J. WATER SYSTEM BASELINE CONDITIONS

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CITY OF ANAHEIM
GENERAL PLAN UPDATE

WATER SYSTEM

BASELINE CONDITIONS
OPPORTUNITIES AND CONSTRAINTS

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I. INTRODUCTION

This report presents a brief summary of baseline conditions and a general overview of key opportunities and constraints associated with the City of Anaheim water system. The main intent of the assessments presented here is to provide a macro-level, order of magnitude assessment of baseline water system facilities which will be used in updating the 1984 General Plan for the City. Detailed accounting of baseline conditions would be part of a comprehensive Water System Master Plan. Briefly, the baseline condition study concludes that the City has adequate supplies and storage capacity to meet current needs. The City also has adequate supplies to support the projected growth through the year 2020, although an additional 14 MG of storage will be required to support the intended growth in the eastern portion of the City.

II. BACKGROUND

The City of Anaheim encompasses an approximate area of about 50 square miles bounded generally by the Cities of Fullerton, Placentia and Yorba Linda to the north; the Cities of Stanton, Garden Grove and Orange to the south; County of Orange unincorporated areas to the east; and the City of Buena Park to the west. The City is comprised of mostly developed land with a variety of land uses including residential, commercial, industrial, roads, and parkland.

The Anaheim Municipal Water Utility began supplying Anaheim residents with domestic water in 1879 and metering of customers in 1890. Prior to that time, each Anaheim family had to arrange for its own water supply. When the Water Utility began its operations, water was supplied from a single well, pumping plant, and a 20,000 gallon elevated redwood tank. The water was then distributed through a four-inch wooden water main a distance of five blocks. By the end of its first year of operation, the municipally owned and operated water system was supplying approximately 4,000 gallons per day (gpd) to Anaheim residents. Later, other wells were constructed, but were the sole source of water for the City until the 1940's. From then on surplus water from the Colorado River Aqueduct was made available by the MWD.

The following two reference documents provide a comprehensive summary of information on the City's water system and have been the principle sources of information for this report.

- The City completed a comprehensive Water System Planning Study in 1999 (Parsons Engineering Science, November 1999). This study analyzed the existing and future water system conditions and identified improvements required to meet water supply goals under both current and ultimate system (2020) conditions.

- The California State Legislature requires every water purveyor with 3,000 or more customers to prepare an Urban Water Management Plan (UWMP) every five years. The City prepared its most recent UWMP in December 2000.

Exhibit A, showing the principal elements of the City of Anaheim water system, follows this page. The exhibit also shows the various pressure zones in the City, which provide a geographical reference for subsequent sections of this report.

The 1984 General Plan's policies and goals with respect to potable water service include the following:

- Provide efficient and economic distribution of adequate water supply and pressure to all residential, commercial, industrial, and public areas served by the Municipal water Distribution System.

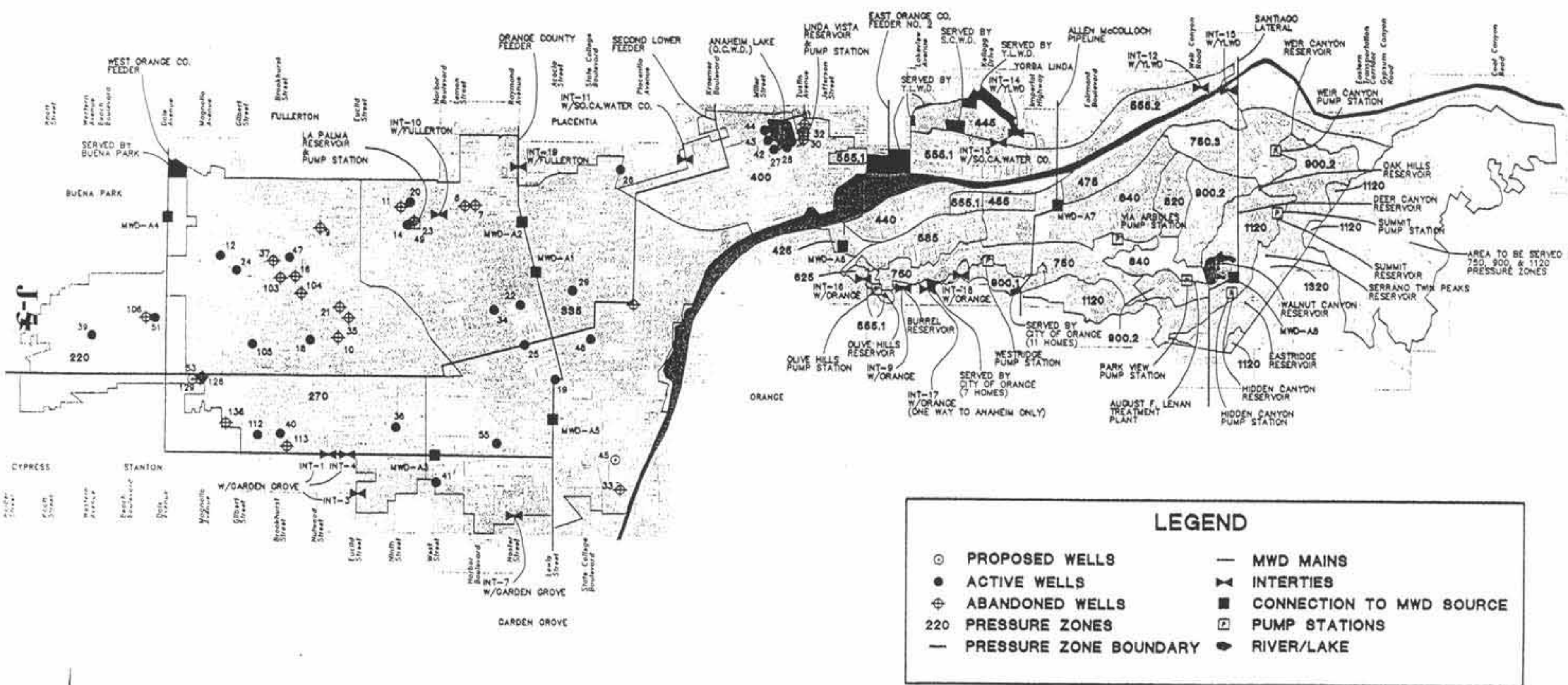
- Establish and enforce requirements for municipal water service, which meet or exceed State health standards and monitor water quality according to established criteria with respect health and acceptance standards.

- Encourage coordination of water facilities in the Planning Areas within the areas within the City but served by the Yorba Linda County Water District, the City of Orange and the City of Buena Park, and also coordinate with the Southern California Water Company for the County "island" areas not within the City limits that they serve.

III. WATER SYSTEM STANDARDS AND CRITERIA

The Water System Planning Study (Parsons Engineering Science, November 1999) identified water system standards and criteria used by the City in the planning, analysis and design of water facilities. They are described herein for the following categories:

- Water Demands
- Fire Flows
- Supply
- Storage
- Transmission and distribution
- Operation and other components


WEST ORANGE CO. FEEDER
SERVED BY BUENA PARK
BUENA PARK
FULLERTON
LA PALMA RESERVOIR & PUMP STATION
INT-10 W/FULLERTON
ORANGE COUNTY FEEDER
INT-19 W/FULLERTON
INT-11 W/SO.CA.WATER CO.
PLACENTIA
SECOND LOWER FEEDER
ANAHEIM LAKE (O.C.W.D.)
LINDA VISTA RESERVOIR & PUMP STATION
EAST ORANGE CO. FEEDER NO. 2
SERVED BY T.L.W.D.
SERVED BY S.C.W.D.
SERVED BY Y.L.W.D.
YORBA LINDA
INT-14 W/YLWD
INT-13 W/SO.CA.WATER CO.
ALLEN McCOLLOCH PIPELINE
INT-12 W/YLWD
INT-15 W/YLWD
SANTIAGO LATERAL
WEIR CANYON RESERVOIR
WEIR CANYON PUMP STATION
OAK HILLS RESERVOIR
DEER CANYON RESERVOIR
SUMMIT PUMP STATION
AREA TO BE SERVED BY 750, 900, & 1120 PRESSURE ZONES
SUMMIT RESERVOIR
SERRANO TWIN PEAKS RESERVOIR
WALNUT CANYON RESERVOIR
EASTRIDGE RESERVOIR
HIDDEN CANYON RESERVOIR
HIDDEN CANYON PUMP STATION
AUGUST F. LENAN TREATMENT PLANT
PARK VIEW PUMP STATION
VIA ARBOLES PUMP STATION
SERVED BY CITY OF ORANGE (11 HOMES)
WESTRIDGE PUMP STATION
SERVED BY CITY OF ORANGE (7 HOMES)
INT-17 W/ORANGE (ONE WAY TO ANAHEIM ONLY)
INT-18 W/ORANGE
BURREL RESERVOIR
INT-9 W/ORANGE
OLIVE HILLS RESERVOIR
OLIVE HILLS PUMP STATION
INT-16 W/ORANGE
ORANGE
MWD-A1
MWD-A2
MWD-A3
MWD-A4
MWD-A5
MWD-A6
MWD-A7
MWD-A8
INT-1
INT-3
INT-4
INT-7 W/GARDEN GROVE
W/GARDEN GROVE
CYPRESS
STANTON
GARDEN GROVE
220
270
335
400
425
440
445
455
475
555.1
555.2
585
625
640
750
750.3
820
840
900.1
900.2
1120
1320
LEGEND
PROPOSED WELLS
ACTIVE WELLS
ABANDONED WELLS
220 PRESSURE ZONES
PRESSURE ZONE BOUNDARY
MWD MAINS
INTERTIES
CONNECTION TO MWD SOURCE
PUMP STATIONS
RIVER/LAKE
SCALE N.T.S.
J-5

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THE PLANNING CENTER
CITY OF ANAHEIM WATER
SERVICE AREA FACILITIES MAP

JOB NO. 2TPC010800 | DATE: 10-16-02

EXHIBIT
A

Water Demands

TABLE 1
City of Anaheim Water Duty Factors[1]

Land-Use	Duty Factor (gpm/acre)	Duty Factor (gpd/acre)	Duty Factor (AFY/acre)
Commercial-Recreational	5.60	8064	9.03
General Commercial	3.29	4738	5.31
Service Commercial	1.40	2016	2.26
General Industrial	2.11	3038	3.40
SFR (Hillside)	1.96	2822	3.16
MFR (Hillside)	2.39	3442	3.86
SFR (Flatland)	3.17	4565	5.11
MFR (Flatland)	3.65	5256	5.89
Parks/Golf Courses/Open Space	0.66	950	1.07
Other[2]	0.50	720	0.81

1. Per the November 1999 City of Anaheim Water System Planning Study (Parsons).
2. Includes demands associated with schools, water use areas, and public facility designations.

Demand Factors:

Maximum Day Demand (MDD) = 1.6 times Average Day Demand (ADD)
Peak Hour Demand (PHD) = 1.19 MDD (flat land)
Peak Hour Demand (PHD) = 1.62 MDD (hill and canyon areas)

Note: Theses factors are used on a regional basis and are not applied to individual projects.

Fire Flows

TABLE 2
Fire Flow Requirements by Land Use Designation[1]

Land-Use Designation	Fire Flow Objective (gpm)	Fire Flow Duration (hours)
Low Density Residential	1500	2
Medium density Residential	2500	2
Multi-family Residential	3000	3
Commercial/Schools	4000	3
Industrial	5000	3

1. Per the November 1999 City of Anaheim Water System Planning Study (Parsons).

Water Supply

TABLE 3 Recommended Criteria for Water Supply		
Storage Type & Volume Provided	**Minimum Required Supply Capacity[1]**	**Required Stand-by Power**
Gravity – Diurnal, Fire & Emergency	MDD plus replace Fire Volume within 24 hours, and with the largest production unit out of service	Standby power to provide fire flows and replenish storage
Gravity – Fire	PHD plus replace Fire Volume within 24 hours, and with the largest production unit out of service	Standby power to meet PHD or the MDD plus Fire Demand, whichever is larger
Non-Gravity – Diurnal, Fire & Emergency	PHD or the MDD plus Fire Demand, whichever is larger, plus replace Fire Volume within 24 hours, and with the largest production unit out of service	Standby power to meet PHD or the MDD plus Fire Demand, whichever is larger
None	PHD or the MDD plus Fire Demand, whichever is larger, and with the largest production unit out of service	Standby power to meet PHD or the MDD plus Fire Demand, whichever is larger

1. Per the November 1999 City of Anaheim Water System Planning Study (Parsons).

Storage

The total required storage consists of water for equalization, fire and emergency storage. The following summarize those requirements.

Equalization Storage: Flat Land = 5% of MDD
Hillside = 15% of MDD

Fire Storage and Emergency Storage: Fire storage consists of the volume needed to meet the fire flow requirements (in terms of flow rate and duration) listed in Table 2. The amount of emergency storage required depends on several different factors and varies throughout the system. Section 5 of the Parsons study discusses emergency storage in detail based on the following:

- The type of emergency (failed pipelines, failed pumps, etc.)
- Probable duration of the emergency
- Other sources of emergency water (such as the interconnections to other agencies)
- Probable existence of multiple emergencies (such as those which might exist in a major earthquake)
- Other similar factors.

Transmission and Distribution

TABLE 4
Recommended Hydraulic Design Criteria for Pipelines

Type of Pipeline	Diameter (inch)	Flow Condition	Maximum Velocity (fps)	Maximum Headloss (ft/1000ft)
Transmission	16 and larger	Maximum Day or Peak Hour	5	3
Distribution	12 and smaller	Peak Hour	5	10
		Maximum Day plus Fire Flow	10	None
Reservoir Inlet/Outlet	As required	Peak Hour or Maximum Day plus Fire Flow (see Note 1)	5	3

Notes:
1. The peak hour and maximum day demand for a given pressure zone is assumed to be shared equally by all reservoirs in the pressure zone. Assume fire flow is not shared equally and can come from any reservoir in the pressure zone.
2. Per the November 1999 City of Anaheim Water System Planning Study (Parsons).

TABLE 5
Recommended Minimum Distribution System Pipe Sizes

Fire Flow (gpm)	Dead-End Pipelines[1]	Looped Pipelines
1500	8-inch	6-inch[3]
2500	12-inch[2]	8-inch
3000	12-inch	8-inch
4000	Not Recommended	12-inch[2]
5000	Not Recommended	12-inch[2]

Notes:
1. Assumes a 500-foot long pipeline from an appropriately sized feeder main; shorter dead-end mains can be reduced one size.
2. Anaheim does not allow 10-inch pipelines in new construction.
3. 8-inch is the recommended size for new construction.
4. Per the November 1999 City of Anaheim Water System Planning Study (Parsons).

Operation and Other Components

TABLE 6		
Recommended Minimum Distribution System Pressure		
Flow Condition	**Minimum Pressure (psi)**	**Maximum Pressure (psi)**
Peak Hour Demand	40	
Maximum Day Demand plus Fire Flow	40 within service area 20 at flowing hydrant(s)	
Minimum Demand		80 recommended 150 maximum
Diurnal Variation	12.5% below average operating pressure	12.5% above average operating pressure

1. Per the November 1999 City of Anaheim Water System Planning Study (Parsons).

IV. METHODOLOGY

The methodology presented herein was developed commensurate with the appropriate level of detail associated with General Plan efforts. Any detailed analyses would be conducted as part of a future City-wide Water System Planning Study and Capital Improvement Projects, and that for General Planning purposes a compilation of previous studies supplemented with a macro-level, order of magnitude assessment of the water system is sufficient.

As noted previously, the two primary sources of information used in this report were the City of Anaheim Urban Water Management Plan of December 2000 (Public Utilities Department) and the City of Anaheim Water System Planning Study of November 1999 (Parsons Engineering Science). These were used to identify the current water distribution system, the current system deficiencies, and recommended system improvements.

Based upon the Parsons 1999 Water Planning Study, water system constraints were identified. Parsons and the City of Anaheim Water Division Staff developed these scenarios and analyses jointly.

V. BASELINE CONDITIONS

The City's water system serves the entire City plus some unincorporated areas of Orange County. The system includes approximately 739 miles of water mains, 61,300 active water meters, and over 7,600 fire hydrants. The system facilities also include eight water connections to the Metropolitan Water District of Southern California (MWD), 27 active wells, one 920 million gallon (MG) reservoir for untreated water, one 15 million gallons per day (MGD) water treatment plant, 13 reservoirs with a total capacity of more than 85 MG for treated water and nine booster pump stations.

The City utilizes two primary sources of water supply: groundwater produced from City-owned wells and imported water from the Metropolitan Water District of Southern California (MWD). In addition to these sources, the City maintains fifteen (15) interconnections with adjacent water purveyors that are available for emergency service.

The City's water system serves areas ranging in elevation from less than 60 feet to over 1,200 feet above sea level. In order to provide appropriate operating pressures for such a wide range of elevations, the water system is divided into 18 pressure zones. The lowest pressure zone operates at a static hydraulic grade line (HGL) elevation of 220 feet above sea level and the highest pressure zone has a static HGL elevation of 1,320 feet above sea level. The City's water distribution system is generally divided into two main geographic areas; the "Flatland Area" (i.e. 555 HGL elevation and below) and the "Hill and Canyon Area" (i.e. the 585 HGL elevation and above). The Flatland Area is approximately 21,000 acres, situated generally north and west of the Santa Ana River, and is almost entirely served by groundwater (with MWD imported water supplemented, as necessary). The Hill and Canyon Area is approximately 11,000 acres, situated generally south and east of the Santa Ana River, and is served primarily by imported water from MWD.

Projected supplies for the City are summarized in Table 7.

TABLE 7
Current and Projected Water Supplies (AFY)[1]

Water Supply Sources	1999-2000	2004-2005	2009-2010	2014-2015	2019-2020
Anaheim Produced Groundwater	52,915	63,500	70,000	72,000	72,300
Imported Water from MWD	27,153	21,200	23,300	24,000	24,100
Total	**80,068**	**84,700**	**93,300**	**96,000**	**96,400**

1. Per the December 2000 City of Anaheim Urban Water Management Plan.

Notes:

- The above 1999-2000 data reflect actual numbers.
- The forecasted data assumes a City water supply breakdown of 75% City produced groundwater, and 25% MWD import water.
- Forecasted total supplies are rounded to the nearest "hundred".

Based on a review of the Water System Planning Study prepared by Parsons Engineering Science (1999) and of the Urban Water Management Plan (2000), it is concluded that there is no evidence of widespread deficiencies in the City's water supply and distribution system based on the current General Plan land uses. There are improvements recommended to be undertaken which are directed at achieving operational goals or improving overall system efficiency and reliability.

The East End development area requires facilities to be built, as new development occurs to meet ultimate demand conditions. The Parsons study identifies the recommended system improvements in that area. Any changes in ultimate land use would need to be analyzed to determine impacts on recommended system improvements.

VI. OPPORTUNITIES AND CONSTRAINTS

The City of Anaheim has two major opportunities to increase available water in the system. These opportunities consist of increased purchases from the Metropolitan Water District of Southern California (MWD) or increased pumping of ground water.

The City of Anaheim currently maintains fifteen (15) interconnections with neighboring cities and water districts. These include the City of Garden Grove, City of Orange, City of Fullerton, Southern California Water Company, and the Yorba Linda Water District. The primary purpose of these interconnections is to supply water during emergency situations or other temporary necessity. The amount available to the City is dependent on the capacity and hydraulic conditions of the neighboring agency's water systems.

Anaheim's primary source of water is groundwater extracted by the City's owned wells. The Orange County Water District governs the percent of the City's need that can be pumped without paying a premium rate known as the "Basin Equity Assessment." The balance of the City's requirement is met through purchases from the Metropolitan Water District (of which the City is a member agency). The exact proportion of pumped water versus purchased water varies based on the rates charged by MWD, the cost of pumping, and the Equity established by OCWD. Typically, the City pumps 75% of its annual water supply.

MWD provides a second source of water to the City of Anaheim to supplement the quantity pumped from the groundwater basin. The City has one untreated and seven treated connections to the MWD supply that accounts for approximately 25% of the total system water. Based on current projections, the City will purchase approximately 24,000 acre-feet per year (AFY) by the year 2020. The total capacity of the connections to the MWD system, including the untreated connection, is approximately 111,000 AFY.

A Seasonal Storage Service program was developed by MWD primarily to increase storage water in the region's groundwater basins. This is achieved by discounting the water sold to the City if the City agrees to participate in the following: Increase water supply by conjunctive use of imported and local water supplies, construction of additional local production facilities, reduction of the City's dependence on MWD water during summer months and times of shortage, and defer MWD's expenditures on capital improvements that would be required to meet summer peak demands if the program did not exist. This results in a cost saving to the City that can be passed on to the ultimate consumer or used for upgrading the system to meet its ultimate needs.

The City actively pursues the opportunity to increase the availability of water supplies by exercising good practices in conserving the resource and requiring customers to do so. These measures may include project specific requirements such as:

1. Requiring that an owner/developer to incorporate the following water conservation measures into the project:

- Use of low-flow sprinkler heads in irrigation systems
- Use of waterway re-circulation systems
- Use of low-flow fittings, fixtures, and equipment including low flush toilets and urinals
- Use of self-closing valves on drinking fountains
- Using reclaimed water for irrigation and washdown when it becomes available
- Use of a cooling tower re-circulation system
- Use of water efficient ice machines, dishwashers, clothes washers, and other water-using appliances
- Use of irrigation systems that operate primarily at night when evaporation rates are lowest
- Provide water conservation information to the public in conspicuous places
- Use of water-conserving landscape plant materials where feasible
- Use of vacuums and other equipment to reduce the use of water for exterior uses

2. Requiring an owner/developer to submit a certified water audit for landscape systems.

3. Requiring an owner/developer to install a separate irrigation meter if the landscaping area(s) for the total project exceeds two thousand five hundred (2,500) square feet (Chapter 10.19 of the Anaheim Municipal Code and Ordinance No. 5349).

The City has adequate storage to serve its population in the current demand. An additional 14 MG is identified as being required to accommodate new developments in the eastern part of the City. These developments will also require improvements to the transmission mains in Anaheim Hills Road and Santa Ana Canyon Road.

A detailed discussion of improvements needs to be undertaken concurrently with the buildout approved in the current general plan, which is presented in Chapter 9 of the Parsons study.

VII. REFERENCES

Water System Planning Study for the City of Anaheim, Parsons Engineering Science, November 1999.

Urban Water Management Plan, City of Anaheim, Public Utilities Department, December 2000.