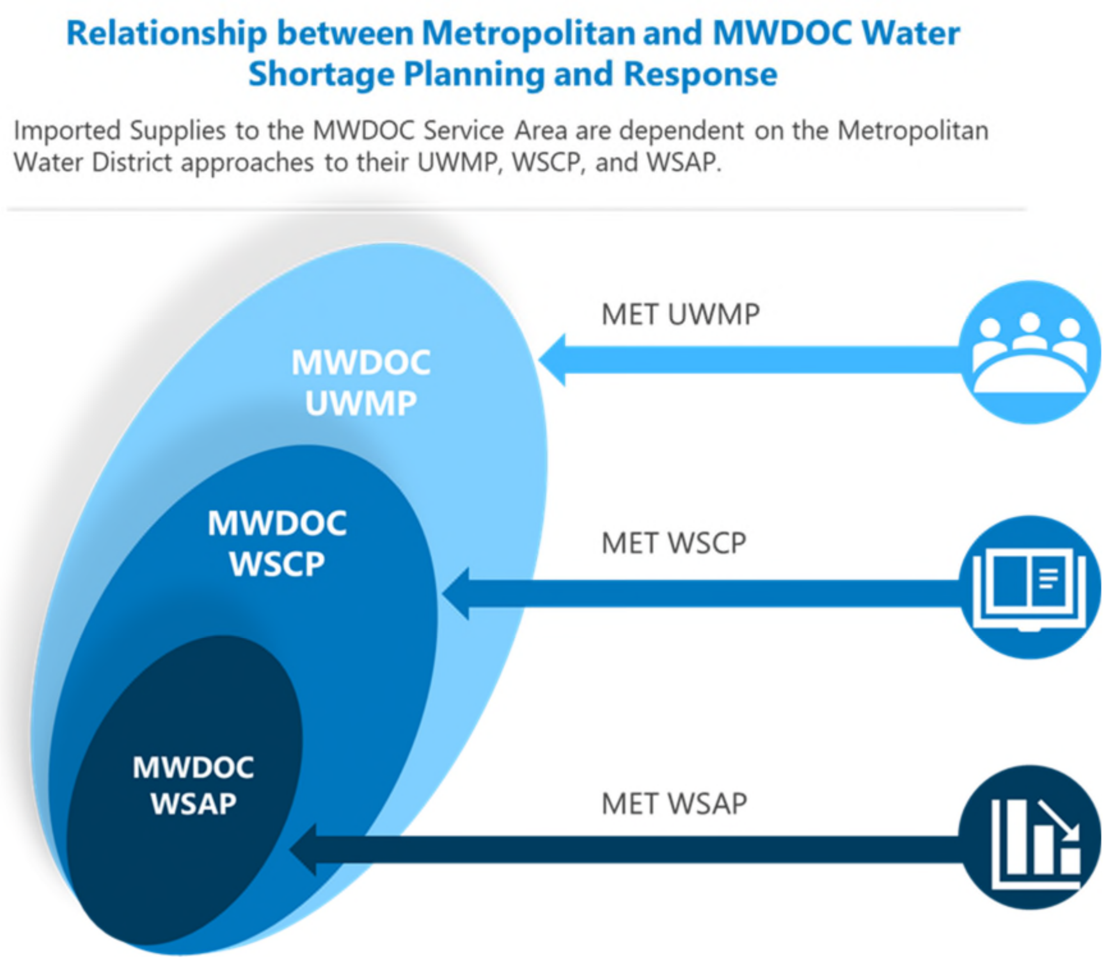


Figure 8-1: Relationship Between MET and MWDOC Water Shortage Planning and Response

WSCP has prescriptive elements, including an analysis of water supply reliability; the drought shortage actions for each of the six standard water shortage levels, that correspond to water shortage percentages ranging from 10 percent to greater than 50 percent; an estimate of potential to close supply gap for each measure; protocols and procedures to communicate identified actions for any current or predicted water shortage conditions; procedures for an annual water supply and demand assessment; reevaluation and improvement procedures for evaluating the WSCP.

During past shortages MWDOC has adopted Board Resolutions urging its retail agencies to develop and implement water shortage plans, calling upon each agency to adopt and enforce regulations prohibiting the waste of water, and implementing an allocation plan for available imported water consistent with reductions, incentives, and allocation surcharges imposed on MWDOC by MET. As part of the 2020 UWMP, MWDOC has worked with retail agencies to develop and align individual WSCPs.

8.3 Summary of Water Shortage Response Strategy and Required DWR Tables

This WSCP is organized into three main sections with Section 3 aligned with the California Water Code Section 16032 requirements.

Section 1 Introduction and WSCP Overview gives an overview of the WSCP fundamentals.

Section 2 Background provides a background on the MWDOC's water service area.

Section 3 Water Shortage Contingency Plan

Section 3.1 Water Supply Reliability Analysis provides a summary of the water supply analysis and water reliability findings from the 2020 UWMP.

Section 3.2 Annual Water Supply and Demand Assessment Procedures provide a description of procedures to conduct and approve the Annual Assessment.

Section 3.3 Six Standard Water Shortage Stages explains the WSCP's six standard water shortage levels corresponding to progressive ranges of up to 10, 20, 30, 40, 50, and more than 50 percent shortages.

Section 3.4 Shortage Response Actions describes the WSCP's shortage response actions that align with the defined shortage levels.

Section 3.5 Communication Protocols addresses communication protocols and procedures to inform customers, the public, interested parties, and local, regional, and state governments, regarding any current or predicted shortages and any resulting shortage response actions.

Section 3.6 Compliance and Enforcement is not required by wholesaler agencies.

Section 3.7 Legal Authorities is a description of the legal authorities that enable MWDOC to implement and enforce its shortage response actions.

Section 3.8 Financial Consequences of the WSCP provides a description of the financial consequences of and responses for drought conditions.

Section 3.9 Monitoring and Reporting is not required by wholesaler agencies.

Section 3.10 WSCP Refinement Procedures addresses reevaluation and improvement procedures for monitoring and evaluating the functionality of the WSCP.

Section 3.11 Special Water Feature Distinction.

Section 3.12 Plan Adoption, Submittal, and Implementation provides a record of the process MWDOC followed to adopt and implement its WSCP.

The WSCP is based on adequate details of demand reduction and supply augmentation measures that are structured to match varying degrees of shortage will ensure the relevant stakeholders understand what to expect during a water shortage situation. MWDOC adopted water shortage levels consistent with the requirements identified in Water Code Section 10632 (a)(3)(A) (Table 8-1).

The supply augmentation actions that align with each shortage level are described in DWR Table 8-3 (Appendix B). These augmentations represent short-term management objectives triggered by the WSCP and do not overlap with the long-term new water supply development or supply reliability enhancement projects.

The demand reduction measures that align with each shortage level are described in DWR Table 8-2 (Appendix B). This table also estimates the extent to which that action will reduce the gap between supplies and demands to demonstrate to the that choose suite of shortage response actions can be expected to deliver the expected outcomes necessary to meet the requirements of a given shortage level.

Table 8-1: Water Shortage Contingency Plan Levels

DWR Submittal Table 8-1 Water Shortage Contingency Plan Levels		
Shortage Level	Percent Shortage Range	Shortage Response Actions
0	0% (Normal)	A Level 0 Water Supply Shortage –Condition exists when MWDOC notifies its water users that no supply reductions are anticipated in this year. MWDOC proceeds with planned water efficiency best practices to support consumer demand reduction in line with state mandated requirements and local MWDOC goals for water supply reliability.
1	Up to 10%	A Level 1 Water Supply Shortage – Condition exists when no supply reductions are anticipated, a consumer imported demand reduction of up to 10% is recommended to make more efficient use of water and respond to existing water conditions. Upon the declaration of a Water Aware condition, MWDOC shall implement the mandatory Level 1 conservation measures identified in this WSCP. The type of event that may prompt MWDOC to declare a Level 1 Water Supply Shortage may include, among other factors, a finding that its wholesale water provider (MET) calls for extraordinary water conservation efforts.
2	Up to 20%	A Level 2 Water Supply Shortage – Condition exists when MWDOC notifies its member agencies that due to drought or other supply reductions, a consumer imported demand reduction of up to 20% is necessary to make more efficient use of water and respond to existing water conditions. Upon declaration of a Level 2 Water Supply Shortage condition, MWDOC shall implement the mandatory Level 2 conservation measures identified in this WSCP.

DWR Submittal Table 8-1 Water Shortage Contingency Plan Levels		
3	Up to 30%	A Level 3 Water Supply Shortage – Condition exists when MWDOC declares a water shortage emergency condition pursuant to California Water Code section 350 and notifies its member agencies that up to 30% consumer imported demand reduction is required to ensure sufficient supplies for human consumption, sanitation, and fire protection. MWDOC must declare a Water Supply Shortage Emergency in the manner and on the grounds provided in California Water Code section 350.
4	Up to 40%	A Level 4 Water Supply Shortage – Condition exists when MWDOC declares a water shortage emergency condition pursuant to California Water Code section 350 and notifies its member agencies that up to 40% consumer imported demand reduction is required to ensure sufficient supplies for human consumption, sanitation, and fire protection. MWDOC must declare a Water Supply Shortage Emergency in the manner and on the grounds provided in California Water Code section 350.
5	Up to 50%	A Level 5 Water Supply Shortage – Condition exists when MWDOC declares a water shortage emergency condition pursuant to California Water Code section 350 and notifies its member agencies that up to 50% or more consumer imported demand reduction is required to ensure sufficient supplies for human consumption, sanitation, and fire protection. MWDOC must declare a Water Supply Shortage Emergency in the manner and on the grounds provided in California Water Code section 350.
6	>50%	A Level 6 Water Supply Shortage – Condition exists when MWDOC declares a water shortage emergency condition pursuant to California Water Code section 350 and notifies its member agencies that greater than 50% or more consumer imported demand reduction is required to ensure sufficient supplies for human consumption, sanitation, and fire protection. MWDOC must declare a Water Supply Shortage Emergency in the manner and on the grounds provided in California Water Code section 350.
NOTES:		

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 GPCD, including innovative measures, if implemented;
- Programs to assist retailers with Conservation Framework Compliance

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.

9.1 Overview

MWDOC demonstrated its commitment to water use efficiency in 1991 by voluntarily signing the MOU Regarding Urban Water Conservation in the California Urban Water Conservation Council. As a signatory to the MOU, MWDOC has committed to a good-faith-effort to implement all cost-effective best management practices (BMPs) as demand management measures DMMs.

An ethic of efficient use of water has been developing over the last 30 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 water 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 DMM-based programs.

MWDOC still honors its commitment to urban water efficiency, and continues to implement BMP-based DMMs through multi-faceted, holistic water use efficiency programs today. As a wholesaler, to help facilitate implementation of DMM throughout Orange County, MWDOC's efforts focus on the following three areas: Regional Program Implementation, Local Program Assistance, and Research and Evaluation. This both complies with and goes beyond the Foundational BMPs of Utility Operations Programs requirements:

Regional Program Implementation - MWDOC develops, obtains funding for, and implements regional water savings 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, maintains a consistent message to the public to use water efficiently, and provides support to retail water agencies by acting as program administrators for the region. As a leader of water efficiency in Orange County, MWDOC provides a holistic suite of programs that are accessible by all consumer groups in the region. Many of these programs have been structured through Integrated Regional Water Management Planning processes in north, central and south Orange County.

Local Program Assistance - When requested, MWDOC assists retail agencies in developing and implementing local programs within their service areas. This assistance includes collaboration with each retail agency to design a program to fit that agency's local needs, including providing staffing, targeting customer classes, acquiring grant funding from a variety of sources, and implementing, marketing, reporting, and evaluating the program. MWDOC assists with a variety of local programs including, but not limited to: Pressure Regulation Valve Replacement Pilot, regional Smart Timer Distributions, Sub-Metering, Custom Commercial Retrofits, various public information, and outreach campaigns, K-12 Choice School Programs, Conservation Pricing, Leak Detection, and Water Waste Prohibitions..

Research and Evaluation - An integral component of MWDOC's 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. MWDOC regularly conducts statistical water savings (impact evaluations) and program process evaluations to determine how to best invest and run its water efficiency programs. From 2016-2020, MWDOC conducted process and impact evaluations on its Spray-to-Drip Program, the results of which have created a starting point of a standardized rebate program throughout the MET service area, and its Landscape Design Assistance Program. Additionally, an evaluation was conducted of MWDOC's Comprehensive Landscape Water Use Efficiency (CLWUE) Program, which included smart timers, rotating nozzles, turf removal, drip irrigation, and recycled water conversions. This study evaluated how much water was saved at properties implementing these measures and compared savings among landscapes that implemented one versus two of the measures (e.g., a turf removal site compared to a turf removal site that also installed a smart irrigation timer). Additionally, MWDOC is currently piloting a research program investigating water savings associated with the replacement of broken pressure regulating valves at residential homes. The results of this study are expected in 2023.

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 MET'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. MWDOC is planning an update to the 2013 Orange county Water Use Efficiency Master Plan in 2023 that will integrate all necessary measures relevant to SB 606 and AB 1668.

Table 9-1 summarizes DMM implementation responsibilities of MWDOC as Orange County's wholesale supplier and responsibilities of MWDOC's retail agencies.

Table 9-1: DMM Implementation Responsibility and Regional Programs in Orange County

Efficiency Measure	Applies to:		MWDOC Regional Program and Activities
	Retailer	MWDOC as a Wholesaler	
Operations Practices			
Wholesale Agency Assistance Programs	-	✓	✓
Conservation Pricing	✓	✓	✓
Conservation Coordinator	✓	✓	✓
Water Waste Prevention	✓	-	✓
Water Loss Control (System Water Audits, Leak Detection and Repair)	✓	(1)	✓
Metering with Commodity Rates	✓	(1)	(1)
Commercial, Industrial, and Institutional (CII) Programs	✓	-	✓
Large Landscape Conservation Programs	✓		✓
Landscape Programs			
Residential and CII Landscape Rebate Programs (Turf Removal, Spray-to-Drip, Smart Timer, High Efficiency Sprinkler Nozzles (HENs), Rain Barrels, Large Rotary Nozzles, In-stem Flow Regulators)	✓	-	✓
Residential Landscape Design and Maintenance Assistance Programs	✓	-	✓
Qualified Water Efficient Landscaper (QWEL) Training Program	✓	✓	✓
Residential Implementation			
High-Efficiency Washing Machine Rebate Program	✓	-	✓

Efficiency Measure	Applies to:		MWDOC Regional Program and Activities
	Retailer	MWDOC as a Wholesaler	
WaterSense Specification Toilets (Residential Plumbing Fixture Retrofits[1])	✓	-	✓
WaterSense Specification for Residential Development	✓	-	-
Commercial, Industrial, Institutional Implementation			
Water Savings Incentive Program	✓	-	✓
On-site Retrofit Program	✓	-	✓
Direct Install High Efficiency Toilets (HET) (DAC and Non-DAC)	✓	-	✓
CII Rebate Programs (HET and Urinals, Plumbing Flow Control Valves, Connectionless Food Steams, Air-cool Ice Machines, Cooling Tower Conductivity Controllers and pH Controllers, Dry Vacuum Pumps, Laminar Flow Restrictors	✓	-	✓
Education Programs			
Public Outreach Programs	✓	✓	✓
Choice K-12 School Programs	✓	✓	✓
Boy Scouts Soil and Water Conservation Badge Program	✓	✓	✓
Girl Scouts Water Resources and Conservation Patch Program	✓	✓	✓
Water Energy Education Alliance	✓	✓	✓

(1) MWDOC does not own or operate a distribution system; water wholesaled by MWDOC is delivered through the MET distribution system and meters.

9.2 DMM 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. Additionally, a program marketing campaign is launched, employing a full spectrum of varying outreach methods. Furthermore, Programs are thoroughly evaluated to maximize water savings, break down barriers to participation, or other ways that effectiveness may be increased. The Implementation Design Steps are illustrated on Figure 9-1.

Figure 9-1: Implementation Design Steps

MWDOC's water use efficiency programs cut across all consumer 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. This program pays a flat incentive per acre foot saved that scales to the water saved at each site so the more they save the higher the incentive. This approach provides an avenue for high water using sites that will save the most water through a custom approach that works for each particular site. Additionally, this method provides an even greater incentive for the highest water users to engage in water savings activity and create a most attractive return on investment for site decision makers.

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. There are a wide variety of standardized device rebates available to all water-users of all water sectors.

Technical assistance, surveys, and education - All customer segments benefit from additional technical support services. MWDOC offers water efficiency educational programs to primary school-age children, residential homeowners, property managers, professional landscapers, or any other interested water-user. These programs provide public awareness of the importance of water efficiency and provide the technical support to implement appropriate water savings measures.

Figure 9-2 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	Water Savings Incentive Program On-site Retrofit Program	• DAC/Non-DAC Direct Install HET • SoCal Water$mart Device Rebates • ULV Urinals • HET • Food Steamers • Ice Machines • pH & Conductivity Controllers • Laminar Flow Restrictors • Dry Vacuum Pumps	Large Landscape Surveys QWEL
Landscape	Water Savings Incentive Program On-site Retrofit Program	• SoCal Water$mart Device Rebates (Commercial and Residential) • Smart Controllers • Large Rotary Nozzles • In-stem Flow Regulators • Turf Removal Incentive Program	Landscape Design Assistance Landscape Maintenance Assistance CA Friendly Landscape Classes

	Field Implementation Approaches		
Program Segments:	Performance Based Incentives	Device Based Incentives	Audits, Assistance & Education
Residential	Single Family -- None Available Multi Family—Landscape planning and future pay for performance.	• SoCal Water$mart Device Rebates • High Efficiency Washers • HET	Residential-direct information/resources
Utility Operations	Distribution System Audits and Technical Support Leak Detection	Budget-Based Rate Technical Assistance Sub-Metering	School Education Public Information Dedicated Irrigation Landscape Measurements

Figure 9-2: Demand Management Measure Implementation Approaches

9.3 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 demand management programs. In addition, MWDOC is providing assistance with compliance of the Conservation Framework and 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
- Legislation compliance assistance

The many programs that MWDOC offers to Orange County on behalf of retail water agencies are described in detail in Appendix K.

9.4 Water Use Objectives (Future Requirements)

To support Orange County retailers with compliance of SB 606 and AB 1668 (Conservation Framework), MWDOC is providing multi-level support to assist agencies meet the primary goals of the legislation including to Use Water More Wisely and to Eliminate Water Waste. Beginning in 2023, Urban water suppliers are required to calculate and report their annual urban water use objective (WUO), submit validated water audits annually, and to implement and report BMP CII performance measures.

Urban Water Use Objective

An Urban Water Supplier's urban water use objective (WUO) is based on efficient water use of the following:

- Aggregate estimated efficient **indoor residential** water use;
- Aggregate estimated efficient **outdoor residential** water use;
- Aggregate estimated efficient **outdoor** irrigation landscape areas with dedicated irrigation meters or equivalent technology in connection with **CII** water use;
- Aggregate estimated efficient **water losses;**
- Aggregate estimated water use for variances approved the State Water Board;
- Allowable **potable reuse water** bonus incentive adjustments.

MWDOC offers a large suite of programs, described in detail throughout Section 9.3, that will assist Orange County retailers in meeting and calculating their WUO.

Table 9-2 describes MWDOC's programs that will assist agencies in meeting their WUO through both direct measures: programs/activities that result in directly quantifiable water savings; and indirectly: programs that provide resources promoting water efficiencies to the public that are impactful but not directly measurable.

Table 9-2: MWDOC Programs to Help Agencies Meet their WUO

WUO Component	Calculation	Program	Impact
Indoor Residential	Population and GPCD standard	**Direct Impact** • High Efficiency Washer • HET • Multi-Family HET (DAC/ non-DAC)	**Direct Impact** Increase of indoor residential efficiencies and reductions of GPCD use

WUO Component	Calculation	Program	Impact
Outdoor Residential	Irrigated/irrigable area measurement and a percent factor of local ETo	**Direct Impact** • Turf Removal • Spray-to-Dip • Smart Timer • HEN • Rain Barrels/Cisterns **Indirect Impact** • Landscape Design and Maintenance Assistance • OC Friendly Gardens Webpage • CA Friendly/Turf Removal Classes • QWELL	**Direct Impact** Increase outdoor residential efficiencies and reductions of gallons per ft^2 of irrigated/ irrigable area used **Indirect Impact** Provide information, resources, and education to promote efficiencies in the landscape
Outdoor Dedicated Irrigation Meters	Irrigated/irrigable area measurement and a percent factor of local ETo	**Direct Impact** • Turf Removal • Spray-to-Dip • Smart Timer • HEN • Central Computer Irrigation Controllers • Large Rotary Nozzles • In-Stem Flow Regulators **Indirect Impact** • OC Friendly Gardens Webpage • CA Friendly/Turf Removal Classes • QWELL	**Direct Impact** Increase outdoor residential efficiencies and reductions of gallons per ft^2 of irrigated/ irrigable area used **Indirect Impact** Provide information, resources, and education to promote efficiencies in the landscape

WUO Component	Calculation	Program	Impact
Water Loss	Following the AWWA M36 Water Audits and Water Loss Control Program, Fourth Edition and AWWA Water Audit Software V5	**Direct Impact** • Water Balance Validation • Customer Meter Accuracy Testing • Distribution System Pressure Surveys • Distribution System Leak Detection • No-Discharge Distribution System Flushing • Water Audit Compilation • Component Analysis	**Direct Impact** Identify areas of the distribution system that need repair, replacement, or other action
Bonus Incentives	**One of the following:** 1. Volume of potable reuse water from existing facilities, not to exceed 15% of WUO 2. Volume of potable reuse water from new facilities, not to exceed 10% of WUO	**Direct Impact** • GWRS **Indirect Impact** • On Site Retrofit Program (ORP)	**Direct Impact** The GWRS (run by OCWD) significantly increases the availability of potable reuse water **Indirect Impact** The ORP expands the recycled water supply grid that will be used for future projects

In addition, MWDOC is providing support to agencies to assist with the calculation of WUOs. DWR will provide residential outdoor landscape measurements; however, Urban Water Suppliers are responsible for measuring landscape that is irrigated/irrigable by dedicated irrigation meters. MWDOC is contracting for consultant services to assist agencies in obtaining these measurements. Services may include but are not limited to:

- Accounting/database clean up (e.g., data mining billing software to determine dedicated irrigation customers);
- Geolocation of dedicated irrigation meters;
- In-field measurements;
- GIS/Aerial imagery measurements;
- Transformation of static/paper maps to digital/GIS maps.

These services will help agencies organize and/or update their databases to determine which accounts are dedicated irrigation meters and provide landscape area measurements for those accounts. These data points are integral when calculating the WUO. MWDOC is also exploring funding options to help reduce retail agencies' costs of obtaining landscape area measurements for dedicated irrigation meters.

CII Performance Measures

Urban water supplies are expected to report BMPs and more for CII customers. MWDOC offers a broad variety of programs and incentives to help CII customers implement BMPs and increase their water efficiencies (Table 9-3).

Table 9-3: MWDOC BMP and Water Efficiency Programs and Incentives

Component	Program Offered	Impact
CII Performance Measures	• Water Savings Incentive Program (WSIP) • HET • High Efficiency Urinals • Plumbing Flow Control Valves • Connectionless Food Steamers • Air-cooled Ice Machines • Cooling Tower Conductivity controllers • Cooling Tower pH Controllers • Dry Vacuum Pumps • Laminar Flow Restrictors	WSIP incentivizes customized CII water efficiency projects that utilize BMPS. Additional CII rebates based on BMPS increase the economic feasibility of increasing water efficiencies.

These efforts to assist OC retail agencies have successfully assisted the retail agencies in OC in using water more efficiently over time. Our plan is to ensure that all agencies are fully ready to begin complying with the new water use efficiency standards framework called for in SB 606 and SB 1668 by the start date of 2023.

PLAN ADOPTION, SUBMITTAL, AND IMPLEMENTATION

The Water Code requires the UWMP to be adopted by the Supplier's governing body. Before the adoption of the UWMP, the Supplier has to notify the public and the cities and counties within its service area per the Water Code and hold a public hearing to receive input from the public on the UWMP. Post adoption, the Supplier submits the UWMP to DWR and the other key agencies and makes it available for public review.

This section provides a record of the process MWDOC followed to adopt and implement its UWMP.

10.1 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 through its public hearing process, which provided residents with an opportunity to learn and ask questions about their water supply management and reliability. Through the public hearing, the public has an opportunity to comment and put forward any suggestions for revisions of the Plan.

Table 10-1 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 10-1: External Coordination and Outreach

External Coordination and Outreach	Date	Reference
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)	2/24/2021	Appendix L
Public Hearing Notice	5/3/2021 - 5/10/2021	Appendix L
Held Public Hearing	5/19/2021	Appendix L
Adopted UWMP and WSCP	5/19/2021	Appendix M
Submitted UWMP to DWR (no later than 30 days after adoption)	7/1/2021	-
Submitted UWMP to the California State Library (no later than 30 days after adoption)	7/1/2021	-
Submitted UWMP to the cities and county within the supplier's service area (no later than 30 days after adoption)	7/1/2021	-
Made UWMP available for public review (no later than 30 days after filing with DWR)	8/1/2021	-

This UWMP was adopted by the MWDOC Board of Directors on May 19, 2021. A copy of the adopted resolution is provided in Appendix M.

10.2 Agency Coordination

The Water Code requires the Suppliers preparing UWMPs to notify any city or county within their service area at least 60 days prior to the public hearing. As shown in Table 10-2, MWDOC sent a Letter of Notification to the County of Orange and the cities within its service area on February 2, 2021 to state that it was in the process of preparing an updated UWMP (Appendix L).

Table 10-2: Wholesale: Notification to Cities and Counties

DWR Submittal Table 10-1 Wholesale: Notification to Cities and Counties		
☑	Supplier has notified more than 10 cities or counties in accordance with Water Code Sections 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 L	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
County Name	60 Day Notice	Notice of Public Hearing
NOTES:		

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 MET. As such, MWDOC involved MET and other relevant agencies in this 2020 UWMP at various levels of contribution as summarized in Table 10-3.

Table 10-3: 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
Cities within service area	-	-	-	-	✓	✓	✓
County of Orange	-	-	-	-	✓	✓	✓
MET	✓	-	-	✓	✓	✓	✓
MWDOC 28 Retail Agencies	✓	✓	✓	✓	✓	✓	✓
OC San	✓	-	-	✓	✓	-	-
OCWD	✓	-	-	✓	✓	✓	✓
Public Library	-	-	-	-	-	✓	-
SJBA	✓	-	-	✓	✓	-	-
SOCWA	✓	-	-	✓	✓	-	-

MET - As a member agency of MET, MWDOC developed this UWMP in collaboration with MET's 2020 UWMP to ensure consistency between the two documents.

MWDOC Retail Agencies - MWDOC provided assistance to its retail agencies' 2020 UWMP development by providing much of the data and analysis such as population projections from the California State University at Fullerton CDR and the information quantifying water availability to meet the retailers' projected demands for the next 25 years, in five-year increments. Additionally, MWDOC led the effort to develop a Model Water Shortage Ordinance that its retail suppliers can adopt as is or customize and adopt as part of developing their WSCPs.

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 6.3.

Wastewater Management Agencies - To meet the requirements of the Act in the preparation of this UWMP, 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 UWMP to describe wastewater discharge methods, treatment levels, discharge volumes, and recycled use in the region.

10.3 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 19 2021. Copies of the draft 2020 UWMP were placed for public inspection at MWDOC's office and made available for the public on MWDOC's website.

Public hearing notifications were sent to retail agencies and other interested parties. A copy of the Notice of Public Hearing is included in Appendix L.

The hearing was conducted during a regularly scheduled meeting of the MWDOC Board of Directors. A staff report and presentation reviewed the process, key components of the UWMP and the conclusions that served as the basis of the UWMP. The President of the Board of Directors then opened the Public Hearing where all comments were recorded.

10.4 UWMP Submittal

The Board of Directors reviewed and approved the 2020 UWMP at its May 19, 2021 meeting after the public hearing. See Appendix M for the resolution approving the Plan.

By July 1, 2021, the Adopted 2020 MWDOC UWMP was filed with DWR, California State Library, County of Orange, and cities within MWDOC's service area. The submission to DWR was done electronically through the online submittal tool –WUE Data Portal. MWDOC will make the Plan available for public review on its website no later than 30 days after filing with DWR.

10.5 Amending the Adopted UWMP or WSCP

Based on DWR's review of the UWMP, MWDOC will make any amendments in its adopted UWMP, as required and directed by DWR and will follow each of the steps for notification, public hearing, adoption, and submittal for the amending the adopted UWMP.

If MWDOC revises its WSCP after UWMP is approved by DWR, then an electronic copy of the revised WSCP will be submitted to DWR within 30 days of its adoption.

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APPENDICES

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