City of Orange

Urban Water Management Plan Update 2005

December 2005

Prepared by

Ergun Bakall
Consulting Civil Engineer

Table of Contents

Table of Contents **2**
1.0 INTRODUCTION **6**
1.1 Urban Water Management Planning Act **6**
1.1.1 Senate Bills 610 and 221 of 2001 6
1.1.2 Requirements of SB610 6
1.1.3 Requirements of SB 221 8
1.1.4 Summary of Changes in the Act Since 2000 8
1.2 Coordination with Other Agencies **10**
1.2.1 Public Community Involvement 10
1.2.2 Department of Water Resource Role and Guidance 10
1.2.3 Organization of this Plan 11
1.3 Resource Maximization/Import Minimization Plan **11**
1.3.1 Integrated Regional Water Management Plan 11
1.3.2 Water Use Efficiency Program 12
2.0 SERVICE AREA INFORMATION **14**
2.1 City of Orange **14**
2.2 Current and Projected Population **16**
2.2.1 Land Use 16
2.3 Climate and Rainfall **18**
2.4 Water Supplies **19**
2.4.1 Groundwater 19
2.4.2 Imported Water 22
2.4.3 Local Water 23
2.5 Reliability of Supply **26**
2.5.1 Reliability of Groundwater Supplies 26
2.5.2 Reliability of Imported Supplies 29
2.5.3 Factors Resulting in Inconsistency of Supply 36
2.6 Transfer and Exchange Opportunities **36**
2.7 Water Use by Customer Type **38**
2.7.1 Historical Usage 38
2.7.2 Residential Sector 38
2.7.3 Non-Residential Sector 38
2.7.4 System Losses 38
2.7.5 Sales to Other Agencies 39
2.8 Demand Management Measures **40**
2.9 Planned Water Supply Projects and Programs **45**
2.10 Development of Desalinated Water **45**
2.10.1 Desalination of Ocean Water 45
2.11 Current and Projected Supply Includes Wholesale Water **46**
3.0 DETERMINATION OF DMM IMPLEMENTATION **48**
4.0 WATER SHORTAGE CONTINGENCY PLAN **48**
4.1 Imported Water Shortages **48**
4.1.1 Stages of Drought Action 48
4.1.2 MWD Water Shortage and Drought Management Plan 49

4.1.3 City of Orange Urban Water Shortage Contingency Plan 55
4.2 Estimate of Minimum Water Supply for Next Three Years 55
4.3 Catastrophic Supply Interruption Plan 55
4.4 Penalties for Excessive Use 57
4.5 Impacts on Revenues and Expenditures 57
5.0 RECYCLED WATER PLAN 58
5.1 Wastewater System 58
5.2 Recycled Water System 58
6.0 WATER QUALITY IMPACTS ON RELIABILITY 59
6.1 MWD Water Quality Issues 59
6.1.1 Total Dissolved Solids Management 59
6.1.2 Perchlorate Management 60
6.1.3 Total Organic Carbon and Bromide Management 60
6.1.4 Other Contaminants of Concern 61
6.1.5 Water Quality Protection Programs 61
6.1.6 Imported Water Quality Impacts on Supply Reliability 61
7.0 WATER SERVICE RELIABILITY 62
8.0 ADOPTION AND IMPLEMENTATION OF UWMP 65
APPENDIX "A" References 67
APPENDIX "B" Cross References of UWMP vs. DWR Tables 68
APPENDIX "C" Public Hearing Comments 69

List of Tables

Table No. Page No.

Table 1 Coordination with Other Agencies 10
Table 2 Population- Current and Projected 16
Table 3 Climate 18
Table 4 Active Groundwater Well 21
Table 5 Imported Water Supply Sources 22
Table 6 Current and Planned Water Supplies 24
Table 7 Groundwater Pumping Rights 25
Table 8 Historical Groundwater Production 25
Table 9 Future Groundwater Production 25
Table 10 MWD Multiple-Dry Year Supply Capability & Projected Demands 30
Table 11 MWD Single-Dry Year Supply Capability & Projected Demands 31
Table 12 MWD Average Year Supply Capability[1] & Projected Demands 32
Table 13 Supply Reliability 33
Table 14 Basis of Water Year Data 34
Table 15 Supply and Demand Comparison 35
Table 16 Factors Resulting in Inconsistency of Supply 36
Table 17 Historical Water Use by Sector 38
Table 18 Past, Current and Projected Water Deliveries 39
Table 19 Total Water Use 40
Table 20 High Efficiency Clothes Washer Rebate Program 43
Table 21 School Education Program 43
Table 22 CII Plumbing Fixture Rebate Program 43
Table 23 ULFT 44
Table 24 Opportunities for Desalinated Water 46
Table 25 City Demand Projections Provided to Wholesale Suppliers 47
Table 26 Wholesaler Identified & Quantified Exist. & Planned Sources of Water 47
Table 27 Wholesale Supply Reliability 47
Table 28 MWD Water Surplus & Drought Management Plan 53
Table 29 Three-Year Estimate of Minimum Water Supply in Multiple-Dry Years 55
Table 32 Projected Normal Water Supply 62
Table 33 Projected Normal Water Demand 62
Table 34 Projected Normal Year Supply and Demand Comparison 62
Table 35 Projected Single-Dry Year Water Supply 63
Table 36 Projected Single-Dry Year Water Demand 63
Table 37 Projected Single-Dry Year Supply and Demand Comparison 63
Table 38 Projected Multiple-Dry Year Water Supply 64
Table 39 Projected Multiple-Dry Year Water Demand 64
Table 40 Projected Multiple-Dry Year Supply and Demand Comparison 64

List of Figures

Figure 1. Map of the City of Orange ……14
Figure 2. Orange County Groundwater Basin Map …… ……19
Figure 3. MWD Resource Stages, Anticipated Actions, and Supply Declarations 54

1.0 INTRODUCTION

1.1 Urban Water Management Planning Act

This report has been prepared in response to Water Code Sections 10610 through 10656 of the Urban Water Management Planning Act (Act), which were added by Statute 1983, Chapter 1009, and became effective on January 1, 1984. This Act, which was adopted by the legislature through Assembly Bill (AB) Number 797, requires that "every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually prepare and adopt, in accordance with prescribed requirements, an urban water management plan." The Act requires urban water suppliers to prepare plans that describe and evaluate reasonable and practical efficient water uses, recycling, and conservation activities. These plans must be filed with the California Department of Water Resources (DWR) every five years. Urban water management plans are due to DWR by December 31, 2005.

Since its passage in 1983, several amendments have been added to the Act, the most recent coming in 2004**.** Some of the amendments provided for additional emphasis on metering, drought contingency planning, and water recycling. Also, new since 2000 is AB 901, which provides new requirements for addressing water quality. Specifically, Urban Water Management Plans must now include information relating to:

- The quality of existing sources over the 20-year planning horizon; and
- The manner in which water quality affects water management strategies and supply.

1.1.1 Senate Bills 610 and 221 of 2001

In 2001 the state legislature passed two bills that amended state law to require that counties and cities should consider information relating to the availability of water to supply certain new large proposed development. This information is required to be included in the administrative record of the approval process for such development projects. SB 610 requires the information to be provided to local governments for inclusion into environmental documents for projects that are subject to the **California Environmental Quality Act** (CEQA). SB 221 requires that city or county approval of certain residential subdivisions must include written verification that a sufficient water supply is available to serve that subdivision. Both of these statutes identify the adopted local **Urban Water Management Plan** (UWMP) as an important source document to be used to fulfill these requirements. The UWMP is also identified as an important source to be considered when local agencies are updating their General Plans.

Under this legislation, the cities and counties that are considering a proposed development application must ask the local water agencies to present the required water supply information. The water agency must provide the information within 90 days of the request. The information required is outlined below.

1.1.2 Requirements of SB610

This legislation requires that cities and counties address in environmental documentation for an applicable development project the sufficiency of the projected water supply. Specifically, SB

610 requires that applicable projects subject to CEQA and supplied with water from a public water system receive a "water supply assessment" from the water service provider on the adequacy of available supplies over a 20-year projection. SB 610 also makes changes to the Urban Water Management Planning Act to:

- Require additional information if groundwater is identified as a source, including a copy of any groundwater management plan, a copy of the adjudication order or decree for adjudicated basins, and if non-adjudicated, whether the basin has been identified as overdrafted; and
- Require a description of specific water supply projects and implementation schedules to meet projected demands over the 20-year planning horizon.
- The new requirements for water supply assessments (under Water. Code §§ 10910-10915) allow compliance by incorporating by reference information from the most recent Urban Water Management Plan, provided the project's water demand was included in that plan.

The water supply assessment must consider supplies under three hydrologic conditions: normal, single-dry and multiple dry years. The information considered must include water received in prior years from existing water supply entitlements or service contracts. In addition to the reporting of these data, supporting documentation should be provided, including written contracts, a water agency program to finance the planned deliveries, any permits required for delivery infrastructure and regulatory approval for diversion or conveyance of water. Where the water agency identifies a new source of water, other agencies that also have rights to the same source of water should be identified. Where the sources of water include groundwater, additional information about the groundwater source must be included, as follows:

- A description of the groundwater basin, including:
  - for adjudicated basins a copy of the order or decree and a description of the amount of water that can be legally withdrawn from the basin.
  - for non-adjudicated basins, information must be provided as to whether the basin is overdrafted or projected to be overdrafted in the most current DWR bulletin and must include a detailed description of the responsible party's efforts to eliminate the long-term overdraft condition
- A detailed description and analysis of the amount and location of groundwater pumped by the water supplier for the past five years from any groundwater basin from which the proposed project will be supplied.
- A detailed description and analysis of the amount and location of groundwater that is projected to be withdrawn from the basin
- An analysis of the sufficiency of the groundwater to meet the projected water demand associated with the proposed project

Where current water sources are not sufficient, the water agency must provide its plans for acquiring additional water supplies. Suggested components that could be included in the plans are cost estimates, a description of permits required, and estimated time frames to supply acquisition.

1.1.3 Requirements of SB 221

This legislation prohibits approval of subdivisions consisting of more than 500 dwelling units unless there is verification of sufficient water supplies for the project over a 20-year projection. This requirement also applies to increases of 10 percent or more to service connections for public water systems with less than 500 service connections. The written verification must include the following information:

- Historical record for at least 20 years;
- Urban Water Shortage Contingency Analysis;
- Supply reduction for "specific water use sector" during times of shortage; and
- Amount of water that can be reasonably relied upon from specified supply projects.

These requirements for written verifications (under Gov. Code § 66473.7) do not directly affect the requirements under the Urban Water Management Plan Act. However, the written verification must be based on substantial evidence, and SB 221 expressly provides that substantial evidence may include the most recent Urban Water Management Plan. Therefore, a water supplier may include the requirements under SB 221 in its Urban Water Management Plan as a means of satisfying the substantial evidence requirement.

1.1.4 Summary of Changes in the Act Since 2000

As a result of the above legislation and some additional legislative changes, the following are changes in the Urban Water Management Planning Act that have occurred from 2000 to the present:

- New legislative findings concerning water quality (Water Code § 10610.2, subds. (a)(4) – (a)(9), (b));
- A new requirement to describe water management tools that maximize local resources and minimize imported water supplies (§ 10620, subd. (f));
- A new requirement to notify all cities and counties within the service area that a plan or plan amendment is being prepared (§ 10620, subd. (b));
- A new requirement for additional information on groundwater where groundwater is identified as an existing or planned water source (§ 10631, subd. (b));
- Revised listing of water demand management measures to be described (CUWCC members may still elect to submit their conservation annual reports to meet this requirement) (§ 10631, subd. (f)(1));
- A new requirement to describe specific water supply projects and implementation schedules to meet projected demands over the 20-year planning horizon (§ 10631, subd. (h));
- A new requirement for data sharing between contracting water suppliers (i.e., wholesale, intermediate, and retail agencies) and a provision allowing suppliers to rely on information provided by a wholesale agency (§ 10631, subd. (j));
- A new provision allowing DWR to consider a water supplier's achievements and implementation plans for water conservation when evaluating applications for grants and loans (§ 10631.5);

- A new requirement to describe quantities of recycled water (§ 10633, subds. (b), (g));
- A new requirement to describe water quality over the 20-year planning horizon (§ 10634);
- A new requirement to notify all cities and counties within the service area of the time and place of the public hearing on plan adoption (§ 10642);
- A new requirement to file the plan or plan amendment with all cities and counties within the service area (§ 10644, subd. (a));
- For a water supplier that does not comply with the Urban Water Management Planning Act, a new requirement that DWR make that supplier ineligible to receive Prop 204 or Prop 13 funding (§ 10656); and
- A new provision allowing DWR to consider a water supplier's compliance with the plan requirements in determining the eligibility of receiving any funds from DWR-administered programs (§ 10657).

1.2 Coordination with Other Agencies

In preparing this 2005 update of the **City of Orange** (the City) **Urban Water Management Plan** (UWMP) a number of appropriate agencies were contacted and consulted as shown on **Table 1** below:

Table 1
Coordination with Appropriate Agencies

Agency	Participated in developing plan	Comment on the draft	Attend public meetings	Contacted for assist.	Sent a copy of the draft plan	Sent a notice of intention to adopt
MWDOC	x			x	x	x
OCWD	x			x	x	x
County of Orange	x			x	x	x
City of Orange- Planning Dept.	x	x	x	x	x	x

The City's General Plan is the source document for the City Water Division in its assessment of its water resource needs. The UWMP also serves as a source document for the City as it prepares its General Plan. The General Plan and UWMP may be linked, as their accuracy and usefulness are interdependent.

To meet the requirement set forth by Water Code section 10631 (k), the City notified **Municipal Water District of Orange County** (MWDOC) of the amount of water it wishes to purchase over the next 25 years. The City contacted **Orange County Water District** (OCWD) for information regarding the **Orange County Groundwater Basin** (the Basin), which is the main source of water supply for the City.

1.2.1 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."

To generate interest and encourage the public's participation in the planning process and to actively seek input, the City conducted a Public Hearing on November 22, 2005 on the draft UWMP.

1.2.2 Department of Water Resource Role and Guidance

California Department of Water Resources (DWR) staff reviews and determines the completeness of individual Urban Water Management Plans pursuant to the Urban Water Management Planning Act. Agencies subject to the Act must have adopted a complete UWMP that meets the requirements of the law and have submited it to DWR to be eligible for drought assistance or to receive funds through the Department. 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 the 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. DWR has provided guidance materials to aid water suppliers in developing year 2005 Urban Water Management Plans. 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 Urban Water Management Planning Act. The City has used the guidance material in the development of this Plan.

1.2.3 Organization of this Plan

This document is divided into nine (9) sections.

1. Section 1 - The introduction, which explains the purpose of the Plan and the development of the plan.
2. Section 2 - The City Water Division as an agency and its service area. This section addresses current and projected water supplies available to the City, and reliability of water supplies
3. Section 3 - Determination of DMM implementation
4. Section 4 - Discusses the water shortage contingency plan.
5. Section 5 - Recycled Water Plan: describes the wastewater management and water recycling in the City service area.
6. Section 6 - Describes the water quality issues that exist in the City service area and addresses their impact on the reliability of providing water service.
7. Section 7 - Water Service Reliability: discusses reliability of water service to the City ‘s customers and compares demand to supplies for normal, single-dry, and multiple-dry year scenarios.
8. Section 8 - Illustrates the adoption and implementation of the Plan.
9. Appendices

1.3 Resource Maximization/Import Minimization Plan

The City has instituted various water conservation plans over the past decade in an effort to decrease present and future water demands.

1.3.1 Integrated Regional Water Management Plan

In an effort to minimize its dependency on imported supplies, City of Orange has taken a proactive stance and participated in the Integrated Regional Water Management Plan along with MWDOC and other Orange County water agencies.

Recognizing that 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 30 cities and special districts serving the water and wastewater needs of Orange County over the years to develop and integrate regional strategies that address, raise community awareness of 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
- Promote water conservation through various conservation programs

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
- Demonstration projects to develop new drinking water treatment and distribution methods.

1.3.2 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. The City recognizes water use efficiency as an integral component of the current and future water resource strategy.

The City, to demonstrate its commitment to water use efficiency, is in the process of voluntarily signing the **Memorandum of Understanding Regarding Urban Water Conservation in California** (MOU). The **California Urban Water Conservation Council** (CUWCC) was

formed through adoption of this MOU and is considered the “keeper” of the fourteen **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, the City will be 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. The 14 BMPs include technologies and methodologies that have been sufficiently documented in multiple demonstration projects that result in more efficient water use and conservation.

The City has instituted various water conservation plans over the past decade in an effort to decrease present and future water demands. As a signatory to the MOU, the City will regularly file BMP Activity Reports.

2.0 SERVICE AREA INFORMATION

2.1 City of Orange

Incorporated in 1888, the City of Orange is situated at Latitude: 33° 47'16" and Longitude: 117° 51' 00" at an elevation of 195 feet covers an area of 23.6 square miles. The City's current sphere of influence extends east to the Cleveland National Forest. Some development plans for projects within the City's east end sphere of influence have also been proposed. These projects are identified as the East Orange or Santiago Hills project areas and are within the service area boundaries of either the **Irvine Ranch Water District** (IRWD) or the **Santiago County Water District** (SCWD).

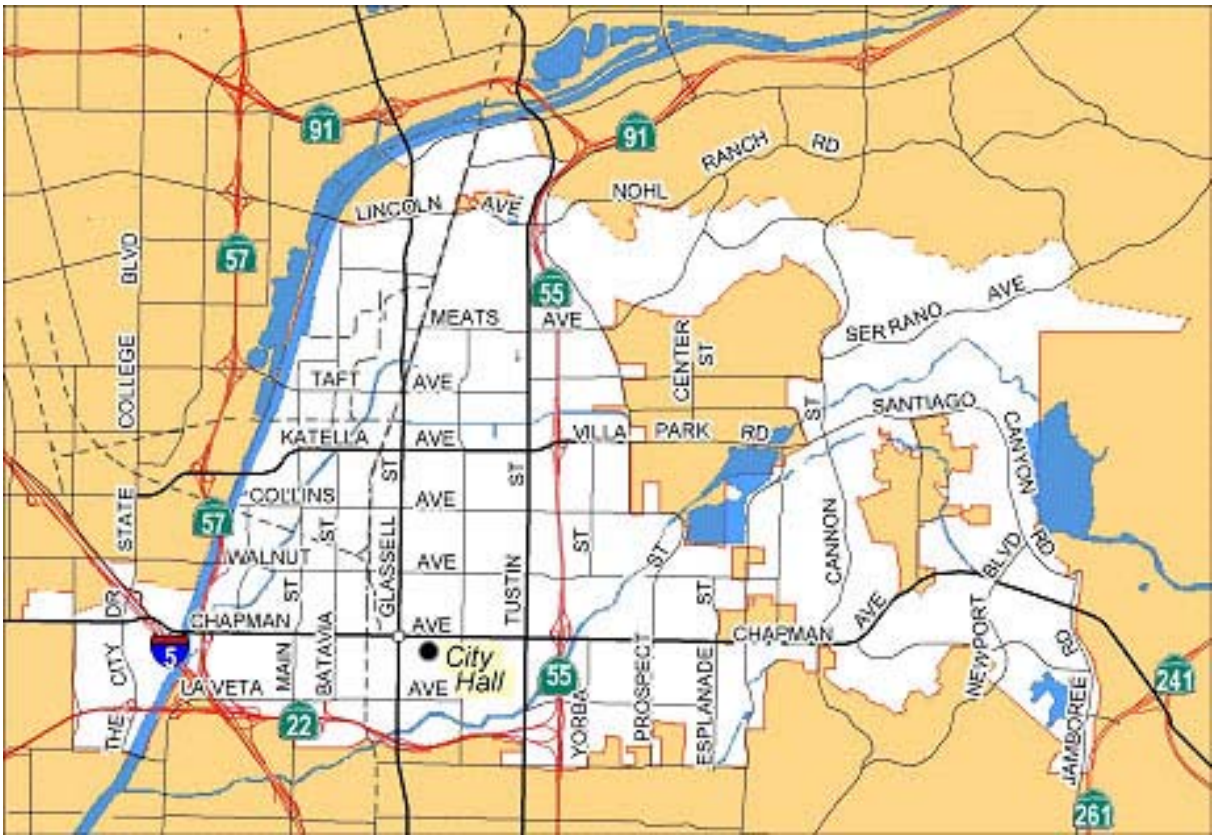


Figure 1. Map of City of Orange

The City has a water system the origins of which date back to the nineteenth century. The present modern system provides reliable service to a population of over 136,000 within the service area and is currently comprised of 15 active groundwater wells, 8 connections to the imported water supply, 18 water storage reservoirs with a total storage capacity of over 42

million gallons, 16 pumping stations, 437 miles of pipelines, and over 34,000 service connections.

The City adopted its most recent Urban Water Management Plan ("UWMP"), in accordance with Section 10610 et seq. of the California Water Code, in December 2000[1].

[1]*Due to the number and size of documents referenced or incorporated by reference herein, if not attached, they are available at the offices of the City Clerk. A list of documents referenced in this UWMP is attached as Appendix "A."*

2.2 Current and Projected Population

Table 2 below shows the projected population of the City service area.

Table 2 Population - Current and Projected						
	2005	2010	2015	2020	2025	2030
Area Population	138,289	146,950	150,152	151,910	152,792	153,576

2.2.1 Land Use

The City is fully developed with the exception of small islands and the eastern sphere area. A Water Supply Assessment (WSA) prepared for the City in July 2004 entitled **City Plaza Two Site** and **605 Building Site** projected water demands for the two proposed developments through Year 2025. The projects included a 19-story, 360,000 square foot office building and a 6-level, 2,720-space parking structure at City Plaza Two and a 10-story, 200,000 square foot office building and a 5-level, 1,528-space parking structure at the 605 Building Site. In addition, the WSA included projected water demands for contemplated or planned development within the service area. These developments are listed below and are currently in various stages of the planning and approval process.

- **Del Rio Development**- Residential development consisting of a maximum of 716 single- family dwelling units (DU) over approximately 54 gross acres. An additional 17.65 acres would be devoted to open space.
- **The Block of Orange Expansion**- The expansion would involve construction of 300 hotel rooms, up to 500 apartment units, 50,000 square feet (SF) market, 120,000 SF retail, a 3800 SF fast food restaurant and a 4,818 SF gas station, impacting a total area of 24.3 acres.
- **Archstone Gateway Project**- A high-density residential development of 884 apartment units located within the Cities of Anaheim and Orange. Approximately 13.11 acres of the proposed development and 532 of the dwelling units are within the City of Orange. Approximately 8.77 acres of the site within the City of Orange are dedicated to open space.
- **University of California, Irvine- Medical Center Expansion**- The Medical Center is located at 101 The City Drive South and covers an area of approximately 33 acres. The proposed project will allow for an increase of development from approximately 910,365 SF, 391 hospital beds, and 1,590 parking spaces to approximately 1,902,049 SF of on-site facilities, 527 hospital beds, and 4,200 parking spaces in two phases. The proposal includes demolition of 16 on-site structures totaling 135,014 SF and 182 parking spaces. The net result is an increase of over 992,000 SF of new space.
- **BRE Development (also known as "Pinnacle at Uptown")**: This is a low-rise (4-story), high-density residential development of 462 luxury apartments on 11.25 acres. The location is the former Cinedome theatre property on the north side of Chapman just west of the Santa Ana River.

- **Trammel Crow**: A conceptual proposal for a 276-unit apartment complex on 4.7 acres including 4,000 square feet of retail/office space. It is located immediately west of the BRE Development and is currently the site of a 150-room hotel. The hotel would be demolished to accommodate the project.
- **Sully-Miller/Fieldstone Communities, Inc, Tract 15750**: This is a single-family residential development of 180 units on 110 acres. It is located in East Orange on the north side of Santiago Canyon Road east of Cannon St. The project also includes a 6-acre park and a 2-acre site for a community equestrian center and RV storage.
- **St. Joseph Hospital Expansion/Renovation**: St. Joseph Hospital is proposing to add 600,000 square feet of new hospital/medical facilities. The work includes some demolition of existing facilities with the net addition of 600,000 square feet. The hospital is located in southwest Orange on La Veta Avenue east of Main Street.
- **Centex Homes, Serrano Heights, Tract 16454**: This is a single-family residential development of 120 units on 9 acres. It is located in northeast Orange on the north side of Serrano St., west of Nohl Ranch Road. This is the only project currently under construction.

In addition to the projected demands associated with the above listed projects, the baseline demands were increased every five years to account for additional development that may take place as other vacant land within the City's water service areas may be developed. Conservative assumptions that reflect higher demands than the City has experienced in the past solely from in-fill development were employed.

2.3 Climate and Rainfall

The City service area enjoys a Mediterranean climate with an average annual rainfall of about 13 inches. Temperatures vary from a mean of 54°F in the winter to a mean of 67°F in the summer. **Table 3** provides climate data for the City service area.

NOAA does not provide historical climate data for the service area of the City but it does provide it for Tustin-Irvine Ranch, California (049087), which is very similar to the City's Service Area for all intents and purposes.

Table 3
Climate

	January	February	March	April	May	June
Standard Average ETo	2.18	2.49	3.67	4.71	5.18	5.87
Average Rainfall	2.53	2.73	2.21	1.01	0.26	0.07
Average Max. Temp.	67.0	68.1	69.4	72.9	75.2	79.0
Average Min. Temp.	40.5	42.4	44.3	47.7	52.2	55.8

Table 3 (continued)
Climate

	July	August	Sept.	October	Nov.	Dec.	Annual
Average ETo	6.29	6.17	4.57	3.66	2.59	2.25	**49.63**
Average Rainfall	0.01	0.08	0.27	0.36	1.32	2.25	**12.82**
Average Max. Temp.	84.0	85.5	84.7	79.7	73.9	68.2	**75.6**
Average Min. Temp.	59.2	59.5	57.0	51.9	44.4	40.7	**49.6**

***** *Period of Record: 12/1/1927 to 6/30/2003*

2.4 Water Supplies

The City's main source of water supply is the groundwater pumped from wells within the Basin. Groundwater has historically provided anywhere from 66 to 80 percent of the total demand. Imported water from **Metropolitan Water District of Southern California** (MWD) through MWDOC is the other significant source of City supplies. The City has also purchased local water from the Serrano Water District (SWD). The source of local water is run-off from Santiago Creek that is impounded behind Santiago Dam in Irvine Lake.

2.4.1 Groundwater

The Basin, also referred to as the **Lower Santa Ana Basin**, provides the main source of water supply for the City of Orange.

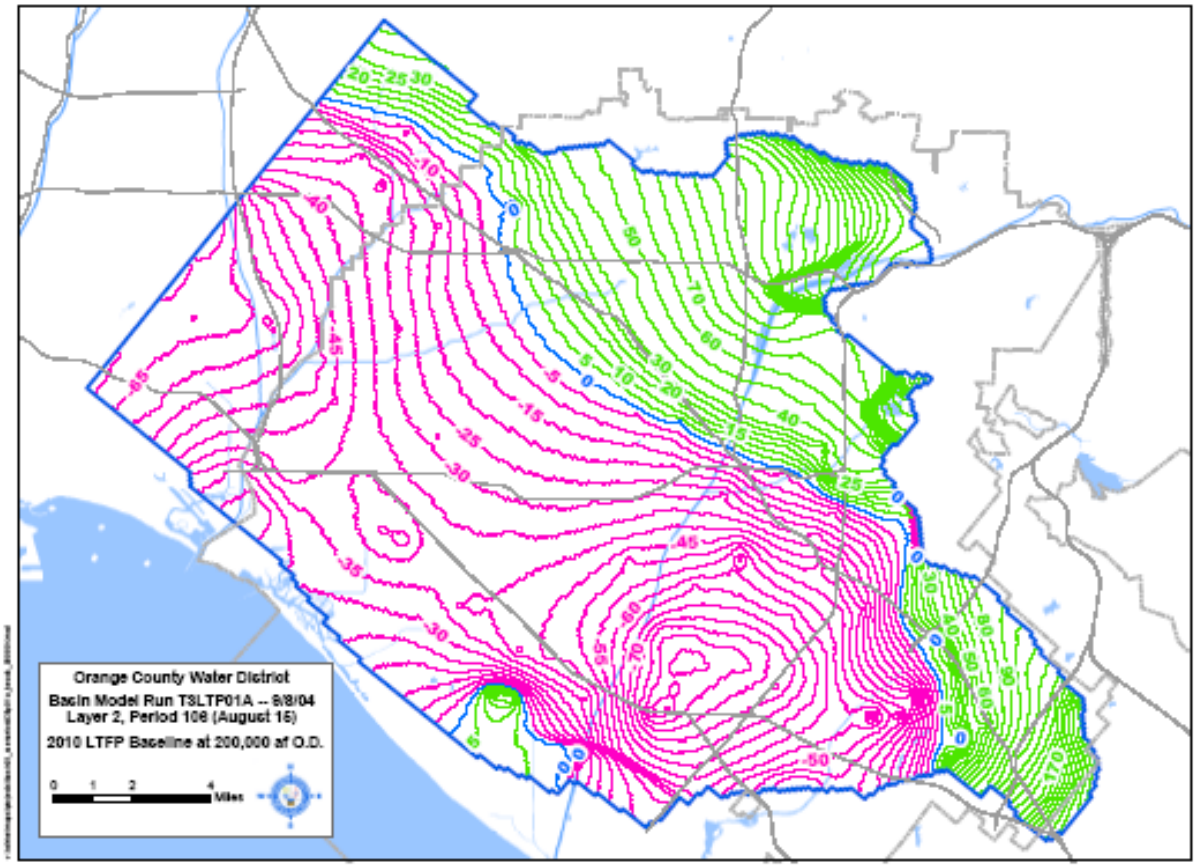


Figure 2. Orange County Groundwater Basin Map

The City's Water Division operates 15 active groundwater-producing wells in the Basin. During the past five (5) years, groundwater production from the Basin by the City has ranged from 20,248 acre-feet to 26,269 **acre-feet of water per year** (AF/Yr). The water is produced

by the 15 wells, which are described on Table 4. A new well, commonly known as Well No. 26, with a production capacity of 3,000 **gallons per minute** (GPM) was constructed but has not yet been put into operation. Three (3) additional wells are planned for construction in accordance with the City's recently adopted Seven Year Capital Improvement Program extending from fiscal year 2005-2006 through fiscal year 2011-2012.

Table 4 below represents the active wells supplying the City water system from the Basin.

Table 4 Active Groundwater Wells				
Well No.	**Capacity (GPM)**	**Diameter (Inches)**	**Depth (Feet)**	**State Well No,**
3	433	12	210	4S/9W-26N1
4	842	16	726	4S/9W-32B1
5	1140	20	751	4S/9W- 32B2
8	1500	16	870	4S/10W-24J1
9	1582	16	910	4S/10W-24J2
14	986	24	560	4S/9W-32B3
15	988	24	506	4S/9W-7P1
18	1500	20	714	4S/9W-31B2
19	2355	18	1,034	4S/9W-19K1
20	2264	20	1,152	4S/10W-36C2
21	2623	20	1,272	4S/9W-17N1
22	1800	22	822	4S/9W-20P1
23	1800	24	660	4S/9W-28J2
24	2246	24	820	4S/9W-28A01
25	2749	20	905	4S/9W-B04S
*26	3000	22	1190	4S/10W-35B04
****Sub-Total**	**27,808**			
***27,28,29	9,000			
Total	**36,808**			

**New production Well No.26 was constructed but not yet operational.*

Sub-Total includes the presently existing capacity of 24,808 GPM plus the capacity of Well No.26. 27,808 GPM is equivalent to 3,687 AF per month or **44,857 AF/Yr** of production capacity. However, to be conservative only 90% of the well production capacity will be counted on for the annual production estimates. Therefore, the production capacity is assumed to be **40,371 AF/Yr.

**** Total capacity of Wells No. 27, 28 and 29 which are presently included in the City's Capital Improvement Program and expected to be operational by 2010. At that time the City's total groundwater production capacity will be 36,808 GPM, which is equivalent to 4,880 AF per month or **59,375 AF/Yr**. However, to be conservative only 90% of the well production capacity will be counted on for the annual production estimates. Therefore, the production capacity is assumed to be **53,437AF/Yr.***

2.4.2 Imported Water

The City is a member agency of MWDOC, which in turn is a member agency of MWD. This entitles the City to receive water from available MWD sources.

The City has a number of service connection agreements with MWDOC whereby MWDOC will deliver water to the City as it receives water from MWD in the amount requested by the City, subject to MWD water availability. The City's imported water supply sources and their flow capacities are shown on **Table 5** below.

Table 5

Imported Water Supply Sources (in cfs)

Source	Connection Designation	Total Allocated Feeder Capacity	Capacity of Connection
Metropolitan Water District of Southern California (MWD)			
East Orange County Feeder No. 2	OC-40	*14.0	20
	OC-41 (future)		
	OC-42		14
Allen-McCulloch Pipeline	OC-67	*22.7	30.0
	OC-69		10.0
Orange County Feeder	OC-3	11.0	*10.0
East Orange County Water District (EOCWD)	EOCWD	9.0	*5.0
Total Imported (MWD) Capacity	***51.7 (37,500 AF/Yr)**		
Local Supplies	**1000 AF/Yr**		
Serrano Water District	SWD-1	2.0	2.0
	SWD-2		

** For determining the total capacity, either the total feeder capacity or the connection capacity, whichever is less, were utilized.*

The City also has entitlements and/or written contracts to receive imported (potable) water from MWD via the regional distribution system located in Orange County, components of which are described below. Although pipeline capacity rights do not guarantee the availability of water, per se, they do guarantee the ability to convey water when it is available to MWD's distribution system and, therefore, operate in tandem with water entitlements and/or contracts to receive

supplemental water for purposes of demonstrating not only water supply reliability, but also physical delivery system reliability. All imported water supplies assumed in this document are available to the City from existing infrastructure facilities.

Allen-McCulloch Pipeline

The **Allen-McCulloch Pipeline** (AMP) is the supplemental source of domestic water from which the City owns specified capacity rights for the delivery of water. MWD owns and operates the AMP. The City's AMP capacity ownership, expressed as rate of flow, is 22.7 cubic feet per second (cfs) or 16,450 acre-feet per year.

The "**Agreement for Sale and Purchase of Allen-McCulloch Pipeline**" (AMP Sale Agreement) among MWD, MWDOC, and certain other identified participants, including the City, dated July 1, 1994, requires MWD, among other things, to meet the City's requests for water deliveries subject to the availability of water from MWD. The AMP Sale Agreement further requires MWD to augment/increase capacity necessary to meet the City's projected ultimate service area water demands, which includes the proposed East Orange development and other undeveloped lands within the City's sphere of influence. Furthermore, the enumerated capacity is the nominal peaking capacity that can be exceeded subject to certain peaking penalties.

East Orange County Feeder No. 2

The East Orange County Feeder No. 2 ("EOCF No. 2") is a pipeline jointly owned by several local agencies and MWD. The City has **14 cfs, or 10,135 acre-feet per year,** of capacity rights in the EOCF No. 2.

East Orange County Water District

A certain part of the City is located within the boundaries of the **East Orange County Water District** (EOCWD). This part of the City is entitled to capacity rights in the EOCWD system. The EOCWD is a wholesale water agency which is also a member agency of MWDOC and MWD. That part of the City within the EOCWD system is supplied with imported water via AMP as well as EOCF No.2 from MWD sources.

According to EOCWD, the retail agencies within its wholesale service area do not have individually designated capacity rights, but are entitled to share all the capacity owned by EOCWD in accordance with their needs and requirements. The City's 2000 UWMP states that "the City has potential additional capacity of up to 4000 GPM" (9.0 cfs). Discussions with City staff indicated that the actual physical capacity of the connection may be able to supply only 5 cfs without improvements such as a new pumping station. Therefore, this document considers only 5.0 cfs capacity being available from EOCWD source.

2.4.3 Local Water

The City has historically purchased local water from SWD. The source of local water is run-off from Santiago Creek that is impounded behind Santiago Dam in Irvine Lake. The City is currently receiving water from SWD.

Table 6 below shows the City's current and planned water supplies.

Table 6 Current and Planned Water Supplies – AF/Y						
Water Supply Sources	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
MWD/MWDOC	35,983	35,983	35,983	35,983	35,983	35,983
Orange County Groundwater Basin	40,371	54,438	54,438	54,438	54,438	54,438
Surface Diversions - SWD	1,000	1,000	1,000	1,000	1,000	1,000
Total	**77,354**	**91,421**	**91,421**	**91,421**	**91,421**	**91,421**

Table 7 below is meant to illustrate the City's pumping rights in the Basin. OCWD as the manager of the Basin annually sets the **Basin Production Percentage** (BPP) under its enabling legislation. The BPP is the factor equal to the amount a producer is allowed to pump without a **Basin Equity Assessment** (BEA) penalty. The BPP is determined annually by the Board of Directors of OCWD. OCWD manages the amount of production through financial incentives. The framework for the financial incentives is based on establishing the BPP, which is the ratio of groundwater production to total water demands expressed as a percentage. Pumping below the BPP is charged at a per acre-foot rate. This fee is called the **Replenishment Assessment** (RA). Groundwater production above the BPP is charged the RA and the BEA, the latter of which is typically set so that the cost of groundwater production above the BPP is similar to the cost of purchasing alternative supplies.

Table 7 Groundwater Pumping Rights – AF/Y	
Basin Name	**Pumping Right - AFY**
Orange County Groundwater Basin	BPP
Total	BPP

Table 8 shows the City's recent groundwater production from the Basin.

Table 8 City's Historical Groundwater Production in Orange County Basin						
	2000	**2001**	**2002**	**2003**	**2004**	**2005**
AF/Year	25,964	26,193	22,059	24,275	21,326	25,964
Percent of Total Water Supply	78	78	68	71	67	64

Table 9 shows the amount of groundwater the City is projecting for pumping in the next twenty-five years and the groundwater production as a percentage of the City's total water supply.

Table 9 Amount of Groundwater projected to be pumped – AF/Y					
Basin Name	**2010**	**2015**	**2020**	**2025**	**2030**
Orange County Groundwater Basin	26,706	27,243	27,243	27,243	27,243
% of Total Retail Water Supply	73%	75%	75%	75%	75%

2.5 Reliability of Supply

2.5.1 Reliability of Groundwater Supplies

The Basin provides the main source of water supply for the City which has a "common law right" to pump as much water as it wants from the Basin subject to the **Orange County Water District Act** (commencing with Section 40 of the California Water Code, hereafter the "Act"). The Basin underlies the north and central area of Orange County. Annual production by all producers from the Basin averaged 328,000 acre-feet between 1995 and 1999, generally increasing with time. The Basin is described in more detail on pages 3-1 through 3-14 of the **OCWD Master Plan Report**, dated April 1999 (MPR) and the **Groundwater Management Plan** (GMP) adopted in 2004 and incorporated herein by reference. Copies of the MPR and GMP are available in the offices of the City Clerk.

Under authority conferred upon it by the Act, OCWD manages the Basin. The Act empowers OCWD to impose replenishment assessments and basin equity assessments on production and to require registration of water-producing facilities and the filing of certain reports; however, OCWD is expressly prohibited from limiting extraction unless a producer agrees (Section 40-2(6)(c) of the Act) and from impairing vested rights to the use of water (Section 40-77 of the Act). Thus, producers may install and operate production facilities under the Act; OCWD approval is not required.

Although the rights of the producers within the Basin vis-à-vis one another have not been adjudicated, they nevertheless exist and have not been abrogated by the Act (Section 40-77). The rights consist of municipal appropriators' rights and may include overlaying and riparian rights.

The efforts being undertaken by OCWD to eliminate long-term overdraft in the Basin are described in the MPR, particularly in Chapters 4, 5, 6, 14 and 15. Although the water supply assessment statute (Water Code Section 10910(f)) refers to the elimination of "long-term overdraft," overdraft refers to conditions that may be managed for optimum basin storage rather than eliminated. The Act defines annual groundwater overdraft to be the quantity by which production exceeds the natural replenishment of the Basin. Accumulated overdraft is defined in the Act to be the quantity of water needed in the groundwater basin forebay to prevent landward movement of seawater into the fresh groundwater body. Seawater intrusion control facilities have been constructed by OCWD since its inception, and have been effective in preventing landward movement of seawater. These facilities allow greater utilization of the storage capacity of the Basin.

OCWD is required to annually investigate the condition of the Basin, assess overdraft and accumulated overdraft, and determine the amount of water necessary for replenishment. OCWD has studied the Basin replenishment needs and potential projects to address growth in demand until 2020. This is described in detail in the MPR. It should be noted that the Basin is not operated on an annual "safe-yield" basis (MPR, Section 3.2). OCWD manages the overdraft to maximize utilization of the Basin for annual production and recharge operations. Overdraft varies over time as the Basin is impacted by availability of recharge water and hydrological cycles.

In April 2003, the Board of Directors of OCWD declared by Resolution No. 03-4-38 that the **accumulated overdraft** as of June 30, 2002 was 406,000 AF and that the estimated **annual overdraft** for the water year July 1, 2002 to June 30, 2003 was 160,000 AF. OCWD further determined that the estimated annual overdraft for the ensuing water year from July 1, 2003 to

June 30, 2004 would be 59,000 AF, and that the accumulated overdraft as of June 30, 2003 was 414,000 AF.

Subsequently, in order to mitigate and reduce the overdraft to desirable management levels, the OCWD Board increased the levies for RA and reduced the BPP from 75% to 66% by its Resolution No. 03-4-39. This means that the City can produce from the Basin up to 66% of its demand for water without incurring BEA levies which would increase the cost of produced groundwater to the level of imported water from MWD but would not preclude the City from pumping at higher levels than the BPP.

OCWD has invested over $250 million in seawater intrusion control, recharge facilities, laboratories and monitoring to effectively manage the Basin. Although the Basin may be defined as "over-drafted" from time to time, it is actually managed to allow utilization of up to 500,000 AF or more of storage capacity during dry periods, thereby acting as an underground reservoir and buffer against drought periods. OCWD 's stated goal is to operate the Basin to maintain accumulated overdraft of 200,000 AF. If the Basin is too full, artesian conditions can occur in many areas including the coastal zone, causing rising water conditions and water logging, both adverse conditions.

OCWD continues to develop new replenishment methods and supplies, recharge capacity and basin protection programs to meet the projected demand from the Basin during normal and drought periods.

Groundwater is not actually an indigenous source of supply but rather storage of a supply that includes natural runoff, treated wastewater, and imported water. Groundwater conditions in the Basin are influenced by the natural hydrologic conditions of rainfall, groundwater seepage and stream flow. Groundwater extraction and injection through wells, the use of imported water for groundwater replenishment, and water use efficiency practices also influence the Basin.

Runoff from local rainfall is the main source of recharge for the smaller basins and accounts for some of the recharge of the Basin. The amount of runoff recharge is highly variable and can only be estimated. Most of the recharge of the Basin is from Santa Ana River flow percolated in-stream or diverted to off-stream spreading basins operated by OCWD. OCWD is responsible for the protection of water rights to the Santa Ana River in Orange County as well as management and replenishment of the Basin.

Santa Ana River base flow is comprised mainly of treated wastewater discharged from treatment plants in Riverside County and San Bernardino County. Thus, about half of the water recharging the aquifer is incidentally recycled wastewater. In addition, OCWD injects about 5,000 AF/yr of recycled wastewater treated at its Water Factory 21 plant into the Basin near the coast as a sea water intrusion barrier. The OCWD recharge operations both expand the production capability of the Basin and prevent seawater intrusion into the aquifers.

Production capability of the Basin is being increased by increasing both the recharge supply and the number of production wells for the extraction of water from the Basin. Aquifers that presently store low-quality water (water high in nitrates, salt color, or industrial pollutants) are being pumped, and the produced water is being treated at local water treatment plants or blended with potable water. Drawing out low-quality water and replacing it with high-quality recharge water facilitates aquifer cleanup.

The so called "In-Lieu" Program also helps groundwater production and quality by replacing quantities of groundwater with imported water to reduce groundwater pumping in coastal areas.

The In-Lieu Program has served as an efficient groundwater replenishment method since the 1970s. Currently, the In-Lieu Program is designated as the Basin Water Supply Management Program under the terms of the 1997 Basin Water Management Agreement with the MWD.

The City meets its water demands from the groundwater basin in accordance with the BPP determined by OCWD. For the most recent fiscal year (July 1, 2004 to June 30, 2005) BPP was set at 64 percent. Historically, the BPP has gone as high as 80 percent, although it was set at 75 percent from 1994 to 2004. The City has the legal right to pump 100 percent from the Basin if it so chooses subject to payment of a BEA.

The OCWD Board of Directors adopted the GMP in May 2004. The previous GMP was prepared in 1994. Earlier versions were prepared in 1989 and 1990. These early plans served as the model for groundwater management plans authorized under Assembly Bill 3030, signed into law in 1992.

Since 1994, significant changes in the Basin have occurred, including (1) annual groundwater pumping increases, (2) development of a new water source for groundwater recharge and injection, (3) increases in the base flow to the Santa Ana River (SAR), (4) additional restrictions on imported water supplies available to the District to supplement local recharge, and (5) new water quality issues driven by changes in water quality regulations.

The current GMP addresses changes in the Basin in a structured framework by identifying the key Basin issues and potential management strategies and by describing factors for OCWD to consider in making decisions regarding how much pumping the Basin can sustain.

The current GMP also addresses the requirements of Senate Bill 1938, passed in 2002, which includes a list of issues to be addressed to ensure compliance of groundwater management plans. Any specific projects that may be developed as a result of recommendations in the current GMP would be reviewed and approved by the OCWD Board of Directors and processed for environmental review prior to project implementation. The GMP does not commit OCWD to a particular program or level of Basin production, but describes the factors and key issues to consider as OCWD makes Basin management decisions on a regular basis each year.

Potential projects that are conceptually described in the GMP are described in greater detail in the OCWD Long-Term Facilities Plan (LTFP). The GMP also provides a general methodology and factors to consider in setting the BPP for future years.

OCWD is currently in the process of preparing other documents for assistance in managing the Basin. These reports would document existing groundwater basin management constraints and opportunities, assist OCWD in making future basin management decisions, and identify potential new projects and programs that, if implemented, would enhance Basin management and possibly allow for greater groundwater basin production. The documents prepared in this effort consist of a Recharge Study (RS) and the LTFP.

The RS documents existing capabilities for recharging water and existing operations, identifies operational constraints and opportunities, explores new operational scenarios, estimates how much groundwater production existing recharge capacity supports, and analyzes and recommends options to increase recharge capacity.

The LTFP establishes the Basin's future maximum (target) annual production amount, estimates

impacts to potential future RA and BPP rates, identifies necessary management programs, capital facilities, cost and funding requirements, reviews impacts of various Santa Ana River base flow projections, and identifies areas of the Basin that can accommodate additional groundwater producer pumping and/or identify necessary projects/management programs to support additional pumping.

2.5.2 Reliability of Imported Supplies

In addition to local groundwater, the City is dependent to a lesser extent on imported water from MWD to meet its demands. Therefore reference is made to the 2005 MWD Regional UWMP for the reliability of MWD water supplies and their vulnerability to seasonal or climatic shortages.

MWDOC has also prepared and adopted a 2005 Regional Urban Water Management Plan for its service area, which is inclusive of and consistent with the City's base supply and demand projections addressed herein. Pursuant to Water Code Section 10631(k), the City is relying upon water supply information provided by the wholesale agencies, MWD and MWDOC, in fulfilling informational requirements addressed in this UWMP Update.

To evaluate supply reliability, MWD developed a computer model called IRPSIM. This model uses 70 years of historical hydrology (from 1922 to 1991) to develop estimates of water surplus and shortage over the 20-year planning horizon. The output from these model runs enables staff to analyze the extent to which a particular supply option can add to the region's supply reliability and determine the need for additional supplies. It also helps to determine the appropriate targets for core and flexible supplies.

The MWD core water supplies provide a certain amount of water in every year, regardless of whether surplus supplies already exist. Examples of core supplies include recycled water projects, safe yield groundwater production, and **Colorado River Aqueduct** (CRA) base supplies. They provide the advantage of greater certainty with respect to the supply yield and cost. The disadvantage of core supplies is that if they are developed solely to meet infrequent dry year supply needs, they can be redundant in surplus years, thus resulting in higher costs. Flexible water supplies provide supply only when needed (such as during a dry year) and do not result in increased amounts of surplus water during years of plentiful supply. Examples of flexible supplies include voluntary water transfers and storage. Flexible supplies tend to be more cost-effective than core supplies, especially in light of the high degree of variability of MWD's existing supplies, but their supply yield may be less certain. Developing a resource strategy that balances both cost and risk requires a combination of core and flexible supplies.

Table 10 summarizes results from IRPSIM model studies performed to test the supply reliability of the MWD adopted resource mix. The IRPSIM results show the region's ability to respond in future years under a repeat of the 1990-92 hydrologies, that is, in the case of **multiple-dry years.** This shows that the region can provide reliable water supplies under a series of multiple dry years. **Table 11** shows a similar analysis using the historic hydrology of 1977, the single driest hydrologic year on record, and **Table 12** reports the expected situation on average over all of the historic hydrologies.

The IRPSIM analyses of the Integrated Resources Plan (IRP) Update report show that MWD can maintain reliable supplies under the conditions that have existed in past dry periods throughout the period 2005 through 2025.

Table 10
MWD Multiple Dry-year Supply Capability[1] & Projected Demands
AF/Yr

	2010	2015	2020	2025	2030
Current Supplies					
Colorado River Aqueduct[2]	722,000	699,000	699,000	699,000	699,000
California Aqueduct[3]	912,000	912,000	912,000	912,000	912,000
In-Basin Storage	482,000	480,000	463,000	449,000	449,000
Supplies Under Development					
Colorado River Aqueduct	95,000	460,000	400,000	400,000	400,000
California Aqueduct	330,000	215,000	299,000	299,000	299,000
In-Basin Storage	78,000	103,000	103,000	103,000	103,000
Transfers to Other Agencies	0	(35,000)	(35,000)	(35,000)	(35,000)
MWD Supply Capability	**2,619,000**	**2,834,000**	**2,841,000**	**2,827,000**	**2,827,000**
MWD Supply Capability w/ CRA Maximum of 1.25 MAF[4]	**2,619,000**	**2,776,000**	**2,741,000**	**2,719,000**	**2,719,000**
Firm Demands on MWD[5,6]	**2,376,000**	**2,389,000**	**2,317,000**	**2,454,000**	**2,587,000**
Potential Reserve & Replenishment Supplies	**243,000**	**387,000**	**424,000**	**265,000**	**132,000**

1 Represents supply capability for resource programs under listed year type.
2 Colorado River Aqueduct includes water management program supplies conveyed by the aqueduct
3 California Aqueduct includes Central Valley transfers and storage program supplies conveyed by the aqueduct
4 Maximum CRA deliveries limited to 1.25 MAF including SDCWA/IID Transfer supplies and Coachella and All-American Canals lining supplies.
5 Based on SCAG 2004 RTP, SANDAG 2030 forecasts, projections of member agency existing and contracted active conservation and local supplies, remaining regional targets for active conservation and local supplies, SDCWA/IID Transfer supplies and Coachella and All-American Canals lining supplies.
6 Includes projected firm sales plus 70% of projected IAWP agricultural sales

Table 11
MWD Single Dry-Year Supply Capability[1] & Projected Demands
AF/Yr

	2010	2015	2020	2025	2030
Current Supplies					
Colorado River[2]	722,000	699,000	699,000	699,000	699,000
California Aqueduct[3]	777,000	777,000	777,000	777,000	777,000
In-Basin Storage	840,000	838,000	808,000	784,000	784,000
Supplies Under Development					
Colorado River Aqueduct	95,000	460,000	400,000	400,000	400,000
California Aqueduct	330,000	215,000	299,000	299,000	299,000
In-Basin Storage	78,000	103,000	103,000	103,000	103,000
Transfers to Other Agencies	0	(35,000)	(35,000)	(35,000)	(35,000)
MWD Supply Capability	**2,842,000**	**3,057,000**	**3,051,000**	**3,027,000**	**3,027,000**
MWD Supply Capability w/ CRA Maximum of 1.25 MAF[4]	**2,842,000**	**3,033,000**	**3,002,000**	**2,970,000**	**2,970,000**
Firm Demands on MWD[5,6]	**2,293,000**	**2,301,000**	**2,234,000**	**2,363,000**	**2,489,000**
Potential Reserve & Replenishment Supplies	**549,000**	**732,000**	**768,000**	**607,000**	**481,000**

1 Represents supply capability for resource programs under listed year type.
2 Colorado River Aqueduct includes water management program supplies conveyed by the aqueduct
3 California Aqueduct includes Central Valley transfers and storage program supplies conveyed by the aqueduct
4 Maximum CRA deliveries limited to 1.25 MAF including SDCWA/IID Transfer supplies and Coachella and All-American Canals lining supplies.
5 Based on SCAG 2004 RTP, SANDAG 2030 forecasts, projections of member agency existing and contracted active conservation and local supplies, remaining regional targets for active conservation and local supplies, SDCWA/IID Transfer supplies and Coachella and All-American Canals lining supplies.
6 Includes projected firm sales plus 70% of projected IAWP agricultural sales

Table 12
MWD Average Year Supply Capability[1] & Projected Demands
AF/Yr

	2010	2015	2020	2025	2030
Current Supplies					
Colorado River Aqueduct[2]	711000	678,000	677,000	677,000	677,000
California Aqueduct[3]	1,772,000	1,772,000	1,772,000	1,772,000	1,772,000
In-Basin Storage	0	0	0	0	0
Supplies Under Development					
Colorado River Aqueduct	0	0	0	0	0
California Aqueduct	185,000	185,000	185,000	185,000	185,000
In-Basin Storage	0	0	0	0	0
Transfers to Other Agencies	0	(35,000)	(35,000)	(35,000)	(35,000)
MWD Supply Capability	**2,668,000**	**2,600,000**	**2,599,000**	**2,599,000**	**2,599,000**
MWD Supply Capability w/ CRA Maximum of 1.25 MAF[4]	**2,668,000**	**2,600,000**	**2,599,000**	**2,599,000**	**2,599,000**
Firm Demands on MWD[5,6]	**2,040,000**	**2,053,000**	**1,989,000**	**2,115,000**	**2,249,000**
Potential Reserve & Replenishment Supplies	**628,000**	**547,000**	**610,000**	**484,000**	**350,000**

1 Represents supply capability for resource programs under listed year type.
2 Colorado River Aqueduct includes water management program supplies conveyed by the aqueduct
3 California Aqueduct includes Central Valley transfers and storage program supplies conveyed by the aqueduct
4 Maximum CRA deliveries limited to 1.25 MAF including SDCWA/IID Transfer supplies and Coachella and All-American Canals lining supplies.
5 Based on SCAG 2004 RTP, SANDAG 2030 forecasts, projections of member agency existing and contracted active conservation and local supplies, remaining regional targets for active conservation and local supplies, SDCWA/IID Transfer supplies and Coachella and All-American Canals lining supplies.
6 Includes projected firm sales plus 70% of projected IAWP agricultural sales

Table 13 summarizes the City 's supply reliability. Since local run-off from Santiago Creek is highly variable, this source was not considered to be reliable for the purposes of these analyses. In addition to account for groundwater production reliability during multiple-dry years the City's groundwater production capacity was reduced by 20 percent. The rationale is the fact that during the recent six years (1999-2005) of unprecedented drought in the Lower Santa Ana Basin, OCWD reduced the BPP only from 75 percent to 64 percent. This is equivalent to only a 15 percent reduction in groundwater production basin-wide and it was the only reduction in the BPP for the preceding 10 years.

Table 13

Supply Reliability – AF/Y

		Multiple Dry Water Years			
Source of Water	**Normal Water Year**	**Single Dry Water Year**	**Year 1**	**Year 2**	**Year 3**
Orange County Groundwater Basin	40,371	40,371	32,300	32,300	32,300
Local Water	1,000	0	0	0	0
Imported MWD Water	35,983	35,983	35,983	35,983	35,983
Total	**77,354**	**76,354**	**68,283**	**68,283**	**68,283**
% of Normal	100%	100%	88%	88%	88%

The supply information presented in **Table 13** relies on the availability of imported supplies as documented in the MWD reliability assessment and is based on the City's connected capacity to the MWD/MWDOC importation system. **Therefore, the imported water supplies are assumed to be equal to the physical ability of the City's importation system.** This does not necessarily mean that the amount of imported supply shown on the Tables will be available from MWD at a given time. However, MWD as the imported supplier has the capability to provide more than the aggregate of all import demands on its system as demonstrated in **Tables 10 through 12** above. Therefore, as long as MWD has enough supplies the City has the capability to purchase up to the imported supply figures shown.

For imported water supply reliability MWD defines its water years with different historical hydrologies. According to its draft Regional Urban Water Management Plan (May 2005), MWD defines its multiple dry years as 1990-1992 and the single-dry year as 1977.

This analysis assumes MWD will be able to supply the imported demand under all hydrologic conditions as shown on **Tables 10, 11** and **12**. As a result, the water year is defined by the net difference of total retail demand less local supplies. In a dry year, the retail demand usually increases due to dry and hot weather. In the case of the City, local supply groundwater availability may also be reduced. The greater the net difference, the more critical it is for the City to be able to depend on imported supply to meet its demand.

MWDOC has developed a water balance computer model. Employing the model, 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. Of the 83 years, the hydrologic condition of 1961 yields the highest demand for imported supply, and therefore 1961 is defined as the **single-dry year** in MWDOC 's service area. Similarly, the historical sequence of 1959 to 1961 yields the highest demand in a three-year sequence for imported supply, and is then defined as the **multiple-dry years** in MWDOC 's service area. Since the City is typical of MWDOC 's service area, the findings are considered applicable to the City service area.

Table 14 shows the basis of water year data utilized for demand purposes in **Table 13**.

Table 14
Basis of Water Year Data

Water Year Type			
Average Water Year	Average of Historical Hydrology from 1922 to 2004		
Single-Dry Water Year	1961		
Multiple-Dry Water Years	1959	1960	1961

Table 15 compares demands and supplies where all water **demands** are based on the MWDOC water balance program results for the critical years: the normal year is the average of historical hydrologies from 1922 to 2004, 1961 is the single-dry year and 1959 through 1961 are the multiple-dry water years for critical demand determination purposes. The imported **supplies,** on the other hand are based upon for the average year repeat of the 1977 hydrology; the single-dry year repeat of 1977 hydrology; and the multiple-dry years repeat of the 1990-92 hydrologies.

Table 15 City of Orange Supply and Demand Comparisons – AF/Y					
2010	**Normal**	**Single**	**Multiple Dry Water Years**		
	Water Year	**Dry Year**	**Year 1**	**Year 2**	**Year 3**
Local Supply Capacity	41,371	41,371	32,300	32,300	32,300
Imported Water Capacity	35,983	35,983	35,983	35,983	35,983
Total Supply Capacity	77,354	77,354	68,283	68,283	68,283
Total Water Demand	36,649	38,690	39,381	39,381	39,381
Demand as % of Normal	104%	105.6%	105.6%	105.6%	105.6%
2015	**Normal**	**Single**	**Multiple Dry Water Years**		
	Water Year	**Dry Year**	**Year 1**	**Year 2**	**Year 3)**
Local Supply Capacity	41,371	41,371	41,371	41,371	41,371
Imported Water Capacity	35,983	35,983	35,983	35,983	35,983
Total Supply Capacity	77,354	77,354	77,354	77,354	77,354
Total Water Demand	37,304	39,381	39,381	39,381	39,381
Demand as % of Normal	106%	105.6%	105.6%	105.6%	105.6%
2020	**Normal**	**Single**	**Multiple Dry Water Years**		
	Water Year	**Dry Year)**	**Year 1**	**Year 2**	**Year 3)**
Local Supply Capacity	41,371	41,371	41,371	41,371	41,371
Imported Water Capacity	35,983	35,983	35,983	35,983	35,983
Total Supply Capacity	77,354	77,354	77,354	77,354	77,354
Total Water Demand	37,304	39,381	39,381	39,381	39,381
Demand as % of Normal	106%	105.6%	105.6%	105.6%	105.6%
2025	**Normal**	**Single**	**Multiple Dry Water Years**		
	Water Year	**Dry Year**	**Year 1**	**Year 2**	**Year 3)**
Local Supply Capacity	41,371	41,371	41,371	41,371	41,371
Imported Water Capacity	35,983	35,983	35,983	35,983	35,983
Total Supply Capacity	77,354	77,354	77,354	77,354	77,354
Total Water Demand	37,304	39,381	39,381	39,381	39,381
Demand as % of Normal	106%	105.6%	105.6%	105.6%	105.6%
2030	**Normal**	**Single**	**Multiple Dry Water Years**		
	Water Year	**Dry Year**	**Year 1**	**Year 2**	**Year 3**
Local Supply Capacity	41,371	41,371	41,371	41,371	41,371
Imported Water Capacity	35,983	35,983	35,983	35,983	35,983
Total Supply Capacity	77,354	77,354	77,354	77,354	77,354
Total Water Demand	37,304	39,381	39,381	39,381	39,381
Demand as % of Normal	106%	105.6%	105.6%	105.6%	105.6%

2.5.3 Factors Resulting in Inconsistency of Supply

The Basin, which provides the majority of the City supplies, has been remarkably successful in meeting the water supply requirements of many water agencies overlying it due to competent management by OCWD. The only reductions in the BPP have been due to unprecedented drought in the region, which has resulted in reductions of 10 to 15 percent for the first time in 10 years, in spite of the fact that the agencies overlying the Basin have grown considerably resulting in growing water needs and subsequent increases in groundwater pumping. The supply and storage in the Basin is dependent not only on climatic conditions but also on the availability of replenishment water from MWD/MWDOC. For factors impacting the consistency of imported water supplies, reference is made to the MWD and MWDOC Regional UWMPs.

Table 16

Factors resulting in inconsistency of supply

Name of supply	Legal	Environ-mental	Water Quality	Climatic
MWD/MWDOC				x
Orange County Groundwater Basin				x
Local Surface Diversions				x

2.6 Transfer and Exchange Opportunities

MWD 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 MWD 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 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 MWD distribution system into the MWDOC service area. This transfer would solidify MWDOC 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.

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 MWD water distribution system.

The City relies on the efforts of MWD as well as MWDOC to pursue transfer or exchange opportunities. As such the City is not currently undertaking any such efforts on its own.

2.7 Water Use by Customer Type

The City of Orange currently has approximately 34,000 customer connections to its potable water distribution system. **All connections are metered.**

2.7.1 Historical Usage

Water use sectors play a large role in determining water supply demands within a given area. Water use sectors within the City include: single family residential, multi-family residential and non-residential consisting of commercial, industrial and governmental demands.

The City does not provide water for agricultural use with the exception of water used by commercial nursery operations, which is included in the non-residential sector.

2.7.2 Residential Sector

The single family residential sector accounts for approximately 49% of the total water demand and multi-family residential accounts for a little over 13%. The rest is the non-residential sector and system losses.

2.7.3 Non-Residential Sector

The City has a mix of commercial uses (markets, restaurants, etc.), public entities (such as schools, fire stations and government offices), office complexes, light industrial, warehouses and facilities serving the public. Total historical non-residential demand is 31% of the overall demand.

The following table shows the amount of water usage by sectors on a fiscal year basis from 1997-98 to 2004-05. The figures are not based on actual billing records but apportionment according to the percentages described above.

Table 17
Historical Water Use by Sector- AF

Fiscal Year	Single-Family Residential	Multifamily Residential	Non-Residential	System Losses	Total
1997-98	13,948	4,155	9,496	2,077	29,676
1998-99	15,488	4,614	10,545	2,307	32,954
1999-00	16,454	4,901	11,203	2,451	35,009
2000-01	15,601	4,647	10,622	2,324	33,194
2001-02	15,837	4,717	10,783	2,359	33,696
2002-03	15,191	4,525	10,343	2,263	32,322
2003-04	16,744	4,442	10,593	2,392	34,171
2004-05	15,714	4,169	9,941	2,245	32,069

2.7.4 System Losses

System losses occur due to leaks, hydrant flushing, un-accounted for usage and miscellaneous other losses. The City system losses amount to about 7% of the total demand.

2.7.5 Sales to Other Agencies

The City does not sell water to other agencies.

Table 18 below shows past, current and projected water deliveries from 2000 through 2030 in five-year increments. Totals include unaccounted for system losses.

Table 18
Past, Current and Projected Water Deliveries

	1999-2000		2005	
	metered		metered	
Water Use Sectors	# of accounts	Deliveries AFY	# of accounts	Deliveries AFY
Municipal & Industrial		34,788		35,096
Agriculture		220		60
Total	34,000	35,008	34,828	35,156

	2010		2015	
	metered		metered	
Water Use Sectors	# of accounts	Deliveries AFY	# of accounts	Deliveries AFY
Municipal & Industrial		36,603		37,259
Agriculture		60		60
Total	35,000	36,663	35,000	37,319

	2020		2025	
	metered		metered	
Water Use Sectors	# of accounts	Deliveries AFY	# of accounts	Deliveries AFY
Municipal & Industrial		37,259		37,259
Agriculture		60		60
Total	35,000	37,319	35,000	37,319

	2030	
	metered	
Water Use Sectors	# of accounts	Deliveries AFY
Municipal & Industrial		37,259
Agriculture		60
Total	35,000	37,319

Table 19 summarizes the total projected water use by City customers in the next 25 years.

Table 19 Total Water Use - AF Year							
Water Use	**1999-2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Total	35,008	35,156	36,663	37,319	37,319	37,319	37,319

2.8 Demand Management Measures

The City recognizes the importance of water conservation and has made water use efficiency an integral part of water use planning. The City has also implemented and is actively participating in many water conservation activities. Although presently not a member of CUWCC and not a signatory to its BMPs, the City nevertheless has implemented many BMPs. The City is in the process of joining CUWCC and will shortly become a signatory. The following summarizes the current state of BMP implementation by the City.

BMP No. 1 - Water survey programs for single-family residential and multifamily residential customers.

The City conducts residential surveys on an as needed basis or in response to customer requests.

BMP No. 2 - Residential plumbing retrofit.

The City of Orange and MWDOC have provided water conservation kits free to customers at special events and upon individual requests. These include low-flow showerheads, toilet tank displacement devices, dye tablets to detect toilet leaks, water conservation tips, and general information. Additionally, the City of Orange enforces the water conserving plumbing fixture standards of the uniform plumbing code, including the requirement for ultra-low-flush toilets and low flow showerheads in all new construction.

BMP No. 3 - System water audits, leak detection, and repair.

Emergency Response – The City of Orange responds to leaks, hydrant knock-offs, and other emergencies on a 24-hour basis. Stand-by crews repair all leaks quickly and efficiently to minimize losses. From time to time, the City surveys specific neighborhoods for leak detection.

Pipeline and Service line Replacement – The City has an ongoing program to replace deteriorated and substandard pipelines and service lines.

Valve and Hydrant Program – All valves in the system are exercised and maintained at regular intervals. This facilitates prompt shut-offs for repairs when necessary and minimizes water losses.

BMP No. 4 - Metering with commodity rates for all new connections and retrofit of existing connections.

The City meters all service connections and bill customers bi-monthly based on water consumption.

BMP No. 5 - Large landscape conservation programs and incentives.

Not implemented.

BMP No. 6 - High Efficiency Clothes Washers.

Implemented through MWDOC. See Table 20 below.

BMP No. 7 - Public information programs.

The City maintains an active public information program to promote and educate customers about water conservation. The following activities are included in the public information program: bill inserts / newsletters / brochures, bill showing water usage in comparison to previous year's usage, program to coordinate with other government agencies, industry and public interest groups and media.

BMP No. 8- School Education.

Implemented through MWDOC. See Table 21 below.

BMP No. 9 - Conservation Programs for Commercial, Industrial and Institutional Accounts

Commercial and Industrial water customers of the City of Orange have the opportunity to participate in the regional programs of MWD and MWDOC. See Table 22 below.

BMP No. 10 - Wholesale Agency Programs:

Not applicable to the City.

BMP No. 11 - Conservation Pricing

The City of Orange promotes conservation through a multi-tier block pricing structure, which became effective in 2001.

BMP No. 12 - Water Conservation Coordinator

MWDOC employs on behalf of all member agencies 3 full-time equivalents for the exclusive purpose of promoting water use efficiency programs within their district. The City of Orange utilizes various staff on an as-needed basis to support water conservation activities but has no permanently assigned full-time Water Conservation Coordinator. Communication regarding regional water use efficiency programs and policies is directed to the Water Manager, who assigns appropriate resources based upon staffing and budgetary opportunities.

BMP No. 13- Water Waste Prohibition

The City of Orange has adopted ordinances to prohibit wasting of water. The following are sections related to the prohibition of water waste in the City of Orange Municipal Code:

Section 13.04.160 Water Waste—Prohibited

It is unlawful for any consumer to wastefully or negligently use water or to otherwise detrimentally impact the service to other consumers.

Section 13.04.170 Water Waste—Discontinuance of Service

Where the Water Manager finds that water is wastefully and negligently used contrary to the provisions of this title, the City may discontinue the service if such conditions are not corrected within five days after written notice to the consumer.

Section 13.28.010 Refusal by City to Furnish Water—Reasons

The City may refuse to furnish water and may discontinue service to any premises for any of the following reasons:

A. Where apparatus, appliances or equipment using water is dangerous, unsafe, or not in conformity with any law or ordinance;

B. Where the demand is greatly in excess of past average or seasonal use;

C. Where such excessive demands by one consumer are or may be detrimental or injurious to other consumers;

D. Where excessive demands by one consumer will result in inadequate service to others;

E. To protect the City against fraud or abuse;

F. Where a consumer fails to comply with any City ordinance or regulation of the Water Department within five days after receiving written notice thereof; and

G. Where a consumer fails to comply and such failure to comply affects matters of health and safety, in which case the City may discontinue water service immediately.

BMP No. 14 - Ultra-Low-Flush Toilets

Implemented through MWDOC. See Table 23 below.

City of Orange has been implementing the following BMPs through MWDOC programs:

BMP No. 6 - High Efficiency Clothes Washers

Table 20
High Efficiency Clothes Washers - Rebate Program

	Previous Years	Fiscal Year					Total:
		00-01	01-02	02-03	03-04	04-05	
Clothes Washers Replaced	0	0	58	247	304	358	967
Water Savings	0	0	.75	3.18	3.92	4.61	12.45

BMP No. 8 – School Education

Table 21
School Education Program

	Fiscal Year					Total:
	00-01	01-02	02-03	03-04	04-05	
Student Participants			2250	1531	1363	
Presentations			37	22	25	

BMP No. 9 – Commercial, Industrial and Institutional

Table 22
Commercial, Industrial and Institutional
Common Plumbing Fixture Rebate Program

	Previous Years	Fiscal Year					Total:
		00-01	01-02	02-03	03-04	04-05	
Devices Replaced	0	0	84	21	22	477	604
Water Savings	0	0	11.0	6.6	2.6	37.8	58.0

BMP No. 14 – Ultra-Low-Flush Toilets

Table 23
BMP No. 14 – Ultra-Low-Flush Toilets

	Previous Years	Fiscal Year					Total:
		00-01	01-02	02-03	03-04	04-05	
Single-Family Retrofits	5,569	1,336	1,823	1,544	1,367	130	11,769
Multi-Family Retrofits	1,672	442	621	1,138	532	63	4,468
Total ULF Toilets Replaced	7,241	1,778	2,444	2,682	1,899	193	16,237
Water Savings AF	239.9	58.9	80.97	88.85	62.91	6.39	537.92

Single-family toilet savings rate = 23.7 gallons per day (gpd)
Multi-family toilet savings rate = 42.8 gpd
Melded rate across all ULFT's for both Single-Family and Multi-Family = 29.58 gpd

2.9 Planned Water Supply Projects and Programs

The City has adopted a Seven Year Capital Improvement Program (CIP) extending from fiscal year 2005-2006 through fiscal year 2011-2012 to increase the reliability of its water supply and delivery system. Three (3) additional wells are planned for construction in accordance with the CIP.

The City's CIP also includes improvements or enhancements to seven (7) pump stations, two (2) water storage reservoirs and miscellaneous pipelines.

2.10 Development of Desalinated Water

2.10.1 Desalination of Ocean Water

Until recently, seawater desalination had been considered uneconomical to be included in the water supply mix. However, recent breakthroughs in membrane technology and plant siting strategies have helped reduce desalination costs, warranting consideration among alternative resource options.

MWDOC has been in the process of studying the feasibility of ocean desalination on behalf of its member agencies, but implementation of large-scale seawater desalination plants faces considerable challenges. These challenges include high capital and operation costs for power and membrane replacement, availability of funding measures and grants, addressing environmental issues and addressing the requirements of permitting organizations such as the Coastal Commission. These issues require additional research and investigation. MWDOC is reviewing and assessing treatment technologies, pretreatment alternatives, and brine disposal issues. Identifying and evaluating resource issues such as permitting and the regulatory approvals (including CEQA) associated with the delivery of desalinated seawater to regional and local distribution systems also present considerable challenges.

MWDOC is also assisting its member agencies in joint development of legislative strategies to seek funding in the form of grants and/or loans, and to inform decision-makers of the role of seawater desalination in the region's future water supplies. Strategies and outcomes of other agency programs (such as Tampa Bay, Florida) are being observed to gain insights into seawater desalination implementation and cost issues.

The City has not, on its own, attempted to investigate seawater desalination due to economic and physical impediments.

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 Corporation 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 located within the AES Generation Power Plant in Huntington Beach. It is being planned to provide 50 million gallons per day (MGD) of

desalinated supply for distribution into Coastal and South Orange County. Currently, the project remains in the environmental review and permitting phase. 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 its feasibility. The project size is yet to be determined, but a large facility is being investigated (50 to 150 MGD). 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 desalination plant in Dana Point, in the vicinity of San Juan Creek. This project would provide system reliability as well as supply reliability to the area and to MWDOC 's greater service area. MWDOC commissioned a preliminary feasibility study of the project in 2000. That study suggested that the site appeared feasible for a desalination project and a 25 MGD facility was recommended for this location.

Table 24 summarizes the opportunities for desalinated water in the section above.

Table 24 Opportunities for desalinated water	
Sources of Water	**Check if yes**
Ocean Water	X
Brackish ocean water	X
Brackish groundwater	X

2.11 Current and Projected Supply Includes Wholesale Water

California Water Code section 10631 (k) requires urban water suppliers that rely upon a wholesale agency for a source of water to provide the wholesale agency with water use projections from that agency for that source of water in five-year increments up to 20 years or as far as data is available. The City therefore has provided MWDOC, its wholesale provider, a projection of future water demands as required. MWDOC has provided information to the City for inclusion in the City's plan. MWDOC receives this information from its import supplier, MWD, who has in turn identified and quantified the existing and planned sources of water for its service area. However, due to their unique circumstances, neither MWD nor MWDOC will identify water available to urban water suppliers. According to Government Code Section 350, in case of a shortage MWD and MWDOC will deliver water based on need.

(Please see Section 4.1 for a more detailed discussion)

The City regularly provides projection of future water demand to MWDOC. The demand figures in **Table 25** were provided to MWDOC for preparation of both the City's and MWDOC 's UWMPs.

Table 25 City Demand Projections Provided to Wholesale Suppliers – AF/Y					
Wholesaler	**2010**	**2015**	**2020**	**2025**	**2030**
MWDOC	9,705	9,696	10,027	9,747	9,799

Table 26 Wholesaler Identified & Quantified Existing and Planned Sources of Water- AF/Y					
Wholesaler sources	**2010**	**2015**	**2020**	**2025**	**2030**
MWDOC	9,705	9,696	10,027	9,747	9,799

In the situation where the reliability of imported supply is not specifically quantified, MWDOC uses the inferred approach and assumes MWD will be able to supply the imported demand under all hydrologic conditions. As a result, the water year is defined by the net difference of total retail demand less local supplies. In a dry year, the retail demand usually increases due to dry and hot weather. At the same time, local supply is usually low due to less precipitation. The greater the net difference, the more critical it is for MWDOC to be able to depend on imported supply to meet its demand.

As described in Section 2.5, the water balance computer model developed by MWDOC the hydrologic condition of 1961 yields the highest demand for imported supply, and therefore is defined as the single-dry year in MWDOC 's service area. Similarly, the historical sequence of 1959 to 1961 yields the highest demand in a three-year sequence for imported supply, and so is defined as the multiple-dry years in MWDOC 's service area.

MWD defines its water years with different historical hydrologies. According to its draft Regional Urban Water Management Plan (May 2005), MWD defines its multiple dry years as 1990-1992 and the single-dry year as 1977. MWDOC reviewed regional imported demand based on MWD defined water years. The result indicated that the single year of 1961 and the sequence of 1959 to 1961 were more conservative because they yielded higher imported demands than any other years in the historical pool. **Table 27** illustrates imported water supply reliability based on MWDOC 's application of demand projections.

Table 27 Wholesale Supply Reliability - % of normal AF/Y					
		Single Dry	**Multiple Dry Water Years**		
Wholesaler sources		**1961**	**Year 1 (1959)**	**Year 2(1960)**	**Year 3 (1961)**
MWDOC	2010	152%	131%	147%	152%
MWDOC	2015	168%	150%	173%	168%
MWDOC	2020	187%	146%	178%	187%
MWDOC	2025	181%	150%	171%	181%
MWDOC	2030	187%	143%	173%	187%

Note: The numbers above reflect only the increased demand on imported supply for the City.

3.0 DETERMINATION OF DEMAND MANAGEMENT MEASURE IMPLEMENTATION

Water Code section 10631.5 states that DWR shall take into consideration whether the urban water supplier is implementing or has scheduled for implementation, the water demand management activities that the supplier identified in its UWMP, in evaluating applications for grants and loans made available pursuant to Section 79163. The Urban Water Management Planning Act allows an urban water supplier who is a signatory to the CUWCC to submit to the department copies of its annual reports and other relevant documents to assist the department in determining whether the urban water supplier is implementing or scheduling the implementation of water demand management activities.

The City recognizes the importance of water conservation and has made water use efficiency an integral part of its water use planning. The City has also implemented and is actively participating in many water conservation activities. The City is in the process of becoming a member agency of CUWCC and a signatory to the MOU.

The City actively participates in many of the BMPs outlined in the MOU in cooperation with MWDOC as described in Section 2.8 herein.

4.0 WATER SHORTAGE CONTINGENCY PLAN

4.1 Imported Water Shortages

As a wholesaler of imported water to the City, it is MWDOC ‘s responsibility to manage its supplies during times of shortage. During shortages, 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.

4.1.1 Stages of Drought Action

MWDOC receives its imported water from MWD. MWD 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 stage more severe than the previous one (see **Table 28**).

It is anticipated that water shortages would have to be extremely severe for MWD 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, MWD could meet all retail water needs of its member agencies by implementing Stages 1 through 6 of the WSDM Plan until 2025 (MWD Integrated Resources Plan Update, 2004).

4.1.2 MWD Water Shortage and Drought Management Plan

The MWD Board of Directors adopted the WSDM Plan in April 1999. This plan provides policy guidance for management of regional water supplies to achieve the reliability goals of the MWD Integrated Resources Plan (IRP). Through effective management of its water supply, MWD fully expects to be 100 percent reliable in meeting all non-discounted non-interruptible demands throughout the next ten years.

Unlike previous shortage management plans, the WSDM Plan recognizes the link between surpluses and shortages, and it integrates planned operational actions with respect to both conditions. The WSDM Plan continues MWD 's commitment to the regional planning approaches initiated in the IRP.

WSDM Plan Development

MWD and its member agencies jointly developed the WSDM Plan during 1998 and 1999. This planning effort included more than a dozen half-day and full-day workshops and more than three dozen meetings of MWD and member agency staff. The result of the planning effort is a consensus plan addressing a broad range of regional water management actions and strategies.

WSDM Plan Principles and Goals

The guiding principle of the WSDM Plan is to manage MWD water resources and management programs to maximize management of wet year supplies and minimize adverse impacts of water shortages to retail customers. From this guiding principle come the following supporting principles:

- Encourage efficient water use and economical local resource programs.
- Coordinate operations with member agencies to make as much surplus water as possible available for use in dry years.
- Pursue innovative transfer and banking programs to secure more imported water for use in dry years.
- Increase public awareness about water supply issues.

The WSDM Plan also declared that, should mandatory imported water allocations be necessary, those allocations would be calculated on the basis of need as opposed to any type of historical purchases. The WSDM Plan contains the following considerations that would go into an equitable allocation of imported water:

- Impact on retail consumers and the regional economy
- Investments in local resources, including recycling and conservation
- Population growth
- Changes and/or losses in local supplies
- Participation in MWD non-firm (interruptible) programs
- Investment in MWD facilities

Ensuring Regional Reliability

As a result of the investments made in conservation, water recycling, storage, and supply, MWD has identified a resource management plan that should result in 100 percent reliability for non-discounted non-interruptible demands through 2025. A key element of the strategy is to store surplus supplies during wet periods for use during drought periods.

The WSDM Plan guides the operations of these resources to ensure short- and long-term regional reliability. It identifies the expected sequence of resource management actions MWD will execute during surpluses and shortages to minimize the probability of severe shortages and eliminate the possibility of extreme shortages and shortage allocations.

Surplus and Shortage Stages

The WSDM Plan distinguishes between *Surpluses*, *Shortages*, *Severe Shortages*, and *Extreme Shortages*. Within the WSDM Plan, these terms have specific meanings relating to MWD 's capability to deliver water to its customers, as follow:

Surplus: MWD can meet full-service and interruptible program demands, and it can deliver water to local, regional and out-of-region storage.

Shortage: MWD can meet full-service demands and partially or fully meet interruptible demands, using stored water or water transfers as necessary.

Severe Shortage: MWD can meet full-service demands only by using stored water, transfers, and possibly calling for extraordinary conservation. In a Severe Shortage, MWD may have to curtail Interim Agricultural Water Program (IAWP) deliveries.

Extreme Shortage: MWD must allocate available supply to full-service customers.

The WSDM Plan also defines five surplus management stages and seven shortage management stages to guide resource management activities. These stages are defined not merely by shortfalls in imported water supply, but also by the water balances in MWD storage programs. Thus, a ten percent shortfall in imported supplies could be a stage one shortage if storage levels are high. If storage levels are already depleted, the same shortfall in imported supplies could potentially be defined as a more severe shortage. Each year, MWD evaluates the level of supplies available and existing levels of water in storage to determine the appropriate management stage for that year. Each stage is associated with specific resource management actions designed to (1) avoid an Extreme Shortage to the maximum extent possible and (2) minimize adverse impacts to retail customers should an Extreme Shortage occur. The current sequencing outlined in the WSDM Plan reflects anticipated responses based on detailed modeling of MWD 's existing and expected resource mix.

Storage Actions by Surplus Stage

MWD 's supply situation is considered to be in surplus as long as net annual deliveries can be made to water storage programs. Deliveries for storage in Diamond Valley Lake and in the SWP terminal reservoirs continue through each surplus stage, provided that there is available storage capacity. Withdrawals from Diamond Valley Lake for regulatory purposes or to meet seasonal demands may occur in any stage. Deliveries to other storage facilities may be interrupted depending on the amount of the surplus. The following section discusses the management actions to be taken under various levels of surplus, ranked from the smallest to the largest amount of surplus.

Surplus Stage 1. MWD may curtail or temporarily suspend (1) deliveries to regional groundwater basins under the Conjunctive Use and Cyclic Storage programs; (2) deliveries to Semitropic and Arvin-Edison groundwater storage programs; (3) deliveries of SWP carryover water to SWP reservoirs; and (4) contractual groundwater storage deliveries.

Surplus Stage 2. MWD may curtail or temporarily suspend (1) deliveries to regional groundwater basins under the Conjunctive Use and Cyclic Storage programs; (2) deliveries to Semitropic and Arvin-Edison groundwater storage programs; and (3) deliveries of SWP carryover water to SWP reservoirs.

Surplus Stage 3. MWD may curtail or temporarily suspend (1) deliveries to regional groundwater basins under the Conjunctive Use and Cyclic Storage programs; and (2) deliveries to Semitropic and Arvin-Edison groundwater storage programs.

Surplus Stage 4. MWD may curtail or temporarily suspend deliveries under the Conjunctive Use and Cyclic Storage programs.

Surplus Stage 5. MWD will make deliveries to all available in-region and out-of-region storage resources, including deliveries under the Conjunctive Use and Cyclic Storage programs.

Shortage Actions by Shortage Stage

When MWD must make net withdrawals from storage to meet demands, it is considered to be in a shortage condition. Under most of these stages, it is still able to meet all end-use demands for water. The following summaries describe water management actions to be taken under each of the seven shortage stages.

Shortage Stage 1. MWD may make withdrawals from Diamond Valley Lake.

Shortage Stage 2. MWD will continue Shortage Stage 1 actions and may draw from out-of-region groundwater storage.

Shortage Stage 3. MWD will continue Shortage Stage 2 actions and may curtail or temporarily suspend deliveries to Long Term Seasonal and Replenishment Programs in accordance with their discounted rates.

Shortage Stage 4. MWD will continue Shortage Stage 3 actions and may draw from conjunctive use groundwater storage (such as the North Las Posas program) and the SWP terminus reservoirs.

Shortage Stage 5. MWD will continue Shortage Stage 4 actions. The MWD Board of Directors may call for extraordinary conservation through a coordinated outreach effort and may curtail Interim Agricultural Water Program deliveries in accordance with their discounted rates. In the event of a call for extraordinary conservation, the MWD Drought Program Officer will coordinate public information activities with member agencies and monitor the effectiveness of ongoing conservation programs. The Drought Program Officer will implement monthly reporting on conservation program activities and progress and will provide quarterly estimates of conservation water savings.

Shortage Stage 6. MWD will continue Shortage Stage 5 actions and may exercise any and all water supply option contracts and/or buy water on the open market either for consumptive use or for delivery to regional storage facilities for use during the shortage.

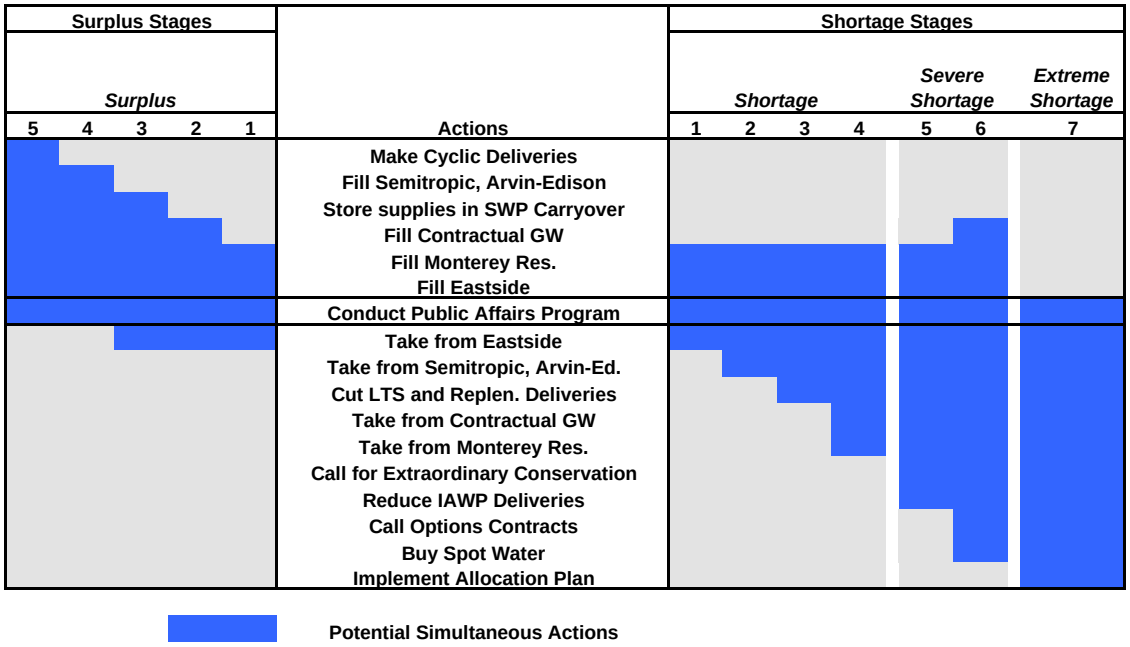
Shortage Stage 7. MWD will discontinue deliveries to regional storage facilities, except on a regulatory or seasonal basis, continue extraordinary conservation efforts, and develop a plan to allocate available supply fairly and efficiently to full-service customers. The allocation plan will be based on the Board-adopted principles for allocation listed previously. MWD intends to enforce these allocations using rate surcharges. Under the current WSDM Plan, the surcharges will be set at a minimum of $175 per AF for any deliveries exceeding a member agency's allotment. Any deliveries exceeding 102% of the allotment will be assessed a surcharge equal to three times the MWD full-service rate.

Although the 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.

Table 28 summarizes the water supply shortage stages and the actions to be undertaken under those conditions.

Table 28 MWD Water Surplus & Drought Management Plan Water Supply Shortage Stages and Conditions	
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 on adopted principles of fairness and need

Figure 3
Resource Stages, Anticipated Actions, And Supply Declarations



4.1.3 City of Orange Urban Water Shortage Contingency Plan

The City is in the process of formally adopting a Water Shortage Contingency Plan. However, the City recognizes the importance of water conservation and has adopted Ordinances to prohibit wasting of water (see Section 2.8 herein).

4.2 Estimate of Minimum Water Supply for the Next Three Years

MWD has declared 100% reliability for full service through the year 2010. The MWD Regional UWMP documents demand supply balance of MWD based on multiple dry years, single dry year and average year as shown in Section 2.5 herein. Therefore the City of Orange relies on its groundwater supplies and MWD for its ability to meet its water demand through the next three years.

Table 29 demonstrates three year estimated minimum water supplies of the City based on multiple-dry years.

Table 29
Three-Year Estimate of Minimum Water Supply (Based on Multiple Dry Years)- AF/Y

source**	Normal			Multiple Dry Year		
	2006	2007	2008	2006	2007	2008
Groundwater Supplies	40,371	40,371	40,371	32,300	32,300	32,300
Local Surface Water	1,000	1,000	1,000	0	0	0
Imported Supply	35,983	35,983	35,983	35,983	35,983	35,983
Total	**77,354**	**77,354**	**77,354**	**68,283**	**68,283**	**68,283**

4.3 Catastrophic Supply Interruption Plan

From a regional perspective, Orange County and all of Southern California are heavily dependent upon imported water supplies from MWD. Imported water is conveyed through the SWP and CRA, which travel hundreds of miles to reach urban southern California, and specifically to Orange County. Additionally, this water is distributed to customers through an intricate network of pipes and water mains that are susceptible to damage from earthquakes and other disasters. Regional storage for Southern California and Orange County is provided by MWD 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. 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. For more details on WEROC, please refer to the MWDOC Regional UWMP.

The City currently relies on imported water for a part of its supply. In the event of a supply interruption in the importation facilities, the City may or may not be impacted depending on the time of year. In high demand summer months an outage of imported supply may adversely impact the City. In December of 1999, the AMP unexpectedly ruptured, immediately eliminating a major source of supply to south Orange County. MWD was able to repair the pipeline and restore regular operations within seven days. It was fortunate that this pipeline failure occurred during the winter in a relatively accessible location. A more difficult pipeline repair or a major failure at the Diemer Filtration Plant in Yorba Linda could result in an interruption in imported supply of far longer than seven days. The MWD Administrative Policy requires that its member agencies be able to withstand planned supply shutdowns of at least seven days between the months of October and April. This policy is designed to facilitate MWD 's ability to conduct scheduled maintenance of the supply and treatment systems.

Earthquakes represent the major area of risk to water system reliability. Imported water is treated locally at the Diemer Filtration Plant and delivered via two pipelines, the EOCF No. 2 and the AMP.

An emergency outage of the Diemer Filtration Plant, which is situated adjacent to the Whittier Fault, is judged to be the most severe supply risk to south Orange County. In addition, there are scheduled and sometimes urgent shutdowns of critical facilities that are necessary to make repairs and improvements.

One of these critical facilities, the AMP, has experienced one pipeline break and two minor leaks since its construction in 1980. It has been shutdown at various times for inspection and repairs. The break that occurred in December 1999 was due to a pressure surge.

The EOCF No. 2, a MWD-operated pipeline, is considered to be in good condition, but it is aging, having been constructed in 1961. An outage of this pipeline has a smaller impact in south Orange County since the AMP and the SCP, the major extension of the AMP into south Orange County, provides about 50% greater capacity than the EOCF No. 2.

There are several faults in the area that could cause earthquake-induced failures. Of the most significance are the Whittier-Ellsinore Fault Zone and, to a lesser extent, the Peralta Hills Fault, San Joaquin Hills Thrust Fault, and the Newport-Inglewood Fault Zone. Knowledge of seismic forces has advanced significantly since the design and construction of the Orange County regional water treatment and distribution system, resulting in improved design standards for protection of structures from major earthquakes.

The scenarios evaluated included MWD planned shutdowns of the Diemer Filtration Plant, either a lower or upper AMP emergency outage, and a Diemer Filtration Plant emergency outage. For the latter, the evaluation included sub-cases with and without implementation of

the Central Pool Augmentation (CPA) Project by MWD. The CPA Project has the greatest positive impact on the ability of South Orange County to withstand outages; however, its implementation is years away.

SEMS/NIMS Multi-hazard Functional Plan

The City of Orange utilizes the Standardized Emergency Management System (SEMS) and National Incident Management System (NIMS) methods for response to extraordinary emergency situations associated with natural disasters, technological incidents, and national security emergencies. Specific plans for addressing extraordinary emergency situations are detailed in the City's Emergency Operation Plan. Normal day- to- day emergencies are managed using the FIRESCOPE Incident Command System (ICS) in conjunction well-established local policy and procedure to cope with such emergencies. As a result, this plan incorporates ICS, SEMS, and NIMS as the management tools that the City of Orange will use for any emergency.

The City's Emergency Management Organization including emergency response and recovery will be directed by the City Manager who serves as the Director of Emergency Services/Emergency Operations Center Director. It is assumed that the City will commit its resources to a reasonable degree before requesting mutual aid and assistance. Mutual aid and assistance will be requested when disaster relief requirements exceed the City's ability to meet them.

4.4 Penalties for Excessive Use

It is unlawful for any consumer to wastefully or negligently use water. Where the Water Manager finds that water is wastefully and negligently used the City may discontinue the service if such conditions are not corrected within five days after written notice to the consumer.

4.5 Impacts on Revenues and Expenditures

The City will closely monitor its revenue requirements, with the potential for special charges or rate adjustments to ensure that revenue needs during a shortage period are met. The City would be at a liberty to adjust the water rates in a water shortage if the City Council deems appropriate to do so to alleviate impacts on the operations of the Water Division.

5.0 RECYCLED WATER PLAN

5.1 Wastewater System

Wastewater is collected by the City and sent to the Orange County Sanitation District (OCSD) waster water treatment plants. OCSD collects, treats, and disposes of wastewater and sludge from a service area covering central and north Orange County. The City of Orange is a member agency of OCSD. OCSD is in the process of upgrading the treatment facilities from advanced primary to secondary treatment standards for ocean discharge.

5.2 Recycled Water System

The City does not possess a recycled water system since it sends all collected wastewater to OCSD for treatment and disposal. The City relies on the Basin for the majority of its water supply. As manager of the Basin, OCWD strives to maintain and increase the reliability of the Basin by increasing recycled water usage to replace dependency on groundwater. To further this goal, OCWD and OCSD have cooperated to construct two water recycling projects, described below:

The Green Acres Project is a water recycling effort that provides recycled water for landscape irrigation at parks, schools and golf courses as well as for industrial uses, such as carpet dyeing.

Additional demands on the Green Acres Project will be forthcoming as future users complete their scheduled hookups. Some of these new users will be the Mile Square Golf Expansion, Bonita Creek Park, Eastbluff Park and the new IKEA site in Costa Mesa. After the addition of these users, the total annual demand for Green Acres Project water will increase from 7,700 AFY to 8,800 AFY.

Since 1991, the Green Acres Project has provided an alternate source of water to the cities of Costa Mesa, Fountain Valley, Huntington Beach, Newport Beach and Santa Ana. Current water users include Mile Square Park in Fountain Valley, Costa Mesa Golf Course, Home Ranch bean field and Chroma Systems carpet dyeing. Due to a growing demand for water in Orange County, it is sensible that recycled water be used whenever possible for irrigation and industrial uses to supplement groundwater.

The Groundwater Replenishment System which is scheduled to go on line in 2007, will divert highly treated sewer water currently discharged into the ocean, and treat it through advanced techniques, including micro-filtration, reverse osmosis and ultraviolet disinfection and hydrogen peroxide. The water will be released into the Orange County Groundwater Basin either by injection along the coast to protect the basin from seawater intrusion or by percolation in ponds in Anaheim.

The resulting water that will actually improve the overall quality of the groundwater basin by lowering the mineral content will be utilized to replenish the groundwater basin, to protect the groundwater basin from seawater intrusion.

The Groundwater Replenishment System reduces the amount of treated wastewater released into the ocean and delays the need for another ocean outfall. It decreases Orange County's

reliance on imported water from northern California and the Colorado River and the new water helps to meet statewide water objectives. The first phase plans to produce approximately 70,000 acre-feet of water per year. The project can be expanded in future years.

6.0 WATER QUALITY IMPACTS ON RELIABILITY

6.1 MWD Water Quality Issues

The City obtains a portion of its water supply through MWDOC, from MWD. MWD 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 material, which can lead to formation of **disinfection byproducts (DBPs)**. MWD recognizes the impacts of water quality on its member agencies and has embraced water quality planning in its **Integrated Resources Plan** (IRP) and monitoring efforts to address water quality issues. Planning efforts have identified management strategies that allow flexibility in operations to improve water quality and source protection while maintaining reliability. MWD water quality staff conducts both required monitoring and monitoring for constituents of concern that are currently unregulated. MWD performs over 300,000 water quality tests each year.

6.1.1 Total Dissolved Solids Management

The high TDS levels in imported water delivered by MWD lead to increased TDS levels in wastewater, resulting in reduced opportunities for recycled water use. In some locations recycled water with high TDS content does not meet Regional Water Quality Control Board (RWQCB) standards. High levels of TDS diminish the ability to use the groundwater basins for imported water storage. To manage TDS in imported water deliveries, MWD has established an operational policy with the objective of delivering imported water to each MWD member agency at a TDS of 500 mg/L or less, whenever feasible.

Colorado River Aqueduct

CRA water has high TDS levels, averaging 650 mg/L during normal water years. TDS levels are dependent upon precipitation in the Colorado River Basin. During drought years salinity levels increase and during years with above normal precipitation salinity levels decline as naturally occurring salt concentrations decline. In times of extreme droughts, salinity levels could exceed 900 mg/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

The TDS levels in the SWP are significantly lower than 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, and 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 the 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 the MWD salinity objective and maintain water supply reliability. The MWD Board has adopted a statement 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

The MWD has taken numerous actions to reduce TDS concentrations in its water supplies. For a more detailed discussion of the management actions, please refer to the MWDOC UWMP.

6.1.2 Perchlorate Management

Perchlorate has been detected at low levels in the CRA water supply, but not in the SWP water supply. An exceedance level for perchlorate has not yet been adopted by the California Department of Health Services (DHS). However, DHS has adopted a notification level of 6 micrograms per liter (µg/L), requiring agencies to inform their governing bodies. Notifying customers of 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.

MWD began monitoring for perchlorate in June 1997 after it was detected in the Colorado River and the Lake Mead outlet at Hoover Dam. The sampling process 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 Department of Environmental Protection manages a remediation project in Henderson area. 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, MWD adopted a Perchlorate Action Plan. Through this plan, MWD has taken a proactive approach toward addressing a potential water quality issue and ensuring minimal or no water supply losses associated with perchlorate. For more detailed discussion of the management actions, please refer to the MWDOC UWMP.

6.1.3 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 DBPs linked to specific cancer types. CRA water does not have high levels of TOC and bromide. TOC and bromide in the Delta region of the SWP are of a significant concern to MWD as concentration levels increase as Delta water is impacted by agricultural drainage and seawater intrusion. In 1998, the United States Environmental Protection Agency adopted more stringent regulations for DBPs that took effect in 2002. Even more stringent regulations are expected to be proposed in 2005.

Management Actions

The MWD Board adopted a Statement of Needs for the CALFED Bay-Delta Program in 1999 stating that MWD requires a safe drinking water supply for compliance with existing and future regulatory requirements. The CALFED Program has developed numerous conceptual actions to improve Bay/Delta water, however MWD asked CALFED to adopt water quality improvement milestones. These milestones are necessary to assure that MWD and its member agencies will be able to comply with pending water quality regulations.

The MWD 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 to below regulatory requirements. By 2010 MWD plans on installing ozonation facilities at the remainder of its treatment facilities reducing the percentage of SWP water that requires blending.

6.1.4 Other Contaminants of Concern

The MWD has identified various other contaminants of concern to MWD water supply sources. These include MTBE, Arsenic, Uranium, and emerging contaminants. For a detailed discussion of these contaminants, please refer to the MWDOC UWMP.

6.1.5 Water Quality Protection Programs

MWD participates in multiple programs to improve water quality supplies. These programs include:

Watershed Sanitary Surveys, Source Water Assessment, support of DWR policies and programs improving the quality of deliveries to MWD, support of the Sacramento River Watershed Program, water quality exchange partnerships and implementation of additional security measures.

6.1.6 Imported Water Quality Impacts on Supply Reliability

Through its management strategies and in coordination with member agencies, MWD is able to provide member agencies supply options that allow them to meet regulatory standards. Both known and foreseeable water quality issues are incorporated into existing management strategies as well as plans for the reliability of MWD supplies for the next 25 years. However, unforeseeable water quality issues could alter MWD water and potentially impact MWD supply reliability.

7.0 WATER SERVICE RELIABILITY

In addition to local groundwater and surface water, the City is dependent on MWD to meet its water demands. Therefore reference is made to the MWD Regional UWMP for the reliability of MWD water supplies and its vulnerability to seasonal or climatic shortages.

The IRPSIM analyses show that Metropolitan can maintain reliable supplies under the conditions that have existed in past dry periods throughout the period 2005 through 2030.

Projected normal water supply to projected normal water demand for the City is compared in **Tables 32** thorough **34** below.

Table 32 shows projected normal year supply available to the City.

Table 32 Projected Normal Water Supply – AF/ Year					
	2010	**2015**	**2020**	**2025**	**2030**
Supply	**90,421**	**90,421**	**90,421**	**90,421**	**90,421**
% of year 2005	117%	117%	117%	117%	117%

Table 33 shows projected normal year water demands on the City.

Table 33 Projected Normal Water Demand – AF/ Year					
	2010	**2015**	**2020**	**2025**	**2030**
Demand	36,649	37,304	37,304	37,304	37,304
% of year 2005	104%	106%	106%	106%	106%

Table 34 compares projected supplies and demands for a normal year.

Table 34 Projected Supply and Demand Comparison - AF /Year					
	2010	**2015**	**2020**	**2025**	**2030**
Supply totals	90,421	90,421	90,421	90,421	90,421
Demand totals	36,649	37,304	37,304	37,304	37,304
Difference	53,772	53,117	53,117	53,117	53,117
Difference as % of Supply	59	59	59	59	59
Difference as % of Demand	147	142	142	142	142

Projected single dry-year water supply to projected single dry-year water use is compared in **Tables 35** thorough **37** below.

Table 35 shows the projected single-dry year water supplies of the City.

Table 35 Projected single dry year Water Supply - AF Year					
	2010	**2015**	**2020**	**2025**	**2030**
Local Supply	1,000	1,000	1,000	1,000	1,000
Groundwater	40,371	40,371	40,371	40,371	40,371
Imported Supply	35,983	35,983	35,983	35,983	35,983
Supply Totals	**77,354**	**76,354**	**76,354**	**76,354**	**76,354**
% of projected normal	85.5%	85.5%	85.5%	85.5%	85.5%

Table 36 shows single-dry year water demands on the City.

Table 36 Projected single dry year Water Demand - AF Year					
	2010	**2015**	**2020**	**2025**	**2030**
Demand	**38,690**	**39,381**	**39,381**	**39,381**	**39,381**
% of projected normal	105.6%	105.6%	105.6%	105.6%	105.6%

Table 37 compares projected water supplies and demands for a single-dry year.

Table 37 Projected single dry year Supply and Demand Comparison - AF Year					
	2010	**2015**	**2020**	**2025**	**2030**
Supply totals	77,354	77,354	77,354	77,354	77,354
Demand totals	38,690	39,381	39,381	39,381	39,381
Difference	38,664	37,963	37,963	37,963	37,963
Difference as % of Supply	50	49	49	49	49
Difference as % of Demand	100	96	96	96	96

Projected multiple dry-year water supplies to projected multiple dry-year water use for the City is compared in **Tables 38** thorough **40** below. As shown on **Table 38,** the City has significant supply reserves in multiple-dry years even with very conservative estimates of the yield (20 percent of normal groundwater production) from the groundwater basin. Groundwater

production reliability for multiple – dry years was reduced by 20% based on the recent six years of drought (1999-2005) in the Basin which necessitated OCWD 's reduction of the BPP from 75 percent in 1999-2003 period to 64 percent in 2005, equivalent to a 15 percent reduction in groundwater production.

Therefore, substituting the more conservative single dry-year water use (demand) projections for multiple-dry year water use (demand), comparison is made between multiple-dry year supplies and more conservative and higher single dry-year demands as if they are occurring in a string of three years.

Table 38 shows projected multiple-dry year water supplies available to the City.

Table 38 Projected Multiple- dry year Water Supply – AF/Year					
	2010	**2015**	**2020**	**2025**	**2030**
Local Supply	0	0	0	0	0
Groundwater	32,300	32,300	32,300	32,300	32,300
Imported Supply	35,983	35,983	35,983	35,983	35,983
Supply Totals	**68,283**	**68,283**	**68,283**	**68,283**	**68,283**
% of projected normal	88	88	88	88	88

Table 39 shows the projected multiple-dry year water demands on the City.

Table 39 Projected multiple- dry year Water Demand – AF/Year					
	2010	**2015**	**2020**	**2025**	**2030**
Demand	38,690	39,381	39,381	39,381	39,381
% of projected normal	105.6%	105.6%	105.6%	105.6%	105.6%

Table 40 compares projected water supplies and demands for multiple-dry year.

Table 40 Projected multiple- dry year Supply and Demand Comparison – AF/Year					
	2010	**2015**	**2020**	**2025**	**2030**
Supply totals	68,283	68,283	68,283	68,283	68,283
Demand totals	38,690	39,381	39,381	39,381	39,381
Difference	29,593	28,902	28,902	28,902	28,902
Difference as % of Supply	43	42	42	42	42
Difference as % of Demand	76	73	73	73	73

The City is capable of providing its customers all their demands with significant supply reserves in single and multiple-dry years through 2030. This would be true even if the demand projections were to be increased by a large margin. Therefore, it is not warranted to show supply versus demand comparisons for **each and every year** during multiple-dry periods through 2030. For that reason **Tables 46** through **60** in the DWR guidelines have been condensed into the above **Tables 32** through **40.**

8.0 ADOPTION AND IMPLEMENTATION OF UWMP

This UWMP was adopted by the City Council of the City of Orange on November 22, 2005, following a public hearing held on the same date. Copies of the adopted plan will be submitted to the City Community Development Department and County of Orange Planning Department in December 2005.

This Plan is available for public review in the offices of the City Clerk.

APPENDIX

APPENDIX "A"
References

1- "Guidebook to Assist Water Suppliers in the Preparation of a 2005 Urban Water Management Plan" by California Department of Water Resources

2- Metropolitan Water District of Southern California – Regional Urban Water Management Plan - December, 2005

3- Municipal Water District of Orange County - Regional Urban Water Management Plan December, 2005

4- City of Orange – Water Supply Assessment – July, 2004

5- NOAA Climate Data – Official Web Site http://www.wrcc.dri.edu/CLIMATEDATA.html

7- City of Orange - General Plan

8- OCWD Groundwater Management Plan - 2004

9- OCWD Long Term facilities Plan (Draft)

APPENDIX "B"

Cross Reference of UWMP v. DWR Tables

Table No. DWR Table No.

Table 1 Coordination with Other Agencies ……...1
Table 2 Population- Current and Projected ……..……2
Table 3 Climate ….....3
Table 4 Active Groundwater Wells ……NA
Table 5 Imported Water Supply Sources ….....NA
Table 6 Current and Planned Water Supplies ……...4
Table 7 Groundwater Pumping Rights ……..5
Table 8 Historical Groundwater Production …….....6
Table 9 Future Groundwater Production …….....7
Table 10 MWD Multiple-Dry Year Supply Capability & Projected Demands ……...NA
Table 11 MWD Single-Dry Year Supply Capability & Projected Demands ……..NA
Table 12 MWD Average Year Supply Capability & Projected Demands…….....NA
Table 13 Supply Reliability …….....8
Table 14 Basis of Water Year Data ……...9
Table 15 Supply and Demand Comparison …….. ……..NA
Table 16 Factors Resulting in Inconsistencies in Supply ……10
Table 17 Historical Water Use by Sector …….…….....12
Table 18 Past, Current and Projected Water Use by Customer Type ……..12
Table 19 Total Water Use …….....15
Table 20 High Efficiency Clothes Washer Rebate Program……F1
Table 21 School Education Program …….....H1
Table 22 CII Plumbing Fixture Rebate Program …….....I1
Table 23 ULFT ……N1
Table 24 Opportunities for Desalinated Water ……....18
Table 25 City Demand Projections Supplied to Wholesaler ……....19
Table 26 Wholesaler Identified & Quantified Existing and Planned Sources of Water...20
Table 27 Wholesale Supply Reliability ……....21
Table 28 MWD Water Surplus & Drought Management Plan …….....NA
Table 29 Three-Year Estimate of Minimum Water Supply in Multiple-Dry Years ….....24
Table 30 Wastewater Collection and Treatment ……...33
Table 31 Disposal of Wastewater ……34
Table 32 Projected Normal Water Supply ……....40
Table 33 Projected Normal Water Demand ……41
Table 34 Projected Normal Year Supply and Demand Comparison ……....42
Table 35 Projected Single-Dry Year Water Supply ……43
Table 36 Projected Single-Dry Year Water Demand ……...44
Table 37 Projected Single-Dry Year Water Supply and Demand Comparison ……...45
Table 38 Projected Supply during Multiple-Dry Years ……...……46
Table 39 Projected Demands during Multiple-Dry Years ….....47
Table 40 Projected Multiple-Dry Year Water Supply and Demand Comparison ……....48

APPENDIX "C"

Public Hearing Comments