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1-A Copy of the Urban Water Management Plan Act (January 2005)

1-B Documentation and presentation for the Coordination Workshops with Metropolitan and MWDOC member agencies

1-C Informational Package Prepared for Each of MWDOC member agencies

1-D(i) Generic letter prepared by MWDOC for its member agencies to notify cities and county for the update of the Urban Water Management Plan

1-D(ii) Copies of the letters sent by MWDOC member agencies for notifying cities and county for the update of the Urban Water Management Plans

1-E Letter that MWDOC sent to notify Metropolitan of the amount of water MWDOC, on behalf of its member agencies, wishes to purchase over the next 25 years

1-F(i) Copies of display ads announcing the two community information meetings

1-F(ii) Record (attendance, presentation, and videotape) of the community information meetings

1-G MWDOC 2005 Urban Water Management Plan Review for Completeness Form

2-A(i) Outputs of MWDOC "Water Balance" Model – baseline run (without annexation)

2-A(ii) Outputs of MWDOC "Water Balance" Model – Supplemental run (assume annexations occur in 2006-07 for Irvine Ranch Water District and City of Anaheim)

2-B Copy of Orange County Water District Groundwater Management Plan

2-C(i) Copy of California State Water Resource Control Board Permit that granted 9,227 acre-feet per year to San Juan Basin Authority for diversion and use from San Juan Basin

2-C(ii) Copy of California State Water Resource Control Board Permit that granted 976 acre-feet to South Coast Water District for diversion and use from San Juan Basin

2-D Copy of San Juan Basin Groundwater Management and Facility Plan

2-E Copy of Metropolitan's 2005 Regional Urban Water Management Plan (September 2005) See Metropolitan Website: http://www.mwdh2o.com/mwdh2o/pages/yourwater/ywater02.html

5-A California Urban Water Conservation Council BMP Implementation Reports 2000 through 2004 (Fiscal Years 1999-2000 through 2003-2004) for MWDOC

5-B California Urban Water Conservation Council BMP Coverage Reports

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7-A Memorandum of Understanding Between MWDOC and IEUA for Exchange of MWD Drought allocation

7-B Irvine Ranch Water District – Water Shortage Contingency Plan

7-C Copy of Resolution for MWDOC Water Shortage Contingency Plan in 1991 (Resolution No. 1433)

8-A(i) Notice of Public Hearing

8-A(ii) Records (attendance, presentation, and videotape) of the Public Hearing

8-B Copy of Resolution Approving Municipal Water District of Orange County 2005 Urban Water Management Plan

LIST OF ACRONYMS

ACRONYMS	DEFINITION
AH/NR	Average Hydrology/Normal Replenishment
AOP	Advanced Oxidation Processes
AWT	Advanced Water Treatment
BEA	Basin Equity Assessment
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
BPP	Basin Production Percentage
CRA	Colorado River Aqueduct
CUWCC	California Urban Water Conservation Council
DATS	Deep Aquifer Treatment System
DBPs	Disinfection Byproducts
DHS	Department of Health Services
DOE	Department of Energy
DRIP	Desalination Research and Innovation Partnership
DWR	Department of Water Resources
DWSAPP	Drinking Water Source Assessment and Protection Program
EDCs	Endocrine Disrupting Compounds
GERA	Gobernadora Ecological Resource Area
gpcd	Gallon per capita (person) per day
gpm	Gallon per minute
GWR System	Groundwater Replenishment System
IDP	Irvine Desalter Project
IRP	Integrated Resource Plan
IRPP	Infrastructure Reliability and Protection Program
IRWD	Irvine Ranch Water District
IRWM	Integrated Regional Water Management
IRWMP	Integrated Regional Water Management Plan
IX	Iron Exchange
LRP	Local Resource Projects – Metropolitan's incentive program for developing local supplies
M&I	Municipal and Industrial
MCL	Maximum Contaminant Level
Metropolitan	Metropolitan Water District of Southern California
MF	Microfiltration
mg/L	Milligram Per Liter (10^{-3} gram per liter)
MOU	Memorandum of Understanding
MWDOC	Municipal Water District of Orange County
MTBE	Methyl Tertiary-Butyl Ether
NDMA	N-nitrosodimethylamine
OCSD	Orange County Sanitation District
OCWD	Orange County Water District
PCE	Tetrachloroethene
pCi/L	Picocuries Per Liter (A unit of measure of levels of radon gas)

LIST OF ACRONYMS

ACRONYMS	DEFINITION
PPCPs	Pharmaceuticals and Personal Care Products
RA	Replenishment Assessment
RO	Reverse Osmosis
RUWMP	Regional Urban Water Management Plan
RWQCB	Regional Water Quality Control Board
SANDAG	San Diego Association of Governments
SARI	Santa Ana River Interceptor
SAWPA	Santa Ana Watershed Project Authority
SCAG	Southern California Association of Governments
SDCWA	San Diego County Water Authority
SFWPA	South Feather Water and Power Agency
SWP	State Water Project
TCE	Trichloroethylene
TDS	Total Dissolved Solid
Title 22	California Title 22 Drinking Water Standards
TOC	Total Organic Carbon
µg/L	Microgram Per Liter (10^{-6} gram per liter)
ULFT	Ultra Low Flush Toilet
USEPA	United States Environmental Protection Agency
UV	Ultraviolet Light
UWMP	Urban Water Management Plan
VOC	Volatile Organic Compounds
WRP	Water Recycling Plant

DWR "REVIEW FOR COMPLETENESS FORM" CHECKLIST

UWMP ACT CODE	REFERENCE IN MWDOC 2005 UWMP
Water Code §10620(d)(1)(2) – Agency Coordination	
Describe the coordination of the plan preparation and anticipated benefits.	Section 1.1.1, Section 1.1.2, and Section 1.1.3 Table 1-1-2-A
Water Code §10620(f) – Resource Maximization Tool	
Describe water management tools/options maximize resources & minimize need to import	Section 4.1
Water Code §10621(a) – Plan Update and File	
Date updated and adopted the plan	Section 8.1 (Date expected to file = 12/22/05)
Water Code §10621(b) – City and County Notification and Participation	
City and County notification and participation	Section 1.1.2
Water Code §10631(a) – Service Area Information	
Service area information, including population, climate, and other demographic factors	Sections 1.2.3 and 2.1.2 Tables 1-2-3-2-A, 2-1-2-1-A, 2-1-2-2-A, and 2-1-2-3-A
Water Code §10631(b) – Water Sources	
Identify and quantify existing and planned water supply sources	Section 2.2.1 Tables 2-2-1-A and 2-2-1-B
Water Code §10631(b)(1-4) – Groundwater Identified as Existing or Planned Source	
Describe basin management plan, attach management plan, describe groundwater basins, describe plan to eliminate overdraft, analyze location, amount, and sufficient of production of last 5 years, and analyze location and amount projected in next 25 years	Section 2.2.1.1 Tables 2-2-1-1-1-A, 2-2-1-1-1-B, 2-2-1-1-2-A, 2-2-1-1-2-B, 2-2-1-1-3-A, and 2-2-1-1-3-B Appendix 2-B and Appendix 2-D
Water Code §10631(c)(1-3) – Reliability of Supply	
Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage	Section 2.2.2 Tables 2-2-2-1-A, 2-2-2-2-A, and 2-2-2-2-B
Water Code §10631(c) – Water Resources Not Available on a Consistent Basis	
Describe reliability/vulnerability of the water supply to seasonal or climatic shortage	Section 2.2.2.2 Tables 2-2-2-1-A, 2-2-2-2-A, and 2-2-2-2-B
Water Code §10631(d) – Transfer or Exchange Opportunities	
Describe short term and long term exchange or transfer opportunities	Section 2.2.1.5
Water Code §10631(e)(1)(2) – Water Use Provision	
Quantify past, current and future water use by sectors	Section 2.1.3 Table 2-1-3-4-A
Water Code §10631(f)(g) – Demand Management	
	Section 5
Water Code §10631(h) – Planned Water Supply Projects and Programs	
Detail description of expected future supply projects and programs	Section 2.2.3 Table 2-2-3-A
Water Code §10631(l) – Opportunities for Development of Desalinated Water	
Describe opportunities for development of desalinated water	Section 2.2.1.6

DWR "REVIEW FOR COMPLETENESS FORM" CHECKLIST

UWMP ACT CODE	REFERENCE IN MWDOC 2005 UWMP
Water Code §10631(j) – District is a CUWCC signatory	
Agency is a CUWCC member, attach 2003-04 annual updates	Sections 5.1, 5.2, 5.3 Appendix 5-A and Appendix 5-B
Water Code §10631(k) – if Supplier Receives or will Receive Water from a Wholesale Supplier	
Provide written demand projections to wholesaler, and wholesaler provides written water availability to agency	Section 2.2.1.4 Table 2-2-1-4-A
Water Code §10632, 10632(a) – Water Shortage Contingency Plan and Stage of Action	
Provide stages of action, include plan for shortage	Section 7.0 Tables 7-2-A
Water Code §10632(b) – Water Shortage Contingency Plan and Stage of Action	
Identify driest 3-year period, quantify minimum water supply available by source for the next three years	Section 7.3 Table 7-3-A
Water Code §10632(c) – Preparation for Catastrophic Water Supply Interruption	
Provide catastrophic supply interruption plan	Section 7.4 Table 7-4-A
Water Code §10632(d) – Prohibitions	
List the mandatory prohibition against specific water use practice during shortage	Section 7.5.1
Water Code §10632(e) – Consumption Reduction	
List consumption reduction method	Section 7.5.2
Water Code §10632(f) – Penalties	
List excessive use penalties or charges for excessive use	Section 7.5.3
Water Code §10632(g) – Revenue and Expenditure Impact	
Describe impacts to revenue and expenditure, and describe measures to overcome them	Section 7.6
Water Code §10632(h) – Water Shortage Contingency Ordinance/Resolution	
Attach a copy of the draft water shortage contingency resolution or ordinance	Section 7.7 Appendix 7-A
Water Code §10632(i) – Reduction Measuring Mechanism	
Providing mechanism for determining actual reduction	Section 7.8
Water Code §10633 – Recycling Plan Agency Coordination	
Describe agency coordination for the recycling plan	Section 6.1 Tables 6-1-A and 6-1-B
Water Code §10633(a) – Wastewater System Description	
Describe and quantify wastewater collection and treatment	Section 6.2 Table 6-2-A
Water Code §10633(a-d) – Wastewater Disposal and Recycled Water Uses	
Describe method of wastewater disposal, describe uses of recycling water, quantify and describe potential uses for recycling	Sections 6.2, 6.3, and 6.5 Tables 6-2-B, 6-3-A, 6-3-B, and 6-5-2-A

DWR "REVIEW FOR COMPLETENESS FORM" CHECKLIST

UWMP ACT CODE	REFERENCE IN MWDOC 2005 UWMP
Water Code §10633(e) – Projected Uses of Recycled Water	
Projected use of recycled water, compare UWMP 2000 projections with UWMP 2005 actual	Section 6.4 Tables 6-3-A and 6-3-B
Water Code §10633(e) – Plan to Optimize Use of Recycled Water	
Describe action to encourage recycled water uses	Sections 6.6 and 6.7
Water Code §10634– Water Quality Impacts on Availability of Supply	
Describe water impacts upon water management strategies	Section 3 Table 3-1-A
Water Code §10635(a)– Supply and Demand Comparison to 25 Years	
Compare the projected supply to projected water use under normal, single-dry, and multiple dry water years	Section 2.3 Tables 2-3-1-A to 2-3-1-F Tables 2-3-2-A to 2-3-2-B Tables 2-3-3-A to 2-3-3-DD
Water Code §10635(b)– Provision of Water Service Reliability to Cities and Counties	
Provide water service reliability section of UWMP to cities and counties within supplier's service area	Section 8.1
Water Code §10642– Does the Plan Include Public Participation and Plan Adoption	
Encourage involvement of social, cultural, & economic community group, provide plan for public review, provide proof of public hearing, attach a copy of adoption resolution, provide meeting notice to local government	Sections 8.1 and 1.1.3 Appendix 8-B Appendix 8-A(i) Appendix 8-A (ii)
Water Code §10643– Review of Implementation of 2000 UWMP	
Review implementation of 2000 UWMP	Section 8.2
Water Code §10644(a)– Provision of 2005 UWMP to local government	
Provide 2005 UWMP to DWR, cities, and counties within 30 days of adoption	Section 8.1
Water Code §10645– Does the Plan or Correspondence Accompanying it show where it is available for public review	
Does UWMP shows where it is available for public review	Section 8.1

EXECUTIVE SUMMARY

BACKGROUND AND PURPOSE

Enacted in 1983, the Urban Water Management Planning Act (Act) requires every urban water supplier providing water to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually to prepare and adopt an Urban Water Management Plan every five years. The Municipal Water District of Orange County (MWDOC), a water wholesaler and regional planning agency, fits the defined criteria and has prepared this Urban Water Management Plan (Plan) to address all the requirements set forth in the *State of California Water Code* Section 10610 through 10657.

Since its passage, many amendments have been added to the Act. These changes are intended to encourage increased regional planning and the cooperative management of California's most precious commodity – water. As a result, Urban Water Management Plans have evolved to become:

- foundation documents and sources of information for Water Supply Assessments (*California Water Code* Section 10613) and Written Verifications of Water Supply (*California Water Code* Section 66473.7);
- long-range planning documents for water supply;
- source data for the development of regional water plans;
- source documents for cities and counties preparing their General Plans;
- key components of Integrated Regional Water Management Plans; and
- a condition to qualify for receipt of certain State grant funds.

For MWDOC, the benefits of updating our Plan extend beyond legislative compliance. The regional approach of documenting water-service planning allows MWDOC to:

- evaluate supply-reliability goals for the region and provide a comprehensive assessment of water resource needs in its service area;
- provide a regional perspective on current and proposed water use efficiency programs and identify measures that can be accomplished in a cost effective manner;
- provide assistance to maximize the beneficial use of recycled water and other local resource supplies that reduce the need for imported supplies; and
- offer opportunities for public participation through publicly-noticed meetings and provide information that will allow the public to gain a better understanding of the region's comprehensive water planning.

Please note that MWDOC is a wholesaler of imported water for the region. For the purpose of evaluating a comprehensive assessment of the region's water services, MWDOC has taken a regional approach in compiling this Urban Water Management Plan. This Plan documents information on all sources of supplies – imported supply, groundwater supply, surface supply, recycled supply, and wastewater, as a summary of information for the regional planning. MWDOC does not currently provide any source of water other than imported supplies from Metropolitan, and it is not responsible for any of the projects or sources other than imported supply discussed in this Plan.

PLAN FINDINGS

The following are summaries for the sections discussed in this Draft Plan:

Water Service Reliability

Based on the preliminary information gathered, the Draft Plan concludes that the MWDOC service area will have sufficient existing and planned supplies to meet 100% of its projected demand under every water-year scenario for the next 25 years.

Retail consumptive demand is projected to grow at a slower rate of 0.5% per year compared to historical demand growth of 1.54% per year. Water demand for municipal and industrial use will continue to grow from approximately 500,000 acre-feet per year at the present time to more than 610,000 acre-feet per year in 2030. Demand in the agricultural sector is expected to decline from nearly 17,000 acre-feet per year today to less than 5,000 acre-feet per year in 2030. As driven by the availability of some of its replenishment supplies, the recharge of the Orange County Groundwater Basin is expected to increase from approximately 325,000 acre-feet per year (via the seawater intrusion barrier, in-lieu water, and spreading basins) to more than 400,000 acre-feet per year in 2030.

This Plan also evaluates each source of water in the region. The resource mix for meeting direct consumption includes local groundwater, recycled water, surface water, and imported water from Metropolitan Water District of Southern California (Metropolitan). The Plan documents MWDOC's cooperative efforts with its member agencies in developing local supplies. In fact, the region anticipates increasing its local supply from its current 53% of direct consumption to 60% in 2030. In particular, groundwater supplies are projected to grow from 45% to 48% and recycled water from 6% to 10%. As a result, it is projected that the region will decrease its dependence on imported supplies under normal climate conditions from 47% in 2005 to 40% in 2030. The resource mix for indirect consumption used for groundwater recharge and the seawater intrusion barrier also includes local and imported supplies. Currently, surface supplies from the Santa Ana River and local streams are meeting approximately 79% of demand for indirect use. Local recycled supply is meeting about 1% of the demand. Imported supplies, primarily from Metropolitan, are used to meet 20% of the indirect consumptive demand. Local supplies for meeting indirect consumptive demand are expected to increase when the Groundwater Replenishment System comes on line in 2007-08, and as municipal discharge continues to increase into the Santa Ana River due to population growth in the upper Santa Ana Watershed. By 2030, the region is projected to meet its indirect consumption with 69% of

surface supplies from the Santa Ana River and local streams, 18% recycled water, and 13% imported water.

When assessing the water supply reliability for the region, MWDOC used an inference approach to conclude that Metropolitan is capable of supplying imported water to meet the demand projected by MWDOC under various hydrologic conditions. In its Draft 2005 Urban Water Management Plan (September 2005), Metropolitan presents its supply availability at the regional level, rather than at the member-agency level. This approach does not enable MWDOC to quantify the availability of imported supply from Metropolitan specific to MWDOC. However, in that Draft Plan (Section II.2 – *Evaluating Supply Reliability*), Metropolitan was able to demonstrate it can maintain 100% reliability in meeting direct consumptive demand under a normal hydrologic year, the single-driest hydrologic year, and a series of multiple dry years through 2030. By inference, MWDOC determined the availability of its imported supply should equate to its projected imported demand. Thus, MWDOC concludes Metropolitan will meet all of the imported demand for direct consumption projected by MWDOC under this Draft Plan.

Water transfers and exchange and ocean water desalination are two potential sources of supply that are discussed in the Plan as part of MWDOC's long-term resource evaluation, but they are not included in the current resource mix. MWDOC and some of its member agencies are now developing long-term relationships with water suppliers in Northern California. MWDOC is also exploring water transfers from other Metropolitan member agencies. These relationships may lead to mutually beneficial transfer agreements in the near future. The Plan also discusses potential ocean desalination projects in the region: the Poseidon Resources Corporation proposed project in Huntington Beach; a potential joint San Diego/Orange County regional project at San Onofre; and the potential MWDOC/Dana Point Desalination Project.

Finally, the Plan compares the region's supply and demand to determine water service reliability under different climatic conditions – types of water years. The Plan first establishes the hydrologic conditions that define the types of water years in the MWDOC region by considering a combination of the following three variables:

1. Total retail demand of the water year;

2. Local supply condition of the water year; and

3. Imported supply condition of the water year.

Imported-supply demand typically increases during dry years when the weather is hot and there is a decrease in local runoff. Furthermore, in its preliminary Draft Plan Metropolitan demonstrated it has developed flexible water supplies through transfers and storage programs designed to increase its resources during dry water year conditions. As a result, the water year is defined by the net difference of total retail demand less local supplies. The greater the net difference, the more critical it is for MWDOC to depend on imported supply. Using this approach, the Plan defines the types of water years in the region as:

- Normal Water Year: average of 83 years, representing the historical hydrology from 1922 to 2004;

- Single Dry Water Year: 1961 hydrology (yields the highest one year demand for imported supply);

- Multiple Dry Water Years: 1959 to 1961 (a sequence that yields the highest three-year demand for imported supply);

When comparing supply and demand under those defined water years, the Plan concludes that the region is projected to maintain 100% water-service reliability under each type of water year. Under normal water years, the total retail demand from 2010 to 2030 is expected to be met by 60% local supply and 40% imported supply. Under single dry water years, retail demand is expected to increase by 6%. Local supply is anticipated to decrease from 60% in normal year to 57% in a single dry year for 2010 and to 52% for 2030. To compensate for the wide gap between retail demand and local supply, imported supply is expected to increase from 40% in a normal year to 43% in a single dry year for 2010, and to 48% in a single dry year for 2030. Similar trends can be observed under multiple dry water years.

Impact of Water Quality on Water Service Reliability

Water quality evaluation is based on known contaminants applicable to local and imported supplies by three levels of standards:

- Primary Drinking Water Standards (health);

- Secondary Drinking Water Standards (aesthetics);

- Notification Levels (not yet regulated contaminants).

After evaluating the water quality in the region, the Plan concludes that current management strategies have accounted for all known and foreseeable water quality impacts. The region does not anticipate that any water quality issues would either reduce supply availability or could not be handled through existing management strategies.

Programs to Improve Water Service Reliability

As a regional provider and resource planning agency, MWDOC is committed to programs that maximize existing water resources and minimize the region's dependency on imported supplies. To that end, MWDOC has taken a proactive stance, participating in the following efforts:

- Integrated Regional Water Management Plan;

- Water Use Efficiency Programs;

- Orange County Water Reliability Plan;

- South Orange County Water Reliability Study;

- Metropolitan's Local Resources Incentive Program - Assisting agency participation in this program for local supply development;

- Cooperative Agreement with Orange County Water District;

- Ocean Water Desalination Feasibility Investigation; and

- Southern California Comprehensive Water Reclamation and Re-Use Study.

Water Conservation Program

The Plan documents MWDOC's water use efficiency efforts. As a wholesaler, MWDOC is committed to developing and implementing regional conservation programs on behalf of its retail water agencies and their customers. This regional approach enables economies of scale, ensures a consistent message to the public, and assists in the acquisition of grant funding for program implementation.

To facilitate the implementation of Best Management Practices (BMPs) throughout Orange County, MWDOC focuses its effort on the following three areas:

- Regional Program Implementation: MWDOC develops, obtains funding for, and implements regional BMP programs on behalf of all retail water agencies in its service area. Program details are discussed in Section 5.4.3 of the Plan.

- Local Program Assistance: Upon request, MWDOC assists retail agencies in developing and implementing local programs within their individual service areas. MWDOC provides assistance with a variety of local programs including, but not limited to, Home Water Surveys, Landscape Workshops (residential and commercial), Public Information, School Education, Conservation Pricing, and Water Waste Prohibitions.

- Research and Evaluation: An integral component of any water use efficiency program is the research and evaluation of potential and existing programs. In the past five years, MWDOC has conducted research that allows agencies to measure the water-savings benefits of a specific program and then compare those benefits to the costs of implementing the program. This cost/benefit analysis enables individual agencies to evaluate the economic feasibility of a program prior to its implementation.

Wastewater Management and Water Recycling

This Plan documents wastewater collection, treatment, recycling, and disposal in the MWDOC service area. Currently the region collects nearly 340,000 acre-feet of

wastewater per year. 11% of that wastewater is used for recycled supply. The remainder is disposed through ocean outfalls. However, the Plan projects the amount of recycled water will increase in the future. The amount of wastewater is expected to grow to approximately 460,000 acre-feet per year in 2030, with 30% expected to be treated for recycled use and only 70% disposed through ocean outfalls.

The Plan projects that recycled water will become a significant, reliable source of supply in the future and examines its expanded use. The mechanisms encouraging recycled water use include:

- assisting retail agencies to secure funding from local, state, and federal agencies;
- promoting partnerships to encourage water recycling projects (example: the Groundwater Replenishment System, which is jointly funded by Orange County Water District and Orange County Sanitation District);
- urging regulatory agencies to streamline regulatory requirements;
- lobbying for state and federal assistance for the construction of brine lines to offset the cost of brine disposal; and
- supporting research that addresses public concerns on recycled water use, develops new technology for cost reduction, and assesses health effects to protect the public.

Water Shortage Contingency Plan

During water shortages, MWDOC works with its member agencies to manage the water supply in the region to ensure it meets the demands of its member agencies. Water shortages may result from variations in weather, natural disasters, or unanticipated situations (i.e. system failures, acts of terror). During a severe water shortage (such as a Stage 7 supply reduction as defined in Metropolitan's Water Surplus and Drought Management Plan), the MWDOC Board would be responsible for allocating imported water from Metropolitan. MWDOC would use the same principles as identified in Metropolitan's Water Surplus and Drought Management Plan for the allocation of imported water to its member (retail) water agencies, subject to any locally developed principles which would be developed in consultation with the retail agencies.

In the early 1980s, three regional water agencies – MWDOC, Coastal Municipal Water District (later merged with MWDOC), and Orange County Water District – jointly formed the Water Emergency Response Organization of Orange County (WEROC) to coordinate emergency response on behalf of all Orange County water agencies. Details of a catastrophic supply interruption plan developed through WEROC are discussed in Section 7.4 of the Plan.

COORDINATION

It is important to note that Metropolitan and many of MWDOC's retail member agencies are also required to prepare Urban Water Management Plans and are doing so simultaneously. As a result, MWDOC recognizes that close coordination among its wholesale agency and MWDOC's retail member agencies is the key to the success of its Plan.

The MWDOC Plan is meant to aggregate the planning information in a meaningful way so the public can better understand water resource planning on the regional level. Every effort has been made to coordinate information with local retail agencies' plans as they were being prepared to avoid any significant discrepancies in facts, figures, and estimates contained in each local Urban Water Management Plan. To that end, much of the information presented in this Plan is based on the BEST AVAILABLE information at the time of drafting. To the extent that any discrepancies exist, the local retail agency plan controls.

PLAN SUMMARY AND ADOPTION

Based on the data compiled in this Plan, water service in the MWDOC region is expected to be 100% reliable for the next 25 years. The Plan also finds that the region is continuing to improve its water reliability by designing programs to protect and ensure water quality, maximize local supplies, promote conservation, encourage recycled water use, and meet its demands during shortages.

In compliance with *California Water Code* Section 10644(b), MWDOC is required to file this Plan with the Department of Water Resources on or before December 31, 2005.

1.0 INTRODUCTION

1.1 Municipal Water District of Orange County's Urban Water Management Plan

This Urban Water Management Plan (Plan) has been prepared by the Municipal Water District of Orange County (MWDOC) for two purposes:

- to comply with *State of California Water Code* under the Urban Water Management Act (Act); and

- to provide information in a meaningful way so that the public can better understand water resource planning within the MWDOC service area.

MWDOC provides wholesale imported water from the Metropolitan Water District of Southern California (Metropolitan) to 30 Orange County cities and water agencies providing retail water service. MWDOC also coordinates and sponsors regional water conservation programs in cooperation with its local retail agencies, and engages in regional water resource and reliability planning in cooperation with other local and regional water, wastewater, and groundwater management agencies.

It is important to note that many of MWDOC's retail member agencies are also required to prepare Urban Water Management Plans and are doing so simultaneously. To that end, much of the information presented in this plan is based on the BEST AVAILABLE information at the time of drafting. <u>However, the final authority of local water supply issues should be the plans prepared by each individual agency. Local supply information is included in this Plan to provide a regional summary and should not be considered in determining if local supplies are adequate for individual agencies.</u>

The MWDOC Plan is meant to aggregate this information in a meaningful way so the public can better understand water resource planning on the regional level. Please note that MWDOC is a wholesaler of imported water for the region. For the purpose of evaluating a comprehensive assessment of the region's water services, MWDOC has taken a regional approach in compiling this Plan. This Plan documents information on all sources of supplies – imported supply, groundwater supply, surface supply, recycled supply, and wastewater, as a summary of information for the regional planning. MWDOC does not currently provide any source of water other than imported supplies from Metropolitan, and it is not responsible for any of the projects or sources other than imported supply discussed in this Plan. Every effort has been made to coordinate information with local retail agencies' plans as they were being prepared to avoid any significant discrepancies in facts, figures, and estimates contained in each local Urban Water Management Plan. <u>To the extent that any discrepancies exist, the local retail agency plan controls.</u>

1.1.1 Purpose of the Urban Water Management Plan

MWDOC has prepared this Plan consistent with the *State of California Water Code* Sections 10610 through 10657, known as the Urban Water Management Planning Act.

Enacted in 1983, the Act requires that every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually prepare and adopt, in accordance with prescribed requirements, an urban water management plan. The Act also requires urban water suppliers to describe and evaluate sources of water supply, efficient use of water, demand management measures, implementation strategies and schedules, and other relevant information and programs.

Since its passage, many amendments have been added to the Act. A copy of the Urban Water Management Plan Act is included in *Appendix 1-A.*

Today, an Urban Water Management Plan (UWMP) also serves as a foundation document and source of information for a Water Supply Assessment, *California Water Code* Section 10613, and a Written Verification of Water Supply, *California Water Code* Section 66473.7. Both statutes require detailed information regarding water availability to be provided to city and county decision makers prior to approval of specified large development projects. Additionally, an UWMP also serves as a:

- long-range planning document for water supply;
- source data for development of a regional water plan;
- source document for cities and counties, as they prepare their General Plans;
- key component of an Integrated Regional Water Management Plan; and
- condition to qualify for receipt of certain State grant funds

California Water Code 10644(a) requires urban water suppliers to file with the Department of Water Resources, the California State Library, and any city or county within which the supplier provides water supplies, a copy of its UWMP no later than 30 days after adoption. Urban water suppliers are required to file an Urban Water Management Plan at least once every five years on or before December 31, in years ending in five (5) and zero (0). The 2005 Urban Water Management Plans are due December 31, 2005.

For MWDOC, the activities associated with the update of its Plan and the benefits the Plan ultimately affords its local retailers extend far beyond the implied or stated supply-reliability goals. For example, the regional approach allows MWDOC to:

- provide a comprehensive assessment of water resource needs in its service area;

- provide guidance to coordinate implementation of water conservation programs in a cost effective manner;

- provide assistance to maximize the beneficial use of recycled water and local groundwater supplies, providing the region with new sources of local water to reduce the need for imported supplies from Metropolitan; and

- offer opportunities for public participation through publicly noticed meetings, and provide information that will allow the public to gain further understanding of the region's comprehensive water planning.

1.1.2 Coordination with Appropriate Agencies in the Preparation of the Plan

Recognizing that close coordination among other relevant public agencies is the key to the success of its Plan, MWDOC also worked closely with many other entities to develop and update this planning document. Table 1-1-2-A documents the name of the agencies with which MWDOC coordinated information for developing its Plan.

Table 1-1-2-A: Coordination with Appropriate Agencies in Preparation of this Plan

Check at least one box on each row	Participated in developing the plan	Commented on the draft	Attended public meetings	Was contacted for assistance	Was sent a copy of the draft plan	Was sent a notice of intention to Update the Plan	Was Sent a notice of Intention to Adopt the Plan
MWDOC 27 Member Agencies	✓	✓	✓	✓	✓	✓	✓
Cities within MWDOC Service Area			✓		✓	✓	✓
County of Orange			✓		✓	✓	✓
Orange County Water District	✓			✓	✓	✓	✓
San Juan Basin Authority	✓			✓	✓		
Metropolitan Water District of Southern California	✓			✓	✓	✓	✓
Orange County Sanitation District	✓			✓	✓		
South Orange County Wastewater Authority	✓			✓	✓		

MWDOC's coordinated efforts with the relevant agencies are described in the following paragraphs.

MWDOC Member Agencies

MWDOC conducted three countywide coordination workshops and several surveys to facilitate the exchange of planning information with its member agencies. See *Appendix 1-B* for the documentation of the workshops conducted. MWDOC requested its 30 member agencies provide 25-year retail demand projections and a description of any planned development of local supplies. Methodologies and assumptions underlying these projections vary from agency to agency, but all projections reflect an in-depth knowledge of the individual agencies' service areas. Particularly in the area of demand projections, the data MWDOC obtained primarily correlated to the General Plans prepared by the County of Orange or cities within MWDOC's service area.

As required by *California Water Code* Section 10631(k), MWDOC provided its member agencies information that quantifies water availability to meet their projected demands for the next 25 years, in five-year increments. Based on the projections of retail demand and local supplies development done by its member agencies and the imported supply availability described in Metropolitan's May 2005 Draft Urban Water Management Plan, MWDOC prepared an informational package with data

specific to each member agency to be used by that agency to update its own UWMP. In the informational package, MWDOC quantified the reliability of the wholesale supplies from Metropolitan and the amount expected to be delivered to each agency during normal, single-dry, and multiple-dry years. A copy of the completed set of informational packages for MWDOC member agencies is included in *Appendix 1-C*. Please note that information collected was the best available at the time, and the results should be viewed as approximation. The values reflected in member agencies' plans should govern if there are any discrepancies from their plans to MWODC's plan.

Cities and County

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

California Water Code Section 10621(b) requires urban water suppliers to notify cities and counties in their service area of the opportunity to submit comments during the UWMP update process. To ensure the County of Orange and all cities within the MWDOC service area received notification of the UWMP updates in an efficient manner and were not bombarded with repeated notifications from numerous retail and wholesale water suppliers, MWDOC initiated a coordinated notification process with its member agencies and its wholesale supplier, Metropolitan. MWDOC created a generic letter describing the UWMP development process. The letter named all pertinent agencies that are updating their plans and requested comments and participation from cities and the county in the development of the plans. See *Appendix 1-D(i)* for a copy of the letter. MWDOC then provided a copy of the letter to each of its member agencies for use in notifying the cities in its service area and the County of Orange. *Appendix 1-D(ii)* includes copies of the letters sent by member agencies to cities within the MWDOC service area and to the County of Orange.

Groundwater Management Agencies

MWDOC also worked with the following five agencies to obtain information for the five groundwater basin resources in its service area: Orange County Water District for Lower Santa Ana River Basin, San Juan Basin Authority for San Juan Basin, City of La Habra for La Habra Basin, City of San Clemente for San Mateo Basin, and Laguna Beach County Water District for Laguna Canyon Basin. Details of the basin information are described in Section 2.2.1.1 of this Plan.

Metropolitan Water District of Southern California

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

To meet the requirement set forth by *California Water Code* Section 10631(k), MWDOC notified Metropolitan of the amount of water MWDOC, on behalf of its member agencies, wishes to purchase over the next 25 years. The letter documenting this formal information exchange is provided in *Appendix 1-E*.

MWDOC also worked with Metropolitan staff to develop demand projections using data from the Southern California Association of Governments (SCAG). A detailed description of the methodology and comparisons used to determine these demand projections are provided in Section 2.1 of this Plan.

Wastewater Management Agencies

To meet the requirements of the Urban Water Management Act in the preparation of this Plan, MWDOC contacted individual wastewater collection and treatment providers and other water agencies within MWDOC's service area for data on recycled water and associated projects in the region. The information MWDOC obtained was then combined with a review of several completed Orange County studies. MWDOC also reviewed operating information and interviewed staff from individual agencies. The information MWDOC obtained from wastewater collection and treatment providers allows the Plan to describe wastewater disposal methods, treatment levels, discharge volumes, and recycled use in the region. A detailed description of MWDOC's efforts, coordination, and the studies researched are discussed in Section 6 of this Plan.

1.1.3 Public Community Involvement

According to *California Water Code* Section 10642, "each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan" (qtd. Guidebook 89).

To generate interest and encourage the public's participation in the planning process and to actively seek input from the broadest audience possible throughout the yearlong endeavor, MWDOC conducted two Community Information meetings – May 12, 2005 and August 18, 2005. These meetings were in addition to the Public Hearing on the draft Plan, which was held in November 2005.

Hundreds of invitation letters and e-mail notifications announcing the Community Information meetings were sent to individuals representing businesses, environmental groups, residents interested in water management, as well as city and county staff. MWDOC also ran ads announcing each meeting in the *Orange County Register*, which has a weekday readership of 768,000. Copies of the display ads, which ran in the Local section of the paper, are attached in *Appendix 1-F(i).*

MWDOC videotaped each Community Information meeting as a way of accurately documenting the input of stakeholders. Copies of the videotapes are included in *Appendix 1-F(ii).* Below is a summary of participants' comments and questions as presented to staff during the May 12th meeting:

Water Supply

- Orange County has to reduce Colorado River water from 20% of our supply to 14%. What are programs to replace (this water)?

Water Quality

- What about medications in drinking water (emerging contaminants)?

Water Reclamation

- What percentage of Orange County Sanitation District wastewater will be recycled by the Groundwater Replenishment System? Could GWR be expanded to do 100%?
- I've heard that 87% of water used in Orange County is for landscape irrigation. Can recycled water be delivered directly to homes for outdoor use?
- What about gray water systems?
- How many acre-feet a day are flushed into the ocean? How much can be reused?
- Could you extend a recycled-water line to each and every home?
- If the Groundwater Replenishment System were expanded, would there be a need for a desalination plant in Huntington Beach?

Population Growth/Water Demand

- How will growth in the Inland Empire impact Orange County?
- How can we be assured the forecasting data is accurate (for agriculture…for industrial…for urban)?
- Who is responsible for forecasting water demand? Will we have more people? Will agricultural use drop off? What about industrial use - will manufacturing plants move out of area? Can statistics be produced showing water use by sector - urban, industrial, ag?
- How much water does agriculture use in California on a percentage basis?

Other Areas of Concern

- What about the privatization of water utilities? (I learned at a recent meeting that international companies are trying to privatize our public trust resource.)
- Need to look at integrated water management. Runoff from excess irrigation has water quality impacts…meeting the Clean Water Act. When looking at the cost of water supply alternatives, the cost of water conservation should factor in Clean Water Act compliance benefits. Desal is talked about as if a silver bullet. It's a new supply that will just make the Clean Water Act even more difficult to achieve. We should take a more holistic approach and look at conservation and reclamation before desal.
- What about solar-generated electricity?
- How can we reduce urban runoff? Can we capture and reuse urban runoff?
- Isn't there a proposal for a pipeline to go through the Santa Ana Mountains?

MWDOC staff also had a unique opportunity to speak before the 2004-05 Orange County Grand Jury and obtain their input, comments, and suggestions during the planning process. Their comments/questions included:

- Since water suppliers from around the state are compiling Urban Water Management Plans, the accuracy and consistency of the data projections they use is critical. How can we be assured everyone is using the same data? How can we be assured of the data's accuracy(Ex.: population projection from the Inland Empire)?
- Who's examining the impact on water quality of runoff from agriculture?
- I've heard there were toxic dumps in Orange County that have now been covered over. What's the impact on our groundwater?
- What's the purpose of all these little water districts throughout Orange County? Boards of directors run them, but what do they do(the water districts…and the boards)?
- It doesn't seem to me that any planning is done in this county. All we read about is that another thousand homes are being built. If planning is done, we need to learn about the new development when it's still in the planning stage.
- Residents really don't know about all the planning that goes on for (water) reliability…and they should. Water agencies should do a better job of educating the public.
- Don't privatize water. Look what happened to electricity.
- Orange County needs more water storage capacity…surface water capacity.

MWDOC conducted a second Community Information meeting on Thursday, August 18th, to keep stakeholders apprised of MWDOC's progress in Plan development and to obtain their continued input. Like its predecessor, this meeting was videotaped to accurately document comments, suggestions, and questions. Copies of the videotapes are included in *Appendix 1-F(ii).* Below is a summary of participants' comments and questions, as presented to staff during the August 18th meeting:

Water Supply

- Included "what if…" scenarios in the plan (ex. Reduction in Colorado River water).
- South County agencies need MWDOC's assistance with transfer and exchange opportunities.
- Address the impact of CALFED.
- Desalination
    - Have you considered brackish water for desalination?
    - Beach wells are preferred
    - Is there enough water for Orange County without a desalination plant in Huntington Beach?
    - Describe the benefits (if any) that private companies provide over public agencies.
    - Include energy costs.
- How do climate changes impact supply and demand?

Water Quality

- Discuss water quality, including perchlorate in the Santa Ana River, and associated monitoring efforts.

Other Areas of Concern

- Include three cities (Anaheim, Fullerton, Santa Ana) in the MWDOC Plan and house a summary at MWDOC.
- Urban runoff is a regional issue that requires regional assistance
- Water cycle:
    - Need to close the loop in the local water cycle.
    - Work toward a more natural, efficient water cycle.
    - Balance supply with demand through conservation.
    - Promote California-friendly plants.
    - Importance of water recycling.
    - Capture and recycle urban runoff.
- UWMPs should include a programmatic Environmental Impact Report.
- Best Management Practices (BMPs) should be the floor, not the ceiling.
- There is a need for collaborative education programs between public agencies and Non Governmental Organizations.
- Need to consider Total Maximum Daily Loads.

- Department Water Resource planning is top down, rather than bottom up (like Orange County is doing); Orange County's approach makes more sense.
- Will the plan identify actions?
- How many years is the plan done?
- Do you monitor any changes from year to year?
- Growth
    - What is included?
    - Large development
    - Build out.
- Would like to know a cost comparison of all water.
- Conservation has a positive impact on water use and should be continued.

The results of our outreach efforts are notable. We were able to obtain input from a diverse population, including the environmental community (Surfrider Foundation), business owners, residents, the League of Women Voters, and others.

1.1.4 Department of Water Resource Role and Guidance for Urban Water Management Plan

California Department of Water Resource (DWR) staff reviews and determines the completeness of individual UWMPs pursuant to the Act. Agencies subject to the Act must have adopted a complete UWMP that meets the requirements of the law and submit it to DWR to be eligible for drought assistance or to receive funds through DWR. Results of the DWR review are provided to urban water suppliers through written correspondence. If necessary, water agencies with plans that do not meet DWR standards may wish to use the comments within the review letter to revise their UWMP for re-submittal. DWR provides a Legislative Report to the California Legislature one year after UWMPs are due, detailing the status and any outstanding elements of the UWMPs. DWR also prepares reports and provides data for any legislative hearings held to consider the effectiveness and/or completeness of the UWMPs in question.

DWR provides technical assistance to urban water suppliers to help them meet the requirements of the Act, and has provided guidance materials to aid water suppliers in developing 2005 UWMPs. These materials are intended both to help water districts comply with the law and to help DWR staff review submitted plans for regulatory compliance. Guidance materials consist of a series of worksheets and check lists detailing acceptable responses to the requirements set forth in the Act. MWDOC has used the guidance material in the development of this Plan. A copy of the completed review sheets with information contained in this Plan can be found in the appropriate tables in *Appendix 1-G*.

Utilizing the format of the review sheets, MWDOC prepared a customized informational package for each of its 30 member agencies. In each individual informational package, which contained data specific to a particular member agency, MWDOC completed 30 of the 60 tables contained in the review sheets. Data used to complete the appropriate tables was collected through a coordinated effort in the development of this Plan. MWDOC's member agencies were encouraged to use the data contained in their customized information package to prepare individual agency UWMPs. A complete set of the informational packages for each member agency is included in *Appendix 1-C*. The effort allows the resources assessed in the member agencies' plans sum to the resources assessed in MWDOC's plan.

1.1.5 Organization of this Plan

This document is divided into nine (9) Sections:

Section 1 – The introduction, which explains the purpose and development of the Plan. The introduction also describes MWDOC as an agency and its service area.

Section 2 – Assesses water service in the MWDOC service area.

Section 3 – Describes the water quality issues that exist in the MWDOC service area and addresses their impact on the reliability of providing water service.

Section 4 – Discusses programs and tools currently in place to maximize resources and minimize imported supplies to the MWDOC service area.

Section 5 – Describes water demand management programs.

Section 6 – Describes wastewater management and water recycling in the MWDOC service area.

Section 7 – Discusses the water shortage contingency plan.

Section 8 – Illustrates the adoption and implementation of the Plan.

Section 9 – Contains Appendix.

1.2 Municipal Water District of Orange County

1.2.1 Formation and Purpose

Orange County was settled around areas of surface water. San Juan Creek supplied the mission at San Juan Capistrano. Santa Ana River supplied the

early cities of Anaheim and Santa Ana. The Santa Ana River also provided water to a large aquifer underlying the northern half of the county, enabling settlers to move away from the river's edge and still obtain water by drilling wells.

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

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

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

It was not long before other parts of Orange County also saw the need for supplemental supplies. A severe drought in the late 1940s further emphasized this need for coastal communities from Newport Beach to San Clemente. In 1948, coastal communities from Newport Beach south to the San Diego county line formed the Coastal Municipal Water District as a way to join in the benefits provided by Metropolitan.

The Municipal Water District of Orange County was formed by Orange County voters in 1951 under the Municipal Water District Act of 1911. Today, MWDOC is Metropolitan’s third largest member agency, providing and managing the imported water supplies used within its service area.

The Coastal Municipal Water District became a part of MWDOC in January 2001, a move that streamlined local government and allowed MWDOC to more efficiently provide wholesale water services at a reduced cost for the benefit of residents living throughout the service area.

1.2.2 Role of the Municipal Water District of Orange County

MWDOC's 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 for all Orange County, and to promote water use efficiency.*

Related water management goals and objectives include:

- Represent the interests of the public within its jurisdiction;
- Appoint its representative directors to the Board of Metropolitan;
- Inform its directors about Metropolitan;
- Guide Metropolitan in its planning efforts and act as a resource of information and advocacy for member agencies;
- 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 member agencies during periods of short supply;
- Coordinate and facilitate the resolution of water issues and development of joint water projects among its member agencies;
- Represent the public and assist its member agencies in dealing with other governmental entities at the local, regional, state, and federal levels on water-related issues; and
- Inform its member agencies and inform and educate the general public on matters affecting present and future water use and supply.

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

In terms of water management, MWDOC became a signatory to the Memorandum of Understanding (MOU) in 1991, monitored by the California Urban Water Conservation Council, which outlines 14 Best Management Practices for urban water conservation. The urban water conservation practices are intended to reduce long-term urban demands from what they would have been without implementation of these practices, and are in addition to programs that may be instituted during occasional water supply shortages.

For more than 30 years, MWDOC's Public Information and Water Education programs have reached thousands of consumers and nearly 90,000 Orange County students annually. The programs are performed on

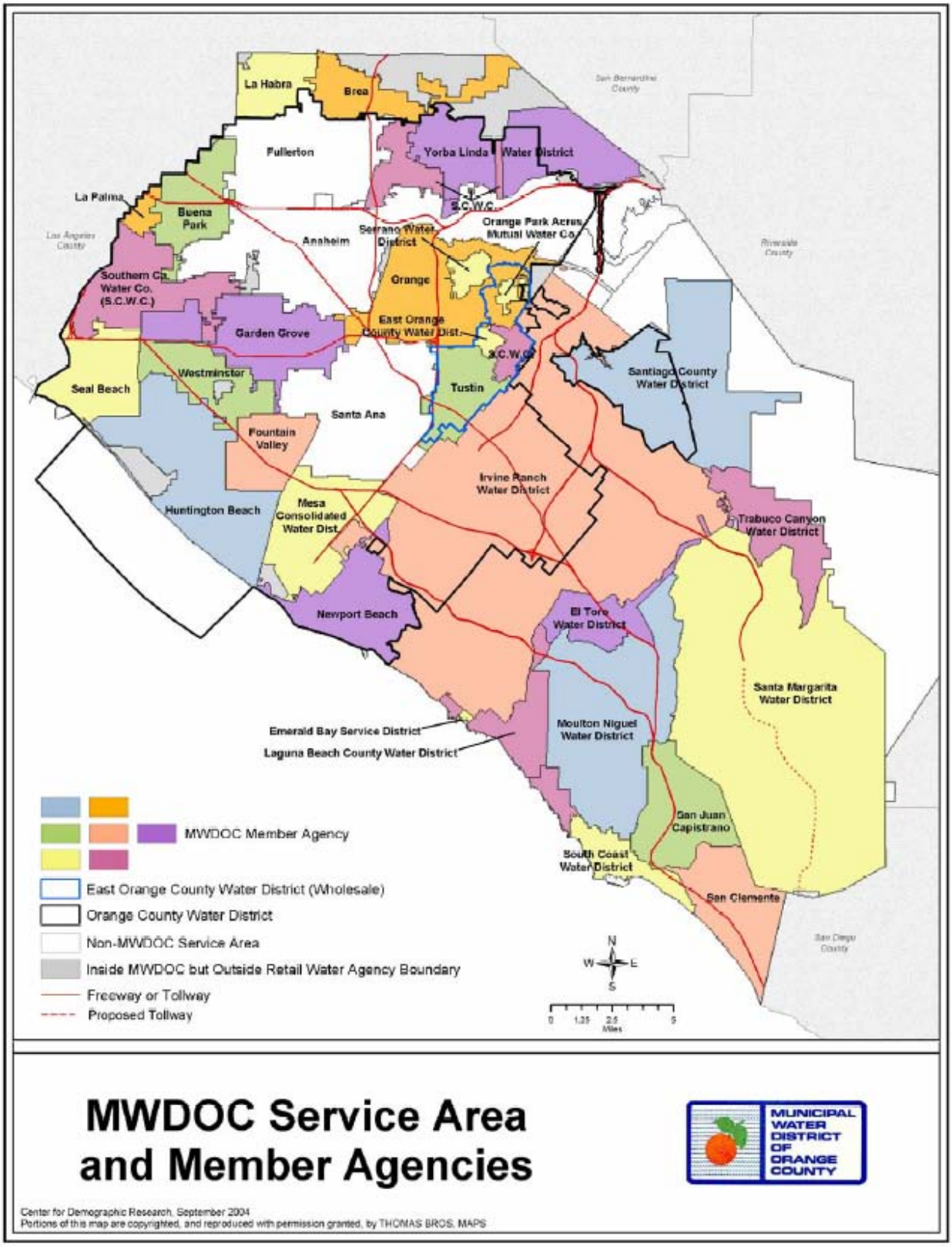
behalf of, and in coordination with, MWDOC's member agencies and are designed to facilitate a student's understanding of current water issues, as well as the challenges, opportunities, and costs involved in securing a reliable supply of high quality water.

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

1.2.3 Service Area

MWDOC is a regional water wholesaler and resource planning agency, managing all of Orange County's imported water supply with the exception of water imported to the cities of Anaheim, Fullerton, and Santa Ana. MWDOC serves more than 2.3 million residents in a 600-square-mile service area (see Figure 1-2-3-A). Its commitment is to ensure water reliability for the communities it serves. To that end, MWDOC focuses on sound planning and appropriate investments in water supply, regional delivery infrastructure and emergency preparedness.

Figure 1-2-3-A: MWDOC's Service Area and Its Member Agencies

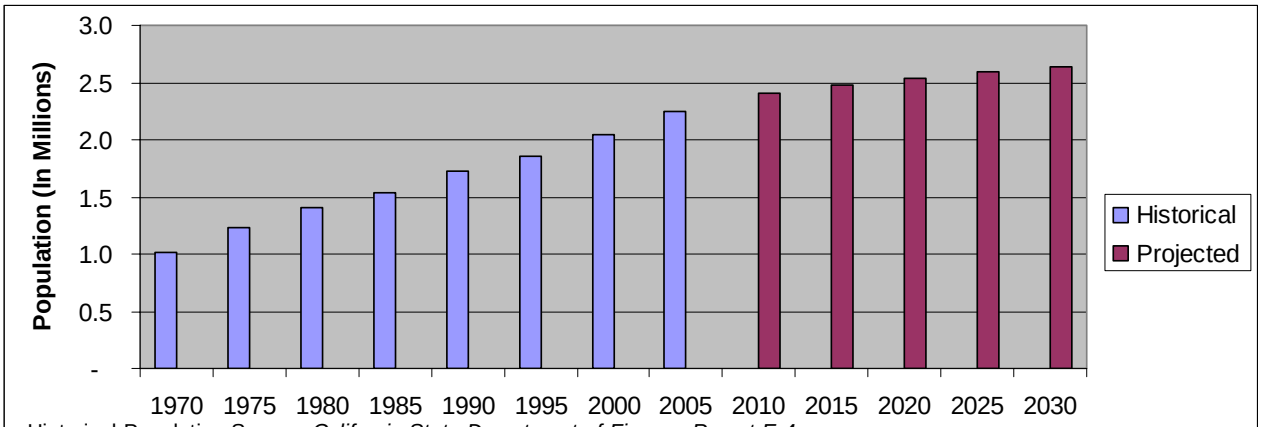


1.2.3.1 Current and Projected Population

The MWDOC service area doubled in population from 1.01 million residents in 1970 to 2.24 million by 2005, according to the California State Department of Finance. This represents an average growth rate of approximately 2.3% per year. Available housing along with a growing economy brought people to Orange County; an enviable lifestyle has kept them here.

Many older cities, especially those in north and central Orange County, anticipate reaching build-out in the near-term and, therefore, their population growth will remain relatively flat over the next 25 years. This, when combined with a relatively young and growing south Orange County population, will result in nearly 2.65 million living in the MWDOC service area by 2030 (Figure 1-2-3-1-A). This represents an average growth rate of 0.66% annually.

Figure 1-2-3-1-A: Historical and Projected Population in MWDOC's Service Area



Historical Population Source*: California State Department of Finance Report E-4*
Projected Population Source*: Southern California Association of Government Regional Transportation Plan - 2004*

1.2.3.2 Climate and Rainfall

Orange County has a semi-arid climate with an average of 14 inches of rain a year. Figure 1-2-3-2-A shows the record of rainfall in the area from 1973 to 2004. The driest year recorded during that period was 2002 with less than four inches of rain. Conversely, the winter of 1998 was one of the wettest during the same period with nearly 31 inches of rain.

Table 1-2-3-2-A presents the average monthly climate characteristics: evapotransportation rate; rainfall; and temperature in the MWDOC service area.

Figure 1-2-3-2-A: Annual Rainfall Record in Orange County

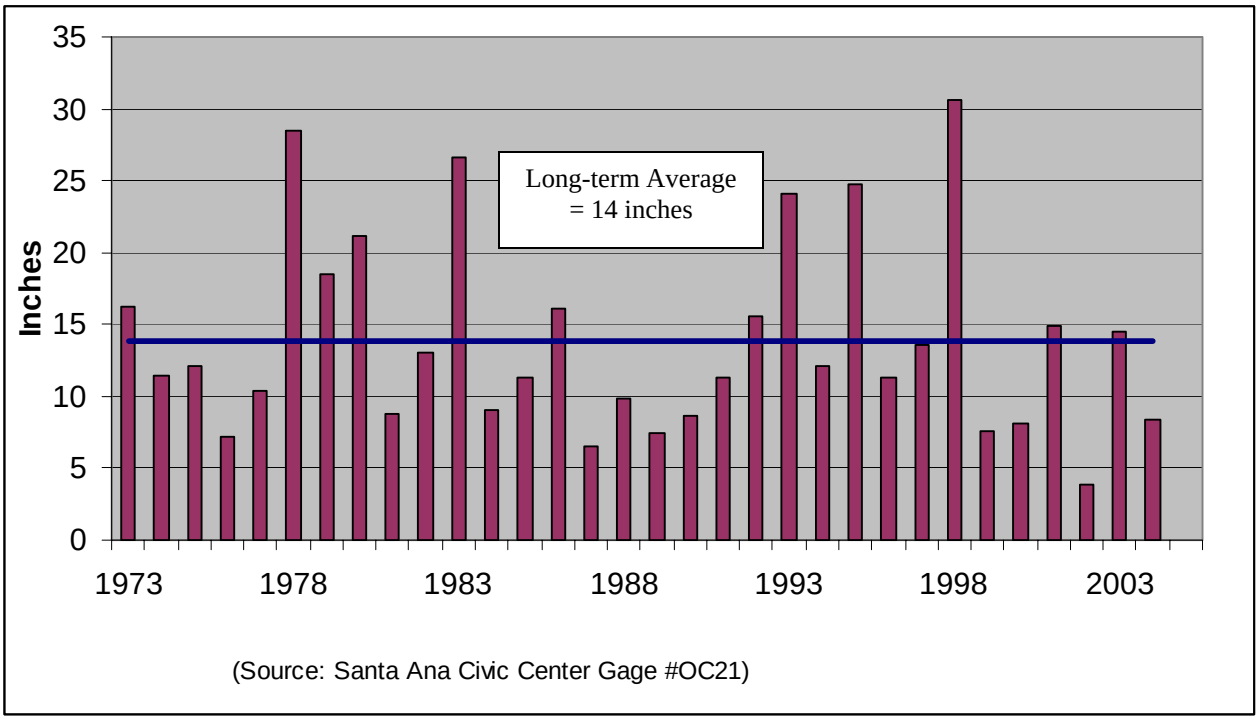


Table 1-2-3-2-A: Climate Characteristics in MWDOC's Service Area

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Standard Average ETo	2.18	2.49	3.67	4.71	5.18	5.87	6.29	6.17	4.57	3.66	2.59	2.25
Average Rainfall	2.53	2.73	2.21	1.01	0.26	0.07	0.01	0.08	0.27	0.36	1.32	1.99
Average Temperature	53.75	55.25	56.85	60.3	63.8	67.4	71.6	72.5	70.85	65.8	59.15	54.45

Sources:
1) Eto (Evapotransportation) is based on California Irrigation Management Information System Station of Irvine South Coast Valleys
2) Rainfall and temperature information are based on station of Tustin Irvine Ranch
3) Average information are based on record from period of 12/1/1927 to 6/30/2003

1.2.3.3 Other Demographic Factors

Orange County is now home to more than 3 million people living in a 798-square-mile area. Comprised of 34 cities, from Brea in the north to San Clemente in the south, Orange County is recognized worldwide for its beaches, recreational facilities, and enviable quality of life.

Of particular note is Orange County's housing market where the median price of an existing resale single-family home is $704,150. The average price of a new home is $543,000. The average price of all homes sold in Orange County is nearing $542,000. It should be noted that a relatively new phenomenon is occurring in the MWDOC service area – the emergence of high-rise condominiums. This type of housing is being marketed to homeowners tired of maintenance responsibilities.

It is estimated that of Orange County's labor force of over 1.6 million, nearly 1.55 million residents are currently

employed, making the unemployment rate a low 3.3%. The median family income is $78,600; the per capita income is just over $42,000 annually.

Major business sectors include:
Manufacturing;
Business and Professional;
Leisure and Hospitality;
Retail;
Government;
Education and Health;
Management; and
Information Services.

The area's gross county product is $160.7 billion, with total taxable sales reaching $12.7 million for the current year. Total assessed valuation for the county is just under $312 billion.

1.2.4 Member Agencies

MWDOC serves 30 member agencies, including:

- City of Brea
- City of Buena Park
- City of Fountain Valley
- City of Garden Grove
- City of Huntington Beach
- City of La Habra
- City of La Palma
- City of Newport Beach
- City of Orange
- City of San Clemente
- City of San Juan Capistrano
- City of Seal Beach
- City of Tustin
- City of Westminster
- East Orange County Water District
- El Toro Water District
- Emerald Bay Services District
- Irvine Ranch Water District
- Laguna Beach County Water District
- Mesa Consolidated Water District
- Moulton Niguel Water District
- Orange County Water District
- Orange Park Acres Mutual Water Co.
- Santa Margarita Water District
- Santiago County Water District
- Serrano Water District

- South Coast Water District
- Golden State Water Company
- Trabuco Canyon Water District
- Yorba Linda Water District

1.2.5 Water Service Organization in MWDOC Service Area

Orange County relies on numerous sources of water and water purveyors to meet the needs of its growing population.

Imported water from Northern California and the Colorado River meet approximately half of the County's water needs. The water is provided by Metropolitan, which serves the needs of six counties – Ventura, Los Angeles, San Bernardino, Riverside, Orange, and San Diego.

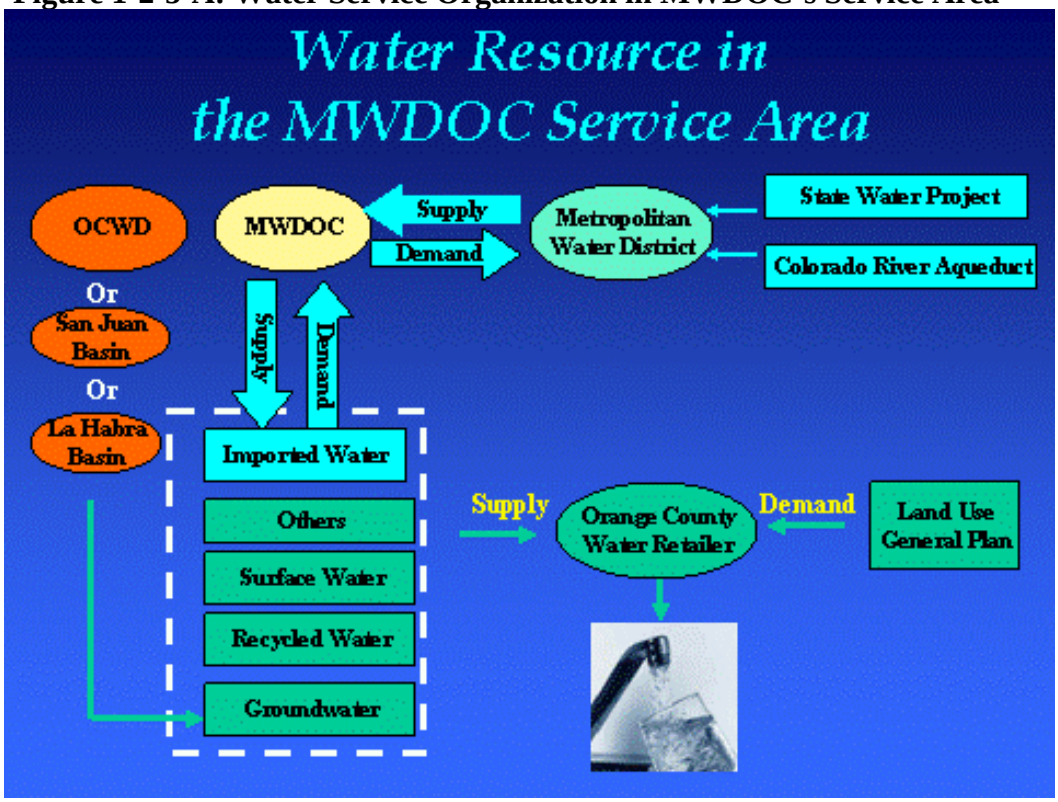
The MWDOC represents the interests of nearly all of Orange County and is Metropolitan's third largest member agency. The cities of Anaheim, Fullerton, and Santa Ana are Metropolitan member agencies and are not represented by MWDOC.

MWDOC is Orange County's imported water wholesaler, supplying 30 water retailers. These entities, comprised of cities and water districts, are referred to as MWDOC member agencies and provide water to approximately 2.3 million customers. South Orange County relies on imported water to meet approximately 95 percent of its water demand. The remaining five percent is provided by surface water, limited groundwater, and some water recycling.

The OCWD manages the Orange County groundwater basin. The groundwater basin, which underlies north and central Orange County, provides approximately 66 percent of the water needed in that area; imported water meets the balance of the water demand. Groundwater is pumped by producers before being delivered to customers.

Figure 1-2-5-A shows a diagram of the water service organization in the MWDOC service area.

Figure 1-2-5-A: Water Service Organization in MWDOC's Service Area



1.2.6 Board of Directors

MWDOC is governed by an elected seven-member Board of Directors, each board member representing a specific area of the County. Each director is elected to a four-year term by voters who reside within one of the seven divisions within the MWDOC service area.

Each director is a member of at least one of the following three working committees: Planning and Operations; Finance and Administration; and Public Affairs/MET Oversight. Each committee meets monthly. The full board convenes for its regular monthly meeting on the third Wednesday of the month.

The president of the board, vice president, and immediate past president also comprise the Executive Committee, which meets monthly with the general manager, assistant general manager, and board secretary.

References:

California State Department of Water Resources. *Guidebook to Assist Water Suppliers in the Preparation of a 2005 Urban Water Management Plan*. January 2005.

Center for Demographic Research, California State University, Fullerton. *www.fullterton.edu/cdr/*.

2.0 WATER SERVICE

One of the primary purposes of an Urban Water Management Plan (UWMP) is to provide a step-by-step guide for water utilities in assessing their water resource needs and reliability. In this section, discussions are dedicated to reviewing the water demands and water supplies in the MWDOC service area. The section concludes with an evaluation of the reliability of providing water service within the MWDOC service area by comparing its planned supplies to its forecast demands.

Information presented in this section is collected based on the best available information from each of MWDOC's 30 member agencies at the time of drafting. The information is presented to provide a regional summary within the MWDOC service area. MWDOC has made every effort to coordinate information during the preparation of this section in a manner that is consistent with local agencies' UWMPs. In the event of a discrepancy, the local retail agency UWMP should be consulted.

2.1 Water Demand

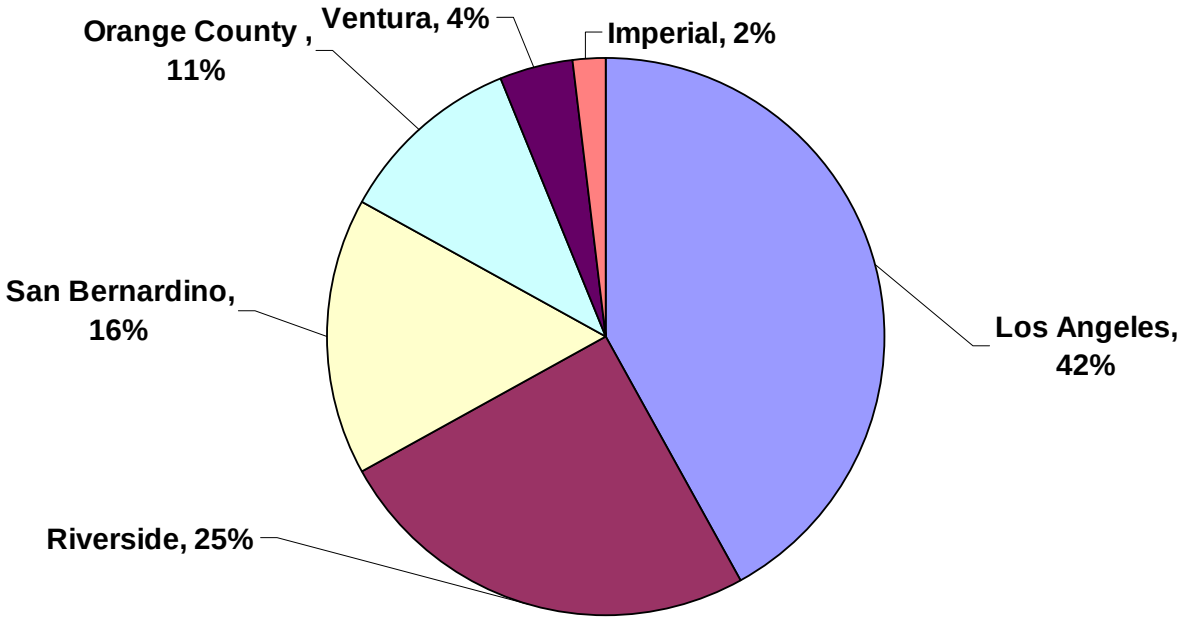
2.1.1 Overview – Orange County Level

There are approximately 3 million people currently residing in Orange County. According to the Southern California Association of Governments (SCAG) *Growth Forecast Report*, Orange County is projected to grow by more than 500,000 people by 2030, bringing the total population in the County to 3.5 million, a 15% increase. The same report also projects the overall SCAG region to increase from 16.26 million to approximately 22.89 million by 2030. Although the majority of this population increase in the SCAG region is due primarily to growth occurring in Los Angeles, Riverside and San Bernardino counties, Orange County is the second largest county in terms of population in the region, and comprises approximately 11% of this population increase (Figure 2-1-1-A). SCAG attributes population growth in the Inland Empire to the migration of people from Los Angeles and Orange County seeking lower-priced housing.

Overall, Orange County will continue to grow during the next 25-year period. As a result, it will be necessary to continue to develop new sources of water and determine the reliability of current water sources, as well as maintaining reasonable water rates. Development of new sources includes water use efficiency, increased capture of surface water, as well as water recycling and seawater desalination.

**Note: The MWDOC service area does not include the cities of Anaheim, Fullerto, and Santa Ana.*

Figure 2-1-1-A: Percent of Population Growth in the Southern California Association of Government Region, by County



Source: Southern California Association of Government, *Growth Forecast Report 2004*

2.1.2 Demographic Trends in the MWDOC Service Area – Past, Present, and Future

2.1.2.1 Population

Population is a key indicator of regional growth. According to the California State Department of Finance, the MWDOC service area had a population of 1.01 million in 1970 and 2.24 million by 2005. This represents an average growth of approximately 2.3% per year. During the 1970s, the population growth averaged 3.3% per year; while during the 1990s growth averaged 1.7% per year. According to the *SCAG Regional Transportation Plan 2004*, the population within the MWDOC service area is expected to increase to about 2.64 million by 2030, representing an average growth of 0.66% annually. This slower rate of growth is attributed to the build-out of the MWDOC service area. Table 2-1-2-1-A and Figure 2-1-2-1-A show historical and projected population for the MWDOC service area.

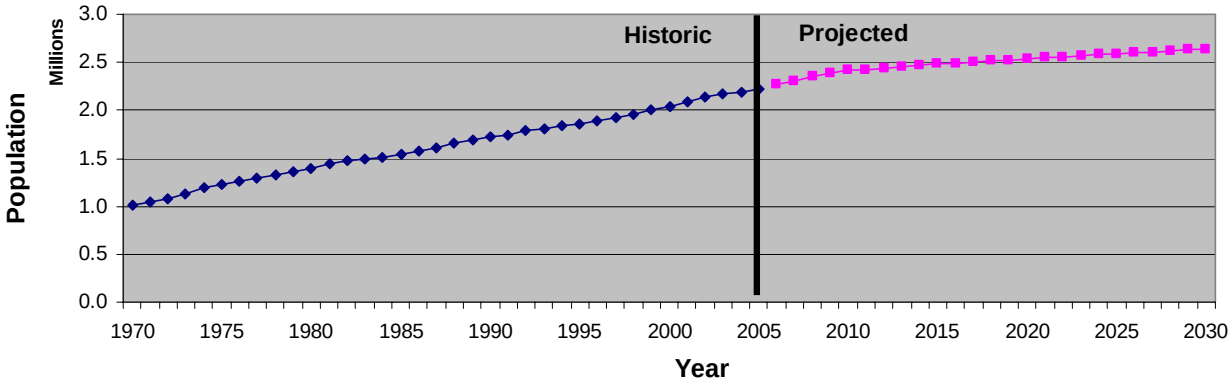
Table 2-1-2-1-A: Historic and Projected Population in MWDOC's Service Area

	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	2020	2025	2030
Population in MWDOC Service Area (in Millions)	1.01	1.23	1.40	1.54	1.73	1.86	2.04	2.24	2.41	2.48	2.54	2.59	2.64

[1] Historical source: California State Department of Finance, *Report E-4*

[2] Projected source: Southern California Assocation of Government, *Regional Transportation Plan-2004*

Figure 2-1-2-1-A: Historical and Projected Population in MWDOC's Service Area



Historical source: California State Department of Finance, *Report E-4*
Projected Source: Southern California Association of Grovernment, *Regional Tranportation Plan - 2004*

2.1.2.2 Employment

Economic trends are also important drivers of water demand in MWDOC's service area.

The recession of the early 1990s cost Southern California 40,000 jobs and caused a major shift in the region's industry base. Almost 300,000 manufacturing jobs were lost by 1995, many of them in the aerospace and defense industries. Los Angeles and Orange counties were especially hard hit by this trend. While manufacturing and other sectors of the economy suffered, service employment held steady and experienced modest growth in Riverside and San Bernardino counties.

The economic recovery of the late 1990s included growth in high-tech and computer-related industries and rapid expansion of the service-related economy. Since 2000, job growth in the region has slowed as a result of the recent mild economic downturn.

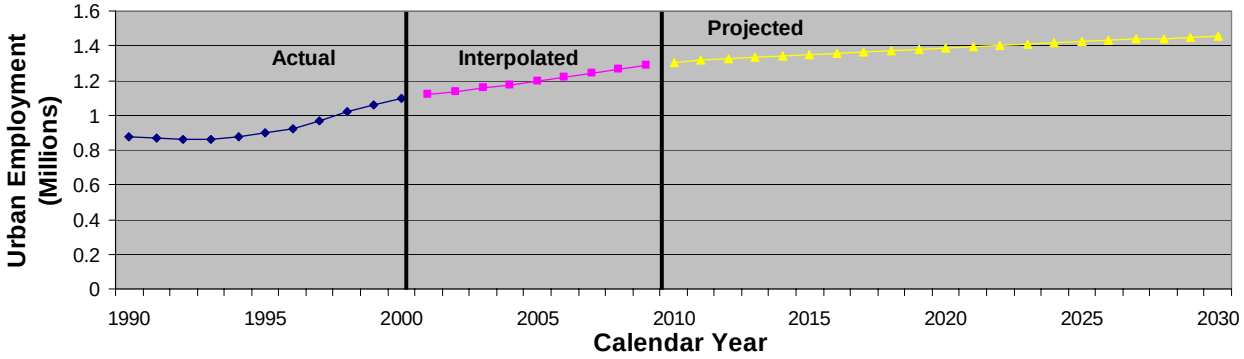
Table 2-1-2-2-A and Figure 2-1-2-2-A summarize the historical and projected employment in MWDOC's service area. The number of people employed in commerce and industry is expected to increase from 1.10 million in 2000 to about 1.46 million in 2030, a 33% increase.

Table 2-1-2-2-A: Historical and Projected Employment in MWDOC's Service Area

(Calendar Year)									
	Actual		Interpolated	Projected					Percent Change
1990	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2000-2030**
876,103	895,512	1,097,428	1,198,707	1,306,183	1,349,422	1,389,566	1,424,369	1,455,281	33%

Source: Metropolitan Water District of Southern California, *Draft 2005 Regional Urban Water Management Plan (September 2005)*

Figure 2-1-2-2-A: Historical and Projected Employment in MWDOC's Service Area



Source: Metropolitan Water District of Southern California, *Draft 2005 Regional Urban Water Management Plan (September, 2005)*

2.1.2.3 Residential Consumers

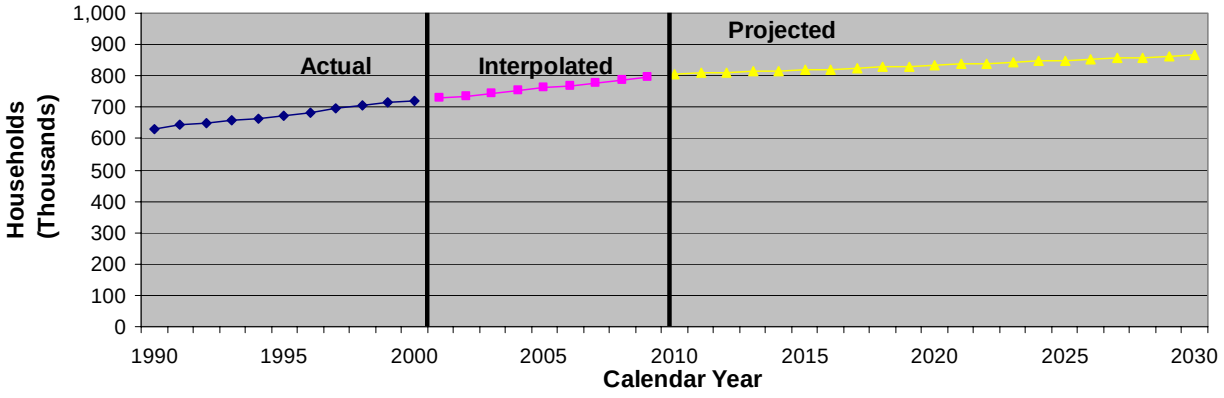
According to the California State Department of Finance, the total occupied housing stock in the MWDOC service area has grown at a steady pace, even during the recession period of the early 1990s. MWDOC had 630,900 occupied households in 1990 and 760,700 in 2005, representing an average growth of 1.3% annually. Regional planning agencies – SCAG – have forecasted growth in residential housing in the MWDOC service area. The total of occupied households is expected to increase to 865,700 in 2030, a 20% increase from 2000. Table 2-1-2-3-A and Figure 2-1-2-3-A show the historical and projected number of residential units in the MWDOC service area. Within the service territory, the household occupancy size (household population divided by total occupied dwelling units) is forecasted to remain at around 3 persons per household.

Table 2-1-2-3-A: Historical and Projected Occupied Households in MWDOC's Service Area

(Calendar Year)									
Actual			Interpolate	Projected					Percent Change
1990	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2000-2030**
630,855	674,238	719,530	760,671	803,971	818,850	834,402	850,135	865,661	20%

Source: Metropolitan Water District of Southern California, *Draft 2005 Regional Urban Water Management Plan (September, 2005)*

Figure 2-1-2-3-A: Historical and Projected Occupied House in MWDOC's Service Area



Source: Metropolitan Water District of Southern California, *Draft 2005 Regional Urban Water Management Plan (September, 2005)*

2.1.3 Water Demand Trends in the MWDOC Service Area– Past, Present, and Future

2.1.3.1 Direct Use and Indirect Use of Water Demand

There are two types of water use in Orange County. "Direct use" is that water directly piped from treatment facilities or wells to homes and commercial and institutional buildings. "Indirect use" is that water needed to replenish groundwater storage and to serve as a barrier against saltwater intrusion. Water used to fill the groundwater basins or act as a saltwater barrier will eventually become a source of supply for Orange County residents. However, due to the nature of its usage, this water is often referred to as "indirect use." This Plan discusses both types of water use.

Integrating the two usages of water in the planning process can be confusing and misleading and does not truly reflect water demand in the region. In practice, the two types of water usage are often shown separately. The following subsections will discuss these two types of uses separately. However, the guidebook provided by the Department of Water Resources specifically instructs suppliers to present total water uses by summing both "direct use" and "indirect use." To comply with the requirement, this Plan also provides a

table summing direct use and indirect use of water demand. However, a footnote is provided to caution the reader not to view the sum as the total water demand in the region for any given point of time.

2.1.3.2 Historical Demand

Direct Use

Historical water demand in the MWDOC service area increased from 285,200 acre-feet per year in 1970 to 467,900 acre-feet per year in 1990. Demand began to decline in 1990, and by 1992 demand was 406,500 acre-feet per year. From that point on, demand began to increase again. By 2000 demand in the MWDOC service area was 524,000 acre-feet per year.

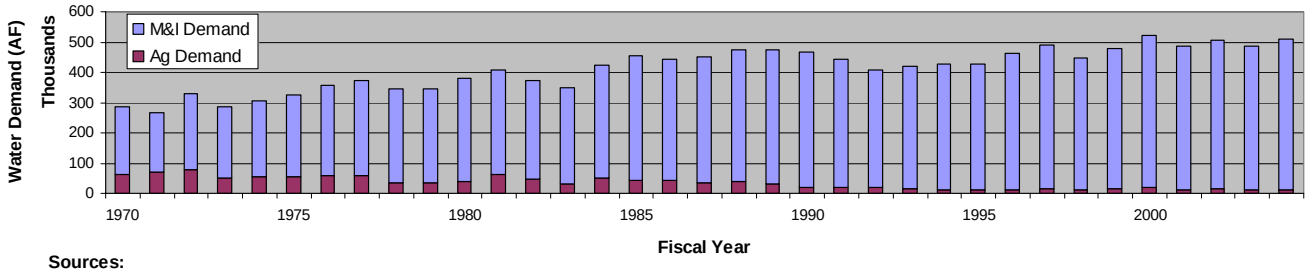
Agriculture-related water demands in the MWDOC service area have steadily decreased since 1971 as agricultural acreage was converted to urban land use. In 1970, agricultural water demands were 64,700 acre-feet and represented approximately 23% of the total demand in the MWDOC service area. By 2004, agricultural water demands were 13,000 acre-feet and represented approximately 3% of total demands. Table 2-1-3-2-A and Figure 2-1-3-2-A show historical water demands for the MWDOC service area.

Table 2-1-3-2-A: Historical Water Demands for Direct Consumption in MWDOC's Service Area

	(Fiscal Year In acre-feet)							
	1970	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2004**
Municipal & Industrial	220,500	272,800	341,100	413,600	447,100	417,700	500,800	498,900
Ag	64,700	53,700	40,800	41,900	20,800	10,700	20,600	12,800
Total Water Demands	285,200	326,500	381,900	455,500	467,900	428,400	521,400	511,700

Sources:
[1] Metropolitan Water District of Southern California, *Annual Report*
[2] Orange County Water District, *Annual Engineer's Report*

Figure 2-1-3-2-A: Historical Water Demands for Direct Consumption in MWDOC's Service Area



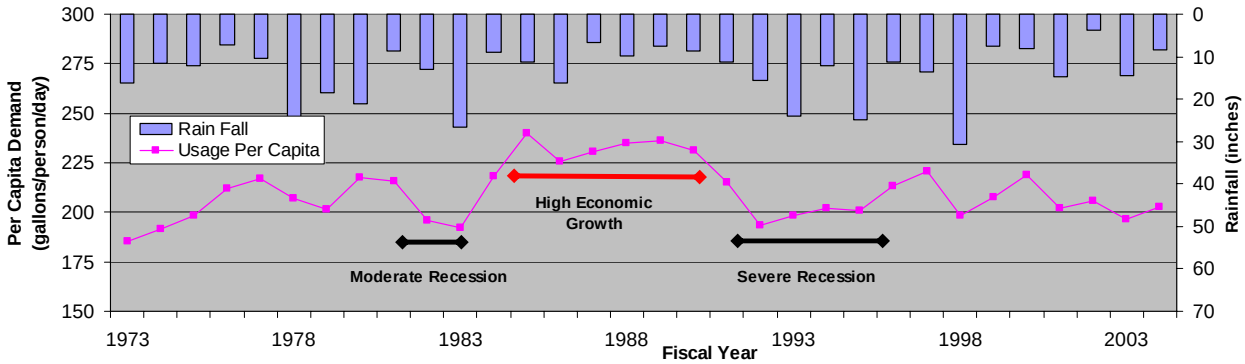
Sources:
1. Metropolitan Water District of Southern California, *Annual Report*
2. Orange County Water District, Annual Engineer's Report

Water demand in the MWDOC service area is influenced by a number of factors, including:

1. population growth;
2. conversion of agricultural areas to urban;
3. health of the economy;
4. weather; and
5. water use efficiency.

To illustrate some of these factors, it is useful to plot municipal and industrial per capita water use (in gallons per person per day). This normalizes for population growth. Any fluctuation in per capita use is, therefore, attributed to weather, the economy, and conservation. Figure 2-1-3-2-B shows the municipal and industrial per capita water use as well as rainfall, a leading indicator for weather, in the MWDOC service area. The same figure also shows periods of economic recession.

Figure 2-1-3-2-B: Historical Per Capita Water Use in MWDOC's Service Area



Source: Orange County Public Facilities and Resources Department, Rainfall Record at Santa Ana Civic Center

Per capita water use increased significantly from 1973 to 1977, with 186 gallons per person per day (gpcd) to 217 gpcd. This increase in per capita water use was most likely a result of urbanization and development trends in which residential homes were becoming more water-use intensive and industry was moving into the area. This was a time in which defense-related and aerospace industries were booming. Rainfall during this period was generally normal. An El Nino event in 1978 reduced per capita use by about 6%. As rainfall normalized, per capita use rose quickly to just above 215 gpcd. A moderate economic recession followed by an El Nino in 1983 reduced per capita use to about 190 gpcd, a decrease of 11%.

A period of high economic growth and lower-than-average rainfall from 1984 to 1990 resulted in per capita water use rising to an average of 230 gpcd. A severe economic recession (from 1991 to 1995) and several years of greater-than-average rainfall resulted in the sharpest reduction in per capita use. This was also a time in which many defense-related and aerospace industries left the MWDOC service area (and the Southern California region). Furthermore, in 1991 the region saw significant water conservation savings as a result of a massive public education/information campaign on the impact of the drought. During this period per capita use averaged about 200 gpcd.

Normalizing for weather, per capita use at present time is averaging around 207 gpcd (the dip in per capita use in 1998 was due to another El Nino rain event). The implementation of long-term water use efficiency measures is credited with reducing per capita use from an average of 230 gpcd in the late 1980s to its current average of 207 gpcd. Please see Section 5 of this Plan for details of conservation programs implemented in MWDOC's service area.

Indirect Use

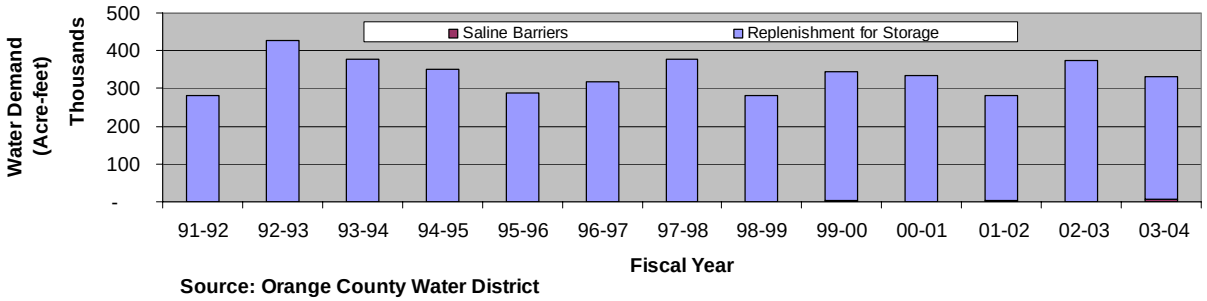
Demands in the past 13 years for replenishing the Orange County groundwater basin are shown in Table 2-1-3-2-B and Figure 2-1-3-2-C. Demands for groundwater storage replenishment in the past were driven by availability of natural supply from the Santa Ana River, incidental recharge, and surplus supply from Metropolitan.

Table 2-1-3-2-B: Historical Water Demands for Indirect Consumption in MWDOC's Service Area

	(Fiscal Year In acre-feet)												
	91-92	**92-93**	**93-94**	**94-95**	**95-96**	**96-97**	**97-98**	**98-99**	**99-00**	**00-01**	**01-02**	**02-03**	**03-04**
Replenishment for Storage	280,924	426,125	376,220	351,336	287,894	318,884	376,538	280,961	343,873	331,947	279,566	371,237	325,373
Saline Barriers	-	-	-	-	-	-	-	-	2,000	942	2,673	1,463	5,087

Source: Orange County Water District

Figure 2-1-3-2-C: Historical Water Demand for Indirect Consumption



Source: Orange County Water District

2.1.3.3 Future Demand

2.1.3.3.1 Municipal and Industrial Demand Forecast

Directly consumed Municipal and Industrial (M&I) demands represent the full spectrum of water use within a region, including residential, commercial, industrial, institutional, and un-metered uses. Within the water industry, there are numerous approaches for projecting future retail M&I water demands. These approaches include per capita projections, trend extrapolation, land use build-out estimates, and econometric models.

During the process of developing this Plan, MWDOC considered two alternatives of forecasting M&I demands. They are described below:

Forecast by MWD-MAIN

MWD-MAIN is an econometric-based model developed by Metropolitan. MWD-MAIN combines statistical and end-use methods that have been adapted to conditions in Southern California. The statistical portion of the model incorporates projections of demographic and economic variables from regional planning agencies – the Southern California Association of Governments (SCAG) and the San Diego Association of Governments (SANDAG) – into statistically estimated water demand models to produce forecasts of water demand. The end-use portion of the model derives estimates of conservation by adding additional information on how that water is used – the end uses.

The MWD-MAIN system features a separate unique model for each sector. Table 2-1-3-3-1-A depicts these key relationships in the MWD-MAIN model. In the residential sector, the forecasts of water demand per dwelling unit are ultimately combined with the forecasts of dwelling units from the regional planning agencies to yield an estimate of total sector water demand. Similarly, in the nonresidential sector, water use per employee is combined with forecasts of employment to yield an estimate of total nonresidential water demand. Table 2-1-3-3-1-B Part A shows the projected demographic and economic variables for the MWDOC service area for the next 25 years. Immediately following it, Table 2-1-3-3-1-B Part B shows the projected water use by sector for the MWDOC service area in the same period of time.

Table 2-1-3-3-1-A: MWD-MAIN Relationships by Demand Sector

Demand Sector	Dependent Variable	Explanatory Vairables
Single Family Residential	Demand per household	Service area location Household size Weather conditions Household income Price and conservation
Multifamily Residential	Demand per household	Service area location Household size Weather conditions Household income Price and conservation
Industrial, Commercial, and Institutional	Demand per employee	Employment by S.I.C grouping Price and conservation Service area location
System Losses/Other	Demand per population	Percentage of total use

Source: Metropolitan Water District of Southern California, *Draft 2005 Regional Urban Water Management Plan, September Draft*

In addition to accounting for future demographic trends, this forecast system also incorporates current and future conservation. The forecasting approach embeds a detailed account of water conservation, distinguishing between:

- Passive Conservation – Water saved as a result of changes in water efficiency requirements for plumbing fixtures in plumbing codes. This form of conservation would occur without any water agency action;

- Active Conservation – Water saved directly as a result of conservation programs by water agencies (includes implementation of Best Management Practices – further description will be provided in later paragraphs). However, please note that the model only accounts for savings from active conservation programs implemented through 2003; and

- Price-effect Conservation – Water saved by retail customers attributable to the effect of changes in the inflation-adjusted price of water.

In 1991, MWDOC signed a *Memorandum of Understanding Regarding Urban Water Conservation in California*. The MOU commits MWDOC to implement a number of long-term water conservation measures referred to as Best Management Practices (BMPs). A more detailed discussion of MWDOC's effort at implementing BMPs is presented in

Section 5 of this Plan. Because MWDOC is fully committed to the implementation of the BMPs, the demand projections account for the effects of conservation resulting from the implementation of BMPs to date. The forecast embeds expected BMP participation, recognizing that some of MWDOC's member agencies are not signatories and that some BMPs are not cost effective in the MWDOC service area. The projected savings by conservation sources as described above are provided in Table 2-1-3-3-1-B Part C. By 2030, it is projected that passive and active water use efficiency will result in conservation savings of about 77,900 acre-feet per year. The conservation savings in each sector is shown in Table 2-1-3-3-1-B Part D.

Outputs of the model include "Base Demand' and "With Conservation" forecasts. "Base Use" forecasts show water demand without any conservation. Table 2-1-3-3-1-B Part E presents the calculated Base Demand by multiplying demographic and economic information in part A to the water use by sector in part B of this table. Finally, on Table 2-1-3-3-1-B Part F, the water demands forecasted with conservation as shown by sectors are calculated by subtracting water demand in part E from the conservation value in part D. The model projects, under normal weather and economy, the total water demand for MWDOC to increase from approximately 502,000 acre-feet in 2005 to approximately 584,000 acre-feet in 2030, a 16.3 % increase. Among the sectors, single family is expected to increase by 12%, multi-family by 18.5%, non-residential by 23%, and system loss by 15.2%.

Table 2-1-3-3-1-B: MWD-MAIN Forecast of Municipal and Industrial (M&I) Water Demands in MWDOC's Service Area

	2005	2010	2015	2020	2025	2030
PART A - Projected Demographic and Economic Details						
Single Family	502,850	526,231	531,990	542,161	552,623	562,725
Multi-Family	257,821	277,740	286,860	292,240	297,512	302,936
Employment	1,198,707	1,306,183	1,349,422	1,389,566	1,424,369	1,455,281
Population	2,241,744	2,414,620	2,480,012	2,535,523	2,588,802	2,640,319
PART B - Projected Water Use by Sector						
Single Family	484	486	497	505	508	511
Multi-Family	269	273	280	284	287	289
Non-Residential	114	118	117	118	118	118
System Loss / Other	16	16	16	16	16	17
PART C - Projected Water Savings by Conservation Sources						
Active	8,858	8,281	7,579	2,904	22	1
Passive	30,707	41,091	48,440	59,163	67,164	71,777
System Losses/Other	3,347	4,177	4,739	5,251	5,684	6,072
Total Active & Passive	42,912	53,549	60,758	67,318	72,871	77,851
PART D - Projected Water Savings by Sector						
Single Family	23,155	28,740	33,040	36,718	39,822	42,600
Multi-Family	10,189	13,003	14,239	15,645	16,861	17,960
Non-Residential	6,221	7,629	8,740	9,705	10,503	11,218
System Losses	3,347	4,177	4,739	5,251	5,684	6,072
PART E - Projected Base Demand (Water Use without Conservation)						
Single Family	272,831	286,548	296,083	306,742	314,683	322,252
Multi-Family	77,663	85,058	89,900	93,100	95,504	97,939
Non-Residential	153,668	172,681	177,482	184,111	188,607	192,531
System Losses	40,529	43,518	45,033	46,640	47,802	48,899
PART F - Projected Demand With Conservation						
Single Family	249,676	257,808	263,043	270,024	274,860	279,652
Multi-Family	67,474	72,055	75,661	77,455	78,643	79,979
Non-Residential	147,447	165,052	168,742	174,406	178,103	181,313
System Losses	37,182	39,341	40,294	41,389	42,118	42,827
Total ProjectedM&I Demand	**501,780**	**534,257**	**547,739**	**563,274**	**573,724**	**583,771**

Source: Metropolitan Water District of Southern California, Output of MWD-MAIN Model

Forecast by MWDOC Member Agencies

In meeting the required information exchange between wholesale and retail water agencies (California Water Code Section 10631(k)), MWDOC requested 25-year retail demand projections from its 30 member agencies. Methodologies and assumptions underlying these projections vary from agency to agency, but all projections reflect an in-depth knowledge of the agencies' service areas. In most cases, the projections are closely correlated to the general plans prepared by the County of Orange or cities within MWDOC's service area. Table 2-1-3-3-1-B shows the M&I demands as projected by each member agency. The sum of agencies' projections shows that the M&I demand is expected to increase from approximately 504,000 acre-feet in 2005 to approximately 614,000 acre-feet in 2030, an increase of 21.9%.

Table 2-1-3-3-1-C: MWDOC Member Agencies Forecast of Municipal and Industrial (M&I) Water Demands

	2005	2010	2015	2020	2025	2030
Brea, City of	11,796	12,345	12,845	13,328	13,640	13,640
Buena Park, City of	18,153	18,904	20,334	23,659	23,659	23,659
East Orange CWD	16,143	16,622	16,627	16,647	16,647	16,647
El Toro Water District	11,536	11,559	11,728	11,898	12,068	12,220
Fountain Valley, City of	12,519	12,745	12,851	12,985	12,985	12,985
Garden Grove, City of	29,671	30,264	30,869	31,486	32,116	32,687
Huntington Beach, City of	33,941	34,714	35,060	35,411	35,765	36,085
Irvine Ranch Water District	87,468	101,589	114,599	123,675	130,450	134,150
La Habra, City of	11,272	11,825	12,077	12,213	12,284	12,299
La Palma, City of	2,617	2,623	2,653	2,706	2,729	2,741
Laguna Beach CWD	4,768	4,853	4,903	4,953	4,998	4,998
Mesa Consolidated Water District	21,849	21,982	22,083	22,193	22,303	22,401
Moulton Niguel Water District	42,752	44,914	45,235	45,735	46,235	46,681
Newport Beach, City of	18,648	19,791	21,555	21,640	21,716	21,716
Orange, City of	35,081	36,588	37,244	37,244	37,244	37,244
San Clemente, City of	11,458	12,162	12,859	13,394	13,394	13,394
San Juan Capistrano, City of	10,950	12,691	13,253	13,776	14,130	14,175
Santa Margarita Water District	34,480	39,937	43,686	48,340	51,363	51,387
Santiago County Water District	429	2,165	2,304	2,354	2,404	2,449
Seal Beach, City of	4,498	4,620	4,735	4,878	4,878	4,878
Serrano Water District	3,379	3,430	3,651	3,721	3,763	3,796
South Coast Water District	8,298	9,063	9,062	9,196	9,306	9,306
Golden State Water Company	30,214	31,431	32,371	33,367	32,920	33,101
Trabuco Canyon Water District	4,301	5,593	5,914	6,153	6,363	6,495
Westminster, City of	14,190	14,475	14,611	14,911	15,005	14,986
Yorba Linda Water District	24,587	25,995	26,795	27,273	27,494	27,637
Total	**504,997**	**542,881**	**569,905**	**593,137**	**605,858**	**611,757**

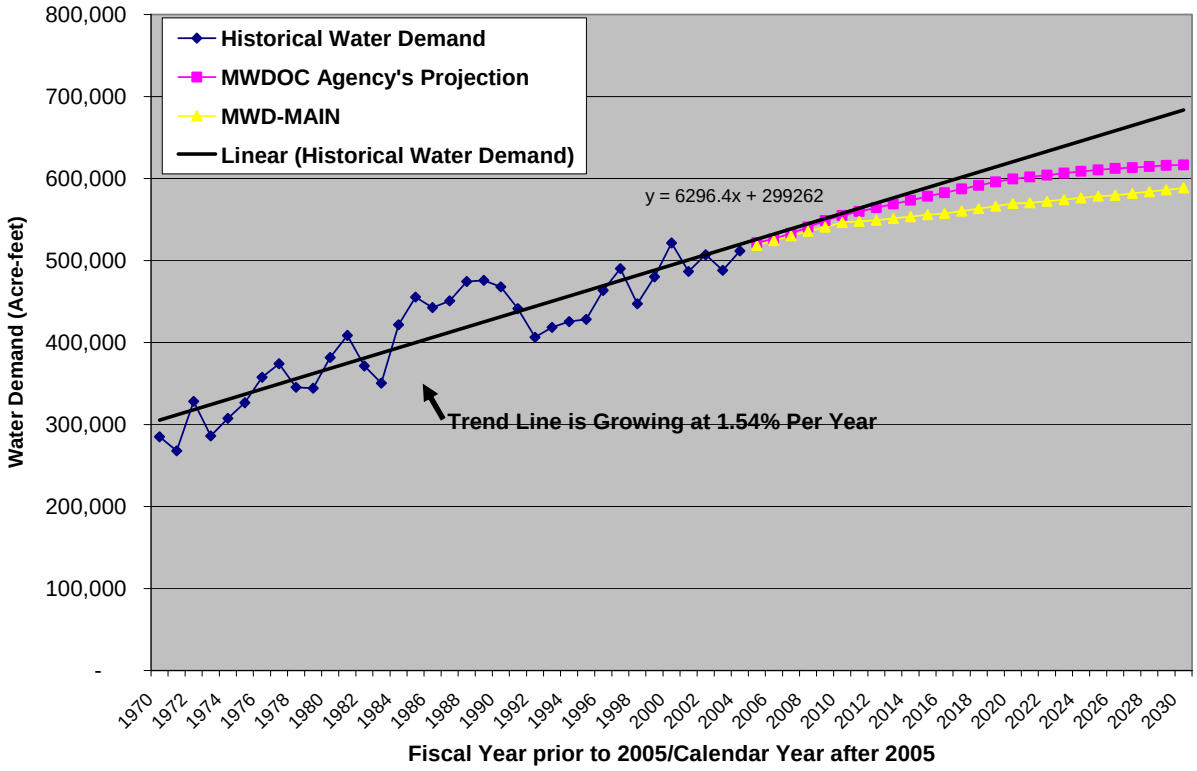
Source: Municipal Water District of Orange County, *Annual 25-Year Survey (Spring 2005)*

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

Describing the future trend and concluding which Analysis Approach will be used for this Plan.

Figure 2-1-3-3-1-A shows the historical water demand and the projected water demand using two aforementioned alternatives. Both alternatives project demand based on normal weather and economy.

Figure 2-1-3-3-1-A: Comparison of Projections for Direct Consumed M&I Demand in MWDOC's Service Area



As discussed in the previous section on historical water demand, MWDOC is expecting a slower rate of growth due to build-out within its service area. Both projection alternatives reflect slower rates of growth, but at different levels. A trend line, plotted through historical demand from 1970 to 2004, indicates an average compounded annual growth rate of 1.54%. The aggregate forecast done by MWDOC member agencies follows a similar growth rate for another five years. The growth in water demand then slowly decreases to less than 1% per year from 2010 to 2020 and to less than 0.5% per year from 2020 to 2030. On the other hand, the demand forecasted by the MWD-MAIN model shows a much more rapid decrease in growth rate. MWD-MAIN projected the growth rate of water demand in the MWDOC service area decreasing to 1% per year over the next five years. The growth rate is then projected to decrease to approximately 0.5% per year from 2010 to 2020 and to less than 0.5% per year from 2020 to 2030.

Although the different methodologies used in the two alternatives lead to different growth rates for the projections,

the results are close. The projected demands from 2015 to 2030 are within approximately 5% of each other.

Since both alternatives generate close results, the member agencies' projections were selected for use in this Plan for the following reasons:

1. They yield to a higher water demand projection and, hence, this is a more conservative approach;

2. California Water Code Section 10631(k) requires that a wholesale agency (such as MWDOC) identifies and quantifies supply available to meet the demands of the retailers (such as MWDOC's member agencies). By using the projection done by its member agencies, MWDOC can address the reliability of its supply to meet the demand of its member agencies as specified by the Code; and

3. To maintain "consistency" in regional planning.

2.1.3.3.2 Agriculture Demand Forecast

As part of its demand survey, MWDOC requested its member agencies provide water demand forecasts for agriculture uses. Table 2-1-3-3-2-A shows agriculture demand projected by each member agency, assuming normal conditions. By 2030, agricultural demands will be approximately 4,800 acre-feet per year, a decrease of 71% from year 2005. It is projected that agricultural demands will make up less than 0.8% of the total demand by 2030.

Table 2-1-3-3-2-A: MWDOC Member Agencies Forecasts of Agricultural Water Demands in MWDOC's Service Area

	2005	2010	2015	2020	2025	2030
Brea, City of	265	152	147	101	101	101
Buena Park, City of	-	-	-	-	-	-
East Orange CWD	-	-	-	-	-	-
El Toro Water District	-	-	-	-	-	-
Fountain Valley, City of	-	-	-	-	-	-
Garden Grove, City of	-	-	-	-	-	-
Huntington Beach, City of	-	-	-	-	-	-
Irvine Ranch Water District	16,064	11,572	7,757	5,779	4,391	4,352
La Habra, City of	-	-	-	-	-	-
La Palma, City of	-	-	-	-	-	-
Laguna Beach CWD	-	-	-	-	-	-
Mesa Consolidated Water District	-	-	-	-	-	-
Moulton Niguel Water District	-	-	-	-	-	-
Newport Beach, City of	-	-	-	-	-	-
Orange, City of	61	61	61	61	61	61
San Clemente, City of	-	-	-	-	-	-
San Juan Capistrano, City of	127	124	101	101	101	101
Santa Margarita Water District	-	-	-	-	-	-
Santiago County Water District	-	-	-	-	-	-
Seal Beach, City of	-	-	-	-	-	-
Serrano Water District	-	-	-	-	-	-
South Coast Water District	-	-	-	-	-	-
Southern Calif. Water Company	-	-	-	-	-	-
Trabuco Canyon Water District	221	142	142	142	142	142
Westminster, City of	-	-	-	-	-	-
Yorba Linda Water District	44	44	44	44	44	44
Total	**16,781**	**12,094**	**8,252**	**6,229**	**4,840**	**4,801**

Source: Municipal Water District of Orange County, *Annual 25-Year Survey (Spring 2005)*

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

2.1.3.3.3 Demand Forecast for Replenishment for Storage and Saline Barriers

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

- Santa Ana River Flows;
- Incidental Recharge;

- Replenishment (surplus) supplies from Metropolitan; and

- Recycled Supplies for replenishment use.

Table 2-1-3-3-3-A shows the projected demand for replenishment for storage and saline barriers.

Table 2-1-3-3-3-A: Projected Demand for Indirect Use in MWDOC's Service Area – Replenishment for Storage and Saline Barriers

	(Demand in Acre-feet per Calendar Year)					
	2005	**2010**	**2015**	**2020**	**2025**	**2030**
Saline Barriers	14,000	40,000	36,000	36,000	36,000	36,000
Replenishment for Groundwater Basin	311,080	348,934	349,993	356,169	365,223	372,479

Source: Municipal Water District of Orange County, output of "Water Balance" Model

2.1.3.4 Conclusion

Overall, MWDOC's water demands will continue to increase, although not as rapidly as in the past. Future demand growth will average just under 0.5% per year, as compared to historical demand growth of about 1.54% per year. This is due to more limitations in new land development (e.g., cost and environmental restrictions) and the continued commitment to water conservation in the region.

M&I demands will continue to grow, while agricultural demands will continue to decline through 2030. By 2030, agricultural demands will represent less than 0.8% of the total direct use demand.

Long-term conservation measures are expected to continue, but current demand projections do not include water savings from active conservation programs planned after 2003. M&I per capita use is projected to remain at approximately 210 gpcd.

Table 2-1-3-4-A summarizes the historical and projected water demand in the MWDOC service area by usage.

Table 2-1-3-4-A: Summary Table of Water Demand in MWDOC's Service Area – Past, Present, Future

	Historic Fiscal Year					Present Calendar Year	Future Calendar Year				
	1980	1985	1990	1995	2000	2005	2010	2015	2020	2025	2030
I. Direct Use (AFY)											
Municipal & Industrial	341,100	413,600	447,100	417,700	500,800	504,997	542,881	569,905	593,137	605,858	611,757
Agricultural	40,800	41,900	20,800	10,700	20,600	16,781	12,094	8,252	6,229	4,840	4,801
Total Direct Use	381,900	455,500	467,900	428,400	521,400	521,778	554,975	578,157	599,366	610,698	616,558
II. Indirect Use (AFY)											
Sea Barriers	NA	NA	NA	-	2,000	14,000	40,000	36,000	36,000	36,000	36,000
Replenishment for Groundwater E	NA	NA	NA	351,336	343,873	311,080	348,934	349,993	356,169	365,223	372,479
Total Indirect Use	NA	NA	NA	351,336	345,873	325,080	388,934	385,993	392,169	401,223	408,479
III. Total Water Use (*see Note)											
	NA	NA	NA	779,736	867,273	846,858	943,909	964,150	991,535	1,011,922	1,025,037

Note: Direct use and indirect use are sum as shown for complying with DWR guideline requirement. But the two uses are typically not summed.

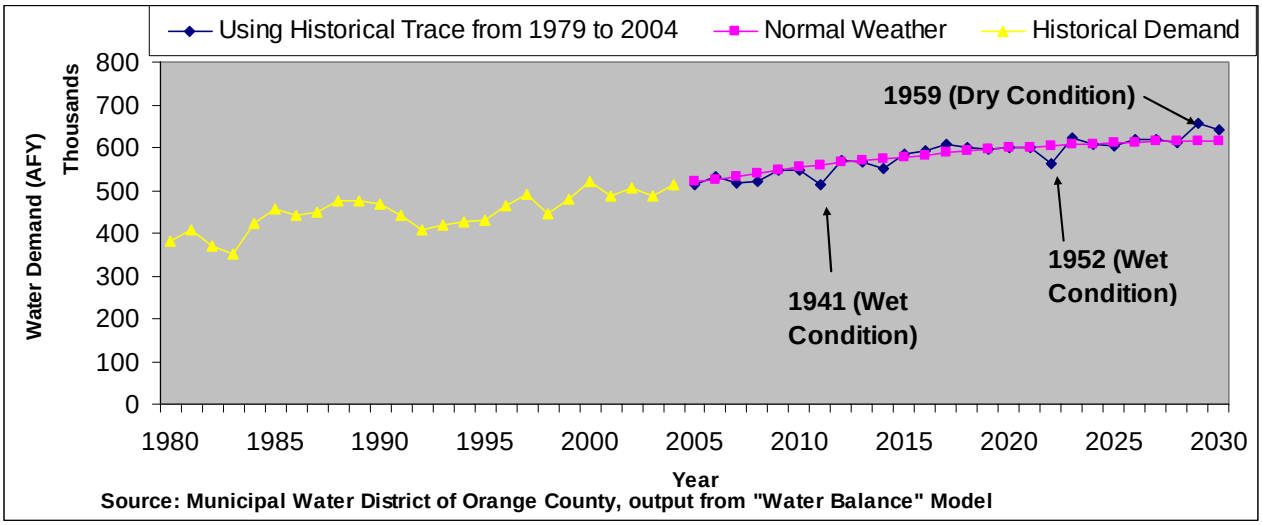
M&I Per Capita Use (gpcd)	218	240	231	201	219	201	201	205	210	210	207

2.1.3.5 Forecast Variability in Demand Due to Weather

Up to this point, we have illustrated the demand projection based on normal weather. However, in order to estimate supply reliability, variations in future demand due to temperature and rainfall must be developed.

In the analysis of water service reliability, MWDOC adapted the climate factors developed by Metropolitan to estimate the variability of demands due to weather. Metropolitan built a model called "MWDFORE" that uses 83 years (1922 to 2004) of climate history recorded at the Los Angeles Civic Center weather station. During the analysis, historical climate traces were superimposed over future demand projections under normal conditions. Wet and cool weather would result in lower-than-normal demands, while dry and hot weather would result in greater-than-normal demands. To illustrate this variation, a climate trace from 1979 to 2004 was superimposed over the projected demand from 2005 to 2030. Figure 2-1-3-5-A shows the two projected demands, one that is based on normal weather and the other that is based on climate traces from 1979 to 2004. In the historic climate sequence, 1941 (a record wet year) falls on the projection year 2011 – indicated by the lower-than-average projected demand. In the same sequence, 1959 (a record dry year) falls on the projection year 2022 – indicated by the greater-than-average projected demands.

Figure 2-1-3-5-A: Retail Demand Projection with Weather Variation in MWDOC's Service Area



Based on 83 different historic climate sequences occurring in any given forecast year, the variation of demand due to weather has been estimated to be about +6.7% (in dry) and -8.4% (in wet).

2.2 Water Supply

2.2.1 Current and Planned Water Supplies

Direct-use water (see Section 2.1.3.1 for definition of direct versus indirect water use) in MWDOC's service area comes from both local and imported supplies. Local supplies developed by individual member agencies, primarily groundwater, presently account for about 50 percent of MWDOC's direct water use. The primary groundwater basin is located in the northern half of MWDOC's service area. Other local supplies include recycled wastewater and surface water. The remaining 50 percent of direct water use demand is met by imported water from Metropolitan. Sources of Metropolitan's imported water include the Colorado River Aqueduct and the State Water Project. Total MWDOC direct water use demand in 2030 is projected to increase only 18 percent from 2005 due to the established plumbing code and aggressive water use efficiency effort.

MWDOC and its member agencies are collectively working to improve the water service reliability within the service area by continuously developing local supplies.

To quantify available supply within MWDOC Service area, MWDOC incorporated the following efforts:

- Collect forecast of retail demands and local supply, except for groundwater supply from Orange County Basin, from its member agencies; and

- Develop a computer model called "Water Balance Model" that forecasts groundwater supply from Orange County Basin and imported demand in Orange County under various types of water year. Section 2.2.1.1.1 has detailed discussion on this computer modeling.

Table 2-2-1-A identifies existing and planned water supply sources and quantities available to meet the direct use demand in the MWDOC's service area. According to this Plan, under normal condition member agencies within MWDOC's service area are expected to increase their reliance on local supply from 53% to 60% in 2030, and decrease their dependence on imported supply from 47% to 40% in 2030.

Table 2-2-1-A: Current and Planned Water Supplies for Direct Consumption in MWDOC's Service Area

Acre-feet Per Year						
Water Supply Sources	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Water Imported from:						
Metropolitan	245,232	208,006	230,494	243,030	245,322	246,981
Groundwater:						
OCWD (Lower Santa Ana Basin)	212,909	259,440	257,192	260,804	266,473	270,610
California Domestic Water Company	13,953	13,700	13,700	13,700	13,700	13,700
Supplies from other groundwater basins	7,157	10,978	11,499	12,124	12,124	12,124
Surface Water	10,908	11,476	10,749	10,500	10,462	10,525
Recycled Water (projected use)	31,619	51,375	54,521	59,208	62,618	62,618
Total	**521,778**	**554,975**	**578,156**	**599,365**	**610,699**	**616,558**

Source: Municipal Water District of Orange County, output of "Water Balance" Model

Indirect water use (groundwater replenishment and saltwater barrier injection) in the MWDOC service area also comes from both local and imported supplies. As indicated in Table 2-2-1-B, the planned supplies for meeting the demand for replenishment and saltwater barriers are expected to increase from approximately 325,000 acre-feet in 2005, to 408,000 acre-feet in 2030. Two main reasons for the increase are:

- Increase in recycled water supply – OCWD is currently constructing a recycling plant called the Groundwater Replenishment System (GWR System). When completed in 2007-08, it is expected to deliver 72,000 acre-feet per year of recycled supply to meet the demands for replenishment and saltwater barriers; and

- Increase in supply from the Santa Ana River – As population increases in the upper Santa Ana Watershed, more municipal discharge (non-storm related flow) is expected and will result in higher flows for stream recharge in the lower Santa Ana River Basin.

According to a study done by the Santa Ana Watershed Project Authority in March 2004, the estimated municipal discharge will increase from 145,000 acre-feet per year at present time to 190,000 acre-feet per year in 2025. Such increases lead to higher projections of total flows (municipal plus storm flow) to be captured in the future.

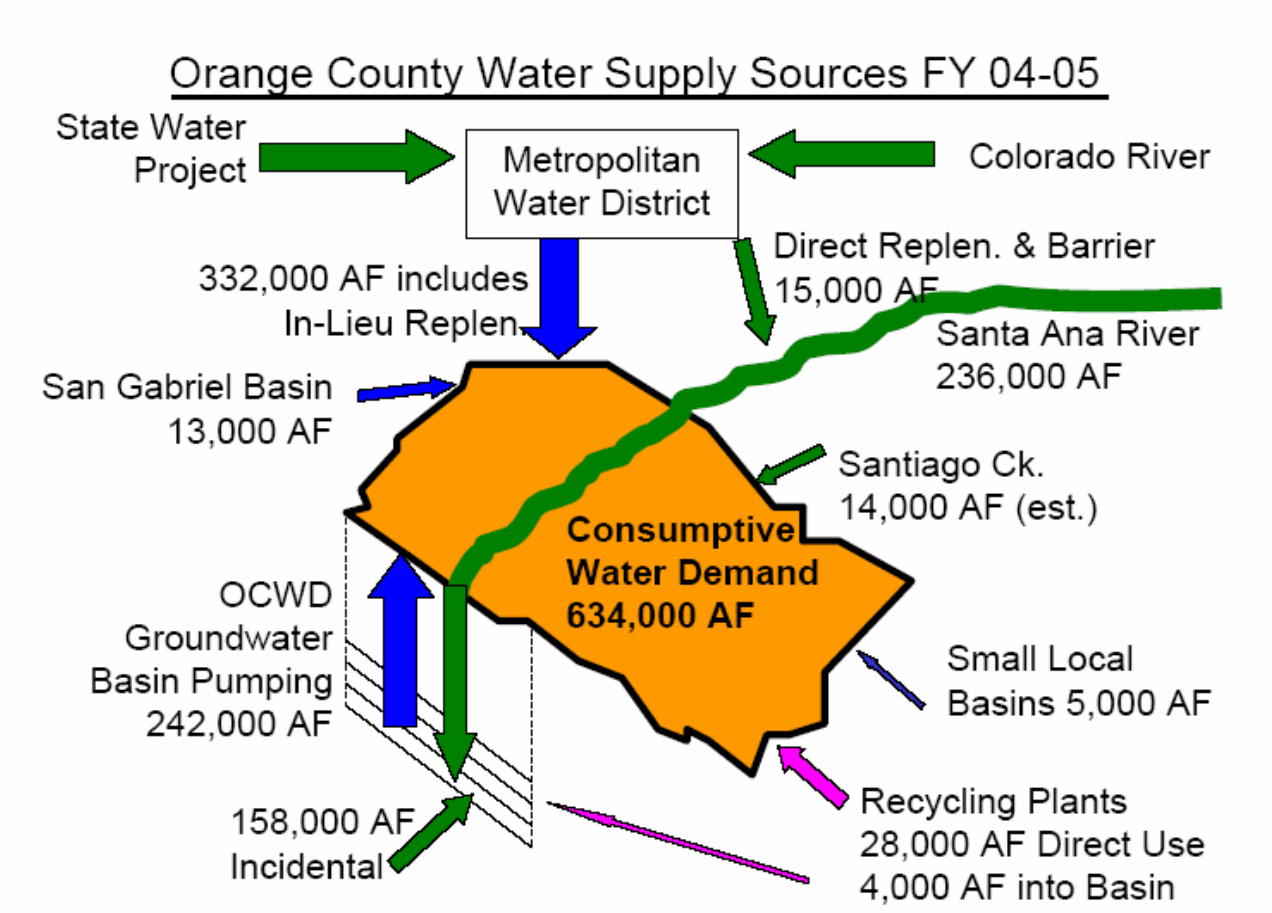
Table 2-2-1-B: Current and Planned Water Supplies for Indirect Consumption in MWDOC's Service Area- Groundwater Replenishment and Saline Barrier

Acre-feet per Year						
Water Supply Sources	**2005**	**2010**	**2015**	**2020**	**2025**	**2030 - opt**
Water purchased from Metropolitan						
For Sea Barrier	8,000	4,000	0	0	0	0
For Replenishment	55,181	57,739	58,734	56,685	57,048	50,700
Purchased from Others						
For Sea Barrier	2,000	2,000	2,000	2,000	2,000	2,000
For Replenishment	2,000	2,000	2,000	2,000	2,000	2,000
Recycled Water						
For Sea Barrier	4,000	34,000	34,000	34,000	34,000	34,000
For Replenishment	0	38,000	38,000	38,000	38,000	38,000
Santa Ana River (Storm and Base Flows)	217,116	202,057	211,339	219,633	227,616	235,913
Incidental Recharge	99,389	47,006	43,745	42,051	41,348	41,826
Withdraw/Deposit to Basin Storage	(62,606)	2,132	(3,825)	(2,201)	(789)	4,041
Total	**325,080**	**388,934**	**385,993**	**392,169**	**401,223**	**408,479**

Source: Municipal Water District of Orange County, output of "Water Balance" Model

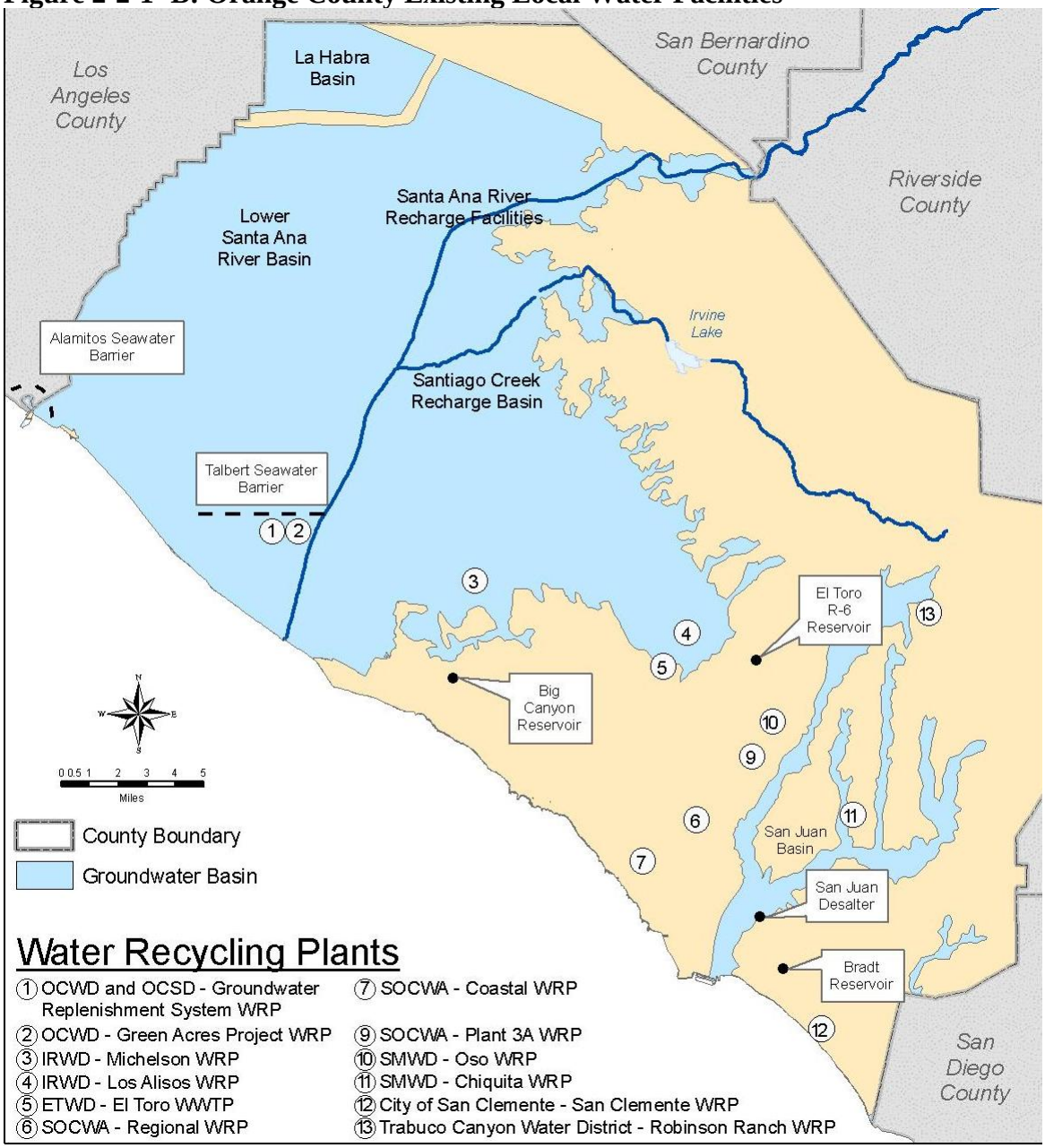
A schematic of all supply sources is shown in Figure 2-2-1-A; Figure 2-2-1-B shows existing local supply facilities within Orange County.

Figure 2-2-1-A: Schematic of Water Supply Sources in Orange County



Source: Municipal Water District of Orange County

Figure 2-2-1- B: Orange County Existing Local Water Facilities



Source: Produced for the Municipal Water District of Orange County by the Center for Demographic Research (CDR), CSU Fullerton

The following section discusses in detail each source of supply available to the MWDOC service area.

2.2.1.1 Groundwater

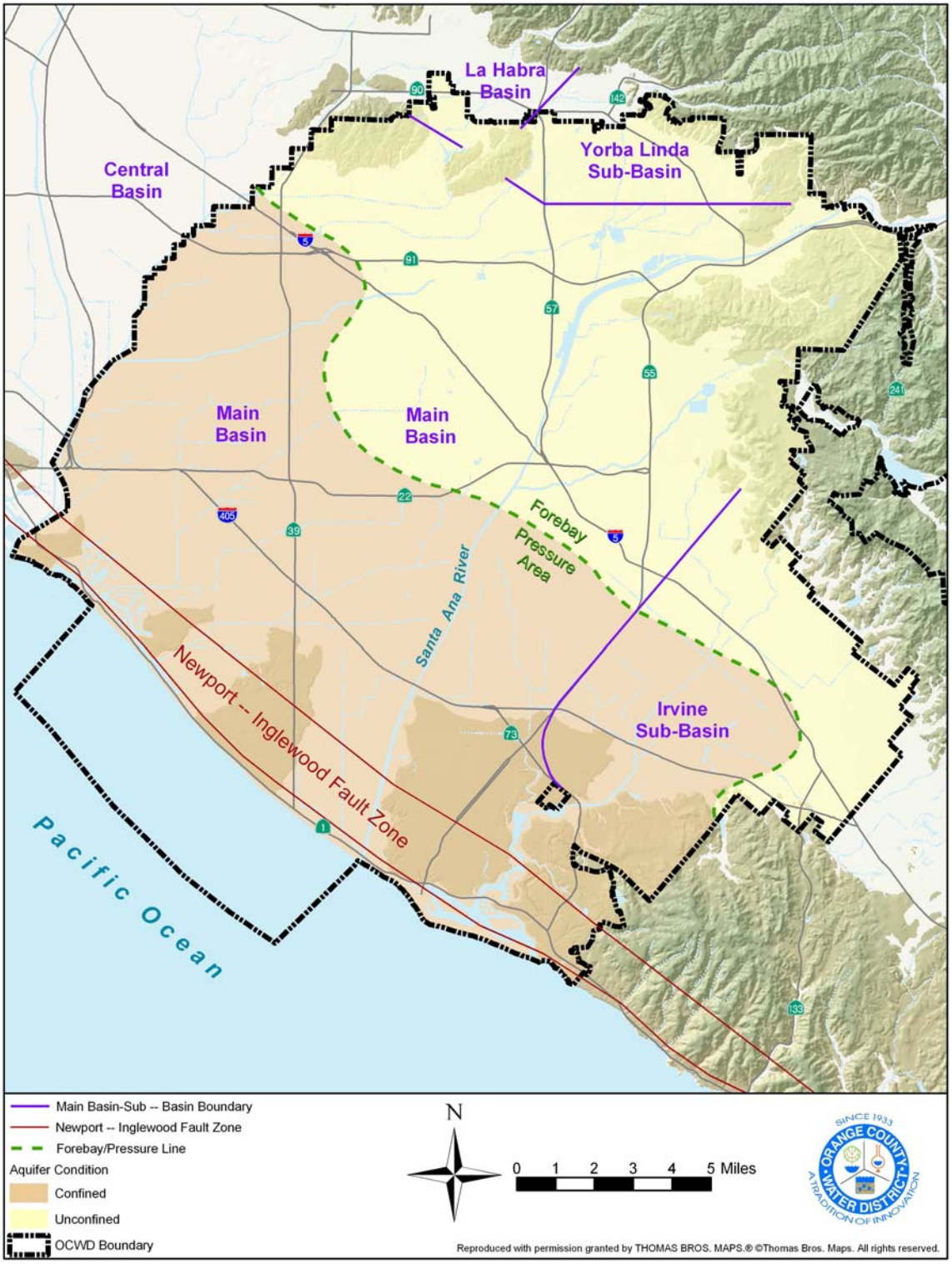
Among all local supplies available to MWDOC's member agencies, groundwater supplies the most water. The water supply resources in MWDOC's service area are enhanced by the existence of the following three groundwater basins, which are used as reservoirs to store water during wet years and storage to draw on during dry years.

2.2.1.1.1 Lower Santa Ana River Basin (Orange County Basin)

Basin Hydrogeology

This basin, also known as Orange County Groundwater Basin (Orange County Basin), underlies a coastal alluvial plain in the northwestern portion of Orange County. It covers an area of approximately 350 square miles beneath broad lowlands known as the Tustin and Downey Plains (Figure 2-2-1-1-1-A). The Basin is bounded by consolidated rocks exposed in the north in the Puente and Chino Hills, in the east in the Santa Ana Mountains, and in the south in the San Joaquin Hills. The Basin is bounded by the Pacific Ocean in the southwest and by the Orange County-Los Angeles County line in the northwest. The Basin underlines the lower Santa Ana River Watershed.

Figure 2-2-1-1-1-A: Map of the Orange County Groundwater Basin



Source: Orange County Water District, *Groundwater Management Plan*, ES-3

The Orange County Basin is dominated by a deep structural depression containing a thick accumulation of fresh water-bearing interbedded marine and continental sand, silt and clay deposits. The proportion of fine material generally increases toward the coast, dividing the Basin into forebay and pressure areas. Consequently, most surface water recharge is through the coarser, more interconnected and permeable forebay deposits. Strata in this Basin are faulted and folded, and may show rapid changes in grain size. The Newport-Inglewood fault zone parallels the coastline and generally forms a barrier to groundwater flow. Erosional channels filled with permeable alluvium break this barrier in selected locations called "Gaps'. In addition to this geologic feature, increased pumping from inland municipal wells causes the coastal gaps at Talbert, Bolsa, Sunset, and Alamitos to be susceptible to seawater intrusion.

The sediments containing easily recoverable fresh water extend to about 2,000 feet in depth near center of the Basin. Although water-bearing aquifers exist below that level, water quality and pumping lift make these materials economically unviable at present. Well yields range from 500 to 4,500 gallons per minute, but are generally 2,000 to 3,000 gallons per minute.

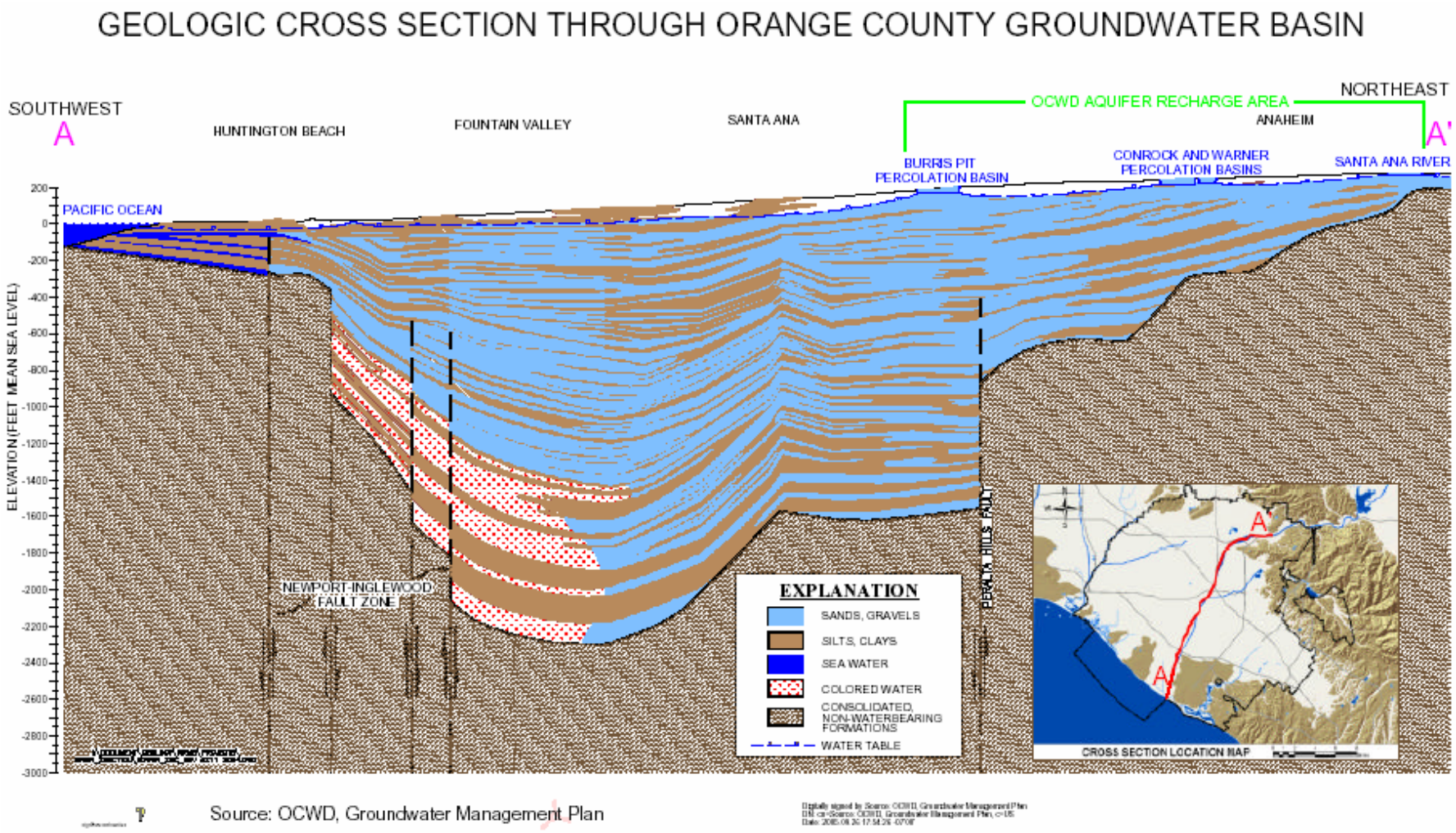
Upper, middle, and lower aquifer systems are recognized in the basin. The upper aquifer system, also know as the "shallow" aquifer system, includes Holocene alluvium, older alluvium, stream terraces, and the upper Pleistocene deposits represented by the La Habra Formation. It has an average thickness of about 200 to 300 feet and consists mostly of sand, gravel, and conglomerate with some silt and clay beds. Generally, the upper aquifer system contains a lower percentage of water-bearing strata in the northwest and coastal portions of the area where clays and clayey silts dominate. Accordingly, recharge from the surface to the groundwater basin may be minor in these areas. Recharge to the upper aquifer system occurs primarily in the northeastern portions of the Basin. With the exception of a few large-system municipal wells in the cities of Garden Grove, Anaheim, and Tustin, wells producing from the shallow aquifer system predominantly have industrial and agricultural uses. Production from the shallow aquifer system is typically about five percent of total Basin production.

The middle aquifer system, also known as the "principal" aquifer system, includes the lower Pleistocene Coyote Hills and San Pedro Formations, which have an average thickness

of 1,000 feet and are composed of sand, gravel, and a minor amount of clay. The primary recharge of the middle aquifer system is derived from the Santa Ana River channel in the northeast of the County. The middle aquifer system provides 90 to 95 percent of the groundwater for the Basin.

The lower aquifer system (or deep aquifer) includes the Upper Fernando Group of upper Pliocene age and is composed of sand and conglomerate 350 to 500 feet thick. Electric logs of this aquifer indicate that it would probably yield large quantities of fresh water to wells, but this zone has been found to contain colored water, and the aquifer is too deep to economically construct production wells. With the exception of four colored water production wells constructed by Mesa Consolidated Water District (MCWD) and Irvine Ranch Water District (IRWD), few wells penetrate the deep aquifer system. Figure 2-2-1-1-1-B presents a geologic cross-section through the Basin along the Santa Ana River.

Figure 2-2-1-1-1-B: Geologic Cross Section through Orange County Basin

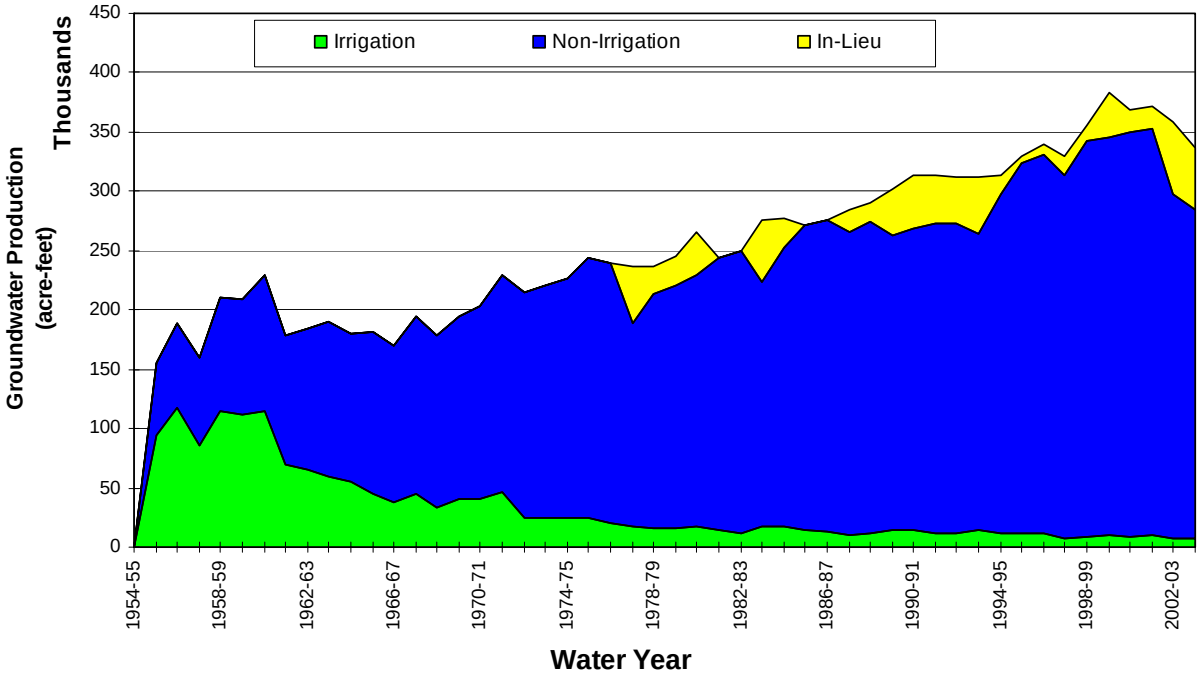


Source: OCWD, Groundwater Management Plan

Basin Groundwater Production Management

OCWD manages the Orange County Basin. Since OCWD was formed in 1933, the Basin has played a key role in meeting the water supply needs of north Orange County. For the past 50 years, OCWD has implemented a management policy to provide for uniformity of cost and access to Basin supplies without respect to how long an entity has been producing from the Basin. As shown in Figure 2-2-1-1-1-C, total groundwater production has approximately doubled since 1954. Groundwater consumption from this Basin has increased from 150,000 acre-feet per year to a maximum of 384,000 acre-feet per year.

Figure 2-2-1-1-1-C: Historical Groundwater Production from Orange County Basin



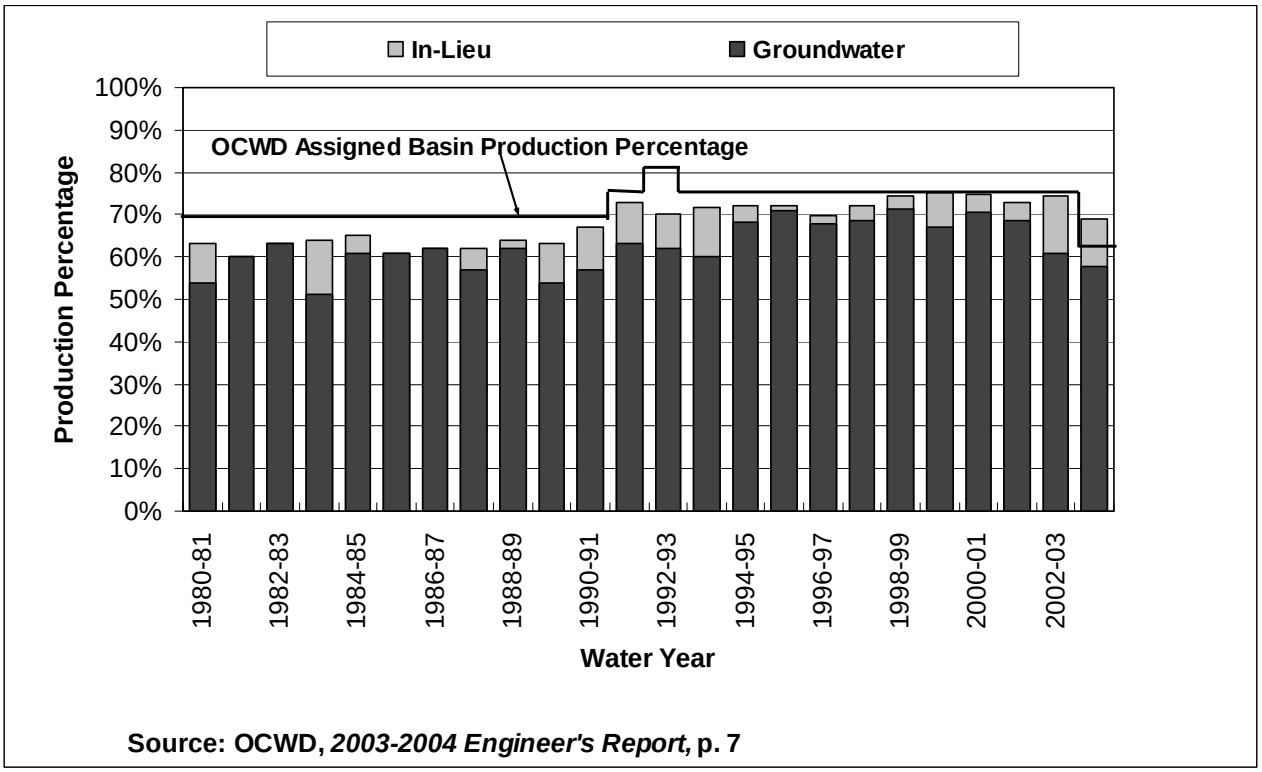
Source: OCWD, 2003-2004 Engineer's Report, p. 6

Historically, OCWD managed the Basin based upon seeking to increase supply rather than restricting demand. No pumping restrictions exist. Because the Basin is not operated on an annual safe-yield basis, the net change in storage in any given year may be positive or negative; however, over the long term, the Basin must be maintained in an approximate balance to ensure the long-term viability of Basin supplies. OCWD manages the amount of production through financial incentives. The framework for the financial incentives is based on establishing the Basin Production Percentage

(BPP). The BPP is the ratio of groundwater production to total water demands, expressed as a percentage. Pumping below the BPP is charged an assessment on a per acre-feet basis. This assessment is called the Replenishment Assessment (RA). Groundwater production above the BPP is charged the RA and the Basin Equity Assessment (BEA), which is typically set so that the cost of groundwater production above the BPP is similar to the cost of purchasing alternative supplies.

OCWD's general goal is to maintain the BPP as high as possible without negatively impacting the basin to allow producers to maximize their groundwater production, thereby lowering their overall water supply cost. Figure 2-2-1-1-1-D shows the history of the BPP along with the actual BPP that was achieved by the producers. Until recently, the actual BPP has sometimes been approximately five percent lower than the allowable BPP. This is primarily due to IRWD, the Yorba Linda Water District (YLWD), and the city of Buena Park, which have been unable to pump up to the BPP.

Figure 2-2-1-1-1-D: Historical Assigned Groundwater BPP and Actual Groundwater BPP Achieved



Source: OCWD, *2003-2004 Engineer's Report*, p. 7

Increasing accumulated overdraft of the Basin since the late-1990s has prompted increased evaluation of the Basin's yield and how the yield can be optimized through projects and programs. As a response to various factors, including a series of years with below-average precipitation and the increased accumulated overdraft, in 2003 OCWD reduced the BPP to decrease pumping from the Basin. As shown on Figure 2-2-1-1-1-D, this was the first BPP reduction since 1993.

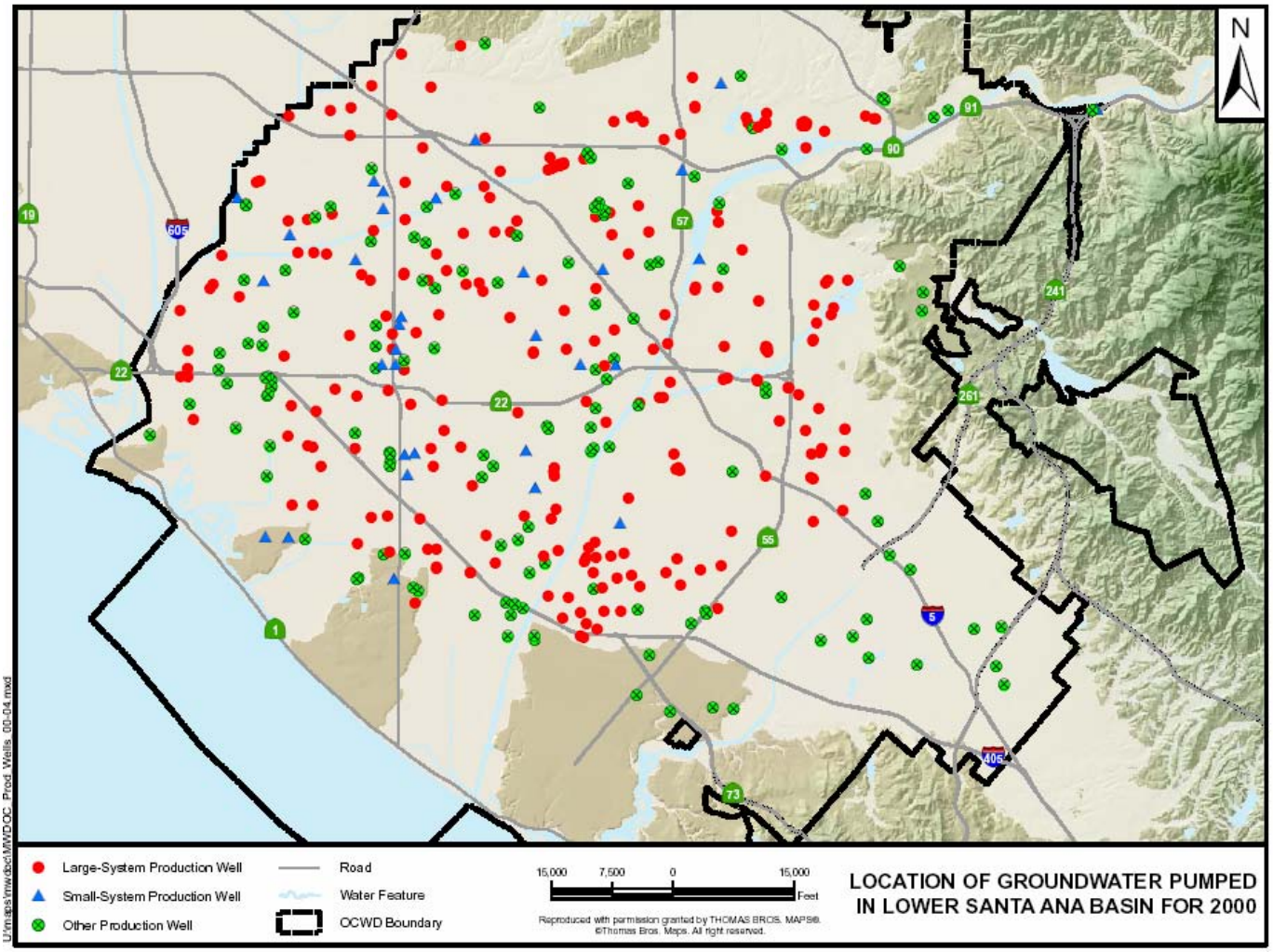
Currently, groundwater is produced from approximately 500 active wells within the Basin, approximately 300 of which produce less than 25 acre-feet per year. Groundwater production from approximately 200 large-capacity or large-system wells operated by the 21 largest water retail agencies accounted for an estimated 97 percent of the total production. All but three of these large retail agencies, the cities of Anaheim, Fullerton, and Santa Ana, are within the MWDOC service area. Table 2-2-1-1-1-A shows the groundwater produced from this Basin for the past five years. Figures 2-2-1-1-1-E to 2-2-1-1-1-I show the location of groundwater pumped during the same period of time. Figure 2-2-1-1-1-J shows the groundwater elevation contour map as measured in November 2004.

Table 2-2-1-1-1-A: Historical Production in Orange County Basin

Acre-feet					
	2000	**2001**	**2002**	**2003**	**2004**
Inside of MWDOC Service Area	200,456	200,721	185,390	176,427	170,150
Outside of MWDOC Service Area (Anaheim, Fullerton, and Santa Ana)	119,028	118,979	101,872	107,609	92,007
Total	**319,484**	**319,700**	**287,262**	**284,036**	**262,157**

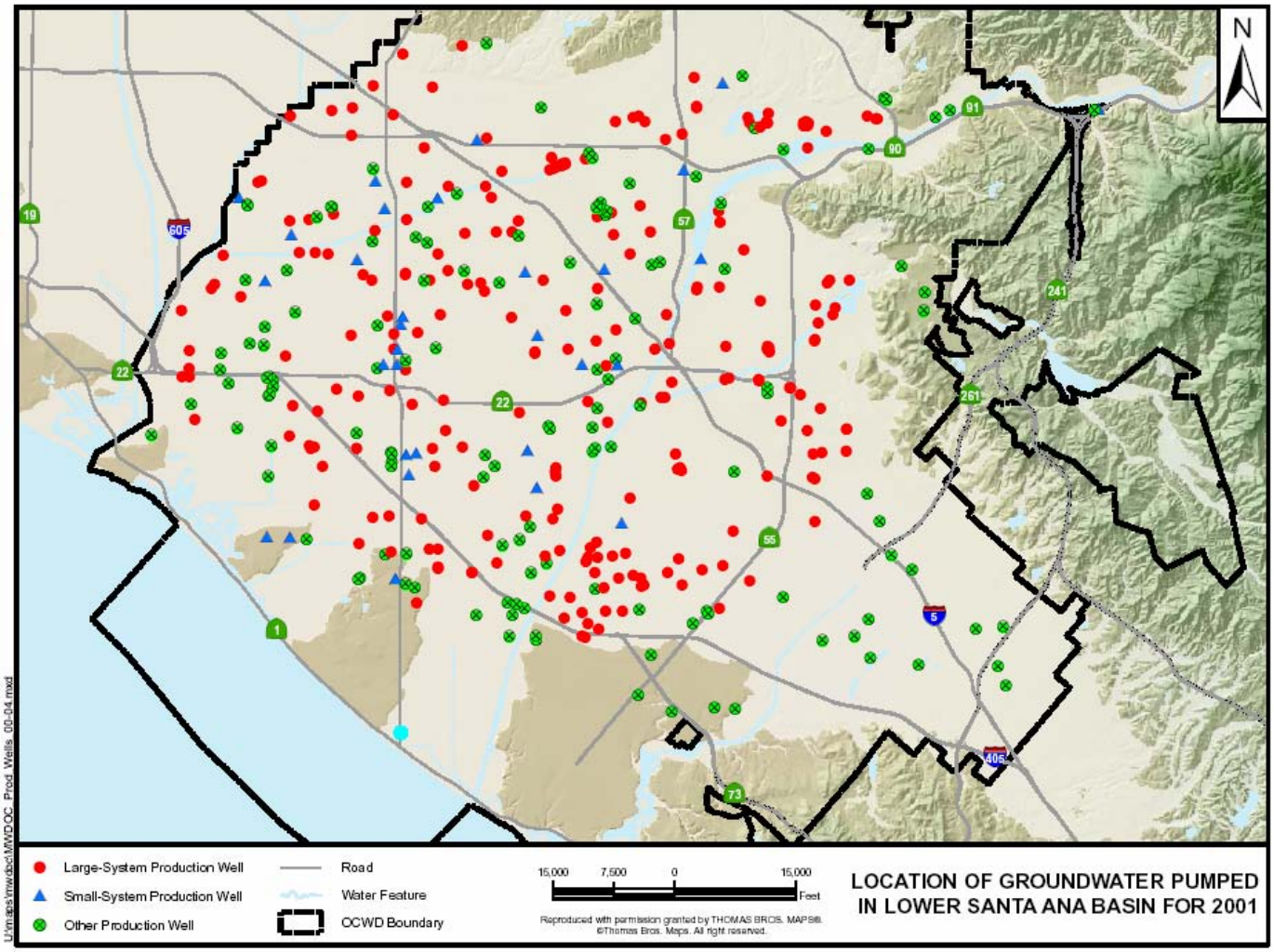
Source: Orange County Water District; Production shown excludes "in-lieu" delivery.

Figure 2-2-1-1-1-E: Location of Groundwater Pumped in Orange County Basin in 2000



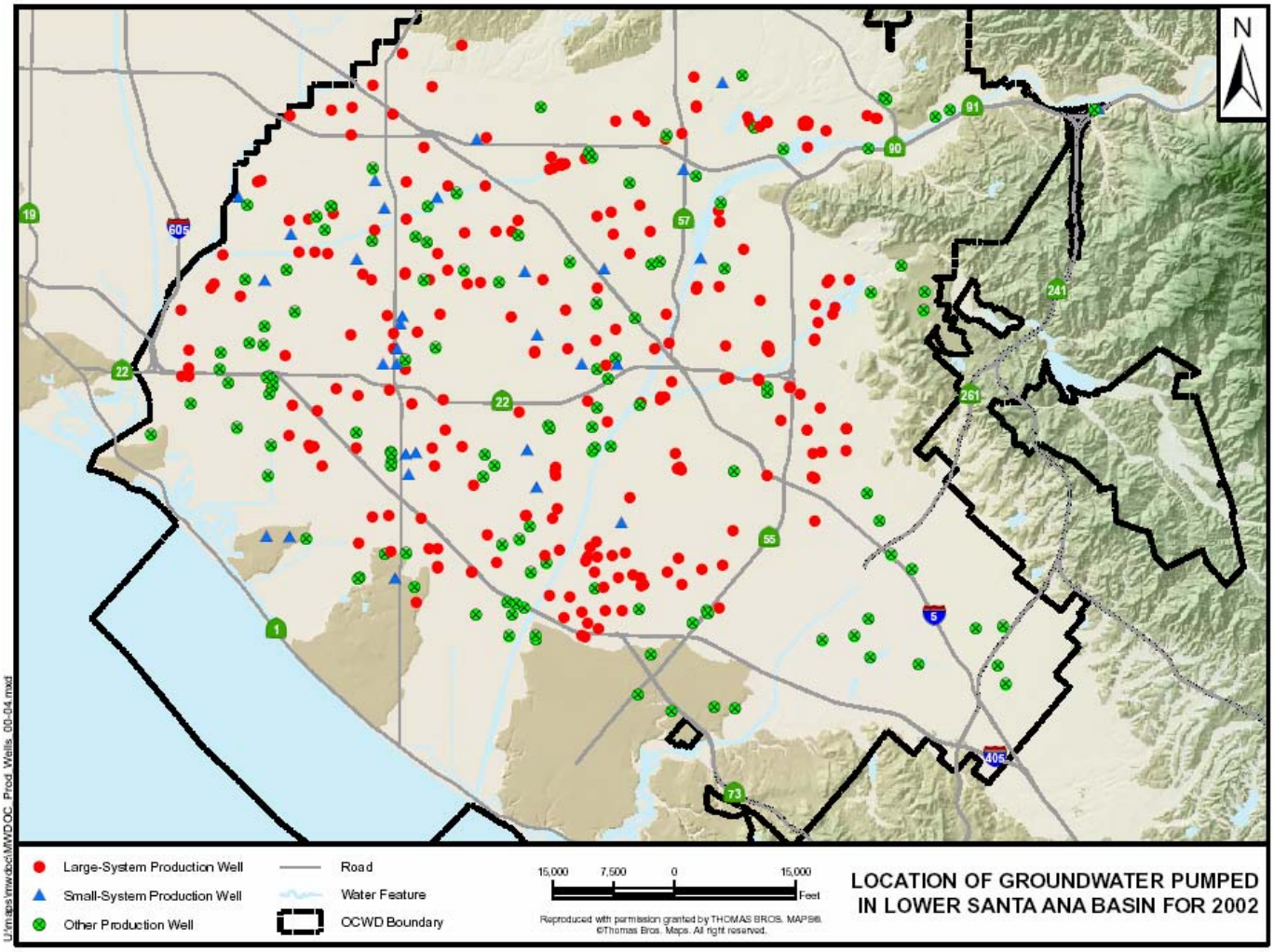
Source: Orange County Water District

Figure 2-2-1-1-1-F: Location of Groundwater Pumped in Orange County Basin in 2001



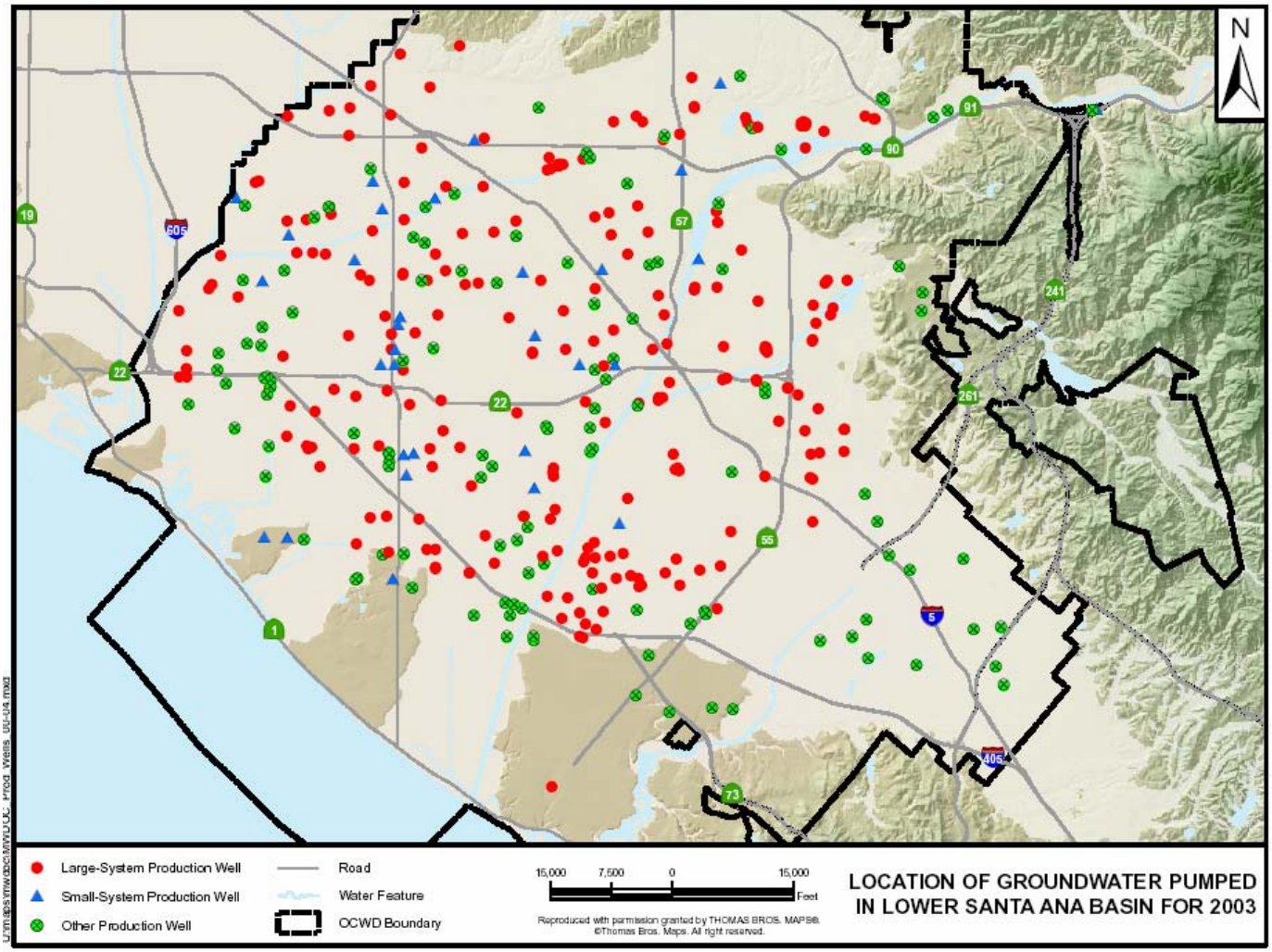
Source: Orange County Water District

Figure 2-2-1-1-1-G: Location of Groundwater Pumped in Orange County Basin in 2002



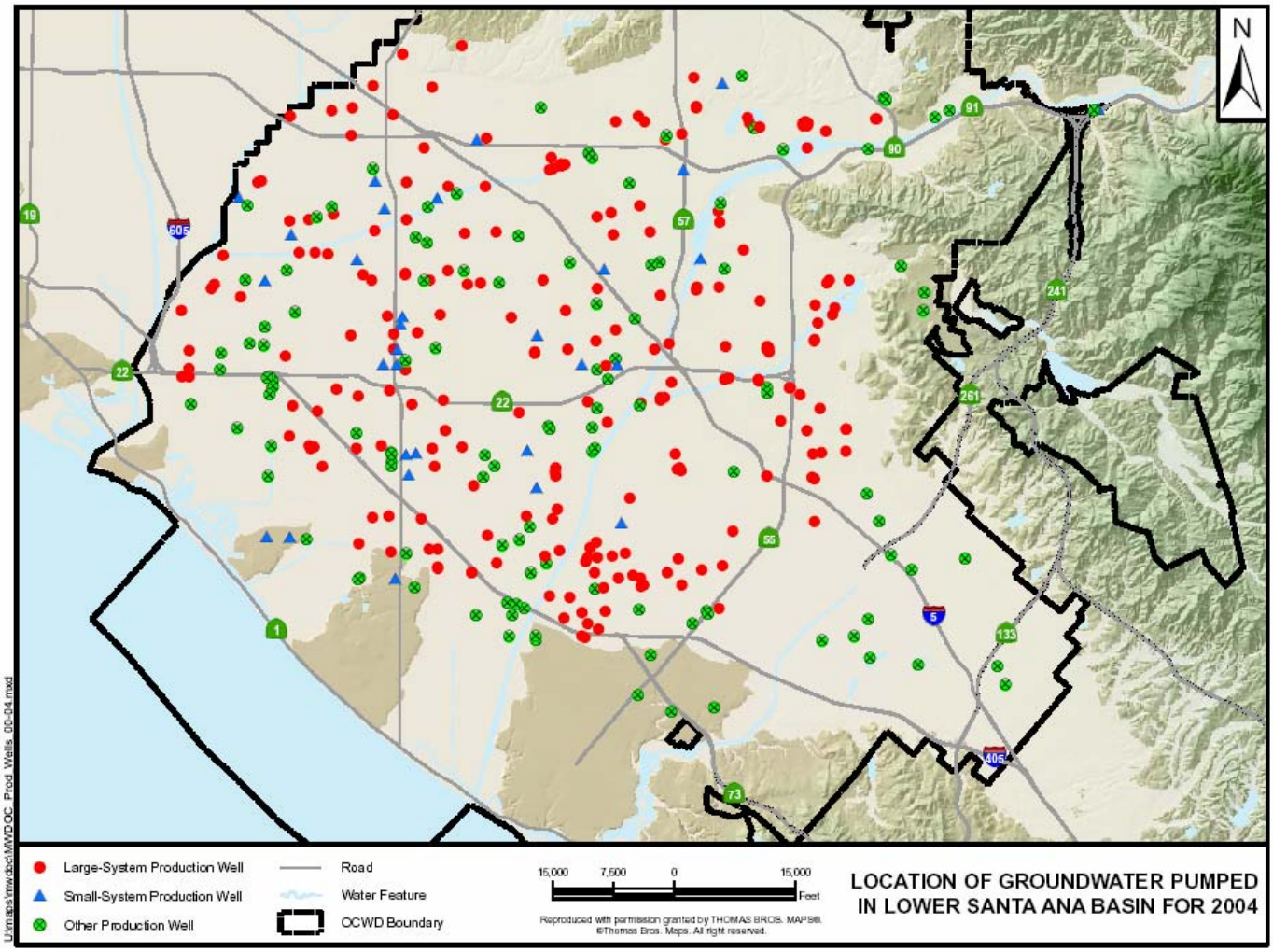
Source: Orange County Water District

Figure 2-2-1-1-1-H: Location of Groundwater Pumped in Orange County Basin in 2003



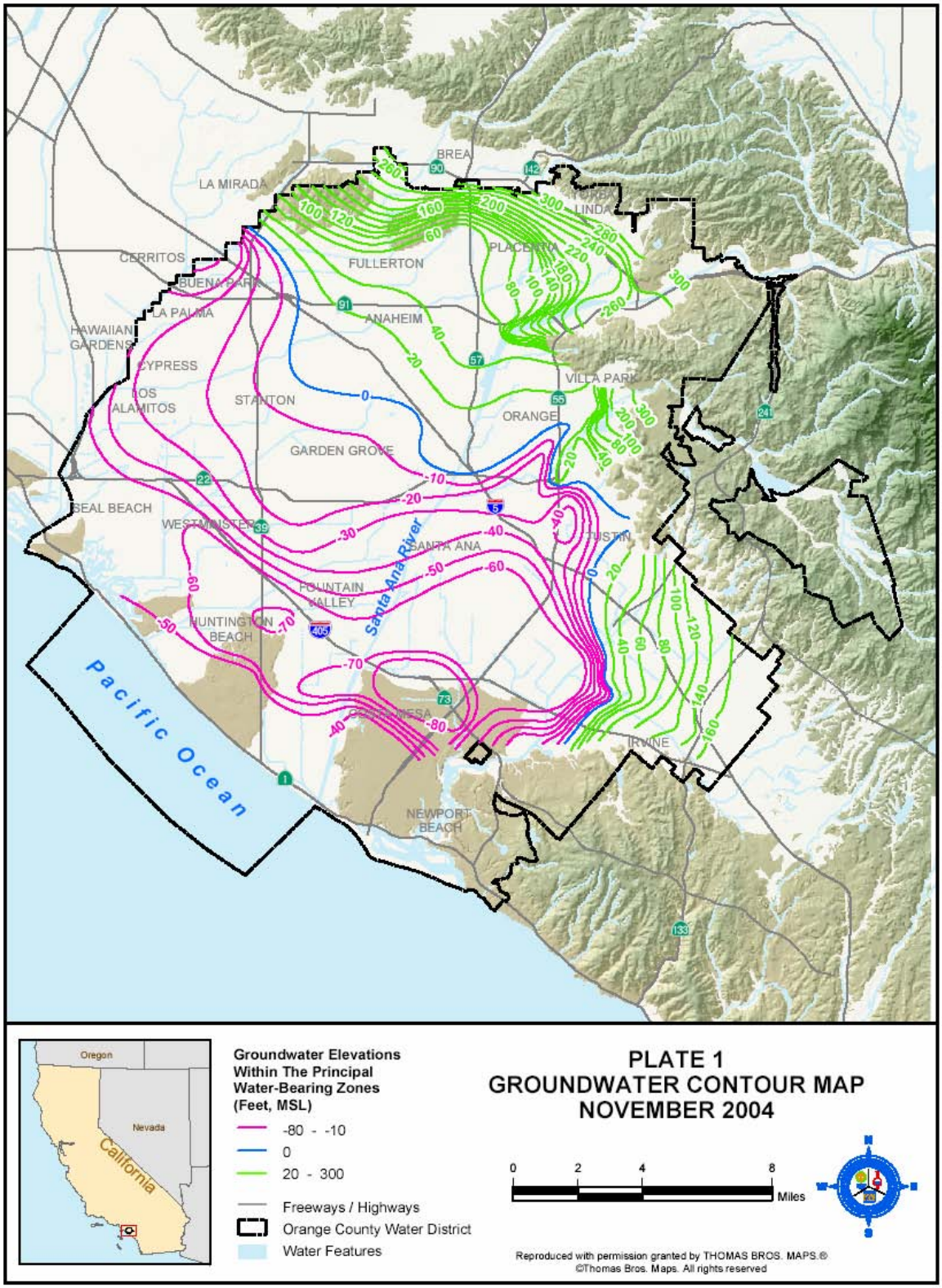
Source: Orange County Water District

Figure 2-2-1-1-1-I: Location of Groundwater Pumped in Orange County Basin in 2004



Source: Orange County Water District

Figure 2-2-1-1-1-J: Orange County Groundwater Elevation Contour Map Measured as of November 2004



Source: Orange County Water District

Groundwater production is generally distributed uniformly throughout the majority of the Basin with the exceptions of the Irvine and Yorba Linda sub-basins, the immediate coastal areas, and the foothill margins of the Basin, where little to no production occurs. Increases in coastal production would lead to increased stress on the Talbert and Alamitos Barriers, requiring additional barrier capacity.

Working closely with OCWD, MWDOC has developed a water balance model, which incorporates OCWD's operating policies in managing the Basin. It is used to project the groundwater production for each producer in this Basin based on a range of assumptions provided by OCWD. A copy of the model run is enclosed in *Appendix 2-A(i)*. Most of the assumptions involve the future condition of replenishment supplies to the Basin, which will be discussed in detail in the next subsection. The variables used to project the groundwater production are:

- Amount of Santa Ana River base flow;
- Amount of Santa Ana River storm flow;
- Amount of Basin incidental recharge;
- Relationship of basin storage and subsurface outflow;
- Basin percolation capacity;
- Basin well production capacity;
- Refill/maintain basin level approach;
- Replenishment purchases from imported sources; and
- Future annexation activities (note: the run used for this Plan assumes no future annexation for IRWD and the City of Anaheim; however, a supplemental run assuming annexation for both producers occurring in 2006-07 is also enclosed in *Appendix 2-A(ii)* for reference).

As a service to its member agencies, some of which are also producers in this Basin, MWDOC has distributed the results of the model run to each producer. Producers may use the information provided to update their Urban Water Management Plans.

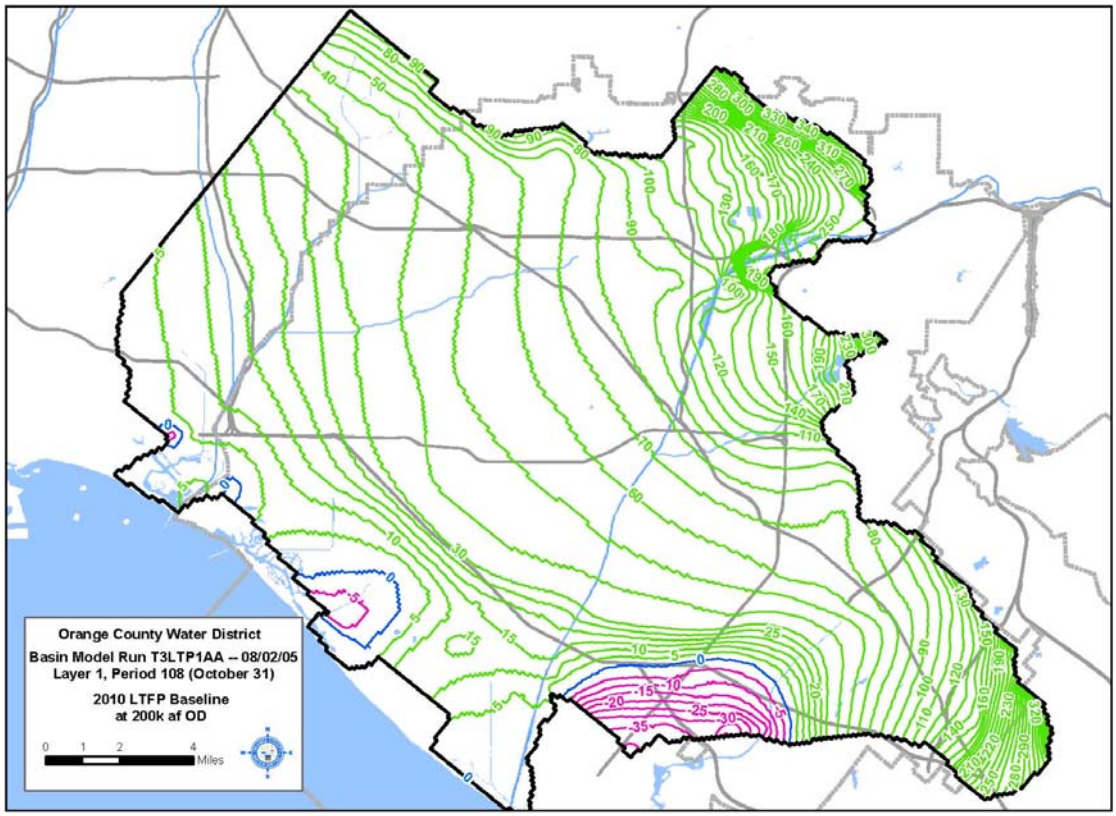
Taking from the aforementioned groundwater modeling effort, Table 2-2-1-1-1-B shows the projected groundwater production from the Basin in five-year increments for the next 25 years based on a normal water year (details of the determination of hydrologic water years are discussed in Section 2.3 of this Plan). Figures 2-2-1-1-1-K to 2-2-1-1-1-M show the projected groundwater elevation contours with location of cone of depression for 2010 according to the projected level of production. Figures 2-2-1-1-1-N to 2-2-1-1-1-P provide the same information for 2025.

Table 2-2-1-1-1-B: Projected Groundwater Production in Orange County Basin – Based on Normal Water Year

Acre-feet					
	2010	**2015**	**2020**	**2025**	**2030**
Inside of MWDOC Service Area	257,415	255,167	258,779	264,448	268,585
Outside of MWDOC Service Area (Anaheim, Fullerton, and Santa Ana)	132,315	132,678	133,017	136,172	138,050
Total	**389,729**	**387,845**	**391,797**	**400,619**	**406,635**

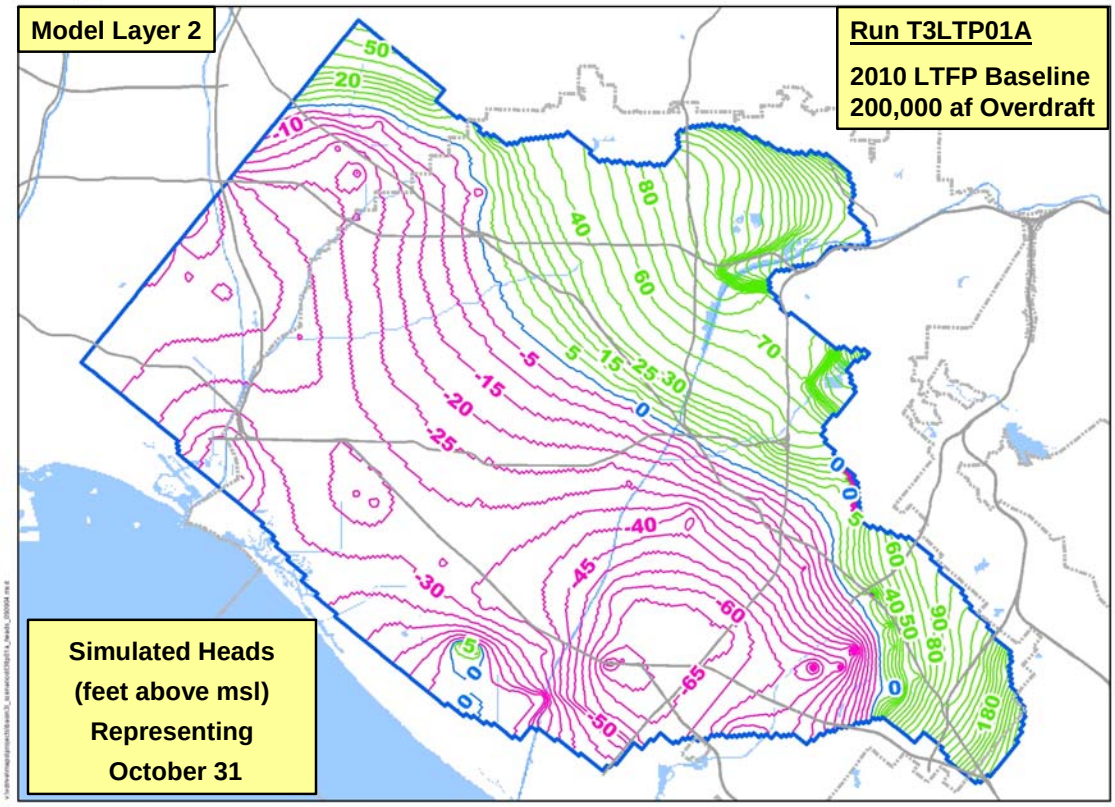
Source: Output from MWDOC's Water Balance Model; Production shown includes "in-lieu" delivery.

Figure 2-2-1-1-1- K: Projected Groundwater Elevation Contour Map at Orange County Basin Layer 1 in 2010



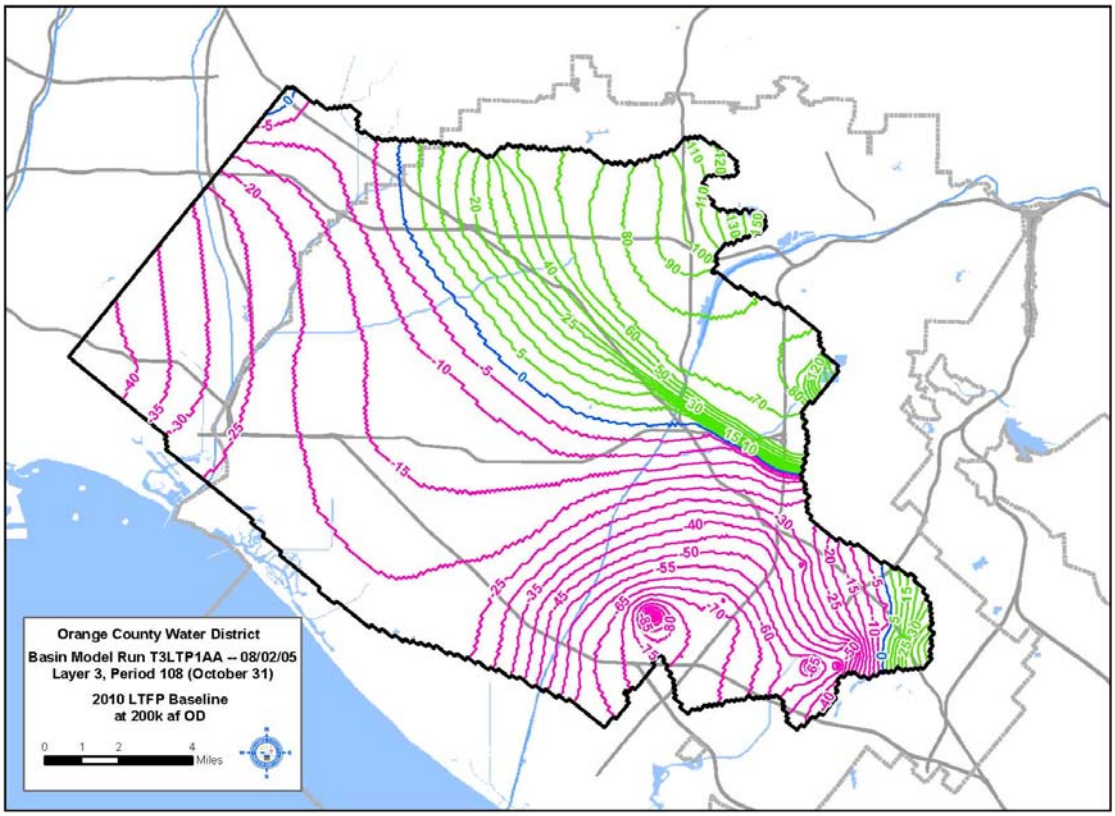
Source: Orange County Water District

Figure 2-2-1-1-1-L: Projected Groundwater Elevation Contour Map at Orange County Basin Layer 2 in 2010



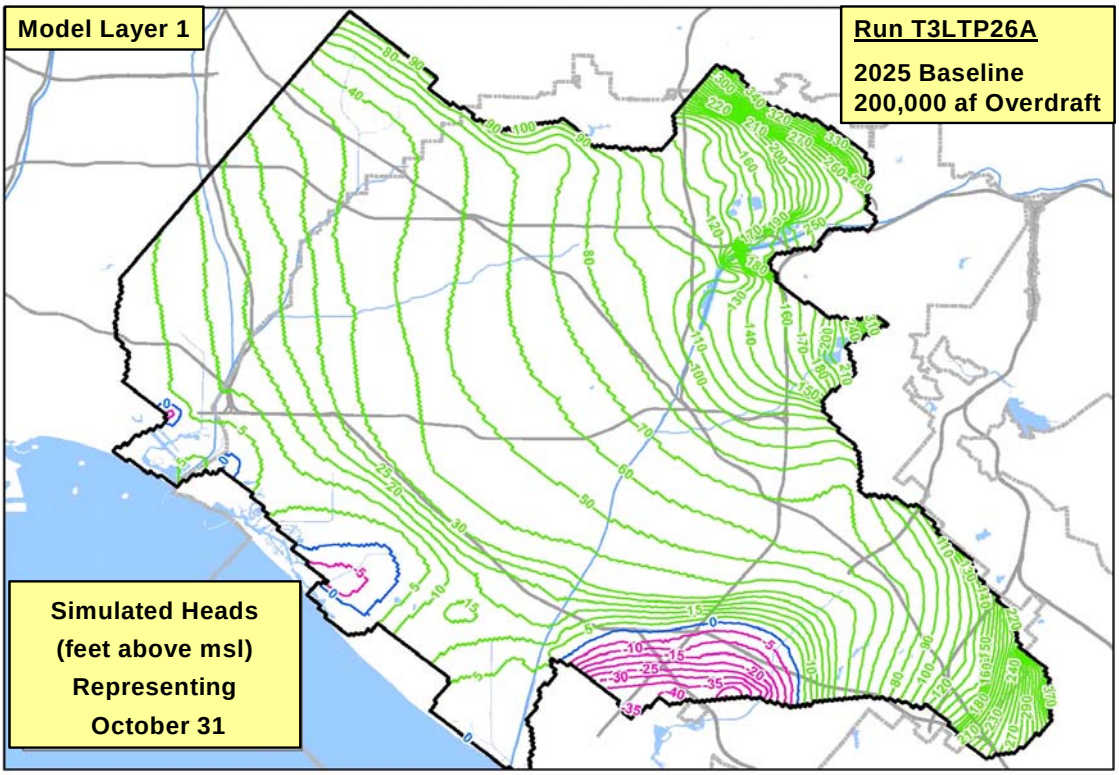
Source: Orange County Water District

Figure 2-2-1-1-1-M: Projected Groundwater Elevation Contour Map at Orange County Basin Layer 3 in 2010



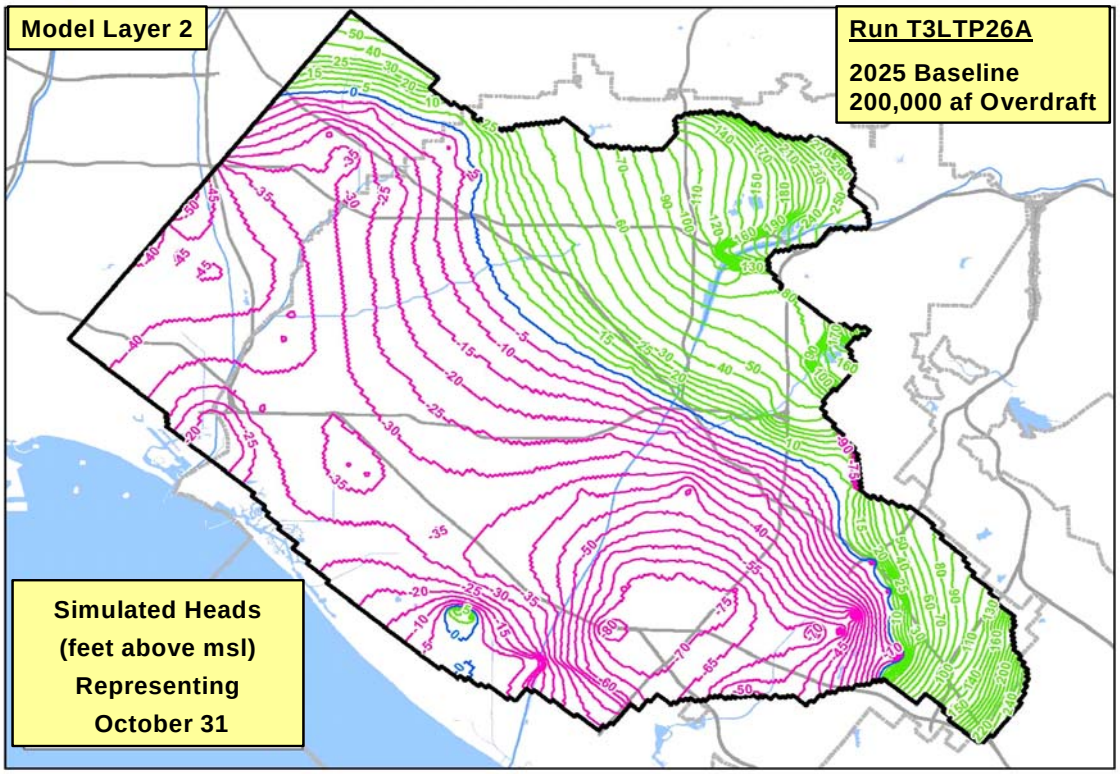
Source: Orange County Water District

Figure 2-2-1-1-1-N: Projected Groundwater Elevation Contour Map at Orange County Basin Layer 1 in 2025



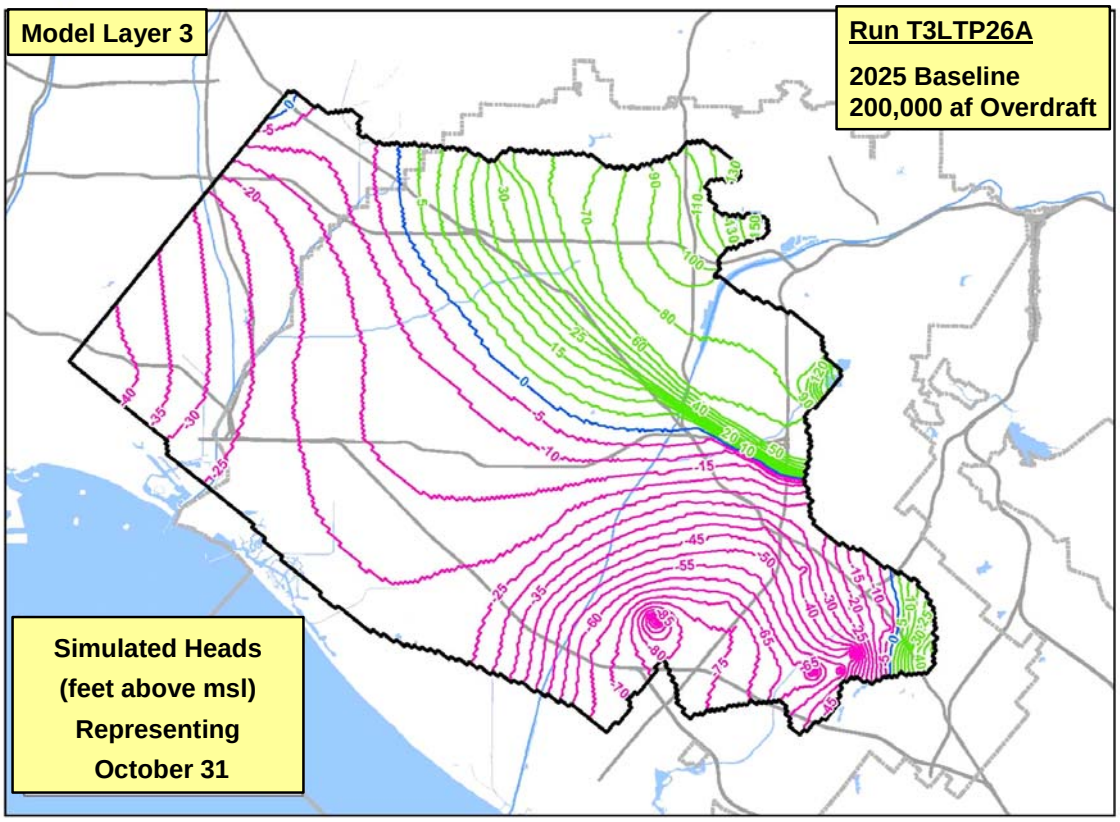
Source: Orange County Water District

Figure 2-2-1-1-1-O: Projected Groundwater Elevation Contour Map at Orange County Basin Layer 2 in 2025



Source: Orange County Water District

Figure 2-2-1-1-1-P: Projected Groundwater Elevation Contour Map at Orange County Basin Layer 3 in 2025



Source: Orange County Water District

Basin Recharge Management

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

OCWD currently owns and operates more than 1,000 acres of recharge facilities in and adjacent to the Santa Ana River and Santiago Creek. Table 2-2-1-1-1-C shows the four main systems of the percolation programs, which consist of 17 major facilities. This table also shows how percolation rates tend to decrease with time as the spreading basins develop a thin clogging layer from fine-grained sediment deposition and from biological growth.

Table 2-2-1-1-1- C: Four Main Systems of OCWD Percolation Program

MAIN RIVER SYSTEM **(ImperialHighway to Ball Road)** **Area:** 245 acres **Storage capacity:** 480 af PERCOLATION RATE: Clean 115 cfs Clogged 87 cfs	 North View of SAR Near Imperial Highway
OFF-RIVER SYSTEM Weir Ponds 1, 2, 3, and 4 Off-River between Weir Pond 4 and Carbon Creek Diversion Channel **Area:** 126 acres **Storage capacity:** 394 af PERCOLATION RATE: Clean 40 cfs Clogged 15 cfs	 Off-River (on left side of main river channel)

Deep Basin System
Huckleberry Basin
Conrock Basin
Warner Basin
Little Warner Basin
Anaheim Lake
Mini Anaheim
Miller Basin
Kraemer Basin
Placentia Basin
Raymond Basin
Area: 280 acres
Storage Capacity: 8,484 af
PERCOLATION RATE:
Clean 300 cfs
Clogged 89 cfs

Kraemer Basin

Burris Pit/Santiago Basin System
Five Coves Basins
Lincoln Basin
Burris Pit
Ball Road Basin
Blue Diamond Pit
Bond Pit
Smith Pit
Area: 373 acres
Storage Capacity: 17,500 af
PERCOLATION RATE:
Clean 210 cfs
Clogged 106 cfs

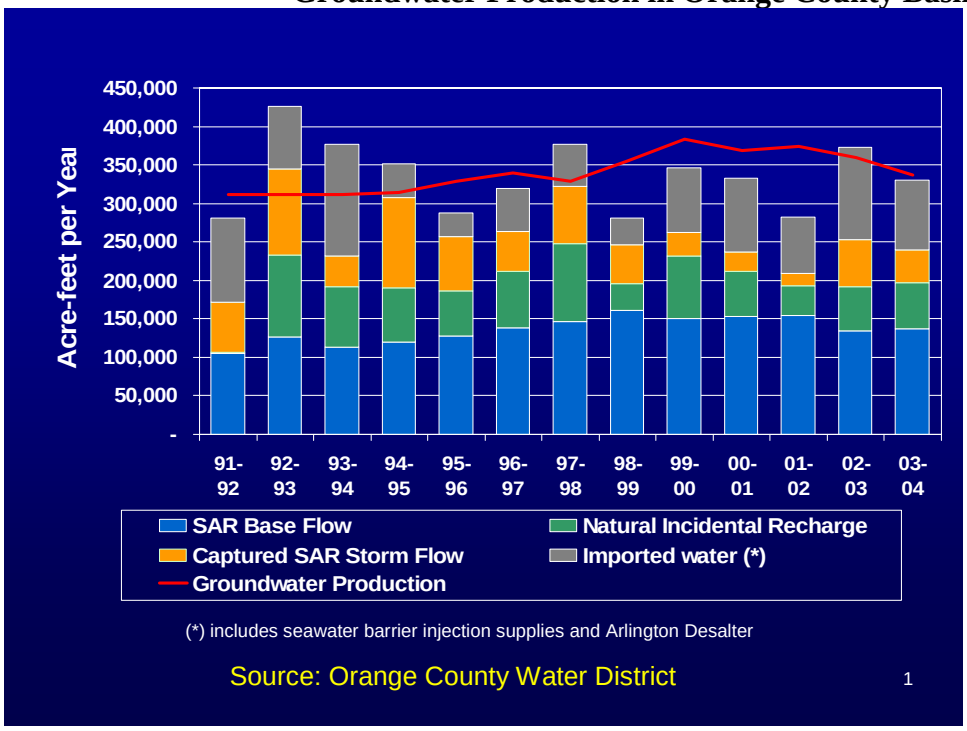
Burris Pit Station

Source: Orange County Water District, *Groundwater Management Plan*, ES-11

Historical groundwater flow was generally toward the ocean in the southwest, but modern pumping has caused groundwater levels to drop below sea level inland of the Newport-Inglewood fault zone. This trough-shaped depression encourages sea water to migrate inland, which if unchecked, could contaminate the groundwater supply. Strategic lines of wells in the Alamitos and Talbert Gaps inject imported and reclaimed water to create a mound of water seaward of the pumping trough to protect the Basin from seawater intrusion. In addition to operating the percolation system, OCWD also operates the Talbert Barrier in Fountain Valley and Huntington Beach, and participates in the financing operation of the Alamitos Barrier in Seal Beach and Long Beach. The barriers help prevent seawater intrusion and also help refill the Basin.

Sources of recharge water include Santa Ana River (SAR) baseflow and storm flow, Santiago Creek Flows, imported supplies purchased from Metropolitan, supplemental supplies from the upper SAR Watershed, and purified water from recycled plants. Figure 2-2-1-1-1-Q shows the historical amount of replenishment with respect to production.

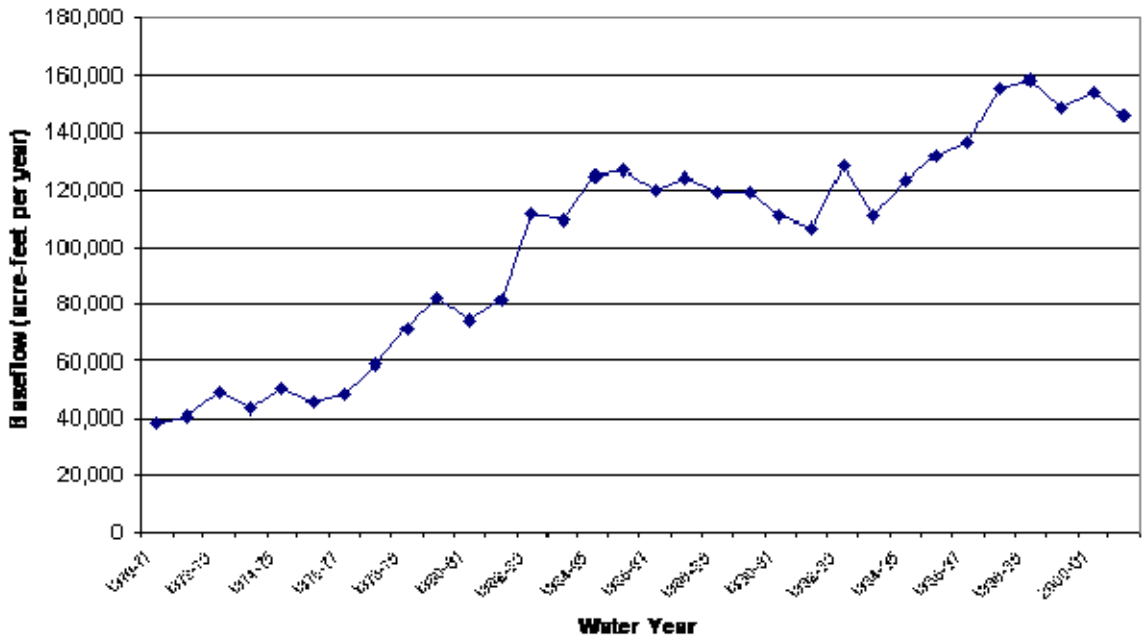
Figure 2-2-1-1-1-Q: Historical Sources of Replenishment and Total Groundwater Production in Orange County Basin



MWDOC has done an extensive and detailed study on each of the following sources when conducting the modeling work for projecting groundwater production for Orange County Basin:

1) Santa Ana River Baseflow - The primary source of replenishment for the basin is SAR flows. SAR flows below Prado Dam consist of a perennial baseflow component and a seasonal stormflow component. The majority of baseflow is composed of tertiary-treated wastewater discharges from wastewater treatment facilities upstream of Prado Dam. Future estimated increases in population in the upper SAR Watershed will result in baseflow increases. Since the 1970s, SAR baseflow has increased with additional runoff and treated wastewater discharges from the establishment of upstream residential communities. Baseflow increases are a replenishment source to the Basin. Figure 2-2-1-1-1-R illustrates historic baseflow in the SAR at Prado Dam for the period of 1970-2002. Reclamation programs, water conservation, and regulatory requirements could affect the amount of wastewater discharged into the SAR. While upstream urbanization and population growth would increase SAR baseflow, reclamation programs in the upper SAR Watershed could reduce SAR baseflows and impact the amount of water captured and spread in Orange County. The projected groundwater production prepared by MWDOC is based on the projection of wastewater discharge estimated by the Santa Ana Watershed Project Authority (SAWPA) in March 2004. According to the study, SAWPA estimates the baseflow, based on the projected level of growth and reclamation at the upper SAR Watershed, to be increased from 145,000 acre-feet per year at present time to 190,000 acre-feet per year in 2025;

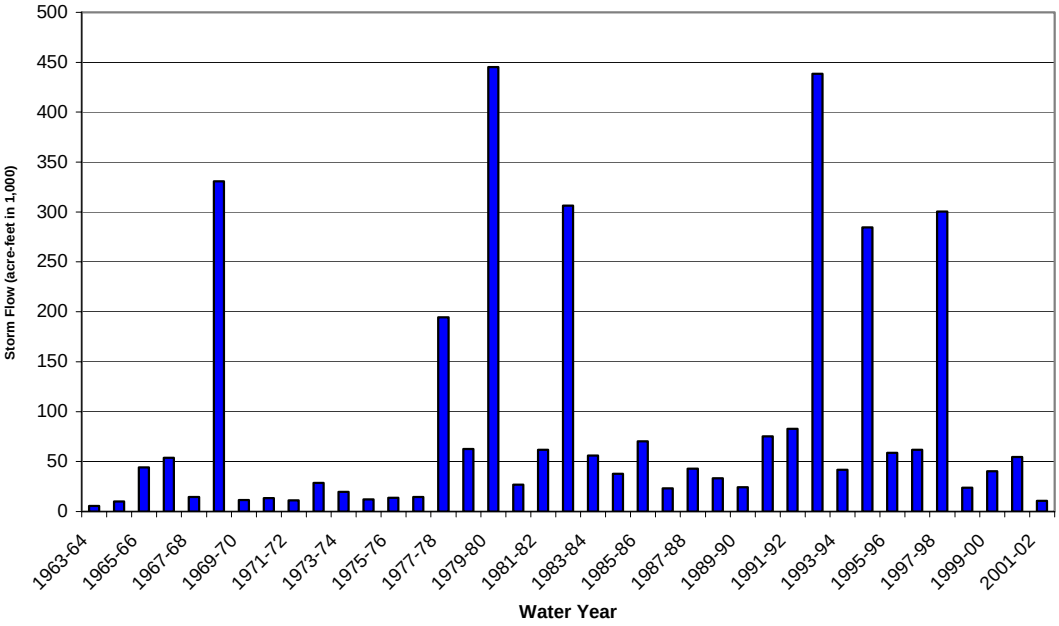
Figure 2-2-1-1-1-R: Santa Ana River Baseflow at Prado Dam



Source: Orange County Water District, Groundwater Management Plan, P. 5-8

2) Santa Ana River Stormflow – The volume of groundwater replenished from SAR stormflows is a function of precipitation intensity, duration, impervious area, and distribution over a given year. Although stormflows average approximately 33 percent of the total SAR flows, they average a lower percentage of the total water recharged at OCWD's spreading facilities. This is primarily because the magnitude of stormflow releases from Prado Dam often greatly exceeds the percolation capacity of the spreading basins. Figure 2-2-1-1-1-S illustrates the amount of SAR stormflow at Prado Dam (measured at the gauging station below Prado Dam). As shown in the figure, the maximum flow from storm runoff can reach above 400,000 acre-feet per year. However, according to OCWD's recharge records, the maximum annual amount of storm flow recharge between 1963-64 and 2002-03 was 117,000 acre-feet and the minimum was 16,000 acre-feet;

Figure 2-2-1-1-1-S: Santa Ana River Stormflow at Prado Dam



Source: Orange County Water Districtc, *Groundwater Management Plan* , P. 5-9

3) Incidental Recharge – This natural recharge to the Basin occurs from local mountain-front recharge, precipitation and irrigation water infiltration, and groundwater underflow to/from Los Angeles County and the ocean. For the most part, natural incidental recharge occurs outside the OCWD's control.

   Net incidental recharge refers to the net amount of incidental recharge that occurs after accounting for subsurface outflow to Los Angeles County. Groundwater outflow from the basin across the Los Angeles/Orange County line has been estimated to range from approximately 1,000 to 14,000 acre-feet per year based on groundwater elevation gradients and aquifer transmissivity. Underflow varies annually and seasonally depending upon hydrologic conditions on both side of the county line. Modeling by OCWD indicates that, assuming groundwater elevations in the Central Basin remain constant, underflow to Los Angeles County increases approximately 8,500 acre-feet per year for every 100,000 acre-feet of increased groundwater in storage in Orange County between 500,000 to zero accumulated overdraft.

4) Imported Water from Metropolitan via MWDOC- Metropolitan sells groundwater replenishment water, via MWDOC, to OCWD when surplus water is available.

This water is delivered by either the in-lieu program or direct spreading. OCWD is able to increase allowable pumping from the Basin, above the natural safe yield, with the purchase of replenishment water. Delivery of replenishment water is interruptible and is frequently turned off throughout the year depending upon firm demands on available delivery and treatment capacity in the Metropolitan system. When surplus replenishment water is unavailable for extended periods, OCWD continues to allow pumping above the Groundwater Basin's natural safe yield. Under this operation, the Orange County Basin would draw on stored water to sustain this level of pumping. Depending on the severity of the drought and local supply conditions, this operation can be sustained for two to three years before the Basin reaches significant overdraft (below 500,000 acre-feet storage level). OCWD must then refill the Basin when the replenishment supply becomes available from Metropolitan. This close coordination of the Basin's operation with the Metropolitan replenishment program benefits the local service area with enhanced pumping levels in normal and wet years, and the entire region by storing surplus water that can be produced via sustained pumping during times of tighter supply availability. Metropolitan also sells treated non-interruptible water to OCWD for injection into the Talbert Seawater Barrier. This water assists in the protection of the Basin from seawater intrusion.

Direct replenishment water is received at OCWD's recharge facilities in the cities of Anaheim and Orange and is physically recharged into the Basin through percolation. In-lieu supplies are physically recharged into the Basin when participating producers turn off their wells and receive excess Metropolitan water in-lieu of pumping groundwater. This reduces the amount of water taken from the Basin. Injection water into Talbert Barrier has been supplied by potable water purchased from Metropolitan since 2002. It is anticipated that potable Metropolitan water will be used to make up a portion of the injection water at the Talbert Barrier until about 2009, when the second year of operation of the GWR System is complete. After this time, the GWR SYSTEM should provide all of the water injected into the Talbert Barrier.

To forecast the availability of Metropolitan's surplus supply for replenishment, MWDOC worked with Metropolitan staff to derive the average replenishment

supply available to MWDOC based on forecasts of Metropolitan's imported supplies and regional demands. The average replenishment supply available to OCWD is reported as shown on Table 2-2-1-1-1-D.

Table 2-2-1-1-1-D: Current and Projected Water Supplies for Groundwater Replenishment and Saline Barrier in Orange County Basin

Acre-feet						
Water Supply Sources	**2005**	**2010**	**2015**	**2020**	**2025**	**2030 - opt**
Water purchased from MWDOC:						
For Sea Barrier	8,000	4,000	0	0	0	0
For Replenishment	55,181	57,739	58,734	56,685	57,048	50,700
Direct Spreading	19,176	19,792	21,634	18,801	17,667	10,590
In-Lieu	36,005	37,947	37,100	37,884	39,381	40,110
Santa Ana River(Storm and Base F	217,116	202,057	211,339	219,633	227,616	235,913
Incidental Recharge	99,389	47,006	43,745	42,051	41,348	41,826
Withdraw/Deposit to Basin Storag	(62,606)	2,132	(3,825)	(2,201)	(789)	4,041
Recycle Water For Sea Barrier	4,000	34,000	34,000	34,000	34,000	34,000
Recycle Water For Replenishment	0	38,000	38,000	38,000	38,000	38,000
Purchase from Others	0	0	0	0	0	0
For Sea Barrier	2,000	2,000	2,000	2,000	2,000	2,000
For Replenishment	2,000	2,000	2,000	2,000	2,000	2,000
Total	**325,080**	**388,934**	**385,993**	**392,169**	**401,223**	**408,479**

Source: Municipal Water District of Orange County, output from MWDOC's Water Balance Model

5) Recycled Water – In 1975, OCWD built a treatment plant called "Water Factory 21" that purified up to approximately 15 MGD of clarified secondary wastewater effluent using lime clarification pretreatment, multi-media filtration, and reverse osmosis (RO). Recently, ultraviolet light (UV) treatment was added. Water Factory 21 was deplaced in 2004 with the first 5 MGD phase of the GWR System.

   GWR System is jointly sponsored by OCWD and the Orange County Sanitation District (OCSD). The first phase of the GWR System will increase the reliability and sustainability of local groundwater supplies through the creation of a new source of water, producing a total of 72,000 acre-feet per year for groundwater recharge. The GWR System will be operational in mid-2007. The GWR System will augment existing groundwater supplies through indirect potable reuse, providing a reliable, high-quality source of recharge water for the basin. Additionally, direct injection of project water into the Talbert Barrier will protect the coastal aquifer from seawater intrusion. GWR System consists of three major components: 1) Advanced Water Treatment (AWT) facilities and pumping stations, 2) a pipeline connection from the treatment facilities to existing recharge basins, and 3) expansion of the Talbert Barrier. The heart of the

GWR System is the advanced water purification plant, which purifies the water with microfiltration (MF), Reverse Osmosis (RO), and advanced oxidation processes (AOP), which consist of UV and hydrogen peroxide.

Following filter screening, OCSD-clarified secondary effluent, normally disposed to the ocean, receives MF membrane treatment. MF is a low-pressure membrane process that removes suspended matter from water. MF filtrate will be fed to RO, and MF reject streams will be returned to OCSD's Plant No.1 for disposal. The RO process will reject dissolved contaminants and minerals. Particularly, RO treatment will reduce dissolved organics, pesticides, TDS, silica, and viruses from MF filtrate. The RO concentrate will be discharged into the ocean via the existing OCSD ocean outfall. Following RO, the water will undergo UV along with hydrogen peroxide treatment. UV treatment involves the use of UV light to penetrate cell walls of microorganisms, preventing replication and often inducing cell death. UV thus provides an additional barrier of protection against bacterial and viral organisms and, combined with RO treatment, increases removal efficiency. More importantly, UV with hydrogen peroxide oxidizes many organic compounds for ultimate removal from water. After RO treatment, the product water is so low in mineral content that it has a corrosive nature, which can be mitigated with the addition of lime. If lime addition did not take place, the concrete transmission pipe would corrode in the presence of the unstabilized water. The GWR System will provide roughly 38,000 acre-feet per year for recharge in Kraemer Basin and 34,000 acre-feet per year of injection water to Talbert Barrier.

Up to 2,000 acre-feet per year of purified water will be used for injection to Alamitos Barrier. This purified water is produced by a plant constructed by the Water Replenishment District of Southern California. OCWD purchases purified water from this plant for Injection into the Alamitos Barrier; and

6) Arlington Desalter – When potable consumption does not match the output of the Arlington Desalter in Riverside, OCWD purchases the excess water for groundwater recharge. Water from this project flows to the OCWD recharge facilities through the Santa Ana River. It is

projected that approximately 2,000 acre-feet per year of water is available for OCWD recharge facilities.

Based on the aforementioned sources, MWDOC projects the replenishment supply for Orange County Basin for the next 25 years in 5-year increments (see Table 2-2-1-1-1-D).

Basin Storage and Elevation Trend

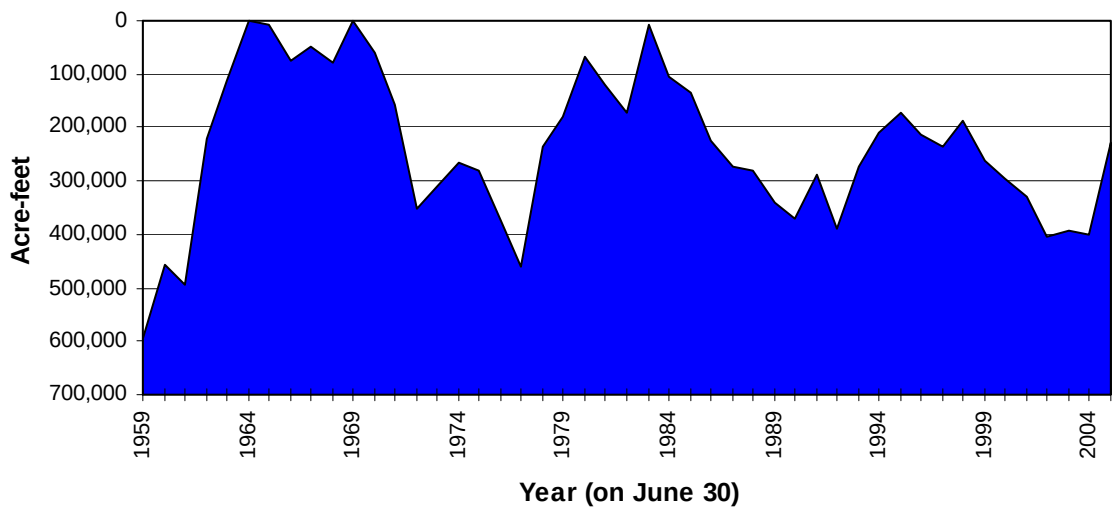
In most years, groundwater levels are generally lower than the level in 1969, when the basin is considered to have been full. Groundwater levels in the forebay have generally stabilized, whereas the southern coastal area has declined steadily through time. Since 1990, the magnitude of yearly groundwater level fluctuation has approximately doubled near the coast because of seasonal pumping patterns and short-term storage programs, but has generally stayed the same in the forebay.

The accumulated overdraft, as defined in OCWD's District Act, is the quantity of water needed to be replaced at OCWD's intake area to prevent landward movement of ocean water into the fresh groundwater body. For the purpose of estimating accumulated overdraft, groundwater levels as measured on November 1, 1969, are assumed to represent a full basin condition (a condition under which seawater intrusion would not occur). Landward movement of ocean water can only be prevented if groundwater levels near the coast are several feet above sea level. Groundwater levels along the coast are related to the volume of water stored in the intake area, water pumped from the entire basin, and the pattern or location of pumping. Seawater intrusion control projects, however, have been constructed and others are under construction or planned that together will be effective in preventing landward movement of ocean water into the fresh groundwater body. These facilities will allow greater utilization of the Basin's storage capacity. Based on these opportunities, a "target" dewatered storage of 200,000 acre-feet has been implemented for the past several years as the appropriate accumulated overdraft level for the Basin. This level allows OCWD the flexibility to fully utilize supply opportunities – even when the groundwater basin is considered "full" at the target dewatered storage of 200,000 acre-feet. Using the 1969 reference year, the groundwater level as of November 1, 2004, shows an accumulated overdraft of approximately 439,000 acre-feet. For the 2003-04 water year, which ended June 30, it is estimated (by

means of back-calculating from November 1, 2004 to June 30, 2004) that the accumulated overdraft totaled 400,000 acre-feet as shown in Figure 2-2-1-1-1-T. This increased trend of increasing Basin overdraft was caused by a cycle of below average rainfall in the region from 1998 to 2004.

As shown in Figure 2-2-1-1-1-T, for the 2004-05 water year, which ended June 30, it is estimated that the accumulated overdraft totaled 250,000 acre-feet. The recent storm in later 2004 and early 2005 brought significant amount of replenishment supply to refill the basin back in such rapid pace.

Figure 2-2-1-1-1-T: Accumulated Basin Overdraft in Orange County Basin



Source: Orange County Water District, *2003-2004 Engineer's Report*, p. 11

This previous increased accumulated overdraft of the Basin prompted evaluation of the Basin's yield and how the yield can be optimized through projects and programs. As a response to various factors, including a series of years with below average precipitation and the increased accumulated overdraft, in 2003 OCWD reduced the BPP to decrease pumping from the Basin. OCWD also updated its management approach to manage the amount of water supply provided by the Basin.

The Basin management approach, approved by OCWD in December 2002, is based upon developing a base amount of groundwater production the Basin can annually sustain utilizing dependable water supplies the Basin can count on receiving given average conditions. The base amount of

dependable replenishment water is derived from the sources described in Table 2-2-1-1-1-E.

Table 2-2-1-1-1-E: Sources of Recharge Water Supplies for Orange County Basin

Can Count on to Determine Sustainable Groundwater Production [Note 3]	
Source	**Methodology for Estimating [Note 1]**
SAR Base Flows	3-year moving average
Captured SAR Storm Flows	10-year moving average
Natural Net Incidental Recharge (Incidental recharge minus Los Angeles County outflow)	5-year moving average, with adjustment to account for storage level in basin
Talbert Seawater Barrier Injection	Annual review and estimate
GWRS Phase 1 water pumped to Kraemer Basin (beginning in 2007)	Annual review and estimate
Alamitos Seawater Barrier Injection	Annual review and estimate
Arlington Desalter Supplies	Annual review and estimate
Other upstream supplies discharged to the SAR	Annual review and estimate
Metropolitan Replenishment Water	Annual review and estimate [Note 2]

Note:

1. Estimated amount of water from each source to be reviewed annually at a minimum (more frequent analysis as conditions warrant)

2. In years when the accumulated basin overdraft is less than 500,000 acre-feet, OCWD uses a constant 65,000 acre-feet of Metropolitan replenishment supply to estimate its sustainable groundwater production for the year. In years when the accumulated basin overdraft is greater than 500,000 acre-feet, OCWD will determine the sustainable groundwater production based on "anticipated" replenishment supply forecast by Metropolitan.

3. Sustainable Groundwater Production is determined by withholding a pre-determined amount of supply to refill the basin.

Source: Orange County Water District, *Groundwater Management Plan* , p. 9-10

In addition to the change of operation approach, completion of GWR System in 2007 will provide 72,000 acre-feet per year of recharge water. Assuming that 12,000 acre-feet per year of water was injected in the Talbert Barrier in the years prior to the GWR System becoming operational, the GWR System will provide a net increase of 60,000 acre-feet per year to the basin.

OCWD's recently adopted management approach for establishing the basin BPP, as described in its Groundwater Management Plan, March 2004 (*see Appendix 2-B*), uses the following principles:

- Set a base production amount at a level utilizing an average amount of replenishment water that can be secured from all sources (Table 2-2-1-1-1-E);

- Account for water quality improvement project pumping that is above the BPP;

- Adjust the BPP annually based upon the previous year's performance relative to the Average Hydrology/Normal Replenishment (AH/NR) condition and current overdraft situation. This approach would allow adjustments for

short-term variables and account for long-term trend changes;

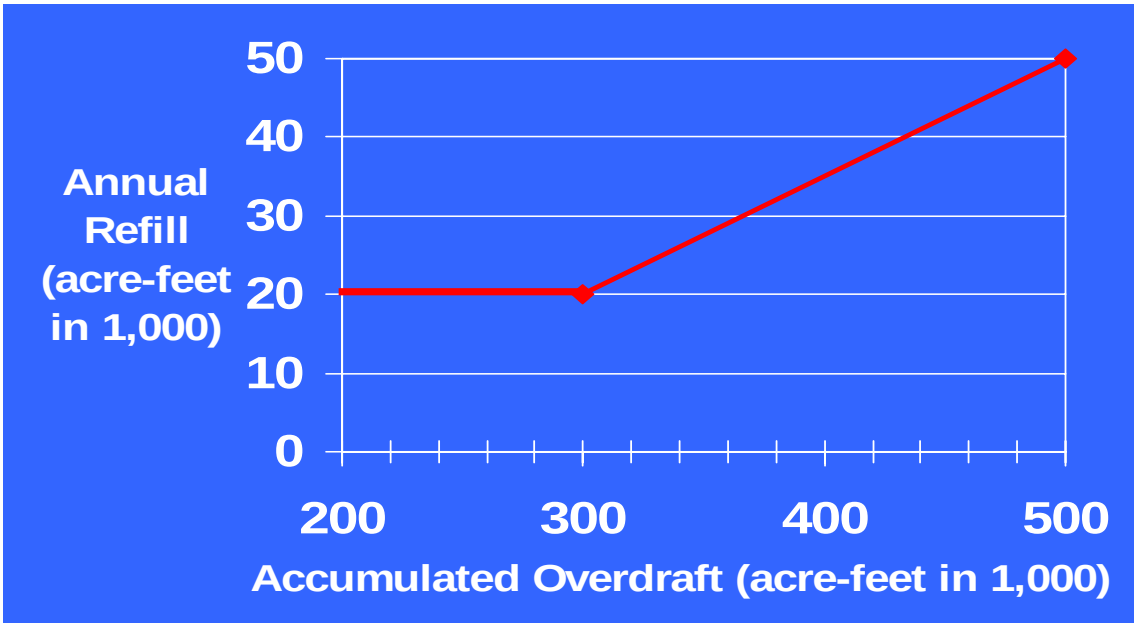
- Adjust the AH/NR condition using a 3-10 year rolling average (as shown in Table 2-2-1-1-1-E);

- To mitigate financial impacts on producers, make all efforts to not reduce the BPP more than five percent in any one year, unless health and safety issues or other emergency circumstances prevail;

- In the event of a drought or curtailment of imported water supplies, OCWD Board may authorize changes to the BPP as necessary to address the circumstances;

- Ensure that the accumulated overdraft is reduced by a minimum of 20,000 acre-feet each year until the accumulated overdraft is 250,000 acre-feet or less. The recommended basin refill rate is shown in Figure 2-2-1-1-1-U, which would refill the basin from 400,000 to 200,000 acre-feet of overdraft in nine years.

Figure 2-2-1-1-1- U: Recommended Basin Refill Rate for Orange County Basin



Source: Orange County Water District, *Groundwater Management Plan*, p. 9-14

Groundwater Quality

For the major inorganic ions, water within the basin is primarily sodium-calcium bicarbonate in character. The average Total Dissolved Solid (TDS) content of the 240 public supply wells is 507 mg/L with a range of 196 – 1,470 mg/L.

Current quality issues are seawater intrusion near the coast, colored water from natural organic materials in the lower aquifer system, salinity, nitrates, and local volatile organic compound.

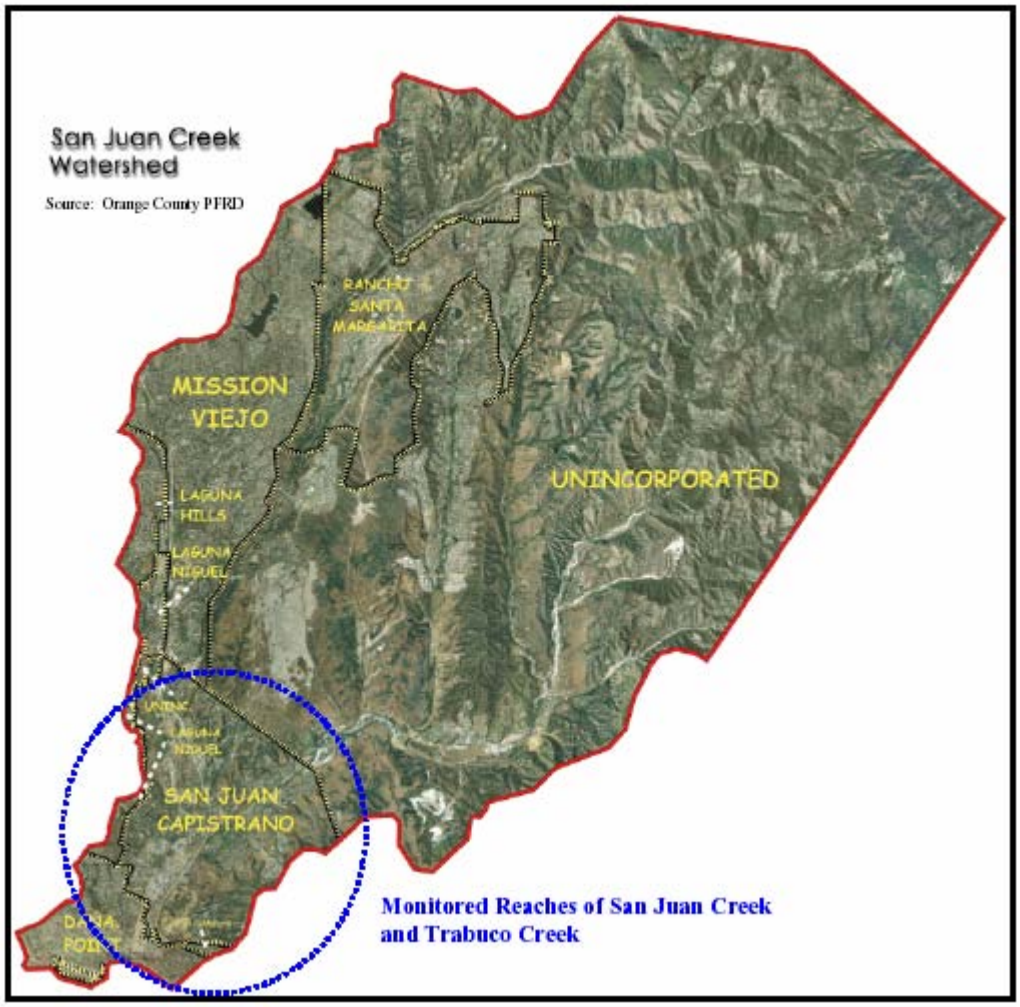
A detailed discussion of water quality relating to this basin is available in Section 3.

2.2.1.1.2 San Juan Basin

Basin Boundaries and Hydrology

This groundwater basin underlies the San Juan Valley and several tributary valleys in southern Orange County. The basin is bounded on the west by the Pacific Ocean and otherwise by tertiary semi-permeable marine deposits. San Juan Creek drains the San Juan Valley, and several other creeks drain valley tributaries to the San Juan. (Figure 2-2-1-1-2-A). Average annual precipitation ranges from 11 to 15 inches.

Figure 2-2-1-1-2-A: Map of San Juan Creek Basin



Source: San Juan Basin Water Authority

Water Bearing Formations

The primary water-bearing unit within the San Juan Valley Groundwater Basin is Quanternary alluvium. This alluvium ranges from a heterogeneous mixture of sand, silt, and gravel in the eastern portion of the basin, to coarse sand near the center, to fine-grained lagoonal sediments in the western portion of the basin. Thickness of the alluvium average about 65 feet and may reach more than 125 feet. Specific yield of the alluvium is estimated to average about 13 percent and range from 3 to 22 percent. Wells typically yield from 450 to 1,000 gpm. Sand layers of the Tertiary Santiago Formation may be water bearing within the region and beneath the basin, and minor amounts of water are extracted from fractured basement rock beneath the basin.

Restrictive Structures

At the confluence of San Juan Creek and Canada Chiquita, near the middle portion of the basin, the Cristianitos fault forms a barrier to subsurface outflow. Forester, Mission Viejo, and Aliso faults are not known to form barriers to groundwater flow, but they are mapped as crossing the basin.

Recharge Areas

Recharge of the basin is from flow in San Juan Creek, Oso Creek, and Arroyo Trabuco and precipitation to the valley floor. Water from springs flows directly from Hot Spring Canyon into San Juan Creek, adding to recharge.

Groundwater Level Trends

Groundwater levels in 1987 were similar to water levels in 1952. Hydrographs show seasonal cycles with average declines related to drought cycles that recover during more plentiful seasons. Groundwater flows southwest toward the Pacific Ocean.

Groundwater Storage Capacity

The total storage capacity has been estimated to be 90,000 acre-feet.

Groundwater Budget

A study by NBS Lowry (1994) investigated and modeled the groundwater basin for 1979 through 1990. They determined a mean pumpage of 5,621 acre-feet per year and a mean subsurface inflow of 2,246 acre-feet per year. Average subsurface outflow to the ocean is estimated to be about 450 acre-feet per year.

Groundwater Historical and Projected Extraction

Up until 2004, there has been a limited amount of supply extraction from this basin. Table 2-2-1-1-2-A shows groundwater produced from the basin from 2000 to 2004.

Table 2-2-1-1-2-A: Historical Groundwater Production in San Juan Basin

Acre-feet Per Year				
2000	2001	2002	2003	2004
2,079	2,161	1,663	1,884	2,224

Source: Data Collected from the following Agencies: City of San Clemente, City of San Juan Capistrano, Santa Margarita Water District, South Coast Water District, and Trabuco Canyon Water District

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

In 2000, the California State Water Resources Control Board granted a water rights permit (*Appendix 2-C(i)*) of 9,227 acre-feet per year to San Juan Basin Authority for diversion and use from San Juan Basin. Member agencies of the San Juan Basin Authority are: City of San Juan Capistrano, Moulton Niguel Water District, Santa Margarita Water District, and South Coast Water District. San Juan Basin Authority completed Phase I of San Juan Basin Desalter Project in December 2004. The current capacity of the plant is projected to reach 4,900 acre-feet per year. Depending on the condition of the basin after the implementation of the San Juan Basin Groundwater Management and Facility Plan (*Appendix 2-D*), future expansion of the production may be possible. Another desalter project (see Section 2.2.3 for details) is currently under construction by South Coast Water District. When complete, the project is expect to extract up to 2,000 acre-feet per year from the basin (see *Appendix 2-C (ii)* for the corresponding water permit from State Water Resource Control Board). Table 2-2-1-1-2-B shows projected groundwater production in San Juan Basin.

Table 2-2-1-1-2-B: Projected Groundwater Production in San Juan Basin

Table 2-2-1-1-2-B: Projected Groundwater Production in San Juan Basin Acre-feet Per Year				
2010	2015	2020	2025	2030
8,378	8,899	9,524	9,524	9,524

Source: Data Collected from the following Agencies: City of San Clemente, City of San Juan Capistrano, Santa Margarita Water District, South Coast Water District, and Trabuco Canyon Water District

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

Groundwater Quality

Groundwater mineral content is variable in this basin. Groundwater in the basin typically has calcium bicarbonate or bicarbonate-sulfate character below the upper reaches of

the valleys, and calcium-sodium sulfate or sulfate-chloride near the coast. In general, TDS content in groundwater increases from below 500 mg/L in the upper reaches of the valley to near 2,000 mg/L near the coast. TDS content of water from three public supply wells averages 760 mg/L and ranges from 430 mg/L to 1,250 mg/L.

Groundwater in the western part of the basin has a high TDS content, and water coming from springs in Thermal Canyon has high fluorine content.

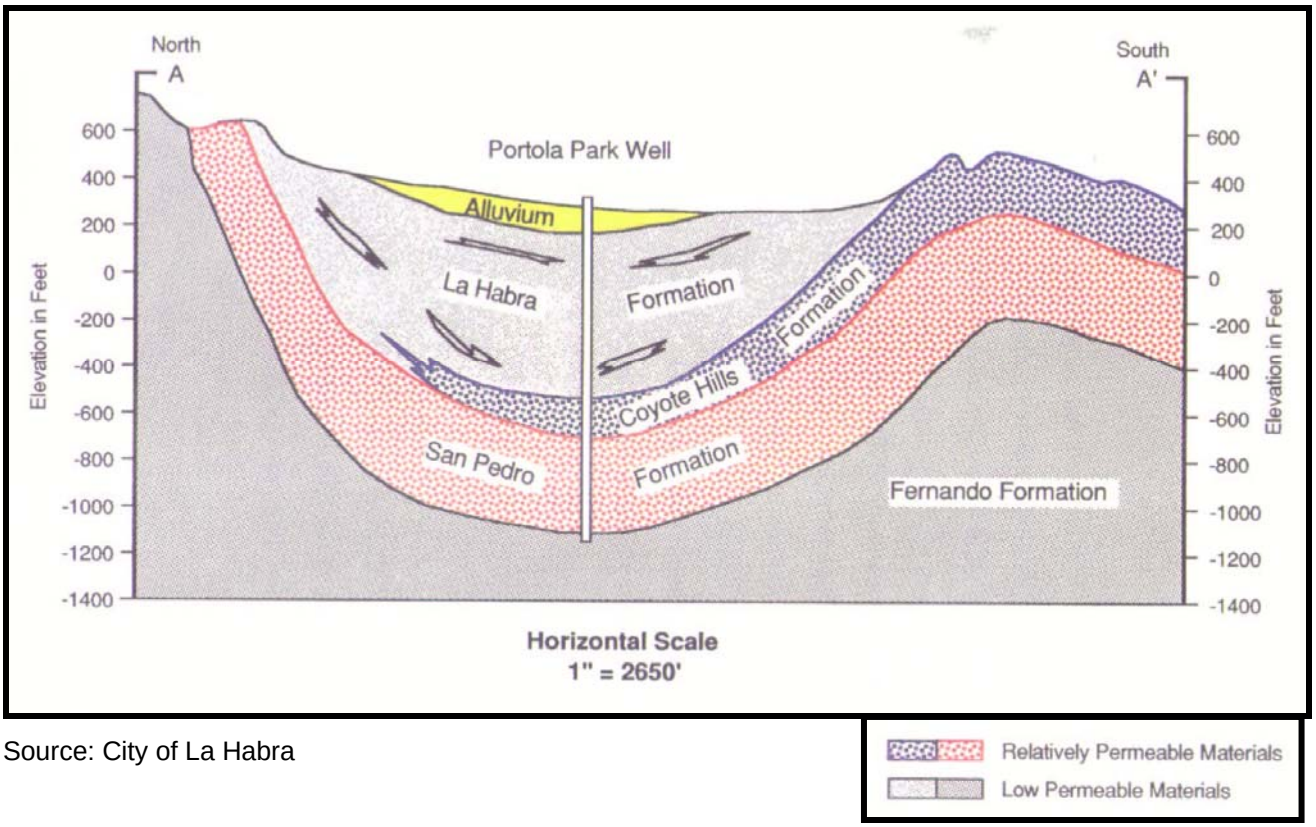
2.2.1.1.3 La Habra Basin

At the preparation of this Plan, there has not been a groundwater management plan available for this groundwater basin. However, the following sections are written, with assistance from City of La Habra, to describe the basin.

Basin Geology

From a structural geology 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 four major formations, which include bearing zones or aquifer units. These are the alluvium, the La Habra formation, the Coyote Hills formation, and the San Pedro formation, all shown on the cross-section contained in Figure 2-2-1-1-3-A.

Figure 2-2-1-1-3-A: Cross-section of La Habra Basin



Source: City of La Habra

The alluvium is found along the surface stream courses and is composed of unconsolidated silt, clay, sand, and gravel. Thickness of the alluvium ranges from a few feet to over 100 feet.

The La Habra Formation lies below the alluvium, but it can be seen where it is uplifted and exposed in both the Coyote Hills and in the Puente Hills. The La Habra Formation consists of 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 La Habra Basin area.

Immediately underneath the La Habra Formation lies the Coyote Hills Formation. The Coyote Hills is made up of mudstone interbedded with sandstone and pebbly conglomerate, which are 300 to 1,200 feet thick. Water levels in wells of the Coyote Hills Formation have been measured at about 120 feet below the ground surface.

The deepest water bearing unit is the San Pedro Formation. The San Pedro Formation is comprised of cemented and non-

cemented sands, silty sandstone, sandy conglomerate, and pebbly conglomerates. 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.

Groundwater Exploration and Water Quality

Currently, this non-adjudicated basin is serving the city of La Habra. The estimated long-term extraction supply is 4,500 acre-feet per year; however, the historical city of La Habra extraction rate is approximately 1,074 acre-feet per year (averaged over the past 15 years), which is considerably less than the potential yield. Thus, the La Habra Basin has not been identified to be in overdraft. In fact, the City plans to utilize the additional groundwater supply by increasing the capacity on the existing Idaho Street Well.

In 1977, the city commenced an exploration program for local groundwater production in which three test wells were drilled. Only one site was considered satisfactory to complete production facilities. This well was placed into service in 1984 and continued service until it collapsed in January of 1997. In August that same year, the Department of Health Services, Drinking Water Field Operation Branch, Santa Ana District approved the well construction plans for the Idaho Street Well, which is located 30 feet southwest of the original well. The Idaho Street Well is currently the only production of potable domestic water within the boundaries of the city of La Habra.

Additionally, in December of 1994, the City Council authorized the drilling of two new wells (one test well and one production well). Initial water quality tests indicated that the water these wells produced was not suitable for potable usage (high sodium and TDS). As a result, the city has given consideration to treatment and blending for potable use and/or blending for irrigation purposes; however, at this time these alternatives are not considered cost-effective.

Groundwater Recharge and Expected Yield

Based upon recorded stream run-off yields, it is estimated that approximately 2,100 acre-feet of water would percolate during the average year. For direct percolation of rainfall and resulting run-off within the valley itself, it is estimated that

an average of 1,600 acre-feet annually would percolate. Thus, the groundwater recharge is estimated at approximately 3,700 acre-feet per year. Subsurface flow estimates are about 5,500 acre-feet annually. Therefore, it is estimated that an average long-term supply which can be extracted is approximately 4,500 acre-feet (an average of the two values) without severe or sustained changes in the amount of groundwater in storage. Current groundwater production by the city of La Habra at the Idaho Street Well produces approximately 1,200 acre-feet per year, which is only about 25% of its potential yield. Additional development of groundwater resources could significantly increase the available water supply for La Habra. Full development of the La Habra Basin could eventually supply up to 40% of the city's current water demands.

The city of La Habra currently plans to double production capacity for the Idaho Street Well from 1,200 to 2,400 acre-feet per year, which will increase reliance on local sources from 11% to 22% of total demands.

Historical La Habra Groundwater Basin Extraction

Table 2-2-1-1-3-A and 2-2-1-1-3-B detail the history and projection of the water extracted from the La Habra Groundwater Basin.

Table 2-2-1-1-3-A: Historical Groundwater Extraction in La Habra Basin

YEAR	ACRE FEET
1983-84	155
1984-85	807
1985-86	1,279
1986-87	706*
1987-88	1,238
1988-89	1,061
1989-90	1,212
1990-91	1,812
1991-92	1,651
1992-93	1,084
1993-94	1,069

1994-95	1,553
1995-96	1,100
1996-97	47**
1997-98	502
1998-99	1,132
1999-00	930
2000-01	1140
2001-02	1207
2002-03	534
2003-04	1346
2004-05	1006

*1986-87 production down due to major well modifications.
**1996-97 Well No. 2 collapsed.
Source: City of La Habra

Table 2-2-1-1-3-B: Projected Production in La Habra Basin

Acre-feet Per Year				
2010	2015	2020	2025	2030
2,400	2,400	2,400	2,400	2,400

Source: City of La Habra

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

2.2.1.1.4 San Mateo Basin

According to information provided by City of San Clemente (One of MWDOC's retail member agencies), MWDOC concludes that no groundwater has been produced or projected to be produced from this basin.

2.2.1.1.5 Laguna Canyon Basin

As of the preparation of this Plan, there has not been a groundwater management plan available for this groundwater basin. However, the following description is written, with assistance from Laguna Beach County Water District, to describe the basin.

The Laguna Creek watershed lies in the San Joaquin Hills of southern Orange County. The drainage area of approximately 5,412 acres includes the Laguna Creek and Niguel Creek basins and is the largest stream basin to drain

exclusively from the San Joaquin Hills into the ocean. The drainage basin is roughly 6.5 miles long and averages 1.5 miles wide between its boundaries. The upper or northern half of the basin is relatively wide with low subdued hills, whereas the lower half is narrow, with steep slopes forming Laguna Canyon. Elevations reach 1,000 feet above sea level in parts of the drainage basin.

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

Historically, no groundwater has been produced from this basin. However, as augmenting local supply is becoming increasingly critical, Laguna Beach County Water District has proposed a project that will utilize the groundwater from this basin. The following table shows the projected groundwater production from the basin provided by Laguna Beach County Water District:

Figure 2-2-1-1-5-A : Projected Production in Laguna Beach County Water District

Acre-feet Per Year				
2010	2015	2020	2025	2030
200	200	200	200	200

Source: Laguna Beach County Water Authority

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

2.2.1.2 Surface Water

Surface water supplies in Orange County are captured mostly from Santiago Creek into Santiago Reservoir (a.k.a. Irvine Lake) and some reclaimed from local streams and urban runoff in south Orange County (in the Santa Margarita Water District service area).

There are a few other dams located on the smaller streams throughout the County; however, these are generally only for flood control or local agricultural use. Effort has been made in exploring the opportunity for increasing utilization of water in San Juan Basin in south Orange County through the development of desalters and percolation basins.

Table 2-2-1-2-A shows the projected surface supply in 5-year increments from 2005 to 2030.

Table 2-2-1-2-A: Projected Surface Water Production in MWDOC's Service Area

Acre-feet Per Year					
2005	**2010**	**2015**	**2020**	**2025**	**2030**
10,908	11,476	10,749	10,500	10,462	10,525

Source: Municipal Water District of Orange County, Annual 25-Year Survey (Spring 2005)

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

2.2.1.3 Recycled Water

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

Recycled water is widely accepted as a water supply source throughout MWDOC's service area. In the past, recycled water was mainly used for landscape irrigation. Irvine Ranch Water District, a MWDOC member agency, is also at the forefront of using recycled water not only for irrigation, but also for other uses such as toilet flushing and commercial needs. The GWR System, currently under construction, is expected to be completed in 2007. This jointly operated OCSD/OCWD project will result in a dramatic increase in the use of recycled water in Orange County. Proposed uses for GWR SYSTEM include injection for seawater barriers and groundwater recharge. Groundwater recharge will surpass landscape irrigation as the greatest consumer of recycled water in Orange County. Recycled water in MWDOC's service area is treated to various levels dependent upon the ultimate end use and in accordance with Title 22 regulation. More details on the recycled projects in the MWDOC service area are discussed in Section 6 of this Plan.

Table 2-2-1-3-A lists the current recycled water use, and Table 2-2-1-3-B summarizes the projected recycled water use in five-year increments from 2010 to 2030.

Table 2-2-1-3-A: Current Recycled Water Supplies in MWDOC's Service Area

Acre-feet Per Year		
User Type	**Treatment Level**	**2005**
I.		
Green Acre Project	Title 22	2,577
City of San Clemente	Title 22	552
El Toro Water District	Title 22	430
Irvine Ranch Water District	Title 22	15,296
Moulton Niguel Water District	Title 22	7,868
Santa Margarita Water District	Title 22	4,270
South Coast Water District	Title 22	890
Trabuco Canyon Water District	Title 22	850
	Subtotal	32,733
II. Seawater Barriers		
Interim GWRS Pilot Plant	Micro-filtration/Reverse	4,000
	Subtotal	4,000
	Total	**36,733**

Note: All recyled water is treated to meet Title 22 standards. Treatment levels vary depending upon the sources.
Source: Interviews conducted by Camp Dresser and McKee for Municipal Water District of Orange County

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

Table 2-2-1-3-B: Projected Recycled Water Supplies in MWDOC's Service Area

Acre-feet Per Year					
User Type	**2010**	**2015**	**2020**	**2025**	**2030**
I.					
Green Acre Project	3,175	3,218	3,240	3,240	3,240
City of San Clemente	1,256	1,767	2,300	2,300	2,300
City of San Juan Capistrano	2,056	2,556	3,039	3,350	3,350
El Toro Water District	575	575	575	575	575
Irvine Ranch Water District	26,203	26,091	27,948	29,231	29,231
Moulton Niguel Water District	9,800	9,800	9,800	9,800	9,800
Santa Margarita Water District	6,367	8,306	10,162	12,122	12,122
South Coast Water District	1,000	1,000	1,000	1,000	1,000
Trabuco Canyon Water District	956	1,000	1,000	1,000	1,000
Subtotal	**51,388**	**54,313**	**59,064**	**62,618**	**62,618**
II. Groundwater Recharge					
Groundwater Replenishment System	**38,000**	**38,000**	**38,000**	**38,000**	**38,000**
II. Seawater Barriers					
Groundwater Replenishment System	34,000	34,000	34,000	34,000	34,000
Alamitos	2,000	2,000	2,000	2,000	2,000
Subtotal	**36,000**	**36,000**	**36,000**	**36,000**	**36,000**
Total	**125,388**	**128,313**	**133,064**	**136,618**	**136,618**

Note: All recyled water is treated to meet Title 22 standards. Treatment levels vary depending upon the sources.
Source: Municipal Water District of Orange County, Annual 25-Year Survery (Spring 2005)

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

Direct non-potable recycled water usage totaled 32,733 acre-feet in the MWDOC service area in 2005, while seawater barrier used about 4,000 acre-feet.

In 2030, direct non-potable recycled water usage is projected to reach nearly 63,000 acre-feet, an increase of 91% from 2005. The indirect usage non-potable water usage for groundwater recharge and seawater barriers is expected to reach 74,000 acre-feet, almost 19 times its current use. Such an increase is due to the forthcoming of GWR System. This single recharge project will ultimately supply 72,000 acre-feet per year, which is currently lost to the ocean as a result of wastewater discharges.

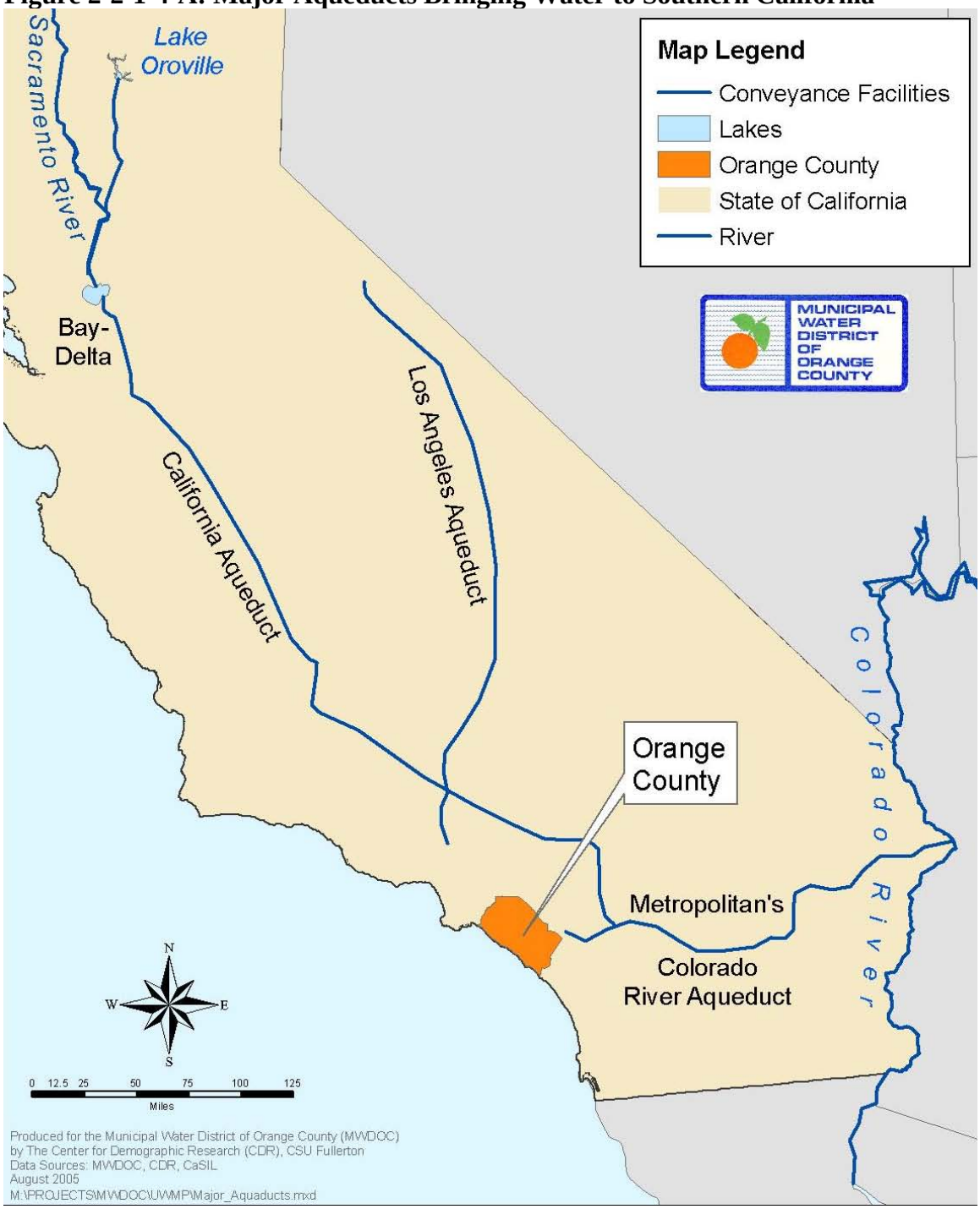
2.2.1.4 Imported Water

Importing Water from Metropolitan Water District of Southern California

Approximately 17.7 million Southern Californians rely on Metropolitan for imported water. Metropolitan wholesales imported water supplies to member cities and water districts in six Southern California counties. Since 1983, the total regional retail water demands within Metropolitan's service area has increased from about 3.0 million acre-feet to 4.1 million acre-feet in 2004. Metropolitan has provided between 45 and 60 percent of the municipal, industrial, and agricultural water used in its nearly 5,200-squre-mile service area. The remaining supply comes from local wells, local surface water, recycled water supplies, and from the City of Los Angeles's aqueduct in the eastern Sierra Nevada.

Historically, Metropolitan has been responsible for importing water into the region through its operation of the Colorado River Aqueduct and its contract with the State of California for State Water Project supplies. Major imported water aqueducts bringing water to Southern California are shown in Figure 2-2-1-4-A. Over the past decade supplies from the Colorado River have averaged 1.2 million acre-feet. Supplies from the State Water Project over the same period have averaged 700,000 acre-feet of water. The future reliability of these supplies is increasingly uncertain; however, Metropolitan has increased its ability to supply water, particularly in dry years, through the implementation of storage and transfer programs. The adopted Metropolitan 2005 Regional Urban Water Management Plan provides detailed documentation of Metropolitan facilities and imported water deliveries. A copy of Metropolitan's 2005 Regional Urban Water Management Plan is included in *Appendix 2-E*.

Figure 2-2-1-4-A: Major Aqueducts Bringing Water to Southern California



In Orange County, MWDOC and the cities of Anaheim, Fullerton, and Santa Ana, receive imported water from Metropolitan. Metropolitan feeders supplying Orange County and the alignment of the major water transmission mains within Orange County are shown in Figure 2-2-1-4-B.

Figure 2-2-1-4-B: Metropolitan Feeders and Transmission Main Serving Orange County

Source: Produced for the Municipal Water District of Orange County by the Center for Demographic Research, CSU Fullerton

MWDOC Imported Demand

To aid in planning future water needs, MWDOC works with its member agencies each year to develop a forecast of future water demand. With this process, MWDOC collects forecasts of total retail demands and local supply, with the exception of forecast of groundwater production from Orange County Basin, from each of its member agencies. MWDOC has developed a computer model that projects the groundwater production from Orange County Basin (please refer to Section 2-2-1-1-1 for a detailed discussion on the modeling effort). The result of this coordination effort allows MWDOC to forecast the imported demand by subtracting total demand from available local supplies. MWDOC then advises Metropolitan annually (in April of each year) of how much water MWDOC anticipates to purchase during the next five years.

In spring of 2005, MWDOC conducted this annual coordination effort by extending the planning horizon specifically to 2030. This is done so MWDOC can use the obtained information to complete this Plan and to comply with *California Water Code* 10631(k), which requires an urban water supplier to provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 25 years.

Table 2-2-1-4-A shows the projected imported water demand in the MWDOC service area for both direct and indirect use. As discussed in Section 2-1-3-1, the term “direct use” refers to water consumed directly by users, and “indirect use” refers to the water used for replenishment storage or for saline barriers.

Table 2-2-1-4-A: Projected Imported Water Demand in MWDOC's Service Area

Acre-feet Per Year					
From Metropolitan	**2010**	**2015**	**2020**	**2025**	**2030**
For Direct Consumptive Use					
Brea, City of	5,997	6,491	6,930	7,242	7,242
Buena Park, City of	4,536	5,982	7,203	7,028	6,799
East Orange County Water District	2,947	3,064	3,092	3,076	3,055
El Toro Water District	10,984	11,153	11,323	11,493	11,645
Fountain Valley, City of	2,697	3,339	3,497	3,413	3,301
Garden Grove, City of	5,122	6,914	7,420	7,375	7,228
Huntington Beach, City of	8,327	10,312	10,781	10,625	10,370
Irvine Ranch Water District	31,178	35,358	39,529	40,867	43,714
La Habra, City of	2,225	2,477	2,613	2,684	2,699
La palma, City of	629	780	824	811	788
Laguna Beach County Water District	2,628	2,678	2,728	2,773	2,773
Mesa Consolidated Water District	616	1,634	1,747	1,599	1,443
Moulton Niguel Water District	35,114	35,435	35,935	36,435	36,881
Newport Beach, City of	4,643	6,200	6,436	6,303	6,097
Orange, City of	7,594	9,773	10,157	9,882	9,521
San Clemente, City of	9,806	9,992	9,994	9,994	9,994
San Juan Capistrano, City of	4,839	4,878	4,919	4,961	5,007
Santa Margarita Water District	30,957	32,767	35,565	36,627	36,651
Santiago County Water District	2,015	2,154	2,204	2,254	2,299
Seal Beach, City of	1,108	1,393	1,485	1,449	1,402
Serrano Water District	-	-	-	-	-
South Coast Water District	7,209	6,686	6,196	6,306	6,306
Golden State Water Company	7,540	9,522	10,159	9,780	9,513
Trabuco Canyon Water District	4,543	4,819	5,058	5,269	5,400
Westminster, City of	3,472	4,298	4,540	4,458	4,307
Yorba Linda Water District	11,280	12,394	12,694	12,619	12,546
Subtotal of Imported Demand for Direct Use	**208,006**	**230,494**	**243,030**	**245,322**	**246,981**
Subtotal of Imported Demand for Indirect Use (For OCWD)	**61,739**	**58,734**	**56,685**	**57,048**	**50,700**
Total Imported Demand	**269,745**	**289,228**	**299,715**	**302,370**	**297,681**

Source: Muncipal Water District of Orange County, output of "Water Balance" Model

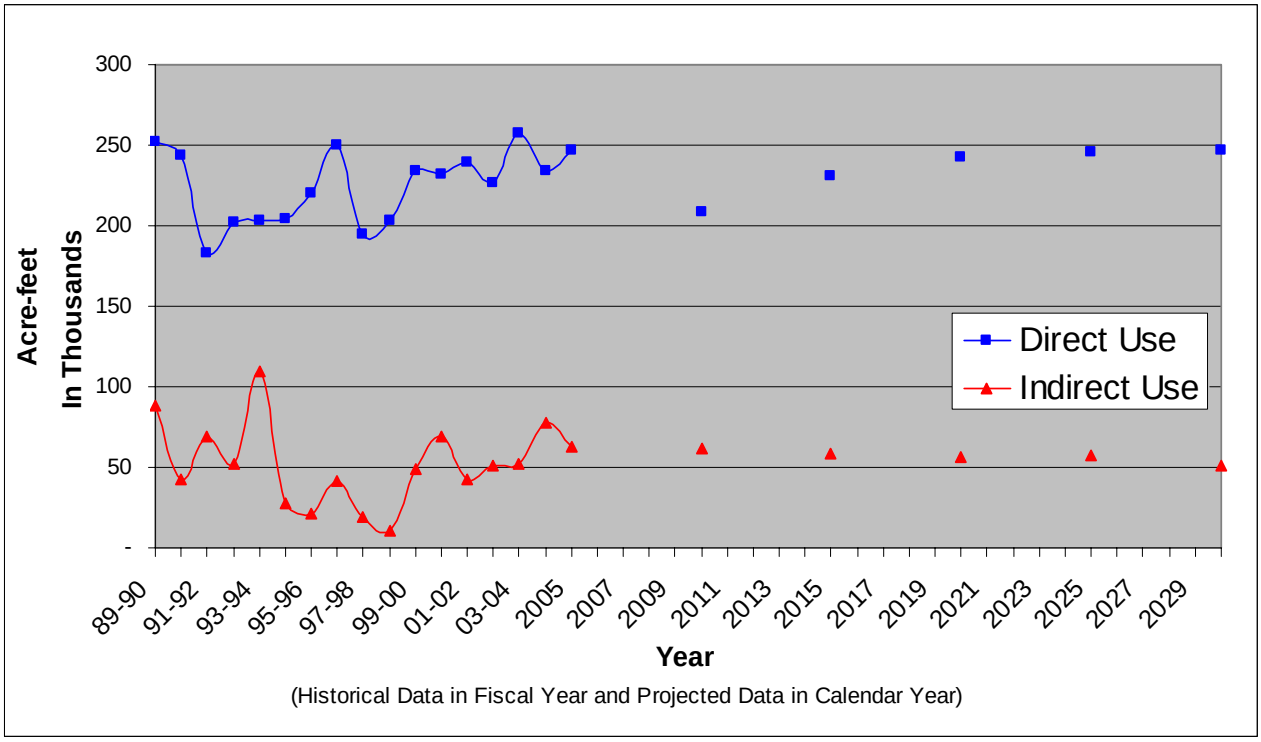
In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

As shown in Figure 2-2-1-4-C, the imported demand was reduced in the mid-90s due to the overall reduction of water demand resulting from post-drought water use efficiency measures. However, the imported demand began to increase again as the overall demands continue to grow. When OCWD reduced its BPP from 75% to 66% in 2003, the imported demand exceeded the pre-drought level as the groundwater supply decreased. The retail demand level is projected to continue to grow in the next 25 years, but local supplies are also expected to increase in the next 25 years. The resulting net demand on Metropolitan would be expected to reduce initially in the next 10

years as local projects become materialized. However, the imported demand will again return to the present level as overall population grows in the region.

Also shown on Figure 2-2-1-4-C is the historical and projected imported demand for indirect use. Historically, the imported water for indirect use has fluctuated based on surplus supply availability. Unlike imported demand for direct use, which is driven by the need of the water use, the imported demand for direct use is driven by the availability of replenishment supply from Metropolitan. To project the availability of replenishment supply from Metropolitan, MWDOC worked with Metropolitan staff to derive the average replenishment supply available to MWDOC based on forecasts of Metropolitan's imported supplies and regional demands. The projected average replenishment supply available is shown in Figure 2-2-1-4-C from 2010 to 2030. The data shown is consistent with MWDOC's projection of local groundwater supply for Orange County Basin, which partially depends on the projected replenishment supply from Metropolitan. If conditions change in the future allowing Metropolitan to provide greater replenishment supply, then the projection for local groundwater supply will increase accordingly.

Figure 2-2-1-4-C: Imported Demand in MWDOC's Service Area



Metropolitan Supply Reliability

In its Draft Regional 2005 Urban Water Management Plan (September, 2005), Metropolitan presents its supply availability at the regional level, rather than at the member agency level. With that, MWDOC is not able to quantify the availability of imported supply from Metropolitan specifically for MWDOC. However, in that draft plan (Section II.2 - *Evaluating Supply Reliability*), Metropolitan was able to show that it can maintain 100% reliability in meeting direct consumptive demand under the conditions that represent normal, single driest, and multi-dry years through 2030.

Inferring from the supply reliability findings stated by Metropolitan, MWDOC concludes that Metropolitan is capable of supplying imported water to meet demand projected by MWDOC under various hydrologic conditions.

2.2.1.5 Transfer and Exchange

Metropolitan currently has a tiered unbundled rate structure. Tier 2 of this rate structure increases the cost of supply to a member agency in order to provide a price signal that encourages development of alternative supply sources. One alternative source of supply may be a transfer or exchange of water with a different agency.

The CALFED program has helped to develop an effective market for water transactions in the Bay-Delta region. This market is demonstrated by the water purchases made by the Environmental Water Account and Metropolitan in recent years. MWDOC and its member agencies plan to take advantage of selected transfer or exchange opportunities in the future. These opportunities can help ensure supply reliability in dry years and avoid the higher Tier 2 cost of supply from Metropolitan. The continued development of a market for water transactions under CALFED will only increase the likelihood of MWDOC's participation in this market when appropriate opportunities arise.

MWDOC is in the process of developing long-term relationships with water suppliers in Northern California. These relationships may lead to transfer agreements in the near future. One example of this is the South Feather Water and Power Agency (SFWPA). MWDOC has discussed a potential transfer of water from SFWPA through the State Water Project and Metropolitan's distribution system into MWDOC's service area. This possible long-term transfer would solidify MWDOC's dry-year supplies while also helping to reduce dry-year costs. Initial discussions indicate this transfer could be in the range of 10,000 acre-feet per year.

A few MWDC member agencies have also expressed interests in pursuing transferring outside of the MWDOC's region. MWDOC will continue to help its member agencies in developing these opportunities and ensuring their success. In fulfilling this role, MWDOC will look to help its member agencies navigate the operational and administrative issues of wheeling water through the Metropolitan water distribution system.

MWDOC may also participate with other Metropolitan member agencies to transfer water across agency boundaries. One such possibility is a purchase of recycled water from the city of Long Beach. This long-term transaction could make up to 10,000 acre-feet per year of recycled water available for delivery in MWDOC's service area. This arrangement will have many benefits including:

- Savings from lower purchases of Metropolitan Tier 2 supplies;
- Reduced Capacity Charges from Metropolitan due to lower demands; and
- Reduced reliance on imported water.

Currently, one of MWDOC's retail member agencies, Santa Margarita Water District has entered into a short-term transfer agreement with Cucamonga Valley Water District. Cucamonga Valley Water District is a retail member agency under Inland Empire Utilities Agency, which is a member public agency of Metropolitan. For details of this exchange agreement, please see Appendix 7-A for a copy of the "Memorandum of Understanding Between MWDOC and IEUA for Exchange of MWD Drought Allocation." According to the agreement, MWDOC and Inland Empire Utilities Agency shall confer with Santa Margarita Water District and Cucamonga Valley Water District to determine the amount of water, which may be up to 4,250 acre-feet per year, called for under the agreement should Metropolitan allocate less than the full amounts of imported supplies to MWDOC and Inland Empire Utilities Agency. Whatever water is reallocated from Inland Empire Utilities Agency to MWDOC under this arrangement would be passed through from MWDOC to Santa Margarita Water District.

2.2.1.6 Desalination

Overview

Water treatment technology has continued to advance, and costs have continued to decrease, providing greater opportunities to develop previously unusable surface water, groundwater, wastewater, and ocean water for potable water supply. One of the

great success stories in advanced water treatment technology since its invention in the mid-1960s at UCLA has been the development and advancement of Reverse Osmosis (RO) membrane systems. Membrane systems have seen increasing application in water supply for removal of salts and other constituents, such as synthetic and natural organic compounds. In addition, many other advanced water treatment technologies, such as advanced oxidation and improved disinfection methods, have been developed and are continuing to be invented and further refined. These unit processes, including membrane systems, can be used in various arrays to meet particular water treatment needs for a given water source.

Today, membrane treatment with RO systems is considered by most practitioners to be the preferred cost-effective technology for desalination and natural organic compound removal (colored groundwater, etc). Most of the earlier seawater desalination projects have been built outside of the United States and were primarily thermal distillation systems. Today, most of the newer plants use RO membrane technology. In addition, a newer membrane technology, microfiltration (MF), is also seeing increased application in surface water treatment and for pretreatment in ocean water desalination projects using open intakes for feedwater supply and RO for desalination.

To accommodate long-term population and economic growth in Southern California, and to protect against long-term trends and more extreme variability in natural water supply, as well as development and depletion of water resources outside of Southern California, continuing regional and local efforts in water resource management and supply development will be necessary. Application of desalination technology is increasingly being recognized as one important supply component to develop new firm water supplies and to bolster water system reliability. Overall supply shortage risks from drought and emergency outages can be lessened with a diversified and disaggregated water supply portfolio that incorporates appropriate desalination projects.

Wastewater Recycling

OCWD initiated research and development activities in water desalination in the late 1960s for the purpose of developing a firm, high quality supply suitable for injection into its seawater intrusion control barrier. By the early 1970s, OCWD had constructed Water Factory 21, an advanced treatment facility that utilized RO and other treatment processes to desalt and purify treated wastewater for seawater barrier injection.

Today, OCWD is in the process of replacing and expanding upon its successful Water Factory 21 project with construction of the GWR System. The GWR System is a water supply project designed to ultimately reuse up to approximately 140,000 acre-feet per year of advanced treated wastewater (recycled water). The initial $487 million project will supply approximately 72,000 acre-feet per year and provide the backbone facilities for future expansion. The purification process consists of MF (microfiltration), RO, AOP (advanced oxidation process) and post-disinfection. This project will increase the capacity and size of the seawater intrusion control barrier through the addition of new injection wells, as well as provide a new, reliable, high quality source of water to replenish the Orange County Basin. It is scheduled to be fully operational in summer 2007. It also provides a major benefit to the OCSD by treating 100 MGD of wastewater through the use of MF during peak wet weather flow conditions, which will defer the need for a new ocean outfall.

Impaired Groundwater

Metropolitan instituted its Groundwater Recovery Program in 1991 to provide financial incentives (up to $250 per acre-foot) to local agencies to develop brackish groundwater impaired from either natural causes or from agricultural drainage. The purpose of the program was to increase utilization of groundwater storage within the region for firm local production, conjunctive use storage, and drought supply. In MWDOC's service area, five groundwater recovery brackish water projects have contracts with MET. Three have been constructed and are now operational, and two are in the process of being implemented. Two additional projects have been constructed to treat groundwater which is unusable due to high levels of color and natural organics.

Two groundwater desalters were constructed and have been successfully in operation for several years by the city of Tustin under a joint agreement with OCWD. Groundwater in the greater Tustin area has high levels of dissolved solids and nitrates due to natural causes and agricultural drainage. Groundwater quality in the Tustin area is showing signs of slow improvement due to the removal of past accumulated salts. The Irvine Ranch Water District is in the process of constructing its Irvine Desalter Project to recover brackish groundwater from the Irvine Subbasin, an area where groundwater has also been impaired from natural causes and agricultural drainage.

The city of San Juan Capistrano has recently constructed a groundwater desalter to treat brackish San Juan Creek underflows which have been impaired primarily due to natural causes. The South Coast Water District is in the process of implementing its San

Juan Creek groundwater desalter project. Both projects utilize RO technology.

The combined yield from these seven projects was 18,632 acre-feet in fiscal year 2004/2005. This supply is expected to increase to 32,380 acre-feet at ultimate development of these projects. Since these projects are recovering 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 utilization 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.

Table 2-2-1-6-A summarizes information on groundwater recovery projects in the MWDOC service area.

Table 2-2-1-6-A: Groundwater Recovery Projects in MWDOC's Service Area

	Lead Agency / Name	On-Line Date	Production FY '04-05 (AF/yr)	Production Ultimate (AF/yr)	Capital Cost ($M)	Total Unit Cost [1] $/AF	Metro-politan Subsidy Contract?	Notes on cost
Colored Water	IRWD DATS	Nov-2001	7,652	7,200	16.0	390	N	DATS O&M $300/AF
	Mesa CWD Colored Water, Ph. 1	Jan-2001	5,290	5,650	12.3		Y	Mesa O&M $357/AF plus $200/AF bromate
subtotal			12,942	12,850	28.3			
Brackish Water	IRWD Irvine Desalter- Potable	7/07	[2] -	7,694	29.9	1,092	Y	
	IRWD Irvine Desalter- Non potable	7/06	[2] -	3,898	combined	293	N	
	San Juan Desalter	Dec-2004	1,628	[3] 4,800	32.0	913	Y	
	SCWD Capistrano Beach Desalter	2006-07	[4] -	1,300	9.5	1,400	Y	5.5M is for plant only; 4.0M for access road
	Tustin Desalter (17th St.)	1996	2,062	3,579	8.8		Y	$7.8 M in 1996, and $1.0 M in 2002
	Tustin Nitrate (Main St.)	1989	2,000	2,000	2.8		N	$1.7 M in 1989, and $1.0 M in 2002
subtotal			5,690	23,271	83.0			
Total			**18,632**	**36,121**	**111.3**			

[1] Unit cost is calculated as total cost (annualized capital cost plus Operation & Maintenance cost) divided by ultimate yield. Number shown is before grants or subsidies have been subtracted.
[2] Irvine Desalter Project includes 2 separate sub-projects: TCE-contaminated water treated for non-potable use, and brackish water treated for potable use. Construction contract award August 2005.
[3] FY '04-05 number for San Juan Desalter is only for part of its first year.
[4] Capistrano Beach Desalter construction began in 2005. Facility is being built to produce 1,300 AF/yr although current permit is for 972 AF/yr.

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

Ocean Water Desalination

Desalination of ocean water provides a potentially unlimited supply of water if it can be desalinated and treated at reasonable costs. This section addresses previous efforts and current proposals for developing a desalinated ocean water supply in Orange County.

Earlier Initiatives

The first proposed desalination project that was considered for location in Orange County was the Bolsa Island Nuclear Power and Desalination Plant project, a joint project of Metropolitan, the U.S. Government (Office of Saline Water of the Department of Interior and the Atomic Energy Commission), and the three major electric utilities serving Southern California (Los Angeles Department of Water and Power, Southern California Edison Company, and San Diego Gas & Electric Company). This proposed project would have augmented treated water supply to Metropolitan and to Metropolitan's central pool area. Agreements to develop the project were entered into in August 1966 by the parties.

This proposed project included a nuclear power thermal generation sized at 1800 MW and a thermal distillation desalination supply sized at 150 MGD. The proposed project was to be sited on a 40-acre island to be constructed 2800 feet offshore of Bolsa Chica State Beach, with product water piped to the Diemer Filtration Plant for blending with imported Colorado River Water. Initial costs were estimated in 1965 at $444 million and were later revised upwards to $765 million in July 1968. Due to escalating costs, the utilities terminated their participation, and by fiscal year 1969/1970 all project agreements had been terminated. Although not constructed, this project opened the way for continued research in development of a cost-effective desalinated water supply source in Southern California. Metropolitan has continued research and development efforts periodically since that time.

Current Initiatives

In the late 1990s, Poseidon Resources Corporation initiated, at their own expense, investigations to develop an ocean desalination plant in Orange County. In early 2000, MWDOC entered into a letter of intent to examine Poseidon's proposed Huntington Beach Seawater Desalination Project offer. MWDOC rescinded its offer later that year after further evaluation. Poseidon continued with offers from Santa Margarita Water District and Southern California Water Company. Both those offers were later not renewed.

As part of MWDOC's South Orange County Water Reliability Study, and upon request from South Coast Water District, an ocean desalination plant was included for consideration in the reliability study. That study found that an ocean desalination plant in south Orange County would provide needed system reliability as well as providing for a firm regional water supply.

As a result of negotiations from the Colorado River Quantification Settlement Agreement process, Metropolitan initiated a request for proposal in November 2001 from its member agencies for participation in the Seawater Desalination Program. MWDOC submitted a proposal along with four other Metropolitan agencies (Los Angeles Department Water and Power, West Basin Municipal Water District, Long Beach Water Department, and San Diego County Water Authority). These five agencies submitted proposals for 126,000 acre-feet per year in late 2002 which was subsequently adjusted to 142,000 acre-feet per year with Los Angeles Department Water and Power increasing its proposal amount. Metropolitan's *July 2004 Integrated Resource Plan (IRP)* update included a seawater desalination goal of 150,000 acre-feet per year. Metropolitan and the five desalination agencies have been in the process of developing a basic agreement for implementation of this program.

Overview of Proposed Projects

In Orange County, there are three proposed ocean desalination projects that could serve MWDOC and its member agencies with additional water supply. These are the Poseidon Resources proposed Huntington Beach Seawater Desalination Project, the joint San Diego County Water Authority (SDCWA) and MWDOC proposed Regional San Onofre Seawater Desalination Project, and the MWDOC proposed Dana Point Ocean Desalination Project.

Poseidon Resources Corporation Proposed Project

The Poseidon Resources proposed Seawater Desalination Project would be co-located within the AES Generation Power Plant in Huntington Beach. It is being planned to provide 50 MGD of desalinated supply for distribution into coastal and south Orange County. Since this is a privately sponsored project, it will require a conditional use permit from the city of Huntington Beach. The city is the lead agency under the California Environmental Quality Act. In 2003, the city found the project would cause unacceptable environmental impacts as proposed by Poseidon. Consequently, the city disapproved the project. Since that time, Poseidon has submitted a revised Draft Environmental Impact Report for reconsideration by the city. Currently, the project remains in the environmental review and permitting phase. Major issues include co-location with an aging power plant, unavoidable entrainment and impingement impacts from incremental increases in feedwater pumping, distribution water quality impacts to Irvine Ranch Water District's large-scale recycled water system, and questions related to operational reliability and price escalation. At this time, there are no current agreements with water agencies in Orange County for purchase of the product water.

Joint San Diego/Orange County Proposed Regional San Onofre Project

The joint SDCWA and MWDOC proposed Regional San Onofre Seawater Desalination Project is currently being investigated to determine project feasibility. The project size is yet to be determined, but a large facility is being investigated (50 to 150 MGD). The feasibility investigation will be reviewing the potential use of the Southern California Edison decommissioned Unit 1 San Onofre Nuclear Generation Station cooling water inlet and outlet conduits for feedwater and brine disposal. The State Lands Commission has just recently completed its Final Environmental Impact Report for disposition of these conduits. A subsurface intake system will also be investigated. Delivery of the product water into MWDOC and SDCWA service areas will require pumping and connecting pipelines. Joint interest with the U.S. Marine Corps and U.S. Bureau of Reclamation's Santa Margarita Project is being explored through a joint study of a Coastal Delivery Pipeline with Metropolitan, MWDOC and SDCWA. This project's time frame has been estimated by SDCWA for implementation in 2020.

MWDOC Proposed Dana Point Ocean Desalination Project

MWDOC is currently investigating the feasibility of an ocean water desalination plant in Dana Point adjacent to San Juan Creek. At this time, the overall feasibility investigation is focused in three areas: (1) feedwater supply utilizing a subsurface intake system, (2) concentrated RO reject seawater co-disposal through an existing South Orange County Wastewater Authority ocean outfall, and (3) energy supply. Upon completion of this work, an updated project feasibility report will be prepared and a decision will be made.

If completed, this project will provide both system and supply reliability to the south Orange County area. MWDOC commissioned a preliminary feasibility study of the project in 2000, and the results suggested that the site may be feasible for a 25 MGD desalination project. The recommended source of feedwater supply was an open-intake system. Upon further review of the preliminary subsurface intake system study, it was found that a subsurface intake system may be feasible at this location.

Due to environmental issues, including entrainment and impingement impacts to marine organisms, and permitting challenges associated with constructing a new open intake system, a decision was made to conduct a more extensive hydrogeology investigation into the feasibility of subsurface intakes at this location.

The mouth of San Juan Creek is entirely situated within Doheny State Beach and any work or project development will require the approval of the California Department of Parks and Recreation. Also, construction would be limited to the winter months, and the project would need to be configured so as to minimize impacts to the public and the park. One concept being investigated is a buried, passive collection system that would only result in short-term construction impacts to Doheny State Beach. The California State Department of Parks and Recreation has been very cooperative in approving the Phase 1 Hydrogeology Investigation, which was conducted in February 2005. That work found the alluvial channel system to be deeper and more permeable than originally found in the preliminary feasibility study.

MWDOC has received a California Department of Water Resources Proposition 50 Desalination Research and Development grant proposal in the amount of $1,000,000 to investigate combining horizontal directional drilling with water well technology for use in constructing long, larger diameter feedwater supply wells in the marine alluvial channel system.

2.2.2 Reliability of Water Supply

2.2.2.1 Basis of Water Year Data

Reliability of a supply may often be impacted by climatic variation. To analyze the changes of reliability due to climate, this Plan first establishes the hydrologic conditions that define the climatic variations within the MWDOC region – what constitutes the normal water year, the single dry water year, and the multiple dry water years.

Table 2-2-2-1-A shows the basis of water year type.

Table 2-2-2-1-A: Basis of Water Year Data in MWDOC's Service Area

Water Year Type	Basis of Water Year (s)			Based on Historical Sequence
Normal Water Year	Average of 83 Historical Hydrologies			1922 to 2004
Single-Dry Water Year	1961			1922 to 2004
Multiple-Dry Water Year	1959	1960	1961	1922 to 2004

Source: Municipal Water District of Orange County, output of "Water Balance" Model

When deciding on which historical hydrology to best represent the types of water year, MWDOC considered the combination of the followings:

- Total retail demands of the water year;

- Local supply condition of the water year; and

- Imported supply condition of the water year.

Imported-supply demand typically increases during dry years when the weather is hot and there is a decrease in local runoff. Furthermore, in its preliminary draft UWMP plan Metropolitan demonstrated it has developed flexible water supplies through transfers and storage programs designed to increase its resources during dry water year conditions. As a result, the water year is defined by the net difference of total retail demand less local supplies. The greater the net difference, the more critical it is for MWDOC to depend on imported supply.

Using the water balance computer model developed by MWDOC (see *Appendix 2-A(i)*), all three variables – retail demand, local supplies, and imported supplies – were simulated using 83 historical hydrologies from 1922 to 2004. The average of the 83 simulated trials was used to represent a normal condition (normal water year). Of the 83 years, the hydrologic condition of 1961 yields the highest demand for imported supply, and is therefore used to define a single dry year in the MWDOC service area. Similarly, the historical sequence from 1959 to 1961 yields the highest demand in a three-year sequence for imported supply, and is used to define a multiple-dry year in the MWDOC service area. In this modeling analysis, the single dry year is defined as "the year with the highest imported demand in the MWDOC service area". It is also coincided with the last year of a multiple dry-year event (a 3-year event). This analysis indicates that by the end of a multiple dry-year event, local supplies – primarily groundwater from the Orange County Basin -- are predicted to decline as storage is depleted. However, this analysis assumes groundwater production levels are based on the modeled Basin Production Percentage (BPP) from Orange County Basin and does not consider that Orange County Water District could choose to set a BPP that provides for no reduction (or an increase) in local supply. Moreover, the Orange County Water District Act does not restrict individual producers from pumping over the BPP to optimize the use of storage in the Basin during dry water year conditions. This is appropriate given the nature and purpose of the basin.

However, Metropolitan defines its water years with different historical hydrologies. According to its Draft Regional Urban Water Management Plan (September 2005), Metropolitan defines its multiple dry years with 1990-1992 and single dry years with 1977. MWDOC did review its imported demand based on Metropolitan-defined water years. The result indicates that the single year of 1961 and the sequence of 1959 to 1961 are considered to be more

conservative because they yield higher imported demands than any other years in the historical pool.

2.2.2.2 Supply Reliability in Normal, Single Dry, and Multiple-Dry Water Years

Table 2-2-2-2-A shows the reliability of local and imported supplies for direct consumption in MWDOC service area in different water year types from 2005 to 2030 in five-year increments.

Table 2-2-2-2-A: Supply Reliability for Retail Consumption in MWDOC's Service Area

Acre-feet Per Year					
2005-2010	**Normal**	**Single**	**Multiple Dry Water Years**		
	Water Year (Average)	**Dry Year (1961)**	**2008 (1959)**	**2009 (1960)**	**2010 (1961)**
Local Supply	346,968	332,774	333,125	332,843	332,774
	% of Normal	95.9%	96.0%	95.9%	95.9%
Imported Supply	208,006	254,476	244,821	237,614	254,476
	% of Normal	122.3%	117.7%	114.2%	122.3%
2010-2015	**Normal**	**Single**	**Multiple Dry Water Years**		
	Water Year (Average)	**Dry Year (1961)**	**2013 (1959)**	**2014 (1960)**	**2015 (1961)**
Local Supply	347,662	322,569	324,837	319,490	322,569
	% of Normal	92.8%	93.4%	91.9%	92.8%
Imported Supply	230,494	288,677	282,844	276,226	288,677
	% of Normal	125.2%	122.7%	119.8%	125.2%
2015-2020	**Normal**	**Single**	**Multiple Dry Water Years**		
	Water Year (Average)	**Dry Year (1961)**	**2018 (1959)**	**2019 (1960)**	**2020 (1961)**
Local Supply	356,336	328,874	329,027	324,399	328,874
	% of Normal	92.3%	92.3%	91.0%	92.3%
Imported Supply	243,030	304,510	302,616	294,339	304,510
	% of Normal	125.3%	124.5%	121.1%	125.3%
2020-2025	**Normal**	**Single**	**Multiple Dry Water Years**		
	Water Year (Average)	**Dry Year (1961)**	**2023 (1959)**	**2024 (1960)**	**2025 (1961)**
Local Supply	365,377	334,801	344,291	330,406	334,801
	% of Normal	91.6%	94.2%	90.4%	91.6%
Imported Supply	245,322	310,194	302,951	301,248	310,194
	% of Normal	126.4%	123.5%	122.8%	126.4%
2025-2030	**Normal**	**Single**	**Multiple Dry Water Years**		
	Water Year (Average)	**Dry Year (1961)**	**2028 (1959)**	**2029 (1960)**	**2030 (1961)**
Local Supply	369,577	341,783	355,198	337,298	341,783
	% of Normal	92.5%	96.1%	91.3%	92.5%
Imported Supply	246,981	309,572	301,024	302,027	309,572
	% of Normal	125.3%	121.9%	122.3%	125.3%

Source: Municipal Water District of Orange County, output of "Water Balance" Model

As shown on Table 2-2-2-2-A, the local supply diminishes during the single-dry and multiple-dry water years. Local supplies available during these years range from 90% to 96% of the amount available in normal years. On the other hand, due to its development of flexible water supplies through transfers and storage programs, Metropolitan demonstrated in its draft Regional UWMP that it has increased resources to supply the increasing demand in the region during dry water year conditions. As the result, the reliability of imported supply was shown to increase from 114% to 126% of those in normal years.

Table 2-2-2-2-B shows the reliability of local and imported supplies for indirect consumption in MWDOC service area in different water year types from 2010 to 2030 in 5-year increments.

Table 2-2-2-2-B: Supply Reliability for Groundwater Replenishment & Saline Barrier in MWDOC's Service Area

Acre-feet Per Year					
2005-2010	**Normal**	**Single**	**Multiple Dry Water Years**		
	Water Year (Average)	**Dry Year (1961)**	**2008 (1959)**	**2009 (1960)**	**2010 (1961)**
Local Supply	327,195	323,279	340,280	340,082	323,279
	% of Normal	98.8%	104.0%	103.9%	98.8%
Imported Supply	61,739	52,750	56,750	40,500	52,750
	% of Normal	85.4%	91.9%	65.6%	85.4%
2010-2015	**Normal**	**Single**	**Multiple Dry Water Years**		
	Water Year (Average)	**Dry Year (1961)**	**2013 (1959)**	**2014 (1960)**	**2015 (1961)**
Local Supply	327,259	309,144	312,108	317,101	309,144
	% of Normal	94.5%	95.4%	96.9%	94.5%
Imported Supply	58,734	46,245	49,531	32,420	46,245
	% of Normal	78.7%	84.3%	55.2%	78.7%
2015-2020	**Normal**	**Single**	**Multiple Dry Water Years**		
	Water Year (Average)	**Dry Year (1961)**	**2018 (1959)**	**2019 (1960)**	**2020 (1961)**
Local Supply	335,483	339,107	311,771	331,754	339,107
	% of Normal	101.1%	92.9%	98.9%	101.1%
Imported Supply	56,685	16,250	48,750	16,250	16,250
	% of Normal	28.7%	86.0%	28.7%	28.7%
2020-2025	**Normal**	**Single**	**Multiple Dry Water Years**		
	Water Year (Average)	**Dry Year (1961)**	**2023 (1959)**	**2024 (1960)**	**2025 (1961)**
Local Supply	344,176	343,029	329,437	335,045	343,029
	% of Normal	99.7%	95.7%	97.3%	99.7%
Imported Supply	57,048	16,250	48,750	16,250	16,250
	% of Normal	28.5%	85.5%	28.5%	28.5%
2025-2030	**Normal**	**Single**	**Multiple Dry Water Years**		
	Water Year (Average)	**Dry Year (1961)**	**2028 (1959)**	**2029 (1960)**	**2030 (1961)**
Local Supply	357,779	360,681	344,781	343,998	360,681
	% of Normal	100.8%	96.4%	96.1%	100.8%
Imported Supply	50,700	8,283	48,750	16,250	8,283
	% of Normal	16.3%	96.2%	32.1%	16.3%

Source: Municipal Water District of Orange County, output of "Water Balance" Model

As shown on Table 2-2-2-2-B, both local and imported supplies diminish during dry water year conditions. Local sources for replenishing storage decrease due to lower runoffs from Santa Ana River and local streams. Imported supply is also shown to be reduced as Metropolitan is allocating all its resources to meet the

direct demand, thereby reducing its surplus supplies for replenishment uses.

Other than climatic variation, MWDOC concludes that there are no other factors contribute to the resulting of inconsistency of supply.

2.2.3 Planned Water Supply Projects and Programs

MWDOC has worked closely with its member agencies to decrease dependence and/or increase their supply reliability on imported water by further developing local supplies. Details on programs undertaken by MWDOC to minimize the dependence of imported demand for the region are discussed in Section 4 of this Plan. Although MWDOC has not carried out specific supply development projects in the region, it follows closely with those currently being developed by its member agencies. The following are brief descriptions of the projects that are in progress to meet the projected water use for the region (presumably, these projects will be discussed in further details in the UWMPs developed by each member agency):

1. El Toro Portion of Advance Wastewater Treatment Joint Project with Irvine Ranch Water District and Moulton Niguel Water District This Advanced Wastewater Treatment Project is a proposed joint project among El Toro Water District, Irvine Ranch Water District, and Moulton Niguel Water District. This regional recycled water project will provide treatment and distribution facilities for a combined demand of 4,313 acre-feet per year within the three districts' service areas. The regional recycled water system will service portions of the cities of Laguna Niguel, Laguna Hills, Laguna Woods, Lake Forest, Irvine, Mission Viejo, and Aliso Viejo.

   The project will develop a 5.0 MGD advanced water treatment plant at the site of the existing El Toro Water District Water Recycling Plant (WRP). The project will also include the construction of a 3,500 gallon per minute (gpm) Recycled Water Effluent Pump Station, rehabilitation of 7,200 linear feet of a 21-inch reinforced concrete transmission pipeline, construction of 3,000 linear feet of a 16-inch high-density polyethylene pipeline, construction a small distribution system pump station, and construction of approximately 22,000 linear feet of distribution pipelines ranging in diameter from 4 to 10 inches.

   The specifics of this project include the reuse of 4,313 acre-feet per year of which 2,730 acre-feet of recycled water would be conveyed to Irvine Ranch Water District (please note that the projected 2,730 acre-feet is currently excluded from Irvine Ranch Water District's supply portfolio), 1,000 acre-feet to Moulton Niguel Water District, and 583 acre-feet to El Toro Water District. This project directly

offsets the need for imported water supplies from Metropolitan, thus providing benefits to the Sacramento-San Joaquin Delta and Colorado River. This project will provide an opportunity for customers that use high valued imported water for non-potable purposes such as landscape irrigation, commercial, and industrial uses to instead take advantage of using recycled water. At this time, the implementation of this project is still subject to grant funding;

2. Irvine Ranch Water District Irvine Desalter – The Irvine Desalter Project (IDP) is a groundwater quality restoration project that will clean groundwater in the vicinity of the former Marine Corps Air Station El Toro base. Because of past chemical disposal and waste handling practices at the former base, volatile organic compounds (VOC) such as trichloroethylene have entered both the shallow and principal aquifers on and adjacent to the former base. In addition, areas just outside the plume of contamination contain elevated salts and nitrates caused by natural geology and past agricultural drainage, which make the water unsuitable for drinking. The IDP proposes to pump and treat groundwater containing salts and nitrates to stop its migration from the Irvine Subbasin into the main Orange County Groundwater Basin and to also prevent VOC-contaminated groundwater from spreading into the main Orange County aquifer.

   The IDP will consist of two water purification plants with separate wells and pipeline systems; one portion of the IDP will produce drinking water, and the other will produce non-potable water. The drinking water purification plant will use reverse osmosis and disinfection, and the non-drinking water plants will purify the VOC contaminated water using air stripping and carbon absorption. During 2003-2004, Wells 76, 77, and 110 were drilled. Wells ET-1, 78, 107, and 113 already exist and will only need to be modified for this project. Wells 106 and 115 are existing Irvine Company wells which have recently been transferred to IRWD. Well 115 has been included, and Well 106 will be added to the system in the future. In addition, Well 75 is a future well which may be drilled if the other wells do not produce sufficient amounts of water;

3. Irvine Ranch Water District Wells – Wells 51, 52, 53, 21, and 22 – collectively are also known as the West Irvine Well Field. Wells 21 and 22 are located outside of the Irvine Ranch Water District boundary (and outside the Irvine Sub-basin) within the city of Tustin, southeast of the Newport and Santa Ana Freeways. Both wells were constructed in 1992. TDS levels for both wells have been measured above 600 mg/l in the past and may require partial desalting. Irvine Ranch Water District owns well 51 located at MacArthur Boulevard and the 55 Freeway. This well has never been placed in service due to high color. The TDS for Well 51 is very low at about 180 mg/L; however color units were found to be high.

Irvine Ranch Water District plans to treat this water for high color. Irvine Ranch Water District owns a site for a second well (well 52) in the vicinity of Alton Parkway and the 5 Freeway, and a third well (well 53) to be constructed north of Barranca Parkway. Groundwater production from well 52 is also expected to require treatment for high color;

4. Irvine Ranch Water District Future Groundwater Wells – IRWD has identified the need to develop additional groundwater supply; however, details of the project are yet to be identified;

5. IRWD Desalter Wells 106 and 115 – Well 115 has been included in the system, and Well 106 will be included in the future system. (See description of Irvine Desalter Project in item #2);

6. Irvine Ranch Water District Michelson and Los Alisos Water Treatment Plant Upgrade – Irvine Ranch Water District produces tertiary-treated recycled water through the District's Michelson Water Recycling Plant and Los Alisos Water Recycling Plant. Irvine Ranch Water District is currently in the process of upgrading both of these treatment plants to allow for increased production to meet growing recycled water demands. The upgrade at Michelson Water Recycling Plant will allow for production to increase from 15 MGD to 18 MGD. The Los Alisos Water Recycling Plant treatment system will be upgraded with tertiary capacity to accommodate flows up to 7.3 MGD. The plan includes pumping and piping facilities to allow Los Alisos WRP recycled water to be delivered to Zone B of the IRWD system and to Zone A areas in the Lake Forest service area. These upgrades are within existing permit authorizations and California Environmental Quality Act compliance;

7. Irvine Ranch Water District Michelson Expansion Phase II – This is a future expansion of the Michelson Water Recycling Plant from 18 MGD to 33 MGD to serve Irvine Ranch Water District's ultimate recycled water demands. IRWD plans to increase the capacity of the existing plant site to produce sufficient recycled water to meet the projected demand in the year 2030;

8. Laguna Beach County Water District Laguna Creek Watershed Project – This project intends to reclaim and treat local runoff and stormwater in Laguna Creek. The treated water would be recharged into the Laguna Canyon groundwater basin and extracted for potable use. The agency is also considering an option that takes the treated water for direct irrigation use;

9. Laguna Beach County Water District Wells in Orange County Basin – Laguna Beach County Water District claims the right to extract

2,025 acre-feet per year from Orange County Basin. The agency is currently exploring options with OCWD to deliver this amount of water to its service area by 2010;

10. Moulton Niguel Water District Reclamation Expansion Phase IV (LRP 98) – This project includes expanding the recycled water distribution system to allow an additional 2,572 acre-feet per year of recycled wastewater to be served throughout the Moulton Niguel Water District. The expansion includes pump stations, reservoirs and pipelines being connected to the existing recycled water distribution system. The source of water is treated wastewater that would otherwise have been discharged to the ocean from a combination of Moulton Niguel Water District Joint Regional Advanced Wastewater Treatment, MNWD 3A Advanced Wastewater Treatment, and purchased from South Coast Water District's Coastal Advanced Wastewater Treatment;

11. Moulton Niguel Water District's portion of SOCWA Advanced Wastewater Treatment – Moulton Niguel Water District is planning to participate in the planned construction of an Advanced Wastewater Treatment plant at the South Orange County Wastewater Authority Jay B. Latham Wastewater Treatment Plant.

    Moulton Niguel Water District will own 1.5 MGD of the treatment capacity of the Advanced Wastewater Treatment and will distribute the recycled water to its customers via its Recycled Water Distribution System. The wastewater treated at the Advanced Wastewater Treatment Plant would have otherwise been discharged to the ocean. This project is a part of the Integrated Water Resources Management Plan for south Orange County and part of the Proposition 50 Chapter 8 grant application;

12. San Juan Capistrano Valley Non-domestic Water System Expansion – The proposed system expansion includes two projects: (i) an Advanced Water Treatment Facility; and (ii) improvements on the San Juan Capistrano Recycled Water Distribution System.

    The proposed Advanced Water Treatment Facility will be constructed at the J.B. Latham Plant, which is operated and maintained by the South Orange County Wastewater Authority. The proposed project will be constructed in three phases. The City of San Juan Capistrano will be the lead agency for the development of Phase 1, a 6 MGD Advanced Water Treatment. This facility will provide recycled water exclusively to the city of San Juan Capistrano.

    In addition to the Advanced Water Treatment Plant, the project also proposes to construct transmission mains and a recycled water

reservoir to the existing recycled water distribution system in San Juan Capistrano.

The water supply from this proposed expansion will serve the largest and most demanding areas for recycled water in the city of San Juan Capistrano;

13. Santa Margarita Water District Chiquita Reclamation Expansion I - The Chiquita Water Reclamation Plant has an existing capacity to produce 5.0 of recycled water. The Phase I expansion is proposed to be 3.0 MGD, to bring the plant tertiary capacity to 8.0 MGD. The expansion is proposed to be on-line in Fiscal Year 2009/2010;

14. Santa Margarita Water District Chiquita Reclamation Expansion II - A final expansion of the Santa Margarita Water District Chiquita Reclamation Plant is proposed between 2015 and 2020, with an addition of 5 MGD bringing the recycled water capacity up to 13 MGD with a projected average annual production of 11 MGD;

15. Santa Margarita Canada Gobernadora - The Santa Margarita Water District proposes to construct the Gobernadora Multipurpose Basin (GMB) to respond to erosion and sedimentation along Gobernadora Creek, high storm flows damaging the downstream restoration habitat area, excessive surface and groundwater originating upstream, and degraded water quality. Canada Gobernadora is a sub-basin (Basin Number 1.24) within the San Juan Creek Watershed. The upper portion of Canada Gobernadora has been developed over the past two decades as the community of Coto de Caza.

    The GMB will consist of a storm detention basin that will be established as a wetland and riparian habitat, an infiltration gallery to capture and divert flows to the wetlands, a pump station and pipeline. The GMB will be utilized to capture and naturally treat urban runoff and storm flows to: 1) reduce downstream erosion and sedimentation; 2) address excessive surface and groundwater; and 3) improve the water quality in the Gobernadora Creek and San Juan Creek.

    Successful implementation of the Basin is anticipated to result in the following project benefits:

    - Attenuation of storm flows, reduction of soil erosion and sedimentation, and removal of excess surface and groundwater. These problems, which are currently damaging Gobernadora Creek and the Gobernadora Ecological Resource Area (GERA), and presenting obstacles to the restoration of Gobernadora Creek advocated by the participants in the Special Area Management Plan and

Natural Communities Conservation Plan, including state and federal resource agencies, are a concern to the Army Corps of Engineers.;

- Higher quality of water, specifically a reduction in total coliform, biological oxygen demand, total solids, ammonia, nitrogen, and phosphates, utilizing natural vegetated treatment methods instead of chemicals;

- Protection of beneficial uses of the GMB, including contact and non-contact recreation, cold and warm freshwater habitat, and wildlife habitat; and

- Capture and reuse of a valuable water resource decreasing the need to utilize domestic water for nonpotable purposes.

Thus the construction of the basin will dramatically improve supply reliability by collecting and storing storm water supplies for irrigation. Construction will also include the creation of wetlands to protect the existing wetlands and other watershed ecosystems, and treat non-point source pollution;

16. Santa Margarita Dove Canyon Project – Santa Margarita Water District in conjunction with the Starr Ranch Audubon Society is developing an urban water return flow collection facility to divert the flow to its seasonal storage Portola Reservoir in Coto de Caza. The facility will collect 100 acre-feet per year. The collection facility will not only be a source of irrigation water but benefits the downstream environment;

17. Santa Margarita Horno Basin Surface Water – Santa Margarita Water District is considering the collection of urban runoff flows from the Horno Water Quality Basin for irrigation uses. The low flows are generally return flows from the sale of water within the Ladera Ranch community. Santa Margarita Water District has not waived or abandoned its rights to recover return flows from the groundwater basin and desires that such waters be put to beneficial use in order to reduce or offset requirements for imported water;

18. South Coast Water District Capistrano Beach Desalter – South Coast Water District is currently constructing this groundwater recovery facility that should be operational by the end of 2006. The plant initially will be built for 1,300 acre-feet per year; however, the current State Water Resources Control Board permit allows for 976 acre-feet per year until additional availability in the basin is shown. The plant is being built for future expansion by additional reverse osmosis trains. The cost of the plant is $5.5 million not including offsite facilities. South Coast Water District may be allowed to

expand beyond the current state permit once the performance of the basin is established;

19. Orange County Water District/Orange County Sanitation District Groundwater Replenishment System (GWR System) – The purpose of GWR System is to augment existing groundwater supplies through indirect potable reuse, providing a reliable, high-quality source of recharge water for the Orange County Basin. The GWR SYSTEM consists of three major components: (1) Advanced Water Treatment facilities and pumping stations, (2) a pipeline connection from the treatment facilities to existing recharge basins, and (3) expansion of the Talbert Barrier. The first phase of the GWR System will produce 72,000 acre-feet per year for groundwater recharge. The GWR System will be operational in mid-2007.

Table 2-2-3-A provides estimated timelines, projected supplies, and expected reliability in single-dry and multiple dry years for the projects listed.

Table 2-2-3-A: Planned Water Supply Projects in MWDOC's Service Area

		2010					2015					2020				
Project Name	Projected Completion Date	Normal-year AF to agency	Single-dry year yield AF	Multiple-Dry-Year 1 AF	Multiple-Dry-Year 2 AF	Multiple-Dry-Year 3 AF	Normal-year AF to agency	Single-dry year yield AF	Multiple-Dry-Year 1 AF	Multiple-Dry-Year 2 AF	Multiple-Dry-Year 3 AF	Normal-year AF to agency	Single-dry year yield AF	Multiple-Dry-Year 1 AF	Multiple-Dry-Year 2 AF	Multiple-Dry-Year 3 AF
ETWD Protion of El Toro AWT Joint project with MNWD and IRWD	2009-10	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
IRWD Irvine Desalter (Nonpotable)	2006-07	3,898	3,898	3,898	3,898	3,898	3,898	3,898	3,898	3,898	3,898	3,898	3,898	3,898	3,898	3,898
IRWD Irvine Desalter (potable)	2007-08	4,645	4,645	4,645	4,645	4,645	5,372	5,372	5,372	5,372	5,372	5,372	5,372	5,372	5,372	5,372
IRWD Wells 51,52,53,21&22	2009-10	5,327	5,327	5,327	5,327	5,327	9,494	9,494	9,494	9,494	9,494	10,375	10,375	10,375	10,375	10,375
IRWD Other Groundwater	2024-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IRWD IrvineDesalter Wells 106,115	2014-15	0	0	0	0	0	2,903	2,903	2,903	2,903	2,903	2,903	2,903	2,903	2,903	2,903
IRWD Michelson&LAWRP Reclamation 2005 Upgrades	2006-07	7,713	7,713	7,713	7,713	7,713	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500
IRWD Michelson Reclamation Expansion Phase II	2014-15	0	0	0	0	0	1,693	1,693	1,693	1,693	1,693	3,524	3,524	3,524	3,524	3,524
LBCWD Laguna Creek Watershed Project	2007-08	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Laguna Beach Well in the OCWD Basin	2009-10	2,025	2,025	2,025	2,025	2,025	2,025	2,025	2,025	2,025	2,025	2,025	2,025	2,025	2,025	2,025
Moulton Niguel Reclamation Expansion Phase IV (LRP 98)	2006-07	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276
MNWD portion of SOCWA AWT	2007-08	204	204	204	204	204	364	364	364	364	364	364	364	364	364	364
MNWD portion of El Toro AWT Joint project	2009-10	50	50	50	50	50	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390
San Juan Capistrano Valley Non-Domestic Water System Expansion (LRP-98)	2007-08	1,250	1,250	1,250	1,250	1,250	1,750	1,750	1,750	1,750	1,750	2,250	2,250	2,250	2,250	2,250
SMWD Chiquita Reclamation Expansion I	2009-10	785	828	838	814	838	2,715	2,864	2,897	2,815	2,897	3,360	3,360	3,360	3,360	3,360
SMWD Chiquita Reclamation Expansion II	2019-20	0	0	0	0	0	0	0	0	0	0	1,154	1,402	1,456	1,321	1,456
SMWD Canada Gobernadora	2008-09	725	653	653	653	653	725	653	653	653	653	725	653	653	653	653
SMWD Dove Canyon	2007-08	100	90	90	90	90	100	90	90	90	90	100	90	90	90	90
SMWD Horno Basin Surface Water	2006-07	215	194	194	194	194	215	194	194	194	194	215	194	194	194	194
South Coast WD Capistrano Beach Desalter	2006-07	800	800	800	800	800	1,300	1,300	1,300	1,300	1,300	2,000	2,000	2,000	2,000	2,000
Groundwater Replenishment System	2007	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000

		2025					2030				
Project Name	Projected Completion Date	Normal-year AF to agency	Single-dry year yield AF	Multiple-Dry-Year 1 AF	Multiple-Dry-Year 2 AF	Multiple-Dry-Year 3 AF	Normal-year AF to agency	Single-dry year yield AF	Multiple-Dry-Year 1 AF	Multiple-Dry-Year 2 AF	Multiple-Dry-Year 3 AF
ETWD Protion of El Toro AWT Joint project with MNWD and IRWD	2009-10	200	200	200	200	200	200	200	200	200	200
IRWD Irvine Desalter (Nonpotable)	2006-07	3,898	3,898	3,898	3,898	3,898	3,898	3,898	3,898	3,898	3,898
IRWD Irvine Desalter (potable)	2007-08	5,372	5,372	5,372	5,372	5,372	5,372	5,372	5,372	5,372	5,372
IRWD Wells 51,52,53,21&22	2009-10	12,155	12,155	12,155	12,155	12,155	12,155	12,155	12,155	12,155	12,155
IRWD Other Groundwater	2024-25	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575
IRWD IrvineDesalter Wells 106,115	2014-15	2,903	2,903	2,903	2,903	2,903	2,903	2,903	2,903	2,903	2,903
IRWD Michelson&LAWRP Reclamation 2005 Upgrades	2006-07	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500
IRWD Michelson Reclamation Expansion Phase II	2014-15	4,931	4,931	4,931	4,931	4,931	4,931	4,931	4,931	4,931	4,931
LBCWD Laguna Creek Watershed Project	2007-08	200	200	200	200	200	200	200	200	200	200
Laguna Beach Well in the OCWD Basin	2009-10	2,025	2,025	2,025	2,025	2,025	2,025	2,025	2,025	2,025	2,025
Moulton Niguel Reclamation Expansion Phase IV (LRP 98)	2006-07	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276
MNWD portion of SOCWA AWT	2007-08	364	364	364	364	364	364	364	364	364	364
MNWD portion of El Toro AWT Joint project	2009-10	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390
San Juan Capistrano Valley Non-Domestic Water System Expansion (LRP-98)	2007-08	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600
SMWD Chiquita Reclamation Expansion I	2009-10	3,360	3,360	3,360	3,360	3,360	3,360	3,360	3,360	3,360	3,360
SMWD Chiquita Reclamation Expansion II	2019-20	3,307	3,674	3,754	3,554	3,674	3,307	3,674	3,754	3,554	3,674
SMWD Canada Gobernadora	2006-07	725	653	653	653	653	725	653	653	653	653
SMWD Arroyo Trabuco	2007-08	100	90	90	90	90	100	90	90	90	90
SMWD Horno Basin Surface Water	2006-07	215	194	194	194	194	215	194	194	194	194
South Coast WD Capistrano Beach Desalter	2006-07	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Groundwater Replenishment System	2007	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000

Source: Municipal Water District of Orange County, Annual 25-Year Survey (Spring 2005)
In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data takes precedence

2.3 Water Service Reliability

This section assesses the reliability of MWDOC's water service to its customers during three water year scenarios: normal water year, single dry water year, and multiple dry water years. As shown in Table 2-3-A, the Plan concluded that the region will be able to meet 100 percent of its demand under every water year scenario.

Table 2-3-A: Summary of Water Service Reliability in MWDOC's Service Area

	2010	2015	2020	2025	2030
Normal Water Year	100%	100%	100%	100%	100%
Single-Dry Year	100%	100%	100%	100%	100%
Multiple-Dry Years	100%	100%	100%	100%	100%

Source: Municipal Water District of Orange County, output of "Water Balance" Model

To evaluate the service reliability of its service area, MWDOC used a computer model called "Water Balance Model" developed by its staff. This model is used to forecast local groundwater supplies from Orange County Basin and the imported demand taking the following into consideration: total retail demand, local recycled water, local surface water, local groundwater supply, and weather. Like the model used by Metropolitan, this model uses 83 years of historical hydrology (from 1922 to 2004) to develop estimates of water supply and demand in Orange County over the 25-year planning horizon. The outputs from these model runs enable MWDOC staff to assess the water service reliability in MWDOC's service area. See *Appendix 2-A* for outputs from the model runs. However, it should be noted that outputs from the model runs provide possible scenarios of supply and demand levels within the MWDOC service area, based on the underlying assumptions. Actual supply and demand will vary from these outputs based on conditions at the time and resource management decisions made by Orange County Water District for production from Orange County Basin and by local agencies.

The region's water supply for direct use is broken down into four categories: groundwater, recycled water, surface water, and imported water. As for indirect use, the supply is broken down into four categories: nature and subsurface flows, recycled water, imported water, and deposit/withdraw from storage. The assessment is done by comparing the supplies in these categories to demands based on historical hydrology that are equivalents to the three types of water year

scenarios. The determination of historical basis of the water year types for MWDOC was discussed in Section 2.2.2 Again the base years are:

- Normal water year: average of 83 historical hydrology from 1922 to 2004;
- Single dry normal water year: 1961 hydrology; and
- Multiple dry water years: 1959 to 1961 hydrology.

The following subsection describes and compares the region's water supply and demand during each of the scenarios for the next twenty five years.

2.3.1 Normal Water Year

With emphasis on local water supply development within MWDOC's service area, it is anticipated that the demand on imported water supplies in ratio will be reduced in the future. Projected normal year supplies for direct consumptive use are presented in Table 2-3-1-A and supplies for replenishment and saline barriers are in Table 2-3-1-B.

Table 2-3-1-A: Projected Supply for Direct Consumption in MWDOC's Service Area – Normal Water Year Condition

Acre-feet Per Year						
	2005	2010	2015	2020	2025	2030
Groundwater	234,019	284,117	282,392	286,628	292,297	296,434
Surface Water	10,908	11,476	10,749	10,500	10,462	10,525
Recycled Water	31,619	51,375	54,521	59,208	62,618	62,618
Imported Water	245,232	208,006	230,494	243,030	245,322	246,981
Total	**521,778**	**554,975**	**578,156**	**599,365**	**610,699**	**616,558**
% of year 2005						
Groundwater		121%	121%	122%	125%	127%
Surface Water		105%	99%	96%	96%	96%
Recycled Water		162%	172%	187%	198%	198%
Imported Water		85%	94%	99%	100%	101%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-1-B: Projected Supply for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Normal Water Year Condition

Acre-feet Per Year						
	2005	2010	2015	2020	2025	2030
Natural Flows Note 1	316,505	249,063	255,084	261,684	268,964	277,739
Recycled Water	4,000	72,000	72,000	72,000	72,000	72,000
Imported from Metropolitan	63,181	61,739	58,734	56,685	57,048	50,700
Imported from Others	4,000	4,000	4,000	4,000	4,000	4,000
+/- Storage	(62,606)	2,132	(3,825)	(2,201)	(789)	4,041
Total	**325,080**	**388,934**	**385,993**	**392,169**	**401,223**	**408,479**
% of year 2005						
Natural Flows		79%	81%	83%	85%	88%
Recycled Water		1800%	1800%	1800%	1800%	1800%
Imported from Metropolitan		98%	93%	90%	90%	80%
Imported from Others		100%	100%	100%	100%	100%
+/- Storage (increase/decrease from 2005)		103%	94%	96%	99%	106%

Source: MWDOC, output of "Water Balance" Model

Note 1: Natural Flows in 2005 reflect an extremely wet year with increased Santa Ana Storm flow and Orange County Basin's incidental recharge

As shown in the two tables above, all local supplies, with the exception of surface water, are projected to be greater than those available in 2005. The following paragraphs describe the projected supplies under a normal water year condition in the MWDOC region over the next 25 years.

Groundwater – During normal water years, groundwater provides the single largest source of supplies (almost 50% of all supplies). The majority of groundwater is produced from the Orange County Basin, with additional water produced from other local groundwater basins. The production from Orange County Basin is directly correlated to the supplies available for replenishment and saline barriers listed in Table 2-3-1-B. However, note that the correlation occurs over multiple year periods, and the Basin should be considered a significant storage reservoir that can be utilized to provide supplies during dry year conditions. Although replenishment water from Metropolitan is projected to decrease by about 20% from 2005 to 2030, both recycled water and natural flows are expected to increase. Anticipating the growth at the upper Santa Ana River watershed, the baseflow, the main components of natural flows, is projected to be increased by expecting greater municipal discharge to the river. When complete in 2007, Groundwater Replenish System will provide 72,000 acre-feet of recycled water for basin replenishment. Together with the addition of desalter projects in San Juan Basin, groundwater production for direct consumption is projected to increase 27% from 2005 to 2030.

Surface Water – A small portion of the water supply for the MWDOC service area is comprised of surface water. The principal sources of surface water came from natural runoff from Santiago Creek collected in Irvine

Lake. However, the initial increase of surface water supply shown in Table 2-3-1-A is attributed to the increasing amount of reclaimed surface water in south Orange County.

Recycled Water – Recycled water is becoming an increasingly important source of local water for the region. Current use of recycled water within the region is approximately 32,000 acre-feet per year and is expected to increase to nearly 63,000 acre-feet per year in 2030, an increase of 96%.

Imported Water – Significant efforts have been made to develop local supplies and, as a result, the demand for imported water in ratio is expected to decrease in the future. While the retail demand is projected to grow, the region is not expected to increase its demand on imported water in normal water years.

Tables 2-3-1-C and 2-3-1-D summarize the region's water demands for direct consumption and for replenishment and saline barriers during a normal year.

Table 2-3-1-C: Projected Demand for Direct Consumption in MWDOC's Service Area – Normal Water Year Condition

Acre-feet Per Year						
	2005	2010	2015	2020	2025	2030
Demand	521,778	554,975	578,156	599,365	610,699	616,558
% of year 2005		106%	111%	115%	117%	118%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-1-D: Projected Demand for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Normal Water Year Condition

Acre-feet Per Year						
	2005	2010	2015	2020	2025	2030
Demand	325,080	388,934	385,993	392,169	401,223	408,479
% of year 2005		120%	119%	121%	123%	126%

Source: MWDOC, output of "Water Balance" Model

Both tables indicate that the demands for direct and indirect uses will continue to grow in the next 25 years.

The comparisons between supply and demand for a normal water year are presented in Tables 2-3-1-E and 2-3-1-F (for direct use and indirect use).

Table 2-3-1-E: Comparison of Supply and Demand for Direct Consumption in MWDOC's Service Area – Normal Water Year Condition

Acre-feet Per Year					
	2010	2015	2020	2025	2030
Supply Totals	554,975	578,156	599,365	610,699	616,558
Demand Totals	554,975	578,156	599,365	610,699	616,558
Difference	0	0	0	0	0
Difference as % of Supply	0%	0%	0%	0%	0%
Difference as % of Demand	0%	0%	0%	0%	0%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-1-F: Comparison of Supply and Demand for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Normal Water Year Condition

Acre-feet Per Year					
	2010	2015	2020	2025	2030
Supply Totals	388,934	385,993	392,169	401,223	408,479
Demand Totals	388,934	385,993	392,169	401,223	408,479
Difference	0	0	0	0	0
Difference as % of Supply	0%	0%	0%	0%	0%
Difference as % of Demand	0%	0%	0%	0%	0%

Source: MWDOC, output of "Water Balance" Model

As shown in the tables, the region is expected to meet 100 percent of direct-use demand and indirect-use demand through the year 2030 under a normal water year condition.

2.3.2 Single-Dry Water Year

The water demands and supplies for MWDOC's service area over the next 25 years were analyzed in the event a single dry year occurs, similar to the drought that occurred in Orange County in 1961, which also was the last year of a three-year drought.

Tables 2-3-2-A and 2-3-2-B present the projected supplies for direct and indirect uses during a single dry year event over the next 25 years.

Table 2-3-2-A: Projected Supply for Direct Consumption in MWDOC's Service Area – Single-Dry Water Year

Acre-feet Per Year					
	2010	2015	2020	2025	2030
Groundwater	274,848	261,413	262,952	265,384	272,366
Surface Water	6,278	6,278	6,278	6,278	6,278
Recycled Water	51,649	54,878	59,644	63,139	63,139
Imported Water	254,476	288,677	304,510	310,373	309,572
Total	**587,250**	**611,246**	**633,383**	**645,174**	**651,354**
% of Normal Year					
Groundwater	97%	93%	92%	91%	92%
Surface Water	55%	58%	60%	60%	60%
Recycled Water	101%	101%	101%	101%	101%
Imported Water	122%	125%	125%	127%	125%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-2-B: Projected Supply for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Single-Dry Water Year

Acre-feet Per Year					
	2010	2015	2020	2025	2030
Natural Flows	213,799	216,627	222,636	229,281	239,729
Recycled Water	72,000	72,000	72,000	72,000	72,000
Imported Water from Metropolitan	52,750	46,245	16,250	16,250	8,283
Imported Water from Others	4,000	4,000	4,000	4,000	4,000
+/- Storage	33,480	16,518	40,471	37,748	44,952
Total	**376,029**	**355,389**	**355,357**	**359,279**	**368,964**
% of Normal Year					
Natural Flows +/- Storage	86%	85%	85%	85%	86%
Recycled Water	100%	100%	100%	100%	100%
Imported Water from Metropolitan	85%	79%	29%	28%	16%
Imported Water from Others	100%	100%	100%	100%	100%
+/- Storage (increase/decrease from Normal Year)	1470%	532%	1939%	4885%	1013%

Source: MWDOC, output of "Water Balance" Model

The following paragraphs describe the reliability of each supply source during a single-dry year event.

Groundwater – The model output shows that production from the Orange County Basin is expected to diminish by 3% to 9% during a single dry year event in next 25 years. This reduction is caused by a decrease of supply from its three replenishment sources – natural flows from the Santa Ana River, local streams, and replenishment supply from Metropolitan. Urban and storm runoff is expected to diminish by 15% during a dry year condition, thereby reducing the supply from natural flows to replenish the Orange County Basin. Furthermore, as the region experiences a dry-year spell, the rest of Southern California is also experiencing shortages. Metropolitan would have less supply and facility capacity for replenishment

uses. As the Southern California region continues to grow, Metropolitan's surplus during dry years would diminish. This is shown on Table 2-3-2-B where the imported supply for replenishment is projected to decrease – 85% of the normal year supplies is available in 2010 whereas only 16% is available by 2030.

Although the replenishment supplies to the Orange County groundwater basin are projected to decrease significantly in a single dry year event, the groundwater production is not expected to decrease by the same amount. As shown in Tables 2-3-2-A and 2-3-2-B, while the total replenishment supplies from natural flows and Metropolitan diminished from about 20% in 2010 to 30% in 2030 in a single dry year event, the groundwater production is projected to diminish less than 10%. This occurs because the groundwater basin in Orange County is expected to draw from basin storage to sustain a production that is higher than the replenishment supplies it receives in a dry year event.

However, it should be noted that these projections are based on modeled groundwater production levels (BPP) based upon hydrologic conditions and assumed Basin operation criteria. The model outputs do not reflect the fact that Orange County Water District may choose to sustain or raise the BPP under single or multiple dry years to optimize the use of Basin storage, or that some groundwater producers may pump in excess of the BPP to sustain local supply levels.

Surface Water – Surface water is expected to decrease during a single dry year by approximately 40% from a normal year.

Recycled Water – During a single dry year, the recycled water is expected to be more than 100% reliable with some treatment plants projecting to produce more supplies in a dry year event.

Imported Water – As local supplies decrease during a single dry year, MWDOC relies on imported water to meet its demand. Metropolitan's draft Regional UWMP, dated September 2005, describes how Metropolitan has created a diverse resource portfolio and aggressive conservation program to protect the reliability of the entire system. Metropolitan demonstrated in its UWMP that sufficient supplies can be reasonably relied upon to meet projected supplemental demands in the region during a dry year event. As a result, MWDOC is expected to fill in the supply gap to meet demand. During a dry year, imported water demands are expected to increase from 22% to 27%.

Tables 2-3-2-C and 2-3-2-D present the projected demand in single dry year conditions. The retail consumptive demand is expect to increase by 6% (an increase occurred in 1961). Since the demand for replenishment and saline barriers is driven by supply availability, it is projected to decrease at a rate from 3% to 10%.

Table 2-3-2-C: Projected Demand for Direct Consumption in MWDOC's Service Area – Single-Dry Water Year

Acre-feet Per Year					
	2010	2015	2020	2025	2030
Demand	587,250	611,246	633,383	645,174	651,354
% of Normal Year	106%	106%	106%	106%	106%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-2-D: Projected Demand for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Single-Dry Water Year

Acre-feet Per Year					
	2010	2015	2020	2025	2030
Demand	376,029	355,389	355,357	359,279	368,964
% of Normal Year	97%	92%	91%	90%	90%

Source: MWDOC, output of "Water Balance" Model

Tables 2-3-2-E and 2-3-2-F compare the supply and demand for direct and indirect use in projected single dry years from 2010 to 2030. By expecting reliable supplemental supply from Metropolitan, MWDOC is projected to be 100% reliable during a single dry year condition.

Table 2-3-2-E: Comparison of Supply and Demand for Direct Consumption in MWDOC's Service Area – Single-Dry Water Year

Acre-feet Per Year					
	2010	2015	2020	2025	2030
Supply Totals	587,250	611,246	633,383	645,174	651,354
Demand Totals	587,250	611,246	633,383	645,174	651,354
Difference	0	0	0	(0)	0
Difference as % of Supply	0%	0%	0%	0%	0%
Difference as % of Demand	0%	0%	0%	0%	0%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-2-F: Comparison of Supply and Demand for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Single-Dry Water Year

Acre-feet Per Year					
	2010	2015	2020	2025	2030
Supply Totals	376,029	355,389	355,357	359,279	368,964
Demand Totals	376,029	355,389	355,357	359,279	368,964
Difference	0	0	0	0	0
Difference as % of Supply	0%	0%	0%	0%	0%
Difference as % of Demand	0%	0%	0%	0%	0%

Source: MWDOC, output of "Water Balance" Model

2.3.3 Multiple Dry Water Years

The water demands and supplies for MWDOC's service area over the next 25 years were analyzed in a multiple-dry-years event, similar to the drought happened from 1959 to 1961.

The following paragraphs describe the available water supply to MWDOC during a multiple dry year period.

Groundwater – Similar to the single dry year scenario described previously, the production of groundwater is expected to decrease due to less supply being available for replenishment of the Orange County Basin.

Surface Water – Reliability of surface water is expected to reduce by 35%-45% in multiple dry years.

Recycled Water – During multiple dry years, the use of recycled water will reduce overall water demands. During multiple dry years, production of recycled water is expected to be greater than 100% of that produced during normal years. Again, this is due to some treatment plants projecting to produce more supplies in the dry year events.

Imported Water – During multiple dry years, MWDOC member agencies are expected to increase their imported demand to make up for the decrease in local supplies.

Again, by relying on Metropolitan for supplying imported demand during multiple dry years, MWDOC is able to demonstrate that the region will maintain 100% reliability during multiple dry years.

The following is a list of tables that summarizes the projected multiple dry year water supply and demand calculations for direct and indirect uses in the MWDOC service area:

- For projection ending 2010: Tables 2-3-3-A and 2-3-3-B summarize projected supplies, Tables 2-3-3-C an 2-3-3-D summarize projected demands, and Tables 2-3-3-E and 2-3-3-F compare the projected supplies and demands;

- For projection ending 2015: Tables 2-3-3-G and 2-3-3-H summarize projected supplies, Tables 2-3-3-I an 2-3-3-J summarize projected demands, and Tables 2-3-3-K and 2-3-3-L compare the projected supplies and demands;

- For projection ending 2020: Tables 2-3-3-M and 2-3-3-N summarize projected supplies, Tables 2-3-3-O an 2-3-3-P summarize projected demands, and Tables 2-3-3-Q and 2-3-3-R compare the projected supplies and demands;

- For projection ending 2025: Tables 2-3-3-S and 2-3-3-T summarize projected supplies, Tables 2-3-3-U an 2-3-3-V summarize projected demands, and Tables 2-3-3-W and 2-3-3-X compare the projected supplies and demands;

- For projection ending 2030: Tables 2-3-3-Y and 2-3-3-Z summarize projected supplies, Tables 2-3-3-AA an 2-3-3-BB summarize projected demands, and Tables 2-3-3-CC and 2-3-3-DD compare the projected supplies and demands;

Table 2-3-3-A: Projected Supply for Direct Consumption in MWDOC's Service Area – Multiple-Dry Water Years Ending 2010

Acre-feet Per Year			
Normal Year	**2008**	**2009**	**2010**
Groundwater	284,915	286,171	284,117
Surface Water	11,044	11,291	11,476
Recycled Water	44,439	49,000	51,375
Imported Water	200,269	202,092	208,006
Subtotal	**540,667**	**548,553**	**554,975**
Multiple Dry Year			
Groundwater	283,301	276,094	274,848
Surface Water	5,084	7,604	6,278
Recycled Water	44,740	49,146	51,649
Imported Water	244,821	237,614	254,476
Subtotal	**577,946**	**570,458**	**587,250**
% of Normal Year			
Groundwater	99%	96%	97%
Surface Water	46%	67%	55%
Recycled Water	101%	100%	101%
Imported Water	122%	118%	122%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-B: Projected Supply for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Multiple-dry Water Years Ending 2010

Acre-feet Per Year			
Normal Year	**2008**	**2009**	**2010**
Natural Flows	242,318	245,938	249,063
Recycled Water	69,500	72,000	72,000
Imported from Metropolitan	65,746	66,201	61,739
Imported from Others	4,000	4,000	4,000
+/- Storage	18,869	9,182	2,132
Subtotal	**400,433**	**397,320**	**388,934**
Multiple Dry Year			
Natural Flows	201,036	198,288	213,799
Recycled Water	69,500	72,000	72,000
Imported from Metropolitan	56,750	40,500	52,750
Imported from Others	4,000	4,000	4,000
+/- Storage	65,744	65,794	33,480
Subtotal	**397,030**	**380,582**	**376,029**
% of Normal Year			
Natural Flows	83%	81%	86%
Recycled Water	100%	100%	100%
Imported from Metropolitan	86%	61%	85%
Imported from Others	100%	100%	100%
+/- Storage (increase or decrease from normal year)	248%	617%	1470%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-C: Projected Demand for Direct Consumption in MWDOC's Service Area – Multiple-dry Water Year Ending 2010

Acre-feet Per Year			
	2008	**2009**	**2010**
Normal Year Demand	540,667	548,553	554,975
Multiple Dry Year Demand	577,946	570,458	587,250
% of Normal Year	107%	104%	106%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-D: Projected Demand for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Multiple-dry Water Years Ending 2010

Acre-feet Per Year			
	2008	2009	2010
Normal Year Demand	400,433	397,320	388,934
Multiple Dry Year Demand	397,030	380,582	376,029
% of Normal Year	99%	96%	97%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-E: Comparison of Projected Supply and Demand for Direct Consumption in MWDOC's Service Area – Multiple-dry Water Years Ending 2010

Acre-feet Per Year			
	2008	2009	2010
Supply Totals	577,946	570,458	587,250
Demand Totals	577,946	570,458	587,250
Difference	0	0	0
Difference as % of Supply	0%	0%	0%
Difference as % of Demand	0%	0%	0%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-F: Comparison of Projected Supply and Demand for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Multiple-dry Water Years Ending 2010

Acre-feet Per Year			
	2008	2009	2010
Supply Totals	397,030	380,582	376,029
Demand Totals	397,030	380,582	376,029
Difference	0	0	0
Difference as % of Supply	0%	0%	0%
Difference as % of Demand	0%	0%	0%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-G: Projected Supply for Direct Consumption in MWDOC's Service Area – Multiple-dry Water Years Ending 2015

Acre-feet Per Year			
Normal Year	**2013**	**2014**	**2015**
Groundwater	278,816	281,598	282,392
Surface Water	10,891	10,815	10,749
Recycled Water	53,136	53,724	54,521
Imported Water	226,074	227,336	230,494
Subtotal	**568,917**	**573,472**	**578,157**
Multiple Dry Year			
Groundwater	265,904	257,861	261,413
Surface Water	5,388	7,710	6,278
Recycled Water	53,546	53,919	54,878
Imported Water	282,844	276,226	288,677
Subtotal	**607,682**	**595,716**	**611,246**
% of Normal Year			
Groundwater	95%	92%	93%
Surface Water	49%	71%	58%
Recycled Water	101%	100%	101%
Imported Water	125%	122%	125%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-H: Projected Supply for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Multiple-dry Water Year Ending 2015

Acre-feet Per Year			
Normal Year	**2013**	**2014**	**2015**
Natural Flows	253,146	253,893	255,084
Recycled Water	72,000	72,000	72,000
Imported from Metropolitan	61,061	60,232	58,734
Imported from Others	4,000	4,000	4,000
+/- Storage	(10,640)	(5,615)	(3,825)
Subtotal	**379,567**	**384,510**	**385,993**
Multiple Dry Year			
Natural Flows	209,661	203,559	216,627
Recycled Water	72,000	72,000	72,000
Imported from Metropolitan	49,531	32,420	46,245
Imported from Others	4,000	4,000	4,000
+/- Storage	26,447	37,542	16,518
Subtotal	**361,639**	**349,520**	**355,389**
% of Normal Year			
Natural Flows	83%	80%	85%
Recycled Water	100%	100%	100%
Imported from Metropolitan	81%	54%	79%
Imported from Others	100%	100%	100%
+/- Storage (increase or decrease from normal year)	349%	769%	532%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-I: Projected Demand for Direct Consumption in MWDOC's Service Area – Multiple-dry Water Years Ending 2015

Acre-feet Per Year			
	2013	**2014**	**2015**
Normal Year Demand	568,917	573,472	578,157
Multiple Dry Year Demand	607,682	595,716	611,246
% of Normal Year	107%	104%	106%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-J: Projected Demand for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Multiple-dry Water Years Ending 2015

Acre-feet Per Year			
	2013	2014	2015
Normal Year Demand	379,567	384,510	385,993
Multiple Dry Year Demand	361,639	349,520	355,389
% of Normal Year	95%	91%	92%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-K: Comparison of Projected Supply and Demand for Direct Consumption in MWDOC's Service Area – Multiple-dry Water Years Ending 2015

Acre-feet Per Year			
	2013	2014	2015
Supply Totals	607,682	595,716	611,246
Demand Totals	607,682	595,716	611,246
Difference	0	0	0
Difference as % of Supply	0%	0%	0%
Difference as % of Demand	0%	0%	0%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-L: Comparison of Projected Supply and Demand for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Multiple-dry Water Years Ending 2015

Acre-feet Per Year			
	2013	2014	2015
Supply Totals	361,639	349,520	355,389
Demand Totals	361,639	349,520	355,389
Difference	0	0	0
Difference as % of Supply	0%	0%	0%
Difference as % of Demand	0%	0%	0%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-M: Projected Supply for Direct Consumption in MWDOC's Service Area – Multiple-dry Water Years Ending 2020

Acre-feet Per Year			
Normal Year	**2018**	**2019**	**2020**
Groundwater	283,777	285,055	286,628
Surface Water	10,601	10,545	10,500
Recycled Water	57,402	58,363	59,208
Imported Water	239,739	241,948	243,030
Subtotal	**591,519**	**595,911**	**599,366**
Multiple Dry Year			
Groundwater	265,727	258,086	262,952
Surface Water	5,388	7,710	6,278
Recycled Water	57,913	58,603	59,644
Imported Water	302,616	294,339	304,510
Subtotal	**631,643**	**618,738**	**633,383**
% of Normal Year			
Groundwater	94%	91%	92%
Surface Water	51%	73%	60%
Recycled Water	101%	100%	101%
Imported Water	126%	122%	125%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-N: Projected Supply for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Multiple-dry Water Years Ending 2020

Acre-feet Per Year			
Normal Year	**2018**	**2019**	**2020**
Natural Flows	259,013	260,358	261,684
Recycled Water	72,000	72,000	72,000
Imported from Metropolitan	56,279	56,847	56,685
Imported from Others	4,000	4,000	4,000
+/- Storage	(3,537)	(3,615)	(2,201)
Subtotal	**387,754**	**389,590**	**392,169**
Multiple Dry Year			
Natural Flows	215,349	208,783	222,636
Recycled Water	72,000	72,000	72,000
Imported from Metropolitan	48,750	16,250	16,250
Imported from Others	4,000	4,000	4,000
+/- Storage	20,422	46,971	40,471
Subtotal	**360,521**	**348,004**	**355,357**
% of Normal Year			
Natural Flows	83%	80%	85%
Recycled Water	100%	100%	100%
Imported from Metropolitan	87%	29%	29%
Imported from Others	100%	100%	100%
+/- Storage (increase or decrease from normal year)	677%	1399%	1939%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-O: Projected Demand for Direct Consumption in MWDOC's Service Area – Multiple-dry Water Years Ending 2020

Acre-feet Per Year			
	2018	**2019**	**2020**
Normal Year Demand	591,519	595,911	599,366
Multiple Dry Year Demand	631,643	618,738	633,383
% of Normal Year	107%	104%	106%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-P: Projected Demand for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Multiple-dry Water Years Ending 2020

Acre-feet Per Year			
	2018	2019	2020
Normal Year Demand	387,754	389,590	392,169
Multiple Dry Year Demand	360,521	348,004	355,357
% of Normal Year	93%	89%	91%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-Q: Comparison of Projected Supply and Demand for Direct Consumption in MWDOC's Service Area – Multiple-dry Water Years Ending 2020

Acre-feet Per Year			
	2018	2019	2020
Supply Totals	631,643	618,738	633,383
Demand Totals	631,643	618,738	633,383
Difference	0	0	0
Difference as % of Supply	0%	0%	0%
Difference as % of Demand	0%	0%	0%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-R: Comparison of Projected Supply and Demand for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Multiple-dry Water Years Ending 2020

Acre-feet Per Year			
	2018	2019	2020
Supply Totals	360,521	348,004	355,357
Demand Totals	360,521	348,004	355,357
Difference	0	0	0
Difference as % of Supply	0%	0%	0%
Difference as % of Demand	0%	0%	0%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-S: Projected Supply for Direct Consumption in MWDOC's Service Area – Multiple-dry Water Years Ending 2025

Acre-feet Per Year			
Normal Year	**2023**	**2024**	**2025**
Groundwater	289,840	291,176	292,297
Surface Water	10,436	10,416	10,462
Recycled Water	61,494	62,257	62,618
Imported Water	244,654	244,873	245,322
Subtotal	**606,424**	**608,722**	**610,698**
Multiple Dry Year			
Groundwater	276,786	260,146	265,384
Surface Water	5,388	7,710	6,278
Recycled Water	62,117	62,550	63,139
Imported Water	303,132	301,425	310,373
Subtotal	**647,423**	**631,831**	**645,174**
% of Normal Year			
Groundwater	95%	89%	91%
Surface Water	52%	74%	60%
Recycled Water	101%	100%	101%
Imported Water	124%	123%	127%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-T: Projected Supply for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Multiple-dry Water Years Ending 2025

Acre-feet Per Year			
Normal Year	**2023**	**2024**	**2025**
Natural Flows	266,014	267,461	268,964
Recycled Water	72,000	72,000	72,000
Imported from Metropolitan	56,666	56,703	57,048
Imported from Others	4,000	4,000	4,000
+/- Storage	(1,438)	(792)	(789)
Subtotal	**397,242**	**399,372**	**401,223**
Multiple Dry Year			
Natural Flows	221,269	215,736	229,281
Recycled Water	72,000	72,000	72,000
Imported from Metropolitan	48,750	16,250	16,250
Imported from Others	4,000	4,000	4,000
+/- Storage	32,168	43,310	37,748
Subtotal	**378,187**	**351,296**	**359,279**
% of Normal Year			
Natural Flows	83%	81%	85%
Recycled Water	100%	100%	100%
Imported from Metropolitan	86%	29%	28%
Imported from Others	100%	100%	100%
+/- Storage (increase or decrease from normal year)	2337%	5567%	4885%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-U: Projected Demand for Direct Consumption in MWDOC's Service Area – Multiple-dry Water Years Ending 2025

Acre-feet Per Year			
	2023	**2024**	**2025**
Normal Year Demand	606,424	608,722	610,698
Multiple Dry Year Demand	647,423	631,831	645,174
% of Normal Year	107%	104%	106%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-V: Projected Demand for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Multiple-dry Water Years Ending 2025

Acre-feet Per Year			
	2023	**2024**	**2025**
Normal Year Demand	397,242	399,372	401,223
Multiple Dry Year Demand	378,187	351,296	359,279
% of Normal Year	95%	88%	90%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-W: Comparison of Projected Supply and Demand for Direct Consumption in MWDOC's Service Area – Multiple-dry Water Years Ending 2025

Acre-feet Per Year			
	2023	2024	2025
Supply Totals	647,423	631,831	645,174
Demand Totals	647,423	631,831	645,174
Difference	0	0	0
Difference as % of Supply	0%	0%	0%
Difference as % of Demand	0%	0%	0%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-X: Comparison of Projected Supply and Demand for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Multiple-dry Water Years Ending 2025

Acre-feet Per Year			
	2023	2024	2025
Supply Totals	378,187	351,296	359,279
Demand Totals	378,187	351,296	359,279
Difference	0	0	0
Difference as % of Supply	0%	0%	0%
Difference as % of Demand	0%	0%	0%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-Y: Projected Supply for Direct Consumption in MWDOC's Service Area – Multiple-dry Water Years Ending 2030

Acre-feet Per Year			
Normal Year	**2028**	**2029**	**2030**
Groundwater	294,676	295,728	296,434
Surface Water	10,525	10,525	10,525
Recycled Water	62,618	62,618	62,618
Imported Water	246,886	247,103	246,981
Subtotal	**614,705**	**615,974**	**616,558**
Multiple Dry Year			
Groundwater	286,534	266,671	272,366
Surface Water	5,388	7,710	6,278
Recycled Water	63,276	62,917	63,139
Imported Water	301,024	302,027	309,572
Subtotal	**656,222**	**639,325**	**651,354**
% of Normal Year			
Groundwater	97%	90%	92%
Surface Water	51%	73%	60%
Recycled Water	101%	100%	101%
Imported Water	122%	122%	125%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-Z: Projected Supply for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Multiple-dry Water Years Ending 2030

Acre-feet Per Year			
Normal Year	**2028**	**2029**	**2030**
Natural Flows	273,889	275,770	277,739
Recycled Water	72,000	72,000	72,000
Imported from Metropolitan	52,796	51,233	50,700
Imported from Others	4,000	4,000	4,000
+/- Storage	2,687	4,239	4,041
Subtotal	**405,372**	**407,243**	**408,479**
Multiple Dry Year			
Natural Flows	231,015	226,146	239,729
Recycled Water	72,000	72,000	72,000
Imported from Metropolitan	48,750	16,250	8,283
Imported from Others	4,000	4,000	4,000
+/- Storage	37,767	41,852	44,952
Subtotal	**393,531**	**360,248**	**368,964**
% of Normal Year			
Natural Flows	84%	82%	86%
Recycled Water	100%	100%	100%
Imported from Metropolitan	92%	32%	16%
Imported from Others	100%	100%	100%
+/- Storage (increase or decrease from normal year)	1305%	887%	1013%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-AA: Projected Demand for Direct Consumption in MWDOC's Service Area – Multiple-dry Water Years Ending 2030

Acre-feet Per Year			
	2028	**2029**	**2030**
Normal Year Demand	614,705	615,974	616,558
Multiple Dry Year Demand	656,222	639,325	651,354
% of Normal Year	107%	104%	106%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-BB: Projected Demand for Groundwater Replenishment and Saline Barriers in MWDOC's Service Area – Multiple-dry Water Years Ending 2030

Acre-feet Per Year			
	2028	**2029**	**2030**
Normal Year Demand	405,372	407,243	408,479
Multiple Dry Year Demand	393,531	360,248	368,964
% of Normal Year	97%	88%	90%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-CC: Comparison of Projected Supply and Demand for Direct Consumption in MWDOC's Service Area – Multiple-dry Water Years Ending 2030

Acre-feet Per Year			
	2028	2029	2030
Supply Totals	656,222	639,325	651,354
Demand Totals	656,222	639,325	651,354
Difference	0	0	0
Difference as % of Supply	0%	0%	0%
Difference as % of Demand	0%	0%	0%

Source: MWDOC, output of "Water Balance" Model

Table 2-3-3-DD: Comparison of Projected Supply and Demand for Direct Consumption in MWDOC's Service Area – Multiple-dry Water Years Ending 2030

Acre-feet Per Year			
	2028	2029	2030
Supply Totals	393,531	360,248	368,964
Demand Totals	393,531	360,248	368,964
Difference	0	0	0
Difference as % of Supply	0%	0%	0%
Difference as % of Demand	0%	0%	0%

Source: MWDOC, output of "Water Balance" Model

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3.0 WATER QUALITY IMPACTS ON RELIABILITY

Information presented in this section is based on the best available data from each Municipal Water District of Orange County (MWDOC) member agency at the time of drafting. The information is presented to provide a regional summary within the MWDOC service area. MWDOC has made every effort to coordinate information during the preparation of this section in a manner that is consistent with local agencies' Urban Water Management Plans. In the event of a discrepancy, the local retail agency plan should be consulted.

3.1 Introduction

Water supplies within MWDOC's service area are derived from a combination of sources: imported water from Metropolitan Water District of Southern California (Metropolitan), groundwater production by individual agencies, and other local supplies. Contamination of any of these sources or more stringent regulatory requirements has the potential to result in adjustments to water resource management strategies and, in a worse-case scenario, impacting supply reliability. Blending available supplies and implementing additional treatment processes are common mitigation options used by water agencies to guard against water quality impacts. Since MWDOC does not operate any facilities, MWDOC does not have any direct responsibilities in water quality sampling or compliance. However, the potential impact of reduced water quality on reliability, either from imported or local sources, is a critical piece in understanding the water system as a whole.

California Title 22 Drinking Water Standards (Title 22) incorporates the federal requirements of the Safe Drinking Water Act, and compliance with Title 22 is required by all water service providers. Therefore, Title 22 monitoring of all regulated chemicals as well as a number of unregulated chemicals is conducted by Metropolitan, Orange County Water District (OCWD), and all of the retail water agencies within the MWDOC service area. In order to be in compliance with Title 22, each agency must ensure that the regulated chemicals in the water supply meet established primary drinking water standards. In addition, secondary drinking water standards have been set for some minerals based on non-health-related aesthetics, such as taste and odor. Both primary and secondary standards are expressed as the maximum contaminated levels (MCL) allowable for a given constituent. Unregulated chemicals do not have established drinking water standards, but are chemicals of concern for which standards may be eventually adopted. These unregulated chemicals often have a "notification level," which is a health-based advisory level established by the U.S. Department of Health Services for chemicals in drinking water that lack MCLs.

As illustrated in Table 3-1, all responsible agencies within MWDOC's service area have accounted for known and foreseeable water quality impacts in their current management strategies. None of the responsible agencies for each water source anticipate water quality impacts that would either reduce the water supply available or that cannot be handled through existing management strategies. Any agencies with water sources having known contamination that cannot be remedied through

treatment, blending, or other options have already removed the impacted water source from their supply portfolio.

Table 3-1-A: Current and Projected Water Supply Change in MWDOC's Service Area Due to Water Quality

Percentage						
Water Source	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
MWDSC	0	0	0	0	0	0
Local Supplies						
OCWD Groundwater Basin						
City of Buena Park	0	0	0	0	0	0
City of Fountain Valley	0	0	0	0	0	0
City of Garden Grove	0	0	0	0	0	0
City of Huntington Beach	0	0	0	0	0	0
City of La Palma	0	0	0	0	0	0
City of Newport Beach	0	0	0	0	0	0
City of Orange	0	0	0	0	0	0
City of Seal Beach	0	0	0	0	0	0
City of Tustin	0	0	0	0	0	0
City of Westminister	0	0	0	0	0	0
East Orange County Water District	0	0	0	0	0	0
Irvine Ranch Water District	0	0	0	0	0	0
Mesa Consolidated Water District	0	0	0	0	0	0
Santiago County Water District	0	0	0	0	0	0
Serrano Water District	0	0	0	0	0	0
Golden State Water Company	0	0	0	0	0	0
Yorba Linda Water District	0	0	0	0	0	0
Non - OCWD Groundwater Basin						
City of Brea	0	0	0	0	0	0
City of La Habra	0	0	0	0	0	0
City of San Clemente	0	0	0	0	0	0
City of San Juan Capistrano	0	0	0	0	0	0
El Toro Water District	0	0	0	0	0	0
Irvine Ranch Water District	0	0	0	0	0	0
Moulton Niguel Water District	0	0	0	0	0	0
Santiago County Water District	0	0	0	0	0	0
Santa Margarita Water District	0	0	0	0	0	0
Trabuco Canyon Water District	0	0	0	0	0	0

Sources:
1) Metropolitan Water District of Southern California, Draft 2005 Regional Urban Water Management Plan (Sept, 2005)
2) Agency interviews conduced by Camp Dresser & Mckee's for Municipal Water District of Orange County
3) Orange County Water District, *Groundwater Management Plan, 2005*

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

Each of the three main water sources for MWDOC member agencies and any water quality impacts, current or future, are discussed in detail below.

3.2 Groundwater Supply from Orange County Water District

OCWD, manages the groundwater resources in the underlying Orange County Groundwater Basin (Basin). Twenty of these agencies are within the MWDOC service area. The other three, Anaheim, Santa Ana, and Fullerton, are direct member agencies of Metropolitan. As part of its management activities, OCWD operates a network of over 800 groundwater monitoring wells that measure and record groundwater quality and levels. Monitoring occurs at both monitoring wells and at production wells. OCWD's member agencies are required by the Department of Health Services (DHS) to monitor at production wells. OCWD performs that monitoring on behalf of its member agencies. Member agencies conduct separate and additional monitoring of their distribution systems. OCWD also monitors surface water quality from the Santa Ana River and its tributaries to verify the quality of recharge water. On the western fringes of the Basin, OCWD monitors seawater intrusion as part of its seawater intrusion barrier operations. More than 100 regulated and unregulated constituents are currently monitored throughout the Basin.

3.2.1 Groundwater Quality Issues

OCWD has taken a proactive approach to protect and prevent pollution via extensive programs that address short-term and long-term water quality issues throughout the Basin. OCWD has programs to minimize the release of contaminants to groundwater including:

- Sanitary landfill program;
- Leaking underground storage tank program;
- DHS-required Drinking Water Source Assessment and Protection Program;
- Review of environmental documents associated with land use developments;
- Public outreach for pollution prevention; and
- Well-closure program for abandoned wells.

To further protect its groundwater resources, OCWD adopted a Groundwater Quality Protection Policy in 1987 that includes water quality monitoring, cleanup of contaminants, managing toxic and hazardous wastes, and sharing information with producers, regulatory agencies and the public. OCWD uses blending techniques and treatment processes to ensure groundwater quality is not degraded. Though OCWD does not currently conduct any direct treatment of groundwater, it has funded both capital, and operations and maintenance costs for the installation of a N-nitrosodimethylamine (NDMA) treatment facility in the Mesa Consolidated Water District and it is in the planning phase of a volatile organic compound (VOC) cleanup plant in the Anaheim/Fullerton area (outside of MWDOC's service area). OCWD has also assisted in the funding of two nitrate removal

plants, one in Tustin, the other in Garden Grove, as well as the Irvine Desalter project, in conjunction with Irvine Ranch Water District (IRWD).

The sections that follow identify the groundwater quality issues in the Basin for primary drinking water standards, secondary drinking water standards, and as yet unregulated drinking water standards.

3.2.1.1 Contaminant Exceeding a Primary Drinking Water Standard Maximum Contaminant Level (MCL)

3.2.1.1.1 Nitrate Management

The most prevalent form of inorganic nitrogen compounds in the Basin is nitrate. Nitrate loading of groundwater is generally associated with past agricultural land uses. However, the scale of agricultural activities is much smaller today than in years past. DHS has set the primary drinking water standard for nitrate as nitrogen in drinking water delivered to retail customers, and expresses that number as a maximum contaminant level (MCL) allowable for nitrate. The MCL established by DHS for nitrate-nitrogen concentrations is 10 mg/L. Five out of more than 500 production wells were found to have nitrate-nitrogen concentrations exceeding MCL. Water extracted from drinking water wells with nitrates exceeding the MCL is either blended with other sources or treated to reduce nitrate concentrations below the MCL. Approximately 89% of the drinking water wells have nitrate-nitrogen concentrations less than 50% of the MCL. Urban uses have replaced agricultural uses in many locations, reducing nitrate loading. However, residuals from past land uses present in underlying soils will continue to enter the Basin over time until they eventually dissipate. Nitrate remediation is occurring through multiple groundwater treatment projects currently in operation. Other projects are in the planning stage and are discussed below. In addition, as part of its Drinking Water Source Assessment and Protection Programs (DWSAPP), OCWD has identified and continuously monitors those areas susceptible to future nitrate contamination. If concentrations approach the MCL, producers evaluate various alternatives, such as additional treatment.

The Santa Ana Regional Water Quality Control Board (RWQCB) also has a water quality objective for nitrate, an average 3.4 mg/L (as nitrogen) in the Forebay and pressure regions, and 6-8 mg/L in the Irvine area. Nitrate levels have exceeded applicable RWQCB standards in individual areas, typically in shallow depths or in groundwater areas located

near former agricultural zones. However, average nitrate levels throughout the Basin meet the RWQCB standard.

3.2.1.1.2 Volatile Organic Compounds

Plumes of volatile organic compounds (VOCs) have been identified in the Basin within the vicinity of the former El Toro Marine Corps Base and Irvine, the Forebay region of the Basin within the vicinity of Fullerton, and at one IRWD well located in Santa Ana. Contamination at the former El Toro Marine Corps Base is associated with Trichloroethylene (TCE), a type of VOC with an MCL of 0.005 mg/L, which was previously utilized as aircraft cleaning solvent on the base. In Santa Ana, concentrations of TCE, PCE, and perchlorate have been detected at IRWD Well No. 3. As discussed below, projects designed to reduce the VOCs to acceptable levels are scheduled for implementation, and therefore no future water reliability impacts are anticipated.

There is also a VOC plume along the Santa Ana River, starting in the southern part of Orange County. OCWD is currently monitoring the plume. Based on available data, the plume is limited in vertical extent to the shallow aquifers. OCWD will continue to monitor the plume and respond appropriately as needed.

3.2.1.1.3 Methyl Tertiary-Butyl Ether (MTBE)

MTBE, a gasoline additive, is commonly found at leaking underground fuel tanks and in surface water (lakes and reservoirs) allowing recreational motorized boats. Hundreds of documented leaking underground fuel tanks are present within OCWD's management area. Most tank owners do not have groundwater cleanup programs in place to remove MTBE. MTBE is very soluble in water and has a low affinity for soil particles resulting in the rapid migration of contaminant plumes.

In May 2000, Department of Healthy Services established the primary MCL for MTBE at 13 µg/L based on the healthy risks. Two drinking wells that were previously removed from OCWD service due to other contaminants had been found to have MTBE exceeding that level. A secondary drinking water standard of 5 µg/L was also adopted. The use of MTBE as an oxygenate in gasoline was required by the Environmental Protection Agency to reduce air pollution. However, MTBE was completely phased out as a gasoline oxygenate after December 31, 2003.

MTBE is primarily found in the shallow portion of the aquifer. OCWD is taking proactive steps and is cooperating with local water agencies in monitoring for MTBE in groundwater to prevent MTBE from migrating down into the main aquifer where most pumping occurs.

3.2.1.2 Contaminants Exceeding a Secondary Drinking Water Standard MCL

3.2.1.2.1 Total Dissolved Solids Management

As described in Section 3.1 above, secondary drinking water standards are those standards that affect the aesthetic quality of water, such as taste. The secondary drinking water standard established by DHS for TDS in water delivered to retail customers is 500 mg/L. The Santa Ana RWQCB set a TDS objective of 580mg/L for Orange County Groundwater Basin.

In general, water recharged into the Basin has TDS concentrations greater than the water extracted. Over the past decades this has increased TDS concentrations within the Basin, creating a salt imbalance. Increased TDS concentrations can adversely impact industrial, commercial, and agricultural uses. Multiple measures have been developed or are currently being developed to reduce TDS levels in the Basin, a few of which are listed below:

- Groundwater desalter projects have been implemented to reduce TDS levels, and are further discussed in the later section;

- OCWD and MWDOC are working with Metropolitan to provide a blend of State Water Project (SWP) and Colorado River water, which will result in lower (TDS) levels for recharge water at Anaheim Lake and Kraemer Basin; Most imported water is from Metropolitan's Colorado River Aqueduct (CRA) which has higher salinity levels than State Water Project (SWP) water;

- Starting in 2007, the Groundwater Replenishment System (GWR System) will provide a source of low TDS recharge water with a concentration of approximately 100 mg/L, resulting in a reduction in the salt imbalance;

- The Santa Ana River is the primary source of recharge water for the Basin. Strategies to reduce TDS levels in the river include developing non-reclaimable waste lines in the upper watershed that segregate high TDS industrial wastewater, extension of the existing Santa Ana River Interceptor (SARI) Brine Line, and controlling TDS introduced from agricultural practices; and

- OCWD is also working with agencies to alter the composition of recharge water at the Los Alamitos Barrier Project from imported water to a blend of imported water and purified water, which will have a lower TDS concentration than the current injection supply.

3.2.1.2.2 Colored Groundwater Management

A significant quantity of colored groundwater is present in the Lower Main Aquifer of the Basin. More than one million acre-feet of water is colored primarily by contacting with redwood trees deposited in the aquifer. Sampling has indicated that the water is very high quality, but has a color and an odor that do not meet secondary drinking water standards. Colored water treatment projects are currently operated in the Basin by Mesa Consolidated Water District and IRWD. This colored water could be an additional source of supply in the region.

3.2.1.3 Contaminant Exceeding an Unregulated "Notification Level"

3.2.1.3.1 Pharmaceuticals, Personal Care Products, and Endocrine Disruptors

Potential water quality issues of concern include compounds found within pharmaceuticals and personal care products (PPCPs). PPCPs include prescription and over-the-counter medicines, fragrances, food supplements, deodorants, insect repellants, and other items. Endocrine Disrupting Compounds (EDCs) are those compounds that affect the endocrine system and include over-the-counter medicines, pesticides, and other industrial compounds. Impacts of these compounds in low doses on human health are for the most part unknown. OCWD is tracking potential regulations concerning these compounds to determine any impacts upon the level of treatment required for future water reclamation projects. The GWR System treatment process with microfiltration, followed by RO, and finally ultraviolet (UV)

light and hydrogen peroxide treatment removes these contaminants.

3.2.1.3.2 N-nitrosodimethylamine

N-nitrosodimethylamine (NDMA), which is found to be a byproduct of drinking water treatment, does not yet have an MCL. However, it has a "notification level," which is a health based advisory level established by DHS for chemicals in drinking water that lack MCLs. NDMA has an action level of 10 ng/L. The treatment process currently conducted by GWR SYSTEM, as detailed above, removes NDMA.

3.2.2 Groundwater Restoration Projects

Restoration of groundwater quality is a high priority for OCWD. As an incentive to encourage water quality improvement projects, on a case-by-case basis OCWD considers offering pumpers full or partial exemptions to the Basin Equity Assessment fees for pumping and treating water that was previously unsuitable for potable use. Benefits of the program are (1) removal and use of poor quality groundwater from the Basin, and (2) reducing or preventing of the spread of contaminated groundwater into non-degraded areas.

Garden Grove Nitrate Removal Project (Existing)

The Garden Grove Nitrate Removal Project utilizes two wells, one with a high nitrate concentration and one with a low nitrate concentration, that are blended together after the groundwater is withdrawn to achieve a nitrate concentration below the primary drinking water MCL for nitrate. Without this project, the high nitrate well would not be utilized.

Tustin Main Street Treatment Plant (Existing)

Tustin's Main Street Treatment Plant reduces nitrate levels produced by two wells through the use of RO or ion exchange (IX) treatment. During fiscal year 2001-2002, 120,000 pounds of nitrates were removed.

Irvine Desalter (Under Construction)

The Irvine Desalter is a joint project implemented by both IRWD and OCWD with financial contributions from the U.S. Navy and Metropolitan. Currently, a plume of VOCs is migrating toward the Main Basin from the former El Toro Marine Corps base. As proposed, the project will consist of two water purification plants with separate wells and pipeline systems. One plant will be designed to remove TDS and VOCs utilizing air stripping, activated carbon adsorption, and RO. The end-product will be used for irrigation in the recycled water system. The other plant, located outside the

main VOC contamination plume, will remove TDS and nitrates via RO with the end product being a new supply of drinking water.

Tustin Desalter (Existing)

Tustin's Seventeenth Street Desalter reduces nitrate and TDS concentration from groundwater produced by three wells. Two RO membrane trains are utilized to treat the water. In fiscal year 2001-2002, 354,000 pounds of nitrate were removed.

River View Golf Club VOC (Existing)

Located in the City of Santa Ana, the River View Golf Club operates a well that removes VOCs. The well is used for golf course irrigation. Prior to contamination, the well was used as a potable supply source.

Forebay VOC Cleanup Project (Future)

A Forebay VOC Cleanup is planned to remove VOC contaminants in the area north of Highway 91 and west of Highway 57 to prevent further spreading of the plume. This plume has previously resulted in the closure of two Fullerton production wells because of perchloroethylene concentrations. Four extraction wells would pump groundwater that would be conveyed to a central treatment facility. Treated groundwater would be discharged to a flood retention basin for recharge. High nitrate groundwater at one of the well sites would be blended with the three other wells to reduce nitrates below the MCL.

N-nitrosodimethylamine Removal (Existing)

N-nitrosodimethylamine (NDMA), which is found to be a byproduct of drinking water treatment, does not yet have an MCL. However, it has an "notification level", which is a health based advisory level established by DHS for chemicals in drinking water that lack MCLs. NDMA has a notification level of 10 ng/L. Mesa Consolidated Water District operates a NDMA facility to remove NDMA from groundwater in a located area and prevent down-gradient migration. Treatment consists of UV oxidation.

In addition, the treatment process currently conducted by GWR SYSTEM, which provides water to OCWD's seawater intrusion barrier and spreading grounds, does remove NDMA. The GWR SYSTEM treatment process currently includes microfiltration, followed by RO, and finally UV light and hydrogen peroxide treatment.

Mesa Consolidated Water District Colored Water Treatment (Existing)

MCWD's colored water treatment facility uses ozone oxidation to remove color extracted from two wells. Treatment of deep colored water reduces

the potential for upward migration of the colored water into areas with clear water.

IRWD Colored Water "Deep Aquifer Treatment System" or DATS (Existing)

IRWD treats colored groundwater from two wells using nanofiltration, with the end-product used as a potable water supply. The removed concentrate is discharged to the sewer for treatment with wastewater. As with the Mesa Consolidate Water District facility, this facility also reduces the potential for upward migration of colored water.

3.2.3 Groundwater Quality Impacts on Supply Reliability

Currently, there are no known water quality impacts that would reduce the reliability of the Orange County Basin as a water supply source for the next 25 years. OCWD's adopted Groundwater Quality Protection Policy serves as a framework for protecting and improving water quality in the Basin. Current water quality impacts and potential future impacts are taken into account in OCWD's management of the Basin. OCWD, in conjunction with local agencies, is proactively managing the Basin to reduce contamination. OCWD has an extensive monitoring program to identify contamination at an early stage to prevent detrimental impacts to the Basin. OCWD has implemented or will be implementing projects to address current contamination issues and to prevent future degradation of the Basin, such as reducing the TDS imbalance through construction of desalters and the GWR System. Additionally, OCWD has a toxic clean-up reserve fund to immediately begin remediation operations if a portion of the Basin were to become threatened with contamination, further enhancing the reliability of the groundwater supply.

3.3 Imported Supply From Metropolitan

MWDOC is a member agency of the Metropolitan. As a water wholesaler, MWDOC obtains 100 percent of its supply through Metropolitan. That supply accounts for approximately 50 percent of the total water supply within the MWDOC service area. Metropolitan has two primary sources of water, the State Water Project (SWP) and the Colorado River Aqueduct (CRA). For most of Orange County, imported water is served as a blend of both sources with the proportions of the blend dependent upon the year-to-year availability of CRA and SWP water. Colorado River water tends to be higher in total dissolved solids (TDS) and lower in dissolved organics. SWP water usually has a lower TDS but higher organic materials, which can lead to the formation of disinfection byproducts (DBPs). Metropolitan recognizes the regional impacts of water quality, and emphases its commitment to ensuring the highest quality water in its Integrated Resources Plan. Planning efforts have identified management strategies that allow flexibility in operations to improve water quality and source protection while maintaining reliability. Metropolitan's water quality staff conducts both required

monitoring and monitoring for constituents of concern that are currently unregulated. Over 300,000 water quality tests are performed each year.

3.3.1 Metropolitan Water Quality Issues

3.3.1.1 Total Dissolved Solids Management

High TDS levels in imported water delivered by Metropolitan to MWDOC have impacts on MWDOC's and OCWD's management of water resources. High TDS levels in potable water lead to increased recycled water treatment costs, result in increased water losses during the recycled water treatment processes, reduce recycled water use as demand decreases for recycled water with high TDS levels, recycled water does not meet RWQCB standards, brine volumes increase, and ultimately the ability to use the underlying groundwater basins for water storage could be diminished. As previously stated, TDS levels in groundwater managed by OCWD have steadily increased as lower TDS water is extracted and replaced with higher TDS water from imported water and other sources. Metropolitan has established an operational policy objective to deliver water to each of its member agencies at a TDS of 500 mg/l when feasible. This requires careful operational planning and management to achieve.

Colorado River Aqueduct

CRA water has high TDS levels, averaging 650 mg/L during normal water years. Salinity levels are dependent upon precipitation in the Colorado River Basin. During drought years, salinity levels increase. During years with above-normal precipitation, salinity levels decline as naturally occurring salt concentrations decline. In times of extreme drought salinity levels could exceed 900mg/L. A long-term salinity management strategy is in place at the state and federal level for the Colorado River Basin. Funds are appropriated annually to help fund salinity mitigation and reduction projects throughout the watershed.

State Water Project

SWP TDS levels are significantly lower than those in CRA water, averaging 250mg/L for water delivered via the East Branch of the SWP and 325 mg/L for the West Branch deliveries. West Branch deliveries have higher TDS levels as a result of salt loading in local streams, operational issues, and evaporation losses at Pyramid and Castaic Lakes. TDS levels and available supply vary based on hydrologic conditions in the Sacramento-San Joaquin watersheds, introduction of saline non-project waters by upstream parties, as well as saline intrusion in the Sacramento-San Joaquin Bay Delta.

Variations of TDS levels over short periods of time are attributed to seasonal and tidal flow patterns, presenting a unique challenge in trying to achieve Metropolitan's 500 mg/L TDS objective. During periods when TDS levels are high at the SWP intake facilities and in the Colorado River, it may not be possible to meet Metropolitan's salinity objective and maintain water supply reliability. Metropolitan's Board has adopted a policy of needs to meet Metropolitan's 500 mg/L salinity-by-blending objective in a cost-effective manner while minimizing resource losses and ensuring the viability of recycling and groundwater management programs.

Management Actions

Metropolitan has taken numerous actions to reduce TDS concentrations in its water supplies. In 1999, Metropolitan's Board adopted a Salinity Action Plan and a Salinity Management Policy with the goal of delivering water with salinity levels less than 500mg/L. A three-year joint effort between the U.S. Bureau of Reclamation and a task force of stakeholders led to the development of the Action Plan. A Salinity Summit attended by representatives from over 60 agencies was held as the Action Plan neared completion to discuss regional salinity issues and how to work together to attain salinity management goals. Components of the action plan include:

- Imported water source control and salinity reductions;
- Distribution system salinity management actions;
- Collaborative actions with other agencies; and
- Local salinity management actions to protect groundwater and recycled water supplies.

Under the Action Plan, Metropolitan is reliant upon blending of its source water to meet salinity goals. It is anticipated that the TDS goal will be met in 7 out of 10 years. Hydrologic conditions would result in Metropolitan not achieving this goal in the other three years. Member agencies, such as MWDOC, are cognizant of this and have taken this concern into development of their management strategies.

Metropolitan has obtained Proposition 13 funding to improve salinity levels for The Water Quality Exchange Partnership and The Desalination Research and Innovation Partnership (DRIP) programs. Metropolitan received $20 million to develop a water exchange partnership to access high quality water from the Sierras in exchange for SWP water. Funds are being used to develop the program and construct additional infrastructure. A total of $4 million was

received for the DRIP program to develop cost-effective advanced water treatment technologies for removing salts from the CRA, brackish groundwater, wastewater, and agricultural drainage.

Under the CALFED Bay-Delta Program actions are already reducing TDS loading in SWP water, and more actions are planned for the next 30 years. Actions in progress include improved management of salts in the San Joaquin Valley, upstream source control, desalination demonstration projects, and programs to control stormwater runoff into SWP aqueducts. In the long-term, additional projects are planned to reduce short-term variations in TDS levels and the long-term average salinity levels.

Without reductions in TDS levels in both the short-term variations and long-term average, desalination of CRA water may be needed. However, at the present time current technologies are expensive, and 5 to 10 percent of the CRA water would be lost during the treatment process. The DRIP program is designed to assist in obtaining a viable solution to reducing CRA TDS levels.

3.3.1.2 Perchlorate Management

Perchlorate has been detected at low levels in the CRA water supply, but not in the SWP water supply. Therefore, this discussion will focus on the CRA water supply. An exceedance level for perchlorate has not been adopted at this time by DHS. However, DHS has adopted a notification level of 6 µg/L, requiring agencies to inform their governing bodies. Notification of customers and the potential health risks is also recommended. DHS recommends non-utilization of sources with perchlorate levels greater than 60 µg/L. Perchlorate primarily interferes with the production of hormones for normal growth and development in the thyroid gland. Further research on the health effects of perchlorate is pending.

Metropolitan began monitoring for perchlorate in June 1997 after it was detected in the Colorado River and the Lake Mead outlet at Hoover Dam. Sampling was able to isolate the source to the Las Vegas Wash and its potential source in Henderson, Nevada. A quarterly monitoring program for Lake Mead was initiated in August 1997 followed by monthly monitoring of the CRA. The Nevada Division of Environmental Protection manages a remediation project in the Henderson area. Since inception, the amount of perchlorate entering the Colorado River has been reduced from 900 pounds per day in 1997 to less than 150 pounds per day as of December 2004.

Management Actions

In 2002, Metropolitan adopted a Perchlorate Action Plan. Plan objectives include:

- Expand monitoring and reporting programs;
- Assess the impact of perchlorate on local groundwater supplies;
- Track remediation efforts in the Las Vegas Wash;
- Initiate modeling of perchlorate levels in the Colorado River;
- Investigate the need for additional resource management strategies;
- Pursue legislative and regulatory options;
- Include information on perchlorate in outreach activities; and
- Provide periodic updates to the Metropolitan Board and member agencies.

Through its Perchlorate Action Plan, Metropolitan has taken a proactive approach towards addressing a potential water quality issue and ensuring minimal or no water supply losses associated with perchlorate.

3.3.1.3 Total Organic Carbon and Bromide Management

Treatment of SWP water supplies containing high levels of total organic carbon (TOC) and bromide with disinfectants, such as chlorine, creates disinfection byproducts (DBPs) linked to specific cancer types. CRA water does not have high levels of TOCs and bromide. TOC and bromide in the Delta region of the SWP are of a significant concern to Metropolitan as concentration levels increase as Delta water is impacted by agricultural drainage and seawater intrusion. In 1998, the United State Environmental Protection Agency adopted more stringent regulations for DBPs, which took effect in 2002. Even more stringent regulations are expected to be proposed in 2005.

Management Actions

Metropolitan's Board adopted a Statement of Needs for the CALFED Bay-Delta Program in 1999 stating that Metropolitan

requires a safe drinking water supply for compliance with existing and future regulatory requirements. CALFED's Program has developed numerous conceptual actions to improve Bay/Delta water; however, Metropolitan desires CALFED to adopt water quality improvement milestones. These milestones are necessary to assure that Metropolitan and its member agencies will be able to comply with pending water quality regulations.

Metropolitan's Board has committed to install ozone treatment processes at its two treatment plants that solely treat SWP water to avoid the production of DBPs through chlorination. In addition to the concern of DBPs, some studies have linked negative reproductive and developmental effects to chlorinated water. The other three treatment plants that receive a combination of SWP and CRA water utilize blending to reduce levels of DBPs below regulatory requirements. By 2009 Metropolitan plans on installing ozonation facilities at the remainder of its treatment faculties removing the percentage of SWP water that requires blending.

3.3.1.4 Other Contaminants of Concern

Metropolitan has identified various other contaminants of concern to its water supply sources.

Methyl Tertiary Butyl Ether (MTBE)

As previously discussed, the use of MTBE as a gasoline oxygenate has resulted in the contamination of surface waters and groundwater. Metropolitan operates boating facilities at its reservoirs. Therefore, these facilities were previously subjected to the introduction of MTBE. MTBE is discharged into surface water from the exhaust of recreational watercraft. MTBE and other oxygenates are regularly monitored in Metropolitan's water supplies. Past monitoring has detected MTBE concentrations varying from non-detected level to 3.9 µg/L in treatment plant effluent and up to 6.4 µg/L in source water effluent.

Metropolitan has taken numerous actions to reduce the contamination of its supplies with MTBE including supporting state and federal legislation to reduce the impacts of MTBE. At its Diamond Valley Lake and Lake Skinner, MTBE free-fuel and clean burning engines are required to minimize the introduction of MTBE into surface waters. Water monitoring programs for MTBE and other gasoline components were instituted at the lakes. Metropolitan has also investigated various treatment mechanisms for MTBE. Future contamination of water supplies will more than likely decrease as time elapses since the phase-out of MTBE. However,

the extent of future contamination is unknown as MTBE is still within the environment.

Arsenic

Effective 2006, a federal MCL of 10 µg/L (10 parts per billion) will go into effect for domestic water supplies. Metropolitan's water supplies contain low levels of this contaminant within the regulatory requirements. Currently, the California Office of Environmental Health Hazard Assessment has set a public health goal of 0.004 µg/L for arsenic.

Radon

The USEPA has proposed a radon MCL of 300 pCi/L for drinking water supplies in states where there are no approved Multimedia Mitigation programs for reducing indoor radon. For states with approved programs, the standard is 4,000 pCi/L. Metropolitan's supplies have radon levels well below the MCL.

Uranium

Uranium is high priority with Metropolitan as a 10.5 million ton pile of uranium mine tailings is 600 hundred feet from the Colorado River in Moab, Utah. Percolation of rainwater through the pile occurs causing contamination of local groundwater resources and flows of uranium into the river. During a large flood or other natural disaster there is the potential for large volumes of the contaminated material to flow enter the river. Interim action measures instituted by the Department of Energy (DOE) include intercepting portions of the contaminated groundwater before it enters the River. Concentrations ranging from 950 to 1,190 pCi/L have been detected at the point local groundwater enters the river. At Metropolitan's intake at the river, uranium concentrations of 1 to 5 pCi/L have been detected. California has a drinking water standard for uranium of 20 pCi/L. Metropolitan continues to monitor clean-up effort instituted by DOE.

Emerging Contaminants

NDMA is an emerging contaminant of concern believed to be widespread. NDMA is a disinfection-product of water and wastewater treatment processes. Chlorine and monochloramines can react with organic nitrogen precursors to form NDMA. California notification level is 0.010 µg/L. Concentrations found in Metropolitan supply ranging from non-detect (reporting limit of 0.002 µg/L) to 0.012 µg/L. Action measures may be required in the future to control or remove NDMA from water supplies.

Hexavalent chromium or chromium VI is a potential surface water and groundwater contaminant. It is an inorganic chemical used in cooling towers for corrosion control, electroplating, leather tanning, wood treatment, and pigment manufacturing. Contaminant pathways include discharges from industrial users, leaching from hazardous waste sites, and erosion of naturally occurring deposits. California has a current MCL for total chromium (includes chromium VI) of 0.05 mg/L. This level is currently under review by DHS. The California Legislature required DHS to set a MCL specifically for chromium VI by January 1, 2004. However, this has not been set at this time. Metropolitan participates in a Technical Work Group reviewing remediation plans for chromium VI near Topock, Arizona along the Colorado River.

3.3.2 Water Quality Protection Programs

Metropolitan participates in multiple programs to improve water quality supplies. Those programs include:

- Watershed Sanitary Survey;
- Source Water Assessment;
- Support of DWR policies and programs improving the quality of deliveries to Metropolitan;
- Support of the Sacramento River Watershed Program ;
- Water quality exchange partnerships; and
- Implementation of additional security measures.

3.3.3 Imported Water Quality Impacts on Supply Reliability

Through its management strategies and in coordination with member agencies, Metropolitan is able provide member agencies supply options that allow local agencies to meet regulatory standards. Currently known and foreseeable water quality issues are already incorporated into existing management strategies and the reliability of Metropolitan's supplies for the next 25 years. However, unforeseeable water quality issues could potentially alter Metropolitan water and potentially impact its supply reliability.

3.4 Local Projects

Multiple MWDOC member agencies supplement MWDOC's water supply with their own local potable and non-potable supplies. Local supplies are supplies not produced from the Orange County Groundwater Basin nor managed by OCWD, but rather are supplies obtained from other groundwater basins, surface waters, or recycled water. Each MWDOC member agency must manage its resources and monitor water quality to ensure all applicable regulatory requirements are met. Annual water quality reports are provided by member agencies to their customers as required. Member agencies have accounted for any anticipated water quality issues within their current management strategies and do not anticipate any future reductions in supplies related to water quality.

3.4.1 City of Brea

The city of Brea obtains local water supplies from the California Domestic Water Company to supplement imported supplies. The California Domestic Water Company extracts its groundwater from the San Gabriel Basin. Minimal groundwater pumping for non-potable uses also occurs at a local golf course for irrigation purposes only. The city of Brea has indicated it does not have any water quality issues with its local water resources nor does it anticipate any future issues that would reduce local supplies.

3.4.2 City of La Habra

The city of La Habra obtains local water supplies from both the California Domestic Water Company and local wells in the La Habra Basin. The California Domestic Water Company extracts its groundwater from the San Gabriel Basin. There are no water quality issues with water obtained from the California Domestic Water Company. Groundwater extracted from the La Habra Basin is treated to reduce iron and hydrogen sulfide to acceptable drinking water standards. Treatment consists of air stripping and the addition of sodium hexavalent. In the future, La Habra expects to double its production from groundwater wells. The city of La Habra has indicated that it does not have any water quality issues with their local water sources, beyond the two contaminants it is currently removing, nor does it anticipate any future issues that would reduce local supplies.

3.4.3 Santiago County Water District

Santiago Count Water District utilizes a small horizontal pipeline in Harding Canyon to capture groundwater under the influence of surface water as a means to supplement MWDOC supplies. This local water supply is available during the wet season only with yields ranging from 50 to 250 acre-feet per year. Previously, Santiago County Water District operated Read Well, but the well is closed as additional treatment of the water is required to meet DHS standards. Current water management strategies do not incorporate Read Well as a local supply option. Santiago County Water

District has indicated it does not have any water quality issues with its local water resource in Harding Canyon nor does it anticipate any future issues that would reduce local supplies.

3.4.4 Moulton Niguel Water District

Moulton Niguel Water District produces recycled water to offset part of its demand on MWDOC. All recycled water meets DHS water quality standards. Occasionally, end users have complained about odor or sand/debris in the recycled water distribution system. When these concerns arise, MNWD flushes the system, and the concerns are alleviated. Moulton Niguel Water District has indicated that it does not anticipate any future water quality issues that would reduce available local recycled water supplies.

3.4.5 El Toro Water District

El Toro Water District utilizes approximately 300 acre-feet per year of recycled water for golf course irrigation. El Toro Water District has indicated its does not have any water quality issues with its recycled water resource nor does it anticipate any future issues that would reduce local supplies.

3.4.6 City of San Juan Capistrano

The city of San Juan Capistrano supplements its imported Metropolitan supplies with extractions from the San Juan Basin. Extracted water is used for both potable and non-potable purposes. High manganese, iron, and TDS levels are present within the San Juan Basin. Management strategies to reduce these contaminants include installing additional wells with treatment capabilities to prevent reductions in future local supplies. Additionally, the city recently completed a groundwater desalter plant that has increased the reliability of local supplies while reducing dependability upon imported water. The desalter plant is expected to produce approximately 4,920 acre-feet per year. The city also treats non-potable groundwater from the San Juan Basin at its non-domestic treatment plant for distribution in its non-potable water system. In the future, the city plans to blend discharge from its wastewater treatment plant with the non-potable groundwater and further treat the water at its non-domestic treatment plant prior to distribution to its non-potable water system. The city does not foresee any future supply issues associated with the existing system.

3.4.7 City of San Clemente

Local groundwater is extracted by the city of San Clemente to augment imported supplies. Treatment facilities remove high iron and manganese concentrations from the extracted water. Recycled water is used to partially offset demands of potable water. The city has resolved all water quality

issues associated with its recycled water supply. The city has indicated that it does not anticipate any future water quality issues that would reduce available local water supplies.

3.4.8 Trabuco Canyon Water District

Trabuco Canyon Water District produces approximately 400 acre-feet per year from local groundwater resources that are blended with imported supplies. Trabuco Canyon Water District also utilizes recycled water to for non-potable uses. Trabuco Canyon Water District has indicated it does not have any water quality issues with its local water resources nor does it anticipate any future issues that would reduce local supplies.

3.4.9 Santa Margarita Water District

Santa Margarita Water District operates one potable groundwater well on a contract only basis, producing approximately 150 acre-feet per year. Supplies from this well are not included in Santa Margarita Water District's resource mix. Recycled water is also part of Santa Margarita Water District's local water resource mix. A portion of its recycled water is derived from stormwater captured at Oso Creek. No water quality issues are associated with this well or recycled water supplies nor are any anticipated in the future.

3.4.10 Irvine Ranch Water District

IRWD obtains the majority of its groundwater from the Orange County Groundwater Basin managed by OCWD (see discussion under that section); however, a minimal amount of local groundwater outside of OCWD's jurisdiction is extracted from a well in the Lake Forest area. Water from this well is poor quality and is used for non-potable uses only. Approximately, 300-400 acre-feet per year are extracted. In the future, IRWD may stop using this local source of groundwater. Current management strategies have taken this into account, and IRWD does not rely on this source to meet supply reliability objectives.

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4.0 PLANNING FOR THE FUTURE

4.1 Programs to Maximize Resources and Minimize Imported Supplies

As a regional provider and resource planning agency, Municipal Water District of Orange County (MWDOC) is committed to identifying ways of maximizing the area's existing water resources in an effort to minimize its dependency on imported supplies. To that end, the agency has taken a proactive stance, participating in the following efforts:

4.1.1 Integrated Regional Water Management Plan

In 2000, the Legislature passed the *Integrated Regional Water Management Planning (IRWMP) Act*, which allows a regional water management group to prepare and adopt an IRWMP that includes qualified programs or projects or qualified reports or studies. The intent of the Legislature is to encourage local agencies to work cooperatively to manage their available local and imported water supplies to improve the quality, quantity, and reliability of those supplies.

Recognizing the sustainable future of the MWDOC service area depends upon the successful management of local and imported water supplies, MWDOC has been working with the County of Orange (lead) and the 24 cities and special districts serving the water and wastewater needs of south Orange County over the years to develop and integrate regional strategies that address, raise community awareness, and coordinate numerous and varied projects that:

- Protect communities from drought;
- Enhance local water supply and system reliability;
- Ensure continued water security;
- Optimize watershed and coastal resources;
- Improve water quality throughout the watersheds;
- Safeguard habitat.

In addition, these projects, which are based on a watershed approach, include one or more of the following water management elements:

- Programs for water supply reliability, water conservation and water use efficiency;
- Storm water capture, storage, treatment and management;

- Removal of invasive non-native plants;
- Creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands
- Non-point source pollution reduction, management, and monitoring;
- Groundwater recharge and management projects;
- Water banking, water exchange, water reclamation, desalting, and other treatment technologies;
- Planning and implementation of multipurpose flood control programs that protect property; improve water quality, storm water capture and percolation; and protect or improve wildlife habitat;
- Watershed management planning and implementation; and
- Demonstration projects to develop new drinking water treatment and distribution methods.

In August 2004, this diverse group came together as a single unit to create stronger regional partnerships and connectivity, to maximize the efficiency of their efforts, and to identify funding opportunities and apply for competitive grants.

Specifically, the South Orange County Integrated Regional Water Management (IRWM) Group provides a framework for coordinating planning activities and projects related to water management and watershed protection that have been studied and funded, or are in need of funding, and integrating them into a water management plan with multiple regional benefits.

To date, nearly 100 short- and long-term projects have been identified and prioritized based on the overall benefit they provide the south county region and their readiness for implementation.

4.1.2 Water Use Efficiency Program

California's water is a valuable and limited natural resource. There is a continuing need to conserve and efficiently utilize existing water supplies. Interest in water use efficiency (conservation) has been heightened by the continued growing need for water throughout California. The growth in water demand will continue due to the projected increase in population, along with increases in commercial and industrial activity. Water use

efficiency and demand management programs will help to stretch existing water supplies to meet these growing needs.

MWDOC recognizes water use efficiency as an integral component of the current and future water resource strategy for Orange County. Along with groundwater, recycled water, and imported water, water use efficiency is recognized as a low-cost source of new supply for the region. An ethic of efficient use of water has been developing over the last 14 years of water use efficiency programs implementation.

MWDOC demonstrated its commitment to water use efficiency in 1991 by voluntarily signing the Memorandum of Understanding(MOU) Regarding Urban Water Conservation in California (CUWCC). The California Urban Water Conservation Council was formed through adoption of this MOU and is considered the “keeper” of the 14 Best Management Practices (BMPs), with the authority to add, change, or remove BMPs. The CUWCC also monitors BMP implementation of the MOU. As a signatory to the MOU, MWDOC has committed to a good-faith-effort to implement all cost-effective BMPs.

Relative to urban water supply and management in general, the term "Best Management Practices" refers to policies, programs, rules, regulations and ordinances, and the use of devices, equipment, and facilities that, over the long term, have been generally justified and accepted by the industry as providing a "reliable" reduction in water demand. These methodologies and technologies are both technically and economically reasonable, are not environmentally or socially unacceptable, and their practice is not otherwise unreasonable for most water suppliers to carry out.

These 14 BMPs include technologies and methodologies that have been sufficiently documented in multiple demonstration projects that result in more efficient water use and conservation.

As a regional wholesaler of imported water, MWDOC's current Water Use Efficiency Program includes regional programs implemented on behalf of its member agencies revolving around the 14 BMPs identified in Table 4-1-2-A and the following four basic goals:

- Provide ongoing water use efficiency program technical support for member agencies that are implementing programs locally;

- Assume the position of lead agency to develop and implement water use efficiency programs that are more cost-effectively implemented on a regional basis rather than a local basis;

- Secure outside funding from Metropolitan’s Conservation Credits Program, the U.S. Bureau of Reclamation, and other sources; and

- Identify the need for and conduct studies to evaluate the effectiveness of existing and potential water use efficiency programs for the region.

Table 4-1-2-A: Memorandum of Understanding Best Management Practices Implementation Responsibility and Regional Programs in Orange County

BMP #	EFFICIENCY MEASURE	Applies to:		MWDOC Regional Program
		Retailer	MWDOC as a Wholesaler	
1	Home Water Surveys	√		√
2	Residential Plumbing Fixture Retrofits	75% Saturation goal achieved in 2001		
3	System Water Audits, Leak Detection and Repair	√	(1)	√
4	Metering With Commodity Rates	√		
5	Large Landscape Conservation Programs	√		√
6	High-Efficiency Washing Machine Rebate Programs	√		√
7	Public Information Programs	√	√	√
8	School Education Programs	√	√	√
9	Commercial, Industrial, and Institutional Programs	√		√
10	Wholesale Agency Assistance Programs		√	√
11	Conservation Pricing	√	√	√
12	Conservation Coordinator	√	√	√
13	Water Waste Prohibition	√		√
14	Residential ULFT Replacement Programs	√		√

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

Source: Municipal Water District of Orange County

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data takes precedence.

Section 5 of this Plan provides a detailed description of MWDOC's overall water use efficiency efforts including regional program descriptions, implementation achievements to date, water savings realized, and research activities.

4.1.3 Orange County Water Reliability Plan

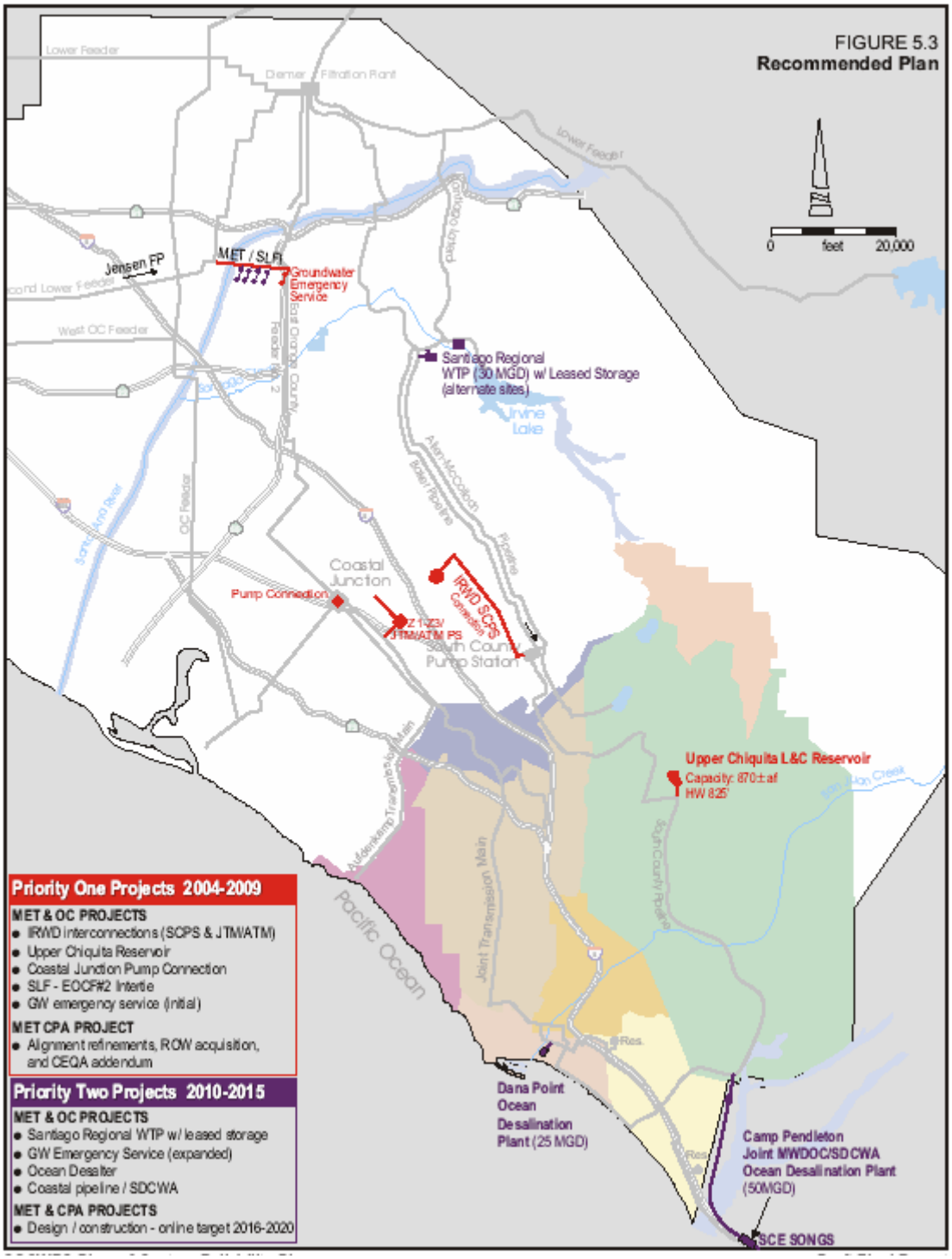
Under this program, MWDOC completed its *Orange County Water System Reliability Study*, which currently consists of separate planning documents for both the south and north county areas. The primary focus of these efforts is developing system reliability improvement plans that will more fully protect Orange County from major facility outages due to earthquakes, facility component or structural failures, or from other causes.

Especially vulnerable areas, such as south Orange County, which receives 95% of its potable water supply from a single regional Metropolitan treatment plant (Diemer Filtration Plan) located more than 35 miles from the

area, will significantly benefit from this program. The Diemer Filtration plant is situated close to the Whittier Fault, which poses a major risk to this facility and the reliability of water supply to South Orange County. Under a collaborative reliability improvement program, MWDOC and Metropolitan have been working cooperatively on various regional reliability improvements. Metropolitan has recently completed its Infrastructure Reliability and Protection Program (IRPP) for the Diemer Filtration Plant and its Orange County distribution system. MWDOC, with the cooperation of eight south Orange County agencies and with funding support from the U.S. Bureau of Reclamation, has developed the South Orange County Water Reliability Study. The Phase 2 System Reliability Plan was released in September 2004. This study recommended several reliability improvements to be implemented under two phases spanning 10 years.

Figure 4-1-3-A shows the recommended reliability improvements. Work is underway on implementing the Phase 1 program. These projects are: (1) two lined and covered reservoirs with emergency interconnections to the South County Pipeline in Santa Margarita Water District (lead agency with MWDOC coordination); (2) emergency interconnections from the IRWD to the South County Pipeline and to the Joint Transmission Pipeline and Aufdemkamp Transmission Pipeline (IRWD lead agency with MWDOC coordination); (3) East Orange County Feeder No. 2 emergency interconnections by construction of the Orange County Cross Feeder and pump risers at the Coastal Junction facility (Metropolitan lead agency with MWDOC coordination); (4) groundwater emergency pump-in service to the East Orange County Feeder No. 2 (MWDOC lead planning agency); and (5) the Dana Point Ocean Desalination Project (MWDOC lead planning agency).

Figure 4-1-3-A: Recommended Reliability Improvements



Source: Municipal Water District of Orange County, *South Orange County Water Reliability Study*, Figure 5.3

The Dana Point Ocean Desalination Project will provide both system reliability benefits as well as a new potable-water supply source in south Orange County. Feasibility investigations are now underway. MWDOC's goal is to determine the feasibility of the project by mid-2006. Primary areas of investigation are feedwater supply using a subsurface intake system, concentrated ocean water disposal utilizing the regional wastewater system outfall, and a project power study. Upon completion of these investigations, the overall project feasibility report would be prepared and costs estimated. At that time, the project will be reviewed and a go/no-go decision considered. Should the project proceed, the next steps will include developing arrangements to preserve the identified sites, conducting a pilot plant and demonstration project to develop the treatment process and cost parameters, and preparation of the full project California Environmental Quality Act documentation.

4.1.4 South Orange County Water Reliability Study

Approximately 95% of south Orange County's potable water supply is imported from Northern California and the Colorado River. This water is treated locally at the Diemer Filtration Plant in Yorba Linda and delivered via two aging pipelines, the East Orange County Feeder No. 2 and Allen McColloch Pipeline. To ensure continued water reliability for south Orange County, 11 Orange County agencies, Metropolitan, and the U.S. Bureau of Reclamation joined together to fund the *South Orange County Water Reliability Study* (SOCWRS) - Phase 2 System Reliability Plan. MWDOC headed these efforts.

The purpose of this planning effort, conducted from 2003-04, was to:

- Identify risks, including earthquakes, that pose the greatest threat to the regional water treatment and distribution infrastructure;
- Identify ways to bolster source-of-supply and regional distribution systems;
- Building on earlier engineering investigations and studies Develop a list of projects that accomplish the above objectives, and identify appropriate investments;
- Allow for flexibility in phasing. Most notably project operational dates and sizing should be flexible to account for changes in local resource development (LRPs);

The plan builds on a number of prior studies, including: SOCWRS Phase 1, which served as the foundation for this effort; Metropolitan's Central Pool Augmentation Project, currently in project and right-of-way refinement; Santa Margarita Water District's Lined and Covered Reservoir investigations to increase local storage for emergency needs;

IRWD's Water Resources Master Plan Update and Planning Area-6 Sub-Area Master Plan; and various Orange County Water District (OCWD) plans and groundwater basin operations studies.

To determine the economic impacts of water shortages, MWDOC retained the services of the Orange County Business Council. According to the Orange County Business Council, the economic impacts could reach $1.7 billion, depending on the shortage scenario. Even a relatively short 10-day outage of 20% carries a projected impact of over $60 million. These numbers illustrate the tremendous potential cost to south Orange County from water system outages.

Key planning principles used to guide the formulation of alternatives and the plan included:

- Developing priorities for accommodating Metropolitan planned shutdowns of seven days of average demand and for emergency outages of up to 31 days of summer demand;

- Evaluating compatibility of project components with existing and future supply needs, with preference for projects providing multiple purposes, and seeking economies of scale through regional joint use facilities;

- Making better use of existing, underutilized infrastructure assets;

- Identifying Metropolitan system investments that can provide for flexibility in system operation, which would maintain and improve system capability and reliability for Orange County; and

- Selecting appropriate projects that can be phased and modified to changing conditions.

Projects were identified and an action plan developed. The recommended projects fell into three categories and are the building blocks of the Base Plan and the Contingency Plan. They included: (1) regional distribution system; (2) storage/treatment; and (3) ocean desalination. Implementation of the recommended plan will commence upon reaching agreement with the south Orange County agencies on the priority projects, gaining plan acceptance, and developing a business plan and organizational structure for implementation of the plan.

4.1.5 Assist Member Agencies to Participate in Metropolitan's Incentive Program for Local Supply Development

MWDOC plays a key role in assisting its member agencies in getting the financial assistance from Metropolitan's incentive programs through the competitive selection process.

Capital risk is a significant constraint to increased local supply project development. Most of the local supply projects require significant capital investments in treatment and distribution system. Uncertainty of market demands creates a risk to the cost recovery required for the repayment of capital debt. This large capital risk often deters agencies from undertaking the development of new supplies.

Metropolitan developed several incentive programs to assist local agencies in overcoming this obstacle. In its role as the regional provider, MWDOC works hard to assist its member agencies to obtain this financial assistance by showing evidence that those local projects do offer regional benefits to offset regional supply shortages.

Followings are summary of the incentive programs:

- Local Projects Program (LPP) – Metropolitan implemented the LPP in 1982 to assist local agencies with the development of recycled water supply projects. Between 1986 to 1990, the LPP contribution for a project was a minimum of $75 per acre-foot of production, which roughly equaled Metropolitan's avoided energy cost for pumping an equivalent amount of water through the State Water Project. In April 1990, Metropolitan modified the LPP contribution to $154 per acre-foot. In August 1995, Metropolitan converted the program again. The contribution for a project for the converted program ranged from $0 to a maximum of $250 per acre-foot, based on the difference between the project's unit cost and Metropolitan's treated water rate;

- Groundwater Recovery Program (GRP) – Metropolitan initiated the GRP in 1991 to encourage local agencies to treat and use degraded groundwater for municipal purposes. Metropolitan provided financial assistance based on the difference between the project unit cost and its treated water rate, up to a maximum of $250 per acre-foot;

- Competitive Local Resources Program (LRP) – In June 1998, Metropolitan retired the aforementioned incentive programs and established the Competitive LRP in their places. The Competitive LRP uses a competitive Request for Proposals process to encourage the development of cost-effective recycled and groundwater

recovery projects. This program offers financial incentives of up to $250 per acre-foot; and

- Seawater Desalination Program (SDP) – Metropolitan and its member agencies view seawater desalination as a future component of a diversified water supply portfolio. In Metropolitan's Integrated Resource Plan Update, Metropolitan identified a target of 750,000 acre-feet per year of local water production by 2025 that could include up to 150,000 acre-feet per year of seawater desalination. Metropolitan initiated the SDP in 2001 and provides financial assistance of up to $250 per acre-foot for 25 years for desalinated seawater that is developed and used within Metropolitan's service area. MWDOC has submitted a proposal on behalf of its member agencies for an amount of 28,000 acre-feet per year of seawater desalination. Currently, MWDOC is working on executing the contract with Metropolitan under this proposal.

Table 4.1.5 summarizes the projects within MWDOC's service area that have been awarded with the incentive program contract.

Table 4-1-5-A: Local Supply Projects within MWDOC's Service Area that Have Been Awarded with Metropolitan's Financial Incentive Program Contracts

Lead Agency Name	Project Name	Met Sponsorship		Types	Usage	Status
		Contract Type	Contract Yield [1]			
Irvine Ranch Water District	IRWD **Irvine Desalter**	GRP 91	6,700	GW Recovery	Potable and Non-Potable	Construction
Irvine Ranch Water District	IRWD **Michelson and LAWRP Reclamation 2005 Upgrades**	LRP 04	8,500	Reclamation	Non-potable	Construction; on-line 12/2006
Irvine Ranch Water District	IRWD **Michelson Reclamation** Project	LPP	10,000	Reclamation	Non-Potable	In Operation
Mesa Consolidated WD	Mesa CWD **Colored Water Treatment Facility Phase I**	LRP 98	5,650	GW Recovery	Potable	In operation
Mesa Consolidated WD	Mesa CWD **Colored Water Treatment Facility Phase II**	LRP 98	5,650	GW Recovery	Potable	In planning
Moulton Niguel WD	Moulton Niguel **Reclamation Expansion Phase II-III** Plus DWR Loan	LPP	8,000	Reclamation	Non-Potable	In operation
Moulton Niguel WD	Moulton Niguel **Reclamation Expansion Phase IV**	LRP 98	1,276	Reclamation	Non-Potable	In operation
MWDOC	MWDOC **South OC Ocean Desalination** Project	ODP 05	28,000	Ocean Desal	Potable	Planning
Orange County Water District	OCWD **Green Acres Reclamation** Project	LRP	7,000	Reclamation	Non-Potable	In Operation
Orange County Water District & Orange County Sanitation District	OCWD & OCSD **Ground Water Replenishment System**	LRP 04	31,000	Reclamation	Potable (indirectly)	Construction; On line Summer 2007
San Clemente, City of	San Clemente Water Reclamation Project	LPP	1,500	Reclamation	Non-Potable	In Operation
San Juan Capistrano, City of	San Juan Capistrano **Desalter**	GRP 98	4,800	GW Recovery	Potable	Construction
San Juan Capistrano, City of	San Juan Capistrano **Non-Domestic Water System Expansion**	LRP 98	2,895	Reclamation	Non-Potable	Planning
Santa Margarita WD	SMWD **Oso Reclamation** Plant (Existing)	LPP	3,360	Reclamation	Non-potable	In Operation
Santa Margarita WD	SMWD **Chiquita Reclamation** Project	LRP 98	2,772	Reclamation	Non-potable	Construction; on-line 2005-06
South Coast WD	South Coast WD **Capistrano Beach Desalter**	GRP 98	1,300	GW Recovery	Potable	Design
Trabuco Canyon WD	**TCWD Reclamation Expansion** Project	LPP	800	Reclamation	Non-potable	In Operation
Tustin, City of	**Tustin Desalter (17th Street)**	GRP 91	2,800	GW Recovery	Potable	Operation

[1] A typical contract provision has MET pay on yield up to 20% over the Contract Yield amount.
[2] South Coast WD South Laguna Reclamation Project not included because MET contract expired in 3/04 after its full 20 years.
Source: Muncipal Water District of Orange County

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data takes precedence.

4.1.6 Cooperative Agreement with Orange County Water District

For the water supply sustainability in this region, it is critical that MWDOC and Orange County Water District (OCWD), work cooperatively for the benefit of the public. MWDOC manages the imported water supplies into the county in conjunction with Anaheim, Fullerton, and Santa Ana. OCWD manages the local supplies and groundwater storage levels of the Lower

Santa Ana River Groundwater Basin. On August 15, 2001 and again on April 23, 2003, MWDOC and OCWD adopted a *memorandum of understanding* (MOU) to coordinate mutual water resources planning, supply availability, and water use efficiency programs for the benefit of the Orange County region.

Such a program requires MWDOC and OCWD to look outside of their strict borders and traditional missions because of the interconnectedness of water issues affecting Orange County. Due to their regional natures, MWDOC as a water wholesaler and OCWD as a groundwater basin manager, both are appropriate agencies in Orange County to lead such a program.

With this program, the Boards of Directors of both MWDOC and OCWD jointly declare the following to be desirable and mutually acceptable objectives:

- Staffs from both agencies should continue working together to prepare and pursue actions toward developing an overall water supply and system reliability program for Orange County;

- Staffs are directed to coordinate with the Metropolitan and its Orange County member agencies to discuss new ideas to further this program;

- Key planning activities within the Orange County are identified as such:

    - Evaluate Orange County Demand;

    - Identify availability/reliability of Metropolitan supplies;

    - Develop groundwater management plans, including coastal pumping transfers and other programs addressing Santa Ana River Watershed issues;

    - Develop a recharge master plan;

    - Develop a long-term facilities plan;

    - Develop an Emergency Service Plan (Orange County Basin to serve areas outside of the Basin during emergency situation;

    - Facilitate responses to Metropolitan Local Resources Program (RFP) for funding assistance;

    - Complete South Orange County Reliability Study;

- Develop water transfers, dry year options, storage;
- Develop water use efficiency master plan and enhanced conservation;
- Implement Metropolitan conjunctive use project;
- Evaluate rate structure refinements; and
- Coordinate and support each others on issues related to legislative, regulatory, and water supply.

- The program creates a joint planning committee, which will continue to meet to monitor progress and make recommendations for the two Boards, which shall also periodically meet on a joint basis.

Not yet adopted, a resolution has been drafted by this joint program to work together to manage supplies during drought and non-drought situation. Goals identified are:

- Avoid water-rationing situations caused by prolonged droughts through proactive management of supplies during both drought and non-drought situations and through efficiency of use of existing supplies;
- Minimize the impacts of prolonged droughts to Orange County; and
- Accelerate the refill of the groundwater basin following any drafting of storage during a drought situation.

4.1.7 Role in Ocean Water Desalination Feasibility Investigation

South Orange County, home to about 500,000 residents and growing, obtains most of it water from imported sources (86% of total, 98% of potable). This imported water is delivered through two pipelines and treated at the Diemer Filtration Plant, as much as 35 miles away from portions of south Orange County. The two pipelines are the Allen McColloch Pipeline and the East Orange County Feeder No. 2. The Diemer Filtration Plant, located in Yorba Linda, was built in 1964 and supplies almost 100% of the treated imported supplies to Orange County. The Diemer FiltrationPlant, the Allen McColloch Pipeline, and the East Orange County Feeder No. 2 pipeline are essential for supplying water, particularly to south Orange County. An outage of any one of the three facilities has the potential to create supply problems until service is restored. In particular, an outage of the Diemer FiltrationPlant would be an extremely difficult event with which to deal. Development of additional local supplies in south Orange County,

such as ocean desalination facilities, can help improve the reliability of the area.

MWDOC recently completed the South Orange County Water Reliability Study, which examined and evaluated options for providing greater water supply and system reliability. A recommendation from the study is the development of an ocean water desalination facility that would provide south Orange County with a new local source of water. Such a project would also provide relief to the area that is almost entirely dependent on imported water, has only two imported water delivery pipelines to serve more than 500,000 people, and is subject to interruptions should it experience another imported water pipeline outage like it did in 1999.

While still in the feasibility stage, MWDOC is considering constructing a 10-20 Million Gallon per Day (MGD) reverse osmosis (RO) ocean desalination facility to supply water to south Orange County. The facility would produce a new water supply of 12,000-to-24,000 acre-feet per year, diversify the sources of supply, provide drought protection, improve system reliability, and improve water quality by providing a lower level of Total Dissolved Solids (TDS) in the supply. This will be especially helpful in expanding water recycling opportunities for south Orange County.

Potential sites for a south Orange County ocean water desalination facility include Dana Point and a somewhat larger facility at Camp Pendleton that could provide water service to Orange County, San Diego County, and could improve the water security to the U.S. Marine Corps at Camp Pendleton. The project at Camp Pendleton would be a joint effort between MWDOC and the San Diego County Water Authority and would potentially use the existing intake and outfall facility from the San Onofre Unit 1, which is currently in the process of being decommissioned.

In February/March 2005, MWDOC conducted the first phase of its hydrogeology and water quality testing at a possible ocean water desalination site in Dana Point at Doheny State Beach. Results of the initial testing are promising, and MWDOC is now continuing to the next phase of feasibility testing. Throughout this effort, MWDOC has worked closely with the city of Dana Point, the South Coast Water District, which serves this part of the county, and the California State Department of Parks and Recreation. MWDOC has also done target community outreach to such important stakeholders as the Surfrider Foundation, Orange County Coastkeeper, and other environmental groups.

4.1.8 Southern California Comprehensive Water Reclamation and Re-use Study

MWDOC participated, as a member of its Project Advisory Committee (PAC), in the Phase II of this comprehensive regional study on the use of recycled supply.

This is a six-year comprehensive effort that fully examined recycled water opportunities from a regional perspective to develop a long-term planning strategy to develop recycled water supplies for *Southern California. Southern California Comprehensive Water Reclamation and Re-use Study* (SCCWRRS) was developed by three phases: Phase IA, Phase IB, and Phase II. The following paragraphs describe each of the phrases:

- Phase IA – The primary purpose of this phase was to compile available information on supply and demand for both fresh and recycled water throughout southern California. At the end of this phase, the study concluded that without increased water recycling, the water supply would remain relatively constant through the year 2040, while demand would increase. It also concluded that the water demand shortfall in the near term could be met with recycled water if the projected recycled water supplies are put to beneficial uses;

- Phase IB – The study gathered inputs and used analysis tools to optimize recycled water use from the regional perspective and, in the process, to identify constraints to maximizing reuse. The major conclusion reached during this phase was that a regional water recycling project that spans the entire study area does not appear practical at this time; however, sub-regional systems warranted further evaluation. The sub-regional areas evaluated in this phase were grouped into geographical regions that facilitated the development of reclamation systems to meet the regional recycling goals. These regions include the Los Angeles Basin region, Orange County region, San Diego region, and Inland Empire region;

- Phase II – This phase of the study focused on developing a long-term regional recycling strategy and identifying short-term opportunities for implementing the strategy. In Phase I, participation was limited to the United States Bureau of Reclamation and eight agencies representing a variety of water recycling interests in Southern California. In Phase II, participation was expanded to include local agencies potentially affected by the implementation of projects arising from the SCCWRRS. In response to the invitation to participate, MWDOC, joined with other 70 local agencies from across Southern California, and became an active participant in the development and analysis of regional water recycling projects. Local agencies were integral participants in the decision-making process of Phase II.

  The objective of this phase was to examine opportunities for short-term and long-term implementation. Unlike typical master planning activities, the SCCWRRS analyses examined two distinct time horizons, which were defined as 2010 (short-term) and 2040 (long-term). Through the short-term analysis, 34 projects distributed

across Southern California were identified for short-term implementation. Of these, 15 projects were identified as regional projects. All projects identified within Orange County were grouped in the regional projects category. The regional projects include a number of agencies, both water and wastewater, cooperating regionally to produce and deliver recycled water. This phase also develop a long-term regional recycling strategy for projects through 2040.

The short term projects have a total potential yield of approximately 451,500 acre-feet per year of additional recycled water, of which 114,600 acre-feet per year were with Orange County. The long-term strategy is expected to satisfy additional demand of 296,300 acre-feet per year by 2040, of which 52,500 acre-feet per year should be within Orange County.

References:

Municipal Water District of Orange County. *Board Resolution – Memorandum of Understanding Cooperative Agreement between MWDOC and OCWD.* 2005

Municipal Water District of Orange County. *Orange County Water Reliability Plan.* 2005

Municipal Water District of Orange County. *South Orange County Water Reliability Study*. 2001

United States Bureau of Reclamation. *Southern California Comprehensive Water Reclamation and Re-use Study, Phase II Final Report.* July 2002

5.0 WATER DEMAND MANAGEMENT PROGRAMS

The Urban Water Management Planning Act describes two distinct methods for providing information related to Demand Management Measures (DMMs) and meeting the requirements of Water Code Section 10631 (f) and (g): (1) Members of the California Urban Water Conservation Council (CUWCC) may submit annual Best Management Practice (BMP) Activity Reports; or (2) water suppliers who are not members or choose not to submit annual BMP Activity Reports must submit information about their programs, including current activities, scheduled activities, methods of evaluation, savings, and costs.

As an active reporting member of the CUWCC, the Municipal Water District of Orange County (MWDOC) has included its BMP Activity Reports as Section 5.1 and BMP Coverage Reports as Section 5.2 of this Urban Water Management Plan.

Although no future programs are needed to meet the scheduled demand management measures, MWDOC believes in the value of demand management and continuously invests in programs beyond those required by BMP. Supplemental information describing those demand management activities that go beyond voluntary wholesaler BMP implementation is included as Section 5.3.

The five most recent annual BMP Activity Reports are included in this Plan (2000 through 2004), along with BMP Coverage Reports as a measure of implementation over time. MWDOC has not submitted any exemption requests as it has found all BMPs applicable to wholesalers to be cost effective.

5.1 Best Management Practice (BMP) Activity Reports (2000 through 2004)

The California Urban Water Conservation Council Annual Best Management Practice Implementation Reports for 2000 through 2004 are provided as *Appendix 5-A* in this report.

5.2 Best Management Practice (BMP) Coverage Report

The California Urban Water Conservation Council Best Management Practice Coverage Reports for 2000 through 2004 are provided as *Appendix 5-B* in this report

5.3 Council Coverage Calculator and Best Management Practice Cost-effectiveness Forms

MWDOC considers all BMPs applicable to MWDOC as a signatory wholesale water agency to be cost effective and is actively pursuing implementation. As a result, MWDOC has not submitted any cost effectiveness exemptions to the CUWCC.

5.4 MWDOC's Accomplishment in Conservation Programs Since 2000

California's water is a valuable and limited natural resource. There is a continuing

need to conserve and efficiently utilize existing water supplies. Interest in water use efficiency (conservation or demand management measures) has been heightened by the growing need for water throughout California. The growth in water demand will continue due to increases in population and changes in commercial and industrial activity. Water use efficiency will help stretch existing water supplies to meet these growing needs.

MWDOC recognizes water use efficiency as an integral component of the current and future water resource strategy for Orange County. Along with groundwater, recycled water, and imported water, water use efficiency is a low-cost source of new supply for the Orange County region. An ethic of efficient use of water has been developing over the last 14 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 Best Management Practices-based efficiency programs makes good economic sense and reflects responsible stewardship of the county's water resources.

As a regional wholesaler of imported water, MWDOC purchases Colorado River and State Water Project water from the Metropolitan and sells it to 29 of 32 retail water agencies in Orange County. The cities of Anaheim, Fullerton, and Santa Ana purchase imported water directly from Metropolitan.

5.4.1 Role of BMPs in MWDOC Service Area

The standards for water use efficiency in California are the 14 BMPs contained in the *Urban Memorandum of Understanding Regarding Urban Water Conservation in California* (MOU) established in 1991. The California Urban Water Conservation Council was established through the MOU and acts as the "keeper" of the BMPs with the authority to add, remove, or change BMPs over time. These 14 BMPs include technologies and methodologies that have been sufficiently documented in multiple demonstration projects which result in more efficient water use and conservation. All retail water agencies in Orange County are actively implementing BMP-based programs; however, not all retail water agencies are signatories to the MOU. Table 5-4-1-A identifies those regional and local water agencies and organizations that have signed the MOU, voluntarily committing to a good faith effort to implement cost effective BMPs.

Table 5-4-1-A: Memorandum of Understanding Signatory Agencies and Organizations in Orange County

Water Agencies	Year MOU Signed
Anaheim, City of	1991
Brea, City of	
Buena Park, City of	
East Orange County WD	2000
El Toro WD	1994

Fountain Valley, City of	2000
Fullerton, City of	
Garden Grove, City of	1996
Huntington Beach, City of	2000
Irvine Ranch WD	1991
La Habra, City of	
La Palma, City of	
Laguna Beach County WD	
Mesa Consolidated WD	1994
Moulton Niguel WD	1991
Municipal Water District of Orange County	1991
Newport Beach, City of	
Orange, City of	
Orange County WD	1991
Orange Park Acres Mutual WCo.	
San Clemente, City of	
San Juan Capistrano, City of	1994
Santa Ana, City of	1999
Santa Margarita WD	
Santiago County WD	
Seal Beach, City of	2002
Serrano WD	
South Coast WD	1991
Golden State Water Co.	1991
Trabuco Canyon WD	1991
Tustin, City of	
Westminster, City of	
Yorba Linda WD	
Other Signatory Agencies and Organizations	
County of Orange	1991
Orange County Sanitation District	1991

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

While implementation of water use efficiency BMPs is focused primarily on retail water agencies, wholesale water agencies, including MWDOC, develop and implement regional programs on behalf of the retail water agencies and their customers. This regional implementation approach enables economies of scale, provides a more consistent message of efficiency to the public, and assists in acquisition of grant funding for program implementation. Table 5-4-1-B sets forth the BMPs and how they apply to retail and wholesale water agencies, and identifies BMP programs being implemented by MWDOC.

Table 5-4-1-B: Memorandum of Understanding BMP Implementation Responsibility and Regional Programs in Orange County

BMP #	EFFICIENCY MEASURE	Applies to:		MWDOC Regional Program
		Retailer	**MWDOC as a Wholesaler**	
1	Home Water Surveys	√		√
2	Residential Plumbing Fixture Retrofits	75% Saturation goal achieved in 2001		
3	System Water Audits, Leak Detection and Repair	√	(1)	√
4	Metering With Commodity Rates	√		
5	Large Landscape Conservation Programs	√		√
6	High-Efficiency Washing Machine Rebate Programs	√		√
7	Public Information Programs	√	√	√
8	School Education Programs	√	√	√
9	Commercial, Industrial, and Institutional Programs	√		√
10	Wholesale Agency Assistance Programs		√	√
11	Conservation Pricing	√	√	√
12	Conservation Coordinator	√	√	√
13	Water Waste Prohibition	√		√
14	Residential ULFT Replacement Programs	√		√

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

Source: Municipal Water District of Orange County

5.4.2 Review of MWDOC Conservation Programs as Described in 2000 Urban Water Management Plan

As a wholesaler, MWDOC did not contain a specific implementation plan in its 2000 Regional Urban Water Management Plan. However, as a signatory to the Memorandum of Understanding regarding urban water use efficiency, MWDOC's commitment to implement BMP-based water use efficiency program continues today. To help facilitate implementation of BMPs throughout Orange County, MWDOC's efforts focus on the following three areas. These areas both comply with BMP No. 10 - Wholesaler Assistance, and go beyond the basic BMP 10 requirements:

- Regional Program Implementation: MWDOC develops, obtains funding for, and implements regional BMP programs on behalf of all retail water agencies in Orange County. This approach minimizes confusion to consumers by providing, countywide, the same programs with the same participation guidelines, and also maintains a consistent message to the public to use water efficiently. Programs implemented by MWDOC on behalf of the region are identified in Table 5-4-1-B above;

- Local Program Assistance: When requested, MWDOC assists retail agencies to develop and implement local programs within their

individual service areas. This assistance includes collaboration with each retail agency to design a program to fit that agency's local needs, which may include providing staffing, targeting customer classes, acquiring grant funding from a variety of sources, and implementing, marketing, reporting, and evaluating the program. MWDOC provides assistance with a variety of local programs including, but not limited, to Home Water Surveys, Large Landscape, Conservation Public Information, School Education, Conservation Pricing, and Water Waste Prohibitions; and

- Research and Evaluation: An integral component of any water use efficiency program is the research and evaluation of potential and existing programs. Research allows an agency to measure the water savings benefits of a specific program and then compare those benefits to the costs of implementing the program in order to evaluate the economic feasibility of the program when compared to other efficiency projects or existing or potential sources of supply. Over the past five years, MWDOC has completed three research and evaluation projects. The efforts are summarized below:

  Orange County Saturation Study, 2001

  The principal objective of the *Orange County Saturation Stud*y was to test the hypothesis that, at least within Southern California, the results from countywide surveys will "produce good estimates of the saturation of low-flow showerheads (LFSHs) among households" served by the individual retail agencies comprising the county. The study results strongly support this hypothesis, but suggest that the required 75% saturation threshold had not quite been achieved as of the winter of 2000. The estimated saturation rates were, however, close enough to the requisite 75% level to support that the combined effect of utility distribution programs and natural replacement may have substantially bridged the gap between then and now. This is an example of an evaluation project that measured the level of project implementation relative to the 75% implementation goal. The full report can be accessed on MWDOC's website.

  Evaluation of the Landscape Performance Certification Program, 2004

  The Landscape Performance Certification Program was a pilot program implemented by MWDOC to comply with the goals of BMP No. 5 - Large Landscape Conservation Programs. BMP No. 5 targets the development of landscape irrigation budgets for dedicated landscape meters and monthly irrigation performance reporting. This program was implemented as a pilot program from 1997 to 2003. As significant participation and program design improvements were made during this time, an evaluation was necessary to determine program effectiveness for continued implementation. This evaluation comprised three parts: (i)

a Process Evaluation designed to determine how effectively the program was being delivered to participants; (ii) an Impact Evaluation to measure water savings; and (iii) the development of Recommendations to be implemented to improve the program. The evaluation revealed a water savings of 367 gallons per day per meter for early participants and 765 gallons per day per meter for later program participants. The evaluation documented several recommendations to improve the project as it transitioned into a standard implementation program. The full report can be accessed on MWDOC's website.

Residential Runoff Reduction Study, 2004

This research project, which began in fall of 2001 and concluded in 2003, was designed to verify the water savings measured in the earlier Westpark Study and to evaluate changes in runoff pollutant content and runoff volume from a neighborhood before and after installation of "smart" weather-based irrigation controllers. The evaluation identified an average annual water savings of 10% for those study participants using "smart" weather-based controllers to schedule and regulate their landscape irrigation systems, and a 49% reduction in runoff leaving the neighborhood. Statistically significant changes in pollutant concentrations were not found, resulting in a pollutant reduction of 49%. The full report can be accessed on MWDOC's website.

5.4.3 BMP Implementation in MWDOC Service Area

BMP No. 1 - Water Survey Programs for Single-Family Residential and Multi-Family Residential Customers

MWDOC assists its retail water agencies to implement this BMP by making available the following programs:

NEW as of 2004 - SmarTimer Rebate Program

This regional program is available to all participating retail agencies and their customers. Residential customers are eligible to receive a rebate when they purchase and install a new, state-of-the-art, weather-based sprinkler timer. This advanced sprinkler timer technology has been shown to save 41 gallons per day per residential installation and to reduce runoff and pollution by 49%. A total of 5,000 residential and commercial SmarTimer installations are targeted over the next few years.

Protector Del Agua Irrigation Management Training (Residential)

The Protector Del Agua Irrigation Management Training Program provides education to residential homeowners on a variety of landscape water efficiency practices they can employ in their home landscapes. These classes are hosted by MWDOC and/or the retail agencies to encourage

participation across the county. Table 5-4-3-A summarizes residential participation in this program.

The program consists of a series of four 4-hour classes taught either on four consecutive Saturdays or a designated Saturday each month. Alternatively, a mini class incorporates the curriculum from all four classes into one condensed class. The presentations cover the following topics:

Basic Landscape Design
Getting Started
The Design Process
The Planting Design
Plant Selection

Landscape Plants
Why Go Native
Plant Selection Tips
Planting Guidelines
Maintenance

Landscape Sprinkler Systems
The Irrigation System
Layout of the Irrigation System
Components of the System
Installation & Maintenance Practices

Landscape Watering, Fertilizing
Scheduling your Irrigation
MWD's Watering Calculator
Controller Programming Basics
Fertilizers

Table 5-4-3-A: Protector Del Agua Irrigation Management Training Residential Participation Summary

	FY 2001-02	FY 2002-03	FY 2003-04	FY 2004-05	Total:
Number of Participants	405	945	847	537	2,734

Source: Municipal Water District of Orange County

BMP No. 2 -Residential Plumbing Retrofit

Using the 2001 *Orange County Saturation Study* as a benchmark, saturation of low-flow showerheads was measured at 67% and 60% in single- and multi-family housing stock respectively. Today, low-flow showerhead saturation is estimated at nearly 100% and 94% saturation in single- and multi-family homes. As a result, water agencies throughout Orange County have achieved the 75% saturation requirement for this BMP. No further low-flow showerhead distribution or installation activity has occurred.

BMP No. 3 - System Water Audits, Leak Detection, and Repair

With the sale of the Allen-McColloch Pipeline to the Metropolitan Water District of Southern California in 1995, MWDOC no longer owns or operates a distribution system. Water purchased and sold by MWDOC is distributed through Metropolitan's system to the MWDOC retail agencies. As a result, implementation of BMP No. 3 is not applicable to MWDOC.

However in an effort to assist our retail agencies, MWDOC publishes annually the *Orange County Water Agencies Water Rates, Water System Operations, and Financial Information* survey. This survey facilitates a pre-screening survey that estimates the volume and percent of unaccounted-for-water for each retail water agency in the county. In 2004, the percent of unaccounted-for-water for retail water agencies ranged from a low of 1.2% to a high of 10.7%, with an average of 5.1%.

BMP No. 4 - Metering with Commodity Rates for all New Connections and Retrofit of Existing Connections

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

BMP No. 5 - Large Landscape Conservation Programs and Incentives

Three programs are offered in Orange County to assist retail agencies and their large landscape customers to use water efficiently. These programs include:

<u>Protector Del Agua Irrigation Management Training (Professional)</u>

This course consists of four consecutive classes in landscape water management geared at the landscape professional, each building upon principles presented in the preceding class. Each participant receives a bound handbook containing educational materials for each class. These classes are offered throughout the year and taught in both English and Spanish languages. The following is a synopsis of each class in the course:

- Irrigation Principles: A comprehensive class that covers the principle factors in landscape irrigation and provides a solid foundation for sound landscape water management. At the conclusion of the class, participants will have attained, through lecture and classroom demonstrations, a practical knowledge of landscape irrigation design, installation, maintenance, and repair. Topics include irrigation system types, sprinkler layouts, sprinkler components, sprinkler selection and spacing, and common sprinkler problems;

- Irrigation System Troubleshooting: This session focuses on an analytical approach to solving irrigation system failures. Three potential problem areas are examined: (1) mechanical problems, 2) hydraulic problems, and 3) electrical problems. Workshop participants receive practical training in the use of electrical troubleshooting equipment;

- Controller Programming: A hands-on workshop where participants learn basic controller features by programming sample cases. Participants then move into advanced controller features as they input more complex schedules, taking into consideration temperature/seasonal changes, rain, landscape activities, and demands that limit irrigation times. Irrigation controllers are provided for in-class use;

- Irrigation Scheduling: This session focuses on two critical questions: 1) When to irrigate? 2) How much water to apply? A variety of field techniques and methods are presented, along with the technical aspects to be considered when scheduling irrigation run times. Each class participant is furnished with the tools needed to perform an irrigation scheduling assignment.

Upon completion of the course, participants receive a certificate listing all classes completed. Participants are eligible for 21 Continuing Education Units as certified by the Irrigation Association. Table 5.4.3-B summarizes commercial participation in this program.

Table 5-4-3-B: Portector Del Agua Irrigation Management Training Professional Participation Summary

	FY 2001-02	**FY 2002-03**	**FY 2003-04**	**FY 2004-05**	**Total:**
Number of English Participants	324	454	66	118	962
Number of Spanish Participants	359	215	198	122	894

Source: Municipal Water District of Orange County

Landscape Performance Certification Program

MWDOC has created a unique and innovative partnership linking landscape water management, green material management, and the non-point source pollution prevention goals of separate agencies into one program -- the Landscape Performance Certification Program. This partnership includes MWDOC as lead agency, Metropolitan, Orange County Integrated Waste Management Department, United States Bureau of Reclamation, and all retail water agencies in Orange County. The Landscape Performance Certification Program is designed to:

- Assist water agencies in meeting the landscape irrigation management requirements of the California Urban Water Conservation Council's Best Management Practice #5;

- Assist cities and the county in meeting Integrated Waste Management Act goals (AB 979) to reduce the volume of waste and to recycle organic materials for the benefit of the landscape; and

- Assist cities and the county in identifying landscape run-off sites and providing site-by-site remedies.

Homeowner associations managing dedicated landscape irrigation meters are the primary target audience for participation in this program; however, city and school district landscapes also participate. There are more than 17,000 dedicated irrigation meters served by retail water agencies in Orange County, of which nearly 14,000 use potable water, while the remaining 3,000 use reclaimed water to irrigate urban landscapes. Table 5-4-3-C identifies the agencies currently activated in the program along with the number of meters and associated acre-feet per year water savings. Water savings is based on the results of the "Evaluation of the Landscape Performance Certification Program" which include a 765 gallon per day savings rate.

Table 5-4-3-C: Landscape Performance Certification Program

Activated Agency	Number of Meters Activated and Acre-Feet Per Year of Water Savings				
	12/31/01	8/31/02	8/31/03	7/31/04	5/30/05
Capistrano Valley Water District	42 Meters 36 acre-feet per year	43 Meters 37 acre-feet per year	47 Meters 40 acre-feet per year	Not reported	Not reported
El Toro Water District	0	0	63 Meters 54 acre-feet per year	79 Meters 68 acre-feet per year	91 Meters 64 acre-feet per year
Irvine Ranch Water District	80 Meters 69 acre-feet per year	122 Meters 105 acre-feet per year	187 Meters 160 acre-feet per year	157 Meters 135 acre-feet per year	242 Meters 207 acre-feet per year
Mesa Consolidated Water District	4 Meters 3 acre-feet per year	115 Meters 99 acre-feet per year	184 Meters 158 acre-feet per year	156 Meters 134 acre-feet per year	249 Meters 213 acre-feet per year
Moulton Niguel Water District	161 Meters 138 acre-feet per year	181 Meters 155 acre-feet per year	189 Meters 162 acre-feet per year	60 Meters 51 acre-feet per year	229 Meters 192 acre-feet per year
Newport Beach	9 Meters 8 acre-feet per year	47 Meters 40 acre-feet per year	48 Meters 41 acre-feet per year	22 Meters 18 acre-feet per year	92 Meters 79 acre-feet per year
Santa Margarita Water District	333 Meters 285 ACRE-FEET PER	354 Meters 303 acre-feet per year	558 Meters 478 acre-feet per year	640 Meters 548 acre-feet per year	753 Meters 645 acre-feet per year

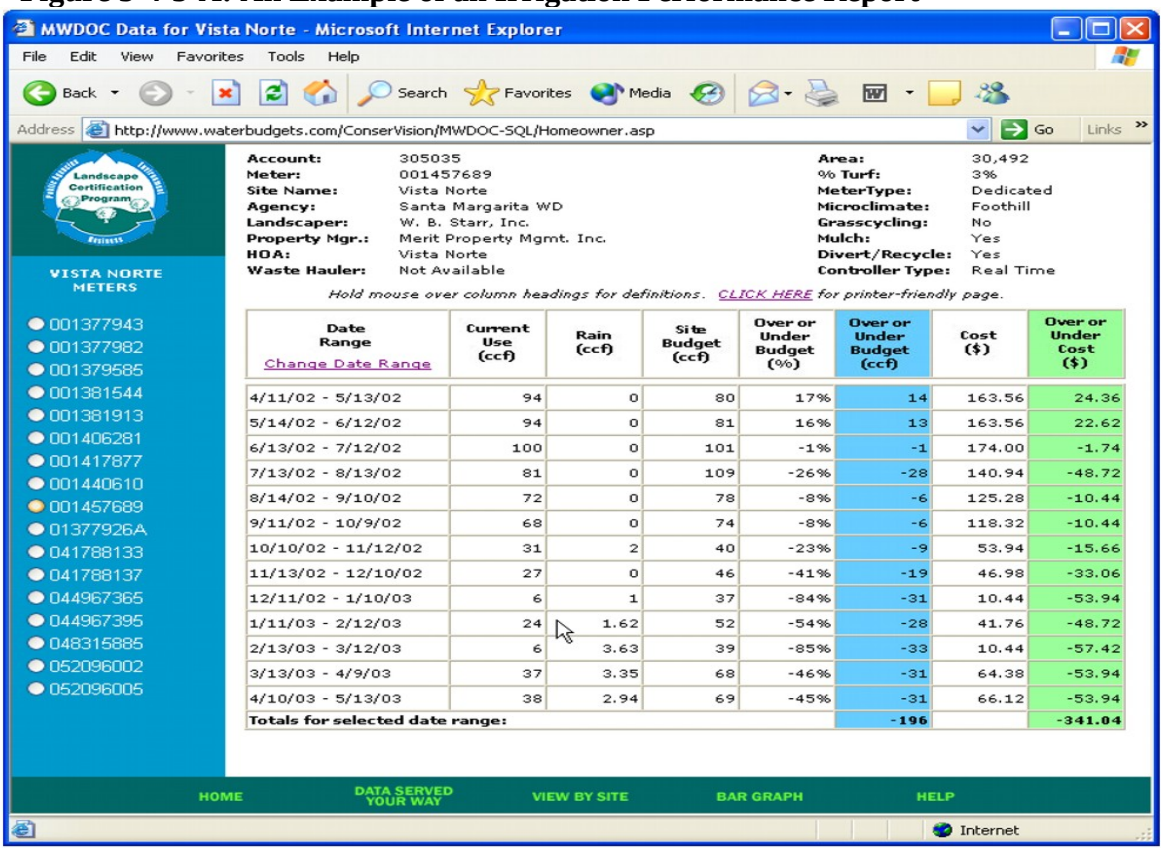
	YEAR				
San Clemente	0	38 Meters 33 acre-feet per year	151 Meters 129 acre-feet per year	134 Meters 115 acre-feet per year	168 Meters 144 acre-feet per year
South Coast Water District	0	0	62 Meters 53 acre-feet per year	21 Meters 18 acre-feet per year	83 Meters 71 acre-feet per year
Westminster, City of	0	0	0	9 Meters 8 acre-feet per year	18 Meters 16 acre-feet per year
Total	**629 Meters 539 acre-feet per year**	**900 Meters 771 acre-feet per year**	**1,489 Meters 1,277 acre-feet per year**	**1,278 Meters 1,095 acre-feet per year**	**1,925 Meters 1,650 acre-feet per year**

Source: Municipal Water District of Orange County

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

Usually, three different parties are involved in managing landscapes associated with these meters: (i) the property owner (home owner association board of directors), (ii) the property manager, and (iii) the landscape contractor. This program creates a "Loop of Accountability" by providing regular (monthly or bi-monthly) irrigation performance reports to all three parties via the program website, www.waterbudgets.com. Participants are sent an e-mail informing them that their Irrigation Performance Report has been updated and requesting that they to log-on to the program website to view their latest reports. A monthly newsletter sent via e-mail encourages implementation of seasonally appropriate landscape maintenance practices, describes case studies, and provides a schedule of upcoming Protector del Agua classes. An example of an Irrigation Performance Report is provided as Figure 5-4-3-A.

Figure 5-4-3-A: An Example of an Irrigation Performance Report



Source: Municipal Water District of Orange County

Each participating landscaper, property manager, or homeowners' association has the ability to become certified as a good water manager through the program. Certification is based on irrigation management performance over time. It is the full intent of the program that every landscaper contractor and property management company receives program certification. The educational materials, training, site case studies, and monthly irrigation performance reports are designed to help accomplish across-the-board certification. The list of certified companies is posted on the web site and updated three times per year. The level of water budget performance per site determines higher levels of certification. With seasonal updating, companies may move up or down the certification scale.

The intent of the certification component of the program is to provide property managers and landscape-contracting companies with increased marketing opportunities for their services, increased business retention, and access to new business opportunities. The ability to recognize and promote certified companies can and should expand over the life of the program. Promotion will include:

- Advertisement of certified companies to local public agencies and their customers;

- Advertisement of certified companies to professional associations;

- Advertisement of certified companies through trade publications; and

- Potential advertisement of certified companies through local media outlets and the Internet.

NEW as of 2004 - SmarTimer Rebate Program

This regional program is available to all participating retail agencies and their customers. Residential and commercial customers are eligible to receive a rebate when they purchase and install a new, state-of-the-art, weather-based sprinkler timer. This advanced sprinkler timer technology has been shown to save 41 gallons per day per residential installation and to reduce runoff and pollution by 49%. A total of 5,000 residential and commercial SmarTimer installations are targeted over the next few years.

BMP No. 6 - High-Efficiency Washing Machine Rebate Programs

Orange County residents are eligible to receive a $100 rebate when they purchase a new High-Efficiency Clothes Washer (HECW). This program is sponsored by MWDOC, Metropolitan, and local retail water agencies. Rebates are available on a first-come, first-served basis, while funds last. Machines must be purchased after January 1, 2002 and installed in Orange County. Participants must be willing to allow an inspection of the installed machine for verification of program compliance. These machines use 15 to 25 gallons less water per load and, depending on use, can save 7,000 gallons of water per year. Effective as of May 1, 2005, machines must have a water factor of 6.0 or less. Participants are encouraged to contact their local gas and/or electric utility as additional rebates may be available.

As detailed in Table 5-4-3-D, more than 13,900 HECWs have been installed in single-family homes through this program. These retrofits are saving more than 160 acre-feet of potable water per year.

Table 5-4-3-D: Clothes Washers Replaced by Agency

Agency	Previous Years	FY 99/00	FY 00/01	FY 01/02	FY 02/03	FY03/04	Total for all Fiscal Years	Cumulative Water Savings across all Fiscal Years
Brea	0	0	0	17	107	178	302	9.60
Buena Park	0	0	0	9	45	88	142	4.47
Cap Valley	0	0	0	16	95	120	231	7.59
East Orange	0	0	0	3	8	20	31	0.98
El Toro	0	0	0	21	88	108	217	7.26
Fountain Valley	0	0	0	36	127	209	372	12.15
Garden Grove	0	0	0	39	173	278	490	15.85
Huntington Beach	0	0	0	114	486	857	1,457	46.73
Irvine Ranch	0	0	0	158	619	1,084	1,861	59.98
La Habra	0	0	0	8	40	86	134	4.17
La Palma	0	0	0	3	5	13	21	0.68
Laguna Beach	0	0	0	17	88	119	224	7.34
Mesa Consolidated	0	0	0	24	117	228	369	11.63
Moulton Niguel	0	0	0	158	630	841	1,629	54.15
Newport Beach	0	0	0	17	144	343	504	15.28
Orange	0	0	0	58	247	304	609	20.36
San Clemente	0	0	0	32	182	235	449	14.73
Santa Margarita	0	0	0	140	510	743	1,393	46.06
Santiago	0	0	0	1	7	4	12	0.43
Seal Beach	0	0	0	13	28	57	98	3.22
Serrano	0	0	0	9	16	54	79	2.47
So Cal Water	0	0	0	37	195	339	571	18.17
South Coast	0	0	0	35	138	165	338	11.39
Trabuco Canyon	0	0	0	10	63	76	149	4.91
Tustin	0	0	0	21	89	152	262	8.44
Westminster	0	0	0	37	159	235	431	14.10
Yorba Linda	0	0	0	36	214	342	592	18.93
MWDOC Totals	**0**	**0**	**0**	**1,069**	**4,620**	**7,278**	**12,967**	**421.06**
Acre-Feet Water Savings	0.0	0.0	0.0	13.8	59.5	93.7		
Anaheim	0	0	0	97	32	-	129	6.23
Fullerton	0	0	0	40	196	369	605	19.14
Santa Ana	0	0	0	15	69	188	272	8.28
Non-MWDOC Totals	**0**	**0**	**0**	**152**	**297**	**557**	**1,006**	**33.65**
Acre-Feet Water Savings	0.0	0.0	0.0	0.2	0.8	1.2		
Orange County Totals	**0**	**0**	**0**	**1,221**	**4,917**	**7,835**	**13,973**	**455**
Acre-Feet Water Savings	0.0	0.0	0.0	13.9	60.3	94.9		

Source: Municipal Water District of Orange County

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

BMP No. 7 - Public Information Programs

MWDOC's water use efficiency public information programs are built around communication, coordination and partnerships with its member agencies and cities, Metropolitan, and other local, state, and federal legislative and regulatory bodies. MWDOC's information programs are carried out on behalf of and in coordination with its member agencies. The goal is to help the member agencies and public understand current issues and the challenges, opportunities and costs involved in securing a reliable supply of high quality water.

Through a variety of public information programs, MWDOC assists its member agencies in reaching the public with accurate information regarding present and future water supplies, the demands for a suitable quantity and quality of water, and the importance of implementing water efficient techniques and behaviors. MWDOC also assists its member agencies in publicizing the availability of water use efficiency programs and technologies throughout Orange County.

Public Affairs Workgroup

MWDOC's Public Affairs Department conducts monthly meetings with its members' public affairs and customer service representatives to coordinate public outreach efforts and to share information and ideas. Through the Public Affairs Workgroup, MWDOC facilitates and ensures message consistency, especially when promoting water use efficiency programs and workshops. The workgroup also serves as a vehicle through which MWDOC can disseminate to its member agencies important materials and information sent by Metropolitan on regional marketing and advertising programs, including outdoor irrigation.

Poster/Slogan Contest

Each year, MWDOC and its member agencies honor elementary school students as winners in the "Water is Life" Poster and Slogan Contest. As part of MWDOC's school education program, MWDOC solicits entries to the contest throughout the fall and winter. More than 1,000 entries are typically received. Winners are recognized in May and June at either a member agency board of directors meeting or at a city council meeting, depending upon the area in which the student residents. A member of the MWDOC Board of Directors also attends, which allows both organizations (MWDOC and the water retailer) to honor the student. The winning artwork and slogans are incorporated into a school-year calendar that is distributed to every classroom in Orange County the following academic year. In 2005 another venue in which to promote the water-conservation message was identified: the Orange County Youth Expo, an annual event held at the Orange County Fair Grounds. Winning artwork and slogans were displayed during the weeklong event, which drew hundreds of thousands of school-aged children and their families.

Local and Regional Events

Through its participation in the Association of California Water Agencies and the California Water Awareness Campaign, MWDOC also supports and participates in statewide events and activities throughout Water Awareness Month. This includes procuring a proclamation from the State Governor, distributing media kits and distributing water education kits to classrooms, all of which reinforce the need to use water wisely, especially in the semi-arid Southern California region.

Speakers Bureau

MWDOC receives approximately 50 requests annually from civic, business, community, and homeowner groups for presentations on key issues affecting Orange County's water supply. MWDOC's water use efficiency programs and conservation tips for residents and businesses are integrated into our presentation. Printed pieces explaining rebate programs (i.e. SmarTimer Rebate Program, High Efficiency Clothes Washer Rebate Program) and other programs (residential and commercial landscaping workshops, landscaper certification) are distributed, and the programs are promoted. MWDOC staff also works with member agency representatives to assist them in being informed and effective spokespersons on these topics.

Facility Inspection Trips

Each of MWDOC's appointed Metropolitan directors is entitled each year by Metropolitan to sponsor inspection trips of the Colorado River Aqueduct, the State Water Project, and the Diamond Valley Lake. MWDOC takes full advantage of this opportunity by inviting public administrators, elected officials, community leaders, and members of the media to attend these highly educational inspection trips. MWDOC's aim is to familiarize trip guests about the facilities that bring imported water into Southern California, and the need to augment supplies from these facilities to keep up with growing demand. MWDOC optimizes these opportunities to educate guests by distributing information on water use efficiency programs and services available in Orange County.

Information Materials

MWDOC Public Affairs staff regularly produces informational materials, including newsletters, fact sheets, brochures, issue bulletins, manager's reports, annual reports, briefing books, press kits, exhibit booths and displays. These materials are made available to the public and to our member agencies and cities. MWDOC also provides information via the Internet on its website, www.mwdoc.com. A consistent and high-profile message in each of these information pieces is the critical need to follow water use efficiency practices and their cumulative impact on Orange County.

Water Quality Reports

Each year, MWDOC coordinates the production of Water Quality Reports for each of its member agencies and cities. These reports, required by the California Department of Health Services, are distributed to all residents of Orange County via the retail water agencies. The reports include information about the sources of water for each customer and quality of that source water, as well as the quality of the water that consumers get from

their taps. The reports also provide MWDOC with the opportunity to include messages about water use efficiency and conservation to all county residents.

Media Relations

MWDOC is a credible source of information to the media for regional and statewide water issues, as well as water issues within Orange County. In addition, staff keeps environment reporters apprised of key conservation issues and messages, which are often integrated into general-interest articles. Staff also prepares press releases on local and regional issues, and provides template press releases that can be tailored for local use by our member agencies and cities. This message consistency has worked well in Orange County, especially as we disseminate information on water use efficiency.

BMP No. 8 - School Education Programs

BMP No. 8 focuses on the implementation of a school education program to promote water conservation and water conservation-related benefits.

One of the most successful and well-recognized water-education curriculums in Southern California is MWDOC's School Education Program. For more than 30 years, MWDOC teachers, assisted by mascot "Ricki the Rambunctious Raindrop," have been educating students in grades K-12 about the water cycle, the importance and value of water, and the personal responsibility we all have as environmental stewards

Since its inception in January 1973, the MWDOC School Education Program has evolved into what has become the standard for all water-education curriculum. To date, nearly 2.5 million Orange County students have benefited from the program.

In 2004, MWDOC formed an exciting partnership with the Discovery Science Center that has allowed both organizations to reach more Orange County students each year and provide them with even greater educational experiences in the areas of water and science. Table 5-4-3-E provides an implementation summary of the school education Program.

Table 5-4-3-E: Implementation Summary for MWDOC School Education Program

	FY 00-01	FY 01-02	FY 02-03	FY 03-04	FY 04-05
Student Participants	118,522	109,919	101,826	66,550	49,433

Source: Municipal Water District of Orange County

BMP No. 9 - Conservation Programs for Commercial, Industrial and Institutional Accounts

The goal of BMP No. 9 is to identify and rank commercial, industrial, and institutional customers according to use and to establish long-term implementation targets for the replacement of high-water-using toilets with Ultra Low Flush Toilets in the Commercial Industrial and Insitutional sector.

Save Water - Save a Buck!

This program began in 2002 and offers rebates to assist commercial, industrial, and institutional customers in replacing high-flow plumbing fixtures with low-flow fixtures. Facilities where low-flow devices are installed must be located in Orange County. Rebates are available only on those devices listed in Table 5-4-3-F below and must replace higher water use devices. Installation of devices is the responsibility of each participant. Participants may purchase and install as many of the water saving devices as is applicable to their site.

Table 5-4-3-F: Retrofit Devices and Rebate Amounts Available Under the "Save Water – Save a Buck!" Program

Retrofit Device	Rebate Amount
Ultra-Low-Flush Toilet	$60 to $120
Ultra-Low-Flush Urinal or Waterless Urinal	$60
Flush Valve Retrofit Kit	$15
Coin/Card-Operated High Efficiency Commercial Clothes Washer	$250
Cooling Tower Conductivity Controller	$500
Hospital X-ray Film Processor Re-circulating System	$2,000
Water Pressurized Broom	$100

Source: Municipal Water District of Orange County

As detailed in Table 5-4-3-G below, more than 5,800 water wasting plumbing fixtures have been replaced with low flow fixtures through this program. These retrofits are saving more than 560 acre-feet of potable water per year.

Table 5-4-3-G: Commercial, Industrial, Institutional (CII) Retrofit Devices Replaced by Agency

Agency	Previous Years	FY 99/00	FY 00/01	FY 01/02	FY 02/03	FY 03/04	Total for all Fiscal Years	Cumulative Water Savings across all Fiscal Years
Brea	0	0	0	0	2	0	**2**	**13**
Buena Park	0	0	0	10	17	28	**55**	**23**
Cap Valley	0	0	0	0	0	21	**21**	**5**
East Orange	0	0	0	0	0	0	**0**	**0**
El Toro	0	0	0	23	20	73	**116**	**35**
Fountain Valley	0	0	0	1	28	2	**31**	**9**
Garden Grove	0	0	0	21	53	51	**125**	**33**
Huntington Beach	0	0	0	5	63	73	**141**	**63**
Irvine Ranch	0	0	0	155	919	87	**1,161**	**455**
La Habra	0	0	0	10	13	52	**75**	**16**
La Palma	0	0	0	0	0	0	**0**	**0**
Laguna Beach	0	0	0	2	1	2	**5**	**1**
Mesa Consolidated	0	0	0	424	37	22	**483**	**85**
Moulton Niguel	0	0	0	31	8	65	**104**	**28**
Newport Beach	0	0	0	4	144	9	**157**	**61**
Orange	0	0	0	84	21	22	**127**	**69**
San Clemente	0	0	0	0	2	5	**7**	**2**
Santa Margarita	0	0	0	0	1	3	**4**	**1**
Santiago	0	0	0	0	0	0	**0**	**0**
Seal Beach	0	0	0	3	0	44	**47**	**12**
Serrano	0	0	0	0	0	0	**0**	**0**
So Cal Water	0	0	0	11	66	34	**111**	**68**
South Coast	0	0	0	0	3	8	**11**	**2**
Trabuco Canyon	0	0	0	0	0	0	**0**	**0**
Tustin	0	0	0	9	64	16	**89**	**34**
Westminster	0	0	0	16	5	32	**53**	**15**
Yorba Linda	0	0	0	0	4	12	**16**	**28**
MWDOC Totals	**0**	**0**	**0**	809	1,471	661	**2,941**	**1,059**
Acre-Feet Water Savings	0.0	0.0	0.0	56.9	223.8	80.1		
Anaheim	0	0	0	1,042	400	647	**2,089**	**299**
Fullerton	0	0	0	28	41	28	**97**	**49**
Santa Ana	0	0	0	115	142	419	**676**	**215**
Non-MWDOC Totals	**0**	**0**	**0**	1,185	583	1,094	**2,862**	**564**
Acre-Feet Water Savings	0.0	0.0	0.0	50.5	50.8	104.6		
Orange County Totals	**0**	**0**	**0**	**1,994**	**2,054**	**1,755**	**5,803**	**1,623**
Acre-Feet Water Savings	0.0	0.0	0.0	107.4	274.6	184.7		

[1] Retrofit devices include ULF Toilets and Urinals, High Efficiency Clothes Washers, Cooling Tow er Conductivity Controllers, Flush Valve Retrofit Kits, Pre-rinse Spray heads, Hospital X-Ray Processor Recirculating Systems, and Water Pressurized Brooms.

Source: Municipal Water District of Orange County

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data takes precedence.

BMP No. 10 - Wholesale Agency Assistance Programs

MWDOC provides financial incentives, conservation-related technical support, and regional implementation of a variety of BMP-based programs. In addition, MWDOC conducts research projects to evaluate implementation of both existing programs and new pilot programs. Examples of this research include the *Orange County Saturation Study* (2001), the *Residential Runoff Reduction Study* (2004), and the *Evaluation of the Landscape Performance Certification Program* (2004). Greater detail describing MWDOC's role in supporting and implementing water use efficiency programs in Orange County is contained in Section 5.4.2.

BMP No. 11 - Conservation Pricing

MWDOC publishes annually the *Orange County Water Agencies Water Rates, Water System Operations, and Financial Information* survey. This survey documents the rates charged by each retail water agency, as well as the type of rate structure, i.e., a flat rate, inclined block, or seasonal rate structure. Table 5-4-3-H provides a brief summary of the types of rates used by retail water agencies in Orange County and shows a slow progression away from uniform rates.

Table 5-4-3-H: Summary of Rate Structure Types Used in Orange County

Types of Rate Structure	Number of Agencies Utilizing Different Rate Structure Types					
	1991	2000	2001	2002	2003	2004
Declining Block	0	0	0	0	0	0
Uniform or Flat	22	19	16	19	16	15
Inclined Block	13	10	12	13	12	13
Seasonal Inclined Block	1	3	3	1	3	3

Source: Municipal Water District of Orange County

BMP No. 12 - Conservation Coordinator

All retail water agencies in Orange County have designated water conservation coordinators, regardless of signatory status to the Memorandum of Understanding. All retail water agencies in Orange County are actively implementing BMPs in their service areas.

BMP No. 13 – Water Waste Prohibitions

In 2004, MWDOC conducted a survey documenting water waste prohibitions enacted at each retail water agency in Orange County and compared enacted prohibitions to the BMP requirement. This survey revealed that out of the 16 agencies that responded, only one agency was in full compliance with the BMP. The remaining agencies were in partial compliance. In addition, the enacted prohibitions were not centrally located

in one section, but generally dispersed throughout each agency's regulations, thus making the survey a difficult process.

As a result of the survey findings, staff began working with retail and regional water agencies and surface water quality agencies to develop a menu of suggested items local agencies could adopt to augment their existing regulations in order to both comply with the BMP and better manage pollutant-laden nuisance runoff. This menu of suggestions will be promoted to local agencies for their consideration in 2005.

BMP No. 14 - Residential Ultra Low Flush Toilet Replacement Programs

Over the past 13 years, MWDOC has continuously implemented regional Ultra Low Flush Toilet Rebate and/or Distribution Programs targeting single- and multi-family homes in Orange County. All retail agencies encourage participation by their customers. MWDOC develops, prints, and provides marketing materials such as water bill inserts, direct mailers, or brochures for retail agencies to distribute to their customers.

As detailed in Table 5-4-3-I below, more than 351,000 high volume flush toilets have been replaced with ultra-low-flush toilets through these programs, with more than 230,000 being replaced over the past five years. The total of these retrofits is saving more than 11,700 acre-feet of potable water per year.

Table 5-4-3-I: Toilets Replaced by Agency

Agency	Previous Years	FY 99/00	FY 00/01	FY 01/02	FY 02/03	FY 03/04	Total for all Fiscal Years	Cummulative Water Savings across all Fiscal Years
Brea	1,287	144	867	585	341	401	**3,625**	**591**
Buena Park	2,161	469	524	1,229	2,325	1,522	**8,230**	**1,021**
Capistrano Valley	2,202	1,319	347	152	201	151	**4,372**	**952**
East Orange CWD RZ	113	17	15	50	41	44	**280**	**41**
El Toro WD	3,958	171	310	564	472	324	**5,799**	**1,242**
Fountain Valley	3,874	2,355	1,697	1,406	1,400	802	**11,534**	**1,856**
Garden Grove	10,811	3,556	2,423	3,855	3,148	2,117	**25,910**	**4,358**
Huntington Beach	13,183	3,492	3,281	2,698	3,752	1,901	**28,307**	**5,204**
Irvine Ranch WD	9,252	3,251	1,531	1,874	2,242	6,726	**24,876**	**3,938**
Laguna Beach CWD	717	306	220	85	271	118	**1,717**	**312**
La Habra	2,472	105	582	645	1,697	1,225	**6,726**	**945**
La Palma	636	132	518	173	343	193	**1,995**	**311**
Mesa Consol. WD (100%)	7,673	1,956	1,393	1,505	2,387	988	**15,902**	**2,828**
Moulton Niguel WD	3,035	475	716	891	728	684	**6,529**	**1,146**
Newport Beach	2,535	1,223	438	463	396	1,883	**6,938**	**1,028**
Orange	4,978	2,263	1,778	2,444	2,682	1,899	**16,044**	**2,435**
San Clemente	752	198	667	483	201	547	**2,848**	**409**
Santa Margarita	2,642	456	1,258	790	664	260	**6,070**	**1,079**
Santiago	94	5	3	28	21	15	**166**	**34**
Seal Beach	1,108	155	132	81	134	729	**2,339**	**364**
Serrano WD	265	52	95	73	123	98	**706**	**115**
So. Cal. Water Co.	12,209	2,957	1,379	2,143	3,222	1,870	**23,780**	**4,468**
South Coast	759	181	133	358	191	469	**2,091**	**312**
Trabuco Canyon WD	197	21	40	181	102	30	**571**	**87**
Tustin	3,446	1,292	1,508	1,206	1,096	827	**9,375**	**1,588**
Westminster	5,611	2,291	2,304	1,523	2,492	1,118	**15,339**	**2,417**
Yorba Linda WD	1,844	1,400	759	1,690	1,155	627	**7,475**	**1,079**
MWDOC Totals	97,814	30,242	24,918	27,175	31,827	27,568	**239,544**	**40,160**
Acre-Feet Water Savings	3,261.3	1,008.3	830.8	906.1	1,061.2	919.2		
Anaheim	8,705	7,551	4,593	6,346	9,707	5,075	**41,977**	**5,470**
Fullerton	5,847	2,138	1,926	2,130	2,213	1,749	**16,003**	**2,596**
Santa Ana	9,097	8,788	5,614	10,822	10,716	9,164	**54,201**	**6,652**
Non-MWDOC Totals	23,649	18,477	12,133	19,298	22,636	15,988	**112,181**	**14,719**
Acre-Feet Water Savings	788.5	616.1	404.5	643.4	754.7	533.1		
Orange County Totals	121,463	48,719	37,051	46,473	54,463	43,556	**351,725**	**54,879**
Acre-Feet Water Savings	4,049.8	1,624.4	1,235.3	1,549.5	1,815.9	1,452.2	11,727.1	

Source: Municipal Water District of Orange County

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

References:

California Urban Water Conservation Council. *Memorandum of Understanding Regarding Urban Water Conservation in California*. 1991.

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Metropolitan Water District of Southern California. *Protector del Agua Training Program: Condensed Residential Class Description*. 2004.

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Municipal Water District of Orange County. *2000 Regional Urban Water Management Plan.* 2000.

Municipal Water District of Orange County and **Irvine Ranch Water District**. *The Residential Runoff Reduction Study*. 2004

Municipal Water District of Orange County, *Orange County Water Agencies Water Rates, Water System Operations, and Financial Information.* 2004

State of California. *Urban Water Management Planning Act.*

6.0 WASTEWATER MANAGEMENT AND WATER RECYCLING

Information presented in this section is collected based on the best available information from each of Municipal Water District of Orange County (MWDOC)'s member agencies at the time of drafting. The information is presented to provide a regional summary within the MWDOC service area. MWDOC has made every effort to coordinate information during the preparation of this section in a manner that is consistent with local agencies' Urban Water Management Plans. In the event of a discrepancy, the local retail agency plan should be consulted.

6.1 Agency Participation in Recycled Water Planning

Recycled water planning within MWDOC's service area requires close coordination with multiple agencies that, in many instances, have overlapping jurisdictional boundaries, leading to institutional hurdles. A six-year study, *the Southern California Comprehensive Water Reclamation and Reuse Study* (SCCWRRS), led by the United States Bureau of Reclamation was completed in 2002 identifying short- and long-term recycled water implementation plans for areas throughout California, including four sub-regional plans within MWDOC's service area. Applicable partners in development of the plan, as it relates to Orange County, included the Metropolitan Water District of Southern California (Metropolitan) and the South Orange County Water Reclamation Authority, the predecessor to the current South Orange County Wastewater Authority (SOCWA). A Project Advisory Committee (PAC) was formed for the Orange County region that included multiple representatives as identified in Table 6-1-A.

Roles of PAC members included setting priorities and establishing objectives and criteria to satisfy regional recycling water needs. Other local water and wastewater agencies within MWDOC's service area contributed data towards planning efforts. Results of the study are discussed in Section 6.5.1.

Other recycled water planning efforts in MWDOC's service area are occurring in smaller geographical areas. Currently, the South Orange County Integrated Regional Water Management Plan is being developed by multiple cities and agencies in southern Orange County. When complete this plan will incorporate recycled water projects into its overall integrated approach to water resources planning for the region. SOCWA, a joint powers authority with ten member agencies, plays a large role in development of the plan as it coordinates recycled water and wastewater planning efforts for its members in southern Orange County. Plan participants are listed in Table 6-1-A.

In the northern part of the County, recycled water planning efforts are led by the Orange County Sanitation District (OCSD), Orange County Water District (OCWD), and Irvine Ranch Water District (IRWD). OCSD provides wastewater treatment in northern and central Orange County. OCWD further processes this wastewater to meet applicable standards in Title 22, Division 4, of the California Code of Regulation for recycled water for sea water barrier use, groundwater recharge, and irrigation. OCWD also manages the Orange County Groundwater

Basin. IRWD treats its own wastewater and coordinates its recycled water production with SOCWA, OCSD, and OCWD as its boundaries overlap with these agencies.

Table 6-1-A: Recycling Plan Agency Coordination

	Participants	Study	
		Southern California Comprehensive Water Reclamation and Reuse Study	South Orange County Integrated Regional Water Management Plan
Water Agencies	Municipal Water District of Orange County	X	X
	City of Anaheim	X	
	City of San Clemente		X
	City of San Juan Capistrano	X	X
	Laguna Beach County Water District		X
	Metropolitan Water District of Southern California	X	
Water/Wastewater Agencies	Irvine Ranch Water District	X	X
	Aliso Water Management Agency	X	
	El Toro Water District	X	X
	Moulton Niguel Water District	X	X
	Los Alisos Water District[1]	X	
	South Coast Water District	X	X
	Trabuco Canyon Water District	X	X
	Santa Margarita Water District	X	X
Wastewater Agencies	Orange County Sanitation District	X	
	South Orange County Reclamation Authority[2]	X	
	County Sanitation Districts of Los Angeles	X	
	South Orange County Wastewater Authority		X
Groundwater Agencies	Orange County Water District	X	
	San Juan Basin Authority		X
Planning/Other Agencies	Santa Ana Watershed Project Authority	X	
	Orange County Public Facilities and Resources	X	
	US Bureau of Reclamation	X	
	California Department of Water Resources	X	X
	Natural Resources Conservation District		X
	Orange County Health Care Agency		X
	Regional Water Quality Control Board - 9		X
	County of Orange		X
	Orange County Flood Control District		X

Sources:
1) *Southern California Comprehensive Water Reclamation and Reuse Study*
2) *2005 Draft South Orange County Integrated Regional Water Management Plan*
Notes:
[1] Annexed into Irvine Ranch Water District
[2] Merged into SOCWA

Individual wastewater collection and treatment providers and water agencies within MWDOC's service area were contacted as a part of recycled water planning efforts for this Urban Water Management Plan (Plan), combined with a review of the aforementioned studies. Operating information was reviewed and individual agencies were interviewed. For wastewater collection treatment providers, the following information was researched to gain an understanding of disposal methods, treatment levels, discharge volumes, and recycle use. For water agencies the following information was researched: projected recycled water uses, potential recycled water demands, and barriers to expanding recycled water systems. Wastewater and collection treatment providers and water agencies involved in

coordination of recycled water planning for this Plan are listed in Table 6-1-B below.

Table 6-1-B: Agencies Contacted for Recycled Water Planning

Orange County Sanitation District	South Orange County Wastewater Authority
Orange County Water District	Irvine Ranch Water District
Trabuco Canyon Water District	Moulton Niguel Water District
South Coast Water District	Mesa Consolidated Water District
City of San Juan Capistrano	City of Newport Beach
City of Fountain Valley	City of San Clemente
El Toro Water District	Santa Margarita Water District

6.2 Wastewater Collection and Treatment Systems

Wastewater collection and treatment within MWDOC's service area is managed by multiple agencies ranging from local agencies handling both potable water and wastewater to large regional agencies. Table 6-2-A summarizes the past, current, and projected (under normal weather) wastewater volumes collected and treated, and the quantity of wastewater treated to recycled water standards for treatment plants within MWDOC's service area. Table 6-2-B summarizes the disposal method, treatment levels, and past, current, and projected discharge volumes.

Table 6-2-A: Wastewater Collection and Treatment in MWDOC's Service Area

	Average Wastewater Collected							Quantity Meeting Recycled Water Standards						
Wastewater Plant	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
OCSD														
Reclamation Plant No. 1[1]	97,408	97,408	156,748	176,902	198,175	198,175	198,175	0	0	0	0	0	0	0
Treatment Plant No. 2[1]	171,304	169,064	161,227	161,227	161,227	161,227	161,227	0	0	0	0	0	0	0
OCWD[2]														
Green Acres Project	0	0	0	0	0	0	0	6,606	11,196	11,196	11,196	13,436	13,436	13,436
Water Factory 21	0	0	0	0	0	0	0	16,794	0	0	0	0	0	0
Initial 5-MGD GWR System	0	0	0	0	0	0	0	0	5,598	0	0	0	0	0
GWR System	0	0	0	0	0	0	0	0	0	109,724	109,724	145,552	145,552	145,552
SOCWA														
Coastal Treatment Plant	3,695	4,255	4,814	5,934	5,934	5,934	5,934	1,008	952	1,120	1,120	1,120	1,120	1,120
JB Latham WWTP	11,196	10,077	10,637	10,637	10,637	10,637	10,637	0	0	4,479	4,479	4,479	4,479	4,479
Plant 3A	2,575	3,919	3,359	3,639	3,639	3,639	3,639	1,791	1,344	1,120	1,344	1,344	1,344	1,344
Regional Treatment Plant	11,532	10,972	11,196	11,476	11,476	11,476	11,476	4,590	6,382	6,718	6,998	7,278	7,837	7,837
El Toro Water District														
El Toro WWTP	4,702	5,625	5,723	5,849	5,974	6,100	6,225	430	430	575	575	575	575	575
Santa Margarita Water District														
Chiquita WRP	5,264	6,720	10,080	12,096	14,224	15,680	15,680	0	2,377	4,329	6,516	8,016	8,016	8,016
Oso Creek WRP	1,495	1,495	2,561	2,000	2,000	2,000	2,000	1,495	1,495	2,561	2,000	2,000	2,000	2,000
Nichols Institute WRP	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Trabuco Canyon Water District														
Robinson Ranch WRP[3]	784	850	956	1,000	1,000	1,000	1,000	784	850	956	1,000	1,000	1,000	1,000
City of San Clemente														
San Clemente WRP	5,150	5,150	5,150	6,718	6,718	6,718	6,718	2,463	2,463	2,463	4,479	4,479	4,479	4,479
Irvine Ranch Water District														
Michelson WRP[4]	14,224	17,320	20,272	21,504	22,624	24,192	24,434	14,555	17,914	30,230	33,589	35,828	36,948	36,948
Los Alisos WRP[5]	4,816	5,936	7,652	8,064	8,176	8,176	8,176	4,816	5,936	7,952	8,064	8,176	8,176	8,176
Total	334,179	338,825	400,409	427,080	451,838	454,988	455,355	55,366	56,971	183,457	191,118	233,317	234,996	234,996

Sources: Agency interviews, Orange County Sanitation District Interim Strategic Plan Update, www.tcwd.ca.gov, Jim Herberg OCSD, and Bruce Chalmers, CDM
1) Agency interviews conducted by Camp Dresser & McKee's for Municipal Water District of Orange County
2) Orange County Sanitation District, Orange County Sanitation District Interim Strategic Plan Update
3) www.tcwd.ca.gov (Tabuco Canyon Water District website)
4) Jim Herberg, Orange County Sanitation District
5) Bruce Chalmers, Camp Dresser & McKee's
Notes:
[1] Projections end in 2020, assumes 2020 projections are the same for 2025
[2] Receives secondary treated effluent from OCSD Reclamation Plant No. 1 for treatment to recycled water standards.
[3] Interpolated 2015-2025 using build-out of 1,949 acre-feet/year in 2030.
[4] 2025 flow assumes expansion complete. Values assume HATS flow go to Michelson
[5] Assumes no El Toro panhandle flows.

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

Table 6-2-B: Disposal of Non-Recycled Wastewater in MWDOC's Service Area

			Wastewater Discharged						
Wastewater Plant	**Disposal Method**	**Treatment Level**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
OCSD									
Reclamation Plant No. 1[1]	Ocean Outfall	Primary and Secondary	74,008	80,614	35,828	55,982	39,187	39,187	39,187
Treatment Plant No. 2	Ocean Outfall	Primary and Secondary	171,304	169,064	161,227	161,227	161,227	161,227	161,227
OCWD[2]									
Green Acres Project	No Discharge		0	0	0	0	0	0	0
Water Factory 21	No Discharge		0	0	0	0	0	0	0
GWR System	No Discharge		0	0	0	0	0	0	0
SOCWA									
Coastal Treatment Plant	Ocean Outfall	Secondary/Tertiary	2,687	3,303	3,694	4,814	4,814	4,814	4,814
JB Latham WWTP	Ocean Outfall	Secondary/Tertiary	11,196	10,077	6,158	6,158	6,158	6,158	6,158
Plant 3A	Ocean Outfall	Secondary/Tertiary	784	2,575	2,239	2,295	2,295	2,295	2,295
Regional Treatment Plant	Ocean Outfall	Secondary/Tertiary	6,942	4,590	4,478	4,478	4,198	3,639	3,639
El Toro Water District									
El Toro WWTP	Ocean Outfall	Secondary	4,272	5,195	5,148	5,274	5,399	5,525	5,650
Santa Margarita Water District									
Chiquita WRP	Ocean Outfall	Tertiary	5,264	4,343	5,751	5,580	6,208	7,664	7,664
Oso Creek WRP	No Discharge		0	0	0	0	0	0	0
Nichols Institute WRP	No Discharge		0	0	0	0	0	0	0
Trabuco Canyon Water District									
Robinson Ranch WRP	No Discharge		0	0	0	0	0	0	0
City of San Clemente									
San Clemente WRP	Ocean Outfall	Secondary/Tertiary	2,687	2,687	2,687	2,239	2,239	2,239	2,239
Irvine Ranch Water District									
Michelson WRP	No Discharge		0	0	0	0	0	0	0
Los Alisos	Ocean Outfall	Secondary/Tertiary	594	3,472	4,110	4,110	4,110	4,110	4,110
Sub-Total			279,738	285,920	231,320	252,157	235,835	236,858	236,983
Unused Recycled Water Disposed	Ocean Outfall	Title 22	19,263	16,470	49,768	46,416	82,749	81,667	81,909
Total			**299,001**	**302,390**	**281,088**	**298,573**	**318,584**	**318,525**	**318,892**

Sources: Agency interviews, Orange County Sanitation District Interim Strategic Plan Update, RWQCB
1) Agency interviews conducted by Camp Dresser & Mckee's for Municipal Water District of Orange County
2) Regional Water Quality Control Board
3) Orange County Sanitation District, *Orange County Sanitation District Interim Strategic Plan Update*
Note:
[1] Does not account for wastewater sent to OCWD for treatment to recycled water standards.

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

Wastewater is treated to various treatment levels. Within the MWDOC service area all wastewater is treated to a minimum of a advanced primary treatment. Wastewater treatment is a series of processes that are designed to progressively remove solids to a level established in regulatory water quality standards. Primary treatment separates settleable and floatable solids from the wastewater for additional wastewater treatment. Secondary treatment removes more solids through biological treatment and further sedimentation and converts organic matter into harmless by-products. Finally, during the tertiary treatment process any remaining impurities are removed through filtration. All wastewater within the MWDOC service area is treated to a minimum of a secondary treatment level for non-OCSD treatment facilities. Currently, treated effluent from OCSD is a blend of advanced primary and secondary treated wastewater. Full secondary treatment of all OCSD effluent flows is not anticipated to occur before 2013.

Additional treatment maybe required to meet recycled water standards. All recycled water must meet Title 22 standards. Title 22, Division 4, of the California Code of Regulations establishes recycled water quality standards and treatment reliability criteria dependent upon the end use of recycled water to protect public health. Both secondary and tertiary treated wastewater can meet Title 22 standards

dependent upon the end use of the water. All water not meeting recycled water standards is discharged through ocean outfalls in MWDOC's service area. Recycled water produced in excess of demands is also disposed through the outfalls.

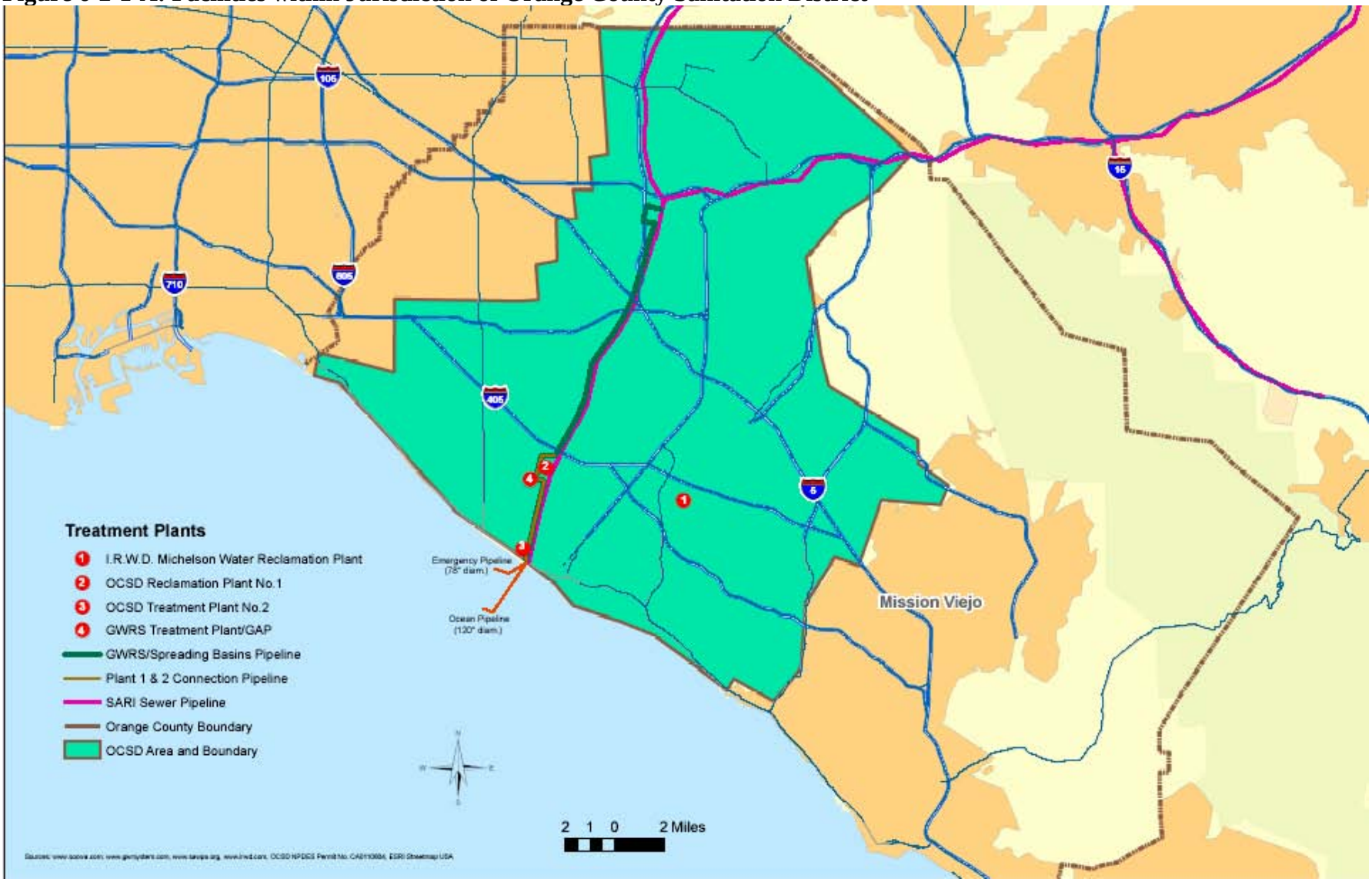
6.2.1 Orange County Sanitation District

OCSD collects wastewater from residential, commercial, and industrial customers in 21 cities, three special districts, and portions of unincorporated Orange County, totaling 471 square miles serving approximately 2.4 million residents. Its wastewater system is the third largest west of the Mississippi River. OCSD treats an average daily flow of 264 MGD or approximately 266,472 acre-feet per year. 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. During the dry weather period, May through September, diverted flows range between 0.7 to 2.6 MGD. During wet months, diverted flows range from 0.4 to 1.4 MGD.

OCSD operates and maintains two treatment plants: Reclamation Plant No. 1, located in Fountain Valley with a capacity of 218 MGD, and Treatment Plant No. 2 located in Huntington Beach with a capacity of 168 MGD. OCSD also operates 650 miles of collection system, with pipelines ranging in size from 6 to 96 inches in diameter along with 20 pump stations. The treated wastewater is discharged to the Pacific Ocean via an ocean outfall in strict and consistent compliance with state and federal requirements as set forth in OCSD's National Pollutant Discharge Elimination System permit, while approximately 10 MGD is reclaimed at facilities operated by the OCWD. OCSD's outfall is 120 inches in diameter and extends four miles into the ocean with an additional one mile long diffuser. Its high tide hydraulic capacity is 480 MGD. A 78-inch-diameter outfall extending one mile offshore is available for emergency situations. Two additional outfalls are located at the Santa Ana River for use in extreme emergency overflow conditions only. Figure 6-2-1-A graphically depicts the location of the outfall and emergency ocean outfall.

Biosolids are 100% land applied as an agricultural soil amendment, while grit and screenings are transported under contract for landfill disposal.

Figure 6-2-1-A: Facilities within Jurisdiction of Orange County Sanitation District



Source: Prepared by Camp, Dresser, and McKee for Municipal Water District of Orange County

Reclamation Plant No. 1

Reclamation Plant No. 1 treats raw wastewater conveyed from six major sewer lines. On average the plant treats approximately 120 MGD of wastewater. The maximum treatment capacity is 218 MGD. The plant provides advanced primary and secondary treatment and supplies secondary treated water to OCWD for further treatment to recycled water standards and distribution. This is the only OCSD treatment plant that provides water to OCWD for reclamation. An interplant pipeline allows flows to be conveyed to Treatment Plant No. 2. Management of interplant flows allows for minimum flow requirements for reclamation facilities to be met during off-peak hours.

Treatment Plant No. 2

Treatment Plant No. 2 provides a mix of advanced primary and secondary treatment. Influent is received via five major sewers and Reclamation Plant No. 1. The average dry weather treatment flow rate is 144 MGD. The maximum treatment capacity is 168 MGD. All treated wastewater is discharged to the ocean through the ocean outfall.

OCSD's 2002 Interim Strategic Plan identifies numerous projects that will improve management of water resources within its service area. Future projects related to wastewater and recycled water include:

- Dry weather diversion, dairy washwater diversions, and water conservation activities; and

- Secondary effluent from Reclamation Plant No. 1 will provide source water to the Groundwater Replenishment System (GWR System)jointly operated by OCWD and OCSD. Diversion of all Santa Ana River Interceptor flows from Reclamation Plant No. 1 to Treatment Plant No. 2 would occur in order to satisfy Department of Health Services' requirements that the largely industrial sources in the Santa Ana River Interceptor flow should not go to the GWR system.

Projected volumes presented in Tables 6-2-A and 6-2-B incorporate the above stated projects.

6.2.2 South Orange County Wastewater Authority

The South Orange County Wastewater Authority (SOCWA) was formed after the completion of the 2000 UWMP. SOCWA is a Joint Powers Authority created on July 1, 2001. It was formed as the legal successor to three agencies: Aliso Water Management Agency, South East Regional Reclamation Authority, and South Orange County Reclamation Authority. SOCRA Member agencies include: City of Laguna Beach, City of San Clemente, City of San Juan Capistrano, El Toro Water District, Emerald Bay Service District, Irvine Ranch Water District, Moulton Niguel Water District, Santa Margarita Water District, South Coast Water District, and Trabuco Canyon Water District. All of these service areas receive wholesale water through MWDOC. As illustrated in Figure 6-2-2, the service area encompasses approximately 220 square miles including the Aliso Creek, Laguna Canyon, and San Juan Creek Watersheds.

Figure 6-2-2-A: Facilities within South Orange County Wastewater Authority's Jurisdiction

Source: Prepared by Camp, Dresser, and McKee for Municipal Water District of Orange County

The purpose of SOCWA is to:

> Plan for, acquire, construct, maintain, repair, manage, operate and control facilities for the collection, transmission, treatment and disposal of wastewater, the reclamation and use of wastewater for beneficial purposes, and the production, transmission, storage and distribution of non-domestic water.

SOCWA utilizes a Project Committee Basis where member agencies financially contribute and participate in committee that they have an equity ownership interest in. Within its service area, SOCWA operates four wastewater treatment plants, the remaining eight wastewater treatment plants are 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, Aliso Creek Outfall and San Juan Creek Outfall, operated by SOCWA. These outfalls have a gravity flow capacity of 50 MGD and 24 MGD (80 MGD pumped), respectively. Aliso Creek outfall extends approximately 7,900 feet offshore near Aliso Creek. San Juan Creek outfall extends 10,550 feet offshore near Doheny Beach and the mouth of San Juan Creek. Ultimately, the hydraulic capacity of the San Juan Creek Outfall will be expanded to 31.5 MGD. At a minimum, full secondary treatment is provided at wastewater treatment plants within the service area, with most plants exceeding this level of treatment.

Coastal Treatment Plant

SOCWA's Coastal Treatment Plant located in Laguna Niguel has a maximum influent capacity of 6.7 MGD. Effluent has been treated to secondary or tertiary levels dependent upon disposal or reuse of the wastewater for recycling. Recycled water is treated to applicable Title 22 standards. Treated effluent that is not recycled is disposed through the Aliso Creek Outfall Ocean Outfall. In 2005, 3.8 MGD or 4,255 acre-feet of dry weather flows were collected and treated on average of which 0.9 MGD or 952 acre-feet was used as recycled water.

Regional Treatment Plant

The Regional Treatment Plant with a maximum influent capacity of 12 MGD lies within Laguna Niguel and is operated by SOCWA. Effluent has been treated to secondary or tertiary levels dependent upon disposal or reuse of the wastewater for recycling. Recycled water is treated to applicable Title 22 standards. Non-recycled effluent is conveyed to the Aliso Creek Ocean Outfall via the SOCWA Effluent Transmission Main. In 2005, the Regional Treatment Plant is receiving and treating an average dry weather flow of 9.8 MGD or 10,972 acre-feet with 5.7 MGD or 6,382 acre-feet treated to recycled water standards.

Plant 3A

Plant 3A is located within Laguna Niguel and is operated by SOCWA. The maximum influent capacity is 6 MGD. Effluent has been treated to secondary or tertiary levels dependent upon disposal or reuse of the wastewater for recycling. Recycled water is treated to applicable Title 22 standards. Unused effluent is conveyed to the San Juan Creek Outfall via the 3A Effluent Transmission Main. On average, in 2005 Plant 3A is receiving and treating 3.5 MGD of dry weather flows or 3,919 acre-feet of which 1.2 MGD or 1,344 acre-feet are treated to recycled water standards.

J. B. Latham Treatment Plant

SOCWA's J. B. Latham Treatment Plant is the largest plant in the service area with a design capacity of 13 MGD. This plant is located in Dana Point. Effluent is currently treated to secondary levels. Effluent is conveyed directly to the San Juan Creek Outfall. In 2005, the average dry weather flows collected and treated are 9 MGD or 10,077 acre-feet. None of the treated effluent currently meets recycled water standards. As proposed, between 2005 and 2010 up to 4 MGD or 4,479 acre-feet of wastewater will be treated to recycled water standards.

El Toro Water District Water Recycling Plant

El Toro Water District Water Recycling Plant is operated by El Toro Water District and is located in Laguna Wood. The plant has a maximum influent capacity of 6 MGD. Wastewater is treated to a secondary to Title 22 standards depending upon the ultimate use of the effluent. On average, in 2005 4.5 MGD or 10,972 acre-feet of secondary treated effluent is disposed via the Southern Orange County Wastewater Authority Effluent Transmission Main to the Aliso Creek Ocean Outfall and 0.5 MGD or 560 acre-feet of effluent is treated to a tertiary level meeting Title 22 standards and is sent to the recycled water distribution system. If grant money is received, El Toro Water District will construct a proposed 5 MGD advanced wastewater treatment facility for recycled water at the plant.

Chiquita Water Reclamation Plant

Chiquita Water Reclamation Plant is operated by Santa Margarita Water District and is located in Chiquita Canyon. Wastewater is treated to a tertiary level with recycled water treated to Title 22 standards. Chiquita Water Reclamation Plant has a maximum design capacity of 9 MGD with plans to increase its size to 14 MGD by 2025. In 2005 approximately 2.1 MGD or 2,377 acre-feet is recycled, with the majority of the effluent, 3.9 MGD or 4,343 acre-feet, disposed via the Chiquita Land Outfall with a connection to the San Juan Creek Ocean Outfall.

Oso Creek Water Reclamation Plant

Oso Creek Water Reclamation Plant (OCWRP) is located along Oso Creek and is operated by Santa Margarita Water District. At this facility, wastewater is treated to a secondary level with recycled water treated to Title 22 standards. A bypass facility allows for excess wastewater to be sent to the previously discussed J.B. Latham Treatment Plant as OSWRP has no outfalls. Without the ability to discharge treated effluent, excess flows beyond recycled water demands are required to be sent to J.B. Latham Treatment Plant. OSWRP has a maximum design capacity of 3 MGD. On average in 2005 approximately 1.4 MGD or 1,495 acre-feet, is treated and recycled. Average wastewater collected in 2010 and after is based on conservative flows. OSWRP is a clipping plant that removes wastewater from the main sewer trunk line.

Nichols Institute Water Reclamation Plant

The Nichols Institute Water Reclamation Plant is operated by Santa Margarita Water District. This small facility treats approximately 34 acre-feet per year. No outfall is available for this facility. Therefore, all wastewater is treated to Title 22 standards for recycling purposes.

San Clemente Water Reclamation Plant

The city of San Clemente owns and operates the San Clemente Water Reclamation Plant located within the city. The San Clemente Water Reclamation Plant has a design capacity of 7 MGD and treats wastewater to secondary or tertiary levels dependent upon if the water will be recycled or disposed. Any water 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 limited to 2.2 MGD or 2,463 acre-feet per year. The average dry weather influent for 2005 is 4.6 MGD or 5,150 acre-feet.

Los Alisos Water Reclamation Plant

Los Alisos Water Reclamation Plant is operated by IRWD and is located in Lake Forest. LAWRP will have a maximum capacity of 7.3 MGD after the 2005 upgrades to the plant are completed. Wastewater is treated to a secondary or tertiary level dependent upon the ultimate use of the effluent. In 2005, average dry weather flows collected and treated are 5 MGD or 5,598 acre-feet. All of the effluent is recycled. When excess water beyond its tertiary treatment capacity is received, it is conveyed to the SOCWA Effluent Transmission Main for disposal via the Aliso Creek Ocean Outfall.

Robinson Ranch Water Reclamation Plant

Robinson Ranch Water Reclamation Plant is operated by Trabuco Canyon Water District and is located in Trabuco Canyon. Robinson Ranch Water

Reclamation Plant has a maximum capacity of 0.85 MGD. In 2005, average dry weather flows collected and treated are 0.76 MGD or 850 acre-feet. Future expansions are planned to increase the capacity to 0.9 MGD. Wastewater is treated to a secondary level and Title 22 standards. All of the wastewater is recycled as the plant is not permitted to have stream discharges, and it is unfeasible to connect to the existing outfalls in the SOCWA service area.

6.2.3 Irvine Ranch Water District

A portion of IRWD falls within both the OCSD and SOCWA jurisdictional boundaries. IRWD operated operates both the Michelson Water Reclamation Plant within the OCSD service area and the previously discussed Los Alisos Water Reclamation Plant within the SOCWA service area.

Michelson Water Reclamation Plant

Michelson Water Reclamation Plant (MWRP) is located in the city of Irvine and is operated by IRWD. MWRP currently has a maximum influent capacity of 18 MGD with plans to expand to 33 MGD by 2025 to meet non-potable demands. Wastewater is treated to a tertiary level with advanced treatment in the form nitrification/ denitrification. All effluent meets Title 22 standards for unrestricted use, except for potable water consumption. All effluent produced by the plant is conveyed to the recycled water distribution system. In 2005, average wastewater influent flows are 13.69 MGD or 15,333 acre-feet.

6.3 Current and Projected Uses of Recycled Water

Recycled water is widely accepted as a source for direct use and indirect use of water supply throughout MWDOC's service area. For definition of direct use verses indirect use, please refer to Section 2.1.3.1 in the Plan. In the past, recycled water was mainly used for landscape irrigation. Large recycled water projects include the Green Acres Project, IRWD's recycled water projects, the recently demolished Water Factory 21, and the forthcoming GWR System. In 2007, GWR System will come online resulting in a dramatic increase in the use of recycled water in Orange County. Uses include injection for sea water barriers and groundwater recharge. Groundwater recharge will surpass landscape irrigation as the greatest consumer of recycled water in Orange County. IRWD is at the forefront of using recycled water not only for irrigation, but also for other uses such as toilet flushing and commercial uses. Other agencies in south Orange County, such as Moulton Niguel Water District and Santa Margarita Water District use a significant amount of recycled water. Recycled water in Orange County is treated to various levels dependent upon the ultimate end use and in accordance with Title 22 regulations.

Tables 6-3-A and 6-3-B summarize current recycled water use and projected recycled water use, respectively, by user type.

Table 6-3-A: 2005 Recycled Water Uses (Actual) in MWDOC's Service Area

Acre-feet Per Year		
User type	**Treatment Level**	**2005**
Landscape		
City of Fountain Valley	Title 22[1]	1,260
City of Newport Beach	Title 22[1]	317
City of San Clemente	Title 22[1]	552
El Toro Water District	Title 22[1]	430
Irvine Ranch Water District	Title 22[1]	15,296
Mesa Consolidated Water District	Title 22[1]	1,000
Moulton Niguel Water District	Title 22[1]	7,868
Santa Margarita Water District	Title 22[1]	4,270
South Coast Water District	Title 22[1]	890
Trabuco Canyon Water District	Title 22[1]	850
	Subtotal	32,733
Groundwater Recharge		
GWR System[2]	Micro-filtration/ Reverse Osmosis	0
Sea Water Barrier		
Initial 5-MGD of GWR System	Micro-filtration/ Reverse Osmosis	4,000
	Total	36,733

Source : MWDOC and OCWD

1) Municipal Water District of Orange County

2) Orange County Water District

Notes:

[1]All recycled water is treated to meet Title 22 standards. Treatment levels vary depending upon the source.

[2] GWR System will be online in 2007.

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

Table 6-3-B: Projected Future Use of Recycled Water in MWDOC's Service Area

Acre-feet per Year					
User type	**2010**	**2015**	**2020**	**2025**	**2030**
Landscape					
City of Fountain Valley	1,500	1,500	1,500	1,500	1,500
City of Newport Beach	444	478	500	500	500
City of San Clemente	1,256	1,767	2,300	2,300	2,300
City of San Juan Capistrano	2,056	2,556	3,039	3,350	3,350
El Toro Water District	575	575	575	575	575
Irvine Ranch Water District	26,203	26,091	27,948	29,231	29,231
Mesa Consolidated Water District	1,231	1,240	1,240	1,240	1,240
Moulton Niguel Water District	9,800	9,800	9,800	9,800	9,800
Santa Margarita Water District	6,367	8,306	10,162	12,122	12,122
South Coast Water District	1,000	1,000	1,000	1,000	1,000
Trabuco Canyon Water District	956	1,000	1,000	1,000	1,000
Subtotal	51,388	54,313	59,064	62,618	62,618
Groundwater Recharge					
GWR System	38,000	38,000	38,000	38,000	38,000
Sea Water Barrier					
GWR System	34,000	34,000	34,000	34,000	34,000
Total	123,388	126,313	131,064	134,618	134,618

Source : Municipal Water District of Orange County

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

Projections are based on implementation of currently planned projects where there is a high level of confidence that the projects will be implemented. In 2005, Landscape use for recycled water is 32,733 acre-feet, groundwater recharge use is zero, and seawater barrier use is 4,000. By 2030 recycled water use in this category is projected to almost double to 62,618 acre-feet per year, groundwater recharge use is projected to be 38,000 acre-feet per year, and seawater barrier is projected to be 34,000 acre-feet per year. Sea water barrier use of recycled water is expected to remain constant once GWR SYSTEM is online in 2007. Use of GWR SYSTEM water for groundwater recharge will continue to increase from 2007 to 2030 as additional phases of the project are constructed. Projects that are planned, but have a lower level confidence are discussed in Section 6.5.

Figures 6-3-A and 6-3-B illustrate the percentage of recycling in the current (2005) and future (2030) supply resource mix for direct consumptive and for replenishment and barriers. As shown on the figures, the aggressive investment made in the region will increase the amount of recycling supplies. This, together with improvements in groundwater supplies, would decrease the region's dependence on imported supply.

Figure 6-3-A: Current and Projected Resource Mix in MWDOC's Service Area for Direct Consumption

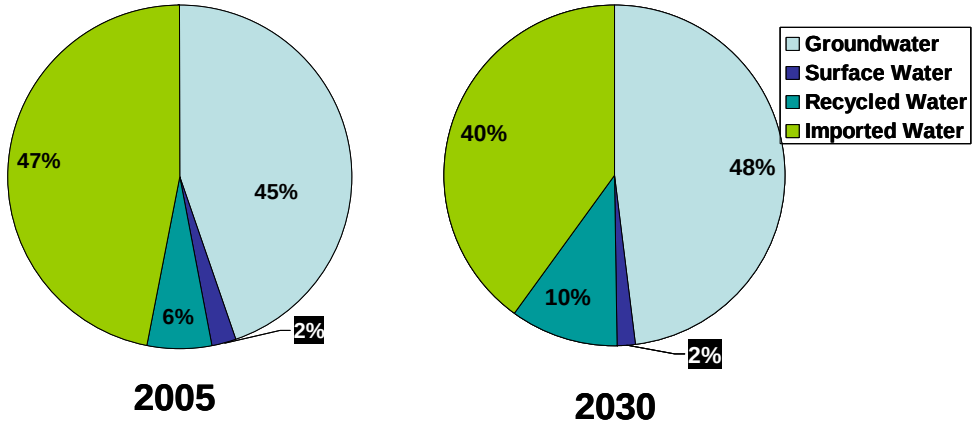
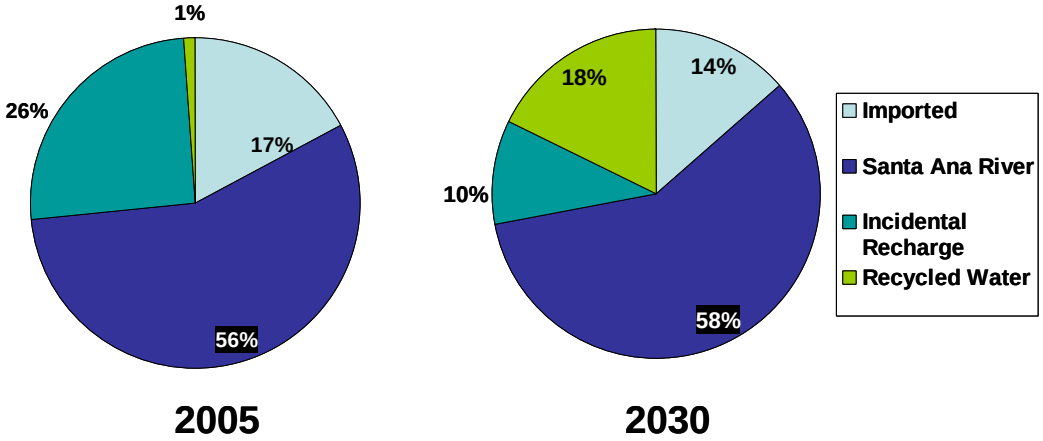


Figure 6-3-B: Current and Projected Resource Mix in MWDOC's Service Area for Groundwater Replenishment and Saline Barriers



As the region continues to grow, more wastewater is expected to be collected. The urban water suppliers in the region also take on the opportunities to recover the treated effluent for recycled water use. Figure 6-3-C shows the percentage of water recycled from wastewater is projected to increase from 11% in 2005 to 30% in 2030. Figure 6-3-D shows that the recycled water use is projected to increase from 36,733 acre-feet in 2005 to 134,618 acre-feet in 2030.

Figure 6-3-C: Current and Projected Percentage of Recycled and Disposed Wastewater in MWDOC's Service Area

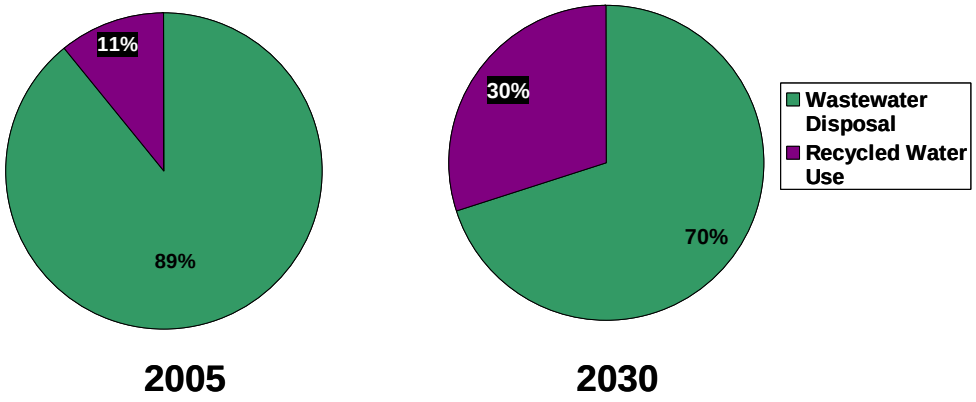
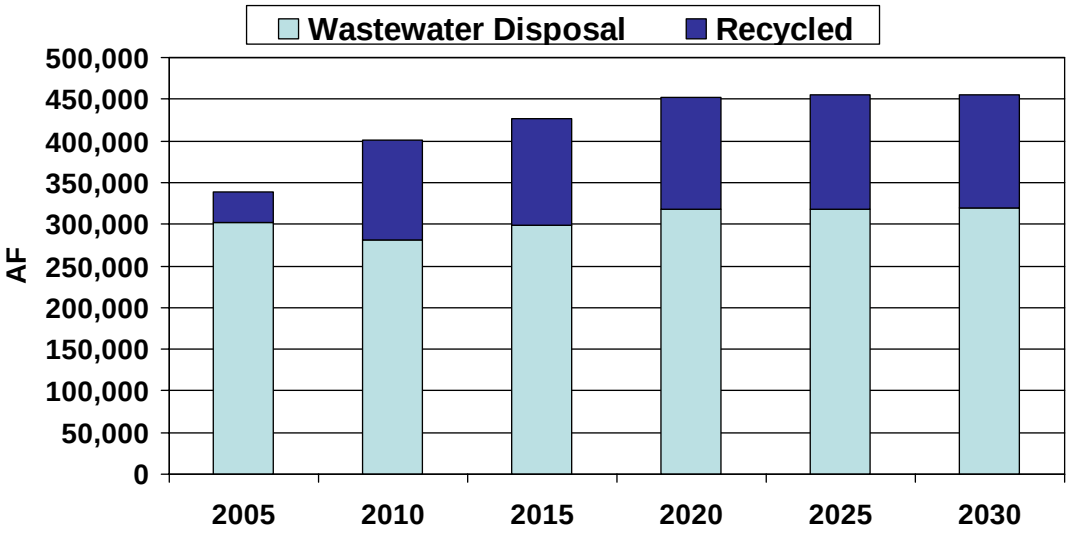


Figure 6-3-D: Current and Projected Recycled and Disposed Wastewater in MWDOC's Service Area



6.3.1 Green Acres Project

During the dry season, typically May through November, tertiary treated recycled water is produced by OCWD's Green Acre Project for wholesale distribution to the cities of Fountain Valley, Huntington Beach, Newport Beach, and Santa Ana, as well as Mesa Consolidated Water District. Additionally, OCWD delivers recycled water to OCSD for use at its two wastewater treatment plants. The capacity of the plant is 7.5 MGD. When demands exceed supply, GAP water can be supplemented with up to 6 MGD of deep colored well water. During winter months, IRWD's Michelson Water Reclamation Plant provides users with advanced treated tertiary recycled water per agreement with OCWD.

Recycled water from GAP is mainly used for landscape and agricultural uses. Landscape uses include, but are not limited to parkways, parks, golf

courses, and schools. Other uses of GAP water include dual plumbing in OCWD's office building, industrial processes, wastewater treatment processes, and carpet dyeing.

6.3.2 Initial 5 MGD Groundwater Replenishment System

Initial operation of the GWR System at 5 MGD commenced in 2004 replace a portion of the water previously produced by Water Factory 21. Until its demolition in 2004 to make room for the GWR System project, the Water Factory 21 project treated approximately 5 MGD of secondary effluent from OCSD with reverse osmosis for blending with approximately 8 MGD of deep well water. The blended water was directly injected into underlying aquifers to prevent seawater intrusion into the Orange County Groundwater Basin. The 5-MGD GWR System uses the same treatment processes that will be used for the full-scale GWR System project, micro-filtration and reverse osmosis. Approximately 4,000 acre-feet per year are produced by the initial 5 MGD GWR System to offset a portion of the injection water that was lost when Water Factory 21 was taken offline. The balance of the lost production water is being replaced with water from Metropolitan until GWR SYSTEM comes online in 2007.

6.3.3 Groundwater Replenishment System

Upon completion in 2007, GWR SYSTEM will produce ultra-pure water using micro-filtration coupled with reverse osmosis, ultraviolet light, and hydrogen peroxide with water obtained from OCSD Reclamation Plant No. 1. When completed GWR System will be one of the most advanced water purification systems in the world. Produced water will exceed all federal and state drinking water standards. At this time, GWR is approved for Phase 1, which will recycle approximately 72,000 acre-feet per year of effluent. Investments beyond Phase 1 have not been approved by OCWD and would require further review before proceeding primarily due to the current lack of OCSD source water. If the future envisioned phases of the project are approved and developed, then it is projected that up to 146,000 acre-feet per year of water will be produced.

GWR SYSTEM was designed to satisfy multiple goals to improve management of groundwater supplies and wastewater supplies. The partnership between OCWD and OCSDS will eliminate the need for construction of another ocean outfall for disposal of treated wastewater. Produced water supplies will be used for percolation into the Orange County Groundwater Basin and injection into seawater barriers. Percolation of this high quality water supply will ultimately assist in boosting the water quality of the Basin by reducing mineral content. Expansion of the seawater barrier may result in the ability to sustain additional groundwater production in coastal areas. GWR SYSTEM water will potentially augment existing recycled water supplies available for irrigation and other uses. With this project, water supply reliability will increase as another local supply option

for groundwater recharge becomes available, reducing dependence on imported water for Basin recharge. Water produced by the project is a drought-proof water supply source

Construction of the project is expected to need a capital investment of $487 million. Funding sources include the United States Bureau of Reclamation, United States Environmental Protection Agency, California State Department of Water Resources, California Energy Commission, Metropolitan's Local Resources Program, and Proposition 13. OCSD and OCWD are equally sharing the cost of construction. OCWD will maintain and operate the system.

6.3.4 Irvine Ranch Water District Water Reclamation

IRWD operates an ambitious recycled water program with up to 20% of its total water supply derived from recycled water. Approximately 80% of all business and community landscaping is irrigated with recycled water. Additional users include agriculture, homeowners' associations, carpet dyeing facilities, large residential lots, commercial buildings for toilet flushing and cooling towers, open space areas, and fountains. IRWD's Michelson Water Reclamation Plant produces water for unrestricted non-potable use, as classified by Department of Health Services, using an advanced treatment process. IRWD has multiple agreements with OCSD, OCWD and SOCWA for operating its program, such as providing water to the GAP project during winter months. IRWD wholesales excess recycled water to OCWD for GAP project and Santa Margarita Water District.

In 2005, the fifteenth building with dual plumbing in the city of Irvine was connected to the recycled water system. These buildings utilize recycled water for toilet flushing. Two of IRWD's fifteen dual plumbed buildings also use recycled water for cooling tower in addition to toilet flushing. Potable water demands in these buildings have decreased by up to 75%. IRWD was the first water district in the country to utilize recycled water for interior uses.

6.3.5 Other Water Reclamation Projects

As listed in Table 6-2-A, seven other wastewater treatment plants provide recycled water on a smaller scale than the previously described projects. Treatment levels by plant vary, but all the plants produce recycled water to Title 22 standards. These plants are owned and operated by SOCWA member agencies or SOCWA itself. Additionally, Santa Ana River water, with a base flow composed mainly of tertiary-treated water from treatment plants in the Upper Santa Ana River Watershed such as the cities of San Bernardino, Corona, and Riverside, is captured and used as recharge water in the Orange County Groundwater Basin. These amounts were not included in Table 6-3-A as they are not produced in MWDOC's service area.

6.4 Comparison of 2000 Projected Recycled Water Use with 2005 Actual Use

Current recycled water projections for 2005 for MWDOC's service area are 25% less than previously forecasted in MWDOC's 2000 UWMP as illustrated in Table 6-4-A. Current 2005 forecasts indicate that approximately 29,287 acre-feet of recycled water will be consumed by these user types, while the 2000 UWMP forecasted 39,600 acre-feet of recycled water use in 2005.

Table 6-4-A: Recycled Water Uses in MWDOC's Service Area – 2000 Projection Compared with 2005 Actual

Acre-feet Per Year		
User type	**2000 Projection for 2005**	**2005 Actual Use**
Landscape		
City of Fountain Valley	1,300	1,260
City of Huntington Beach	400	No Use
City of Newport Beach	500	317
City of San Clemente	1,000	552
El Toro Water District	600	430
Irvine Ranch Water District	16,853	15,296
Mesa Consolidated Water District	1,000	1,000
Moulton Niguel Water District	9,000	7,868
Santa Margarita Water District	5,700	3,972
South Coast Water District	1,000	890
Trabuco Canyon Water District	900	850
Subtotal	38,253	32,435
Sea Water Barrier		
Initial 5-MGD of GWR System		4,000
Total	38,253	36,435

Sources :

1) Municipal Water District of Orange County, *2000 MWDOC Urban Water Management Plan*

2) Municipal Water District of Orange County

Notes:

[1]WaterFactory 21 is not included as it was demolished in 2004. GWR System's Initial-5-MGD Plant was not included in 2000 for 2005.

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

For comparison purposes, indirect use of water demand such as seawater barrier use and groundwater recharge are not included in Table 6-4-A. Water Factory 21 provided recycled water for seawater barrier use until it was demolished in 2004. For the 2000 UWMP, recycled water projections were not made for the initial 5 MGD GWR SYSTEM currently in operation. GWR SYSTEM will provide this water beginning in 2007 as previously discussed.

Expected recycled water use by individual retail agencies for 2005 was lower than forecasted in the 2000 UWMP for 2005. However, projected recycled water use is

on target for 2020 as currently and previously projected. Consumption of recycled water, not including groundwater recharge and seawater barrier use, for the MWDOC service area is forecast to be approximately 61,254 acre-feet per year in 2020, close to the 2000 UWMP forecast for 2020 of 62,850 acre-feet per year. On a percentage basis, the city of San Clemente satisfied the least amount of their 2000 projection for 2005 and will only meet 55% of its 2000 UWMP forecast for 2005. Additionally, the city of Huntington Beach has not started using recycled water as previously forecasted. The GAP project was not extended into the city as was anticipated. Discrepancies between the current 2005 expected use of recycled water and the 2000 forecast are attributed to multiple reasons, including a lack of funding and complex interagency agreements. Discussions of individual agency discrepancies in recycled water use are available in their respective UWMPs.

6.5 Potential Uses of Recycled Water and the Feasibility of Serving those Users

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), water quality, public acceptance, infrastructure requirements, and reliability. Recycled water quality, in combination with the tolerance of landscaping to high total dissolved solid levels, plays a large role in whether irrigation with recycled water is feasible. Recycled water that has TDS levels that constantly or occasionally exceed the tolerance level of specific landscape requirements will result in adverse impacts to the landscape. Therefore, some users are not able to utilize recycled water unless TDS levels are held below specific plant-based thresholds.

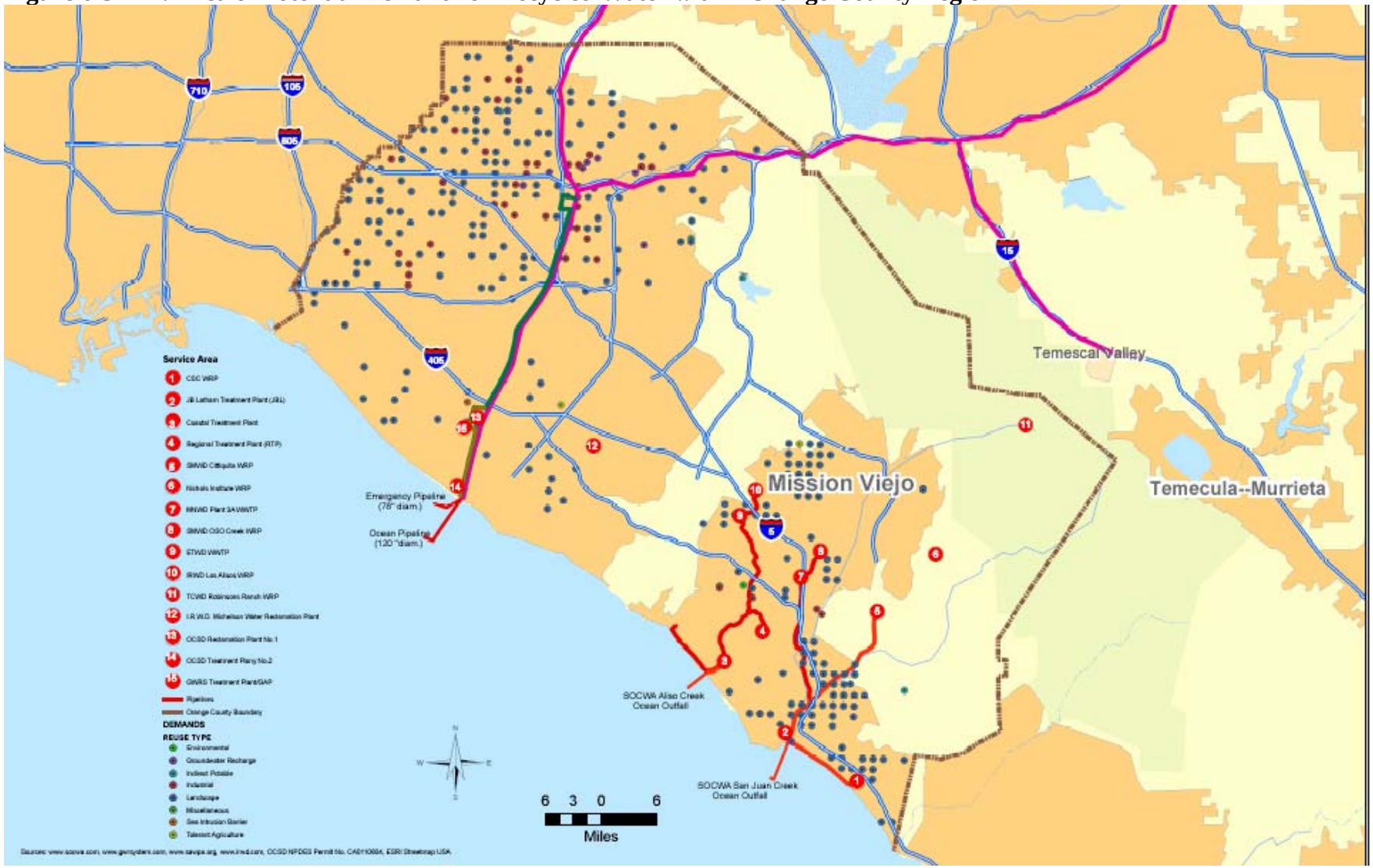
Even with high identified demands, it is not necessarily economically feasible to provide recycled water to all potential users. Expansion of recycled water systems eventually reaches a point where returns diminish, or more money is required to extend the system further, but the benefits of the expansions are less per dollar spent for previous expansions of the system. Water recycling projects involve collecting and treating wastewater to applicable standards dependent upon the ultimate end use, storing recycled water for seasonal use, pipeline construction, pump station installation, and plumbing retrofits for existing end users or dual plumbing systems for new users. Creative solutions to secure funding, overcome regulatory requirements, institutional arrangements, and public acceptance are required to offset existing potable demands with potential recycled water demands.

6.5.1 Southern California Comprehensive Water Reclamation and Reuse Study

In 2002, short-term and long-term regional implementation plans for increasing recycled water use were developed as part of the *Southern California Comprehensive Water Reclamation and Reuse Study* (SCCWRRS). As previously identified, SCCWRRS participating agencies were composed of a consortium of local, state, and federal agencies to address regional recycled water planning in Southern California. The six-year comprehensive study utilized 2040 as a long-term planning horizon,

with more detailed short-term implementation plans (STIP) developed for implementation between 2002 and 2012. Within the Orange County portion of the study five short-term regional implementation plans were developed for the following geographical areas: North Orange County, Central Orange County, Upper Oso, and San Juan. One long-range plan building upon the STIPs was developed for the region. It should be noted that the study incorporates Orange County as a whole and thus extends beyond MWDOC's jurisdictional boundaries and was based on pre-2000 data. Figure 6-5-1-A illustrates areas of potential demand based on eight main classifications of recycled water users within Orange County.

Figure 6-5-1-A: Area of Potential Demand for Recycled Water within Orange County Region



Source: Prepared by Camp, Dresser, and McKee for Municipal Water District of Orange County

Criteria utilized to develop regional projects in the SCCWRRS study included water quality issues, projected available supply of effluent, and interactions with other water management projects. Water quality played a significant role in development of regional projects. For the SCCWRRS study, it was assumed that all proposed regional projects would meet full compliance with Title 22 of the California Administrative Code. Full compliance allows irrigation of food crops, parks, playgrounds, and allows the most stringent degree of human contact. Salinity played a role in development of regional projects as salinity has wide ranging impacts from groundwater management to plant damage. Where necessary regional projects incorporated desalters and brine lines to remove and dispose of excess salinity. Projected supplies of recycled water considered existing treatment capacities and planned reclamation projects. Regional projects also considered other water management projects that could potentially impact recycled water production such as water conservation, salinity of imported waters, and brine produced by desalination plants.

Projects were evaluated from an economic standpoint based on three perspectives as defined in the SCCWRRS study:

- The total Society perspective represents the most extensive geographic calculations of societal benefits of all three perspectives. This perspective is an important component of the regional analysis and helps in the development of cost-sharing arrangements and other funding mechanisms;

- The Southern California perspective represents societal economic benefits from a more localized geographic perspective. This perspective is also needed for a regional analysis to help in the development of cost-sharing arrangements and other funding mechanisms; and

- The All Agencies perspective includes a narrower geographic perspective from the viewpoint of affected water, wastewater, groundwater, and recycled water agencies that would be involved in the proposed projects as part of this short implementation plan. This perspective looks at agency costs and benefits and does not include the broader benefits in the Total Society and Southern California perspectives.

North Orange County

As proposed, the north Orange County STIP links recycled water supplies in Los Angeles County with demand in northern Orange County with a linkage to central Orange County. Treated effluent from the Los Coyotes Water Reclamation Plant operated by Los Angeles County Sanitation District would be conveyed via the existing distribution network in the city of Cerritos and new pipelines to the cities of La Palma and Buena Park. Los

Coyotes Water Reclamation Plant is slated for expansion independent of the STIP from 37.5 MGD to 50 MGD by 2010. The STIP allocates, 1.9 MGD of recycled water in 2010. After losses associated with treatment and allocation, the remaining supply available is 42.5 MGD. Approximately 1,100 acre-feet of demand in 2010 has been identified, including1,000 acre-feet per year to landscape users and 100 acre-feet per year to industrial users.

MWDOC and the city of Long Beach have agreed to do a joint study of this conceptual project. A preliminary economic study is scheduled to occur in 2005/2006 in cooperation with local agencies.

Economic sensitivity analysis conducted as part of the SCCWRRS study illustrated net positive impacts from the three economic perspectives. Benefits remained positive across a range of assumptions for project costs or avoided wastewater and water supply costs. The net benefit for the Total Society perspective is estimated at $5 million. Total capital costs in 2000 dollars are estimated at $10.1 million, with an annual operation and maintenance cost of $100,000. Per acre-foot costs are estimated at $700-800 in 2000 dollars.

Implementation issues include institutional, regulatory/water quality, and economic equity. Multiple agencies in two counties would be involved, including two wholesale water agencies, two groundwater agencies, two sanitation districts, two regional water quality control boards, and seven retail water agencies, thus complicating coordination and equitable distribution of costs.

Central Orange County

The proposed Central Orange County STIP would continue to develop connections between existing recycled water systems in the IRWD and OCWD service areas, expand the recycled water service areas to include Newport Beach, Huntington Beach, Anaheim, Placentia, and Fullerton, construct a new 100 MGD recycled water facility, and construct approximately 55 miles of pipelines and a regional brineline. This proposed STIP includes the GWR SYSTEM facilities under construction. Existing facilities in the study area have treatment capacity of approximately 108 MGD for treatment to secondary standards and 40.5 MGD for treatment to tertiary standards. By 2010, 137 MGD of tertiary treatment capacity is planned. In 2010, approximately 94.5 MGD of recycled water is allocated under the STIP, resulting in a remaining supply of approximately 98.8 MGD after losses associated with the treatment process. The STIP has identified approximately 93,100 acre-feet per year of demand that would be served by the project in 2010, including landscape, industrial, agriculture-tolerant, groundwater, and seawater intrusion barrier users.

Sensitivity analyses for the three economic perspectives indicate net benefits for each perspective. For Total Society a net benefit of $476.6 million is estimated as the groundwater and seawater intrusion barriers create significant water supply savings. With the STIP, an avoided cost of $150 million associated with the construction of a second outfall would be achieved. Capital and annual operation and maintenance costs per year in 2000 dollars are estimated at $683.1 million and $32.4 million, respectively.

Implementation issues include institutional, regulatory/water quality, and economic equity. Multiple agencies would be involved, including two wholesale water agencies, two groundwater agencies, two sanitation districts, one regional water quality control board, and sixteen retail water agencies, thus complicating coordination and equitable distribution of costs.

Upper Oso

The proposed Upper Oso STIP focuses on expanding and developing connections between the recycled water systems in the SOCWA service area, including the former Los Alisos Water District portion of IRWD, El Toro Water District, Moulton Niguel Water District, and Santa Margarita Water District. Plans include the construction of approximately 38 miles of pipeline. Treatment facilities in the area have a capacity of approximately 28.5 MGD of secondary treatment and 13.3 MGD of tertiary treatment capacity. By 2010, tertiary treatment capacity is expected to increase to 24.7 MGD. In 2010, allocated recycled water supplies are estimated to be 6.5 MGD with a remaining supply of 5.9 MGD. Demands of 4,100 acre-feet per year are identified in the STIP for 2010, including 3,300 ACRE-FEET PER YEAR for landscape use and 800 acre-feet per year for agriculture-tolerant use.

Conclusions of the economic analysis for the three perspectives indicate that there is a net benefit for all three perspectives. Total Society has a net benefit of $10.2 million. Capital costs are estimated at $48.4 million in 2000 dollars with an annual associated O&M cost of $1.1 million in 2000 dollars. Per acre-foot annual costs are estimated between $800 and $1,000 in 2000 dollars.

Implementation issues include institutional, regulatory/water quality, and economic equity. Multiple agencies in would be involved including two wholesale water agencies, one joint powers sanitation agency, two regional water quality control boards, and five retail water agencies with many providing both water and wastewater services complicating coordination and equitable distribution of costs.

San Juan

Implementation plans for the San Juan STIP focus on expanding existing systems and interlinking the systems for the city of San Clemente, city of San Juan Capistrano, and the Santa Margarita Water District. Construction of 52 miles of pipelines with varying diameters is proposed under this plan. The plan would utilize existing recycled water facilities in the area as a supply and the Portola Reservoir as a storage facility. Planned capacities for 2010 for tertiary treatment are 17 MGD and 33.3 MGD for secondary treatment. Allocated water supplies in 2010 are 25.3 MGD with an available supply of 0.5 MGD. Demands of 16,300 acre-feet per year are identified in the STIP for 2010, including 3,300 acre-feet per year for groundwater, 12,000 acre-feet per year for landscape, and 1,000 acre-feet per year for miscellaneous use.

An economic analysis for the three perspectives indicated that there is a net benefit for all three perspectives. Total Society has a net benefit of $90.5 million. Capital costs are estimated at $123.6 million in 2000 dollars, with an annual associated operation and Maintenance cost of $4.8 million in 2000 dollars. Per acre-foot annual costs are estimated between $600 and $700 in 2000 dollars.

Implementation issues include institutional, regulatory/water quality, and economic equity. Multiple agencies would be involved, including two wholesale water agencies, one joint powers sanitation agency, two regional water quality control boards, and six retail water agencies, with many providing both water and wastewater services, thus complicating coordination and equitable distribution of costs.

Long-Range Implementation Plan

The *Orange County long range implementation plan* builds upon the STIPs by expanding the treatment capacities of the treatment plants to adequately handle anticipated 2040 flows. Expansion of the recycled water system would consist of serving additional users that are not served by the STIPs. Expansion areas would include Anaheim, Anaheim Hills, Buena Park, Cypress, Fullerton, Garden Grove, Laguna Niguel, San Juan Capistrano, and Yorba Linda. As part of the long term plan, the seven treatment facilities and recycled water storage reservoirs would be linked, creating one regional system and expanding the trunk line from the GWR SYSTEM to Kramer Basin and the Jay B. Latham WRP trunk line. The plan allocates an additional 52,500 acre-feet per year to the existing planned recycling projects by local agencies up to 2040. Estimated capital costs in 2000 dollars to supply the additional 52,500 acre-feet per year is $519 million with an estimated operation and maintenance of $29 million in 2000 dollars per year.

6.5.2 Potential Recycled Water Use in the MWDOC Service Area

MWDOC conducted a survey of its member agencies to determine potential recycled water projects, as illustrated in Table 6-5-2-A Potential uses of recycled water identified within the SCCWRRS study are based on pre-2000 data and do not reflect the latest available information. As identified there, potential recycled water projects include the sum of planned recycled water projects, as listed in Table 6-3-B, and potential recycled water projects. Between 2010 and 2030 potential recycled water use is expected to increase by 85,600 acre-feet per year. The GWR System project has the greatest potential to increase recycled water use if all three phases are constructed. Potential use related to the GWR System project reflects operation of all three phases of the project. In 2030, wastewater treated to recycled standards for the MWDOC service area is estimated to be 234,996 acre-feet per year, with 134,618 acre-feet per year allocated to projected recycled water projects resulting in the availability of 100,378 acre-feet per year for potential recycled water projects. Implementation of the identified potential recycled water projects and planned recycled water projects for the year 2030 total 202,226 acre-feet per year and will result in disposing approximately 32,770 acre-feet per year of water that has been treated to recycled standards.

Table 6-5-2- A: Orange County Potential Recycled Water Uses

Acre-feet Per Year					
User type	**2010**	**2015**	**2020**	**2025**	**2030**
Agriculture/Landscape/ Industrial/Commercial					
City of Fountain Valley	1,500	1,500	1,500	1,500	1,500
City of Newport Beach	444	478	500	500	500
City of San Clemente	1,256	1,767	2,300	2,300	2,300
City of San Juan Capistrano	2,056	2,556	3,039	3,350	3,350
El Toro Water District	575	575	575	575	575
Irvine Ranch Water District	27,797	31,359	33,941	36,246	34,246
Mesa Consolidated Water District	1,231	1,240	1,240	1,240	1,240
Moulton Niguel Water District	10,168	11,500	11,500	11,500	11,500
Santa Margarita Water District	9,109	10,978	12,866	14,515	14,515
South Coast Water District	1,000	1,000	1,000	1,000	1,000
Trabuco Canyon Water District	956	1,000	1,000	1,000	1,000
Subtotal	56,092	63,953	69,461	73,726	71,726
Groundwater Recharge					
GWR System	38,000	65,000	96,500	96,500	96,500
Sea Water Barrier					
GWR System	34,000	34,000	34,000	34,000	34,000
Total	128,092	162,953	199,961	204,226	202,226

Source : Municipal Water District of Orange County, Survey conducted in 2004

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

6.5.3 Barriers to Expansion of Existing Recycled Water Users

Barriers to expanding recycling water systems vary by retail agencies as agencies in Orange County have many unique constraints. The ability to serve end users must take into account the size of end users, the type of water use, proximity to existing recycled water systems, and willingness to use recycled water and the cost effectiveness for agencies and end users. An underlying theme limiting expansion of most recycled water systems in MWDOC's service area is the significant capital and operation and maintenance costs. As expansion of existing recycled water systems continues, the cost tends to increase for each new connection, as most of the recycled water systems already serve those end users where capital and operation and maintenance costs are the lowest.

Trabuco Canyon Water District

Trabuco Canyon Water District currently utilizes approximately 850 acre-feet per year of recycled water. Trabuco Canyon Water District 's master

plan calls for expansion of the existing Robinson Ranch Wastewater Treatment Plant in logical increments to serve the remaining proposed developments. However, the central portion of Trabuco Canyon Water District, located in remote canyon areas, is currently unsewered as the 250 existing dwelling units are served by septic systems or a small package treatment plant in the case of the Joplin Boys' Ranch. As the area in the central portion of the District develops, it is contemplated that sewers will be added in the areas that are currently served by septic systems. The cost of the recycled water would be expensive due to elevation differences. Additionally, when the recycled system is expanded, Trabuco Canyon Water District may need to supply additional staff to properly manage the system.

South Coast Water District

South Coast Water District utilizes approximately 890 acre-feet per year of recycled water. South Coast Water District's system currently has a recycled water capacity that is greater than the demand. The main barrier towards connecting additional users in the future is the cost associated with retrofitting existing landscaping systems, in particular small homeowners associations with less than 15 acres in area. Large irrigation users, such as large homeowners associations greater than 15 acres in size, and two golf courses already utilize recycled water. Landscape retrofitting costs for small users are more difficult to justify as less benefits per dollar spent are received as compared to large users that utilize greater volumes of recycled water.

Moulton Niguel Water District

Moulton Niguel Water District currently uses approximately 7,868 acre-feet per year of recycled water. Within MNWD numerous items present barriers to future expansion of their recycled water facilities. Athletic facilities that have relied on recycled water in the past have been converted to artificial turf, reducing demands for recycled water. Compared to other areas Moulton Niguel Water District is more restrictive and conservative in its retrofit inspections, increasing the cost to end users associated with converting from potable water to recycled water for irrigation needs.

Mesa Consolidated Water District

In 2005, Mesa Consolidated Water District expects to use approximately 1,000 acre-feet of recycled water. Mesa Consolidated Water District currently obtains its recycled water supplies from the Green Acres Project. In the winter, source water is supplied by IRWD, and in the summer, by OCSD. Available supplies from GAP are limited, thus restricting future expansion of Mesa Consolidated Water District's system. Costs to hook-up end users are expensive such that it deters end users from utilizing recycled water. The state hospital located within the Mesa Consolidated Water

District's service area is a potential future user of recycled water for irrigation needs, but institutional issues currently exist. Water quality in the form of total dissolved solid levels is also a concern limiting expansion of recycled water use. Golf courses are concerned that total dissolved solid levels are too high on occasion to meet their requirements.

City of San Juan Capistrano

The city of San Juan Capistrano does not currently use recycled water, but rather treats non-potable groundwater at its non-potable domestic treatment plant for distribution in its non-potable water system. Currently, approximately 460 acre-feet per year of non-potable water is used per year. In the future, the city plans to blend discharge from its wastewater treatment plant with the non-potable groundwater and further treat the water at its non-domestic treatment plant prior to distribution to its non-potable water system. Multiple barriers are foreseen as limiting the city's ability to expand its non-potable/recycled water system in the future. A recycled water use master plan was completed in 1999 documenting costs associated with expansion and potential expansion areas. Main barriers include costs associated with expanding the system and hiring additional staff, raising needed capital for reservoirs and pipelines. Because of limited resources, the priority has been to provide potable needs over recycled water needs. The city requires all new developments to be dual piped for common area irrigation with non-potable/recycled water, but the existing non-potable/recycled water system has not been expanded to physically connect to many of these developments. Currently, the city is revising its master plan and expects to release a new master plan in September, 2005.

City of Newport Beach

The city of Newport Beach expects to utilize approximately 317 acre-feet per year in 2005. The city obtains its recycled water from GAP. Problems that limit future expansion of the city's recycled water system include pressure issues, limited supply, and high salinity (TDS) levels in the summer months when water is provided by OCSD. One high school and multiple parks are currently ready to tie into the system, but have not connected to the system as a result of an unreliable supply of recycled water. Existing users have also expressed concerns about TDS levels. If these concerns were alleviated, future barriers to expansion of the system would be reduced.

City of Fountain Valley

In 2005, the city of Fountain Valley expects to utilize approximately 1,260 acre-feet per year of recycled water. Recycled water distributed within the city is obtained from GAP. As with other GAP users, the current limited supply is viewed as a barrier to potential future expansion of the recycled

water system. Potential large users of recycled water include a high school and Southern California Edison easement lessees. However, without an available supply, future expansion of the system to these users is not feasible.

City of San Clemente

The city of San Clemente expects to use approximately 552 acre-feet of recycled water in 2005. Future expansion of recycled water use in the city of San Clemente is linked to obtaining adequate funding. In 1995, the city completed a recycled water use master plan that identified an additional potential demand of 2,500 acre-feet per year beyond 2005 levels and associated costs with serving the potential demand. If funding becomes available, the city may possibly pursue serving the identified potential demands.

El Toro Water District

In 2005, El Toro Water District expects to use approximately 430 AF of recycled water. Barriers to future expansion of El Toro Water District's recycled water system include the cost of expanding its recycled water distribution system. The area within its jurisdiction is built out, thus any expansion of the recycled water distribution system would result in extensive work beneath existing roadways. However, in the early 1990s El Toro Water District completed a recycled water master plan study indicating a future potential demand of up to 2,500 acre-feet per year beyond the current 2005 use and the cost associated with expansion of the recycled water system beyond its current size. El Toro Water District is considering building a regional facility to produce recycled water with the intent of selling the water to other agencies that have unmet demands.

Santa Margarita Water District

Santa Margarita Water District expects to use approximately 3,972 acre-fee of recycled water in 2005. Santa Margarita Water District has an ongoing capital improvement program to expand its recycled water system. However, this program is limited by the cost associated with expansion projects. Build out of the system requires the construction of a seasonal reservoir proposed for construction in the next 5 to 7 years. The community of Rancho Santa Margarita may not be connected to the recycled water system in the future as construction of the distribution system may be economically unfeasible. At this time, no formal analysis or study beyond an initial staff analysis has been completed to document the economic unfeasibility of connecting Rancho Santa Margarita to the existing recycled water system. All new developments within Santa Margarita Water District are dual plumbed to allow landscape areas to be connected to the system when the distribution system is expanded.

Irvine Ranch Water District

Irvine Ranch Water District (IRWD) has been recognized for its aggressive recycled water programs. In 2005, IRWD produced 15,296 acre-feet of recycled water and demands for non-potable water were 22,878 acre-feet. In 2003, IRWD completed a Wastewater Treatment Master Plan which provided a guide for phased upgrade and expansion of IRWD's reclamation plants to handle projected wastewater flows, to meet effluent quality requirements and to satisfy a portion of the non-potable water demands. IRWD will seek phased expansions/upgrades to allow for maximized wastewater recycling within the service area. This decision will be based on economic factors including availability of regional, state and federal funding assistance, as well as avoided cost.

6.6 Encouraging Recycled Water Use

Recycled water use is encouraged throughout MWDOC's service area using various methods. MWDOC itself does not produce recycled water, but as a member of Metropolitan it represents retail agencies that produce and distribute recycled water. On the regional level, Metropolitan is involved with funding local projects, facilitating partnerships, regulatory issues, brine disposal, and public acceptance. These benefits are passed through MWDOC to the individual retail agencies. Assigning projected yields as a result of these recycled water encouragement mechanisms is not feasible, except for financial assistance provided by Metropolitan. These recycled water encouragement mechanisms are known to encourage recycled water production and use, but the extent that any mechanism influences a retail agency's decision-making process and is directly attributable to a portion of produced yields is unknown, except for direct funding provided by Metropolitan, per acre-foot produced.

6.6.1 Funding

Capital risks associated with recycled water projects are significant hurdles towards increased recycled water production and use. Similar to a potable water system, treatment facilities, distribution networks, pumping stations, and storage reservoirs are required to adequately supply a reliable source of recycled water. These expensive capital investments result in high per unit costs, especially if demand is limited in the beginning of the project. Many times the cost per unit is more than purchasing other non-recycled supplies.

To assist in offsetting the cost of recycled water production and delivery per unit, Metropolitan has developed the Local Resources Program (LRP) to replace previous funding programs. The primary objective of the LRP is to support the development of cost-effective water recycling and groundwater projects that reduce demands for imported potable water. Incentives are provide on a contractual basis for locally developed yield. In 1998, Metropolitan offered incentives up to $250 per acre-foot for the

development of up to 53,000 acre-feet in the Metropolitan service area by 2010. In the 2003 funding cycle, two MWDOC-sponsored projects were selected for funding: the IRWD Recycled Water System Upgrade and the Groundwater Replenishment System. Contributions per acre-foot on behalf of Metropolitan are $117 and $100-$137, respectively. Yields are 8,500 and 31,000 per acre-foot per year, respectively. Funding can be up to 25 years. Eleven MWDOC projects have received financial funding from Metropolitan as illustrated in Table 6-6-1-A. A more detailed discussion of the Metropolitan Incentive Program is contained in Section 4.1.5 of this Plan.

Table 6-6-1-A: Metropolitan Financial Incentive Funding

Project	Contract Yield (AFY)
Groundwater Replenishment System	31,000
IRWD Recycled Water System Upgrade	8,500
IRWD Michelson Reclamation Project	10,000
Moulton Niguel Water Reclamation Project Phase II-III	8,000
Moulton Niguel Water Reclamation Project Phase IV	1,276
San Juan Capistrano Valley Non-Domestic	2,895
San Clemente Water Reclamation Project	1,500
SMWD Oso Water Reclamation Project	3,360
SMWD Chiquita Water Reclamation Project	2,772
Trabuco Canyon Reclamation Expansion Project	800
Green Acres Reclamation Project	7,000
Total	77,103

Sources:
1) Municipal Water District of Orange County, *MWDOC 2000 UWMP*
2) Metropolitan, D*raft 2005 Regional UWMP*

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

Federal funding is also available to encourage recycled water use. The United States Bureau of Reclamation's Title XVI program has resulted in appropriations totaling approximately $152 million in Metropolitan's service area. In Orange County, appropriations have included the GWR System project. United States Environmental Protection Agency funds have also been allocated for the GWR System project.

State propositions have dedicated allocations for water recycling. Proposition 204 provides funding up to $60 million for water recycling loans in California. Proposition 13, provides up to $40 million in grants and low-interest loans. The Santa Ana Watershed Project Authority (SAWPA) obtained $235 million from Proposition 13 with a portion of that expected to be used for water recycling-related projects in MWDOC's service area.

Financial incentives drive down the per-unit cost of recycled water and assist in encouraging recycled water use. CALFED has recommended that the state and federal government spend $1.5 to $2 billion over the next seven years on water use efficiency, including water recycling.

6.6.2 Partnerships to Encourage Water Recycling

Partnerships between agencies are another means of encouraging recycled water use. Both OCWD and OCSD are jointly funding GWR SYSTEM as both agencies will benefit. OCSD will not have to construct a new outfall as GWR System will recycle the treated wastewater. Financially, the initial capital investment is spread between two agencies.

Most recycled water production efforts require close coordination between multiple agencies. At a minimum, wastewater, groundwater, and water agencies are all impacted by recycled water production. Recycled water production efforts tend to cross jurisdiction boundaries and require new management strategies to ensure all parties' concerns are met. The formation of SOCWA provides a mechanism for wastewater and water agencies to discuss projects and work toward achieving greater levels of recycling. Additionally, the previously discussed joint agency SCCWRRS fostered coordination among wastewater, groundwater, and water agencies in MWDOC's service area.

Projected yields from promoting partnerships to encourage recycled water use are unknown and cannot be readily allocated from total project yields.

6.6.3 Regulatory Issues

On behalf of its member agencies, including MWDOC, Metropolitan is actively involved in regulatory issues that safely address recycled water. Both the Regional Water Quality Control Board and Department of Health Services are involved with water recycling use. The local Regional Water Quality Control Board is the permitting authority and Department of Health Services regulates recycled water use from a health concern and standards viewpoint. Title 22 of the California Code of Regulation provides specific regulations for treatment levels and reuse applications. Currently, there are no uniform criteria for regulating groundwater recharge applications requiring state agency review on a case-by-case basis. Metropolitan is involved in regulatory issues to ensure streamlined administration, public health, and environmental protection. Uniform criteria for regulating groundwater recharge would encourage agencies that are reluctant to currently pursue such options based on unknown requirements to pursue groundwater recharge with recycled water.

Projected yields from involvement in regulatory issues to encourage recycled water use are unknown and cannot be readily allocated from total project yields.

6.6.4 Brine Line Construction

Through MWDOC's membership in Metropolitan, MWDOC agencies also receive benefits from Metropolitan's other programs that encourage recycled water use. Metropolitan is actively involved in research related to recycled water, including brine disposal. Recycled water projects produce brine as a by-product of the treatment process. Metropolitan, in conjunction with the U.S. Bureau of Reclamation, conducted a Salinity Management Study identifying the need for approximately $200 million in brine lines. As an outgrowth of the study, the Southern California Salinity Coalition has lobbied for state and federal assistance for the construction of brine lines. Offsetting the cost of brine lines with outside funding will reduce capital investments required on behalf of recycled water producers.

Projected yields from brine line construction to encourage recycled water use are unknown and cannot be readily allocated from total project yields.

6.6.5 Research to Encourage Recycling Use

Metropolitan supports research efforts to encourage recycled water efforts. 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. From an aesthetic standpoint, the public tends to have negative connotations associated with recycled wastewater. Education is required to inform the public of treatment processes. Developing new technologies is a prerequisite to help reduce the cost of producing recycled water. Health effects assessments have a two-fold purpose of alleviating public concerns and ensuring the protection of public health and the environment. Further research supported by Metropolitan will have the benefit of reducing risks for MWDOC's retail agencies.

Projected yields from research to encourage recycled water use are unknown and cannot be readily allocated from total project yields.

6.7 Optimizing Recycled Water Use

Over the next 25 years, recycled water use is projected to increase four-fold to 136,463 acre-feet per year in 2030. This means more than 25% of the wastewater generated in the MWDOC service area will be recycled, becoming a significant and valuable resource. To assist in meeting these 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, as such, cannot impose development requirements or enact ordinances that require the use of recycled water. Most recycled water projects that provide the greatest benefit for the cost have been developed or are planned. In many cases, additional recycled water production and use is economically unfeasible given the current cost of potable water supplies in comparison to recycled water costs. As described in the

SCCWRRS study, further recycled water production will require a regional approach to water recycling. MWDOC has taken the following actions to facilitate further production and use of recycled water:

- Sponsoring member agencies in obtaining Local Resource Program incentives from the Metropolitan;
- Assisting and supporting member agencies in applications made for bond funds such as Proposition 13 and Proposition 50;
- Encouraging Metropolitan to participate in studies that will benefit recycled water production;
- Supporting Metropolitan in deriving solutions to regulatory issues;
- Participating in sub-regional studies, such as the South Orange County Integrated Regional Water Management Plan;
- Participating in regional studies such as the South Orange County Integrated Regional Water Management Plan;
- Participating in an upcoming study with city of Long Beach and retail water agencies/cities in west Orange County. MWDOC may consider the opportunity to purchase recycled water from the city of Long Beach. This transaction could comprise up to 10,000 acre-feet per year of recycled water available to the MWDOC service area;
- Advocating and participating in a 1998 U.S. Bureau of Reclamation/Metropolitan Salinity Management Study, which recommended that Metropolitan adopt a salinity goal of 500 mg/l for the water it delivers to its customers; and
- Working cooperatively with member agencies, Metropolitan and its member agencies, and other Orange County water and wastewater agencies to encourage recycled water use and to develop creative solutions to increasing recycled water use.

Additional funding and removal of recycled water implementation barriers at the state level would assist in increasing recycled water production within MWDOC's service area. State funding assistance could reduce the overall cost per acre-foot of recycled water so that it is comparable to potable water allow the development of more expensive recycled water projects in an earlier timeframe. There are numerous barriers to increasing water recycling that the State could assist with removing. These include establishment of uniform Regional Water Quality Control Board requirements for recycled water, especially in areas where water and wastewater agency jurisdictions cross Regional Water Quality Control Board 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.

Past planning efforts in MWDOC's service area have led to innovative recycled water projects. As previously discussed, GWR System is an innovative and technologically advanced means to increase recycled water production and ultimately increase water supply reliability in MWDOC's service area. Continuing the aforementioned actions that MWDOC has already taken to facilitate further recycled water production and investigating new opportunities when they arise will lead to increased recycled water use in MWDOC's service area.

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7.0 WATER SHORTAGE CONTINGENCY PLAN

7.1 Introduction

During water shortages, Municipal Water District of Orange County (MWDOC) manages its water supply to ensure it meets the demands of its member (retail) water agencies. In turn, retail water agencies must manage their local supplies and supplies they receive from MWDOC utilizing various mechanisms to ensure the reliability of their supply. Water shortages may result from variations in weather and natural and unnatural catastrophes such as, but not limited to, earthquakes, pipeline failures, supply contamination, and transmission facility failures. The discussion in this chapter focuses on MWDOC's water shortage planning efforts.

7.2 Stages of Drought Action

MWDOWC is responsible for exercising its authority over water it sells in a manner that is consistent with law, conditions of use placed on the water by Metropolitan Water District of Southern California (Metropolitan), and that reasonably meets the needs of its customers. MWDOC will determine specific stages of shortage actions in conjunction with local ordinances of member agencies and other relevant water actions by local government. Thus, as in the past, MWDOC will adopt Board Resolution urging its retail agencies to develop and implement water shortage plans, calling upon each agency to adopt and enforce regulations prohibiting the waste of water, and implementing an allocation plan for available imported water consistent with reductions, incentives, and penalties imposed on MWDOC by the Metropolitan

MWDOC receives its imported water from Metropolitan. Metropolitan has a *Water Surplus and Drought Management* (WSDM) *Plan* for the management of its imported water. The WSDM Plan has identified seven stages of water shortages caused by dry years and drought, with each one getting significantly more severe (see Table 7-2-A).

It is anticipated that water shortages would have to be extremely severe for Metropolitan to implement the action listed for stage 7, which is to allocate its imported water supplies to its member agencies. For example, even with significant reductions in Colorado River water supplies and a repeat of the 1987-1992 drought on the State Water Project, Metropolitan could meet all retail water needs of its member agencies by implementing stages one through six of the WSDM Plan until 2025 (*Metropolitan Integrated Resources Plan Update*, 2004).

Table 7-2-A: Water Supply Shortage Stages and Conditions (Metropolitan's Water Surplus and Drought Management Plan)

Water Supply Shortage Stages and Conditions Rationing Stages	
Stage No.	**Actions**
1	Withdraw stored water from Diamond Valley Lake
2	Stage 1 plus draw from out of region groundwater storage
3	Stage 2 plus curtail/temporarily suspend deliveries to local groundwater and surface storage replenishment in accordance with their discounted rates
4	Stage 3 plus draw from local Conjunctive Use Groundwater Programs & SWP terminus reservoirs
5	Stage 4 plus extraordinary conservation through coordinated outreach and curtail Interim Agricultural Water Program deliveries in accordance with discounted rates
6	Stage 5 plus exercise water transfer option contracts and/or buy water on open market for consumptive use or for delivery to regional storage facilities
7	Stage 6 plus allocation of imported water to member agencies based upon adopted principles of fairness and need

Source: Metropolitan, *Water Surplus and Drought Management Plan*

Although Metropolitan's WSDM Plan did not specify the exact formula for how imported water would be allocated in Stage 7, it did include some principles for allocation. Metropolitan's board of directors adopted the WSDM Plan and principles for imported water allocation in 1999.

Should the severity of drought warrant the need to allocate imported water, Metropolitan would do so following an overall principle of equity, and on the basis of meeting agencies' retail needs. Metropolitan will consider the following in the equitable allocation of imported water:

1. Impact on retail water customers and economy;
2. Investments in recycling and conservation;
3. Population change;
4. Overall investment in local resources;
5. Changes and/or loss of local supply;
6. Participation in Metropolitan's non-firm (interruptible) programs; and
7. Investment in Metropolitan's facilities.

During a severe water shortage (such as a Stage 7 supply reduction as defined by Metropolitan), the MWDOC Board would exercise its authority consistent with law, giving due consideration to the Metropolitan WSDM Plan and to the contingency plans of its retail agencies.

MWDOC's authority for stages of drought action relate only to the imported water MWDOC provides. As Metropolitan moves through its stages of action, MWDOC would assist and facilitate actions at the retail agency level within MWDOC's service area. Under the WSDM Plan, imported water only becomes allocated at the Stage 7 drought condition as declared by Metropolitan. Therefore, the requirements stated in Urban Water Management Act Section 10632 (a) for defining stages of water supply shortage up to a 50% reduction are not applicable to MWDOC. It is more appropriate for the stages of drought action to be implemented to the public through the retail agencies.

Within MWDOC's service area local retail agencies have adopted or are in the process of developing ordinances that address urban water shortage requirements. Table 7-2-B shows two examples of shortage action plans prepared by MWDOC's local retail agencies:

Table 7-2-B: Examples of Water Shortage Stage and Action, Irvine Ranch Water District and Santa Margarita Water District

Irvine Ranch Water District			
Stage	**Water Supply Condition**	**% Shortage**	**Action**
1	Drought Warning and low level shortage condition	10%	See Appendix 7-B "IRWD Water Shortage Contingency Plan"
2	Significant drought condition	10% to 25%	See Appendix 7-B "IRWD Water Shortage Contingency Plan"
3	Emergency condition	25% to 40%	See Appendix 7-B "IRWD Water Shortage Contingency Plan"
Final Stage	Crisis condition of water supply shortage	40%+	See Appendix 7-B "IRWD Water Shortage Contingency Plan"
Santa Margarita Water District			
Stage	**Water Supply Condition**	**% Shortage**	**Action**
1	Voluntary Conservation	10%	Customers are encouraged to voluntarily conserve water
2	Mandatory Conservation - Drought	20%	Prohibit using potable water for street washing
			Prohibit using potable water for dust control for construction activity
3	Mandatory Conservation - Serious Drought	30%	Limiting outdoor irrigation to restricted times
			Prohibit washing of vehicles
			Refilling or filling artificial lakes by permit only
			Prohibit using potable water for operation of fountains
			Use of potable water for construction by permit only
4	Mandatory Conservation - Severe Drought	40%	Prohibit using potable water for outdoor irrigation
			Prohibit filling ponds, artificial lakes, pools and spas
			Prohibit using potable water for construction

Sources:
Irvine Ranch Water District 2005 Urban Water Management Plan (Draft)
Santa Margarita Water Distric 2005 Urban Water Management Plan (Draft)

7.3 Three-Year Minimum Water Supply

Through its modeling efforts, MWDOC has determined minimum water supplies available for retail consumption for each of the next three years, 2006-2008. Table 7-3-A compares supplies available under normal conditions and supplies available under a hypothetical repeat of the historical driest three-year period for MWDOC's service area, 1959-1961. During multiple dry years, less local supplies are available for retail consumption and retail demands increase, resulting in the use of increased imported supplies from Metropolitan to offset the reduction in local supplies.

Even with decreased local supplies available, MWDOC is expected to meet all retail consumption during a three-year dry period of 2006-2008 based on the three

driest years on record. Metropolitan is expected to be able to supply all of MWDOC's imported water during the same period. Metropolitan's 2005 Regional Urban Water Management Plan (Draft) indicates that Metropolitan can provide 100% of the supply demanded by its member agencies until 2030.

Table 7-3-A: Three-Year Estimated Minimum Water Supply for Direct Consumption in MWDOC's Service Area– Based on Multiple Dry Years

Acre-feet per Year						
Source	Normal			Multiple Dry Year		
	2006	2007	2008	2006	2007	2008
Local Supplies	272,824	295,193	320,046	263,142	270,408	305,886
Imported Supply	253,756	239,271	221,919	299,887	285,695	267,948
Total	526,580	534,464	541,965	563,029	556,102	573,833

Source: Municipal Water District of Orange County, output of "Water Balance" Model

7.4 Catastrophic Supply Interruption Plan

From a regional perspective, Orange County and all of Southern California is heavily dependent upon imported water supplies from Metropolitan. Imported water is conveyed through the State Water Project (SWP) and Colorado River Aqueduct (CRA), which travel hundreds of miles to reach urban Southern California, and specifically to Orange County. Additionally, this water is distributed to customers through an intricate network of pipes and water mains that are susceptible to damage from earthquakes and other disasters. Regional storage for Southern California and Orange County is provided by Metropolitan to mitigate an outage of either the SWP or CRA. The recently completed Diamond Valley Lake is an 800,000 acre-foot reservoir, of which about 400,000 acre-feet of water is reserved for catastrophic emergencies. In fact, protection from catastrophic events such as earthquakes was a major reason for the construction of Diamond Valley Lake.

In 1983, the Orange County water community developed a *Water Supply Emergency Preparedness Plan* to respond effectively to disasters impacting the regional water distribution system. This plan was jointly funded by three regional water agencies; MWDOC, Coastal Municipal Water District (later merged with MWDOC), and Orange County Water District (OCWD), with the support and guidance from the Orange County Water Association. The collective efforts of these agencies resulted in the formation of the Water Emergency Response Organization of Orange County (WEROC) to coordinate emergency response on behalf of all Orange County water agencies, develop an emergency plan to respond to disasters, and conduct disaster training exercises for the Orange County water community. WEROC is unique in its ability to provide a single point of contact for representation of all water utilities in Orange County during a disaster. This representation is to the county, state, and federal disaster coordination agencies. Within the Orange County Operational Area, WEROC is the recognized contact for emergency disaster response for the water community. Table 7-4-A summarizes

possible catastrophe scenarios and actions that would be taken in response to a catastrophe.

Each local water utility is responsible for developing its own disaster preparedness and response plan to meet emergencies within their service area. WEROC performs coordination of information and mutual-aid requests among water agencies, and with Metropolitan.

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

- Collect damage assessment reports from Orange County water utilities;
- Assess the overall condition of Orange County water supply system;
- Identify needs of water utilities;
- Quantify available resources;
- Determine optimal use of resources;
- Establish repair priorities;
- Recommend water allocations;
- Liaison with water utilities, Metropolitan, and County Operational Area; and
- Document remedial actions taken during the disaster operation.

Two dedicated WEROC Emergency Operations Centers (EOCs) are located within Orange County. Both sites are maintained in a state of readiness in the event that they will be activated following a major emergency disaster. WEROC EOCs are staffed by trained personnel from the water community. WEROC's Emergency Radio Communication System consists of two mountain-top radio repeaters and several control stations. WEROC is a flexible and dynamic program that continues to make improvements to its emergency preparedness plan, emergency response facilities, and its training program to address new issues as they surface.

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

Table 7-4-A: Preparation Actions for a Catastrophe

Possible Catastrophe	Summary of Actions*
Regional power outage	Coordinate communication with So. CA. Edison and Sempra Energy Co. for restoration of services. Provide contacts for vendors of rental generators and initiate mutual assistance between unaffected and affected agencies for emergency backup power. Consult with the California Department of Health for water quality concerns and public notices.
Earthquake	Coordinate the resources necessary for repair of the Orange County retail water agencies' infrastructure. Facilitate mutual aid from outside agencies through Metropolitan, California Utilities Emergency Association, and the Orange County Operational Area. Utilize vendor lists to identify available water haulers, temporary water lines, piping, heavy equipment, etc.
Tsunami	If time allows, notify coastal agencies to shut down operations in inundation zone, including but not limited to: wells and pumps. Request California Department of Health Services support in evaluating water contamination via salt water intrusion and backflow of raw sewer water. Support agency efforts to restore water flow in unique conditions of flooding (safety) and probably lack of electricity (refer to above actions). Continue support similar to an earthquake response.
Malicious Act	Since such an incident typically involves a long term response with law enforcement, WEROC could support the agency with staff, communications with the County, and temporary water facilities/pipelines. In addition, coordination of WEROC water quality advisors, California Department of Health Services, and public information officers will be critical.
Flooding	Coordination with the Orange County Resource and Development Management Department for flood control support. Coordination of mutual assistance for repair of infrastructure.
Dam Failure	Coordinate communications of inundation zone evacuation through the local law enforcement. Identify water losses and what the loss means for the county during the current weather season and conditions. Evaluate the need and ability for immediate reconstruction and restoration of services.
SONGS - Nuclear Release	Work with Orange County retailers that have open water sources: consider shutting down those systems. Work with California Department of Health Services for effects and countermeasures. Also work with agencies within the fall out zone to determine future use of infrastructure in the affected area.
Wild Land Fire	Coordinate with the Orange County Fire Authority to ensure that they have enough water for fire flow. Refer to "Actions To a Regional Power Outage" for loss of power to pumps due to fire. Identify available emergency generators for backup power supply. If ongoing, fire response may coordinate county wide water reduction campaign, and reallocate and move water towards incident area. If infrastructure is within the fire path, identify secondary routes of delivery and services depending on the location of the incident.
Water Contamination	Contamination can be from multiple sources: malicious, sewer leak, underground contaminate plume, etc. WEROC would work with the agency to coordinate with California Department of Health Services and local laboratory to identify the contaminate and action needed. Will utilize Orange County retail agency support in trying to reroute water where possible, and to provide water haulers when needed. The WEROC Public Information Officer will work with the agency and the media to ensure proper information is provided to the public for their health and safety.
Hazardous Materials Spill/Release	Depending on the material the response would vary. Any aerosolized material release would require coordination with the local law enforcement for evacuation, and would only affect open source water supplies. Notification of agencies with open source water supplies to adjust their water supply to non-open source if available. A release within a particular agency's facility that is contained would require coordination of cleanup and potentially a secondary water supply for only that agency. Lastly, the release of a liquid hazard would require coordination with the local sanitation agency for treatment of cleanup byproduct.

* As a wholesale water district the Municipal Water District of Orange County has no facilities of its own to ensure their protection and integrity. The Water Emergency Response Organization of Orange County (WEROC) was created to ensure that the water supply to all of Orange County is protected and restored in as efficiently a manner as possible. This is done through the coordination of WEROC with Metropolitan, the Orange County Operational Area, and all of the Orange County retail water districts to ensure the sharing of resources and a unified response. The WEROC program includes a Regional Emergency Response Plan, two emergency operation centers, and a communications system that includes a dedicated radio communications system, cell and landline phones, fax, and internet.

Source: Municipal Water District of Orange County

Day-to-day management of WEROC is provided by MWDOC, and program oversight is conducted by the WEROC Executive Committee. The Executive Committee includes representatives from MWDOC and OCWD. A WEROC Steering Committee serves as an advisory group providing general guidance to the program, and includes representatives from member agencies, Metropolitan, California Department of Health Services, and the County Operational Area.

Additional emergency services in the State of California include the Master Mutual Aid Agreement, California Water Agencies Response Network (WARN), and Plan Bulldozer. The Master Mutual Aid Agreement includes all public agencies that have signed the agreement, and is coordinated out of the California Office of Emergency Services. WARN includes all public water and wastewater utilities that have signed the agreement to WARN, and provides mutual aid assistance. It is managed by a State Steering Committee. Plan Bulldozer provides mutual aid for construction equipment to any public agency for the initial time of disaster when danger to life and property exists.

7.5 Water Reduction Mechanisms

Working with its member agencies, MWDOC is able to reduce its demands on Metropolitan during water shortages. Although MWDOC requires more water during water shortages to offset losses of local supplies, it is able maintain this demand at a lower level than would be possible if water reduction mechanisms were not implemented. A variety of mechanisms, such as mandatory prohibitions, consumption reductions, and penalties and charges has been and can be implemented during water shortages.

7.5.1 Mandatory Water Use Prohibitions

Because MWDOC's powers to enforce restriction of use are confined to imported water, as a practical matter, mandatory use prohibitions would be difficult for MWDOC to enforce given the different sources of water accessed by end users. The establishment of mandatory prohibitions on water usage during water shortages are therefore not part of MWDOC's Plan under Water Code Section 10620 (c). However, historically MWDOC has focused its activity in developing shortage allocation plans that include water purchase allocations and penalties. In addition, MWDOC has urged its retail agencies to develop specific shortage management plans to meet targeted reduction in total water demand during a shortage. Retail agencies of MWDOC will address mandatory prohibitions during water shortages in their individual UWMPs.

7.5.2 Water Reduction Methods

As mentioned in Section 7.5.1 of this Plan, MWDOC's powers to enforce the restriction of use of water are confined to imported water. Therefore, it is more appropriate for water reduction methods to be applied to the public through the retail agencies. Reductions in water consumption by

MWDOC's retail agencies during water shortages will ultimately reduce MWDOC's overall demands on Metropolitan. MWDOC's Board has the authority to provide for a method of allocation for available supplies, as the Board may determine necessary, through adoption of a Water Shortage Management Plan for all classes of service. Each retail agency decides how it will allocate supplies it receives from MWDOC during water shortages. Retail agencies of MWDOC will address water reduction methods during water shortages in their individual UWMPS.

7.5.3 Penalties for Excessive Water Use

Should Metropolitan have to allocate imported water during a severe water shortage, as identified in Stage 7 of its Water Surplus and Drought Management Plan, Metropolitan can impose surcharges (penalty pricing) on water consumption in excess of the imported water allocation. Penalties are expected to be severe, as much as three times Metropolitan's full service water rate.

MWDOC's Board has the authority to adjust water rates to reflect any penalties imposed by Metropolitan under Metropolitan's WSDM Plan or other allocation programs as determined necessary by the Board. Rates may also be adjusted based on any Water Shortage Management Plan or other allocation program implemented by MWDOC as determined necessary by the Board.

7.6 Water Reduction Impacts on Revenues and Expenditures

During water shortages, MWDOC's revenues and expenditures simultaneously increase as MWDOC purchases more water from Metropolitan to offset reductions in local supplies. There are two potential revenue related issues for which MWDOC must plan: loss of Incremental Rate Revenue due to reduced water sales in a shortage, and increased cost to purchase Tier 2 water during high demand episodes caused by drought conditions.

<u>MWDOC Incremental Water Rate</u>

MWDOC's operating budget is funded from two rate components. One is a fixed annual Retail Meter Charge collected from MWDOC's member agencies for each retail water meter in their service area. This charge provides a stable source of revenue that does not vary with weather or water sales. The other is a commodity Incremental Water Rate (per acre foot of water sold). Revenue from this Incremental Rate increases when water sales rise, and decreases when sales fall. To the extent a water shortage causes water sales to drop, the shortfall in revenue would be made up from reserves held by MWDOC for this purpose.

Metropolitan Tiered Supply Rate and MWDOC Melded Supply Rate

Metropolitan charges for its supply to MWDOC using a Tiered Rate. MWDOC has the ability to buy up to 222,924 acre-feet at the Tier One supply rate. However, additional water purchased above pre-determined Tier One demand is at Metropolitan's Tier Two water rate. Tier Two water is sold at a higher price than Tier One water. MWDOC sells water to its retail agencies at a Melded Supply rate. The rate is set each year based on the expected combined cost of Tier One and Tier Two purchases – plus or minus any adjustment to add or decrease from reserves.

In June of 2002, MWDOC adopted a resolution establishing a Tier Two Contingency Fund to offset any Tier Two costs that MWDOC may incur. The goal of the Tier Two Contingency Fund is to maintain stable water rates regardless of weather variations or other unexpected increases in demand of imported water. The melded water supply rate is higher than Metropolitan's Tier One water supply rate. The revenue difference between MWDOC's Melded Supply rate and Metropolitan's Tier One rate is deposited into a restricted fund, the Tier Two Contingency Fund.

Uses of funds in the Tier Two Contingency Plan are restricted to the following:

- Payment of Tier Two costs if MWDOC's water purchases from Metropolitan exceed the Tier One level;

- Advances to the General Fund to pay charges imposed on MWDOC by Metropolitan, in which the revenues are collected in a period that is different than the payment date. All advances are repaid to the Fund when the charges are collected from the retail agencies; and

- If the funds are not immediately needed for the previous two items, the Board may utilize the funds to offset any increase in water rates or charges imposed by Metropolitan which would require a rate increase by MWDOC.

If the Board determines that any portion of the Tier Two Contingency Fund is no longer needed for the purposes they were designated, then the Board will declare those funds surplus. The Board may either adjust the melded rate to reflect the surplus or distribute the surplus to each retail water agency in proportion to the amount of the melded rate water each agency purchased in the preceding two fiscal years.

7.7 Water Shortage Contingency Ordinance

In a water shortage event, MWDOC will adopt a Water Shortage Management Resolution or Ordinance. In past shortages, MWDOC has adopted Board Resolutions urging its retail agencies to develop and implement water shortage plans, calling upon each member agency to adopt and enforce regulations prohibiting the waste of water, and implementing an allocation plan for available imported water consistent with reductions, incentives, and penalties imposed on

MWDOC by Metropolitan. MWDOC has adopted a resolution pertaining to water shortage conditions during the late 1980s and early 1990s drought. A copy of that resolution is provided in *Appendix 7-A*. In the event of a water shortage, MWDOC will adopt a Water Shortage Management Resolution that reflects the needs and conditions of the current drought. Such reflection would include the same allocation principles identified by Metropolitan at the time of the drought. However, as mentioned in Section 7.2 of this Plan, MWDOC will consult with the retail agencies regarding the development of local principles or adjustments to the Metropolitan allocation.

7.8 Methods to Determine Water Consumption Reductions

The establishment of a method to measure water consumption reductions during water shortages is necessary to determine the effectiveness of water reduction mechanisms. Although MWDOC, as a wholesale supplier, would have difficulty enforcing water reduction mechanisms upon end users, MWDOC does work closely with its member agencies to develop plans to meet targeted reductions. To monitor the effectiveness, MWDOC generally relies on monthly reading of Metropolitan's meter connection. Monthly reading would allow MWDOC to evaluate the trends of consumption at the retail agency level.

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

References:

Metropolitan Water District of Southern California. *Draft Regional Urban Water Management Plan.* May 2005.

Metropolitan Water District of Southern California. *Water Surplus and Drought Management Plan.* 2000.

Metropolitan Water District of Southern California. *Metropolitan Integrated Resources Plan Update.* 2004.

Municipal Water District of Orange County. *Ordinance No. 49, Municipal Water District of Orange County Establishing Classes of Water Service and Terms and Conditions of Water Service Within the District.* June 18, 2003.

Municipal Water District of Orange County. *Resolution No. 1766, Municipal Water District of Orange County Establishing Water Rates.* June 15, 2005.

Municipal Water District of Orange County. *Electronic correspondence*. June 2005

Municipal Water District of Orange County. *2000 Regional Urban Water Management Plan.* December, 2000.

Municipal Water District of Orange County. *Resolution No. 1697, Municipal Water District of Orange County Establishing Restricted Tier II* . June 19, 2002.

8.0 URBAN WATER MANAGEMENT PLAN (UWMP) ADOPTION AND IMPLEMENTATION

8.1 UWMP adoption process

The adoption process for the Municipal Water District of Orange County's (MWDOC) Draft 2005 Urban Water Management Plan (Plan) formally commenced on October 12, 2005 with the beginning of the 30-day public comment period. Letters of notification announcing the availability of the Draft Plan, the 30-day comment period, and the day, time, and place of the Public Hearing were sent to approximately 250 stakeholders, including:

- City council members from Orange County's 34 municipalities
- City managers from Orange County's 34 municipalities
- Appropriate County of Orange staff members
- MWDOC's member agencies (30)
- Representatives of local environmental groups, and
- Residents and business owners who attended one or both of MWDOC's Urban Water Management Plan community information meetings

To reach the broadest audience possible, MWDOC also ran a display ad in the October 27, 2005 edition of the *Orange County Register* announcing the Public Hearing and where and how to obtain a copy of the Draft Plan. (See *Appendix 8-A(i)*.)

The Draft Plan, in its entirety, was also posted on MWDOC's website on October 12, 2005. The document was divided into sections, which allowed readers to easily identify and access those sections of greatest interest to them.

Board Review

Throughout the yearlong information-gathering, writing, and public participation process, staff kept the Board of Directors apprised of its progress on Plan development.

Staff presented copies of the Draft Plan to MWDOC's governing board in late September 2005 as part of the agenda package for the October 2005 Planning and Operations Committee meeting. (Planning and Operations is one of three board working committees.) During the committee meeting, which was held October 3, 2005, staff also presented a review of the draft document and answered questions from committee members.

Upon the recommendation of the Planning and Operations Committee on October 12, 2005, the full seven-member Board of Directors approved the distribution of the Draft Plan and the proposed 30-day public review and comment period.

Public Hearing

A Public Hearing for MWDOC's Draft Plan was held Thursday, November 3, 2005. The hearing was conducted during a special meeting of the MWDOC Board of

Directors at MWDOC's offices in Fountain Valley. For the public's convenience, the hearing was held from 6-8 p.m.

A 45-minute staff report, which reviewed the information-gathering process, the data obtained from MWDOC member agencies and other resource planning agencies, and the conclusions that served as the basis of the Draft Plan, began the special meeting. The President of the Board of Directors then opened the Public Hearing, which was videotaped to ensure all comments were recorded in their entirety.

While seven members of the general public attended the hearing, only one person spoke. She did not comment on the Draft Plan, but rather had questions related to the availability of demand projections beyond the 25-year window, the accuracy of past demand projections, and future allocations of Colorado River water.

Comment cards were also provided for those attendees who preferred to submit their comments in writing.

Please see *Appendix 8-A(ii)* for the record of attendance, presentations, and videotape of the Public Hearing.

Written Comments
When the 30-day comment period closed on November 16, 2005, MWDOC had received 10 written comments from MWDOC's member agencies and zero from the general public. Those that made the comments are Irvine Ranch Water District, Santa Margarita Water District, Orange County Water District, City of San Clemente, Moulton Niguel Water District, El Toro Water District, Trabuco Canyon Water District, Yorba Linda Water District, City of Garden Grove, and City of La Habra. Based on the comments received, staff revised and finalized the UWMP.

Adoption
Members of the Board of Directors reviewed the Final Draft Plan during the December 5, 2005 Planning and Operations Committee meeting. The Committee recommended that the Board of Directors approve the 2005 Urban Water Management Plan at its December 2005 meeting.

The seven-member MWDOC Board of Directors approved the 2005 Urban Water Management Plan at its final meeting of the year, which was held on December 21, 2005.

Filing
Before December 31, 2005, the Adopted 2005 MWDOC Urban Water Management Plan is filed with California State Department of Water Resources, California State Library, County of Orange, and cities within MWDOC's service area.

8.2 Review the Implementation of Water Conservation and Water Recycling Programs in 2000 Plan

As required by California Water Code, Municipal Water District of Orange County (MWDOC) summarizes the implementation of the Water Conservation and Water Recycling Programs to date, and compares the implementation to those as planned in its 2000 Urban Water Management Plan (2000 UWMP).

8.2.1 Comparison of 2000 Planned Water Conservation Programs with 2005 Actual Programs

As a wholesaler, MWDOC did not contain a specific implementation plan its 2000 UWMP. However, as a signatory to the Memorandum of Understanding regarding urban water use efficiency, MWDOC's commitment to implement Best Management Practice-based water use efficiency program continues today. For MWDOC's specific achievements in the area of conservation, please see Section 5 of this Plan.

8.2.2 Comparison of 2000 Projected Recycled Water Use with 2005 Actual Use

Current recycled water projections for 2005 for MWDOC's service area are 25% less than previously forecasted for 2005 in the 2000 UWMP for the agricultural/landscape/industrial/commercial use category, as illustrated in Table 8-2-2-A.

Table 8-2-2-A: Recycled Water Uses in MWDOC's Service Area– 2000 Projection Compared with 2005 Actual

Acre-feet Per Year		
User type	**2000 Projection for 2005**	**2005 Actual Use**
Landscape		
City of Fountain Valley	1,300	1,260
City of Huntington Beach	400	No Use
City of Newport Beach	500	317
City of San Clemente	1,000	552
El Toro Water District	600	430
Irvine Ranch Water District	16,853	15,296
Mesa Consolidated Water District	1,000	1,000
Moulton Niguel Water District	9,000	7,868
Santa Margarita Water District	5,700	3,972
South Coast Water District	1,000	890
Trabuco Canyon Water District	900	850
Subtotal	38,253	32,435
Sea Water Barrier		
Initial 5-MGD of GWR System		4,000
Total	38,253	36,435

Sources :

1) Municipal Water District of Orange County, *2000 MWDOC Urban Water Management Plan*

2) Municipal Water District of Orange County

Notes:

[1]WaterFactory 21 is not included as it was demolished in 2004. GWR System's Initial-5-MGD Plant was not included in 2000 for 2005.

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

Current 2005 forecasts indicate that approximately 29,287 acre-feet of recycled water will be consumed by these user types, while the 2000 UWMP forecasted 39,600 acre-feet of recycled water use by 2005.

On a percentage basis, the city of San Clemente satisfied the least amount of their 2000 projection for 2005 and will only meet 55% of its forecast. Additionally, the city of Huntington Beach has not started using recycled water as previously forecasted. The Green Acre Project, an Orange County Water District project, was expected to serve the city of Huntington Beach, but was not extended into the city as was anticipated. Discrepancies between the current 2005 expected use of recycled water and the 2000 forecast are attributable to numerous reasons, including a lack of funding and complex interagency agreements. Discussions of individual agency discrepancies in recycled water use should be available in their respective Urban Water Management Plans.