LAKE HEMET MUNICIPAL WATER DISTRICT

WATER MASTER PLAN

NOVEMBER 2010
96006-037

ENGINEERING RESOURCES
OF SOUTHERN CALIFORNIA, INC.

LAKE HEMET MUNICIPAL WATER DISTRICT

WATER MASTER PLAN

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ENGINEERING RESOURCES
OF SOUTHERN CALIFORNIA, INC.

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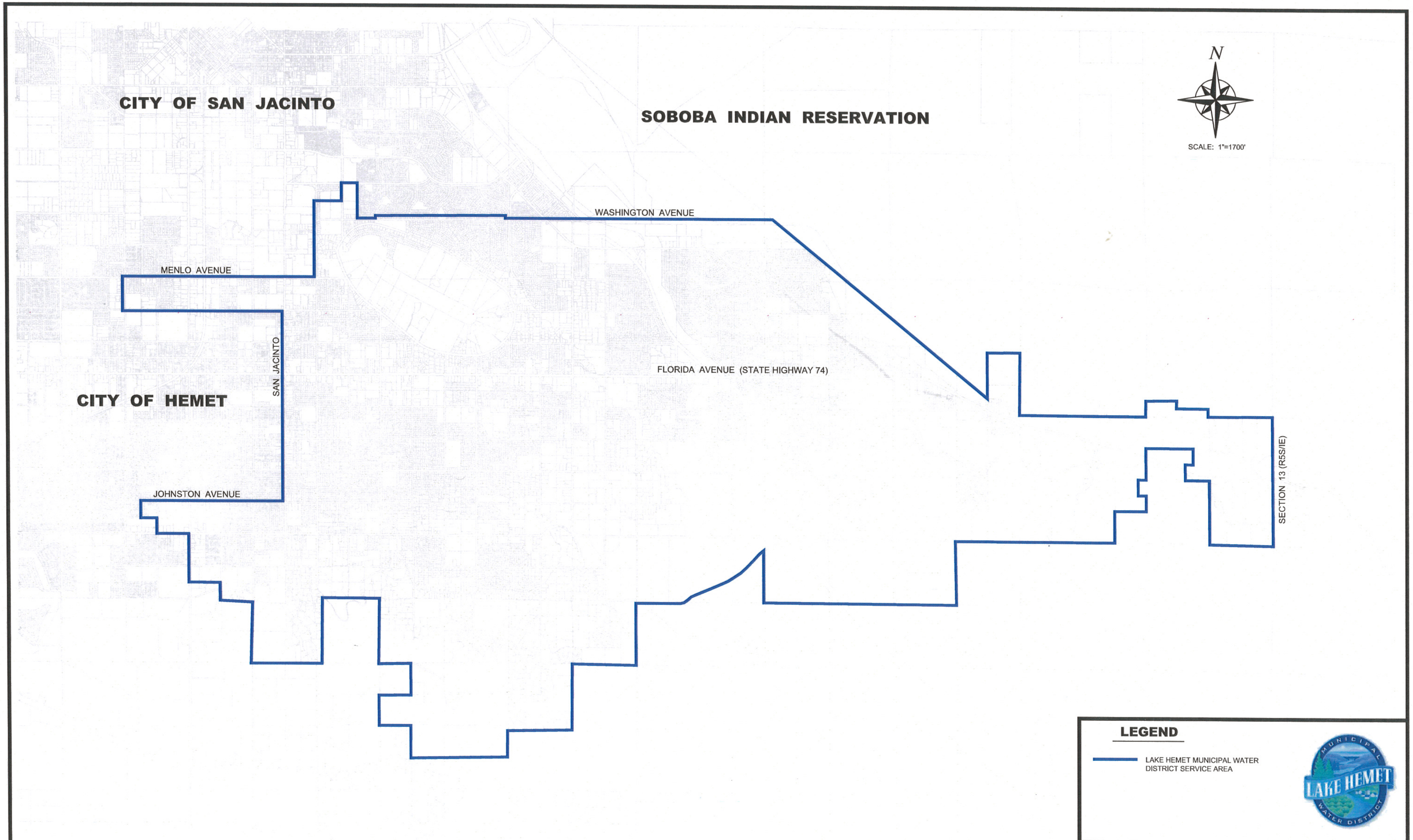
INTRODUCTION

BACKGROUND

The Lake Hemet Municipal Water District (District) service area encompasses a total of approximately 12,700 acres, and consists of a mixture of residential development and agricultural uses, comprised mostly of citrus groves. The District's overall service area is shown on Figure 1-1, and is bounded on the north by Menlo Avenue and Washington Avenue, to the east by the eastern bounds of Section 13 (R5S/IE), to the south by the Santa Rosa Hills and to the west by the City of Hemet. There are a number of issues facing the District for which the planning and associated funding mechanisms must be identified. These issues include the following:

- The growth within the District service area and the potential need for supplemental water supplies, additional transmission mains, distribution pipelines, and storage facilities;
- The need to continue with the capital facilities replacement program;
- The continuing legal and engineering efforts related to the Soboba Band of Mission Indians water rights settlement;
- The planning and integration of other major capital expenditure or replacement programs.

In order to support the District's projected growth, continue to provide existing and new customers with an adequate and reliable water supply, and provide the District with a tool to identify and evaluate District-wide capital improvements in an efficient and cost-effective manner, the District needs an up-to-date, comprehensive water master plan which will provide the District with the appropriate vehicle to formally develop, plan, and implement an assessment of the existing water system and an evaluation of what additional facilities will be required in the future.



LAKE HEMET MUNICIPAL WATER DISTRICT

EXISTING SERVICE AREA

FIGURE 1-1

S:\Lake Hemet Municipal Water District\96006.037-Water Model\Report\96006037-Figure 1-1.dwg, 5/7/2010 10:53:21 AM, Adobe PDF (temporary).pc3

Project Objectives

To meet the District's goal of updating the Water Master Plan to guide its future water system expansion and operation, the following project objectives were identified:

1. Evaluate the current system's adequacy;

2. Update the capital improvement program (CIP) to remove completed projects and add identified projects to meet the needs of existing users and increase system reliability, and identify what specific supply sources and facilities will be required to provide service. The CIP will also integrate issues regarding infrastructure, the Soboba water rights settlement, and the planning of other major capital expenditures such as the purchase of construction equipment and vehicles, campground upgrades, and the budgeting and financing required to support these future expenditures.

3. Analyze potential supplemental supply options and identify the required infrastructure needed to meet the projected demands through 2030.

Abbreviations

The following abbreviations are used throughout the remainder of this report:

acre	ac
acre-feet	af
acre-feet annually	afa
acre-feet per day	afd
acre-feet per year	af/yr
acre-feet/acre/year	af/ac/yr
average-day demand	ADD
California Department of Public Health	CDPH
cubic feet	cf
cubic feet per second	cfs
Department of Water Resources	DWR
dwelling unit	DU
Engineering News Record	ENR

Environmental Impact Report	EIR
Environmental Protection Agency	EPA
equivalent dwelling unit	EDU
feet per second	fps
fire demand	FD
gallons per capita per day	gpcd
gallons per day	gpd
gallons per minute	gpm
gallons per minute per square foot	gpm/ft^2
Ground Water Disinfection Rule	GWDR
hours	hrs
inch	in
linear foot	lf
maximum-day demand	MDD
maximum contaminant level	mcl
milligrams per liter	mg/L
million gallons	mg
million gallons per day	mgd
Municipal and Industrial	M&I
Operations and Maintenance	O&M
peak-hour demand	PHD
pounds per square inch	psi
pressure reducing valve	PRV
pressure sustaining valve	PSV
Safe Drinking Water Act	SDWA
State Water Project	SWP
Total Dissolved Solids	TDS
Total Organic Carbon	TOC
United States Bureau of Reclamation	USBR
United States Geological Survey	USGS
Water Treatment Plant	WTP

CHAPTER 2

DESCRIPTION OF EXISTING WATER SYSTEM FACILITIES

INTRODUCTION

This chapter provides a summary of Lake Hemet Municipal Water District's (District) existing water system including water supply, treatment, distribution and storage facilities. The information detailed in this chapter was developed from the following:

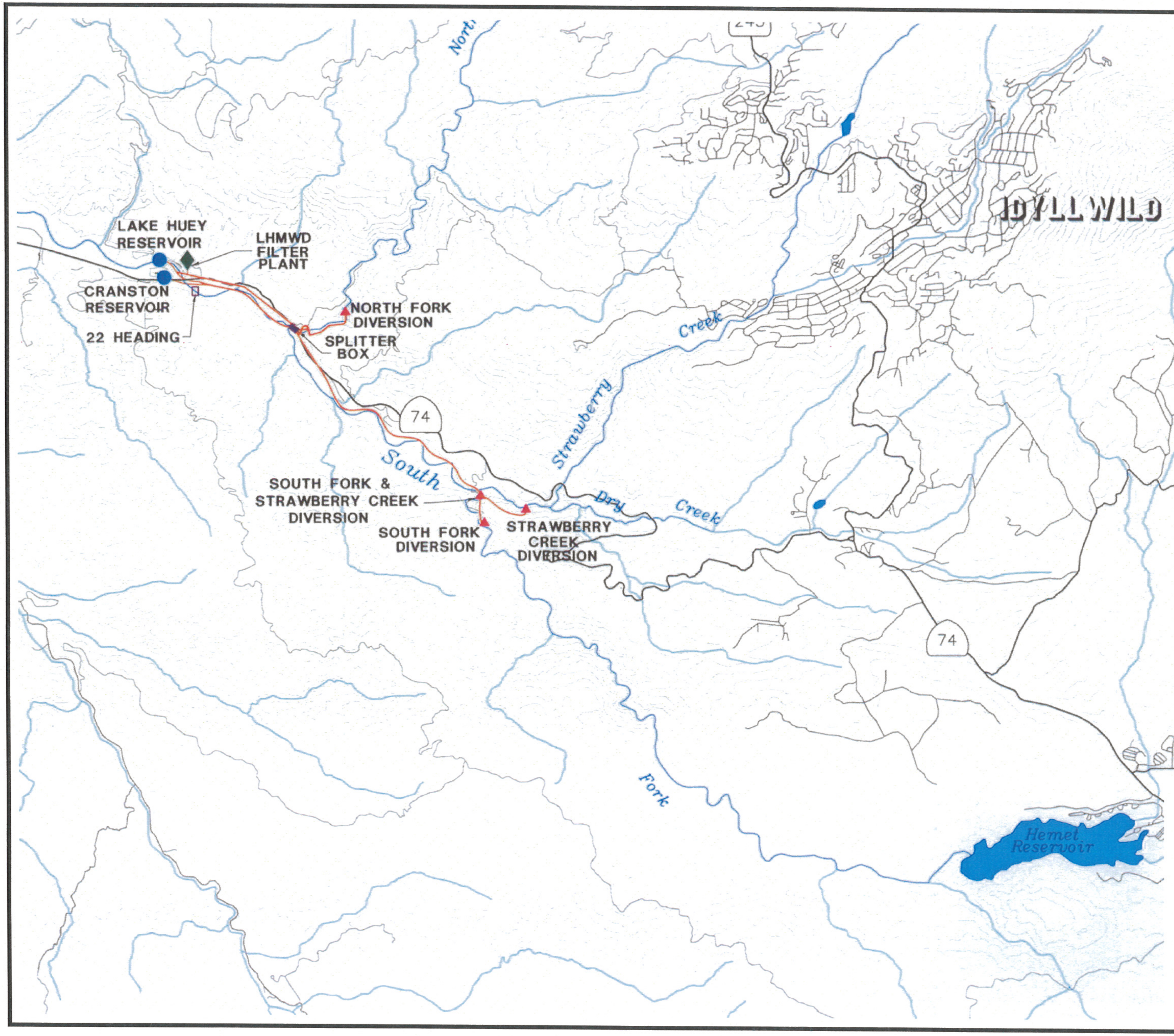
- Meetings with District staff to identify and collect available information, studies, reports, designs, and operational data;
- In depth field review of the District water system with District operational staff regarding the District's facilities and to provide an opportunity for District staff to exchange their views on system operations, adequacy of facilities and known inadequacies.

WATER SUPPLY AND TREATMENT FACILITIES

The District's water supply and treatment facilities can be divided into three groupings: surface water intakes, groundwater production wells, raw water storage reservoirs, and imported water from EMWD. The following sections provide details for each of these facilities.

Surface Water Intakes

The District has three primary surface water intake structures. The South Fork Diversion Structure, located approximately six miles downstream of Lake Hemet Dam, diverts water into a pipeline from the South Fork of the San Jacinto River. Approximately 0.5 miles downstream of the South Fork Diversion structure, flow diverted from Strawberry Creek joins the diverted South Fork pipeline flow. This combined flow is then conveyed to a collection box located in the North Fork drainage basin. Surface flows from the North Fork Diversion structure are also conveyed to the collector box and commingled with water from Strawberry Creek and South Fork. From there the water is transported by pipeline into either the Cranston Reservoir or Lake Huey, for subsequent release into the District's concrete irrigation flume, and ultimate delivery to its agricultural customers. The District also has the ability to divert surface water at two other locations. One location is known as the 22 Heading, located upstream of Cranston Reservoir in the San Jacinto River. The 22 Heading is capable of diverting flow from San Jacinto River into the Cranston Reservoir. The District can also divert flow from the Bautista Canal into the District's spreading grounds located on the west side of the Bautista Canal, just north of Florida Avenue. The locations of these diversion points are shown on Figure 2-1.



LAKE HEMET MUNICIPAL WATER DISTRICT

SURFACE WATER DIVERSION FACILITIES

FIGURE 2-1

Wells

Of the 20 wells used by the District to meet demands, the District owns 11 wells which provide supply to the domestic water system, and 6 wells which supply the irrigation system. These wells are located primarily in the northeastern portion of the District's service area, just south of the San Jacinto River from which they are recharged. In addition, the District also has agreements with the owners of M&M Well, located in the District's Upper Pressure Zone near Bautista Creek, McMillan (aka Temecula Ranchos) Well located in the District's Lower Pressure Zone, and Sprowl Well. These wells provide the District with an additional source of water. In exchange for the water provided to the District from these wells, the District provides agricultural water to the owners at various citrus groves located in the Valle Vista area and at the mouth of Bautista Canyon. Total well production averages about 11,500 acre-feet annually (afa). The current capacities of all the above wells are presented in Table 2-1.

Table 2-1 Well Capacity

Well	Capacity (gpm)	Horsepower	Pump Setting (ft)	Well Depth (ft)	Pressure Zone	District Owned
1A	100	15	147	760	Upper System	Yes
2	800	125	400	526	Upper System	Yes
4	425	50	280	377	Upper System	Yes
8	300	125	500	557	Lower System	Yes
9	800	200	510	1,300	Lower System	Yes
10	1,200	150	400	615	Upper System	Yes
11	485	200	700	270	Lower System	Yes
14	690	100	390	478	Upper System	Yes
15	125	30	400	513	Upper System	Yes
M&M (a)	1,600	250	540	1,297	Upper System	No
WLB	1,650	400	540	1,230	Lower System	Yes
McMillan (a)	1,200	200	540	1,345	Lower System	No
Webcor	650	125	540	1,016	Lower System	Yes
5	120	50	410	732	Irrigation	Yes
A	300	100	370	408	Irrigation	Yes
B	180	60	400	410	Irrigation	Yes
D	400	125	420	430	Irrigation	Yes
E	400	200	420	600	Irrigation	Yes
F	700	125	400	522	Irrigation	Yes
Sprowl	310	125	420	461	Irrigation	No
Total	12,435					

(a) The District is leasing this well

Source: District staff

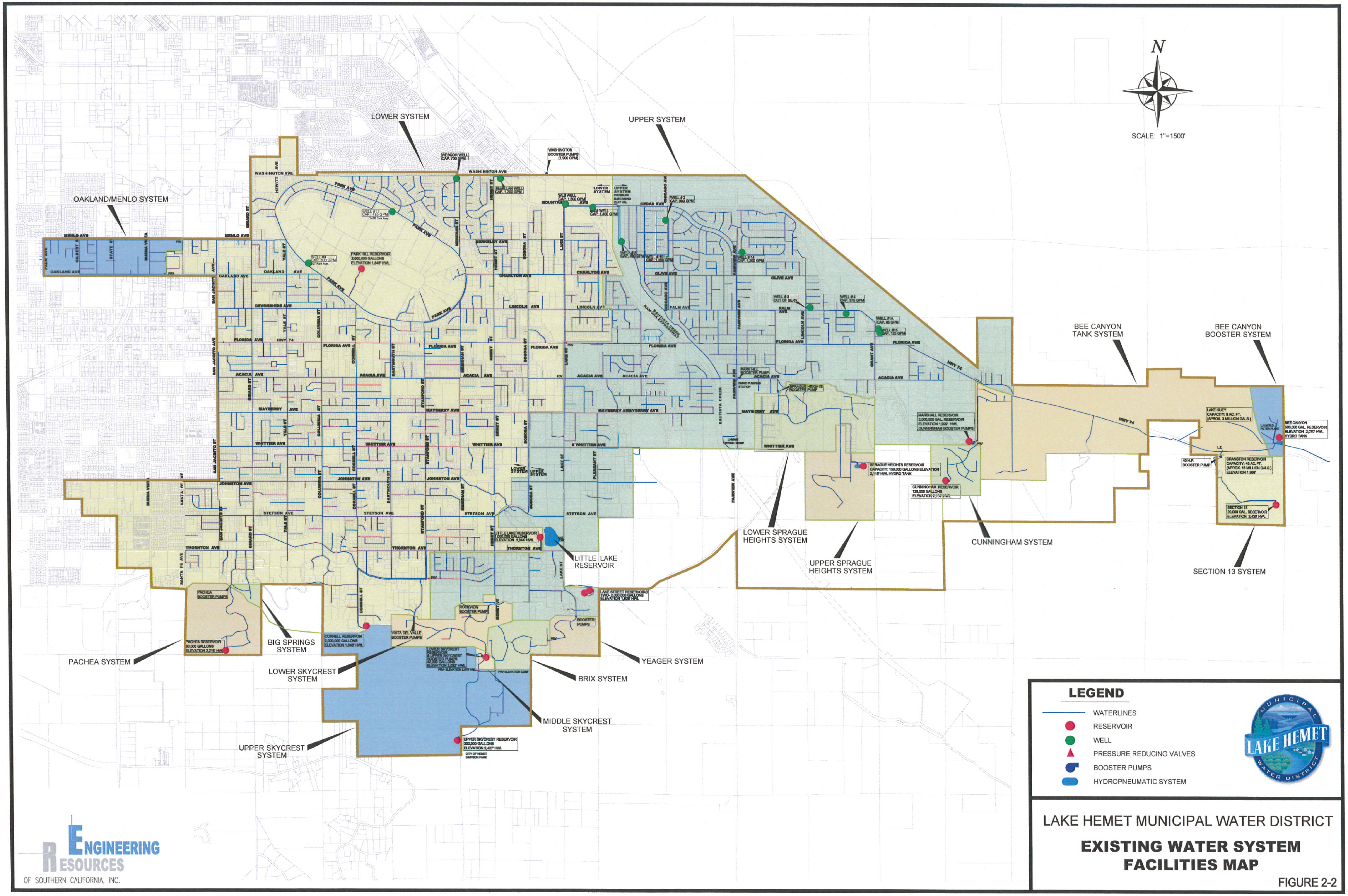
Raw Water Reservoirs

The District has four raw water storage reservoirs. Besides the District's Lake Hemet Reservoir, the other three are primarily used as regulating reservoirs for the irrigation system. The Cranston Reservoir is located near the east boundary of the District's service area, north of Highway 74. This regulating reservoir is used to provide District personnel with more operational flexibility in meeting agricultural demands. This facility was constructed in 1991 and is capable of storing up to 49.9 acre-feet (af) or approximately 16 million gallons (mg) of water. Natural runoff and diverted surface water are stored in Cranston for short periods of time and then released for agricultural irrigation use. Lake Huey Reservoir has a capacity of approximately 3 mg and is located slightly north of Cranston Reservoir. The third reservoir, Little Lake, serves as the terminal reservoir for the District's irrigation flume system. These reservoirs are shown on Figures 2-1 or 2-2. The District also operates a raw water storage tank (Marshall Tank). This above ground 1 mg steel storage tank is located adjacent to the domestic water Marshall Tank near the southeastern edge of the District's service area. The raw water Marshall Tank is used in conjunction with the other raw water reservoirs (Cranston, Huey, and Little Lake) to provide regulating storage capacity for the irrigation system.

DISTRIBUTION AND STORAGE

Potable Water Storage

There are thirteen domestic water storage tanks located in the District's main valley water distribution system. The locations of each of these storage tanks are shown on Figure 2-2 and their capacities are presented in Table 2-2. These storage facilities provide the District with storage capacity to meet diurnal demand fluctuations, demands during power outage conditions, and provide fire flow reserve. The reservoirs are generally in good condition and are routinely inspected. The current total system storage is 12.2 mg.



LAKE HEMET MUNICIPAL WATER DISTRICT

EXISTING WATER SYSTEM FACILITIES MAP

FIGURE 2-2

Table 2.2 Existing Potable Water Storage Facilities

Tank	Capacity (mg)	Pressure Zone	Height (ft)	Nominal Elevations (ft)	
				Floor	HWL
Bee Canyon	0.50	Bee Canyon	24	2,047	2,070
Cornell	2.00	Lower System	32	1,813	1,845
Cunningham	0.12	Cunningham	24	2,086	2,109
Lake Street East	2.00	Upper System	32	1,895	1,927
Lake Street West	2.00	Upper System	32	1,895	1,926
Little Lake	1.00	Lower System	32	1,813	1,844
Lower Skycrest	0.04	Lower Skycrest	16	2,017	2,032
Marshall West	2.00	Upper System	40	1,890	1,929
Pachea	0.06	Pachea	24	2,192	2,216
Park Hill	2.00	Lower System	32	1,814	1,845
Section 13	0.02	Section 13	16	2,414	2,430
Sprague Heights	0.15	Sprague Hts.	8	2,107	2,115
Upper Skycrest	0.40	Upper Skycrest	32.5	2,396	2,427
Total Storage Capacity	12.2 mg				

Source: District staff

Distribution

The distribution system shown on Figure 2-2 has two major pressure zones and fourteen independent hillside pressure zones. The two primary pressure zones (the Upper and Lower) serve the majority of the District's "Valley" service area. Table 2-3 provides a summary of the various pressure zones served by the District.

Table 2-3 Distribution System Pressure Zones

Pressure Zone	Nominal Storage Volume (million gallons)	Service Elevation Range (feet)	Service Zone (feet)
Upper System	6.00	1,691 – 1,862	171
Lower System	5.00	1,598 – 1,800	202
Bee Canyon	0.50	1,830 – 2,047	217
Bee Canyon hydro-pneumatic	0 (a)	1,955 – 2,136	181
Section 13	0.02	1,965 – 2,414	449
Cunningham	0.12	1,902 – 2,086	184
Lower Sprague Heights	0.15	1,810 – 2,065	255
Upper Sprague Heights hydro-pneumatic	0 (b)	1,935 – 2,107	172
Lower Skycrest	0.04	1,759 – 2,017	258
Pachea	0.06	1,710 – 2,216	506
Big Springs	0 (c)	1,710 – 1,761	51
Upper Skycrest	0.30	2,075 – 2,396	321
Brix	0 (d)	1,880 – 2,088	208
Yeager	0 (e)	1,820 – 1,980	160
Oakland/Menlo	0 (f)	1,560 – 1,600	40

(a) 0.50 mg available from Bee Canyon Tank
(b) 0.15 mg available from Sprague Hts. Reservoir
(c) 0.06 mg available from Pachea Tank
(d) 0.30 mg available from Upper Skycrest Tank
(e) 0.30 mg available from Upper Skycrest Tank
(f) 5.00 mg available from Lower System

Source: District staff

The Upper Pressure Zone is a gravity system which extends from the eastern end of the District's service area, west to Lake Street. Water is supplied to this zone by the following District wells: 1A, 2, 4, 10, 14, 15, and M&M. Water is pumped from the groundwater wells serving the upper system directly into the distribution system or through a pump station located at the Marshall Tank site into the Bee Canyon Tank. General characteristics of these booster pumping facilities are provided in Table 2-4.

The Lower Pressure Zone is a gravity system serving the western portion of the District's service area, extending from Lake Street, west to Santa Fe Avenue. Water is supplied to this zone by the following wells and associated booster pumping stations: 8, 9, and 11, Webcor, McMillan, and WLB. Details for each of these stations are presented in Table 2-4.

Water is also delivered into this zone through pressure reducing valves (PRV) from the Upper Pressure Zone at Cedar Avenue (east of Lake Street) and Florida Avenue (east of Lake Street), and through bypass valves at Acacia Avenue (west of Lake Street) and Crest Drive (west of Lake Street).

Table 2-4 Main Pressure Zones: Booster Pump and Motor Characteristics

Booster Pump Name	Approximate Pumping Capacity (gpm)	Horsepower (hp)	Nominal Speed (rpm)	Discharge Pressure (psi)	Pressure Zone
Well #2 Booster	1,070	100	1,770	103	Upper System
Well #10 Booster	1,500	150	1,770	100	Upper System
Well #14 Booster	1,500	200	1,770	88	Upper System
Pipeyard Booster (a)	1,260	75	1,770	59	Upper System
M&M Booster	2,540	250	1,770	124	Upper System
Well #8 Booster	750	75	1,770	68	Lower System
Webcor Booster	1,000	125	1,770	89	Lower System
McMillan Booster	1,580	150	1,770	87	Lower System

(a) Pumps water into the distribution system from wells 1A, 4, & 15 Source: District staff

Water is boosted from the Lower System Pressure Zone up into the Pachea System from a booster pump located on Pachea Trail and to the Lower Skycrest System through the Vista Del Valle booster pumps. The Hillside Pressure Zones receive water that is boosted up through various booster pump stations, the locations of which can be found in Table 2-5.

Table 2-5 Hillside Pressure Zones: Booster Pump Stations

Pump Name	Source Zone	Hp	Service Zone
Pachea	Lower System	25	Pachea
Vista del Valle	Lower System	15	Lower Skycrest
Rockview	Upper System	25/25	Lower Skycrest
Upper Skycrest	Lower Skycrest	60/50	Upper Skycrest
Sprague Heights	Upper System	50/50	Sprague Heights
Sprague Hts. - Hydro-pneumatic	Sprague Heights	15/15	Sprague Heights Pressure
Cunningham	Upper System	50/25	Cunningham
Marshall	Upper System	100/100	Bee Canyon
Bee Canyon Hydro-pneumatic	Bee Canyon	15/20	Bee Canyon Pressure
Section 13	Bee Canyon	75/20/20	Section 13

Source: District staff

Pressure Regulation Between Zones

Currently the District has sixteen valves in the water distribution systems which separate the pressure zones from one another. These valves are used to regulate flow between zones, depending on the system pressure in each zone. Each valve can operate in three different modes:

Pressure Sustaining Valve (PSV) - The valve will maintain a set upstream pressure at the bottom of the zone it is serving. If the pressure increases above this set point, the valve will open and release water into the Lower Pressure Zone. A PSV will not open and release water if the pressure in the Upper Pressure Zone drops below its set point. This serves to maintain a minimum pressure in the Upper Zone.

Pressure Reducing Valve (PRV) - The valve will allow flow into a lower pressure zone, if the pressure in that lower pressure zone falls below the set point of the valve. The valve will remain open until the pressure in the lower pressure zone increases to above the set point of the valve.

By-pass Valve - The valve will allow flow between pressure zones depending on the differential pressures. The District uses this feature at some of their regulation stations to control flow rather than pressure.

Although the valves can operate three different ways, their primary function is that of a PRV. The characteristics of these valves are summarized in Table 2-6.

Table 2-6 Inter-Zone Control Valves

Valve Location	Mode of Operation	Size (in)	Elevation (ft)(a)	Setting (psi)	Source Zone
Cedar Avenue-4 Cedar Avenue-8	PRV/PSV PRV/PSV	4 8	1,673	74/125 70/92	Upper System
Florida Avenue	PRV/PSV	12	1,722	65/85	Upper System
Acacia Avenue	Bypass	12	1,730	NA	Upper System
Crest Drive	Bypass	12	1,742	NA	Upper System
Marshall Tank	Bypass	12	1,889	NA	Bee Canyon
Oakland Avenue	PRV/PSV	6	1,598	72/75	Lower System
Menlo Avenue	PRV/PSV	6	1,578	70/75	Lower System
Rawlings Road-1 Rawlings Road-4	PRV	1 4	2,096	60	Upper Skycrest
Vista del Valle-2 Vista del Valle-4	PRV	2 4	2,094	40	Upper Skycrest
Lower Skycrest Tank	PRV	4	2,024	2	Upper Skycrest
Yeager Tract-2 Yeager Tract-6	PRV	2 6	1,980	45	Upper Skycrest
Big Springs	PRV	3	1710	100	Pachea

Source: District staff; 1998 Master Plan

Backup Power

Backup power generators are installed at seven well sites and at the Sprague Heights hydro-pneumatic system pumps. The well generators establish a firm water supply of 6,890 gpm to the District in the event of a widespread power outage.

Table 2-7 Backup Power Generators

Location	Rating (kW)
Well 2	180
Well 8	230
Well 10	300
Well 14	250
M&M	550
WLB	500
Webcor	250
Sprague Hts. Pneumatic	30

Source: District staff

Pipelines

The water distribution system consists of over 100 miles of pipeline (not including raw water transmission pipelines), some of which are over 100 years old. Existing distribution pipeline sizes range from 2 inches to 20 inches in diameter. The pipeline materials include cement-mortar lined steel, cast iron, asbestos cement, riveted steel, welded steel and PVC. The major transmission and distribution pipelines are shown on Figure 2-2.

The District also has multiple locations throughout their water distribution system where emergency connections exist. All of these locations require a valve to be manually opened or a pump manually started. Depending on the location, these connections are either two-way or one-way connections. The District has emergency two-way domestic connections to Eastern Municipal Water District (EMWD) at the following locations:

- Fairview and Acacia Avenues, and
- Washington Avenue and Hemet Street

The Washington Avenue connection requires EMWD to operate a pump to feed the District. The District also has additional one-way emergency connections with the City of Hemet (Hemet) and EMWD. At these locations the District is able to provide emergency water to either Hemet or EMWD, but is not able to receive water from these agencies. These locations are listed below:

- Menlo Avenue at San Jacinto Street
- Johnson Avenue and San Jacinto Street
- Marion and Santa Fe Avenues
- Park Avenue at Well 9
- Park Avenue at Well 11

Irrigation Distribution System

The District also owns and operates an irrigation distribution system. This system is made up of a gunited irrigation flume which runs along the District's southern "Valley" boundary from the eastern edge of their service area to Little Lake. In addition to the flume, the District operates the 12- and 16-inch diameter "Washburn Pipeline", which provides irrigation water from the District's B, D and E wells to the Washburn property, located in the southeastern area of the valley, west of the Bautista Channel. There is also a 12-inch, C-900, PVC District pipeline which runs along Mayberry Avenue from Soboba Avenue east to the flume. This line is supplied from wells A and F and can deliver water to the flume and east to Marshall Tank via an 18-inch pipeline. EMWD can also deliver water into the District's irrigation system. This point of delivery is at Marshall Avenue and Valle Heights Road, near the Marshall Tank; water can be delivered directly into the Marshall Tank or the flume at this location.

CHAPTER 3

OPERATIONAL AND DESIGN CRITERIA

INTRODUCTION

This chapter summarizes the standard design and performance criteria used to evaluate the adequacy (from a pressure, flow, redundancy and reliability standpoint), of the Lake Hemet Municipal Water District's (District) existing treated water supply and distribution system, and identifies the need for additional water facilities. These criteria were obtained from District documents and a number of other sources, including:

- Discussions with District staff
- California Department of Public Health (CDPH) Waterworks Standards
- Riverside County Fire Department
- American Water Works Association ("AWWA")
- National Fire Protection Association Standards (Uniform Fire Code)
- Insurance Services Office, Inc. (ISO)

Criteria utilized by other water purveyors were reviewed and compared to the District criteria. This comparison provided a method of determining if the District criteria were consistent with other local water agencies throughout California. The results of this review and District comments were used to establish these planning criteria, which were applied to the system in order to evaluate and size future District water facilities and other system improvements.

FIRE FLOW REQUIREMENTS

Discussions with District staff indicate that minimum design standards for fire flows are somewhat variable. However, the fire flow criteria to be used in this Master Plan for sizing and designing pipeline improvements are provided on the following page. In this case, minimum fire flows are to be met concurrently with a maximum-day demand condition, while maintaining a residual system pressure of 20 pounds per square inch (psi) or higher. Fire flows and the expected duration are also used to establish potable water storage requirements. The required fire flows and associated durations to be used in this master planning effort are provided in Table 3-1.

SYSTEM PERFORMANCE EVALUATION CRITERIA

The following operational performance criteria are recommended for use in this Master Plan to evaluate the adequacy of the District's existing potable water distribution system, including potable water storage facilities. These criteria also provide the basis for development of a program of improvements to provide effective service through ultimate build-out of the District. These criteria reflect standard water system planning criteria and design guidelines which have been developed by various state agencies and other water utilities to evaluate water systems under both normal and stressed demand conditions, including maximum-day, fire flows, and peak-hour demand conditions. The criteria to be used in this Master Plan are recommended for use by the District as long-term system performance criteria, and are defined below for critical operational conditions impacting individual water system components.

Table 3-1 Fire Flow Requirements

Land Use	Fire Flow (gpm)	Duration (hours)
Single Family Residential	1,500	2
Multi-Family Residential	1,500	2
Commercial/Industrial/School	3,000 (a)	4

(a) For this Master Plan, a 3,000 gpm fire flow has been used for commercial, industrial and school buildings. Fire flow requirements for these building types should be evaluated on a case by case basis.

Potable Water Supply

The following criteria should be used to assess the adequacy of the District's potable water supply.

Average-Annual Demand – The reliable yield of all sources of supply shall be greater than the projected annual demand on the system. The definition of reliable yield of water supplies is that which can be delivered to the District during the worst drought (delivery in all years). The five-year average annual demand is approximately 8,829 af or 7.88 million gallons per day ("mgd").

Maximum-Day Demand – Total potable water production and supply delivery capacity shall be equal to or greater than the maximum-day demand. Using data from telemetry and operator logs, a maximum-day demand factor of 1.9 times the average-day demand will be used. The five-year average maximum-day demand is 15.5 mgd.

Maximum-Day Demand plus Fire Flow – The water supply system shall have the capability to meet a system demand condition equal to the occurrence of a maximum-day demand concurrent with a fire flow event. If the supply to an individual pressure zone is from a pumped source, the supply requirement shall be met with the largest pump and/or well out of service. The fire flow shall be met through a combination of flow from supply sources and potable water storage tanks.

Peak-Hour – Peak-hour demands shall be met from supply sources and potable water storage tanks and is calculated from average-hour demand during the maximum-day. This is estimated to be 1.7 times the average-hour demand (or 3.23 times average-day demand).

Pumping Facility Criteria

As mentioned above, if pumping facilities are to be used to meet the demands of a pressure zone, sufficient pumping capacity shall be provided so that the maximum-day demand can be supplied with the largest pump out of service. The pumping facility shall also be equipped with a back up energy source of sufficient capacity to operate the pumping plant at its rated capacity. This minimum supply requirement sets the pumping capacity requirement, if the pressure zone includes adequate potable water storage, at sufficient elevation to allow gravity flow to serve the zone.

Water Storage Requirements

Criteria have been defined for determining potable water storage capacity needs within the distribution system and individual pressure zones for the above conditions. Storage requirements can generally be categorized into the following two components:

- Fire storage, and
- Emergency storage

Fire Storage – Fire fighting storage requirements are identified in the Insurance Services Office, Inc. (ISO) guidelines and National Fire Code. These storage requirements are based on flow [in gallons per minute (gpm)] requirements for the building use type (*i.e.* commercial residential, school, industrial *etc.*), size of building (in square feet), and type of construction (wood frame, metal, masonry, installation of sprinklers, *etc.*). Once the fire flow requirement is established, it is multiplied by the required duration. This calculation will provide an estimate of the total volume required for fire flow reserve storage. Currently, the highest fire flow requirement in the District is 3,000 gpm for a duration of four hours for a school and for some commercial buildings. The resulting volume needed for fire flow reserve is 720,000 gallons. Fire flows of 1,500 gpm for a two-hour duration are generally required in foothill areas, equating to a storage volume requirement of 180,000 gallons. The resulting fire flow volume must be stored in reservoirs located within the pressure zone or readily available by gravity from storage located in higher pressure zones.

For the District's future system, the required fire flow storage volume for the Upper and Lower Pressure Zones should be 720,000 gallons, while the foothill pressure zones should provide for a fire flow storage volume of at least 180,000 gallons. Additional discussion is provided in Chapter 7 regarding existing storage volumes within the District, compared to recommended storage quantities.

Emergency Storage – A potable water supply is also required to meet demands during emergency outage periods, when normal supply is interrupted. Such conditions may arise due to power failure, pumping equipment or pipeline failures, or the need to take facilities out of service for repair. The required emergency storage volume is a function of several factors including the diversity of the sources of supply, redundancy and reliability of the production facilities, and the anticipated length of the emergency outage.

The District's potable water is obtained from wells owned by the District and leased from private well owners. During supply shortages, additional water can be purchased from Eastern Municipal Water District (EMWD). Interconnections between the City of Hemet's and the District's water distribution systems allow for a transfer of water in either direction in emergency situations.

The potable water storage requirements as published by the California Department of Public Health in Title 22, Chapter 16 call for a minimum emergency storage volume in each pressure zone equivalent to 1.0 times the average-day demand. For this Master Plan, emergency storage in each pressure zone is equal to one maximum-day demand.

Total Water Storage - The minimum treated water storage capacity in the system available by gravity flow to each pressure zone should thus be the sum of the following:

- **Fire Flow -** Additional storage to provide a fire flow equivalent to the maximum fire flow in the pressure zone times the duration the flow rate must be maintained. Fire flows of 1,500 gpm shall be maintained for two hours in the foothill zones and school fire flows of 3,000 gpm must be maintained for four hours.

- **Emergency -** Minimum storage to provide water during periods when normal supply is interrupted (*i.e.*, loss of wells due to a power failure, pumping equipment or pipeline failure, or facility removal from service for repair, or other outage) shall be equivalent to the District's maximum-day demand.

Table 3-2 summarizes the above storage criteria using an average annual demand of 9,600 af as a base.

Table 3-2 Water Storage Requirements

Storage Component	Actual (mg)	Recommended Current (mg)(b)	Projected Storage 2020 (mg)
Fire		2.34(a)	2.34(a)
Emergency		16.26	19.85
Total	12.19	18.60	22.19

(a) Assumes 3,000 gpm for 4 hours in the Upper and Lower Pressure Zones, and 1,500 gpm for 2 hours in each foothill pressure zones (with the exception of Section 13).
(b) In the event of loss of the District's wells (power failure), 69%+ of District's supply from existing wells with backup generators.

The District has greatly increased source reliability by installing standby generators at District and leased well sites to provide power during local or regional outages. Backup generators have been installed at seven well sites and the Sprague Heights hydropneumatic system pumps. Four of these generators are at well sites located in the Upper System, providing 4,290 gpm or 6.2 mgd of supply and the remaining three generators are at well sites located in the Lower System providing 2,600 gpm or 3.7 mgd of supply. The combined source available to the District in the event of a local power outage is 6,890 gpm or 9.9 mgd, sufficient capacity to meet average day demands. In the event of an emergency, peak day and peak hour demands would be met by a combination of source capacity from wells with backup generators and from existing storage reservoir capacity.

Water Distribution System Sizing

The pipelines and transmission mains in the District's distribution system shall be sized based on the criteria described below for normal, maximum-day, maximum-day plus fire flow and peak-hour demand conditions.

Normal Operation

Service pressures shall be maintained between a maximum of 90 pounds per square inch (psi) and a minimum of 40 psi.

New tanks/reservoirs shall be placed so the overflow elevation is approximately 100 feet above the normal upper service elevation of the pressure zone it is serving.

Hydropneumatic systems will be accepted only upon specific written approval by the District.

Velocity within distribution system pipelines shall not exceed 8 feet per second (fps). Head losses within distribution system pipelines shall be limited to 3.5 feet per thousand feet of pipeline.

Maximum-Day Demand plus Fire Flow

The maximum velocity within the distribution system pipelines shall not exceed 15 fps. The minimum allowable residual pressure at hydrants located in the immediate vicinity of the simulated fire shall be 20 psi or greater.

CHAPTER 4

WATER SUPPLY AND DEMAND

INTRODUCTION

The development of the District's Water Master Plan in 1998, in part, was to fulfill several objectives, as presented below.

- To determine an accurate, detailed distribution of existing water demands for development and calibration of the District's hydraulic model.
- To aid in the assessment of whether existing hydraulic capacity is currently available and/or if deficiencies exist within the District's distribution system.
- To provide a detailed distribution of future water demands for the hydraulic model which represents future planned land uses.
- To aid in the assessment of future system capacity availability and/or deficiencies within the existing distribution system based on the future development of planned land uses.

This chapter describes the existing water supply sources, water production and use patterns for the District, and how this data was used to estimate future water demands and needs. The analysis of current and future demands was conducted for the area within the District's main valley service area, and does not include Garner Valley.

SERVICE AREA

The District's service area encompasses a total of approximately 12,700 acres, and consists of a mixture of residential development and agricultural uses, consisting mostly of citrus groves. The District's overall service area is shown on Figure 4-1, and is bounded on the north by Menlo Avenue and Washington Avenue, to the east by the eastern boundary of Section 13 (R5S/IE), to the south by the Santa Rosa Hills and to the west by the City of Hemet.

EXISTING SOURCES OF SUPPLY

The District currently serves its municipal and industrial (M&I or domestic) customers from two main sources of supply. They are:

- Locally pumped groundwater
- Water purchases from Eastern Municipal Water District (EMWD).

The Eggen Filtration Plant which treated water from North Fork, South Fork and Strawberry Creek from 1982 to 1998 for domestic customers has been decommissioned and is no longer in service.

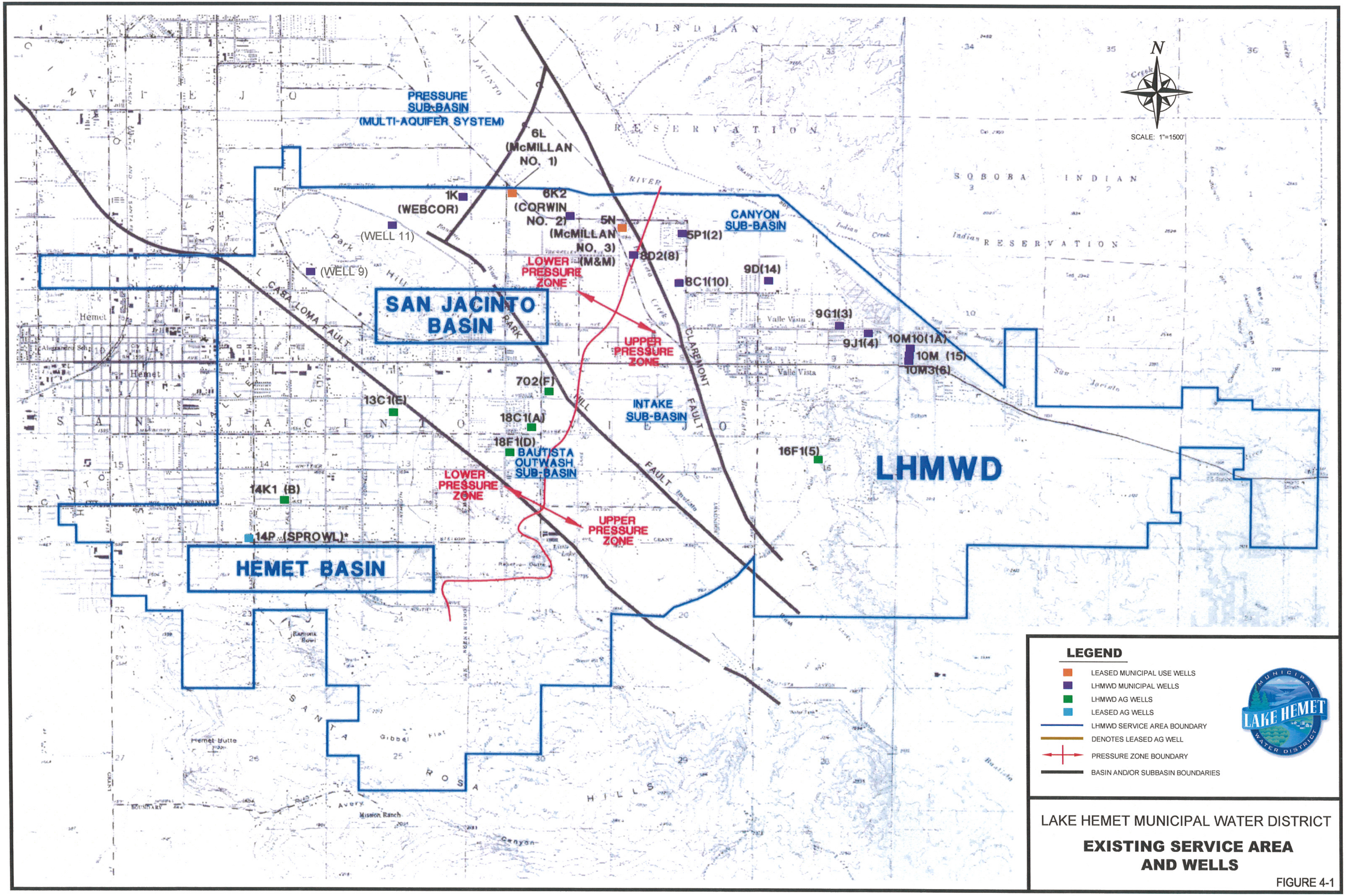
The District also has emergency interconnections with the City of Hemet water system which are normally closed. The following sections describe the historic use, rights and availability of these supply sources.

Local Groundwater

The District pumps groundwater from two local groundwater basins known as the San Jacinto and Hemet Basins. The San Jacinto groundwater basin is divided into several subbasins. Each subbasin contains several production wells and is separated from adjacent subbasins by geologic faults. The location of the subbasins and the District's wells are shown in Figure 4-1. As presented in Figure 4-1, those wells used for domestic supply (municipal and water exchange) are located in the Canyon, Upper Pressure and Hemet South subbasins, with wells used to meet agricultural demands generally located in the Hemet South and Upper Pressure subbasins. Figure 4-2 presents a graphic of the District's total groundwater production (for both domestic and agricultural usage), by basin and subbasin. The Canyon's water storage capacity is limited compared to the other subbasins; consequently, production is closely tied to the amount of precipitation received each year. In years of high rainfall, runoff from the watershed quickly replenishes the aquifer. This makes groundwater more available to the District's wells than during drought conditions when runoff is limited. Production from the Canyon subbasin decreased during the drought years of 2000 – 2004, but picked up again due to increased rainfall in 2005 and 2006. Dry years followed in 2007-2009 reducing production again. The much larger Upper Pressure subbasin becomes the District's main groundwater source during dry periods.

Of the 20 wells used to meet total demand, the District operates 13 wells for its domestic water supply. These wells are located primarily in the northeastern portion of the service area, just south of the San Jacinto River from which they are recharged. Over the last ten years, these wells have produced an average of 10,357 acre-feet annually (afa) with 2007 seeing the highest production at 11,533 acre-feet (af). Quantities of groundwater pumped by the District to meet domestic and agricultural demands are depicted in Figure 4-3. As shown in Figure 4-3, the majority of the groundwater pumped from municipal wells is used for domestic purposes, although a small amount is consumed by agricultural customers.

The District has a one-for-one exchange agreement with the owner of M&M Well, located in the District's Upper Pressure Zone (1890 Zone) near Bautista Creek, and the McMillan (aka Temecula Ranchos) well located in the Lower Pressure Zone (1814 Zone). Both of these wells provide the District with additional domestic water. In exchange, the District provides agricultural water to the owner of the McMillan citrus groves, located in the southeastern portions of Bautista Canyon. Excess water produced from these wells is purchased by the District for the domestic system.



LAKE HEMET MUNICIPAL WATER DISTRICT

EXISTING SERVICE AREA AND WELLS

FIGURE 4-1

S:\Lake Hemet Municipal Water District\96006.037-Master Plan\FINAL REPORTAUG 11 2010\96006037-Figure 4-1.dwg, 10/26/2010 3:33:20 PM

Figure 4-2: Groundwater Production by Sub-basin

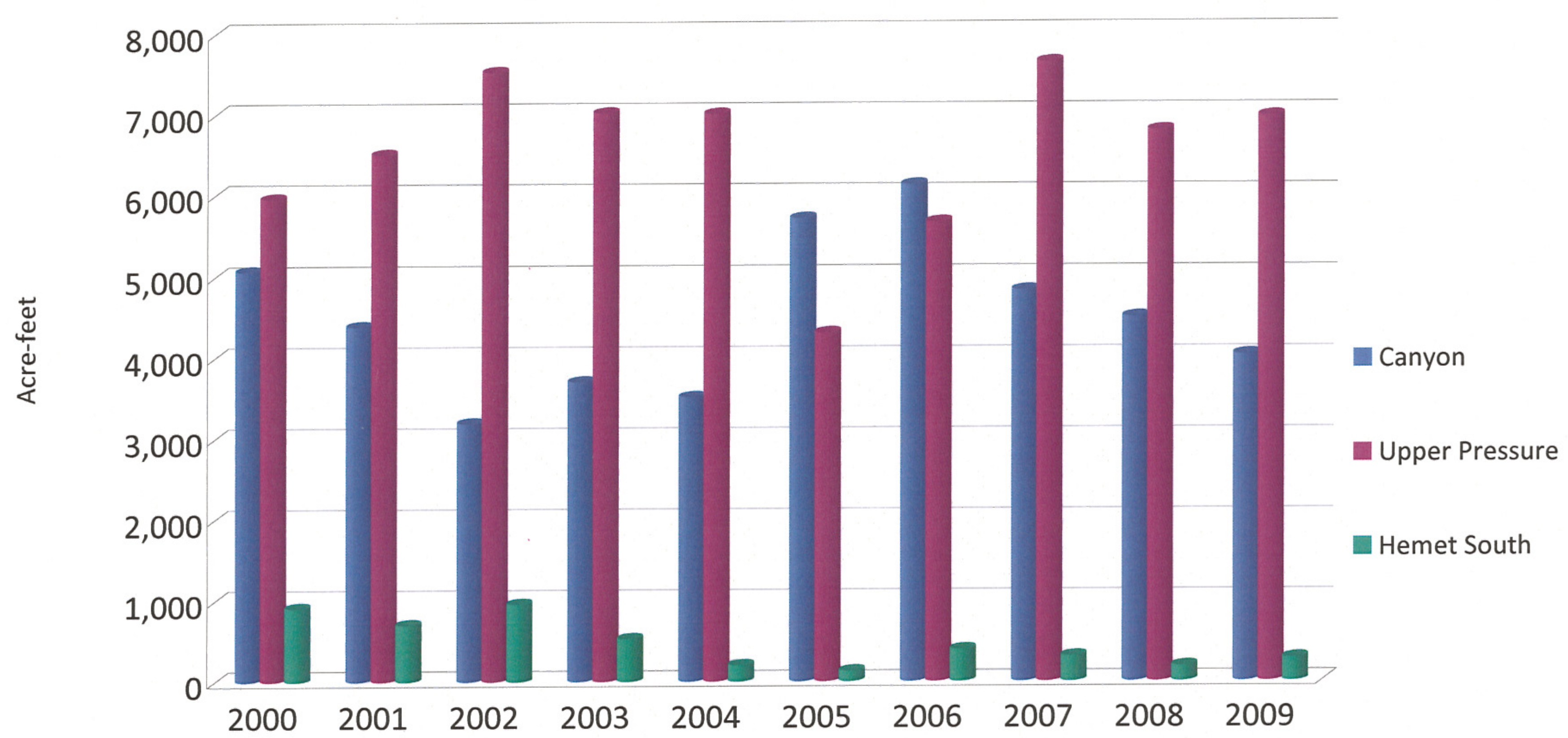
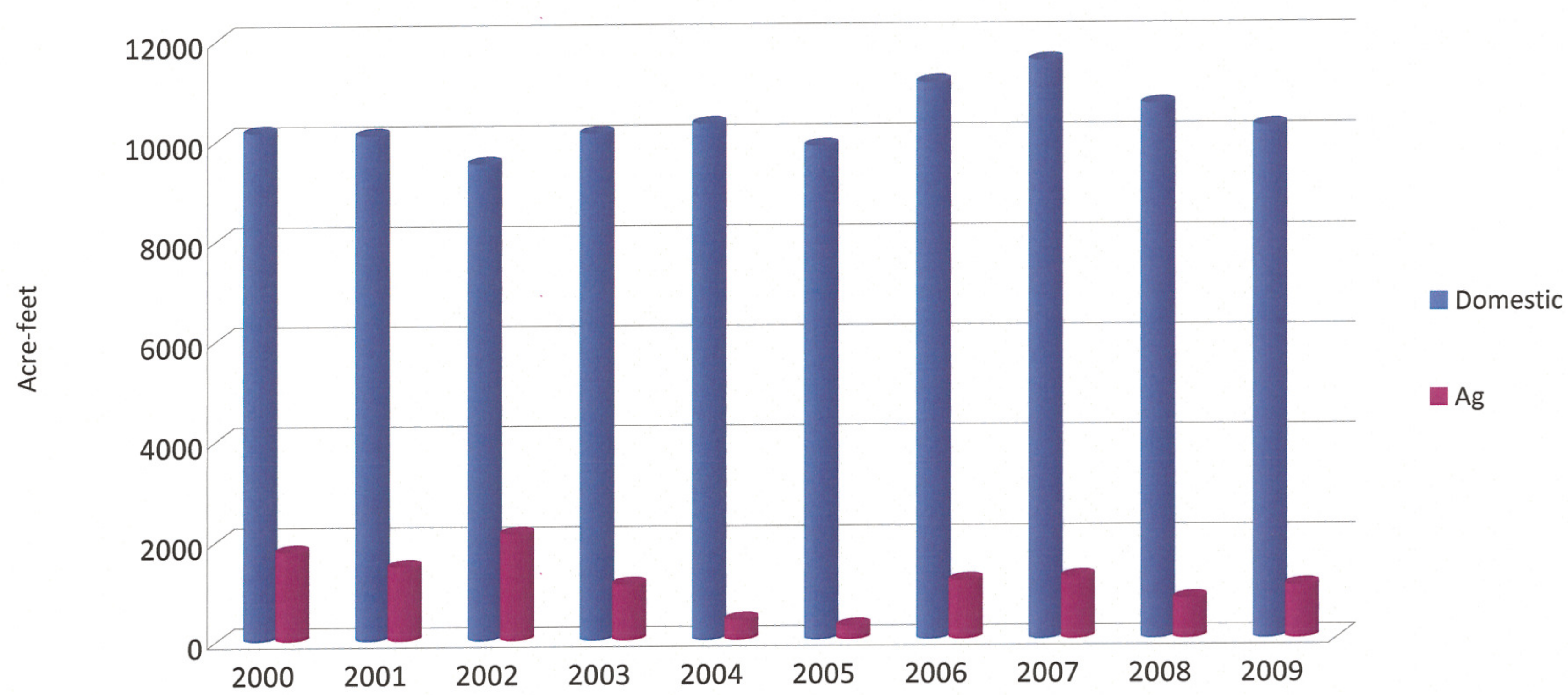


Figure 4-3: Groundwater Production



Diversions from San Jacinto River

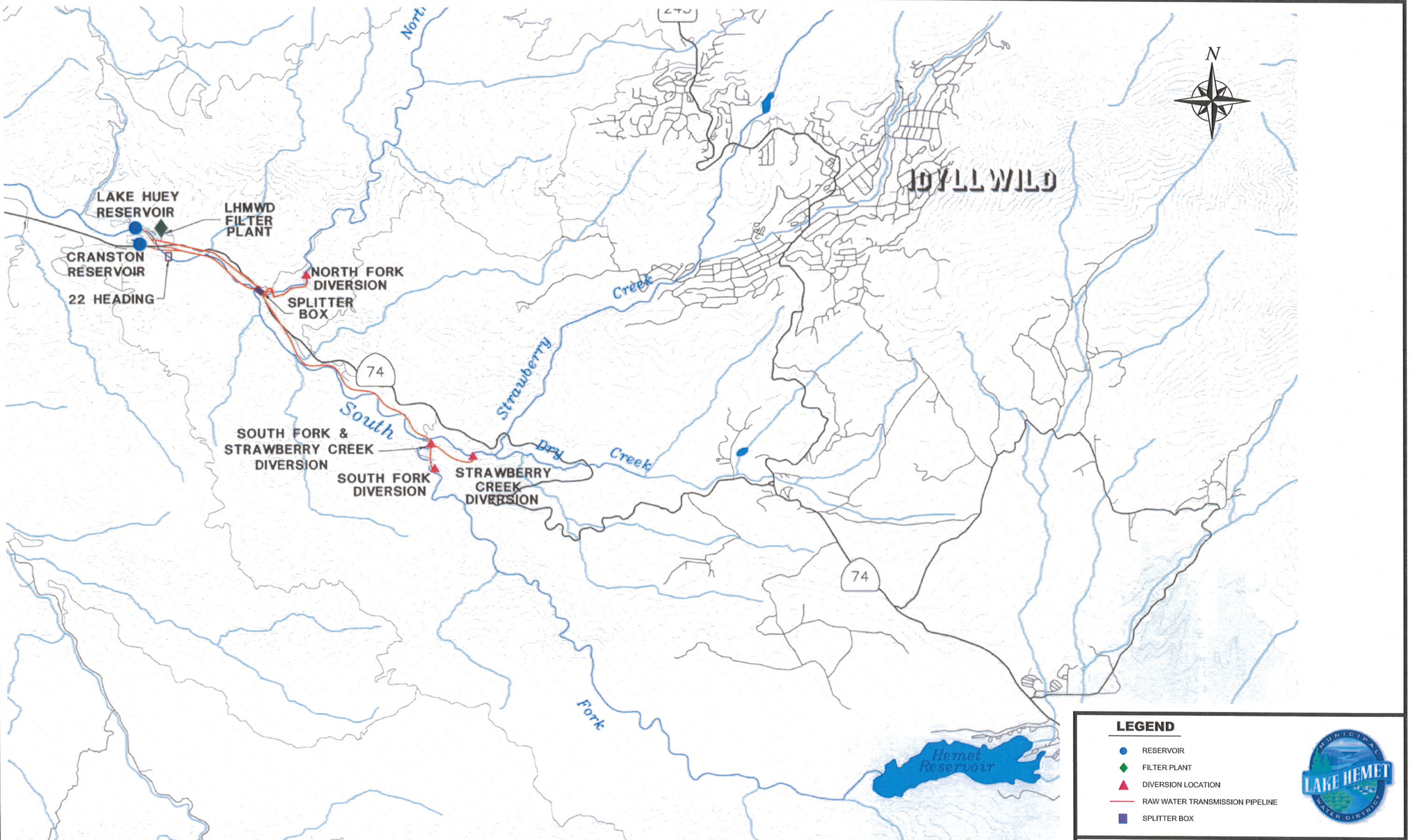
Flow in the upper San Jacinto River is partially controlled by releases from Lake Hemet Reservoir, a water supply/recreation reservoir located about 14 miles east of the District's municipal service area. The District releases water from Lake Hemet to the South Fork of the San Jacinto River and then diverts the water for agricultural uses through the South Fork Diversion Structure located approximately six miles downstream of the dam. Flows from two tributary creeks, North Fork and Strawberry Creek, which join the South Fork of the San Jacinto River further downstream, are also diverted by the District for agricultural uses. Water is diverted from the creeks, measured by weirs or meters and delivered through pipelines and a flume to agricultural customers. The locations of these diversion points in relation to Lake Hemet Reservoir are shown in Figure 4-4.

The District has pre-1914 appropriative rights to the water captured, stored and released from Lake Hemet Reservoir and diversions from Strawberry and North Fork Creeks. The District has historically diverted water from the South Fork, North Fork and Strawberry Creeks, and utilized it for both municipal and irrigation uses. From 2000 to 2009 surface diversions averaged about 2,400 afa. The amount of water available for diversion is dependent upon runoff from rainfall events and available water previously stored in Lake Hemet Reservoir. Figure 4-5 illustrates the amount of water diverted for domestic and agricultural purposes. During the drought years 2001–2009 the average diversion was approximately 1,700 afa.

Lake Hemet Reservoir

The District has rights to divert, store and use all surface and subsurface water of the South Fork watershed above Lake Hemet Dam. These rights were acquired in an 1887 agreement with the Fairview Land and Water Company. Lake Hemet reservoir has a capacity of 12,775 acre-feet and is owned and operated by the District for water storage and recreation. In a typical year, the reservoir fills to or near capacity by January or February (depending on the severity of the winter rainfall), and stays essentially full until the District begins controlled releases in June or July (again depending on climatic conditions). The start of these lake releases is timed to correspond to when runoff in North Fork and Strawberry Creeks declines, and releases from the lake are needed to meet the high summer demands of the District's agricultural users.

Based on historic data including lake levels, temperature, rainfall and releases from the lake, a preliminary reservoir operations model was developed for the lake. Using historical data and assuming a minimum allowable lake elevation (minimum pool) of 90 feet (actual minimum pool of 94.25 feet occurred in November 1990), the long-term annual yield was calculated to be approximately 2,000 afa.

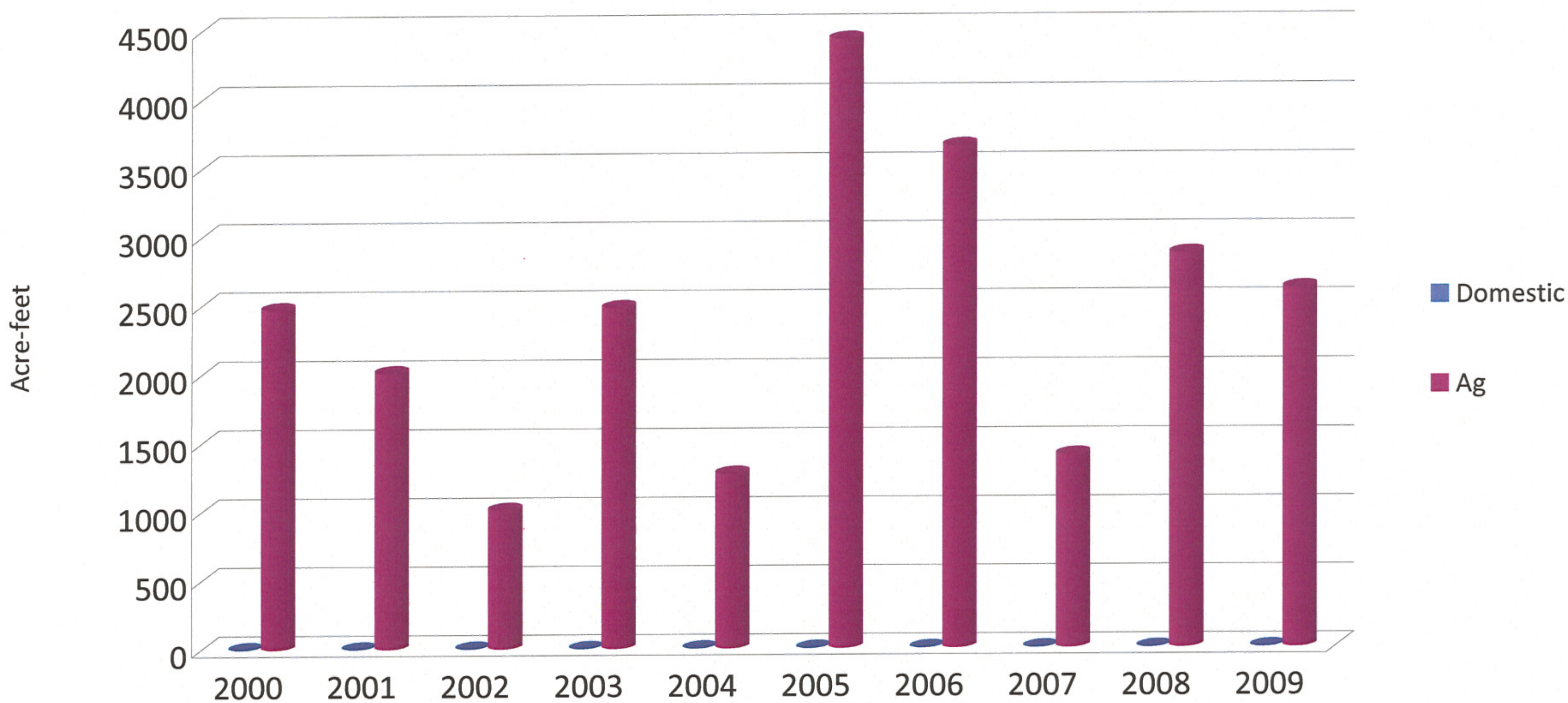


LAKE HEMET MUNICIPAL WATER DISTRICT

SURFACE WATER DIVERSION FACILITIES

FIGURE 4-4

Figure 4-5: Surface Water



Purchased Water from EMWD

Purchased water from EMWD can be delivered through several water system interconnects within the District's service area. Prior to 1992, the District purchased both local groundwater and imported surface water from EMWD for both domestic and agricultural use. The EMWD local groundwater is obtained from the "Fruitvale System" and the imported surface water had been from the Colorado River. However, since 1992, with federal implementation of the Safe Drinking Water Act (which required all surface water supplies used for domestic consumption to be filtered), Colorado River water is no longer being imported into the San Jacinto Valley area. Beginning in 2002, EMWD began importing surface water from Northern California through its EM-14 connection with MWD, and is able to deliver irrigation water to the District's canal at Marshall Avenue. The District's domestic water purchases are being supplied mostly by groundwater from the Fruitvale System with some supplemental treated import water coming from EMWD's Hemet Water Filtration Plant. The District is entitled to a minimum of 336 afa of EMWD's Fruitvale System water at a special water rate (due to a 1972 agreement) and can purchase additional groundwater as needed, provided that EMWD has adequate supplies to meet its own demands (these additional supplies are purchased at EMWD's normal water billing rate). The Fruitvale Agreement will be retired when the valley-wide Water Management Plan currently being drafted is implemented.

The amount of water purchased by the District from EMWD for domestic and agricultural purposes is shown in Figure 4-6. Water purchases from EMWD averaged 1,991 afa over the last ten years for domestic and irrigation. This figure includes imported raw water from Northern California, which commenced in 2002, for the use of the District's agricultural customers. Purchases for agricultural water gradually increased as drought set in, and reduced stream flow and diminished production from District and customer wells limited local supply. Increased rainfall later in the period allowed for reduced purchases.

Figure 4-7 shows the District's total water production from 2000 through 2009.

WATER DEMANDS AND USE

The District's total water demand for municipal and agricultural uses (domestic and irrigation) in 2000 was approximately 15,000 af, or an average of approximately 13.4 mgd. Based on the District's records, domestic water sales accounted for approximately 58.5 percent (8,788 af) of the total demand with the remaining 41.5 percent (6,204 af) sold for agricultural irrigation. The total amount of water billed to the District's customers (domestic and irrigation) in 2009 was 14,021 af (12.5 mgd). Domestic sales comprised about 58.6 percent (8,212 af) of water billed with the remaining 41.4 percent (5,809 af) sold for irrigation.

The number of District-serviced residential connections has increased from approximately 12,188 in 1998 to nearly 13,945 in 2009. Agricultural use has remained relatively constant over the last ten years as older citrus groves have been replanted and continue to require District water.

Figure 4-6: Purchases from EMWD

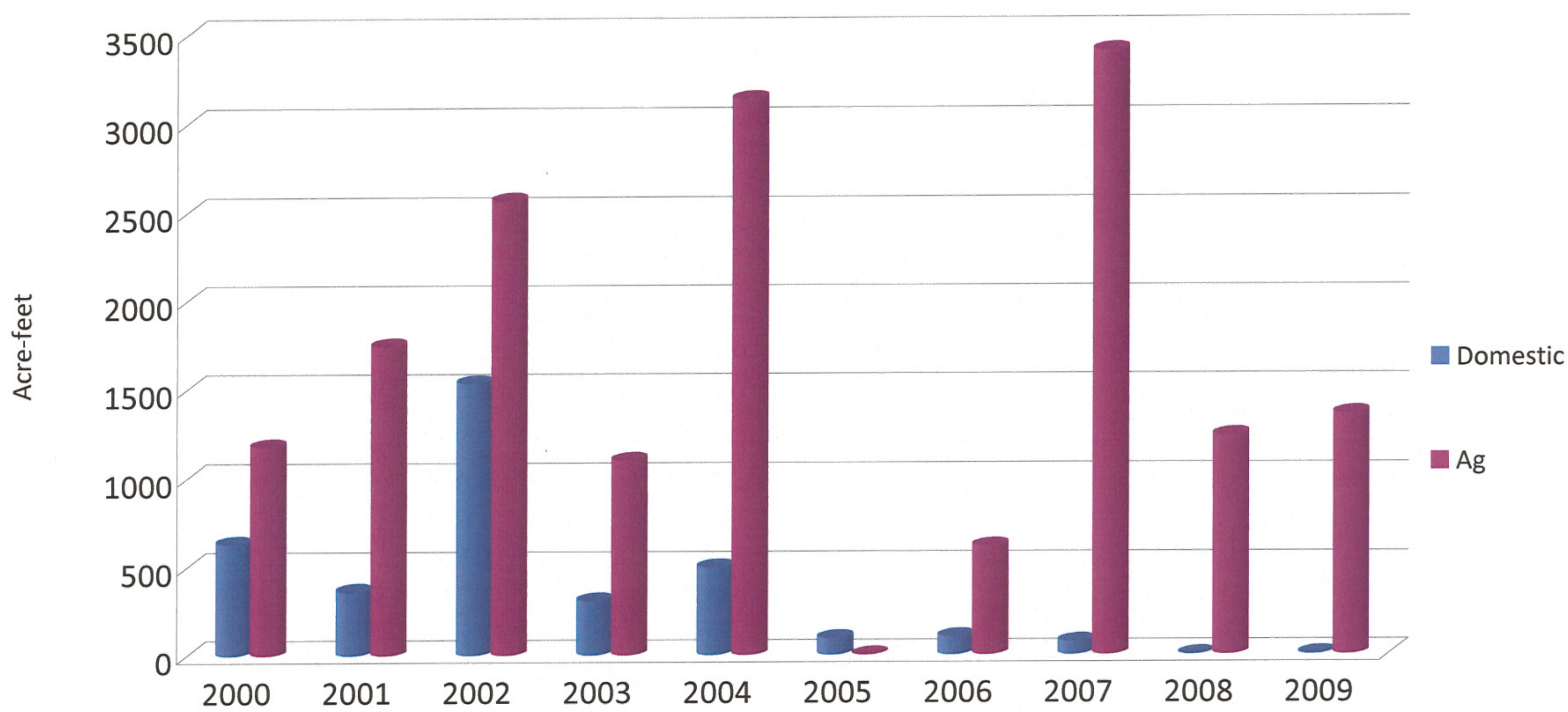
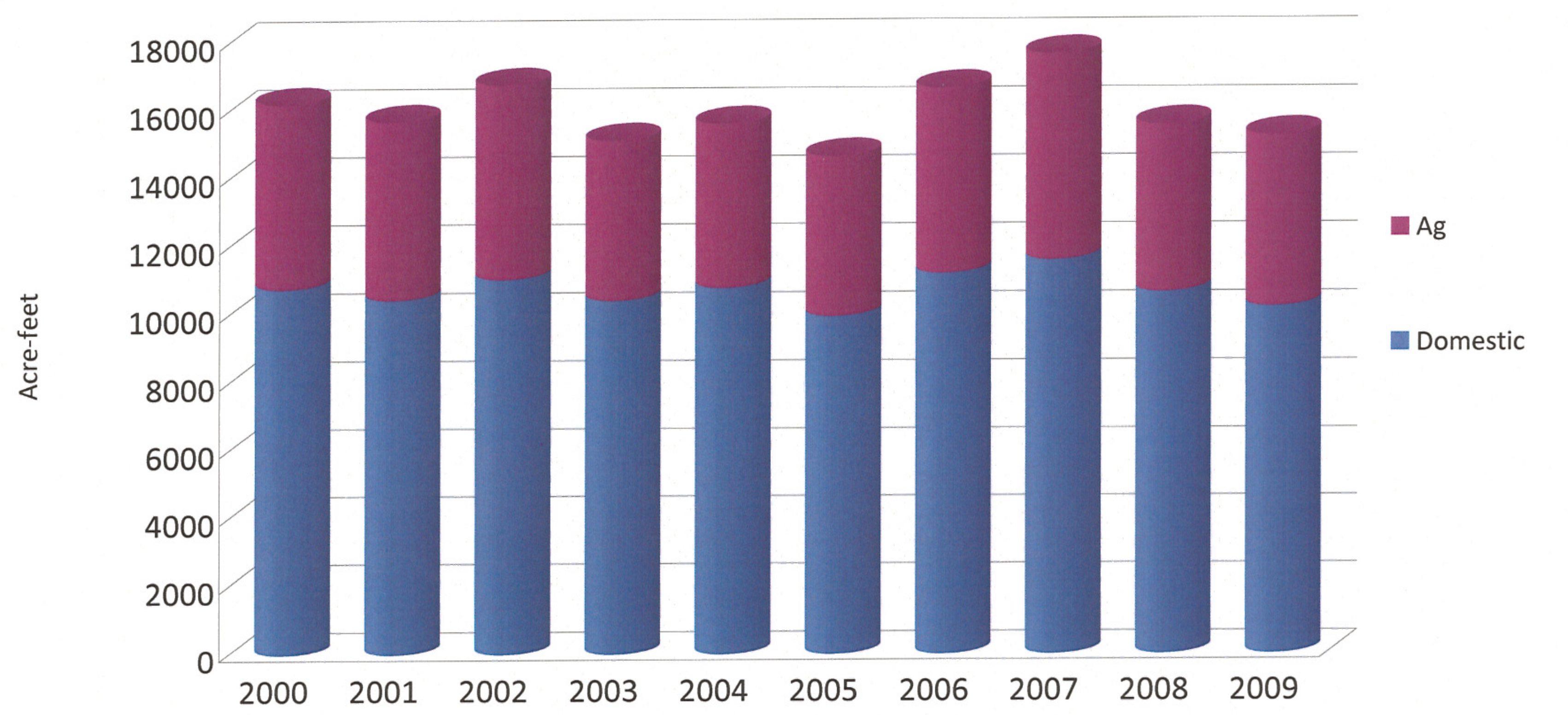


Figure 4-7: Total Production



Demand will vary considerably from year to year because of the effect of rainfall on water usage patterns. Years with higher than normal precipitation totals will have correspondingly lower water demands. This is especially true in the agricultural sector where demand over the last 10 years fluctuated between 4,637 afa and 6,449 afa due primarily to hydrology. Similarly, domestic consumption in the same period fluctuated between 0.57 and 0.74 acre-feet per year per service connection. Water demand (both domestic and agricultural) and service connection data is presented in Table 4-1.

Table 4-1 Summary of District's Water Demand

Year	YEAR END CONNECTIONS (ACTIVE)		TOTAL DOMESTIC DEMAND (afa)	TOTAL AGRICULTURAL DEMAND (afa)	TOTAL DEMAND
	Domestic	Agriculture			
1998	12,188	53	6,969	4,689	11,658
1999	12,248	58	8,472	5,855	14,327
2000	12,404	58	8,788	6,204	14,992
2001	12,629	56	8,917	5,249	14,166
2002	12,897	49	9,516	5,842	15,358
2003	13,247	45	8,922	4,637	13,559
2004	13,361	48	9,598	4,703	14,301
2005	13,659	48	8,581	4,735	13,316
2006	13,834	45	9,083	5,557	14,640
2007	13,890	45	9,627	6,449	16,076
2008	13,929	45	8,670	5,501	14,171
2009	13,945	46	8,212	5,809	14,021

Data obtained from billing records

The increase in the number of domestic service connections over the last ten years corresponds to an average-annual growth rate of approximately 1.15 percent per year. Based on total domestic water demand in 2007 of 9,627 af, domestic consumption averaged about 0.7 afa per service connection. Assuming there are 2.86 people per service connection, the average per capita consumption rate was approximately 0.24 acre-feet per capita per year (af/cap/yr), or about 215 gallons per capita per day (gpcd). The District's 26 agricultural customers receiving raw water from the canal used an average of 227 afa in 2007. Agricultural customers supplied potable water from the domestic system consumed an average of 28 afa. There were 19 of these pressure-ag accounts in 2007.

PROJECTED WATER DEMANDS

Domestic connections in the District are anticipated to increase at a rate of approximately 1.15 percent per year, with build-out projected to occur past 2050. Agricultural water use is expected to decrease slightly as irrigated land converts to urban use. The number of irrigation connections decreased from 58 in 2000 to 46 in 2009 due to a decrease of about 30 irrigated acres and changes in ownership and consolidation of some parcels. However, since a significant portion of the acreage planted in citrus today is comprised of new plantings and some is contained in agricultural preserves, it is expected that the demand for irrigation water will exist through 2030.

Table 4-2 shows the expected population growth within the District's service area over the next 20 years. A factor of 2.86 persons per service connection was used to calculate the number of people served.

Table 4-2 Population - Current and Projected

	2010	2015	2020	2025	2030
Service Area Population	40,340	42,715	45,228	47,889	50,707

Based on 2.86 persons per service connection – 2000 US Census

Single Family

Most of the District's growth has occurred in the single family residential sector. As mentioned above, water use per service connection in 2007 was 0.7 acre-feet per connection, or 215 gallons per capita per day (gpcd). The number of service connections is projected to grow at a 1.15 % growth rate through 2030 with most of that growth in the single family residential sector. The goal of the District is to reduce residential consumption to 165 gpcd by 2020 through conservation programs for a savings of 13,800 acre-feet over the 13-year period.

Multi-Family

The multi-family sector includes mobile home parks, apartments, retirement homes, and other housing that has more than one family using water from a single service connection. This sector has the second highest domestic water demand behind the single family residential sector, however its per capita water use is lower due to a minimal need for outside watering. Savings can still occur with installation of low-flow shower heads, water efficient toilets and household appliances, and through drought tolerant landscaping and efficient irrigation by the apartment owner. The District's goal is to reduce water consumption in this sector by 85,000 gallons per year per service connection by 2020.

Commercial

The commercial sector is comprised of supermarkets, car washes, retail stores and businesses. This sector is not a large water user segment, however the District needs to continue its audits of establishments to ensure water fixtures are efficient and in good repair.

Industrial

There are only three industrial accounts in the District's service area, none of which are large users of water. No significant demand impacts are projected from this sector.

Institutional/Government

Schools, churches, special districts, fire stations, governmental offices and other public buildings are included in this sector. Water use per service connection in this sector is the highest of all domestic categories due to extensive landscaping, particularly at the schools. More efficient irrigation practices could save at least 75 acre-feet (25 million gallons) per year. The District needs to concentrate its efforts on educating public administrators in sound water management practices.

Landscape

Shopping centers and other large commercial and retail developments have service connections dedicated to landscape irrigation only, with each retail space metered separately. Although the amount of water used in this sector is less than 50 acre-feet per year, savings can still be realized by adjusting sprinklers to prevent overspray onto hardscaped areas and fine-tuning timer cycles to prevent runoff.

Agriculture

Irrigation of citrus groves places the greatest demand on District agricultural supplies. The main supply is untreated runoff from local streams and water that has been stored in Lake Hemet Reservoir, both of which are delivered via gravity through a canal network to farmers. When stream water disappears in the summer, water from wells that cannot meet domestic water quality standards is delivered to the canal for distribution. Water from domestic sources contributes to canal supplies on an as-needed basis. Imported water from the State Water Project is also purchased from EMWD to stretch the District's local supplies in times of drought. Delivered canal water from all sources averages over 4,942 acre-feet per year.

Several farmers, due to location, are not able to take delivery of water from the canal system and must be served from the domestic distribution system. This demand totals about 527 acre-feet per year and is charged at a higher rate due to the cost of obtaining and treating high quality domestic water.

Local farmers are using the latest irrigation technology to minimize their costs. Consequently, future water savings from this sector are expected to be minimal. A decrease in water use will only occur when agricultural land is taken out of production. However, when this occurs, the same land will most likely be developed into housing units, creating new demand in the domestic water sectors.

System Losses

The above discussion addresses water that is metered by the District as it is used by the customer. There are other demands on both the domestic and agricultural systems that cannot be metered, but can be estimated. These include leaks in the sides and bottom of the concrete irrigation canals, evaporation from uncovered canals, meter inaccuracies, unscheduled shutdowns of customer canal pumps, and daily canal run changes. In the domestic system, leaking pipelines, service lines and meters are sources of water loss, along with flushing of dead-end mains, flushing newly constructed and disinfected mainlines, unmetered storage tank overflow, and unauthorized connections. The magnitude of these losses is the difference between the amount of source water produced and acquired by the District and the amount sold, or billed, to the customer. From 2000-2009, this loss averaged 1,453 afa or about 10.0 percent of sales (9.1 percent of production).

A significant portion of these losses comes from the operation of the irrigation canal system. The losses stem from the difference between the amount of source water put into the canal and the amount that is actually delivered to the customers. As mentioned earlier, there are many causes of water loss in the canal system, but the largest occurs during daily run changes when canal water is dumped to the river so that turnouts to the farmers can be adjusted for the new run. In 2007, daily runs averaged about 4,200 gpm over 264 days of operation. Assuming it takes 2-3 hours to adjust the turnouts, approximately 1.5-2 af would have exited the canal each time the runs were changed. Some farmers schedule water for several days at a time, so runs are not changed every day. However, the loss of water from the canal in 2007 can be estimated at 300-400 af (assuming 200 run changes).

To emphasize this point, improvements have been made. In 2008, the loss from the canal system dropped from 14.5% to 8.8%; in 2009, the loss had dropped to 4.3%, a savings of over 400 af and 200 af, respectively.

Domestic system losses are decreasing as well. The ten-year average is 10%, while for 2009, the loss was 8.6%. Table 4-3 presents customer demand and system losses. This total demand equals the total amount of water produced from the District's three sources of supply.

Table 4-3 Customer Demand & System Losses (acre-feet)

Year	Customer Demand			System Losses	Total Production
	Domestic	Agriculture			
		Pressure Ag (Domestic System)	Canal (Raw Water)		
2000	8,788	760	5,445	1,219	16,212
2001	8,917	653	4,595	1,525	15,691
2002	9,516	616	5,226	1,408	16,766
2003	8,922	527	4,110	1,562	15,120
2004	9,598	416	4,287	1,308	15,609
2005	8,581	408	4,327	1,336	14,653
2006	9,083	463	5,095	2,007	16,647
2007	9,627	537	5,913	1,567	17,643
2008	8,670	473	5,028	1,387	15,558
2009	8,212	415	5,394	1,212	15,233
Average	8,991	527	4,942	1,453	15,913

Data obtained from billing & production records

Future water demands will be determined by several factors including the rate at which urban development will replace agricultural land, and conservation efforts employed by the District in response to the States 20 by 2020 Water Plan. The States 20 by 2020 Water Plan (Senate Bill X7 7) sets forth a goal to achieve a 20 percent reduction in urban per capita water use by 2020. Urban water suppliers are required to increase urban water efficiency and maximize conservation efforts between 2010 and 2020 and beyond with an interim target of 10% by 2015. The District should conduct an in-depth analysis on water usage, target levels and conservation plans when preparing their 2010 Urban Water Management Plan. Table 4-4 estimates future water demands through 2020 without this reduction.

Table 4-4 Estimated Future Water Demands (including system losses)

Year	Annual Domestic Water Production Requirements (acre-feet)	Total Annual Water Production Requirements (acre-feet)
2007-2009[(a)]	8,836	16,145
2010	9,500	16,400
2015	10,600	17,100
2020	11,700	17,700

(a) Since annual demand fluctuates significantly because of hydrology, an average of the last 3 years was used

DEVELOPMENT OF DEMAND PEAKING FACTORS

Demand factors are used to calculate the water demand expected under varying future demand conditions. The resulting demand conditions are then used to evaluate and size transmission and distribution pipelines and storage facilities, and to define water supply needs. This section will be used to evaluate the adequacy of existing facilities and to size system expansions and upgrades. Typical factors needed to evaluate compliance with these criteria and to complete system master planning include the average-day to maximum-day demand factor, and average-day to peak-hour demand factor.

Maximum-Day Demand Factor

Using data from telemetry, operator logs and the 1998 Master Plan, a maximum-day demand factor of 1.9 times the average-day demand will be used to project future demand for the domestic system. The average-day demand in 2009 was 22.5 afd. Therefore, the maximum-day demand in the domestic system was 42.8 afd.

Agricultural peak-day demand occurred on September 1, 2006, when 10,600,000 gallons were delivered to irrigation customers.

Peak-Hour Demand Factor

Storage and conveyance system facilities must also be able to meet the anticipated peak-hour demand. To quantify the District's actual peak-hour demands, water delivered from all potable water sources, including storage tanks, needs to be recorded on a continuous or hourly basis. The District has a complete Supervisory Control and Data Acquisition (SCADA) system which monitors daily and hourly production for all of the District's water sources and records storage tank levels. The domestic system operators also keep detailed daily logs of storage tank levels and well production.

CHAPTER 5

WATER CONSERVATION PROGRAM

INTRODUCTION

This Chapter evaluates the existing water conservation efforts of the Lake Hemet Municipal Water District (District) and outlines the framework of a proposed long-term water conservation program and the potential water savings which would result from the District's implementation of such a program. Water conservation can be defined as practices, techniques, and technologies that improve the efficiency of water use. Increased efficiency can extend the use of locally available water resources, freeing up existing water supplies for other uses. Although restrictions on water use can be a useful emergency tool for drought management or service disruptions, water conservation programs emphasize lasting day-to-day improvements in water use efficiency. In the event of water shortages, agencies with broad-based water conservation programs are typically able to mitigate short-term and long-term effects better than those without a conservation program.

It should be noted that the degree of sophistication for a water conservation program suitable for a particular water agency is dependent on several factors which reflect the potential value and magnitude of water savings available to the water purveyor. These factors include type of water sources, geography and climate, water use characteristics, cost of water, location relative to other water systems, and number of customers. Since the District has already implemented several water conservation measures, it does not appear that the District would realize large additional benefits compared with the high costs of implementation of a more detailed water conservation program. However, the District's implementation of the broad-based water conservation program discussed in this Chapter will be an important component in the District's ability to serve future water demands.

SUMMARY AND RECOMMENDATIONS

The recommended water conservation program developed for the District expands on the existing efforts of the District and is comprised of the following components:

- **Water Conservation Coordinator** – a District staff person should be designated as the Water Conservation Coordinator, responsible for implementing the Water Conservation Program and monitoring its results. The overall goal of the Water Conservation Coordinator is to keep the concept of water conservation directly in the minds of the public to ensure efficient water use on a day-to-day basis, regardless of water supply, and to reduce public reaction time given the onset of a drought or emergency situation.

In addition, the Water Conservation Coordinator should also keep the District appraised of any new laws or ordinances which require existing or new customers to install water saving devices.

- **Minimal Retrofit Kit** – the District should make available a water conservation package to its existing customers containing a shower flow restrictor and two toilet tank leak detection dye tablets. This package should be available at the District office and advertised as an insert to the resident's monthly water bill at least twice a year.

- **Public Information and Education** – the District should expand its current public information/school education program including the distribution of water conservation brochures, presentations to local schools and community groups and reminders on water bills regarding efficient water use. The level of effort given to the program will vary year-to-year based on the availability of water supplies; however, continuing public education is essential to a successful Water Conservation Program and this effort must be maintained.

- **Metering** – the District should continue to meter all new connections, all residential and agricultural users, as well as dam releases and stream diversions.

- **Water Audit/Leak Detection** – the District should continue to perform a rough water balance of the system annually, comparing total quantities of water sold with total quantities of water produced. If water losses in the system are estimated to be equal to or higher than ten percent, a comprehensive water audit of the distribution system should be performed as described in Chapter 10, "Operations & Maintenance and Other Special Programs".

- **Water Rates** – the District should continue to develop a water rate structure to encourage efficient water use, and require customers to pay for every drop of water which is used.

- **Drought Contingencies** – the District should continue to refer to its adopted Water Shortage Contingency Plan for instructions and guidance during years of water shortage, and review drought contingency plans on a biennial basis.

- **Tier 5 Customer Outreach** – The District's domestic water customers purchase potable water on an inclining block rate structure (i.e. tiered rate). The "tiers" were structured on a bell-shaped curve nomograph based on usage. Tier 1 corresponds to the 10th percentile by volume; Tier 2 = 30th percentile, Tier 3 = 70th percentile, Tier 4 = 90th percentile, and Tier 5 represents the highest water users (e.g. top 10%).

  It is recommended that District staff contact 10% (i.e. approximately 120 customers per year) of the District's highest use (e.g. Tier 5) customers (e.g. Tier 5 customers) to offer friendly assistance to help these customers reduce their water consumption.

- **Automatic Meter Customer Profiles** – The District recently installed automatic meter read (AMR) equipment on approximately 580 services on Florida Avenue and Stetson Avenue. Many of these services are commercial accounts. The AMR meters have the ability to trend the customers usage every few minutes throughout a 24-hour period. Graphs of the usage can be printed for the customer's use.

  It is recommended that District staff review approximately 100 (1 in 5 or 1 in 6) of these accounts each year to look for leaks. If the graphs depict no period of zero usage within a 24-hour period, it is likely the customer has a leak on their property. "Mail Merge" in Microsoft Word can be utilized in conjunction with the District's billing software to generate a friendly form letter notifying said customers of a leak on their property.

The estimated water savings associated with implementation of the proposed water conservation program is about 500 acre-feet annually (afa). It is estimated that if the District implements this water conservation program immediately, the potential savings could be realized within the next several years. The Water Conservation Program is a critical element to meeting the District's future water demands and reducing the District's projected future water supply requirements.

CONSERVATION MEASURES

The District's water conservation program should include the following basic water conservation measures:

- public information and education programs to promote water conservation and to assist residential and commercial customers with conservation practices;

- cost-of-service based water rates;

- reduction of unaccounted-for water through metering and accounting of water use, routine meter testing and repair, and distribution system leak detection and repair;

- adopted water contingency plan, used to provide guidance and instruction during years of water shortage.

This section presents comprehensive descriptions of the water conservation measures listed above. Much of the information presented here was collected through a comprehensive review of pertinent manuals and reports from the Department of Water Resources (DWR), American Water Works Association (AWWA), American Public Works Association (APWA), and various other published literature.

Public Information/School Education

Public information and school education programs aim at developing an efficiency ethic among water users by increasing the public's awareness of water use. Many consumers have no knowledge of their water source, supply capacity or availability. Public information and school education programs can motivate consumers to purchase and install water-saving devices, to participate in District programs, such as installation of retrofit kits, and to use water more wisely, eliminating habits, plumbing, or procedures which waste water. The District should be active and responsible in developing and maintaining these programs. The District should also look for opportunities to work with and assist school education programs regarding water conservation activities.

There is a wide variety of items which can be used to educate the public on water use and the need to conserve. Items such as brochures, guidebooks, movies, slides, posters, and buttons can be utilized to convey information on where water is wasted and how it can be conserved. These items can be obtained from DWR and other agencies such as the Water Education Foundation at very low costs. These items can then be made available at the District's office, distributed to the public as bill inserts, and supplied to schools.

The water savings resulting from a public education program are difficult to quantify but have been estimated by DWR and others as follows:

Type of Use	Short-Term Reduction (%)	Long-Term Reduction (%)
Residential-Interior	5.0	5.0
Residential-Exterior	5.0	10.0
Commercial	5.0	7.5

A public education program can be one of the most effective means of reducing urban water use. Considerable water savings are attainable with only minor habit changes or assistance from the general public. For example, because most residential landscapes in California are typically overwatered by 20 to 40 percent, a public education program on proper watering techniques can significantly reduce exterior water use. Furthermore, a public education program can permanently improve water use habits. As a consequence of inclining public awareness, citizens will also tend to better identify and promptly report possible leaks in the water system.

Metering

The installation of water meters, working in conjunction with an appropriate rate structure, is probably the most effective conservation measure currently available to water purveyors. The effect of metering on residential water is closely linked to the pricing of water, which is evaluated in greater detail in subsequent sections. The fundamental principle which governs the effect of metering is that consumers will make more efficient use of water if it is priced on a per unit basis rather than a flat rate. The effect of metering is also highly dependent on the rate structure used and the local climate. If water rates are too low, then the effect of metering may be insignificant because consumers will not notice a significant change in their water bills and have no incentive to conserve.

Revised Rate Structures (Pricing)

By increasing unit rates, varying rates with respect to quantity or season, or some combination, consumers will instinctively reduce water consumption in order to reduce their water bills. The goal in pricing water should be to recover water costs of production, treatment and distribution in proportion to quantity/capacity requirements imposed on the District by its customers. A brief description and evaluation of conservation potential for each of the most commonly employed rate structures is given below. The District currently has an inclining block rate (tiered rate) structure in place.

Flat Rate - fixed rate regardless of quantity used, offers no incentive to use water efficiently.

Uniform Rate - one unit rate for all water use, provides some incentive to conserve.

Decreasing Block - unit rates decreased as quantity of use increases, offers little incentive to conserve since cost reduction is proportionately lower than water use reduction.

Inclining Block (Tiered Rate) - unit rates increase as quantity of use increases, provides good incentive to conserve since cost reduction is proportionately related to a reduction in water use.

Seasonal - high summer rates designed to return capital costs of facilities in proportion to peak demands, low winter rates designed to recover only variable operation costs, provides high incentive to conserve in peak season to avoid large water bills.

Water-Saving Devices

The use of water-saving household devices is, by far, the most common and well-known water conservation measure employed by water utilities and their customers. There are various laws, codes, and ordinances which now require the installation of low-flow showerheads, low-flush toilets and self-closing faucets in new construction. Most new appliances such as clothes washers and dishwashers are also now built to be more water-efficient.

In 1992, a new State ordinance under Assembly Bill No. 2355 went into effect which requires that all new buildings constructed in the State use ultra-low-flow toilets which use no more than 1.6 gallons of water per flush.

In addition, many water utilities have conducted campaigns to retrofit existing households with water-saving devices by offering free water conservation kits. These kits typically include shower-flow restrictors, water displacement bags for toilets, and dye tablets to identify toilet leaks.

The effectiveness of kit distribution programs and the potential water savings associated with each device are related to the number and type of installations. The water savings associated with the installation of various household devices based on review of the findings from DWR studies are as follows:

Device	Water Savings Per Device (gallons/day)
Shower Flow restrictor	6.3
Toilet Tank Displacement Bags	4.2
Ultra-Low-Flow toilets	12.0

Water Audit

A water audit is a process of accounting for water use throughout a municipal water system. The main objective of an audit is to identify and quantify the Unaccounted-For Water (UAW) in a municipal water system. UAW includes both authorized (firefighting, main flushing, public use, *etc.*) and unauthorized (inaccurate meters, leaks, thefts, *etc.*) uses. Once UAW is estimated, appropriate corrective actions, such as meter replacement or leak detection programs, can be taken. A water audit also helps the utility gain a better understanding of water use patterns so that areas with good potential for conservation can be identified.

A water audit is a relatively straightforward process. Production records are compared with consumption records to locate and quantify UAW within the system. The audit may identify broken water mains, illegal connections, and broken or inaccurate water meters or system leaks. While the audit process itself does not save water, UAW in the system can be reduced to about 5 to 10 percent of total production. Minimizing UAW will save the cost of producing, treating, and distributing this previously "lost" water. Much of the benefit from a water audit will be realized through a subsequent leak detection program. Audits should be conducted on an annual or biannual basis.

Leak Detection and Repair

Leak detection and repair is a systematic method of locating and repairing leaks in pipelines, valves, and meters. Leaks are detected either visually from the surface (usually wet spots or depressed pavement) or with the aid of sonic equipment which uses sensitive microphones to "listen" for leaks. In addition to the traditional equipment which includes a hand-held microphone and headphones, there are now sophisticated computerized systems which can pinpoint leaks more precisely.

Water losses due to leaks in a municipal water system can be significantly reduced through a leak detection and repair program. DWR reported that statewide averages indicate that 50 percent of all UAW in California water systems is due to leaks and 32 percent of the leaks would be cost-effective to repair. DWR recommends a leak detection program if UAW is greater than 13 percent or if leaks alone account for more than 10 percent of total production. In metered systems, a leak detection program should be preceded by a water audit. Depending on system size, condition of mains, and available resources, a leak detection program can range from a onetime limited effort with concentration on suspected trouble areas, to a continuous survey conducted by a full-time crew.

Drought Contingency Measures

During extended dry periods or water shortage emergencies, the District could potentially experience a water supply deficiency unless the total water demand can be reduced. Drought contingency conservation measures could be implemented by the District to reduce overall water demands, including voluntary reductions in water use though public awareness campaigns, bans on exterior use, water rationing and fines for excessive use. The severity of the water shortage will dictate drought contingency measures which will be implemented. The District adopted a Water Shortage Contingency Plan in April 1992 which identifies both trigger levels and actions for a five-stage Drought Management Plan.

In addition to using its adopted Water Shortage Contingency Plan, the District should also seek to participate in cooperative drought planning efforts with other water agencies in the Valley to maximize use of local water resources during drought conditions. Although it is not feasible for all agencies to adopt one plan, it is appropriate that all the agencies share planning methods and programs (particularly in the public education area) to ensure that the communities benefit equally from available media opportunities and messages.

EXISTING DISTRICT PROGRAM

Although the District does not have a formal water conservation program at this time, some of the measures discussed in the previous section are currently practiced by the District. The following paragraphs give brief descriptions of those measures currently practiced by the District and their effectiveness.

School Education /Public Information

The District currently only makes a few formal presentations to schools and service groups each year. During the 1987-1993 drought, the District was extremely active in educating the public on water conservation issues. The District's presentations were very informative and helped to increase the public's awareness regarding water use, water supply issues and the need to practice conservation. Furthermore, the District developed a brochure entitled, "Every Drop Counts" which describes relatively easy ways for the consumer to save water in the bathroom, in the kitchen and laundry, and outside. The brochure was distributed at formal presentations, was available at the District office, and has been used in the past as a bill stuffer. In recent years, following the end of the drought, the number of District presentations to the public has decreased. These school education/public information activities and presentations should be reinstituted.

Metering

All municipal water services in the District's distribution system are metered. As noted previously, metering is the most effective water conservation method currently available to water purveyors. In addition, the District has a meter maintenance/replacement program for improperly operating meters.

Leak Detection and Repair

The District currently does not have a formal leak detection and repair program; however, in the early 1990s, the District checked 20 miles of their distribution system for leaks using an ultrasonic leak detector, and no leaks were found. Typically, leaks are detected either visually or from large differences in production and sales records. These leaks are then further investigated, located, and repaired.

As part of a collaborative effort with the State, the District has developed a "Leaky Pipe Program" to replace old, domestic distribution system lines that are leaking throughout the District. Existing steel pipelines, the majority of which are in excess of 40 years old and have deteriorated due to age and corrosive soils, were identified on an application to the State for financial help to fund this program. In 1998, the District's application for a loan for approximately $4 million at an interest rate of 4% over a 20-year period was approved by the State. Similar funding opportunities should be considered for future improvements.

Currently, the District is anticipating a $23 million capital improvement program to replace aging infrastructure over the coming decade. Approximately $7 million worth of system improvements are planned for the next 3-5 years.

Rate Structure

On March 19, 2009, the District adopted a new increasing block rate (tiered rate) structure for residential users. The tiered rates were subsequently increased again on February 18, 2010. With the new rate structure, the user is charged more per unit of water as consumption increases, providing incentive to conserve, since the additional charge is directly proportional to water use. The rate structure for single family homes is as follows:

Current Residential Water Rates					
Tier	Water Usage Per Monthly Billing Period	Commodity Charge (no change)	Imported Water Surcharge	Capital Improvement Surcharge	Total $/HCF
1	0 to 7 HCF	$1.848	$0.221	$0.090	$2.159
2	8 to 13 HCF	$1.867	$0.225	$0.090	$2.182
3	14 to 25 HCF	$1.894	$0.245	$0.090	$2.229
4	26 to 38 HCF	$1.922	$0.305	$0.090	$2.317
5	≥ 39 HCF	$2.013	$0.385	$0.090	$2.488

Drought Contingency Measures

During the 1976-77 drought, the District aggressively promoted water conservation and reduced the bi-monthly minimum quantity from 1,000 cubic feet to 750 cubic feet per month. As a result of the District's action and an increase in the public's awareness to conserve, the District's per capita water use decreased dramatically during 1977.

In early 1991, during what turned out to be the 1987 to 1992 6-year drought period, EMWD implemented Phase 1 of a five-phased water conservation plan (based on Metropolitan Water District's five-stage plan) for all water users and water service purveyors within EMWD's service area. Phase 1 was a voluntary program with a goal of reducing individual water use by at least ten percent. In response to the ongoing drought, the District also voluntarily adopted a Drought Management Plan in January 1991. The District's Drought Management Plan established a five-stage drought program with various trigger levels and corresponding goals for reducing demands. In February 1991, faced with a fifth consecutive year of statewide drought conditions, EMWD entered Phase III of its program which required all of EMWD's customers, including the District, to reduce water demands by a minimum of ten percent. In response, the District certified Ordinance No. 84 implementing Stage III of its Drought Management Plan which has a total District water demand reduction goal of 20 to 30 percent and includes mandatory water use restrictions and fines and penalties for non-compliance. The Board rescinded Stage III of the Drought Management Plan in May 1992.

In April 1992, in response to requirements by DWR, the District adopted a Water Shortage Contingency Plan as an amendment to the District's Urban Water Management Plan. The Water Shortage Plan incorporates the District's Drought Management Plan and provides overall discussion on the District' water supplies and worse case water supply scenarios.

RECOMMENDED WATER CONSERVATION PROGRAM

In 1985, the District prepared an Urban Water Management Plan (UWMP) to satisfy the requirements of DWR. In accordance with the requirements of an UWMP, the District was also required to develop a Water Conservation Plan. The District's UWMP was last updated in 2005 and must be updated again prior to June 2011.

The following section describes the recommended water conservation program, developed for District implementation. The proposed water conservation program is based on previous work prepared for the District, expands on the District's existing water conservation efforts and includes several new water conservation measures selected for implementation by the District. A brief description of each of the water conservation program components is described below.

Water Conservation Coordinator

A District staff person should be designated as the water conservation coordinator, responsible for implementing the water conservation program and monitoring its results. The time required per week for the Conservation Coordinator will vary year to year depending on the water supply outlook for that year; generally maintaining minimal effort on the water conservation program during wet hydrologic periods and maximum effort during years of water shortage. However, the overall goal of the Water Conservation Coordinator is to keep the concept of water conservation directly in the minds of the public to ensure efficient water use on a day to day basis, regardless of water supply and to reduce reaction time given the onset of a drought.

Minimal Retrofit Kit

The District will make available a water conservation package to existing customers. The package will include the following items:

- One shower flow restrictor
- Two toilet tank leak detection dye tablets

The package will be available at the District office. Availability of these retrofit packages will be advertised by placing an insert into the resident's monthly water bill at least twice a year and through the District's public information and education program.

Public Information and Education

The District should reinstitute and expand its current public information/school education program. By maximizing the public's awareness of the needs and methods for conserving water, water use in all customer classifications can be reduced at a small cost. Furthermore, a comprehensive public information program is essential to the overall success of a water conservation program because it increases the effectiveness of most other conservation efforts. Information on proper landscape watering and water-saving devices or appliances should receive top priority due to the hot, dry summer climate and the exterior water use on the residential lands in the service area.

This recommended measure includes two components: (1) public information and (2) education. The proposed public information measure would include the distribution of water conservation brochures and bill stuffers such as the District's "Every Drop Counts" brochure and a speakers bureau which would conduct presentations for local community groups and organizations. In addition, during the Spring, reminders on proper landscape watering such as recommended watering schedules should be added to the District's monthly water bills. The water education program should target school children by providing teacher training workshops and conducting in-school water conservation assemblies.

The level of effort given to keeping the concept of water conservation in the public's mind will vary year to year based on the availability of water supplies. However, public education is essential for a successful water conservation program. In general, the more educated the public is regarding efficient water use, the easier it will be for the public to react during critical water shortages.

Metering

The District should continue to meter all new connections to encourage efficient water use and to help maintain a proper accounting of water supplies.

Water Audit/ Leak Detection Program

For a distribution system water audit, the District should compare the amount of water produced, to the amount of water used by its customers on an annual basis. If water losses in the system are estimated to be in excess of ten percent, the District should conduct a comprehensive water audit of the distribution system. The comprehensive water audit should include field investigations and testing of representative residential meters for under- or over-registration and inspection of controls and master meters.

In conjunction with the water audit, the District should also proceed with initiation of a formal leak detection and repair program for the distribution system as recommended in Chapter 10, "Operations & Maintenance and Other Special Programs". In addition, because many of the District's pipelines are old and of varying condition, it has been recommended that the District implement a pipe replacement program, annually setting aside funds to replace a prioritized listing of aging pipelines each year.

Inclining Block Rates (Tiered Rate)

The District should continue to use an inclining block tiered rate structure designed to encourage conservation. Additional discussion is provided in Chapter 10.

Drought Contingency Measures

The District should continue to refer to its adopted Water Shortage Contingency Plan for instructions and guidance during years of water shortage. The existing plan should be updated within the coming year to account for recent changes in the District's overall water supply strategies including implementation of the anticipated Groundwater Management Plan.

ESTIMATED SAVINGS AND IMPLEMENTATION SCHEDULE

The recommended Water Conservation Program is an expansion of the District's current program and could be implemented at any time. The estimated water savings from implementation of the entire Water Conservation Program is about 500 afa. Combined with the estimated 500 afa savings from the District's Leaky Pipe Program, the total estimated reduction in demand is estimated at 1,000 afa. It is recommended that the District implement the Water Conservation Program immediately to realize the potential 500 afa savings. Because the Water Conservation Program has been identified as a 500 afa reduction to the District's projected future demands, the implementation of the program is critical to meeting the District's future water supply requirements.

CHAPTER 6

HYDRAULIC MODEL

INTRODUCTION

This chapter presents an overview of the methodology used for updating and calibrating the hydraulic network model of Lake Hemet Municipal Water District's (District) existing potable water distribution system. Engineering Resources of Southern California, Inc. (ERSC) updated the hydraulic model of the District's water distribution system to include all pipelines within the system, allowing computer simulations of various current and future flow conditions through the District's water distribution facilities during the following demand conditions:

- maximum-day
- peak-hour
- maximum-day plus fire flow conditions
- impacts of projected demands

Using existing maps showing the location and sizes of the District's wells, storage tanks, transmission mains, distribution pipelines, and zone breaks, ERSC updated the hydraulic network model to represent the District's current distribution system.

DESCRIPTION OF MODEL

H_2ONET was the hydraulic modeling software used to represent the potable water system. This computer simulation model transforms information about the physical system into a mathematical model that solves for various flow conditions. For each set of specified demands, the computer model generates information on pressure, flow, velocity and head loss which is used to analyze the system performance and to identify system deficiencies. The model can also be used to verify the adequacy of recommended or proposed system improvements.

The original model of the water distribution system was a skeletonized network of nodes and node-connecting elements and was constructed by assigning nodes at each major street intersection (1/4 mile sections) and at locations where pipeline diameters changed. Nodes were added at locations where there was a significant water demand or supply (e.g., fire hydrants, pump stations, reservoirs or wells). Nodal input for the model consisted of information on elevation and demands at a given location. Pipelines connecting the nodes consisted of information on pipeline lengths, diameters and friction factors.

To update the hydraulic model, ERSC incorporated all waterlines within the District's distribution system into the model; this included distribution pipelines 2-inches in diameter through transmission pipelines 20-inches in diameter. The end product is a model with over 200 miles of interconnecting pipeline. The resultant is a model that not only simulates flow and demand characteristics along major streets within the City, but through residential neighborhoods as well.

MODEL INPUT DATA AND ASSUMPTIONS

To meet the objectives of this project, a complete model was developed to evaluate overall system performance and determine the required capital improvements. The level of accuracy of the input data, model assumptions and model calibration were consistent with these objectives. The following data reflects the methodology used to create the hydraulic model and includes the updates that ERSC has made.

Nodes: Input data for each node in the water distribution system model consists of an elevation and a gallon per minute (gpm) demand. The elevation of each node was determined in the original model by using a digital United States Geological Survey (USGS) 7.5 minute quad sheet of the District's service area. This digital map was used to overlay the model and elevations read directly from the map, providing for a high degree of accuracy in the model. This map provided a contour interval of ten (l0) feet. Point elevations for use in the model were interpolated between topographic contours.

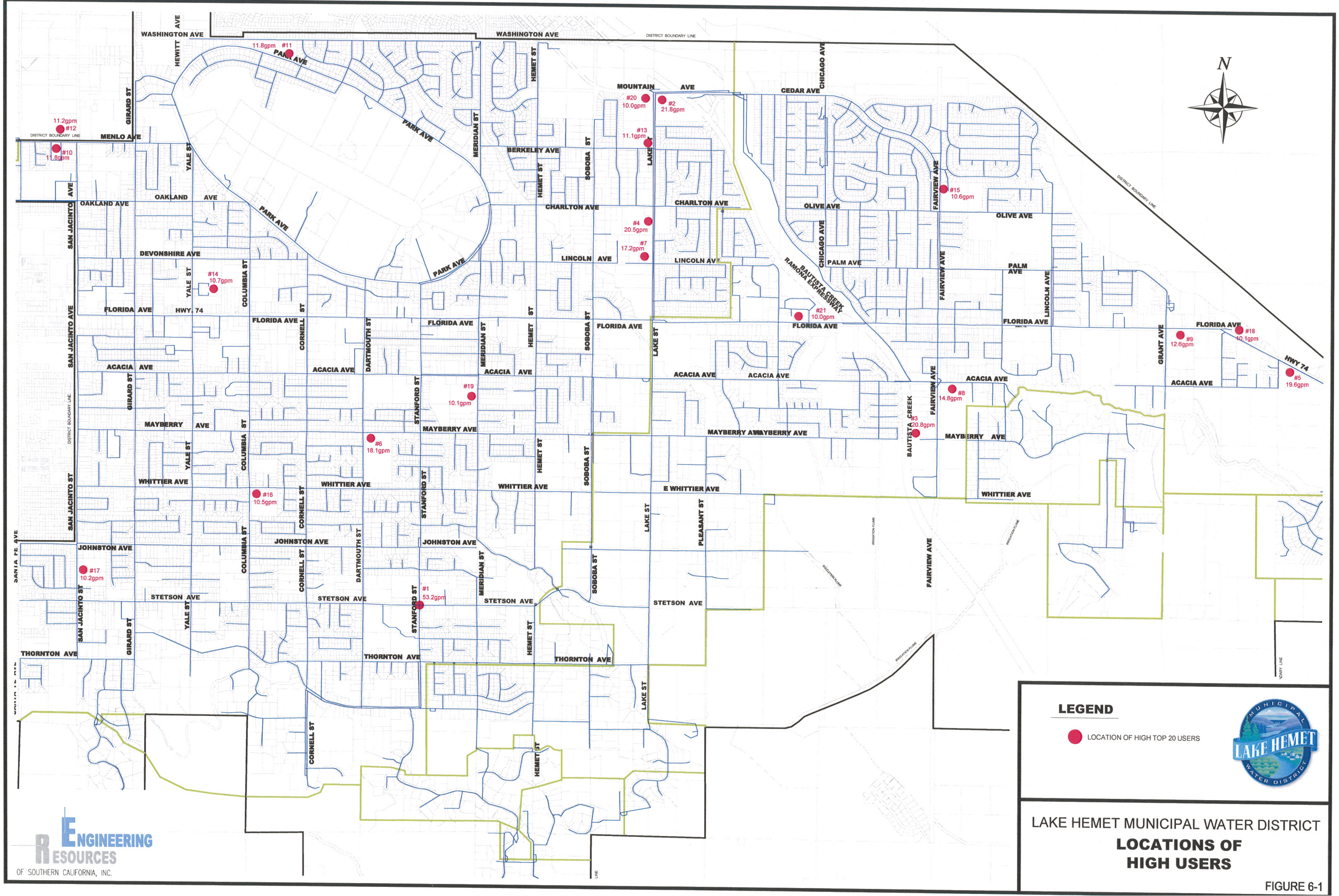
With the addition of the interior pipelines, nodes were added at the ends of all cul-de-sacs and at every street intersection. The elevations used for these nodes were interpolated from the existing nodes within the system, by referencing United States Geological Survey (USGS) 7.5 minute quad maps and from spot elevations from virtual globe software.

Demand information was obtained from the District's 2007 billing records. This information listed the bimonthly meter usage of the 14,144 customer accounts and sorted the data into a minimum and maximum bimonthly usage, an average bimonthly usage and a yearly usage total.

For each account, a street name and number was provided which ERSC used to compile a list of each account's pressure zone, by identifying the location of each address within the distribution system. This provided a yearly demand by pressure zone, from which an average daily demand and a gallon per minute demand for each pressure zone could be obtained. Table 6-1 lists the average-day demand and the projected maximum-day demand for each of the pressure zones. The demands for each pressure zone were entered into the model and distributed evenly amongst the nodes in that zone, except for the 20 largest users within the system, which were entered separately. Figure 6-1 illustrates the location of the 20 largest users within the District and their corresponding gallon per minute usage.

Table 6-1 Lake Hemet Municipal Water District Demands 2007

Pressure Zone	Average-Day Demand (gpm)	Maximum-Day Demand (mgd)
Bee Canyon Booster System	1	0.003
Bee Canyon Tank System	28	0.077
Brix System	16	0.044
Big Springs System	11	0.030
Cunningham System	48	0.131
Lower Skycrest System	32	0.088
Lower Sprauge Heights System	104	0.285
Lower System	3,847	10.525
Middle Skycrest System	5	0.014
Oakland/Menlo System	63	0.172
Pachea System	26	0.071
Section 13 System	1	0.003
Upper Sprague Heights System	57	0.156
Upper System	1,657	4.534
Upper Skycrest System	35	0.096
Yeager System	13	0.036
Total	**5,944**	**16.263**



LAKE HEMET MUNICIPAL WATER DISTRICT

LOCATIONS OF HIGH USERS

FIGURE 6-1

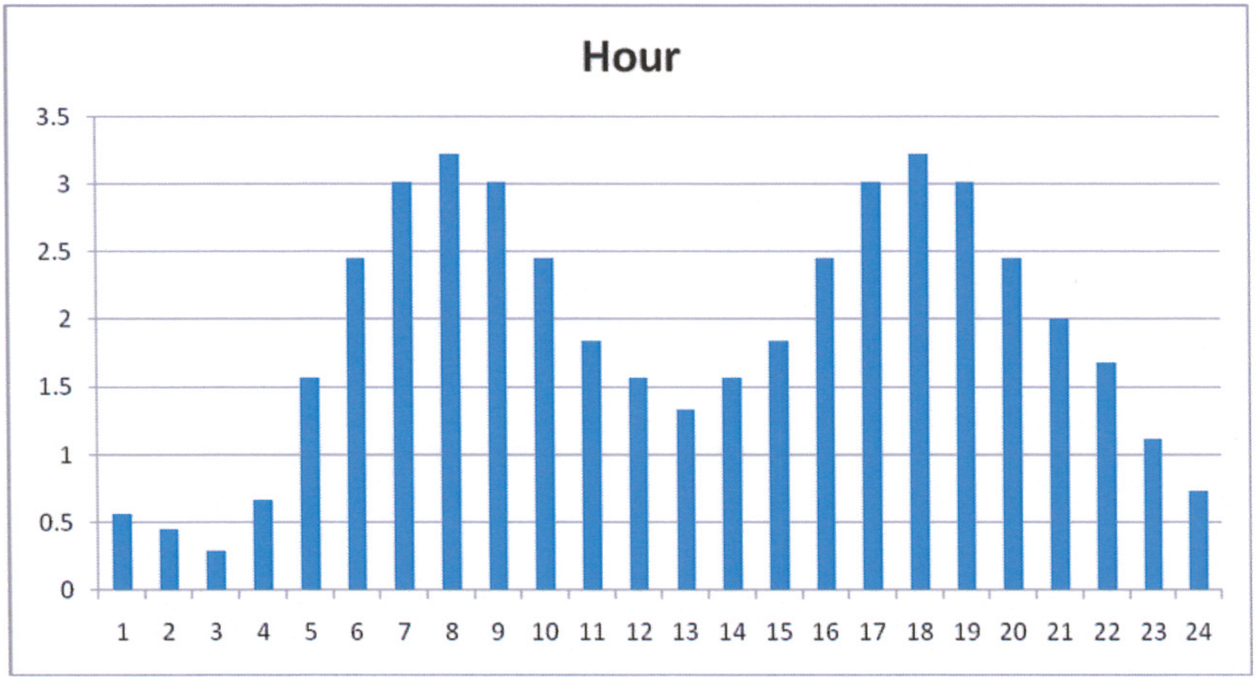
The large water users shown in Figure 6-1 are listed in Table 6-2 with their corresponding usage, meter location and a description of the user. The demands for these large water users were obtained through meter records provided by the District.

Table 6-2 Lake Hemet Municipal Water District Large Water Users

	Description	Address Meter Location	Consumption (gpm)
1	Hemet Unified School District (High School)	41701 Stetson Avenue	53.24
2	Kramar; L S (Mobile Home Park)	24600 Mountain	21.80
3	Hemet Unified School District	43900 Mayberry Avenue	20.71
4	Hemet Unified School District	441 Lake Street	20.48
5	Vista De Oro Mobile Home Park	45521 Florida Avenue	19.62
6	Hemet Unified School District	41535 Mayberry Avenue	18.12
7	Valley Wide Recreation	Lake Street	17.18
8	Valley Wide Recreation	43935 Acacia Avenue	14.81
9	Linda Vista Mobile Home Park	45055 Florida Avenue	12.63
10	Hemet Estates (Apartments)	1101 Menlo Avenue	11.81
11	Moreno Valley CAPM Group (Church)	1151 Park Avenue	11.79
12	Hemet Estates (Apartments)	1101 Menlo Avenue	11.24
13	Casa Del Rey (Mobile Home Park)	880 Lake Street	11.14
14	Franklin Terrace Apartments	200 Yale Street	10.71
15	Valley Wide Recreation & Park District	25175 Fairview Avenue	10.58
16	HUSD Ramona School	41051 Whittier Avenue	10.48
17	Hemet Unified School District	26866 San Jacinto Avenue	10.24
18	V. V. Assembly of God (Church)	45252 Florida Avenue	10.14
19	Hemet Unified School District	26091 Meridian Street	10.09
20	Casa Del Rey (Mobile Home Park)	880 Lake Street	10.05

The maximum-day demand was calculated by the District to be 1.9 times the average-day demand. This peaking factor was then used to generate a 24-hour demand curve within the model for maximum day. A peak-hour demand of 1.7 times maximum-day demand or 3.23 times average day was used. The demand curve used to simulate maximum-day demands is shown in Figure 6-2 and is characterized by a greater early morning and evening usage.

Figure 6-2 Model Demand Curve



Pipelines: The input data for the pipelines consists of length, diameter and pipeline C-factor. The pipeline lengths, diameters, type and age for the skeletal model were determined from the water system maps provided by the District. Pipeline roughness coefficients (C-factors) depended on pipe material and age, and typically ranged from 70 (high friction) to 145 (low friction, such as newer PVC pipe). Recently installed pipelines are cement mortar lined and wrapped (initial C-factor = 130), while older pipeline materials include steel, cast iron, asbestos cement, wrought iron, wrapped steel, and cement lined steel (initial C-factor range 80 to 120).

ERSC's update of the hydraulic model reflects the 200 miles of pipeline currently within the system. The diameters of these pipelines range in size from 2-inch to 20-inch, and were entered into the model from maps provided by the District. The C-factor used for all of these interior waterlines was 120.

Storage Reservoirs: The District's treated water distribution system has 13 above ground steel reservoirs. Each of the reservoirs has been input into the model as cylindrical tanks with maximum levels and diameters corresponding to their storage capacity.

Pump Stations: The District operates 8 booster pumps throughout the water distribution system. Pump curves, where available, were entered into the model. All other booster pumps in the system are modeled as horsepower pumps. The horsepower of each of these booster pumps was provided to ERSC by the District. Operation of the pumps was controlled by elevations in the reservoirs to which they supply water.

Wells: Each of the District's wells was modeled as a node with a negative demand. In the model, this denotes an input of water into the distribution system. At several of the wells, groundwater is pumped from the well into an aeration tank and then is boosted from the tank into the distribution system. Therefore, at each of these well sites, the aeration tank and the booster pump were modeled.

As an operational plan, to reduce power costs, booster pump stations and wells were evaluated based on an off peak time of use (TOU) pumping schedule. Pumps were turned off between 11 am and 7 pm regardless of reservoir levels.

HYDRAULIC MODEL CALIBRATION

The purpose of calibrating a hydraulic model is to confirm that the computer model is accurately representing the operation of the water distribution system.

After updating the District's hydraulic model, 18 hydrant flow tests, supplied by the District, were used to calibrate the model and ensure that the model closely represented actual observed pressure conditions in the field. These tests represented flows throughout the system between 2002 and 2009.

Each simulation involved monitoring residual pressures at the 18 hydrant sites while providing the corresponding flow through the hydrant node as was performed in the field. Static pressures were measured at the sites with no flow through the hydrant. During the tests, the wells were shut down and the system was fed by gravity from the distribution storage tanks.

CALIBRATION RESULTS

Hydrant flow tests were simulated using the updated hydraulic model of the District's treated water system. Results were then compared to field data to determine the accuracy of the model. The difference between static and residual pressures for the field hydrant test and the calibrated model were calculated.

Overall, the results from the hydraulic model calibration validated the system pipeline configuration. Minor pressure differentials that were observed between the model and the field observations can be attributed to varying simulation and site conditions. Factors such as the time of day the test was performed, the demand on the system, storage reservoir levels and supplies from booster pumps and wells will influence pressures within the system. The model simulates pressures as seen within the pipeline adjacent to the hydrant and does not account for any pressure losses through the hydrant.

CHAPTER 7

WATER DISTRIBUTION SYSTEM ANALYSIS

INTRODUCTION

This chapter summarizes the evaluation of the District's existing water distribution system and its ability to meet water demands under existing design conditions. The evaluation is based on the criteria presented in Chapter 3, "Operational and Design Criteria", and on additional information provided by the District.

BACKGROUND

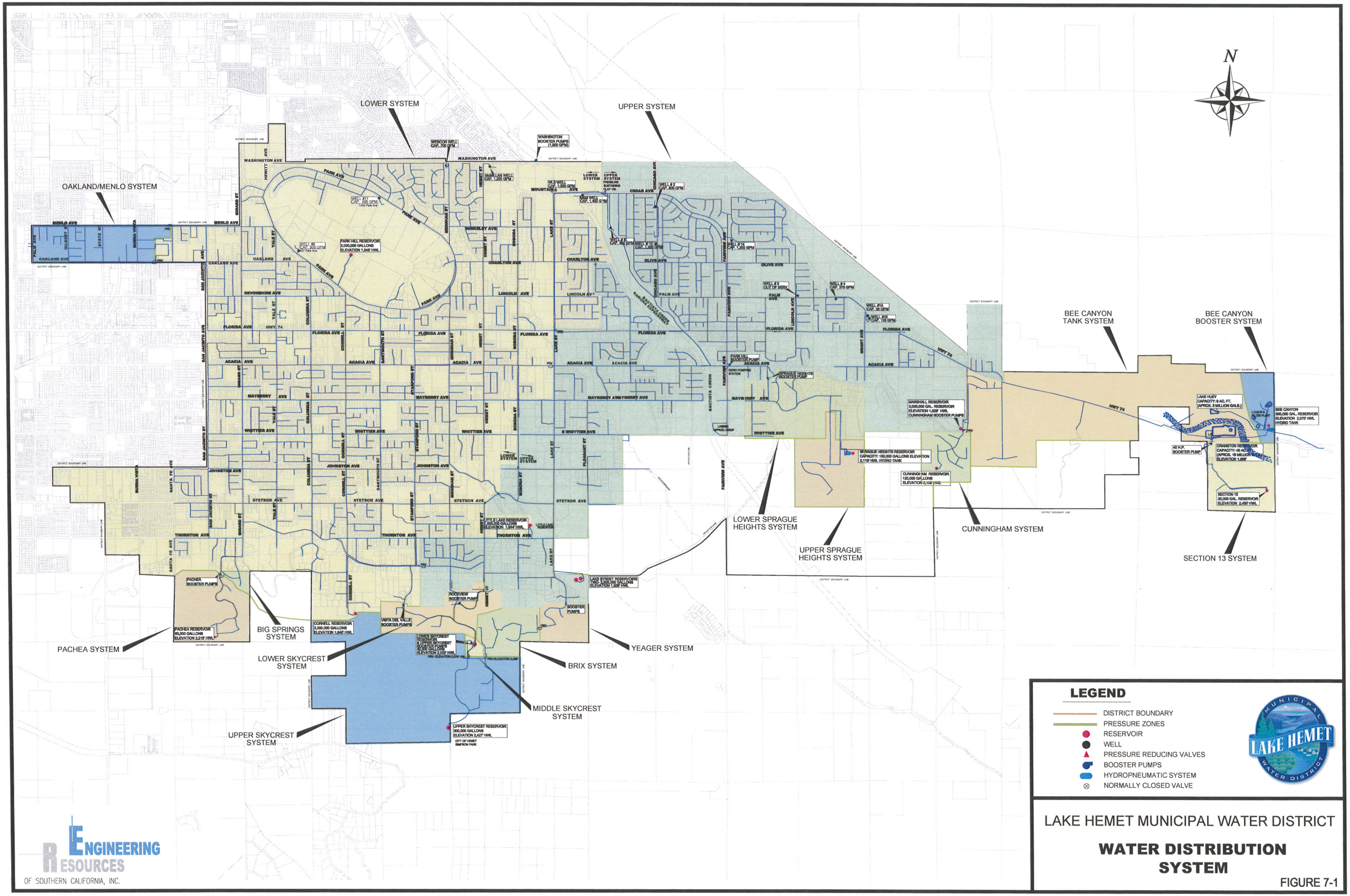
The District's existing water distribution system was evaluated as follows:

- The existing distribution system with all current operational facilities for the potable water service area
- Demands represented by 2009 usage

The existing water distribution system was evaluated under the following demand scenarios:

- Maximum-day
- Peak-hour
- Maximum-day plus fire flow conditions

The above conditions were analyzed using the updated hydraulic model. These model simulations were conducted to evaluate potential system improvements and/or enhancements, including new pipeline connections, parallel pipelines and replacement mains. Existing local and regional emergency storage requirements and provisions for backup power for the pump stations and wells were also evaluated as part of the analysis. Figure 7-1 depicts the existing water distribution system boundary, pressure zones and facilities.


LOWER SYSTEM
UPPER SYSTEM
OAKLAND/MENLO SYSTEM
BEE CANYON TANK SYSTEM
BEE CANYON BOOSTER SYSTEM
LOWER SPRAGUE HEIGHTS SYSTEM
UPPER SPRAGUE HEIGHTS SYSTEM
CUNNINGHAM SYSTEM
SECTION 13 SYSTEM
PACHEA SYSTEM
BIG SPRINGS SYSTEM
LOWER SKYCREST SYSTEM
YEAGER SYSTEM
BRIX SYSTEM
MIDDLE SKYCREST SYSTEM
UPPER SKYCREST SYSTEM
N
LEGEND
DISTRICT BOUNDARY
PRESSURE ZONES
RESERVOIR
WELL
PRESSURE REDUCING VALVES
BOOSTER PUMPS
HYDROPNEUMATIC SYSTEM
NORMALLY CLOSED VALVE
MUNICIPAL LAKE HEMET WATER DISTRICT
LAKE HEMET MUNICIPAL WATER DISTRICT
WATER DISTRIBUTION SYSTEM
FIGURE 7-1
ENGINEERING RESOURCES OF SOUTHERN CALIFORNIA, INC.
S:\Lake Hemet Municipal Water District\96006.037-Master Plan\Report markups from ERSC after Jeffs markups\AUG 11 2010\96006037-Water Model.dwg, 9/3/2010 8:57:16 AM

EVALUATION OF EXISTING WATER DISTRIBUTION SYSTEM

This section presents an evaluation of the District's existing water distribution system and its ability to meet recommended performance and planning criteria under existing demand conditions and current system configurations. The existing water distribution system was evaluated under the following demand scenarios:

- **Maximum-Day Demand -** Maximum-day demand conditions are met by flows from water supply facilities only. A maximum-day demand condition was simulated for the existing system to evaluate the District's supply facilities, pump station capacity, and the distribution system capabilities.

- **Peak-Hour Demand -** Utilizing the model demand curve (Figure 6-2) peak hour demands occur twice each day. The first occurrence is met by the combined flows from the District's supply sources and storage reservoirs. The second occurrence is met by reservoir storage only. Both peak-hour flow conditions were simulated for the existing system to evaluate the distribution facility's capability to meet these peak-hour demand conditions.

- **Maximum-Day Demand Plus Fire Flow -** To evaluate the system under each maximum-day plus fire flow condition, a two-step analysis was followed. The first step used the H_2ONET "Available Fire Flow Analysis" option to determine if the minimum pressure and required fire flow could be met with existing District facilities. If the analysis indicated that the system failed to meet the minimum requirements for pressure and flow, a second analysis was performed. The second analysis involved running the model, but with pipeline improvements/system modifications added to the distribution system to eliminate previously identified deficiencies.

Pump Station Analysis

Pump stations should be evaluated on their ability to deliver a firm, reliable capacity equal to a system's maximum-day demand. The estimated maximum-day demand for the District in 2009 is approximately 13.93 million gallons per day (mgd) [approximately 9,673 gallons per minute (gpm)]. Firm pump station capacity is defined as the total pump station capacity with the largest pump out of service. Analysis of the District's pump stations is divided into three categories:

- Water distribution system booster pump stations
- Wells
- Well booster pump stations

Water Distribution System Pump Stations - The water distribution system booster pump stations are those pump stations which boost the water from the Main Valley System to the Hillside or Upper Valley Pressure Zones. Details of the District's eight booster pump stations is provided in Table 7-1. All of these in-line booster pumps are sized to provide maximum-day demands to their service pressure zones, and each station has at least one backup pump.

Table 7-1 LHMWD Water Distribution System Booster Pump Stations

Pump Name	Source Zone	Primary Pump Hp	Backup Pump HP	Primary Pump Efficiency (%)	Service Zone
Pachea	Lower	25	25	55.2	Pachea
Valle Del Vista	Lower	15	None (a)	54.4	Lower Skycrest
Rockview	Lower	25	25	66.4	Lower Skycrest
Upper Skycrest	Lower	60	50	80.2	Upper Skycrest
Sprague Hts.	Upper	50	50	72.4	Sprague Hts.
Sprague Hts. Hydro-pneumatic	Sprague Hts.	15	15	58.2	Sprague Hts. Pressure
Cunningham	Upper	50	25	52.4	Cunningham
Marshall	Upper	100	100	65.1	Bee Canyon
Bee Canyon Hydro-pneumatic	Bee Canyon	15	20	55.6	Bee Canyon Pressure
Section 13	Bee Canyon	75	20/20	80.0	Section 13
Washington Booster	Lower	150			Lower

(a) Rockview booster station feeds the same zone and backs up this pump

Well Pumps - The District's well pumps are those pumps that actually lift the groundwater from the groundwater basin into the deaeration tanks or distribution system at each of the well sites. These wells are tested on an annual basis by Southern California Edison (SCE) or by District staff. Table 7-2 presents a summary of these wells and their efficiencies. In addition, based on pump tests, several wells are operating in an inefficient manner. The most common reasons for this are the pump and/or motor may be worn and need to be replaced or the pump is operating outside of its design curve. A major impediment to consistently operating a well pump on its design curve is that the pumping level within a well can change dramatically in less than a year due to a continually dropping water table. The San Jacinto and Hemet groundwater basins are currently experiencing an overdraft of approximately 15,000 afa and has necessitated the District to lower well pumps (newly designed for the increased head) to keep them adequately submerged. In fact, M&M well's production is being throttled at the discharge valve to prevent the pump from breaking suction. Until the basins' water levels are stabilized, it will be very difficult to operate the wells efficiently.

Table 7-2 Lake Hemet Well Pumps

Well Pump Name	Approximate Pumping Capacity (gpm)	Efficiency (%)	Pressure Zone
WLB	1,650	61.8	Lower
McMillan Well	1,200	69.0	Lower
Webcor Well	650	70.4	Lower
Well 8	300	59.5	Lower
Well 9	800	61.1	Lower
Well 11	485	59.0	Lower
Well 1A	100	29.9	Upper
Well 2	800	49.8	Upper
Well 4	425	53.5	Upper
Well 10	1,200	72.9	Upper
Well 14	690	75.1	Upper
Well 15	125	34.2	Upper
M&M Well	1,600	62.5	Upper
Total Capacity	10,025		

Source: District Staff

Well Booster Pumps - These pumps boost the water from the deaeration tanks at the well sites into the distribution system. A listing of these pumps and their current efficiencies are detailed in Table 7-3. Booster pumps tend to operate more efficiently than well pumps because they pump against a more consistent head, allowing them to remain on their design curve.

Table 7-3 Lake Hemet Well Booster Pumps

Booster Pump Name	Approximate Pumping Capacity (gpm)	Efficiency (%)	Pressure Zone
Well #8 Booster	750	84.2	Lower
McMillan Booster	1,580	71.1	Lower
Webcor Booster	1,000	70.0	Lower
Well #2 Booster	1,100	81.0	Upper
Well #10 Booster	1,500	82.0	Upper
Well #14 Booster	1,500	75.0	Upper
Pipeyard Booster [(a)]	1,300	78.0	Upper
M&M Booster	2,000	80.0	Upper
Washington Booster	1,900	75.0	Lower
Total Capacity	12,630		

[(a)] Pipeyard Booster pumps water from wells 1A, 4 and 15.

Source: District Staff

Backup Power

Backup power generators are installed at seven well sites and the Sprague Heights hydro-pneumatic system pumps. The well generators establish a firm water supply of 6,890 gpm to the District in the event of a widespread power outage. It is recommended that the District continue this program with the goal of installing backup power to all well sites. Also, in order to reduce the deficiencies in fire flow storage in the foothill pressure zones by utilizing pump capacity (firm capacity), generators should be installed at all foothill boosters.

Table 7-4 Backup Power Generators

Location	Rating (kW)	Well Production (gpm)
Well 2	181	800
Well 8	230	300
Well 10	300	1,200
Well 14	250	690
M&M	550	1,600
WLB	500	1,650
Webcor	250	650
Sprague Hts. Pneumatic	30	-

Source: District Staff

Reservoir Analysis

Reservoir storage is accounted for in each of the District's pressure zones to provide emergency storage and fire flow storage. Specific volume requirements for each of these components include volumes of one maximum-day demand for emergency storage and fire storage for a 4-hour duration at a flow rate of 3,000 gpm (schools/commercial) or a 2-hour duration of 1,500 gpm for a residential fire. Fire flow storage of 3,000 gpm for 4-hours or 720,000 gallons is needed in the Upper and Lower Systems to satisfy the fire flow requirements for schools and or commercial developments which are located within these pressure zones. All other zones would require fire flow storage of 1,500 gpm for 2-hours or 180,000 gallons to satisfy the residential fire flow requirements.

A breakdown, by pressure zone, of the existing total storage volume within the District is presented in Table 7-5. Based on the planning criteria discussed above for the 2010 Master Plan update, Table 7-5 presents an overall District storage deficiency of 6.411 mg. There is a surplus of 750,000 gallons in the Upper System pressure zone that could be dropped down to the Lower System when needed. The foothill zones have a total deficit of 741,000 gallons, with only Section 13 and Bee Canyon showing a storage surplus. Pachea needs its storage capacity increased by 220,000 gallons, Lower Sprague Heights by 470,000 gallons, Cunningham by 190,000 gallons, and Upper Skycrest by 118,000 gallons.

Section 13 and Bee Canyon zones are unique in that a large percentage of their demand is from the agricultural sector. In emergency situations, agriculture customers could be notified to reduce or stop irrigating until the emergency had passed. This would free-up substantial storage for fire fighting. The figures in Table 7-5 do not include agricultural demand.

There are no quick solutions to remedying the existing foothill storage deficiencies. At each of these existing reservoir sites, there is very limited access for installing a second or larger tank, and because the foothill pressure zones are not very large (small service areas), water quality and tank turnover issues are also concerns if increased storage is installed. However, it is recommended that the District continue to search for potential tank sites in each of these pressure zones and/or to increase line size and pumping capacities to eliminate these storage deficiencies. Backup power supplies at the booster sites will help reduce the deficiencies in storage by establishing firm pump capacity. Water quality issues can be avoided by installing tank inlet manifolds that create turnover in the tanks, thereby eliminating stagnant water conditions caused by winter usage patterns. Operational procedures can also be modified, e.g. lowering maximum tank levels, to increase turnover.

The District has overcome its deficiency in above ground storage by greatly increasing their source reliability by installing standby generators at District and leased well sites to provide power during local or regional outages. Backup generators have been installed at seven well sites and the Sprague Heights hydropneumatic system pumps. Four of these generators are at well sites located in the Upper System, providing 4,290 gpm or 6.2 mgd of supply and the remaining three generators are at well sites located in the Lower System providing 2,600 gpm or 3.7 mgd of supply. The combined source available to the District in the event of a local power outage is 6,890 gpm or 9.9 mgd, sufficient capacity to meet average day demands. In the event of an emergency, peak day and peak hour demands would be met by a combination of source capacity from wells with backup generators and from existing storage reservoir capacity.

Table 7-5 Existing District Storage Volumes and Storage Deficiencies

Tank Description	Existing Volume (mg)	Assumed Fire Flow Duration (hrs)	Planning Level Storage Requirement		Total Planning Level Storage Required (mg)	Storage Deficiency (mg)
			Emergency[a] (mg)	Fire (mg)		
FOOTHILL PRESSURE ZONES						
Pachea & Big Springs	0.06	2	0.10	0.18[b]	0.28	0.22
Lower Sprague Heights	0.15	2	0.44	0.18[b]	0.62	0.47
Upper, Middle & Lower Skycrest, Brix and Yeager	0.342	2	0.28	0.18[b]	0.46	0.118
Cunningham	0.12	2	0.13	0.18[b]	0.31	0.19
Section 13 (no ag)	0.02	2	0.003	-[c]	0.003	-0.017[d]
Bee Canyon (no ag)	0.50	2	0.08	0.18[b]	0.26	-0.24[d]
Foothill Total	1.192		1.033	0.90	1.933	0.741
VALLEY PRESSURE ZONES						
Upper System						
Marshall	2.00	-	-	-	-	-
Lake Street	4.00	-	-	-	-	-
Upper System Total	6.00	4	4.53	0.72	5.25	-0.75[d]
Lower System						
Cornell	2.00	-	-	-	-	-
Park Hill	2.00	-	-	-	-	-
Little Lake	1.00	-	-	-	-	-
Lower System Total	5.00	4	10.70	0.72	11.42	6.42
Valley Total	11.00		15.23	1.44[e]	16.67	5.67
DISTRICT TOTAL	**12.192**	-	**16.26**	**2.34**	**18.60**	**6.411**

[a] Based on maximum-day demands from 2007.
[b] Assumes fire flows of 1,500 gpm for 2 hours in Pachea, Sprague Heights, Upper and Lower Skycrest, Cunningham and Bee Canyon zones.
[c] Fire storage was not calculated for Section 13 due to the small service area. Fire flow demand to be provided by existing storage reservoir and booster pumps.
[d] Negative numbers represent a surplus in storage.
[e] Based on estimated storage requirement to suppress a 3,000 gpm fire for 4-hours in both the Upper and Lower valley systems.

Pipeline Analysis

For the hydraulic pipeline analysis, an extended period simulation was conducted to identify areas of the District's system with pressure, velocity, and/or head loss deficiencies. Pipelines are typically designed to deliver peak-hour flows and maximum-day demands plus fire flows within acceptable pressure, velocity and head loss ranges.

Peak-Hour Demands - The peak-hour demand for the District was estimated to be 3.23 times average-day demand (1.9 times average-day demand for maximum-day demand and 1.7 times for peak hour demand). That peak-hour demand was simulated in the model and the results indicated that the existing system contained areas that could not adequately meet those demands under the District's minimum pressure criteria of 40 psi. Most of the areas of low and high pressure are in the District's foothill pressure zones. ERSC was informed that there are some areas in the District which have always had low and/or high pressures. ERSC has confirmed that these areas of concern are due mostly to the topographic location of the services and cannot be adjusted without major reconfiguration of the pressure zones. In the future, with the addition of storage reservoirs and pipeline installations, the District may be able to adjust pressure zone boundaries in some of the areas of concern to provide improved pressures.

Maximum-Day plus Fire Flow Demand - Fire flow demands were simulated in the District's foothill pressure zones and the Upper and Lower Pressure Zones. These evaluations are mostly relevant to the performance of the District's distribution system as of 2007.

Fire flow demands throughout the District vary between residential, commercial and institutional buildings and are based on fire flow requirements for buildings as set forth in the 2007 California Building Code. Minimum fire flow and flow durations are based on factors such as building square footage, building construction material and the intended use of the building. The local fire chief is authorized to reduce fire flow requirements for isolated buildings in rural areas and for buildings with approved automatic sprinkler systems. He can also increase these requirements where there is a potential for group fires. Since the fire flow requirements are so variable, ERSC and District staff concluded that the following criteria would be used in the model:

Single Family Residential – Fire Flow 1,500 gpm for a 2-hour duration

Commercial/Institutional – Fire Flow 3,000 gpm for a 4-hour duration

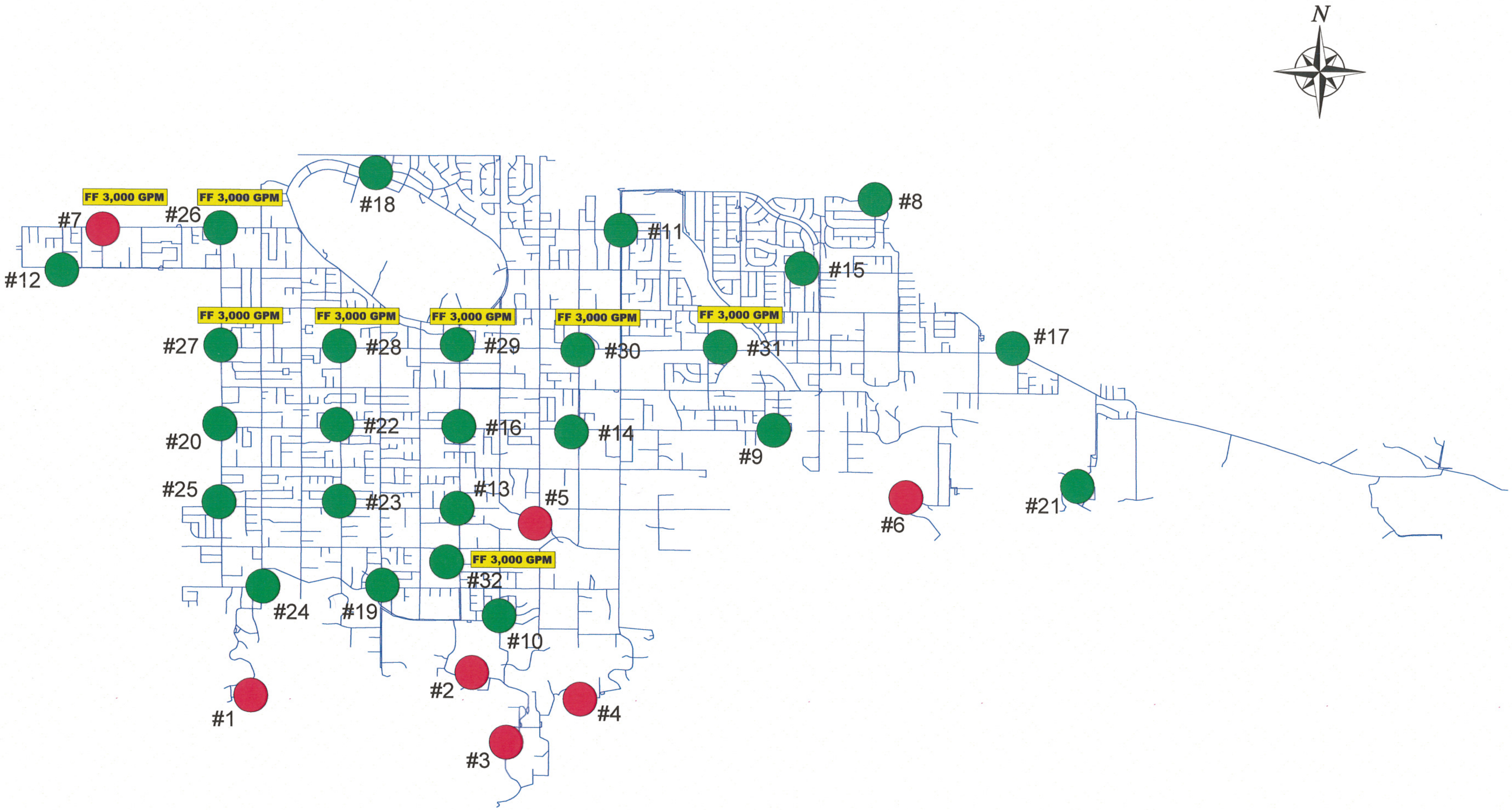
These flow rates were modeled during maximum-day demand conditions while maintaining a minimum 20 pounds per square inch (psi) residual system pressure. An analysis of the existing pipelines and storage reservoirs to determine if and where upgrades were required was then performed. Thirty-two fire flow simulations were analyzed. These locations were chosen as they represented a cross section of areas and fire flow associated demands. It was observed that 7 of the 32 areas analyzed required pipeline upgrades to achieve the 20 psi residual pressure at the given fire flow rate. Each of the fire flow simulation locations are shown on Figure 7-2 and are further described below.

Fire Flow Scenario #1 - Simulated 1,500 gpm fire flow in the Pachea Pressure Zone.
For Scenario #1, a 1,500 gpm fire flow was simulated near the intersection of Pachea Trail and Peak Road in the upper portion of the Pachea Trail Pressure Zone. The 1,500 gpm demand was split between two hydrants, one near the intersection of Pachea Trail and Peak Road and one on Peak Road, 400 feet southeast of the intersection of Pachea Trail and Peak Road. When the distribution system was tested under this assumed fire flow, the model indicated that the existing distribution system was inadequate to fight a fire of this magnitude for the reasons stated below:

- There is not enough fire storage in the Pachea Trail Tank to meet a 1,500 gpm fire flow for a duration of 2 hours (180,000 gallons required, only 60,000 gallons of storage is available).
- The existing 6-inch diameter pipelines in Pachea Trail and Peak Road are undersized.
- The Pachea Trail pump station does not have enough firm capacity to deliver the required fire flow.

At first glance, the solution to these system deficiencies seems straightforward; however, there are other constraints to consider prior to making any recommendations. These include:

1. Replacing the pipeline in Pachea Trail will be very difficult due to the width and grade of the existing roadway.
2. Increasing the size of the Pachea Trail Tank might cause some water quality problems (i.e. stale water) in the future because the demands are not large in the Pachea Trail Pressure Zone and it could take weeks for a large tank to turn over completely.
3. Increasing the size of the Pachea Trail Booster Pump would be difficult because of site constraints.
4. The discharge pressure of the Pachea Trial Booster Pump should not exceed 200 psi because it would over-pressurize the homes closest to the Pump Station.



LEGEND

- NO UPGRADE REQUIRED
- UPGRADE REQUIRED
- FF 3,000 GPM — FIRE FLOW REQUIRMENT 3,000 GPM

LAKE HEMET MUNICIPAL WATER DISTRICT

FIRE FLOW

MODELING LOCATIONS

FIGURE 7-2

ENGINEERING RESOURCES OF SOUTHERN CALIFORNIA, INC.

In trying to maintain the required pressures, velocities and head losses with the constraints listed above, ERSC concluded that it is impossible to provide a 1,500 gpm fire flow for 2 hours in this area. It was observed that most of the pressure zone could provide a 1,000 gpm fire flow while maintaining a 20 psi residual.

It is recommended that the storage in the Pachea Trail Tank be increased from 60,000 to 220,000 gallons to accommodate future demands in the zone and a 1,500 gpm fire flow for a 2-hour duration.

The Pachea Trail Booster Pump is recommended to be increased to 90 Hp to provide some additional water at a higher discharge pressure during a fire flow.

It is recommended that the District increase the 6-inch diameter pipeline along Pachea Trail from the Pachea Trail Booster Pump Station to Peak Road to a 12-inch diameter pipeline. There will still be areas near the tank which will still be below the minimum pressure criteria of 20 psi during a fire flow; however, these low pressures are due to topography and not to head losses in the pipelines. In addition, these areas are not associated with fire hydrant locations and therefore will not affect the required minimum pressure at the fire hydrants. The only way to increase this area of low pressure near the tanks is to physically raise the bottom of the tank to a higher elevation.

Fire Flow Scenario #2 - Simulated 1,500 gpm Fire Flow in the Lower Skycrest Pressure Zone. Under Scenario #2, a 1,500 gpm fire flow was simulated along Vista Del Valle in the Lower Skycrest Pressure Zone. The 1,500 gpm demand was split between two hydrants, one near the intersection of Vista Del Valle and Vermont Street and one on Vista Del Valle, northwest of the Lower Skycrest Tank. When the District's distribution system was tested under this assumed fire flow, the hydraulic model indicated that the existing distribution system was inadequate to fight a fire of this magnitude. A fire flow simulation performed on the pressure zone indicated that there were a few locations that could only be provided 360 gpm while maintaining a 20 psi residual, but that most areas could be provided 700 gpm. After evaluating the head losses, velocities and available storage in the Lower Skycrest System, the following conclusions can be reached:

- There is not enough fire storage in the Lower Skycrest Tank to meet a 1,500 gpm fire flow for a duration of 2 hours. Therefore, the Upper Skycrest Tank will need to provide the additional flow required. This is possible through the existing pressure reducing valve (PRV) located between the Upper and Lower Skycrest Pressure Zones near the Lower Skycrest Tank.
- The existing 4-inch diameter pipelines in Vista Del Valle are undersized.
- The existing 6-inch diameter I/O pipeline from the Lower Skycrest Tank is undersized.

- The Rockview and Vista Del Valle Pump Stations do not have enough firm capacity to deliver the required fire flow.

In evaluating the site specific constraints and discussing the available options with District staff, our recommended solution to the fire flow problem is to replace pipelines and add new facilities. First, we recommend increasing the size of the pipeline from the discharge side of the Booster Pump Stations to the inlet side of the Lower Skycrest Reservoir from a 4-inch pipeline to a 12-inch pipeline. There are areas near the tank which will still be below the minimum pressure criteria of 20 psi during a fire flow; however, these low pressures are due to topography and not to head losses in the pipelines. The only way to increase this area of low pressure near the tanks is to physically raise the bottom of the tank to a higher elevation. In discussions with District staff it was determined that the pipeline from the discharge of the Rockview Booster pump should be relocated within a new easement along property lines and that the pump station could be relocated west to the intersection of Margoni Way and Hemet Street. In order to achieve this, the suction pipeline to the existing Rockview Booster pump would be abandoned and a new 12-inch pipeline constructed in Hemet Street from Chambers Avenue to Margoni Way. The Vista Del Valle booster Pump Station, when upgraded, should be relocated to an adjacent parcel. It is assumed that the Upper Skycrest Tank will make up any storage deficiency for the Lower Skycrest Tank through the 4-inch PRV on Rawlings Road.

Fire Flow Scenario #3 - Simulated 1,500 gpm Fire Flow in the Upper Skycrest Pressure Zone. Under Scenario #3, a 1,500 gpm fire flow was simulated along Rawling Road in the Upper Skycrest Pressure Zone. When the distribution system was stressed under this assumed fire flow condition, the model indicated that the existing distribution system was incapable of providing sufficient flow at the minimum required pressures to fight a fire of this magnitude. It was noted that most areas within the Upper Skycrest System could be provided a 500 gpm fire flow demand while maintaining required pressures. After evaluating the head losses, velocities and available storage in the Upper Skycrest Tank, the following was concluded:

- The existing 4-inch diameter pipelines in Rawlings Road and Vista Del Valle are undersized.
- There is not enough storage to provide 1,500 gpm fire flow for a duration of 2 hours on peak days.

There are areas near the tank which are still below the minimum pressure criteria of 20 psi during a fire flow; however; these low pressures are due to topography and not to head losses in the pipelines. The only way to increase this area of low pressure near the tanks is to physically raise the bottom of the tank to a higher elevation.

It is recommended that the pipeline Rawling Road be upgraded to a 12" line and that the pipelines in Vista Del Valle be upgraded to an 8" line.

Fire Flow Scenario #4 - Simulated 1,500 gpm Fire Flow in the Brix Zone.
Under Scenario #4, a 1,500 gpm fire flow was simulated along Segner Drive in the Brix Pressure Zone. When the distribution system was tested under this assumed fire flow, the model indicated that the existing distribution system was inadequate to fight a fire in this area.

In evaluating all of the system constraints our recommended solution to the fire flow problem is to replace pipelines in the Upper Skycrest Pressure Zone. The Upper Skycrest Reservoir provides water to the Brix Pressure Zone through a 4-inch PRV near the intersection of Vista Del Valle and Conrad Street. The existing pipeline in Segner Drive should be upgraded to an 8-inch pipeline from Hemet Street to the 8-inch line in Brix Street. It is also recommended that the services being fed from the 4-inch pipeline just west of Hemet Street be relocated to the front of the properties and connected to the proposed upgraded pipeline in Vista Del Valle.

Fire Flow #5 - Simulated a 1,500 gpm Fire Flow in the Lower Pressure Zone
In scenario #5 a fire flow of 1,500 gpm was placed on Little Lake Road. This area is at the top of the Lower Pressure Zone where lower static pressures will occur. When the distribution system was tested under this assumed fire flow, the model indicated that the existing system was inadequate to fight a fire of this magnitude at this location.

In evaluating the distribution system in this location it is recommended that the line on Little Lake Road be upgraded to an 8-inch line and that the line be extended down to Meridian Street and connected to the existing 8-inch line to loop the system and provide increased circulation. In the future the District may want to investigate adjusting the pressure zone boundary to increase pressure in this area by adding a PRV at Stetson Avenue and Little Lake Road.

It is inherent that lower pressures will be observed in the upper part or higher elevations of all pressure zones and that high pressures will be seen in the bottom or lower elevations of the pressure zone. In some locations where demands are at elevations close to the reservoir that serves them, there will be low pressures that can not be adjusted without physically relocating the reservoir to a higher elevation.

Fire Flow #6 – Simulated a 1,500 gpm Fire Flow in the Upper Sprague Heights Pressure Zone
In scenario #6 a 1,500 gpm fire flow was simulated at the end of Adobe Drive in the Upper Sprague Heights Pressure Zone. When the distribution system was tested under this simulated condition, it was observed that a fire flow of this magnitude could not be achieved, due to the varying elevations, the pipeline diameters and the limited capacity of the pump at the

hydropneumatic tank serving the pressure zone. It was observed that the available fire flows within the pressure zone ranged from 200 gpm to 800 gpm.

To achieve a 1,500 gpm fire flow it is recommended that the pipeline size be increased to 8-inch in diameter and that the pump at the hydropneumatic tank serving this area be upsized to accommodate a fire flow of this magnitude.

Fire Flow Scenario #7 - Simulated 3,000 gpm Fire Flow in the Oakland/Menlo Pressure Zone. Under Scenario #7 a 3,000 gpm fire flow was simulated at the intersection of State Street and Menlo Avenue in the Oakland/Menlo Pressure. When the distribution system was tested under this assumed fire flow, the model indicated that the existing distribution system was inadequate to fight a fire of this magnitude. It is recommended that the pipeline in Oakland Avenue and State Street be upgraded.

Table 7-6, Lake Hemet Municipal Water District Fire Flow Simulations, shows the fire flows for Fire Flow Scenarios #1 through #7, with simulated fire flows of 1,500 gpm each for #1 through #6, and 3,000 gpm for #7.

Fire flow scenarios #8 through #25 simulated a 1,500 gpm fire flow event at various intersections throughout the system. When the distribution system was tested under these conditions the model indicated that the existing distribution system was adequate to fight a fire of this magnitude in that area. It should be noted that these areas were at intersections which benefitted from the supply of two sufficiently sized pipelines. In some areas that are supplied from one pipeline and areas that are supplied by two smaller diameter pipelines, model simulation results indicated that the existing distribution system was inadequate. Figure 7-3 shows the locations of recommended pipeline upgrades based on those findings. Replacement of these pipelines should be made by the District on a case by case basis.

Fire flow scenarios #26 through #32 simulated a 3,000 gpm fire flow event at various commercial and institutional locations throughout the system. When the distribution system was tested under these conditions the model indicated that the existing distribution system was adequate to fight a fire of this magnitude in that area.

Table 7-6

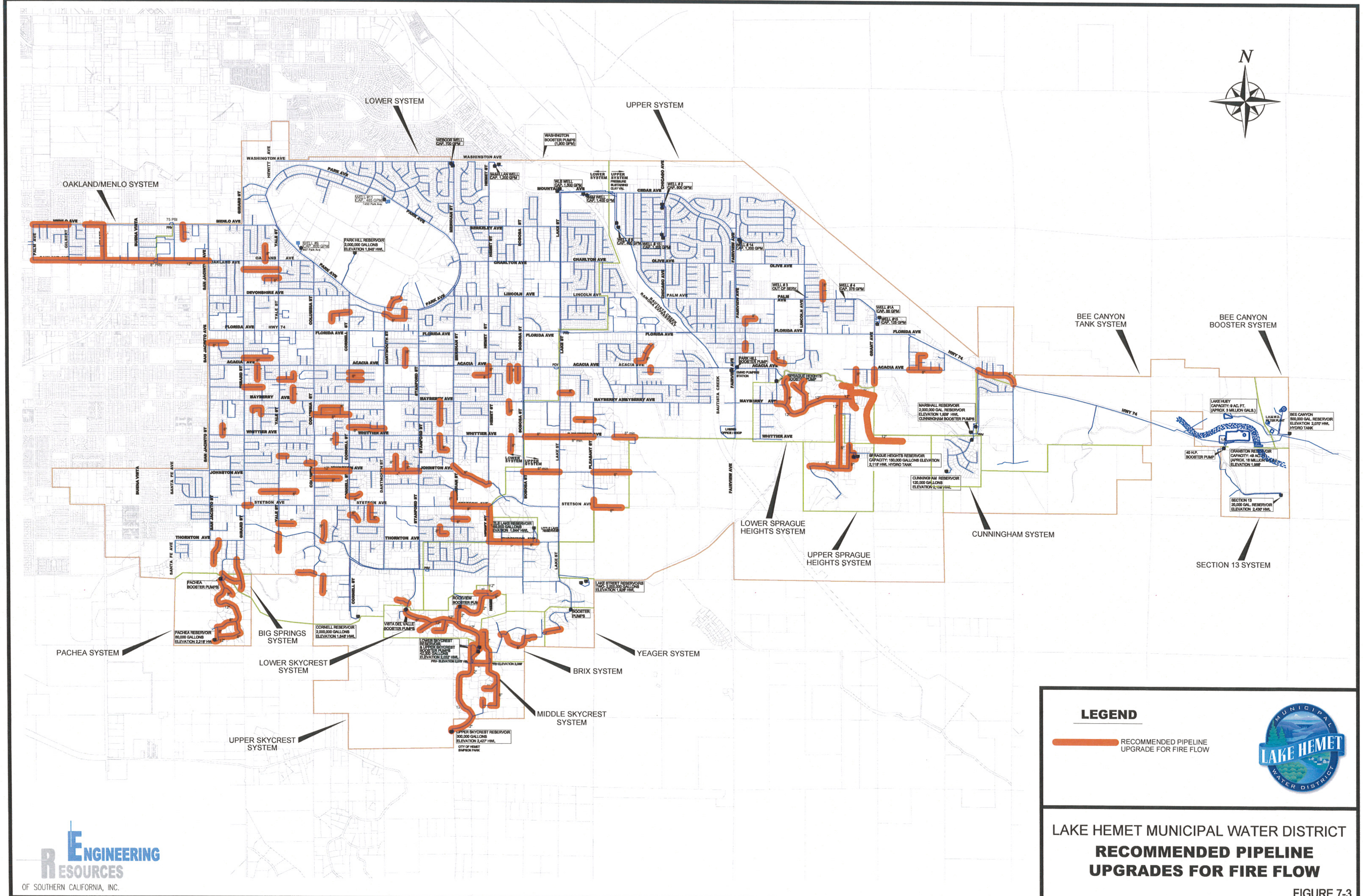
Lake Hemet Municipal Water District
Fire Flow Simulations

	ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Fire-Flow Demand (gpm)	Residual Pressure (psi)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
Fire Flow #1 Pachea	J867	8.23	40	2,212	1,500	-14	907	20
	J862	0	125	2,215	1,500	7	1,413	20
	J811	8.23	163	2,217	1,500	-26	1,304	20
	6290	8.23	49	2,213	1,500	-101	641	20
	6280	8.23	49	2,213	1,500	-86	678	20
	6279	8.23	75	2,213	1,500	-6	1,238	20
	6250	8.23	175	2,217	1,500	18	1,498	20
	6265	0	220	2,218	1,500	53	1,647	20
Fire Flow #2 Lower Skycrest	6670	4.09	107	2,192	1,500	-492	394	20
	6645	7.47	57	2,081	1,500	-51	824	20
	6635	4.09	180	2,214	1,500	6	1,251	20
	6600	4.09	98	2,198	1,500	-436	367	20
	6585	4.09	94	2,132	1,500	-52	963	20
	6580	4.09	105	2,157	1,500	-41	1,009	20
	6550	4.09	120	2,186	1,500	-8	1,200	20
	6545	4.09	137	2,192	1,500	-91	868	20
	6540	4.09	144	2,198	1,500	-120	762	20
	6535	4.09	188	2,214	1,500	22	1,559	20
Fire Flow #3 Upper Skycrest	J861	11.08	81	2,416	1,500	-187	642	20
	6690	11.08	141	2,413	1,500	-282	725	20
	6665	11.08	93	2,415	1,500	-238	623	20
	6660	0	90	2,418	1,500	8	1,370	20
	6655	0	45	2,418	1,500	-117	521	20
	6650	0	45	2,418	1,500	-22	844	20
	6636	11.08	73	2,415	1,500	-532	376	20
	6630	11.08	147	2,413	1,500	-284	741	20
	6620	11.08	147	2,413	1,500	-370	672	20
	6605	0	147	2,413	1,500	-283	730	20
	6595	11.08	119	2,414	1,500	-257	699	20
	6590	0	51	2,419	1,500	27	1,755	20
Fire Flow #4 Brix	6890	3.38	135	2,191	1,500	-410	789	20
	6885	3.38	109	2,191	1,500	-442	726	20
	6880	3.38	74	2,191	1,500	-562	598	20
	6865	3.38	90	2,191	1,500	-572	622	20
	6860	3.38	90	2,191	1,500	-580	618	20
	6855	3.38	95	2,191	1,500	-584	625	20
	6849	3.38	109	2,191	1,500	-427	735	20
	6847	3.38	68	2,191	1,500	-451	641	20
	6700	0	45	2,192	1,500	-356	650	20
	6675	0	117	2,191	1,500	-860	547	20
Fire Flow #5 Lower System	5650	6.21	26	1,826	1,500	-12	506	20

Table 7-6

Lake Hemet Municipal Water District
Fire Flow Simulations

	ID	Static Demand (gpm)	Static Pressure (psi)	Static Head (ft)	Fire-Flow Demand (gpm)	Residual Pressure (psi)	Available Flow at Hydrant (gpm)	Available Flow Pressure (psi)
Fire Flow #6 Upper Sprague Heights	J447	16.21	84	2,294	1,500	-331	227	20
	4815	9.22	119	2,294	1,500	-145	559	20
	4805	9.22	153	2,294	1,500	-239	626	20
	4800	9.22	166	2,294	1,500	-104	883	20
	4795	9.22	128	2,294	1,500	-90	716	20
	4790	9.22	108	2,294	1,500	-86	564	20
	4785	9.22	99	2,295	1,500	-67	502	20
	4761	9.22	98	2,295	1,500	-31	599	20
	4760	9.22	85	2,295	1,500	-21	384	20
	4745	0	85	2,295	1,500	-9	407	20
	4740	0	85	2,295	1,500	-4	422	20
	4781	9.22	115	2,294	1,500	-248	437	20
Fire Flow #7 Oakland/Menlo	J819	3.23	79	1,770	1,500	67	2,633	20
	J817	3.23	89	1,770	1,500	59	2,174	20
	J816	3.23	89	1,770	1,500	68	2,454	20
	J600	3.23	78	1,770	1,500	-307	539	20
	400	3.23	83	1,770	1,500	69	2,608	20
	1815	3.23	81	1,770	1,500	-15	1,177	20
	1795	3.23	83	1,770	1,500	27	1,610	20
	1790	3.23	83	1,770	1,500	33	1,688	20
	1755	3.23	87	1,770	1,500	-44	1,043	20
	1750	3.23	86	1,770	1,500	-82	907	20
	1745	3.23	75	1,770	1,500	61	2,520	20
	1737	3.23	83	1,770	1,500	63	2,389	20
	1736	3.23	83	1,770	1,500	48	1,975	20
	1730	3.23	78	1,770	1,500	65	2,611	20
	1720	3.23	78	1,770	1,500	70	2,827	20
	1715	3.23	79	1,770	1,500	70	2,824	20
	1710	3.23	78	1,771	1,500	70	2,833	20
	1705	3.23	79	1,771	1,500	70	2,789	20
	1695	3.23	80	1,770	1,500	73	2,967	20
	1690	3.23	83	1,770	1,500	75	2,965	20
	1655	3.23	85	1,770	1,500	69	2,557	20
	1680	3.23	85	1,770	1,500	70	2,614	20
	1675	3.23	82	1,770	1,500	-37	1,051	20
	1670	3.23	85	1,770	1,500	68	2,542	20
	1665	3.23	85	1,770	1,500	63	2,348	20
	1664	3.23	85	1,770	1,500	-126	795	20
	1663	3.23	85	1,770	1,500	-111	827	20
	1662	3.23	86	1,770	1,500	25	1,575	20
	1661	3.23	86	1,770	1,500	43	1,860	20
	1660	3.23	85	1,770	1,500	63	2,338	20
	1765	3.23	87	1,770	3,000	3	2,736	20
	1700	3.23	82	1,771	3,000	-13	2,508	20
	1685	3.23	83	1,771	3,000	-18	2,458	20



LAKE HEMET MUNICIPAL WATER DISTRICT

RECOMMENDED PIPELINE UPGRADES FOR FIRE FLOW

FIGURE 7-3

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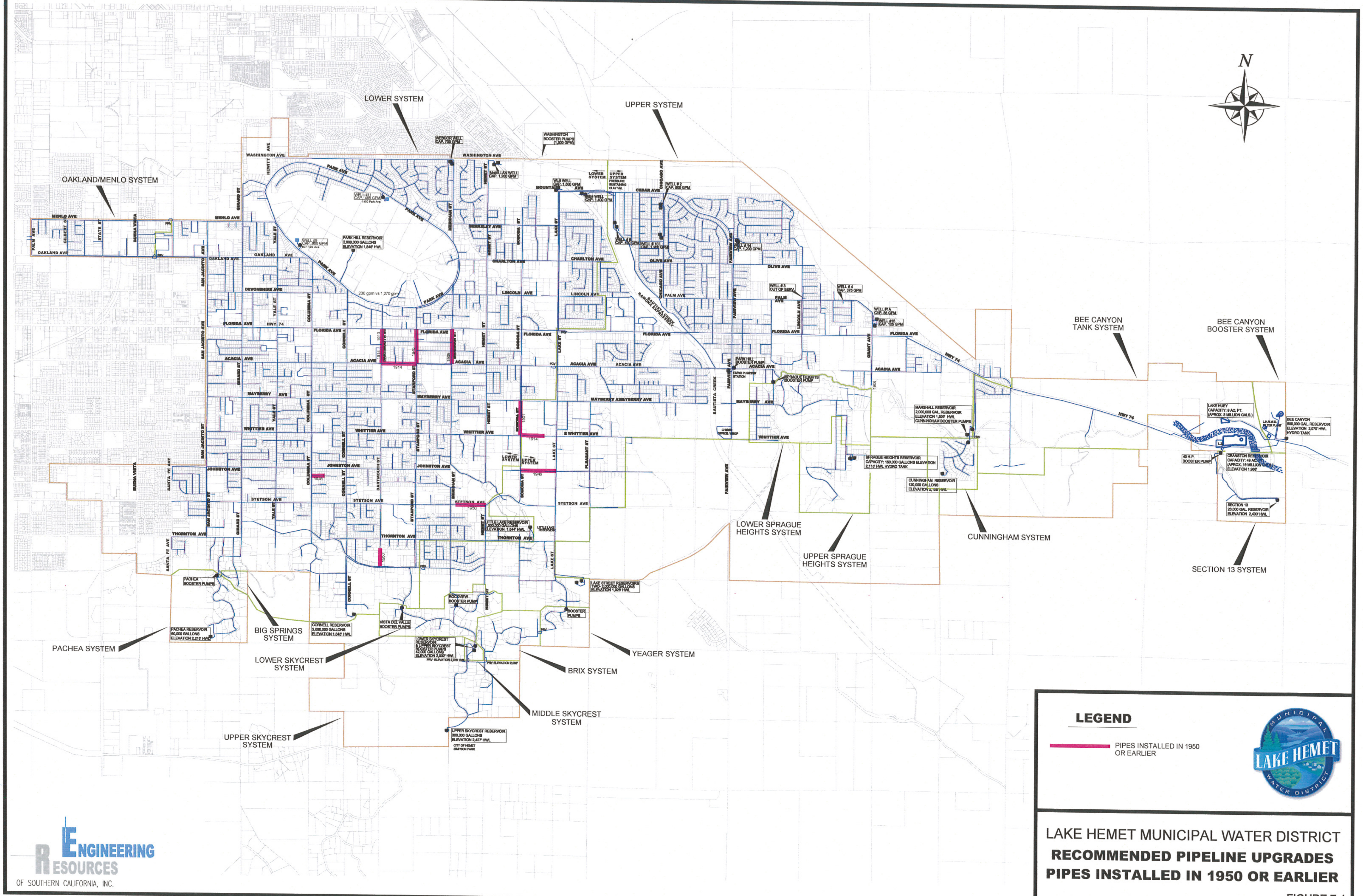
In addition to pipeline analysis during fire flow events on maximum-day and peak hour, they were also evaluated on pipeline age, diameter and frequency of repairs. Although the District has replaced some of this aging pipeline, there still remains over 11,000 feet, most of which was constructed between 1901 and 1914. The locations of the aging waterlines are shown in Figure 7-4. It is recommended that the District replace these waterlines on a scheduled proactive maintenance program before they experience excessive leakage that could disrupt service, undermine roadways or cause property damage.

When evaluating existing pipelines, diameters, pressures, velocities, hydrant locations and dead-end lines were considered. Waterlines should be looped when possible and dead end lines limited to 600 feet in length. As a District pipeline design policy, all new waterlines are required to be 8-inch diameter minimum. Within the distribution system there are several locations that are serviced with 2-inch and 4-inch waterlines that would benefit from improved system flow if upgraded. The locations of these small diameter pipelines and dead end lines that are greater than 330 feet are highlighted in Figure 7-5.

The District provided ERSC with a list of mainline repairs performed by maintenance personnel and their locations. These repair sites were then located on the distribution system map, revealing areas with multiple repair reports. Since pipelines are the backbone of the distribution system, a major emphasis should be put on replacing pipelines that require frequent repairs, thus eliminating unplanned repairs, inconvenience to customers and avoiding water loss. The locations of the repair points are shown on Figure 7-6.

Figure 7-7 is a compilation of the recommended pipeline upgrades. It includes pipeline upgrades based on fire flow simulations, aging pipelines, small diameter pipelines and areas requiring mainline repairs. This compilation was performed to identify areas within the system that have overlapping problems. This process identified three main areas of concern and provided a basis of pipeline replacement prioritization. It is recommended that Areas #1, #2 and #3 as shown on Figure 7-7 be given first priority in system upgrades followed by the replacement of aging pipelines and areas that if upgraded would provide increased circulation within the system. All other identified pipelines have been assigned third priority. The District should evaluate on a case by case basis upgrades given Priority 2 and 3 status.

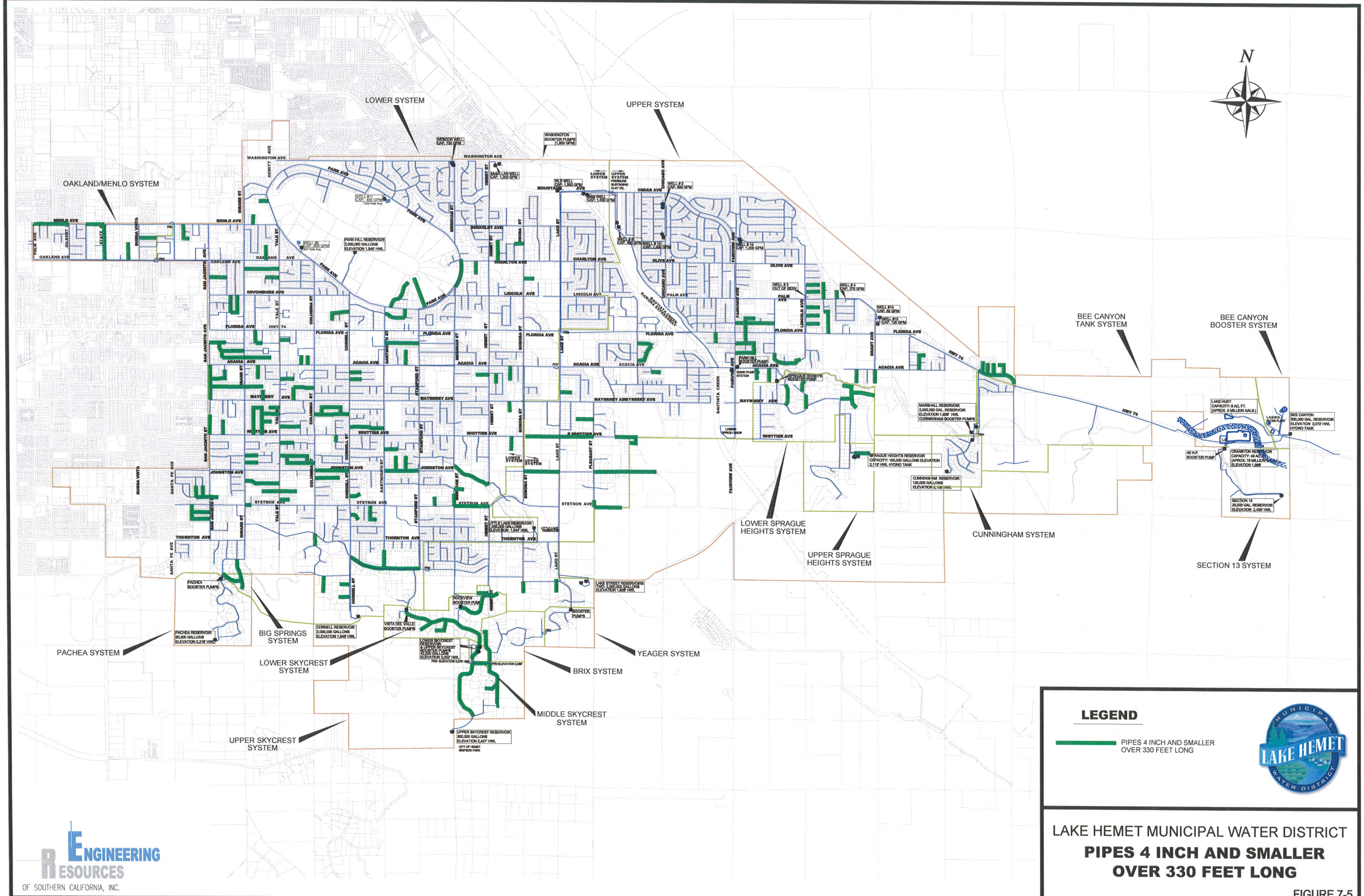
The recommended upgrades for Area #1 are shown in Figure 7-8 and include upgrades for the Pachea, Big Springs and Lower Systems. Figure 7-9 shows the Area #2 recommended upgrades within the Upper Skycrest, Middle Skycrest, Lower Skycrest, Brix and Yeager Systems. These upgrades include booster pump station locations, pipeline replacement and pipeline relocations. The recommended upgrades within the Lower and Upper Sprague Heights Systems, or Area #3 are shown in Figure 7-10. These upgrades include pipeline replacements, a new booster pump station and two proposed locations for increased storage.



LAKE HEMET MUNICIPAL WATER DISTRICT

RECOMMENDED PIPELINE UPGRADES
PIPES INSTALLED IN 1950 OR EARLIER

FIGURE 7-4



LAKE HEMET MUNICIPAL WATER DISTRICT

PIPES 4 INCH AND SMALLER OVER 330 FEET LONG

FIGURE 7-5

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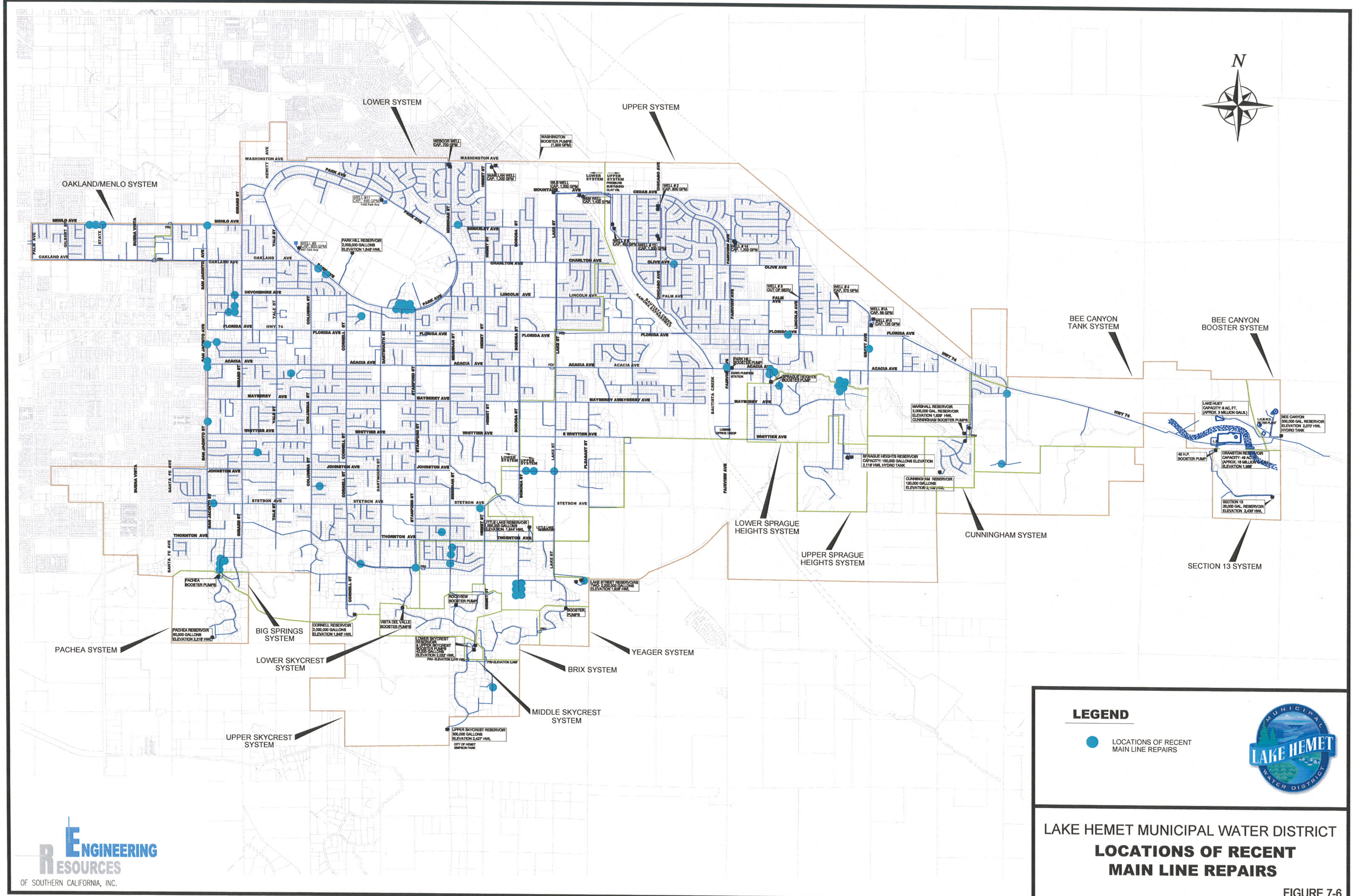

LAKE HEMET MUNICIPAL WATER DISTRICT

LOCATIONS OF RECENT MAIN LINE REPAIRS

FIGURE 7-6

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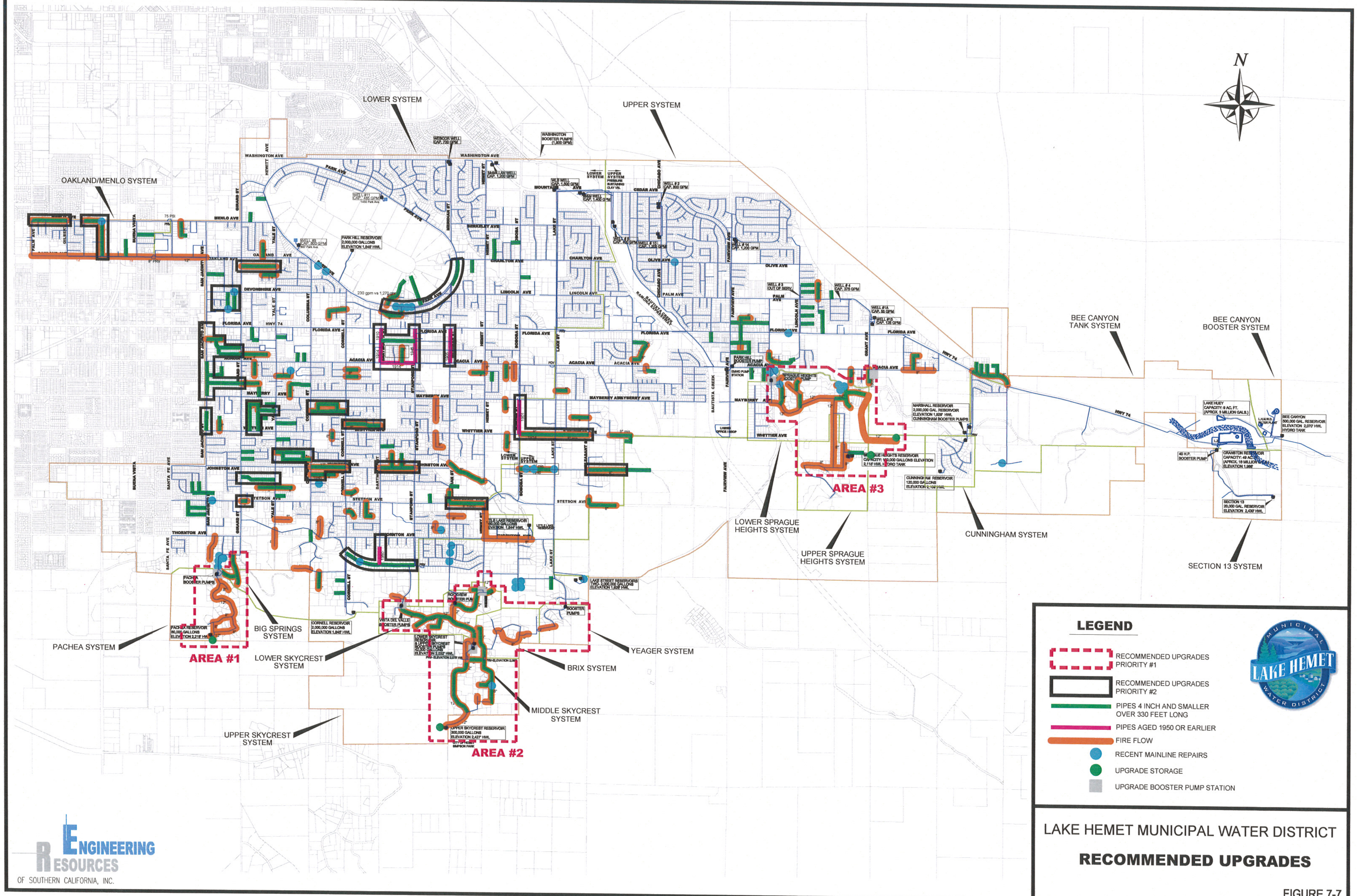

LAKE HEMET MUNICIPAL WATER DISTRICT

RECOMMENDED UPGRADES

FIGURE 7-7

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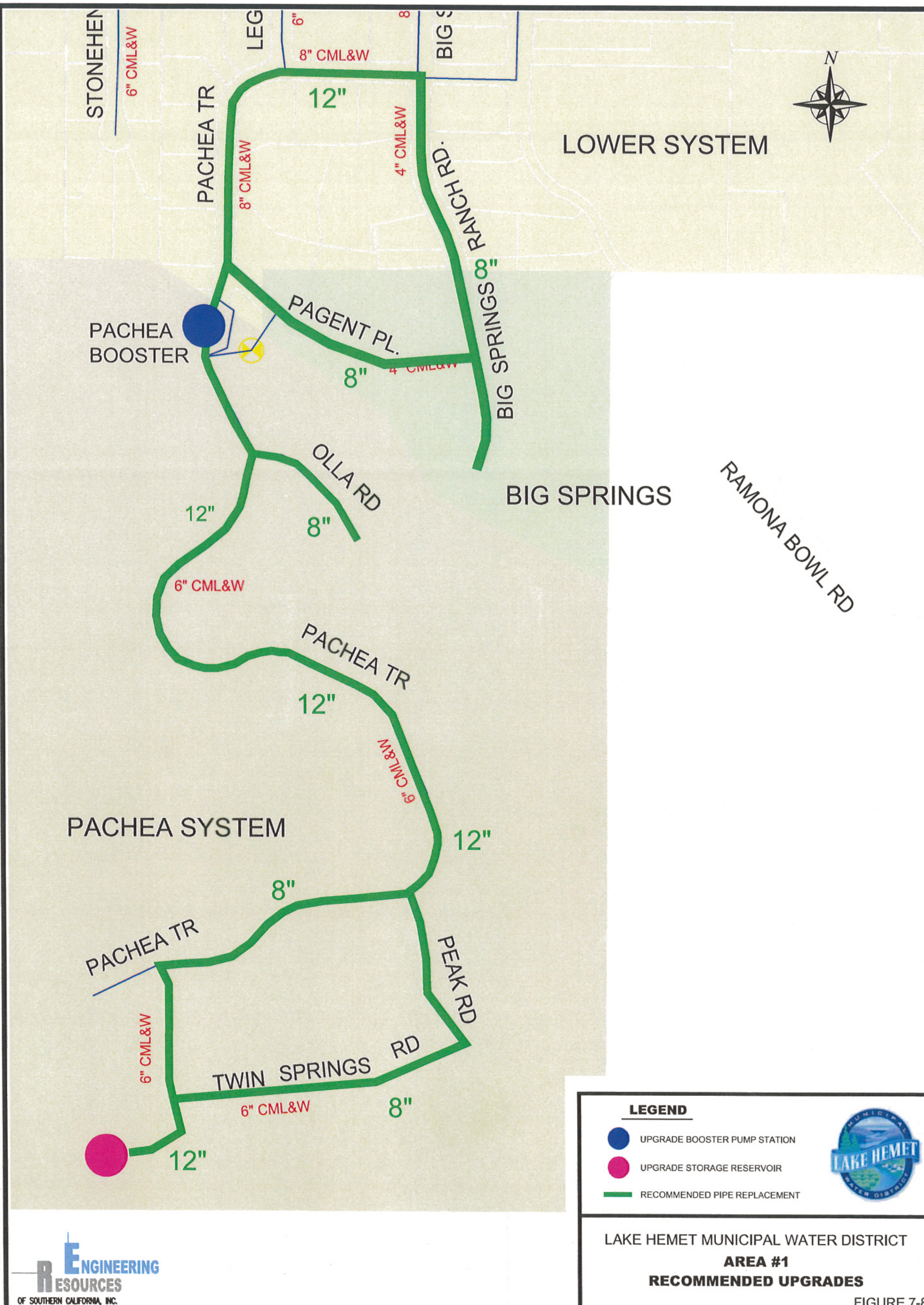

LAKE HEMET MUNICIPAL WATER DISTRICT

AREA #1

RECOMMENDED UPGRADES

FIGURE 7-8

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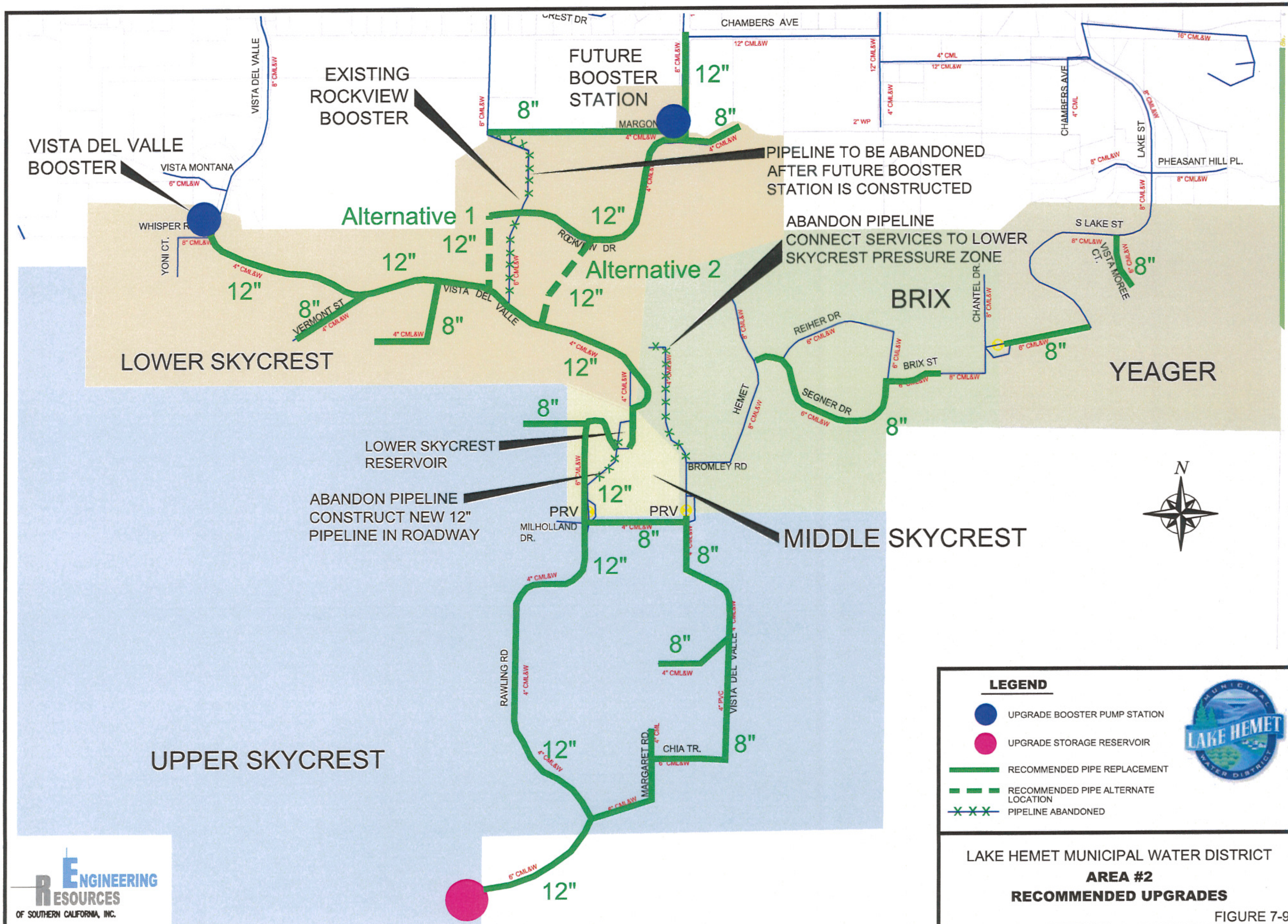

LAKE HEMET MUNICIPAL WATER DISTRICT

AREA #2

RECOMMENDED UPGRADES

FIGURE 7-9

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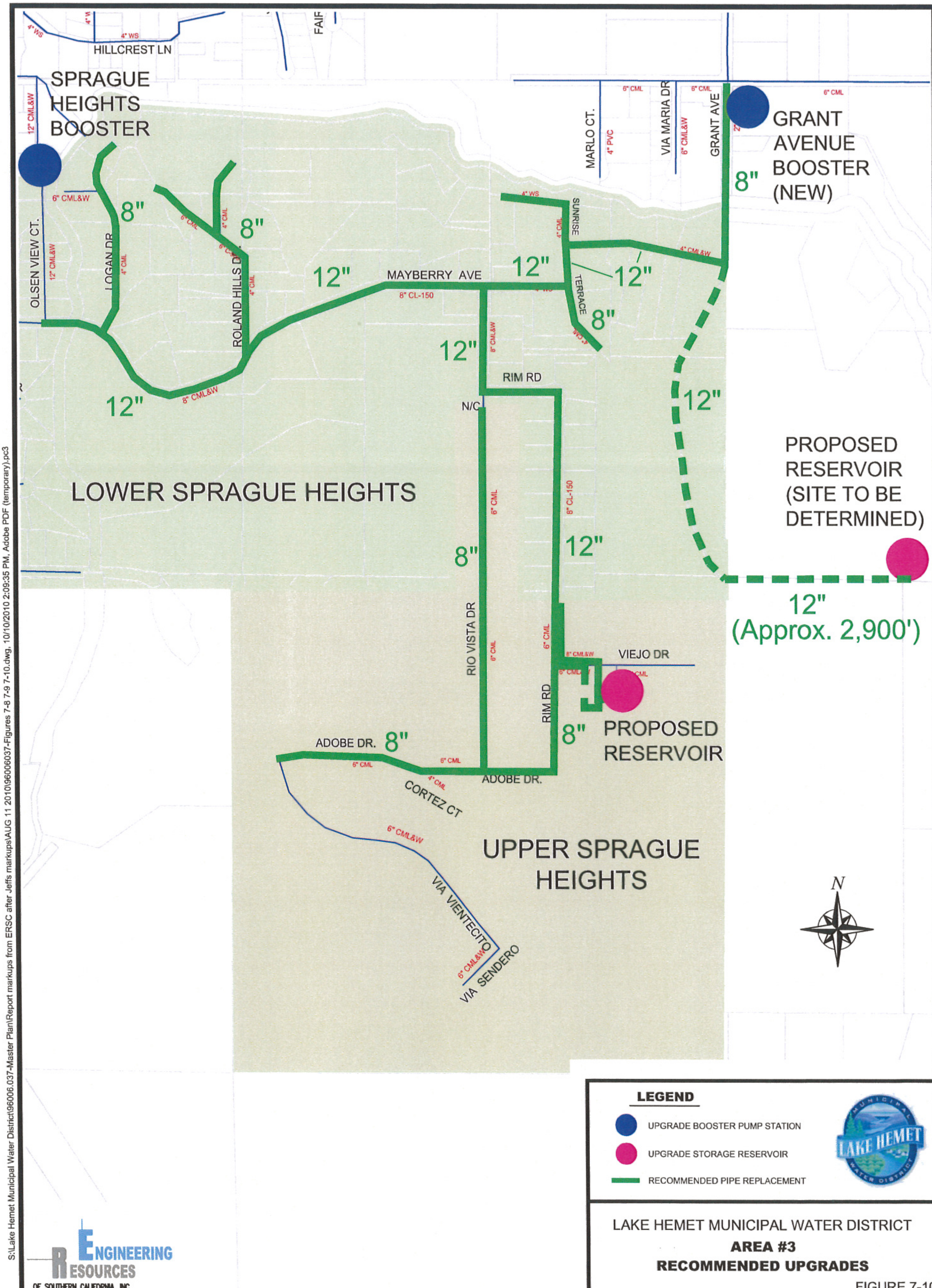


LAKE HEMET MUNICIPAL WATER DISTRICT
AREA #3
RECOMMENDED UPGRADES
FIGURE 7-10

CHAPTER 8

SUPPLEMENTAL WATER SUPPLIES

INTRODUCTION

As discussed in Chapter 4, "Water Supply and Demands", the Lake Hemet Municipal Water District (District) currently obtains its water supplies from three primary sources:

- Groundwater
- Local Surface Water
- Water Purchases from the Eastern Municipal Water District (EMWD)

This chapter compares the District's existing use of local surface and groundwater supplies to projected future water demands and presents an analysis of potential water supply options available to the District to meet future water requirements.

EXISTING WATER SUPPLY USAGE

Based on the water supply and demand discussion provided in Chapter 4, Table 8-1 lists the District's existing use of local surface and groundwater supply sources, with actual surface and groundwater usage varying year to year depending on hydrologic conditions. The basis for determining the existing use for each of the District's supply sources is described in this section.

Table 8-1 District's Existing Water Supply Usage

Existing Water Supply	Existing Usage (afa)[1]
Groundwater	11,831
Local Surface Water	2,293
EMWD Purchases	2,021
Total	16,145

[1] 2007-2009 average

Groundwater

The District currently extracts groundwater from both the San Jacinto and Hemet Groundwater Basins. Neither groundwater basin is currently managed or adjudicated; therefore any basin user can pump as much groundwater as they need to meet their water demands. It has generally been agreed upon by members of the Hemet-San Jacinto Groundwater Technical Committee that both the San Jacinto and Hemet Groundwater Basins are currently in a state of overdraft, with total groundwater extractions by local agencies and private groundwater users exceeding the natural long-term recharge capability of the groundwater basins. The District is committed to the ongoing effort of developing principles for a regional groundwater management plan that would include the operation of the San Jacinto and Hemet Groundwater Basins on a "safe-yield" or "perennial yield" basis. This means operating the groundwater basins so that long-term total groundwater extractions would not result in overdraft of the groundwater basins. As an acknowledgement of the current state of overdraft in the San Jacinto and Hemet Basins, the principles propose to limit basin users to some mutually agreed upon historic extraction quantity, consistent with the estimated perennial yield of the basins. The mutually agreed upon quantity would be subject to a nominal extraction fee to help pay for the importation of new water supplies to artificially recharge the basins and to help alleviate the existing overdraft condition. Production in excess of the mutually agreed upon production quantity would be subject to the full costs of bringing new imported water into the region.

Local Surface Water

As described in Chapter 4 and discussed further on in this chapter, the District's surface water use is not necessarily reflective of actual surface water availability. Due to constraints in the District's ability to store surface water supplies, the District is unable to fully take advantage of local runoff when it is available. The District's use of surface water for agricultural purposes, based on irrigation stream diversions over the last three years, averaged 2,300 afa. The surface water diverted for irrigation purposes includes releases from Hemet Dam plus any natural runoff occurring between the dam and the diversion point, minus estimated evapotranspiration losses between the dam and the diversion point.

EMWD Water Purchases

The District receives EMWD water for domestic and irrigation purposes. The domestic system receives well water from EMWD's Fruitvale System to augment the District's supplies during peak summer demand periods. Since the acquisition of Wells 9, 11 and WLB (aka Corwin) these purchases have been minimal.

The District's irrigation system utilizes surface water from the streams and Lake Hemet as much as possible to meet demand from canal system customers. As the availability of surface water decreases, the District's agricultural wells are used along with water purchased from EMWD. EMWD imports Northern California water through its EM-14 connection with the Metropolitan Water District (MWD). During dry years when stream flow is low and releases from Lake Hemet are curtailed, the District must purchase a significant amount of this water. Over the last three years, the District has purchased on average 2,021 afa of imported water. This has been used almost exclusively to meet agricultural demands.

Supplemental Water Supply Requirement

As discussed in Chapter 4, the District currently projects a water demand of 17,700 afa in 2020, or a total increase of approximately 1,500 afa over the District's existing demand. It is expected that this will be comprised of about 6,000 afa of water for agricultural needs and approximately 11,700 afa to satisfy domestic demand.

IDENTIFICATION OF SUPPLEMENTAL WATER SUPPLY OPTIONS

Potential supplemental water supply options have been grouped into categories and are discussed in further detail in the following section.

1. Demand Reduction/Water Conservation
2. Recycled Water Projects
3. Supplemental Imported Water Supplies and Conjunctive Use
4. Increased Use of Local Surface Water

Demand Reduction/Water Conservation

In 2007, there were over 2,000 domestic customers who used one acre-foot of water, or more, on their property. This includes all customers types from homeowners to businesses to schools. The amount of water consumed by this group totaled more than 4,000 acre-feet. Utilizing water audits performed by District personnel, or a new part-time employee, it is reasonable to expect a demand reduction of 10 percent across this group. Table 8-2 illustrates how such a focused effort could possibly "produce" water for the District at a significantly lower cost pumping groundwater.

Table 8-2 Conservation Coordinator (Example scenario)

Year	Budget	# of SCs audited/year	Water saved (afy)	Cost of water saved ($/af)
1	50,000	400	80	625
2	51,500	400	160	322
3	53,045	400	240	221
4	54,636	400	320	171
5	56,275	400	400	141
Totals	265,457	2,000	1,200	N/A

If a 400 afy savings could be realized within five years, a total of 1,200 af would be saved at an average cost of $221 per acre-foot. The alternative would be to pay pumping assessments of about $820,000 on the same water produced from District wells.

As mentioned earlier, water losses in the distribution systems average around 1,100 acre-feet per year or 7.2 percent of production. Several pipelines have been identified by staff as in need of replacement due to numerous leak repairs. Many of these pipelines, and others, are 4-inch diameter mains that create bottlenecks, restricting flow from one area to another. Not only does this reduce pressure and reliability of service in certain neighborhoods, it also results in higher energy costs at the pump stations due to increased pressure heads. Participation in a low interest loan program through the California Department of Water Resources to fund pipeline replacements is an option the District may want to explore. Actual water savings and cost of construction will depend on which mainlines are chosen for replacement. A hypothetical scenario is presented in Table 8-4.

Recycled Water Projects

EMWD presently operates four regional water reclamation facilities (RWRF) within the San Jacinto River Basin. The majority of the reclaimed water is used by agricultural users, golf courses and sod farms, and the balance of the reclaimed water is disposed of through evaporation and incidental groundwater recharge. A proposed project between EMWD and the District to deliver recycled water to the canal at Marshall Tank is currently under study. In the currently preferred alternative, tertiary treated water from the San Jacinto Valley Regional Water Reclamation Facility would be picked up at the Alessandro Ponds and conveyed through a new pipeline to the existing Reach 5 pipeline that currently delivers raw water to the canal at Marshall. The new facilities would cost about $4.2 million and operating at 6 cfs could supply 4,400 af annually. Using a tertiary rate of $77/af, with O&M and capital recovery costs, the water delivered to the canal would cost $219/af. This project has been included in the list of projects submitted for incorporation into the San Jacinto Integrated Regional Watershed Management Plan. The list of projects in the IRWMP will be incorporated into Santa Ana Watershed Project Authority's application to DWR for Proposition 50 and Proposition 84 grant funds. In addition to the possibility of obtaining a grant, the future Watermaster may consider subsidizing the cost of the water in lieu of the farmers pumping their wells. This could potentially save the basin up to 1,550 af of groundwater pumping per year, enabling the District to extract it later for domestic use. Recycled water would also replace domestic well water that is occasionally used to augment canal supplies, leaving this water available to satisfy domestic demand. Although this project is currently on the list to be submitted to DWR, it is not a commitment by the District or EMWD to build the project. It can be removed from consideration at anytime.

Imported Raw Water for Basin Replenishment

As previously mentioned, the District is engaged with EMWD and the Cities of Hemet and San Jacinto in drafting a Water Management Plan to reverse the overdraft of the Hemet-San Jacinto groundwater basins, and to operate these basins on a safe yield basis. The central element of the

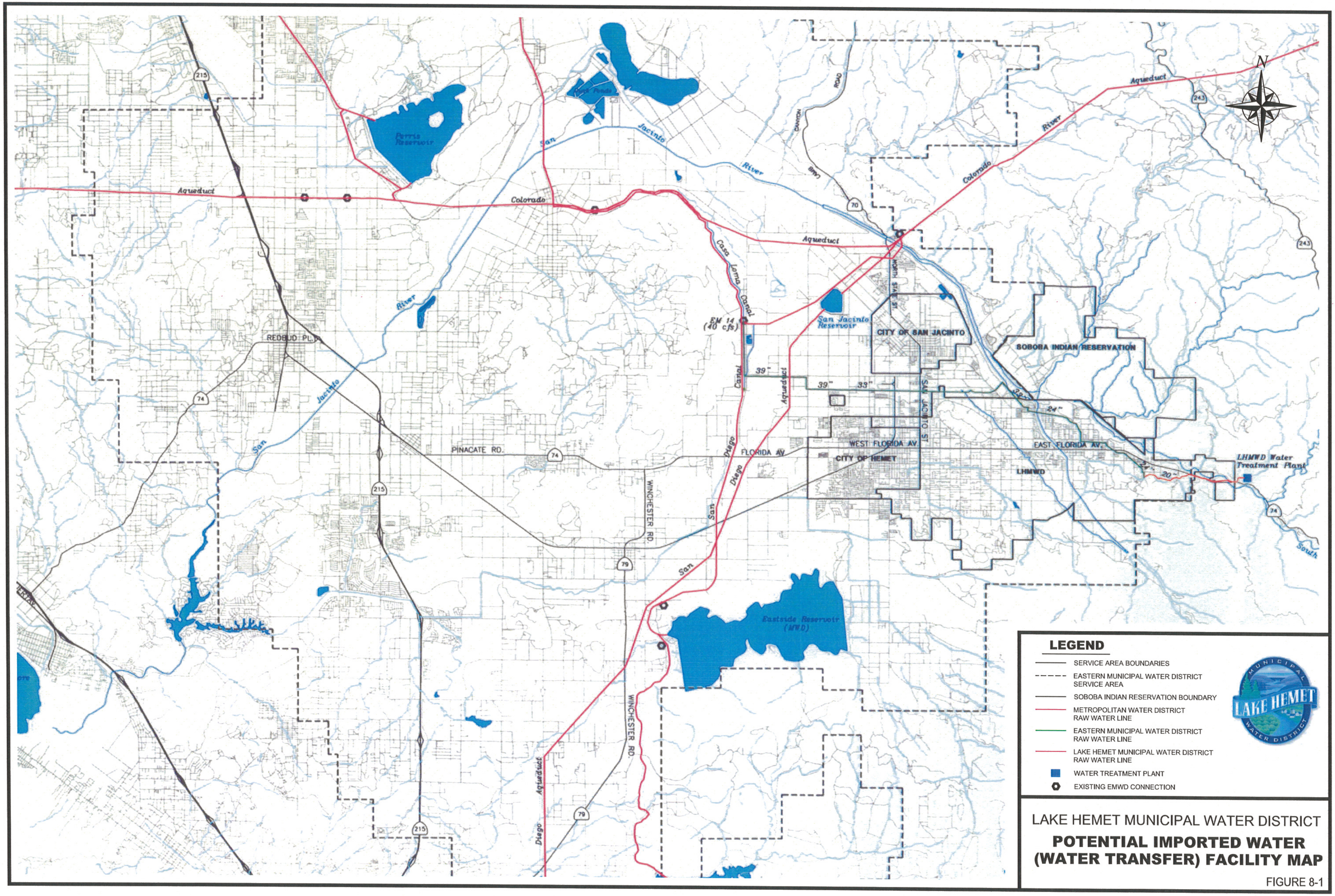
WMP is to import raw water from the Metropolitan Water District for recharge in the groundwater basins. The agencies would be required to purchase replenishment water to replace groundwater pumped above their allotted production right.

The production right of each agency is its average 1995-1999 groundwater production from the Hemet Basin and the San Jacinto Upper Pressure Subbasin. The District's production right was determined to be 11,063 af. Comparing production rights to total municipal groundwater production for that period, the District pumped 34.2% of the groundwater; EMWD, 33.7%; City of Hemet, 19.6%; and the City of San Jacinto, 12.5%. Once the WMP takes effect, the agencies will pay a nominal administrative assessment fee (currently assumed to be $50/af) for production right pumpage. Any production above that amount will require payment of a replenishment fee based upon the actual cost to import replenishment water (currently about $432/af) to mitigate the extra production. Since the basins are in overdraft of at least 10,000 afa, the agencies have agreed to reduce their production rights by 30% in stepped amounts of 10% over a six year period. The purpose of these reductions is to increase the amount of water imported and stored in the basins, over time, to eliminate the overdraft and bring the basins into a safe yield status.

Some important components of the WMP are based upon elements of the Water Settlement Agreement with the Soboba Band of Luiseño Indians which, among other obligations, requires MWD to supply State Water Project water for the Tribe's use, through 2035. MWD must supply on average 7,500 af annually, but the Tribe's demand will not exceed 4,100 afa over the next 50 years. This 50-year supply of surplus water has been offered to the WMP at a price of $7,000,000. The District and the three other public agencies have agreed to the purchase. Since the Tribe's current demand is much lower than 4,100 afa, however, there will be more water available in earlier years. For example, the Tribe's demand over the first five years of the agreement will not exceed 2,900 af annually. This leaves a surplus of 6,100 afa, of which, the District's share will be 2,086 acre-feet. This water would be used to satisfy the replenishment water requirement mentioned above at a reduced cost to the District.

EMWD's raw water pumping and transmission facilities will be expanded to handle the flows necessary to achieve these objectives and new facilities, including recharge basins and recovery wells will be built. The cost of the improvements to EMWD's system and new construction currently stands at $29.6 million. EMWD has obtained a $5 million construction grant from the California Department of Water Resources to offset some of the cost. The four agencies have agreed to share the remaining cost at the above production rights percentages. The District's share is 34.2% of $24.6 million or $611,210 annually for 30 years.

Figure 8-1 presents the costs of the Water Management Plan during a normal hydrological year and with normal groundwater production. During a multi-year drought, and thus reduced surface



LAKE HEMET MUNICIPAL WATER DISTRICT

POTENTIAL IMPORTED WATER (WATER TRANSFER) FACILITY MAP

FIGURE 8-1

S:\Lake Hemet Municipal Water District\96006.037-Water Model\Report\96006037-Figure 8-1.dwg, 5/6/2010 3:14:04 PM, Adobe PDF (temporary).pc3 water availability, the costs would be higher due to a greater reliance on groundwater, leading to increased assessments.

WMP Extraction Well Supply

As part of the WMP's facilities, three wells are being constructed to extract imported water that has been recharged into the basins. The design capacity of the wells is 7,500 afa and the water will be available to the four agencies at turnouts to their distribution systems. The charge per acre-foot would consist of O&M for the three wells and wheeling charges through EMWD's distribution system to each agency's turnout. The District's share of the 7,500 af is 34.2% or 2,565 af, of which no more than 15% can be delivered in any one month. This monthly maximum is equal to 385 acre-feet.

Add New Well Capacity

The District can add to its well capacity and take advantage of water recharged at the Grant Ave. Ponds by redrilling Well 3. The original well was drilled in 1925 and could produce 1,000 af per year. The well casing began collapsing in the 1990's and several water samples tested positive for coliform bacteria. The State Department of Health Services decertified the well as a potable water source in 1996. The well site is small and located close to residences which may complicate drilling, however, the District should investigate the possibility of siting a new well at this location. Assuming the cost of construction and equipping the well is $1,500,000 and the well produces 1,000 afa, the cost of production would be approximately $234/af, amortizing the capital cost over 30 years at 6% interest and assuming an O&M cost of $125/af.

In 2009, the District purchased a parcel on Fairview Avenue, approximately 1,000 feet south of Well #14, for the purpose of constructing another well. The Mitigated Negative Declaration, in accordance with the California Environmental Quality Act (CEQA), for this well has already been processed through the State Clearinghouse and filed with the County of Riverside Clerk. Funds have been budgeted to drill and equip this new well in fiscal years 2010/2011 and 2011/2012.

Increase Use of Local Surface Water Supplies

Historically, the District has relied primarily on groundwater supplies to meet its water demands. Even after 1982, when the treated water filter plant went into operation, groundwater continued to be used as the primary water supply source for both domestic and agricultural use. The ability of the District to maximize its use of local surface water will most likely require capital investment in new treatment and/or conveyance facilities and modifications to current District operations. However, a comparison of costs should be made to determine the most economical water supply to meet future demands.

New Water Treatment Plant

As discussed previously, due to the decertification of the Eggen Filtration Plant (EFP), the District is unable to use locally available surface water supplies for domestic purposes. The construction of a new water treatment plant with conventional treatment processes would remove both the existing pressure filter and turbidity constraints, and allow the new treatment plant to treat water at an increased rate and for a longer time period. An alternative water treatment technology to Conventional Treatment is microfiltration (MF). Compared with conventional techniques, membrane systems offer a potentially more reliable and effective means of treatment. Membrane processes can help meet stricter requirements for turbidity, disinfection by-products (DBPs) and microbiological organisms (*e.g.*, Giardia, Cryptosporidium, and viruses). This type of filtration system can effectively remove all particulate matter and provide a physical barrier to microorganisms of concern. The physical removal of microorganisms of concern means that less disinfection is required, in turn reducing DBP formation. Although the quantity of water available for treatment each year would still be dependent on hydrologic conditions, with the pressure filter and turbidity constraint removed, the District, for the most part, would be able to maximize its use of available surface water.

The sizing of a new water treatment plant will depend on available surface water flow rates and limitations imposed by existing auxiliary facilities. Most of the valley's rainfall occurs from December through March, about 70% of the annual total. Since the ground and vegetation are extremely dry following several months of limited rainfall, little of the precipitation in December results in runoff. Significant stream flow begins with larger storms in January and continues through April and May as the snowpack melts and continues to feed the streams. These five months comprise the timeframe when adequate surface runoff would be available for diversion and treatment. Although stream flow can be as high as 100 cubic feet per second (cfs), the diversions would be limited to the capacities of the diversion structures, and the pipeline conveying the diverted water to the plant. The 24-inch transmission main which delivered water to the EFP has a 21-inch pipeline segment that could potentially limit the quantity of water delivered. Also, the 18-inch pipeline that carried finished water from the EFP to the distribution system would constrain the operational capacity of a new plant. Considering these limitations, a new plant would not be able to exceed the design capacity of the EFP which was 6 mgd. If a plant was to operate daily at this capacity for five months, it could treat approximately 2,700 af.

In 2004, the District contracted with Krieger and Stewart, Engineering Consultants, located in Riverside, CA, to develop a preliminary design for a new water treatment plant to be located at the EFP site. They developed cost estimates for five filtration alternatives with each alternative utilizing ultraviolet primary disinfection. Table 8-3 summarizes these alternatives with costs adjusted for inflation.

Table 8-3 New Water Treatment Plant Alternatives

Design Alternative	Capital Cost[1,2] ($)	Capital Cost/yr[3] ($/yr)	O&M Costs[1] ($/yr)	Annual Cost ($)	Treated Water (AF)	$/AF
Conventional	12,828,750	1,003,550	236,500	1,240,050	2,700	459
Pressure Membrane						
Koch	20,913,200	1,635,970	555,500	2,191,470	2,700	812
Pall	21,408,200	1,674,690	423,500	2,098,190	2,700	777
Submerged Membrane						
Zenon	23,549,020	1,842,160	353,320	2,195,480	2,700	813
Memcor	20,748,200	1,623,060	305,800	1,928,860	2,700	714

[1]2004 estimates increased by 10%
[2]Cost estimates projected from 10% design and construction phases engineering
[3]Amortized at 6% interest for 25 years

Receive Credits from Watermaster for Recharging Diversion Right Water

Another avenue the District may be able to pursue if building a new treatment plant is cost prohibitive is to apply to the Watermaster for replenishment credits in exchange for recharging water that would otherwise have been diverted for treatment. The benefit would be a decreased cost to the District for replenishment water it would be required to purchase due to excess groundwater pumping. This alternative can be explored in more detail after the Watermaster is formed in 2011.

SUMMARY

It is projected the District will need an additional 1,500 af of water supply to be able to satisfy projected growth within the District's service area through 2020. This increase is expected to occur in the domestic sector only, with irrigation demand remaining nearly constant. Infill of vacant parcels will be the biggest driver of this increase in domestic demand. Table 8-4 summarizes the potential sources available to the District.

Table 8-4 Future Water Supply Options

New Source Options	Reason for increased yield	Estimated Capital Cost ($)	Estimated Additional Yield (AF)	Cost/ AF ($)
Conservation Program	Reduce inefficient use of water	50,000/yr	400 afa within 5 years	$221/af average (a)
Pipeline Replacement Program	Replace leaking pipelines; reduce unaccounted for water	2,500,000	250	510 (b)
Recycled Water Project	Replace purchased raw water; reduce domestic and ag well use; replace private well production	4,177,000	4,400	219 (c)
WMP Extraction Wells	Recovery of recharged imported water	N/A	2,565	120 (d)
New Well Capacity	Drill new well for additional pumping capacity; help meet peak demand	2,500,000	2,000	216 (e)
Water Treatment Plant				
Conventional	Increase use of surface water diversion rights	12,828,750	2,700	459 (f)
Membrane (Memcor)	Increase use of surface water diversion rights	20,748,200	2,700	714 (f)

(a) Average cost per af after 400 afa savings reached within 5 years

(b) $2.5M amortized over 30yrs, 3% APR

(c) $4.177M amortized over 20 yrs, 6% APR,$77/af water cost, $59/af pumping cost; 4,400 maximum supply

(d) Capital cost part of Phase I IRRP facilities; Estimated O&M and EMWD wheeling charges

(e) $2.5M amortized over 30 yrs, 6% APR, $125/af O&M

(f) Includes O&M costs

USE OF GROUNDWATER BASIN TO PROVIDE RELIABILITY DURING DROUGHT PERIODS

Although the District's currently available water supplies are 16,145 afa, the actual quantity of water produced by each supply source will vary in any given year based on hydrologic conditions. Under a worst-case-drought scenario, if no surface water supplies or imported water is available and the District is forced to rely only on groundwater, the District would require 31.6 mgd in well capacity to meet maximum day demands in 2020 (based on a total projected water demand of 17,700 afa and a maximum day peaking factor of 1.9). Assuming domestic use increases by the projected 1,500 af by 2020 and agriculture remains unchanged, 20.9 mgd in domestic well capacity and 10.7 mgd in agricultural well capacity will be required. As shown in Tables 8-5 and 8-6 the District's existing irrigation well capacity is approximately 4.0 mgd and the existing domestic well capacity is estimated at 14.4 mgd. Therefore, in 2020, the District will require an additional 6.5 mgd of well capacity to provide 100% maximum day reliability to domestic users and 6.3 mgd of well capacity to provide 100% maximum day reliability for agriculture.

For agriculture, if the District releases the assumed perennial yield of 2,000 afa from the Lake, and assuming 400 afa in evapotranspiration losses, 1,600 afa will be available for agricultural purposes during the peak summer months. Because of the flexibility in the District's water system to provide domestic water to the agricultural system, the main concern for providing reliability to agricultural users will be during the peak summer months when the maximum domestic water demand coincides with maximum agricultural demand. If we assume this will occur during a three month period, and the District releases water from the Lake for agricultural purposes at a steady rate over these three months, the average flow will be approximately 6.7 mgd. Therefore, assuming releases from the Lake under a worst-case drought scenario, the District will be able to provide agriculture with 100% maximum day reliability using both groundwater and surface water. However, if the District chooses to provide 100% maximum day reliability to agriculture with groundwater alone, additional wells will be required.

The above analysis assumes total production from irrigation wells will be available to the District. However, due to contractual obligations to a local grower whereby he receives a portion of this well water, the District can only rely on about 1,500 afa, little of which is available during peak summertime periods. This will require releases from Lake Hemet, domestic system water, or purchases from the Watermaster (extraction well water or imported from EMWD). The option in Table 8-4, to bring recycled water to the canal at Marshall, should be seriously considered as a way to increase the reliability of supply for the District's agricultural customers.

Table 8-5 Capacity of Irrigation Wells

Ag Well	Capacity (gpm)	Capacity (mgd)
5	120	0.2
A	300	0.4
B	180	0.3
D	400	0.6
E	400	0.6
F	700	1.1
Sprowl	310	0.4
Total	2,410	4.0

Source: District Staff

Table 8-6 Capacity of Domestic Wells

Domestic Well	Capacity (gpm)	Capacity (mgd)
WLB	1,650	2.4
M&M Well	1,600	2.3
McMillan Well	1,200	1.7
Webcor Well	650	0.9
Well 1A	100	0.1
Well 2	800	1.2
Well 4	425	0.6
Well 8	300	0.4
Well 9	800	1.2
Well 10	1,200	1.7
Well 11	485	0.7
Well 14	690	1.0
Well 15	125	0.2
Total	10,025	14.4

Source: District Staff

In order to provide 100% reliability from the groundwater basin to meet domestic water demands in 2020, the District will require an additional 6.5 mgd of well capacity. The two groundwater options listed in Table 8-4 will provide about one-half of this production. Because the District currently relies primarily on groundwater to meet maximum day demands for domestic customers in most years, it is recommended that the District have enough well capacity to meet future maximum day demands from the groundwater basin. Consequently, additional wells should be drilled over the next few years to supply the remaining 2.9 mgd (2,000 gpm) by 2020.

This analysis is solely based on available well capacity and does not include an analysis of the resulting system wide water pressures. These issues are addressed in Chapter 7, "Water Distribution System Analysis". In addition, because of the affects of increased groundwater extractions by other Basin users during a drought condition, this analysis does not analyze affects to the overall Groundwater Basin including resulting groundwater levels and possible subsidence issues, particularly in the Upper Pressure Subbasin. It is assumed that these issues will be further addressed as components to the Hemet-San Jacinto Groundwater Management Plan.

CHAPTER 9

FUTURE WATER DISTRIBUTION SYSTEM ANALYSIS AND CIP

INTRODUCTION

This chapter summarizes our evaluation of the Lake Hemet Municipal Water District (District) water distribution system and its ability to meet future, projected water demands. The evaluation is based on the criteria presented in Chapter 3, "Operational and Design Criteria", and on additional information provided by the District.

BACKGROUND

The District's future water distribution system was evaluated as follows:

- The District's existing potable water distribution system with all current operational facilities plus the proposed near term improvements as the result of any existing deficiencies as discussed in Chapter 7.

- The future demands including a potential sphere of influence and future pressure zones

The future water distribution system was evaluated under the following demand scenarios:

- maximum-day
- peak-hour
- maximum-day plus fire flow conditions

Each of the above conditions was analyzed using the developed and calibrated hydraulic model. The results of these model simulations were then compared to the established planning and design criteria. Additional model simulations were conducted to evaluate potential system improvements and/or enhancements, including new pipeline connections, parallel pipelines or replacement mains. Existing local and regional emergency storage requirements and provisions for backup power for the pump stations and wells were also evaluated as part of the analysis.

EVALUATION OF FUTURE WATER DISTRIBUTION SYSTEM

This section presents the evaluation of the District's future water distribution and its ability to meet recommended performance and planning criteria (as presented in Chapter 3) under future demand conditions. The future water distribution system was evaluated under the following demand scenarios:

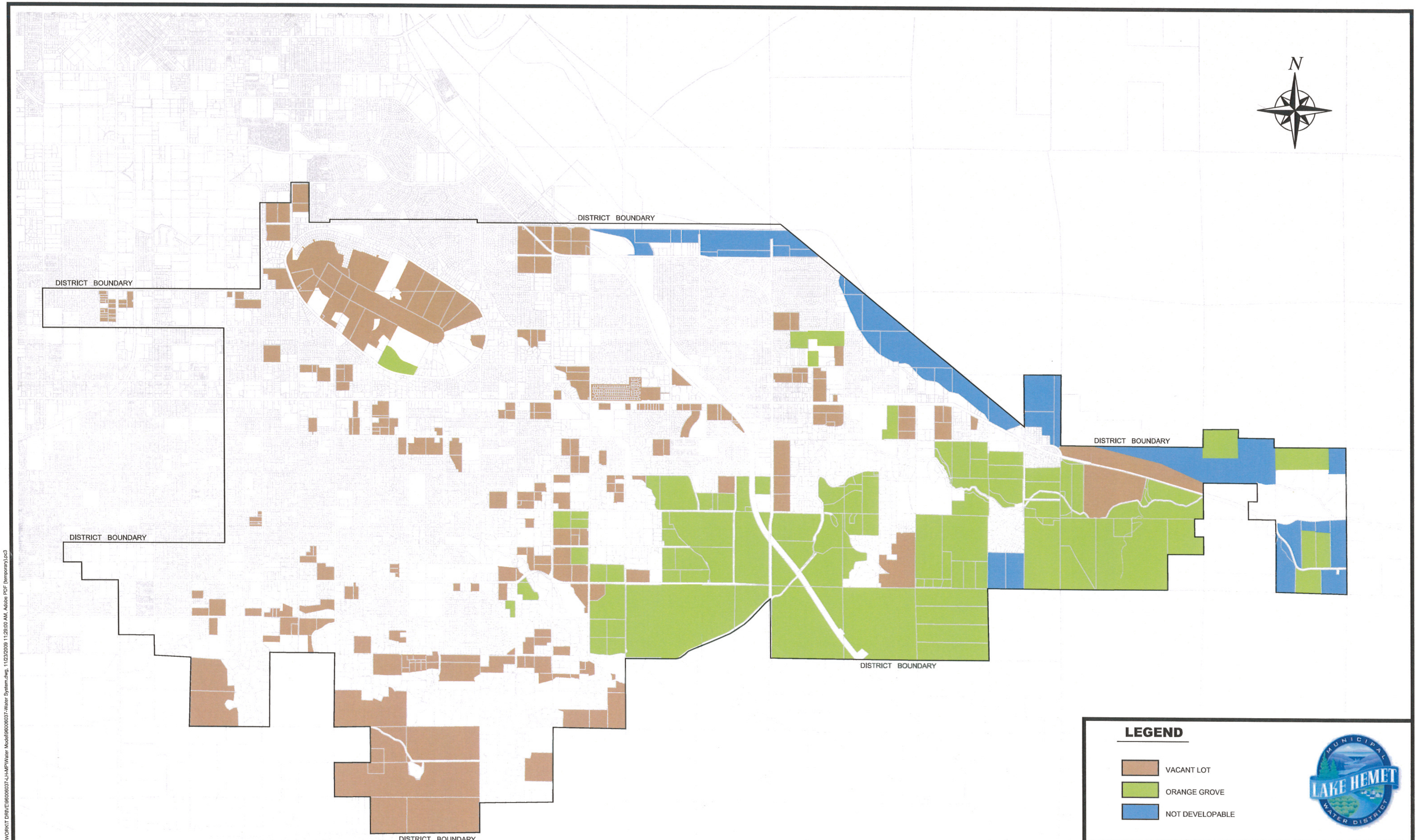
- **Maximum-Day Demand -** Maximum-day demand conditions are met by flows from water supply facilities only. A maximum-day demand condition was simulated for the future system to evaluate the District's supply facilities, pump station capacity, and the distribution system capabilities.

- **Peak-Hour Demand -** Peak-hour demands are met by the combined flows from the District's supply sources and storage reservoirs. A peak-hour flow condition was simulated for the future system to evaluate the distribution facilities' capability to meet this peak-hour demand condition.

- **Maximum-Day Demand Plus Fire Flow -** To evaluate the system under maximum-day demand plus a fire flow condition, a two-step analysis was followed. The first step used the H_2ONET "Available Fire Flow Analysis" option to determine if the minimum pressure and required fire flow could be met with future District facilities. If the analysis indicated that the system failed to meet the minimum requirements for pressure and flow, a second analysis was performed. The second analysis involved running the model, but with pipeline improvements and system modifications added to the distribution system to eliminate previously identified deficiencies.

The evaluation of future expansion within the District included areas that are currently undeveloped. These areas included vacant parcels, existing areas with orange groves and areas that are not anticipated to be developed based on topography. Figure 9-1 outlines these three areas where future growth is expected. It is assumed that development will first occur in the infill areas of the Upper and Lower Pressure Zones before any major development is seen as a result of orange groves converted to residential development.

An estimate of the timing of future growth over the next 10 years within the District was made and is shown in Table 4-4. Table 9-1 presents a summary of the projected growth for build out of the system including the ultimate conversion of groves to development and the potential sphere of influence.



LAKE HEMET MUNICIPAL WATER DISTRICT

UNDEVELOPED LAND AS OF 6/10/09

FIGURE 9-1

Table 9-1 Projected Future Water Demand by Pressure Zone

Pressure Zone	Groves (acres)	Vacant (acres)	Hillside & Wash (acres)	Total Undeveloped Land (acres)	Number of Homes (per acre)	Number of Connections	ADD 530 (gpd) SFR	ADD 3,500 (gpd) Comm.	ADD Total (gpd)	PDD 1.9 (gpd)	ADD (gpm)	PDD (gpm)	Future Water Demand (AF/YR)	Existing Water Demand (AF/YR)	Total Projected Water Demand (AF/YR)
Bee Canyon	11			11	2	22	11,660		11,660	22,154	8	15	13	1	14
Bee Canyon Tank	285	134		269	2	538	285,140		285,140	541,766	198	376	319	45	365
				150	0.2	30	15,900		15,900	30,210	11	21	18		18
Brix		6		6	0.5	3	1,590		1,590	3,021	1	2	2	26	26
Cunningham	21			21	4	84	44,520		44,520	84,588	31	59	50	77	127
Lower Sprague	62			62	2	124	65,720		65,720	124,868	46	87	74	168	242
Lower System	16	556		572	4	2,288	1,212,640		1,212,640	2,304,016	842	1,600	1,358	6,204	7,562
Commercial		71		71		0	0	248,500	248,500	472,150	173	328	278		278
		18		18	2	36	19,080		19,080	36,252	13	25	21		21
		15		15	0.33	5	2,647		2,647	5,030	2	3	3		3
Park Hill		300		300	2	600	318,000		318,000	604,200	221	420	356		356
	16	**960**		**976**		**2,929**	**1,552,367**	**248,500**	**1,800,867**	**3,421,648**	**1,251**	**2,376**	**2,017**		**2,017**
Menlo		18		18	4	72	38,160		38,160	72,504	27	50	43	102	144
Pachea		86		86	0.33	29	15,178		15,178	28,838	11	20	17	42	59
Section 13	51			51	2	102	54,060		54,060	102,714	38	71	61	2	62
Upper Sprague	41			41	2	82	43,460		43,460	82,574	30	57	49	92	141
		49		49	0.2	10	5,194		5,194	9,869	4	7	6		6
	41	**49**		**90**		**92**	**48,654**		**48,654**	**92,443**	**34**	**64**	**55**		**55**
Upper System	395	341		736	2	1,472	780,160		780,160	1,482,304	542	1,029	874	2,673	3,547
High School	30			30		1	0	76,320	76,320	145,008	53	101	85		85
Commercial		45		45		0	0	157,500	157,500	299,250	109	208	176		176
	425	**386**		**811**		**1,472**	**780,160**	**233,820**	**1,013,980**	**1,926,562**	**704**	**1,338**	**1,136**	**2,673**	**3,809**
Upper Skycrest		84		84	0.33	28	14,825		14,825	28,168	10	20	17	56	73
		380		380	1.05	400	211,994		211,994	402,788	147	280	237		237
		464		**464**		**428**	**226,819**		**226,819**	**430,956**	**158**	**300**	**254**		**254**
Yeager		42		42	0.5	21	11,130		11,130	21,147	8	15	12	21	33
Big Springs	-	-	-	-	-	-	-	-	-	-	-	-	-	18	18
Lower Skycrest	-	-	-	-	-	-	-	-	-	-	-	-	-	52	52
Middle Skycrest	-	-	-	-	-	-	-	-	-	-	-	-	-	8	8
Hillside/Wash			643	643											
Sub-Total	**912**	**2,145**	**643**	**3,550**		**5,916**	**3,135,158**	**482,320**	**3,617,478**	**6,873,209**	**2,512**	**4,774**	**4,052**	**9,586**	**13,638**
Sphere of Influence		1,100		1,100	2	2,200	1,166,000		1,166,000	2,215,400	810	1,538	1,306		1,306
Total	**912**	**3,245**	**643**	**4,650**		**8,116**	**4,301,158**	**482,320**	**4,783,478**	**9,088,609**	**3,322**	**6,312**	**5,359**	**9,586**	**14,944**

Land uses were assigned to undeveloped areas based on County and City land use maps and from information provided by the District on known developments. Based on information provided by the District, the average usage in 2007 for a single family residential account was 530 gpd. This usage was then used to project future residential demands in Table 9-1. These land uses are shown in Figure 9-2 .

Pump Station Analysis

Pump stations should be evaluated on their ability to deliver a firm, reliable capacity equal to a system's maximum-day demand with the largest pump out of service. Our analysis of the ability of the District's pump stations to meet future demands, is divided into three categories:

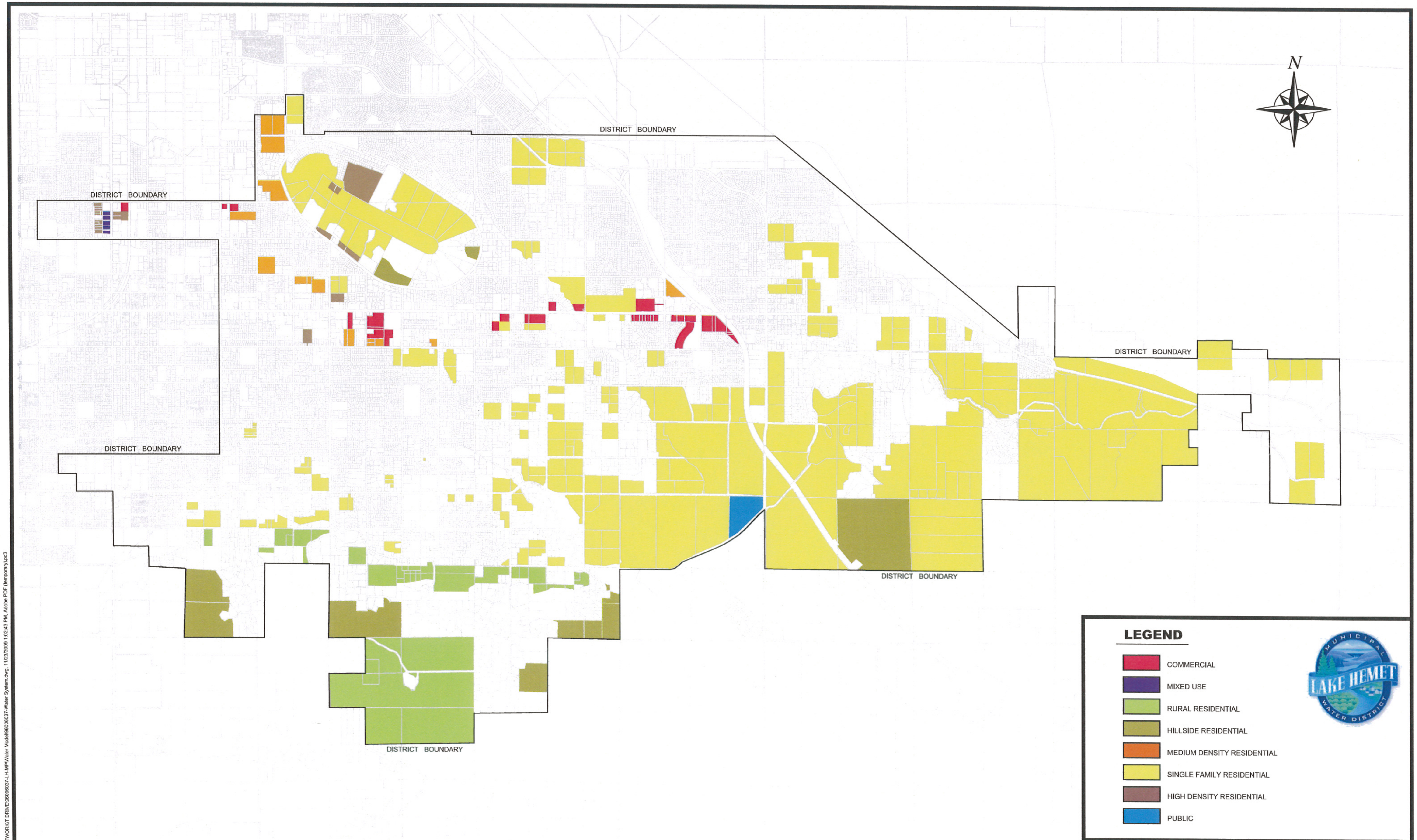
- water distribution system booster pump stations
- wells
- well booster pump stations

Booster Pump Stations

The majority of the demands anticipated within the next 10 years are in-fill demands that will occur in the Main Valley System. Significant future demand is anticipated to occur in the Hillside Pressure Zone, just to the west of the Upper Skycrest Pressure Zone (Mesa Grande), above the Cornell Tank. This future demand will require the construction of an additional booster pump station at the Cornell Tank site. There may also be significant growth in the Lower Pressure System on Park Hill, where plans to build 252 multi-family dwelling units and 374 single family homes on approximately 319 acres has been contemplated. This would require boosting water from the Lower Pressure Zone up to a new pressure zone on Park Hill. Future booster pump stations may be required if the potential sphere of influence area outlined in Figure 9-3 is developed and if development encroaches into previously undeveloped areas. Areas such as the hillsides south of the Upper Sprague Heights Pressure Zone and east of the Cunningham Pressure Zone would require water to be boosted up from a lower pressure zone. It is not anticipated that booster pump stations will be required for these areas within the next 10 years.

Well Pumps

As presented in Table 4-4, the maximum-day domestic demands for Years 2010, 2015 and 2020 are: 16.1 mgd, (11,190 gpm); 18.0 mgd, (12,486 gpm); and 19.8 mgd, (13,782 gpm), respectively, based on a peaking factor of 1.9 times average-day demand. Build-out of the District is projected to occur around 2050 with an estimated average-day demand of 13.38 mgd (9,300 gpm). The District's existing wells at their rated capacities can produce approximately 10,025 gpm and the supply from the Washington Booster provides an additional 1,900 gpm for a total supply of 11,925 gpm; therefore, additional well capacity will be required to meet maximum-day demands. In order to meet the ultimate demand within the District's service area, approximately 5,700 gpm of additional supply will be required for maximum-day demand.



LAKE HEMET MUNICIPAL WATER DISTRICT

ANTICIPATED LAND USE OF UNDEVELOPED AREAS - 6/10/09

FIGURE 9-2

Well Booster Pumps
At each new well site, a new booster pump will also need to be constructed. Each of these Well Booster Pumps should be rated at 100 Hp and should be constructed in conjunction with the well. All new wells and booster pumps should be constructed with backup power.

Reservoir Analysis
Specific volume requirements for reservoir storage were previously defined as one maximum-day demand for emergency storage and the fire storage component of 3,000 gpm for 4-hours (schools/commercial) or a 2-hour duration of 1,500 gpm for a residential fire.

A breakdown, by pressure zone, of the existing total storage within the District is presented in Table 7-5. As shown on this previously presented table, there is a storage deficiency of 6.411 mgd. Backup power generators located at seven well sites provide a firm supply of 6,890 gpm or 9.9 mgd. With the largest source of supply (equipped with a backup generator) out of service (Well WLB @ 1,650 gpm) the firm supply capacity is 5,240 gpm or 7.55 mgd which can be used to supplement future storage requirements. It is assumed that all future emergency storage will also come from the groundwater basin, and that no additional fire storage will be required.

There are future infill areas which will require additional storage, because they are not located in areas where they can take advantage of the water stored in the Upper and Lower Valley Systems. These future infill areas are the Mesa Grande Area located to the west of the Upper Skycrest System, the Park Hill Area located within the Lower System, the potential Sphere of Influence and the undeveloped hills south of the Upper Sprague Heights Pressure Zone and the hills east of the Cunningham Pressure Zone.

Pipeline Analysis
As previously discussed, a pipeline system analysis was conducted to identify potential pressure, velocity, and head loss deficiencies. The hydraulic model of the existing system was modified to create a future system model for use in evaluating the demand conditions expected in Year 2020. The Year 2020 model was further expanded to represent the development and demand conditions expected at ultimate build-out. Ultimate build-out of the District is not anticipated to occur for another 40 years, if the average annual projected growth rate of 1.15% continues.

The water system model for 2020 was developed by assigning additional water demands to the District's existing hydraulic system model to represent expected growth. Growth projections were based on an annual connection growth rate of 1.15% and the land use development was based on County and City land use maps. The hydraulic model was then run to simulate future water deliveries to the new demand areas, and identify potential pressure, velocity, and head loss deficiencies under peak-hour flows and maximum-day demands plus fire flows.

The existing system limitations and problem areas were identified and the system improvements required to eliminate these deficiencies were identified and added to the model. The revised system model was then reanalyzed to confirm that the proposed future District system would be capable of meeting the required minimum performance criteria.

Peak-Hour Demands

The future peak-hour demand for the District in Years 2010, 2015 and 2020 is approximately 19,000 gpm, 21,200 gpm and 23,400 gpm, respectively, based on a peaking factor of 1.7 times peak day demand or 3.23 times average day demand. These peak-hour demands were simulated in the hydraulic model and the results indicated that there are areas within the existing system that could not adequately supply these demands at the District's minimum pressure criteria of 40 psi.

As most of the future development in the Upper and Lower Valley Systems is infill, the same high and low pressure constraints exist as with the existing system. In discussing these areas with the District, it was confirmed that there are some areas in the District which have always had and always will have low and/or high pressures. These areas of concern were due mostly to topographic location of the services and could not be adjusted without major restructuring of the pressure zones. Therefore, the District decided that in evaluating the future system under a peak-hour demand condition, we were to assume that if a high or low pressure problem area was due to topography, and not poor looping and/or poor condition of the pipelines, no changes needed to be recommended.

With the future Mesa Grande Area, we are limited to the same high and low pressure problems that currently exist in the Upper Skycrest System, since this new demand area would be served from the Upper Skycrest Tank. The only way the District can control the pressure in this area is to limit the upper and lower topographic boundary of this development.

Maximum-Day Plus Fire Flow Demand

Additional fire flows were not performed in the Upper and Lower Systems because previous analysis performed on the existing system infrastructure indicated that the water system could provide fire flow service to these areas.

RECOMMENDED SYSTEM UPGRADES

The recommended upgrades based on the analysis of the District's existing distribution system have been prioritized based on their importance. The priorities were based on fire flow analysis, storage requirements, booster pump capacities, pipeline age, water circulation within the system and areas with frequent repairs.

The first priority projects include three areas within the distribution system that require upgrades to increase fire flows and storage capacity. These areas are located in the southern hills area and were identified in response to the fire flow simulations performed and outlined in Chapter 7. Second priority was given to areas that contained aging and/or undersized pipelines. The third priority was given to areas experiencing frequent repairs.

Priority #1 Projects

Priority one projects include Areas #1, 2 and 3 as shown in Figure 11-1 and outlined in greater detail in Figures 7-8, 7-9 and 7-10. Area #1 is shown in Figure 7-8 and is located within the Pachea System where fire flows of 1,500 gpm were not able to be obtained during a simulation of the system. This was due to the size of the existing pipelines, the storage capacity and the location of residential units with respect to the storage reservoir. In order to increase fire flows within the pressure zone, it is recommended that the existing pipeline be replaced with approximately 4,900 lineal feet (LF) of 8-inch pipeline and 3,900 LF of 12-inch pipeline. The existing 60,000-gallon storage reservoir is to be kept in service and a 220,000-gallon reservoir constructed that will handle existing demands and fire flow requirements and will also accommodate future expansion within the pressure zone. To improve supply reliability, two 25-hp booster pumps (one operating as a back-up) should be constructed to replace the aging facilities and provide a firm supply.

Area #2 is comprised of improvements for the Upper, Middle and Lower Skycrest pressure zones as well as the Brix and Yeager pressure zones. Upgrades for this area are outlined in Figure 7-9 and include the replacement of existing pipelines, additional storage and replacement of aging pumping facilities. Approximately 10,235 LF of 8-inch and 10,900 LF of 12-inch pipeline are to be constructed. This upgrade will be sufficient to handle all future growth within these pressure zones.

The Vista Del Valle Booster Pump Station will need to be relocated to an adjacent parcel to accommodate two new 25-hp pumps (one standby). The Rockview Booster Pump Station will also need to be upgraded to two 25-hp pumps and relocated to a parcel at Hemet Street and Margoni Way. This new pump station will be fed from a new 12-inch waterline in Hemet Street and discharged to a new 12-inch waterline constructed in Rockview Drive. The existing 8-inch pipeline that currently connects Rockview Drive and Vista Del Valle will be abandoned and a 12-inch pipeline constructed along property lines. Two alternatives for pipeline alignment have been shown in Figure 7-9. The

Upper Skycrest Booster Pump Station should also be upgraded with two 40-hp booster pumps (one as backup) and located adjacent to the Lower Skycrest storage reservoir.

Area #3 included the Lower and Upper Sprague Heights Pressure Zones. These two pressure zones also need pipeline upgrades and increased storage capacity in response to fire flow demands. Approximately 8,400 LF of 8-inch pipeline and 8,800 LF of 12-inch pipeline are recommended for this area. A 12-inch waterline that connects Mayberry Avenue to Sunrise Terrace and east to Grant Avenue is recommended to facilitate water flow from the new booster pump station and/or from a new storage reservoir. The upgrades for this area are outlined on Figure 7-10 and show the location of the new Grant Avenue Booster Pump Station at Acacia Avenue and Grant Avenue. This station should be equipped with two 25-hp pumps (one as backup) and will provide the District operational flexibility and increased supply reliability.

In addition, the Sprague Heights Booster Pump Station should also be retrofitted with two new 25-hp booster pumps (one as backup). A fire pump capable of providing fire flow for the Upper Sprague Heights should be installed at the hydropneumatic tank that serves this pressure zone.

The Lower Sprague Heights pressure zone is served by an existing 150,000-gallon reservoir on Viejo Drive. Additional storage capacity is required in this zone for maximum-day demands and for fire flow. It is recommended that a new 600,000-gallon reservoir be constructed in this zone to replace the existing storage reservoir. The new reservoir could be located as shown on Figure 7-10 or it could be located adjacent to the existing reservoir. In either case, additional land will have to be obtained by the District.

Priority #2 and #3 Projects

The recommended upgrades for Priority #2 and #3 projects consist of pipelines that are currently undersized and should be replaced to improve system flow, are old and in need of replacement or have had frequent repairs. Several locations that have been identified as needing replacement due to fire flow limitations are also locations that have pipelines 4-inch or smaller and/or have aging pipelines. This group was divide into Priority #2 and Priority #3 projects based on the benefit that each area would gain from upgrades. Figure 11-1 illustrates the locations of the Priority #1 (Areas #1, #2 and #3) and Priority #2 projects. All other identified pipelines fall into Priority #3.

Priority #2 projects consist of pipelines installed in 1950 or earlier with the majority built between 1901 and 1914. Over 11,000 LF of this aging pipeline is recommended to be replaced. Priority #2 projects also consist of pipelines that are 2-inch and 4-inch that are over 330 feet in length and if replaced could provide increased system flow. The scheduled replacement of these lines will minimize future unplanned repairs and minimize system water losses.

Project Costs

Unit construction costs used to estimate the cost of the Priority 1, 2 and 3 projects are presented in Chapter 11. The estimated costs for construction have been calculated and a 30% markup has been applied to cover cost estimates for construction management, contingencies, engineering, legal costs, environmental, inspections and contract administration. These additional cost items have been added to the unit construction costs to provide the District with a budgetary estimate of the total project cost for each proposed improvement.

These unit costs are representative of the construction cost of water system facilities under normal construction conditions. Estimations of construction costs for facilities to be constructed in areas requiring rock excavation, special foundation considerations or other special conditions should be developed based on specific unit cost data matching the expected conditions or requirements.

EVALUATION OF FUTURE WATER SUPPLY

The District needs an estimated 11,700 af/yr in water supplies to be able to satisfy projected future growth within the District's service area in 2020 and an additional 3,300 af/yr at build-out. Build-out includes the conversion of agricultural lands to residential developments and the potential sphere of influence.

As discussed earlier, the District in preparing its 2010 Urban Water Management Plan needs to assess the projected water savings associated with the State's water conservation requirements of SBX7-7 and the proposed demand reduction/conservation measures included in the District's overall water supply planning efforts to help reduce future water demands. The District's Conservation Program should be continually monitored and annually checked for results of those efforts and, if required, the recommended supplemental water supplies adjusted accordingly. Prioritize existing water supplies to maximize use of local surface water when available and extract groundwater for irrigation as a second priority source.

In order to provide 100% reliability from the groundwater basin to meet potable water demands at build-out, the District would require an additional 8.3 mgd of well capacity. To provide this required well capacity, the District could construct new wells in the Intake Subbasin or Canyon Subbasin.

Since the District relies primarily on groundwater to meet maximum-day demands for its potable water users in almost all years, it is recommended that the District have enough well capacity to meet maximum-day demands from the groundwater basin.

At some point in the future (depending on development growth), when the demands for irrigation water decreases and the demand for potable supplies increases, the District will have to evaluate the feasibility of utilizing the existing agricultural wells for potable purposes. This may include the installation of wellhead treatment, rehabilitation of wells or drilling replacement wells and would have to be evaluated on a case by case basis.

Future Water Demands

The anticipated future development for the next 10 years within the District will be predominantly infill. The criteria used to determine what additional District water facilities were required included:

- Reservoir Storage Requirements - must contain maximum-day demand and fire flow storage.
- Allowable system pressure at peak hour must be maintained at or above 40 psi.
- Allowable system pressure during a maximum-day plus fire flow demand must be maintained at or above 20 psi.

The District's existing system is capable of meeting all of these criteria, with the design and construction of the various water facilities identified in the Priority 1, 2 and 3 projects.

Without these identified facilities, the District's future infill development will not be able to meet the District's adopted performance and design criteria for the water distribution system. Some of the benefits that the new/modified water facilities bring to the infill developments include:

- Increased water circulation (improves fire flow and lowers pumping pressures)
- Provides required peak hour and fire flow pressure.
- Adequate storage (maximum-day demand and fire).

Additional water transmission mains, pumping facilities, storage facilities and water supply sources will be required to meet the projected new water demands for ultimate build-out areas. The District's existing system will be unable to treat, store and deliver water of appropriate quality, quantity and pressure if additional water facilities are not constructed to serve these future infill demands. Therefore, additional water facilities will be required to provide water service to all new developments.

Potential Sphere of Influence

The District's service area encompasses approximately 12,700 acres which consists mainly of a mixture of residential development and agricultural usage consisting of citrus groves. Figure 9-3 outlines an area of approximately 1,100 acres that currently lies outside of the District's service area boundary that could potentially be within the District's future sphere of influence. This area lies within a valley and is bounded by the District's service area to the north and west and the Santa Rosa Hills to the south and east. The major land use is irrigated orange groves with a small area occupied by single family dwelling units which are being served by EMWD from a small reservoir on Fairview Avenue.

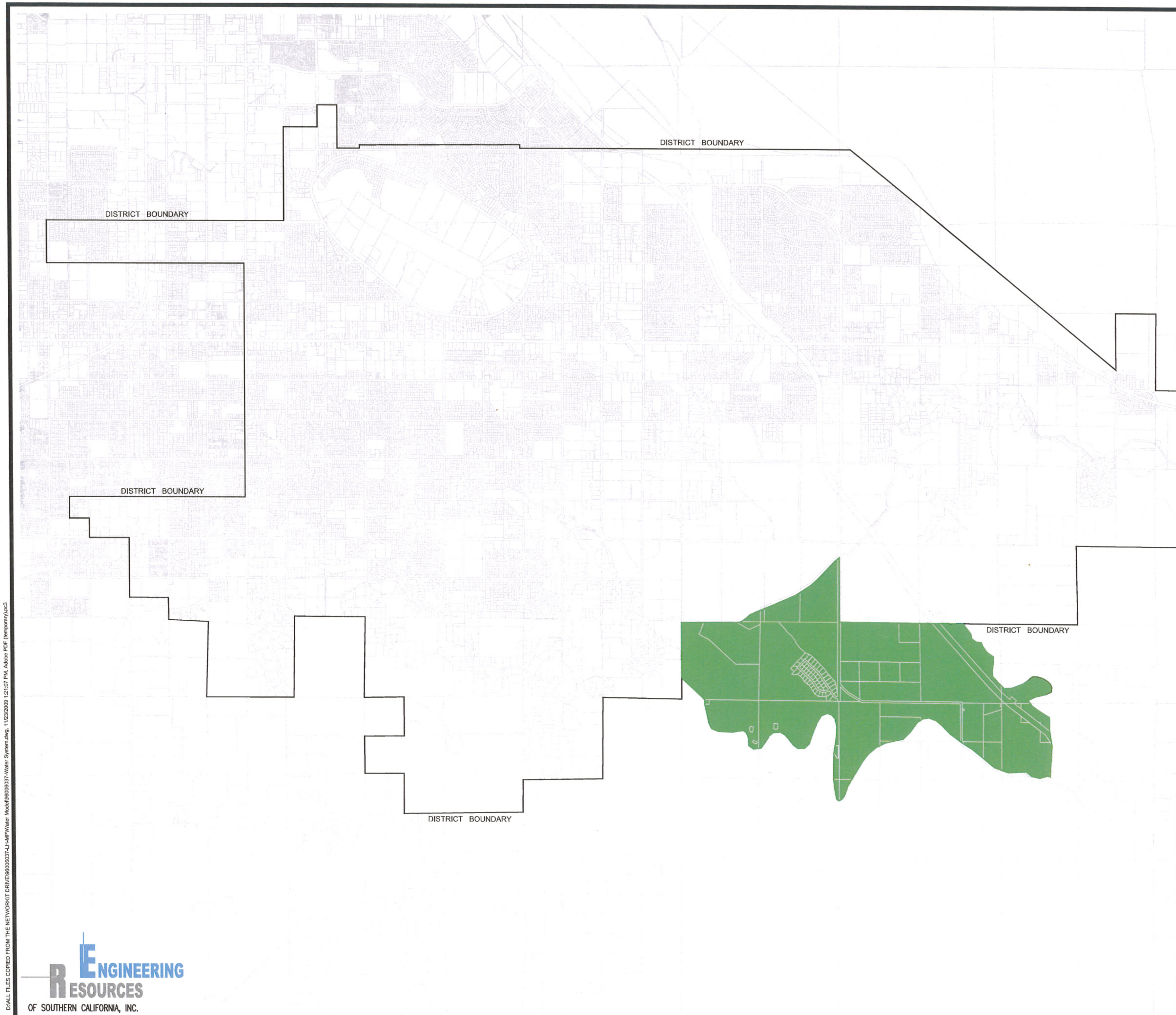
Future water demands for this area (when groves are replaced with development) are projected to be 1.17 mgd for average-day demand, 2.22 mg for maximum-day demand or 1,300 acre-feet per year. A supply of 810 gpm for average-day demand or 1,540 gpm during maximum-day demand would be required. These demands are based on a land use designation of single family homes with two dwelling units per acre and 530 gpd per dwelling unit.

Land elevations in this area range from 1890' to 2070' requiring two pressure zones. Each pressure zone would require its own storage reservoir, sized to accommodate maximum-day demands and fire flow storage capable of providing 1,500 gpm for a duration of two hours. In order to supply this demand, additional water sources would be required and booster pump stations to lift the water to the desired reservoir. Pressure Zone 1 (PZ1) and the majority of Pressure Zone 2 (PZ2) as outlined in the following section 'Future Pressure Zones' make up the area within the sphere of influence.

Future Pressure Zones

In evaluating the sphere of influence and the southern hills area, it was determined that new pressure zones would need to be created for development in these areas. Six pressure zones (PZ1 through PZ6) were identified based on the required service pressure. Figure 9-4 shows the location of each new pressure zone with respect to the existing zones.

Pressure Zone 1 (PZ1) is located entirely within the projected sphere of influence and would serve elevations 1970' through 2070' encompassing an area of approximately 240 acres. With a projected land use of two dwelling units per acre, the average day demand was calculated to be 176 gpm or 334 gpm on peak day (0.48 mg). The required storage for this zone including a fire flow storage of 0.18 mg (1,500 gpm for 2 hours) would be 0.66 mg. If a



LEGEND

AREA OF POTENTIAL SPHERE OF INFLUENCE

LAKE HEMET MUNICIPAL WATER DISTRICT

POTENTIAL SPHERE OF INFLUENCE

FIGURE 9-3

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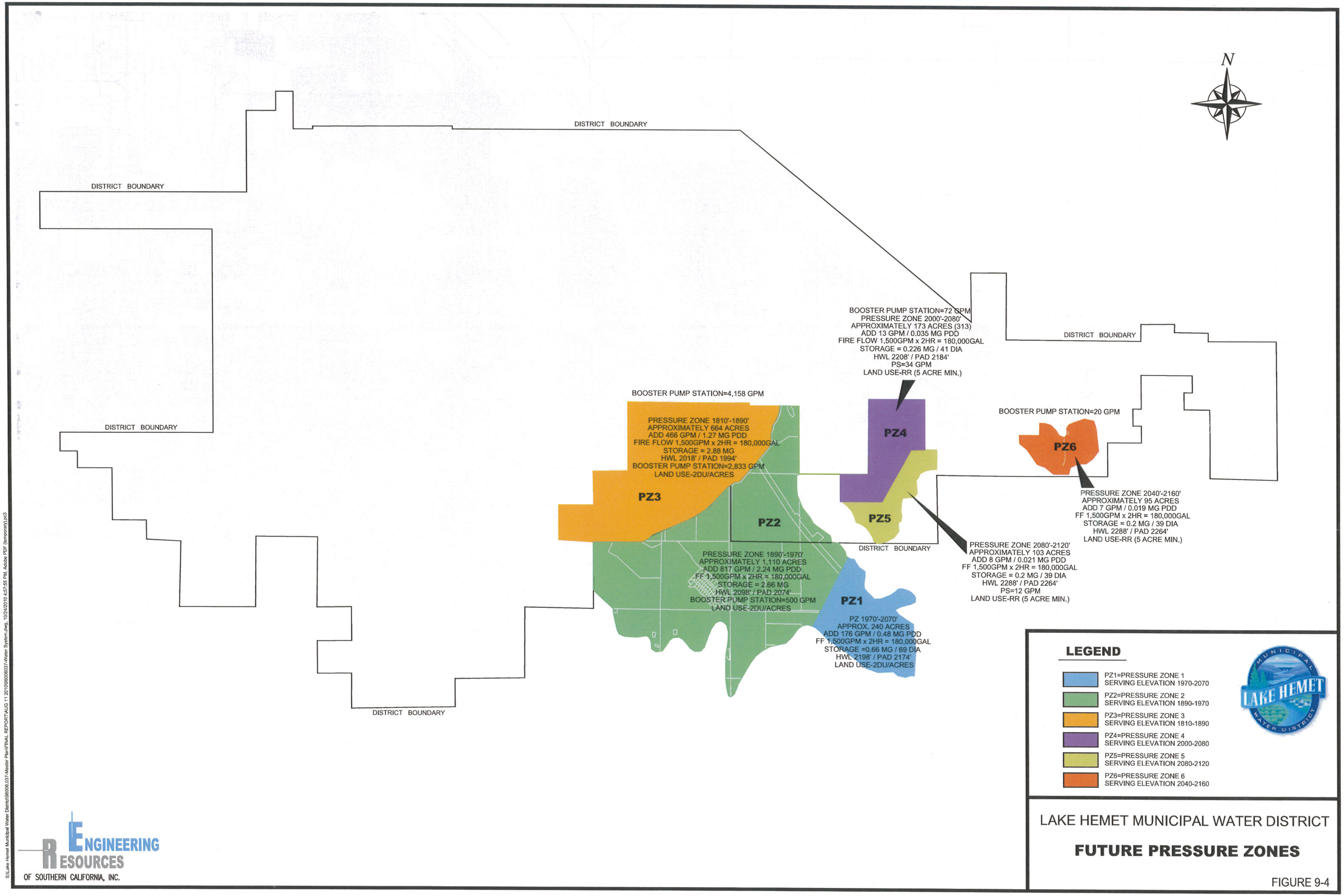


LAKE HEMET MUNICIPAL WATER DISTRICT

FUTURE PRESSURE ZONES

FIGURE 9-4

24-foot high reservoir was erected, it would need to be constructed on a pad elevation of 2174' resulting in a high-water level of 2198'. The site would need to be sized to accommodate a 69-foot diameter reservoir.

The majority of **Pressure Zone 2** (PZ2) is located within the proposed sphere of influence and would serve elevations 1890' through 1970' encompassing an area of approximately 994 acres. With a projected land use of two dwelling units per acre, the average-day demand was calculated to be 730 gpm or 1,387 gpm on peak day (2.0 mg). The required storage for this zone including a fire flow storage of 0.18 mg (1,500 gpm for 2 hours) would be 2.43 mg. If a 24-foot high reservoir was erected, it would need to be constructed on a pad elevation of 2074' resulting in a high-water level of 2098'. The site would need to be sized to accommodate a 132-foot diameter reservoir and a 500-gpm booster pump station (based on supplying peak day demand to PZ1 in 16 hours) .

Pressure Zone 3 (PZ3) would serve elevations 1810' through 1890' encompassing an area of approximately 664 acres. With a projected land use of two dwelling units per acre, the average-day demand was calculated to be 488 gpm or 927 gpm on peak day (1.33 mg). The required storage for this zone including a fire flow storage of 0.18 mg (1,500 gpm for 2 hours) would be 2.8 mg. If a 24-foot high reservoir was erected, it would need to be constructed on a pad elevation of 1994' resulting in a high-water level of 2018'. The site would need to be sized to accommodate a 141-foot diameter reservoir and a 2,600-gpm booster pump station (based on supplying peak day demand to PZ1 and PZ2 in 16 hours) .

Pressure Zone 4 (PZ4) would serve elevations 2000' through 2080' encompassing an area of approximately 173 acres. With a projected land use of one dwelling unit for every five acres, the average-day demand was calculated to be 13 gpm or 25 gpm on peak day (0.035 mg). The required storage for this zone including a fire flow storage of 0.18 mg (1,500 gpm for 2 hours) would be 0.226 mg. If a 24-foot high reservoir was erected, it would need to be constructed on a pad elevation of 2184' resulting in a high-water level of 2208'. The site would need to be sized to accommodate a 41-foot diameter reservoir and a 22-gpm booster pump station (based on supplying peak day demand to PZ5 in 16 hours).

Pressure Zone 5 (PZ5) would serve elevations 2080' through 2120' encompassing an area of approximately 103 acres. With a projected land use of one dwelling unit for every five acres, the average-day demand was calculated to be 8 gpm or 15 gpm on peak day (0.021 mg). The required storage for this zone including a fire flow storage of 0.18 mg (1,500 gpm for 2 hours) would be 0.20 mg. If a 24-foot high reservoir was erected, it would need to be constructed on a pad elevation of 2264' resulting in a high-water level of 2264'. The site would need to be sized to accommodate a 39-foot diameter reservoir.

Pressure Zone 6 (PZ6) would serve elevations 2040' through 2160' encompassing an area of approximately 95 acres. With a projected land use of one dwelling unit for every five acres, the average-day demand was calculated to be 7 gpm or 13 gpm on peak day (0.019 mg). The required storage for this zone including a fire flow storage of 0.18 mg (1,500 gpm for 2 hours) would be 0.20 mg. If a 24-foot high reservoir was erected, it would need to be constructed on a pad elevation of 2264' resulting in a high-water level of 2288'. The site would need to be sized to accommodate a 39-foot diameter reservoir.

CHAPTER 10

OPERATIONS/MAINTENANCE AND OTHER SPECIAL PROGRAMS

The Lake Hemet Municipal Water District's (District) existing water treatment and distribution system was described in Chapter 2. This Chapter focuses on the District's existing Operations and Maintenance (O&M) procedures and identifies any deficiencies in the District's existing program, including staffing and additional funding, that may need to be addressed. In addition, in order to accurately determine future water rates, several of the District's Special Programs are also discussed.

The District's 2010/11 Fiscal Year (FY) budget is nearly $13.9 million, including a $3.4 million working capital component. The working capital component is used to provide funding for capital outlay and special projects, such as this Water Master Plan. Heavy equipment and office equipment purchases are also budgeted under this capital component. Of the District's nearly $13.9 million total budget, approximately 47% of this budget is allocated to operating expenses, which include O&M programs.

The O&M programs are under the direct supervision of the District's Assistant General Manager as shown on the organizational chart provided as Figure 10-1. The responsibility for the O&M program is divided primarily among three of the District's sections and include a total staff of approximately 59 persons. The staff is responsible for a variety of activities including the operations and maintenance of the pump stations, storage reservoirs, pressure reducing stations, pipeline and service leak repairs, meter reading and replacement, and main flushing.

The goal of a successful O&M program is to operate and maintain facilities such that they are capable of providing reliable, high quality water to customers on a day to day basis. Because the District is not anticipating a substantial increase in future growth, this Chapter focuses primarily on evaluating the District's existing O&M procedures, with recommendations for additional actions to enhance the District's existing O&M program.

ORGANIZATIONAL CHART

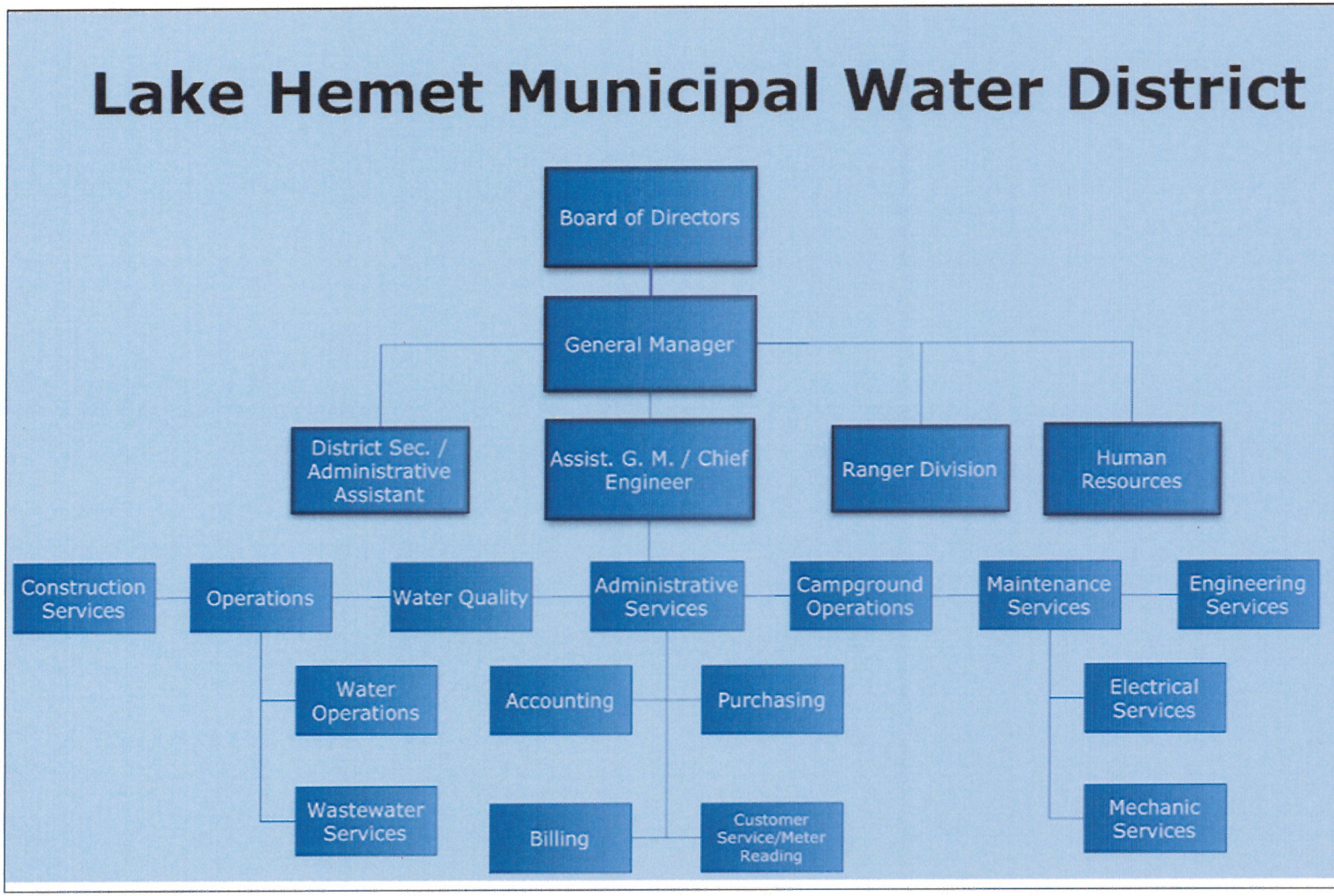


FIGURE 10-1

PROACTIVE MAINTENANCE MANAGEMENT

In developing a long-term O&M program, the District should consider implementation of a proactive maintenance strategy. This concept is described briefly below, as is the distinction between a proactive and a reactive maintenance program. This discussion is presented to provide the District with general information at this time. Additional details regarding implementation of this type of program should be developed as resources become available and can be devoted to the effort needed to implement this more intensive maintenance approach.

The proactive approach responds primarily to equipment assessment and predictive procedures. The overwhelming majority of corrective, preventive, and modification work is generated as a result of inspections and predictive procedures identified by maintenance programs. The goals of this proactive approach is continuous equipment performance to established specifications, maintenance of productive capacity, and continuous improvement.

Function and Control System

The function and control system of a good maintenance management program should be computer based. The computer, in an integrated operation, should be available for use by every member of the maintenance organization and the operators and other employees who have a need. The computer system should be viewed as another important tool in the general tool box of operations and maintenance personnel. The comprehensive integration of data systems ties together maintenance warehousing, purchasing, accounting, engineering, and production in such a way that all parties work together and have access to each other's information.

The Maintenance Function

Maintenance is simply defined as the act of maintaining. The basis for maintaining is to keep, preserve, and protect. This means that the focus of maintenance should be to keep equipment and systems in the existing state of operation or preserve them from failure or decline.

It is best to assign the responsibility and accountability of the maintenance function to a single person, whether that be a maintenance person or an operator. To split the responsibility between maintenance and any other department where overlapping responsibility occurs results in establishing an operation where no one is accountable. When the maintenance department or group is held responsible and accountable for maintenance, the relationship with other departments takes on a whole new meaning.

Service Versus Product

Does the maintenance function provide a service or a product? Service is defined as a useful labor that does not produce a tangible commodity. A product is something that is produced, usually tangible, but definitely measurable. In the case of the maintenance function and the development of a proactive maintenance philosophy, both a service and a product are considered to be an output of maintenance.

The current thinking, which is related to a traditional reactive maintenance philosophy, suggests that the maintenance function is for the most part a service function. But the proactive philosophy considers the maintenance function as the provider of a product with a small but limited service component. In the case of a water system, one can consider the product produced by maintenance to be water production and distribution capacity.

Most maintenance operations today are designed to respond to the stimulus of breakdown and the work order request, except for small efforts related to preventive and predictive maintenance, representing usually less than 25 percent of the available hours. In a proactive maintenance environment, the goal is to expend 75 percent of the labor in preventive and predictive activities. To be successful, the maintenance function must provide facilities and equipment that perform to specifications and produce desired production capacity.

Proactive Maintenance Planning

In an ideal world, the water treatment and distribution divisions would be adequately staffed to allow the respective supervisors the time to perform the planning functions for a proactive maintenance program. This planning function is not designed to be concerned with today's activity, except in real emergency situations. It looks to the future. The planning function has primary responsibility for providing job plans and procedures, job estimates, drawings, specifications, manuals, vendor information, special tools or equipment, job materials, production coordination, work schedules, overhaul and shutdown schedules, and equipment histories and records.

EVALUATION OF EXISTING O&M PROCEDURES AND RECOMMENDED PROGRAM ENHANCEMENTS

This section provides a comprehensive description of O&M procedures which are an integral part of a successful O&M program. The District's existing level of effort is discussed and additional recommended actions to enhance the District's existing program are identified, including additional staffing and funding that may be required.

Pipeline Main Flushing

Main flushing programs are generally designed to respond to water quality complaints. These system problem areas are routinely flushed when the degree and frequency of water quality complaints warrants immediate attention. Secondary considerations include hydraulic conditions such as dead ends in the distribution system, low flow areas, and areas subject to flow reversals.

The actual flushing procedure takes two maintenance workers or operators to perform and training is minimal. Very little special equipment is required. Generally, flushing is performed at water hydrants, and a simple diffuser is needed to direct the flow of water to the discharge point (usually a storm drain). Dechlorination of the discharge with sodium thiosulfate is recommended.

Water quality samples should be collected before and after flushing is performed to establish a base line for system performance. The number of analyses should be kept to a minimum and can normally be performed with basic analytical equipment such as a turbidimeter and colorimeter.

The District has implemented a "proactive" main flushing program. Priority flushing areas are based on the above criteria with special attention paid to historic water quality problem areas. A reasonable proactive main flushing program is be performed on a five-year cycle where 20 percent of the distribution system is flushed on an annual basis. For the District's system, Operators generally take about a month for a two-person crew to complete the work. System flushing is typically performed during the winter period when water demand is low. It is estimated that this activity requires about 200 hours per year.

Existing District Program: The District's main flushing program is currently performed by the Water Operations Department staff (see Figure 10-1) and consists of flushing each of the over 400 dead end distribution system lines annually.

Recommendations: The District's current program should be modified slightly. It has been estimated by District staff that over 65% of the 400 flushing locations are below grade facilities. This type of below grade system flushing requires District staff to expend considerably more time and effort at each location than with an aboveground hydrant. Therefore, the District's main flushing program should be modified slightly to include the conversion of these below grade line flushing facilities to aboveground hydrants. If 20 to 30 facilities per year could be converted, within a 10-year period all below grade facilities could be replaced with aboveground hydrants. The District should also consider ways to increase looping/interconnections in the system to eliminate some of the dead ends, improve water quality and system redundancy.

Leak Detection and Repair

A formal leak detection and repair program is required of all urban water agencies in California under the requirements of the Urban Water Management Program administered by the Department of Water Resources (DWR). The program applies to agencies serving water to more than 3,000 connections. The DWR currently offers technical assistance to water agencies desiring to conduct leak detection and repair programs, and in the past has offered financial assistance in the form of grants to procure testing equipment.

Typically, the majority of leaks are found on service lines, which are more susceptible to developing small leaks at fittings and pipe connections. Leak detection programs are set up on a priority basis, based upon historical leak records. A trained maintenance worker, who can cover about three miles of piping per day, surveys the water distribution system. A sonic leak detection device can be purchased for about $5,000. Water main leaks are less common than service line leaks, so the primary emphasis should be placed on service lines. Skilled maintenance workers can typically make repairs.

Existing District Program: The District currently has no formal leak detection and repair program. Leaks are detected on an as-needed basis, either visually or from large differences in production and sales records. These leaks are then further investigated, located and repaired. Since 1992, the District has kept an inventory of the frequency of leaks by pipe.

Recommendations: The District should implement a formal leak detection and repair program. Pipelines should be inspected on a five-year cycle where 20% of the distribution system is checked annually using a sonic leak detection device. Any pipe leak detected should be plotted on a map of the distribution system. These maps should then be reviewed annually to identify potential candidate pipelines for the pipeline replacement program. It is estimated that an additional 100 hours annually would be sufficient to adequately staff this program. Currently, the District has funds allocated for transmission and distribution repairs, so the additional level of effort would primarily be the labor designated for this program.

Pipeline Replacement

First priority on pipeline replacement should be devoted to distribution mains that have a demonstrated leak history. Because distribution mains are the lifelines of the water distribution system, the replacement program should be designed to replace old, substandard and leaking mains on a regular basis. This is usually accomplished by including this line item in the "main replacement element" of the Capital Improvement Program (CIP) in the annual budget.

The District's existing water distribution system consists of over 200 miles of pipeline (not including raw water pipeline), some of which are over 100 years old. The pipeline materials include cement-mortar lined cast iron, asbestos cement, riveted steel, welded steel and PVC.

Existing District Program: The District generally budgets for $1M-$2M towards its pipeline replacement.

Recommendations: Given the age and condition of the distribution system, the District may require a fairly aggressive replacement program. The identification, prioritization and funding of pipelines to be replaced is fully discussed in Chapter 11, "Recommended Capital Improvement Program".

Valve Exercising

Valve exercising programs are important for reliable operation of the distribution system, especially during emergencies when transmission and/or distribution mains must be closed to isolate the system from a leak. Many agencies have a goal to exercise each distribution valve on a five-year cycle. Critical isolation valves may require annual exercising. The exercise program consists of one complete open/close cycle. If problems are found, maintenance is performed immediately.

Staffing for this program can vary. If an agency has resources to dedicate someone to this function, one maintenance worker can perform this work. When the workload permits, more workers can be assigned to this task. Special air operated actuators greatly assist in the operation of larger sized valves.

Existing District Program: After an eight to nine year absence, in 1997 the District dedicated a two-person crew to the valve exercising program. The crew is approximately one-third of the way through the system and has encountered numerous broken valves.

Recommendations: Because of the lack of attention given to this program in the last decade, the District should accelerate its existing work effort to exercise all system valves, and also locating and repairing broken valves. Currently, the District may be vulnerable to an emergency situation where they are unable to open/close a critical valve. Based on discussions with District staff, this program is currently understaffed. Due to the quantity of broken valves that are being discovered, there appears to be inadequate staff available to quickly replace/repair the broken valve in a timely manner. It is estimated that one additional staff person temporarily dedicated to the valve exercising crew should help the District complete this existing work effort. In the future, the District should implement an aggressive valve exercising program, exercising all valves approximately once per year. Once the initial work effort is complete, the level of staffing for the future valve exercising program would probably be sufficient with the two-person crew. Additional funding may be required for this program in the near-term, depending on the number of broken valves discovered.

Backflow Prevention Program
Backflow prevention devices should be tested on an annual basis in accordance with American Water Works Association (AWWA) recommendations. Devices should be prioritized by the degree of risk that they present to the potable water system. Commercial and industrial installations having processes using chemicals under pressure create the greatest potential risk of backflow into the potable water distribution system. Hospitals, funeral homes, auto repair shops and many other commercial facilities can also present significant backflow risks.

The degree of vulnerability of the system should define how critical the installation is. If incomplete agency records are available, the local fire department, which issues permits for business and industries handling hazardous materials, usually can provide these records which are helpful in establishing a base-line program.

The California-Nevada Section of the AWWA has a very active Backflow Committee which provides numerous training and certification opportunities for backflow testers and device installers. Many smaller sized agencies have chosen to contract for these services from certified testers and installers and there are many to chose from. The DHS also provides guidelines for backflow requirements in potable water systems, which should form the basis for the agencies program. Many agencies have ordinances in place that mandate this type of protection for certain installations.

Existing District Program: The District currently tests over 300 backflow prevention devices on an annual basis in accordance with AWWA recommendations.

Recommendations: The current level of effort is adequate. However, community education is an important consideration in making the community aware of the risks of water system contamination created by backflow. The District may want to consider making literature on backflow prevention devices available through bill stuffers and general mailings.

Corrosion Control
In general, corrosion control programs should look at both internal and external pipeline corrosion. Several agencies use the U.S. Department of Transportation Pipeline Safety Regulations as a reference document for establishing corrosion control programs. A review of historical records (soil analyses, water quality analyses, and leak records) are a good starting point for prioritizing areas in which to conduct corrosion surveys. Pipeline construction materials and age of pipe also should be taken into consideration. PVC and AC pipe are far less prone to corrosion than iron or steel pipes. Generally, iron and steel pipes create the biggest concern, especially in areas where the soil is "hot" or the water is aggressive. Coating integrity is also a major concern on coated pipelines and fittings. Once problem areas have been identified, a cost-

benefit analysis should be performed to protect the most expensive and vulnerable portions of the transmission and distribution system.

Test stations should also be installed at all vulnerable points in the system. A certified corrosion engineer should be retained to do the pipeline survey work and make recommendations on where cathodic protection is necessary or desirable. These surveys should be conducted every five years unless the vulnerability of the site warrants more frequent attention. In critical areas, rectifier stations should be installed and monitored four times per year. Sacrificial anodes should be checked regularly, if practical to do so. These are typically designed with a 20- to 25-year life expectancy. Life-cycle costs are important in establishing a cost-effective corrosion control and protection program.

From a proactive perspective, quality coatings are a must on all new metallic installations. These should be specified using appropriate industry coating standards and the installation should be carefully inspected by the District. Consideration should also be given to installing test stations and cathodic protection on all new installations where pipe, valves, and fittings are subject to internal or external corrosion.

Existing District Program: The District currently has no formal corrosion program. However, soil surveys are conducted as part of standard specifications for any job that is bid out in an effort to identify potentially high resistivity soil areas.

Recommendations: The District should retain a corrosion engineer every five years to evaluate the impacts of corrosion on the District's water system, do pipeline survey work and make recommendations on where cathodic protection is necessary or desirable. Additional services should be contracted for on an as-needed basis.

Storage Tank Inspection

Every other year, routine inspections of the exterior of storage reservoirs should be performed on a regular basis to observe leaks, corrosion, vandalism, and other obvious changes in the condition of the reservoir exterior. Operations or maintenance staff as part of their routine duties typically perform these inspections. Interior inspections should begin with the installation of a new reservoir and should be done every two to three years thereafter.

Contract services provide a good alternative for performing interior storage tank inspections. These inspections can be accomplished with the tanks in a full or dewatered condition. Still pictures and videos should be made to document tank condition. It is important that corrosion inspections be conducted and certified by qualified technicians.

Existing District Program: The District currently performs routine inspections of the exterior of its reservoirs to observe leaks, corrosion, vandalism and other obvious changes in condition. Per requirement, interior inspections are performed once every five years by independent contract services.

Recommendations: Current level of effort is adequate.

Calibration and Repair of Meters

All metering equipment should be calibrated at least once per year. There is a general perception in the industry that calibration is needed on a more frequent basis. While this may be true in some instances, most instruments and analyzers are pretty stable. Operators that use these instruments on a daily basis have the best knowledge as to the reliability and performance of this equipment. Their knowledge and experience should weigh heavily in the development of any calibration and maintenance program.

Existing District Program: Commercial and industrial meters are periodically spot checked on an as-needed basis.

Recommendations: The District should reinstitute the District program to physically inspect all production and flow meters in the distribution system and implement a meter maintenance/replacement program for improperly operating meters. It is anticipated that the existing metering staff is adequate to perform these additional duties.

Meter Reading

Existing District Program: Domestic meters are manually read on a monthly basis. Agricultural meters are read monthly. The District has also begun to use hand-held computers to enter real-time data into the system, with the capability to download these water readings directly into a billing software program, thus avoiding number transcribing errors and saving time and costs.
Recommendations: Current level of effort is adequate.

Recently, the District installed approximately 580 Automatic Meter Readers (AMR) on Florida and Stetson Avenues. These meters are predominately on commercial accounts. The AMR meters have the ability to trend the customer's usage every few minutes throughout a 24-hour period. Graphs of the usage can be printed for the customer's use/reference. Aside from the benefits of reduced labor and customer profiling (i.e. water conservation), the automatic meters provide a safer work environment for the Meter Reading Department staff whom are otherwise at risk while reading meters on these busy streets.

If the AMR program is successful, the District may elect to install more AMR meters in the coming years.

Wells

Of the 20 wells used by the District to meet its total demand, the District owns and operates 11 wells for its domestic water supply and 6 wells for its irrigation supply. These wells are located primarily in the northeastern portion of the service area, just south of the San Jacinto River from which they are recharged.

Existing District Program: The District typically physically inspects these wells at a minimum of once a month. Staff takes static water levels monthly and performs efficiency testing at least once a year, if not more frequently.

Recommendations: Current level of effort is adequate.

Agricultural Surface Water Delivery System

The District also owns and operates an irrigation distribution system. This system is made up of an irrigation flume which runs along the District's Southern "Valley" boundary from the eastern edge of the service area to Little Lake. In addition to the flume, the District operates the 12- and 16-inch diameter "Washburn Pipeline" which provides irrigation water from the District's B, D, E and Sprowl wells to the Washburn property, located in the southern portion of the District's service area.

Existing District Program: Flume, weirs, tunnel and siphons are inspected on an annual basis. The Dam and spillway are inspected as required by the Division of Dam Safety.

Recommendations: Current level of effort is adequate.

Major Equipment

Existing District Program: Prior to FY 98/99, the District did not set aside funding for the purchase of new heavy equipment, including vehicle maintenance and replacement. Beginning in FY 98/99, the District began setting aside $9,000/month into a vehicle fund to be used for the purchase of new and/or replacement vehicles. Other major equipment purchases are on an as-needed basis and are included in the proposed capital expenditures for that fiscal year.

Recommendations: Current level of effort is adequate.

SPECIAL PROGRAMS

In order to accurately determine future water rates, several of the of the District's Special Programs were also evaluated and are discussed below.

Leaky Pipe Program

In the past, the District has collaborated with the State, on a "Leaky Pipe Program" to replace old, domestic distribution system lines that are leaking. Existing steel pipelines, the majority of which were in excess of 40 years old and have deteriorated due to age and corrosive soils were identified on an application to the State for financial help to fund the program. In 1998, a loan for approximately $4 million at an interest rate of 4% over a 20-year period was approved by the State.

This program was deemed a success and the District anticipates pursuing similar pipeline replacement projects in the future.

San Jacinto Basin Investigation

For several decades, the District, in cooperation with outside consulting services has continued to evaluate and investigate water supply resources and groundwater basin management. Duties have included collecting water level measurements from District wells, developing seasonal water level contours, modeling of groundwater management alternatives, and review of historic water rights information and data. The current work effort is anticipated to continue and funding is adequate.

Soboba Water Rights Issue

For the last decade, the District, in coordination with multiple agencies and both legal and technical services has been involved in ongoing water rights issues regarding the Soboba Band of Mission Indians. This level of effort is expected to continue and should continue to be funded as part of the District's ongoing programs.

SUMMARY

A summary of the District's existing O&M and Special Programs and recommendations are provided in Table 10-1. The goal of the recommendations is to enhance the quality and reliability of the District's water service. Based on our review of the District's existing O&M and Special Programs, it appears that the District is adequately funding each of the identified activities. However, the following activities were identified to require additional staff:

- **Valve exercising program -** It appears that a temporary hire of an additional person to help with the valve exercising program would help the District complete the identification and replacement of broken valves within the next year or so. This is of critical importance, because of the long delay in attention given to this program. Until the District completes its first round of valve exercising, the District may be vulnerable to emergencies that require the closing or opening of valves.

Table 10-1. Summary of Operation/Maintenance Procedures and Other Special Programs

	EXISTING	RECOMMENDED		
Activity	District Program	Enhanced District Program	Additional District Person, Hours per Year	Additional Cost per Year Not Including Labor ($1,000)
Pipeline Main Flushing	• Performed by Metering Staff. • Dead ends in distribution system flushed once per year. • Distribution system contains over 400 dead ends.	• Current level of effort is adequate. • Evaluate ways to increase looping/interconnections to eliminate some of the dead ends in the system, improve water quality and system redundancy. • Convert below grade facilities to above grade hydrants.	0	100
Leak Detection and Repair	• No formal leak detection and repair program. Leaks are detected on an as-needed basis, either visually or from large differences in production and sales records. These leaks are then further investigated, located and repaired. • In the early 1990's, the District checked 20 miles of their distribution system and no leaks were detected. • Since 1992, District has kept an inventory of the frequency of leaks by pipe.	• Implementation of a formal leak detection and repair program. • Five-year cycle where 20% of distribution system is inspected annually using a sonic leak detection device. • Plot each detected pipe leak on a map of the distribution system. Review maps annually to identify potential candidate pipelines for the Pipeline Replacement Program.	100	0
Pipeline Replacement	• Pipes replaced on an as - needed basis.	• Given the age and condition of the District system, may require a fairly aggressive program. • Required funding will be identified as part of the CIP program.	0	Identified as part of CIP

Activity	EXISTING District Program	RECOMMENDED Enhanced District Program	Additional District Person, Hours per Year	Additional Cost per Year Not Including Labor ($1,000)
Valve Exercising	• After an 8-9 year absence, in 1997 the District dedicated a 2-person crew to a valve exercising program. • They are approximately ½ of the way through the system and have encountered numerous broken valves.	• Implementation of an aggressive program to identify and replace/fix broken valves. • Additional crew may be required temporarily to help exercise and identify valves in critical locations that may be broken. • An acceleration of the existing work effort is required because the District may be vulnerable in an emergency situation where they are unable to close/open a critical valve. • Exercise all valves approximately once per year. • Exercise program consists of one complete open/close cycle.	2080	May initially require additional funding depending on the number of broken valves discovered.
Backflow Prevention	• Over 300 devices tested on an annual basis in accordance with AWWA recommendations.	• Current level of effort is adequate. • Could make literature available to public.	0	0
Corrosion Control	• No formal program. • Soils survey is part of standard specifications for any job bid out.	• Certified corrosion engineer should be retained every five years to do pipeline survey work and make recommendations on where cathodic protection is necessary or desirable. • Contract services on an as-needed basis.	0	0

	EXISTING	RECOMMENDED		
Activity	District Program	Enhanced District Program	Additional District Person, Hours per Year	Additional Cost per Year Not Including Labor ($1,000)
Storage Tank Inspection	• Routine inspections of exterior of reservoir to observe leaks, corrosion, vandalism and other obvious changes in condition. • Per requirements, interior inspections are performed once every five years by independent contract services.	• Current level of effort is adequate.	0	0
Calibration and Repair of Meters	• Commercial & industrial meters periodically spot-checked on an as-needed basis.	• Re-institute District program to physically inspect all production and flow meters in the distribution system and implement a meter maintenance/replacement program for improperly operating meters.	0	0
Meter Reading	• Domestic meters read monthly manually. • Agriculture meters read monthly. • The District has started to use hand-held computers to enter real time data into the system to avoid number transcribing errors.	• Current level of effort is adequate.	0	0
Wells	• Well and pump equipment maintained and exercised monthly. • Efficiency testing should be performed annually. • Static water levels recorded monthly.	• Current level of effort is adequate.	0	0

	EXISTING	RECOMMENDED		
Activity	District Program	Enhanced District Program	Additional District Person, Hours per Year	Additional Cost per Year Not Including Labor ($1,000)
Agricultural Surface Water Delivery System	• Flume, weirs, tunnel, siphons inspected on an annual basis. • Dam and spillway inspected per requirement of Division of Dam Safety.	• Current level of effort is adequate.	0	0
Major Equipment Inventory	• Prior to FY 98/99, the District did not set aside funds for heavy equipment, including vehicle replacement. • Beginning in FY 98/99, the District began setting aside $9,000/month into a vehicle fund. Other major equipment purchases are on an as-need basis and are included in the proposed capital expenditures for that fiscal year.	• Current level of effort is adequate.	0	0
SPECIAL PROGRAMS				
Leaky Pipe Program	• As part of a collaborative effort with the State, the District has developed a "Leaky Pipe Program" to replace old, domestic distribution pipelines. • The District currently anticipates being able to replace most of the pipeline projects identified within a three-year time frame.	• Current level of effort is adequate.	0	0

Activity	EXISTING	RECOMMENDED		
	District Program	Enhanced District Program	Additional District Person, Hours per Year	Additional Cost per Year Not Including Labor ($1,000)
San Jacinto Basin Investigation	• Track water levels in Basin monthly. • Each Spring take water levels from as many District and other wells as possible. • Compile data to analyze seasonal and long-term fluctuations in the groundwater basin.	• Current level of effort is adequate.	0	0
Soboba Water Rights Issue	• For the last five years, the District has been involved in negotiations regarding the water rights of the Soboba Indian Tribe.	• Need to continue to have District staff work with the Legal and Technical Teams to reach a Settlement.	0	0
		TOTAL	**2,180**	**$100**

- **Leak detection and repair program** – It is recommended that the District implement a more formal leak detection program. This will require the commitment of a staff person for several weeks a year to check a portion of the distribution system and record leaks detected on District distribution maps. These maps should then be reviewed annually to proactively develop a listing of pipelines which are candidates for the pipeline replacement program.

- **Pipeline main flushing program** – It is recommended that the District began replacement of the below grade flushing facilities in the District's system with above ground hydrants. This will require the District to budget additional funding for these new, replacement hydrants and corresponding distribution pipeline modifications.

CHAPTER 11

RECOMMENDED CAPITAL IMPROVEMENT PROGRAM

INTRODUCTION

The purpose of this chapter is to summarize the recommendations made in the preceding chapters and integrate them into a staged Capital Improvement Program (CIP). In addition, this chapter presents the assumptions used in developing construction cost estimates for facilities recommended in this Water Master Plan.

UNIT CONSTRUCTION COSTS

Unit costs which were used to estimate the construction cost of recommended water system facility improvements are presented in this section. These costs are for construction only and do not include cost estimates for land acquisition, contingencies, engineering, legal costs, environmental, inspections and/or contract administration. These additional costs will be added to the unit construction costs separately, to provide the District with a budgetary estimate of the total project cost for each proposed system improvement.

The unit costs were developed based on cost data supplied by manufacturers, and published cost data and curves. All construction costs have been adjusted to reflect the 2010 price level. These costs are to be used for conceptual cost estimates only.

Pipelines

Unit costs for water mains 6- through 36-inches in diameter are provided in Table 11-1. These costs are intended to be used for replacement of existing pipelines. These costs generally include pipe materials, trenching, placing and jointing pipe, valves, fittings, hydrants, service connections, placing imported pipe bedding, native backfill material, and asphalt pavement replacement.

Table 11-1. Unit Construction Costs[a] for Pipelines

Pipe Diameter (inches)	Unit Construction Cost (Dollars/lineal foot)
6	$ 75
8	$100
10	$125
12	$150
14	$175
16	$200
18	$225
24	$250
30	$275
36	$300

[a] Based on 2010 construction costs

Based on engineering cost estimating experience and recent pipeline replacement projects, the nominal unit cost for pipelines between 6-inches and 36-inches in diameter with appurtenances is estimated to be approximately $12.50/lineal foot/diameter-inch. This cost includes fire hydrants and service connections. It is assumed that the larger diameter pipelines are used for transmission purposes and have fewer appurtenances such as hydrants and service connections.

Treated Water Storage Tanks

Unit costs were developed for the construction of water storage tanks in the size ranges of 250,000 gallons to 3 million gallons (mg). Table 11-2 lists the estimated construction costs for ground-level steel storage tanks. As previously stated, these costs represent construction under normal excavation and foundation conditions and would be significantly higher for special or difficult foundation requirements.

Table 11-2. Construction Costs for Water Storage Tank[a]

Capacity (Gals.)	Estimated Construction Cost Steel Storage Tank	Estimated Construction Cost per Gallon
250,000	$500,000	$2.00
500,000	$650,000	$1.30
750,000	$750,000	$1.00
1,000,000	$850,000	$0.85
1,500,000	$1,200,000	$0.80
2,000,000	$1,500,000	$0.75
3,000,000	$1,950,000	$0.65

[a] Based on 2010 construction costs

Groundwater Production Wells

Well construction consists of drilling, casing, developing the well and providing the necessary housing, pump, motor, automatic control equipment, discharge piping, aeration tank, booster pump and disinfection equipment. Costs are estimated to be approximately $1,000,000 per well, for a 1,000-gpm well, approximately 1,000 feet deep with a standby generator. These costs represent construction under normal drilling conditions and would be significantly higher for special or difficult soils (*i.e.* volcanic).

Pumping Plants

Distribution pumping station costs vary considerably, depending on such factors as architectural building design, pumping head, and station capacity. Table 11-3 presents estimated average construction costs for distribution pumping stations, based on enclosed stations with architectural and landscaping treatment suitable for residential areas. Pumping station cost estimates include allowances for engine drives or auxiliary engine-generator sets.

Table 11-3. Construction Costs for Booster Pumping Stations [(a)]

Capacity, gpm (mgd)	Estimated Construction Cost
500 (0.72)	$275,000
1,000 (1.4)	$546,000
1,500 (2.2)	$672,000
2,000 (2.9)	$756,000
2,500 (3.6)	$840,000

[(a)] Based on 2010 construction costs

Backup/Standby Generators

Backup or standby power supplies may be provided in three ways:

- Dual electrical power systems. Dual electrical power feeds does not guarantee that a general failure of interlocked systems or that a failure in the main switchyard which shuts the system down will not occur.

- Standby engines with either clutches or direct drives or an engine-generator.

- Use of only standby generators with one backup/redundant engine and pump. Diesel fuel provides the most reliability, and natural gas is more reliable than electrical power.

If standby electrical generation is required for a pumping station with electric motors and variable speed drives, using engines and direct drives is more economical in both capital and operating costs. Maintenance for engines is much greater than for motors, but the savings in capital and operations is more than adequate for the maintenance and ultimate replacement of engines. Therefore we recommend using standby engines and direct drives at an estimated cost of $1,000 per Hp. These costs represent construction under normal conditions.

Engineering Markups and Contingencies after Construction Estimates
Engineering services associated with new facilities include preliminary investigations and reports, site and aerial surveys, foundation explorations, and preparation of drawings and specifications. For this study, engineering costs are assumed to be 10 percent of the construction cost estimates after construction contingencies have been applied.

Construction management covers such items as contract management and inspection during construction, surveying and staking, sampling of testing material, and start-up services. The cost of these items can also vary, but for the purpose of this study, it is assumed that construction management charges will equal approximately 10 percent of the construction costs after construction contingencies have been applied.

Finally there are program implementation costs which cover such items as legal fees, financing expenses, administrative costs, and interest during construction. The cost of these items can also vary, but for the purpose of this study, it is assumed that construction management charges will equal approximately 10 percent of the construction costs after construction contingencies have been applied. Therefore, the total cost of all necessary engineering services, construction management, contingencies and program implementation is 30 percent of the base construction costs for each project.

CAPITAL IMPROVEMENT PROGRAM

ERSC worked closely with District Staff to review the constructability of each project and develop specific cost estimates. The results of these efforts were used to develop the individual project costs provided in Tables 11-4, 11-5, 11-6, 11-7,11-8, and 11-9.

Table 11-4
Estimated Construction Costs
Reservoir Storage for Southern Hills

	Existing Storage (gallons)	Peak Day Demand (gallons)	Fire Flow Storage (gallons)	Peak Day plus Fire Flow (gallons)	Projected Ultimate Storage (gallons)	Recommended Storage (gallons)	Storage Costs
Area #1 Pachea System	60,000	71,100	180,000	251,100	280,000	220,000	**$440,000**
Area #2 Skycrest System	342,000	276,222	180,000	456,222	520,000	178,000	**$356,000**
Area #3 Lower Sprague	150,000	284,544	180,000	464,544	590,000	600,000	**$1,050,000**
Upper Sprague						60,000 Fire Pump	**$200,000**
							$2,046,000

Table 11-5
Estimated Construction Costs
Booster Pump Stations for Southern Hills

	Booster Pump Station	Pressure Zone	Booster Station Costs
Area #1 Pachea System	2-25 HP Pumps	Pachea	**$275,000**
Area #2 Skycrest System	2-25 HP Pumps	Vista Del Valle	$275,000
	2-25 HP Pumps	Rockview	$275,000
	2-40 HP Pumps	Upper Skycrest	$370,000
			$920,000
Area #3 Lower Sprague	2-25 HP Pumps	Sprague Heights	$275,000
Upper Sprague	2-25 HP Pumps	Grant Ave.	$275,000
			$550,000
			$1,745,000

Table 11-6
Estimated Construction Costs
Pipelines For Southern Hills

	8" Pipe Length (feet)	8" Pipe Cost $100 per foot	12" Pipe Length (feet)	12" Pipe Cost $150 per foot	Pipeline Costs	Construction Cost for Storage, Booster Stations, and Pipeline
Area #1 Pachea System	4,900	490,000	3,900	$585,000	$1,075,000	**$1,790,000**
Area #2 Skycrest System	10,235	1,023,500	10,900	$1,635,000	$2,658,500	**$3,934,500**
Area #3 Lower Sprague/ Upper Sprague	8,400	840,000	8,800	$1,320,000	$2,160,000	**$3,960,000**
Projected Cost for Storage, Booster Pump Stations, and Pipelines for the Southern Hills						**$9,684,500**

Table 11-7
Estimated Construction Costs
Priority 2 Projects

8" Pipe Length (feet)	8" Pipe Cost $100 per foot	12" Pipe Length (feet)	12" Pipe Cost $150 per foot	Construction Cost for Pipe
38,290	$3,829,000	9,240	$1,386,000	**$5,215,000**

Table 11-8
Estimated Construction Costs
Priority 3 Projects

8" Pipe Length (feet)	8" Pipe Cost $100 per foot	12" Pipe Length (feet)	12" Pipe Cost $150 per foot	Construction Cost for Pipe
73,525	$7,352,500	6,575	$986,250	**$8,338,750**

Table 11-9
Estimated Construction Costs – Priority 1, 2, and 3 Projects

PRIORITY 1 PROJECTS	**$9,684,500**
PRIORITY 2 PROJECTS	**$5,215,000**
PRIORITY 3 PROJECTS	**$8,338,750**
TOTAL	**$23,238,250**

Construction cost data presented in this chapter are not intended to represent the lowest prices in the industry for each type of construction, but rather to be representative of average or typical construction costs. The planning level cost estimates have been prepared for guidance in evaluating various options, and are intended for budgetary purposes only, within the context of this master planning effort.

This recommended plan for capital improvements was developed based on the information presented in the preceding chapters and reflects the completion of projects from the 1999 Master Plan. Recommended facilities are scheduled in accordance with priorities established jointly with District staff to match funding limitations and to meet critical implementation milestones.

Based on the section entitled "Engineering Markups and Contingencies After Construction Estimate", the Construction Cost will be increased by 30% to have a Total Project Cost.

Priority #1 – Areas 1, 2, and 3
Upgrade Piping, Storage Capacity, and Booster Pump Stations in the Southern Hills are shown on Figure 11-1.

Total Project Costs(1) are estimated at $12,590,000: 2010-11 to 2013-14 (4 Years)

Priority #2
Replace Aging Pipelines and Increase Circulation in the System (shown on Figure 11-1).

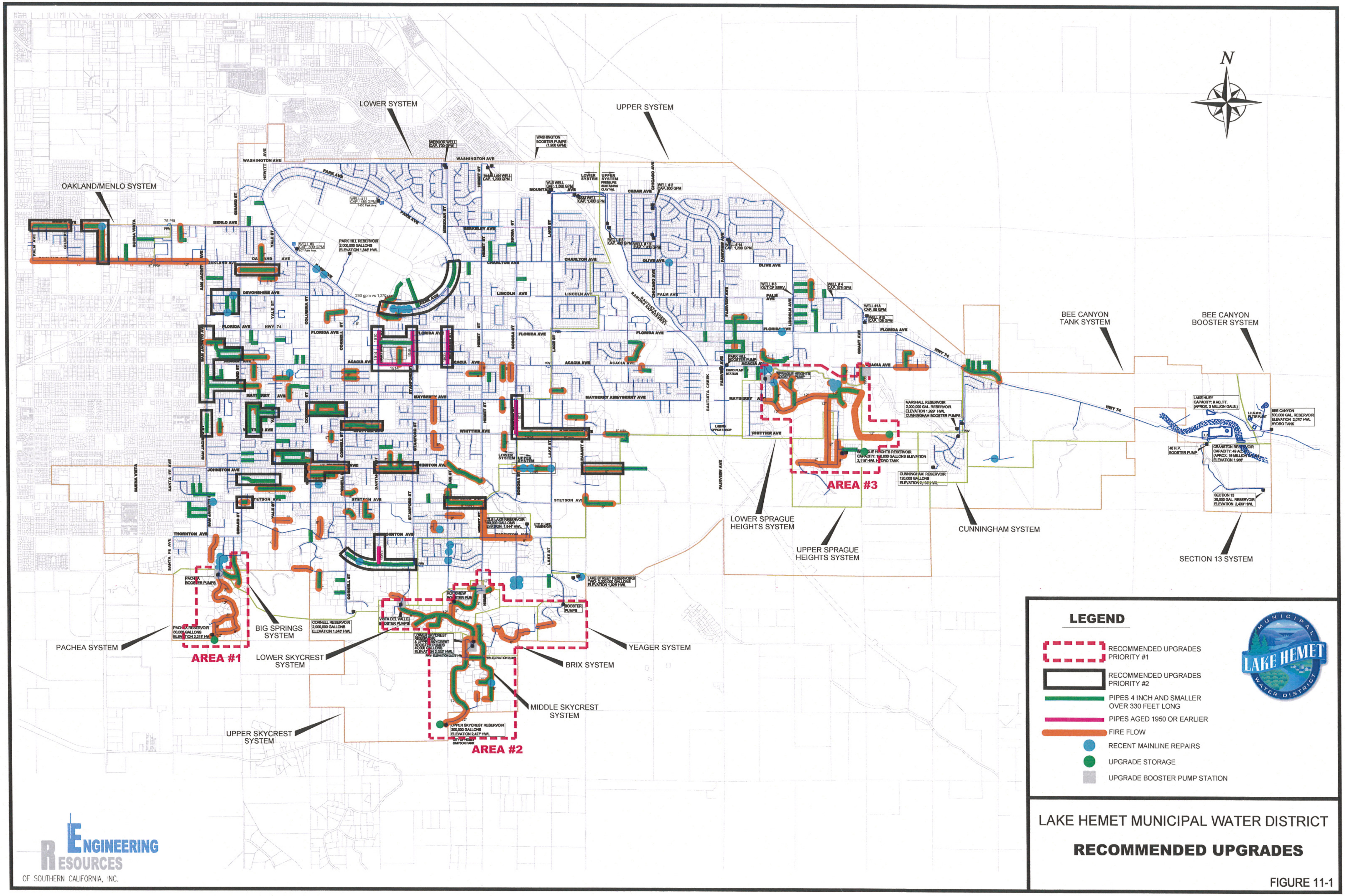
Total Project Costs(1) are estimated at $6,780,000: 2015-16 to 2017-18 (3 Years)

Priority #3
All Other Identified Pipes are shown on Figure 11-1.

Total Project Costs(1) are estimated at $10,840,000: 2019-20 to 2022-23 (4 Years)

Grand Total $30,210,000 (1)

(1) Construction Costs plus a 30% Markup



LAKE HEMET MUNICIPAL WATER DISTRICT

RECOMMENDED UPGRADES

FIGURE 11-1

S:\Lake Hemet Municipal Water District\96006.037-Master Plan\Report markups from ERSC after Jeffs markups\AUG 11 2010\96006037-Figure 11-1.dwg, 9/3/2010 9:41:25 AM

APPENDICES

APPENDIX A

FIRE FLOW DATA

1

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date 8/13/08 Start time________ End time________

Party requesting test Hemet Valley Adventist
Phone Number____________________

Address of property 26312 Hemet St

apn # 552-070-013

Hydrant location	Static press	Residual	G.P.M.
Hemet St S/ Mayberry	60	50	850

Distance –flowed hydrant to driveway 7 ft

Hydrant Type – Super____ Standard ✓ Dry Barrel____

Be sure to mark map with driveway & hydrant locations

I certify that at the time of test these flows were available.

LHMWD Employee [signature]
LHMWD Employee assisting [signature]

2

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date 2/1/05 Start time________ End time________

Party requesting test Superior Fire Protection
Phone Number________________

Address of property 1360 Acacia

apn # 445 - 321 - 020 & 024

Hydrant location	Static press	Residual	G.P.M.
Acacia Ave	80	70	1050
E/San. Jac			

Distance –flowed hydrant to driveway________________

Hydrant Type – Super____ Standard ✓ Dry Barrel____

Be sure to mark map with driveway & hydrant locations

I certify that at the time of test these flows were available.

LHMWD Employee [signature]
LHMWD Employee assisting [signature]

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date 10-12-04 Start time 1:45 P.m End time 1:50 P.m

Party requesting test GRAIG DEARDORFF
Phone Number 927-5627

Address of property 1365 Whittier

apn # S/S EAST / SAN. JAC.

Hydrant location	Static press	Residual	G.P.M.
1335 San Jacinto	85		1020
1425 San Jacinto	85	70	

Distance –flowed hydrant to driveway 75'

Hydrant Type – Super____ Standard ✓ Dry Barrel____

Be sure to mark map with driveway & hydrant locations

I certify that at the time of test these flows were available.

LHMWD Employee [signature]
LHMWD Employee assisting [signature]

4

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date 7/9/08 Start time ________ End time ________

Party requesting test ________________________
Phone Number ________________

Address of property 42956 MAYBERRY AVE

apn # 552-382-026

Hydrant location	Static press	Residual	G.P.M.
MAYBERRY &/SOBOBA	75	70	850

Distance –flowed hydrant to driveway ________________

Hydrant Type – Super____ Standard ✓ Dry Barrel____

Be sure to mark map with driveway & hydrant locations

I certify that at the time of test these flows were available.

ERNEST CONTRERAS

LHMWD Employee [signature]
LHMWD Employee assisting [signature]

5

= CRAIG,
A.S.A.P. PLEASE :)

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date 3-22-04 Start time 6:50 A.m End time 6:55 A.m

Party requesting test RITA / RICHARD MURPHY
Phone Number ____________________

Address of property 42150 MARJONI WAY

apn # 555-450-007

Hydrant location	Static press	Residual	G.P.M.
NE corner of Crest Dr & Meridian	68		1010
In front of 42088 Crest	66	38	

Distance –flowed hydrant to driveway 1255'

Hydrant Type – Super____ Standard ✓ Dry Barrel____

Be sure to mark map with driveway & hydrant locations

<u>I certify that at the time of test these flows were available.</u>

LHMWD Employee [signature]
LHMWD Employee assisting [signature]

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date 1-3-03 Start time 9:10 Am End time 9:12 Am

Party requesting test Jim Q Marsh

Address 27431 Dartmouth St Hemet 92544

Phone Number 658-4733

Person(s) doing test Craig Pirot
Ernie Contreras

Hydrant location	Static press	Residual	G.P.M.
Denizen Hts Rd & Valle Hts Rd	80 PSI		810
Garrett Ryan Ct & Valle Hts Rd	75 PSI	62 PSI	

Distance –flowed hydrant to driveway 147'

I certify that at the time of test these flows were available.

LHMWD Employee Craig Pirot

LHMWD Employee assisting [signature]

7

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date________ Start time________ End time________

Party requesting test JERRY GOLLAHER

Address 41790 VERMONT.

Phone Number 283-6263

Person(s) doing test________

Hydrant location	Static press	Residual	G.P.M.
Vista Del Valle / VERMONT	50		225
200' S of Vermont W of Vista Del Valle	74 PSI	49 PSI	

Distance –flowed hydrant to driveway 98

Hydrant Type – Super____ Standard ✓ Dry Barrel____ 4"

I certify that at the time of test these flows were available.

LHMWD Employee [signature]

LHMWD Employee assisting [signature]

8

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date 1/1/04 Start time ________ End time ________

Party requesting test Robert Smith
Phone Number 233-9381

Address of property 42520 chambers

apn # 555-060-001

Hydrant location	Static press	Residual	G.P.M.
N/E cor of morningside	50 psi	45psi	890 GPM

Distance –flowed hydrant to driveway 622'

Hydrant Type – Super____ Standard ✓ Dry Barrel____

Be sure to mark map with driveway & hydrant locations

I certify that at the time of test these flows were available.

LHMWD Employee [signature]
LHMWD Employee assisting Geoff Wolever

9

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date 7-28-07 Start time 8:37AM End time ________

Party requesting test W.D. PARTNERS
Phone Number 949 753-7676

Address of property New RITE-AID FLORIDA & MERIDIAN

apn # 551-210-029

Hydrant location	Static press	Residual	G.P.M.
(E/S S of Florida on Meridian)	55PSI	53PSI	845GPM.

Distance –flowed hydrant to driveway 25'

Hydrant Type – Super____ Standard ✓ Dry Barrel____

Be sure to mark map with driveway & hydrant locations

I certify that at the time of test these flows were available.

LHMWD Employee [signature]
LHMWD Employee assisting [signature]

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date 7-2-03 Start time ________ End time ________

Party requesting test FRANK TURNER

Address 1480 E. FLORIDA

Phone Number 714-932-5647

Person(s) doing test ERNIE CONTRERAS
CHASE SEXTON

Hydrant location	Static press	Residual	G.P.M.
N/S OF FLORIDA BETWEEN SAN JACINTO & GIRARD	90 PSI	[illegible]	1,000
		20	

Distance –flowed hydrant to driveway ________

Hydrant Type – Super ____ Standard ✓ Dry Barrel ____

I certify that at the time of test these flows were available.

LHMWD Employee ________
LHMWD Employee assisting ________

ESTIMATED FLOW OK

Church of NAZARENE

11

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date 4-5-04 Start time 1:29 P.m End time 1:33 P.m

Party requesting test Simon Lee & ASSOC.
Phone Number (626) 571-8000

Address of property VACANT LOT

apn # 551-210-028 South west Corner FLORIDA @ HEMET

Hydrant location	Static press	Residual	G.P.M.
60' w of subject prop line	60		910
w prop line of 42151 Florida	60	55	

Distance –flowed hydrant to driveway

Hydrant Type – Super____ Standard ✓ Dry Barrel____

Be sure to mark map with driveway & hydrant locations

I certify that at the time of test these flows were available.

LHMWD Employee [signature]
LHMWD Employee assisting [signature]

TANK ELEV. 1812 78 lbs 12

443-070-016

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date 9-27-06 Start time 10:30 AM End time 11:00 AM

Party requesting test ____________________
Phone Number ____________________

Address of property 440 E. OAKLAND AVE.
WEST OF BUENA VISTA

apn # ____________________

Hydrant location	Static press	Residual	G.P.M.
S/S on OAKLAND.	80 PSI	70 PSI	1020

Distance –flowed hydrant to driveway 50'

Hydrant Type – Super____ Standard ✓ Dry Barrel____

Be sure to mark map with driveway & hydrant locations

I certify that at the time of test these flows were available.

LHMWD Employee [signature] Ernest Contreras
LHMWD Employee assisting [signature] CHASE SEXTON

13

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date 12-30/03 Start time 6:45 Am End time 6:50 Am

Party requesting test BRIAN & Michelle Fox
Phone Number ____________________

Address of property JOHNSTON

apn # 449-323-021

Hydrant location	Static press	Residual	G.P.M.
Johnston E of	80 PSI		825
Stanford			

Distance –flowed hydrant to driveway 190'

Hydrant Type – Super____ Standard ✓ Dry Barrel____

Be sure to mark map with driveway & hydrant locations

I certify that at the time of test these flows were available.

LHMWD Employee Craig Pirot
LHMWD Employee assisting Ernie Contreras

14

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date 3-18-04 Start time 1:45 Pm End time 1:52 Pm

Party requesting test ____________________
Phone Number ____________________

Address of property 28221 Vista Del Valle

apn # 450-190-013

Hydrant location	Static press	Residual	G.P.M.
300' E of Vermont Vista Del Valle	60		400
E Vermont	60	15	

Distance –flowed hydrant to driveway 535

Hydrant Type – Super ____ Standard ✓ Dry Barrel ____ 4"

Be sure to mark map with driveway & hydrant locations

<u>I certify that at the time of test these flows were available.</u>

LHMWD Employee [signature]
LHMWD Employee assisting [signature]

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date 3-5-09 Start time 3:00 PM End time 3:30 PM

Party requesting test ____
Phone Number ____

Address of property ____

apn # ____

Hydrant location	Static press	Residual	G.P.M.
NE COR OF OLIVE / WANDA	95 PSI	85 PSI	1000

Distance –flowed hydrant to driveway ____

Hydrant Type – Super ____ Standard ✓ Dry Barrel ____

Be sure to mark map with driveway & hydrant locations

I certify that at the time of test these flows were available.

LHMWD Employee [signature]
LHMWD Employee assisting [signature]

16

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date 10/17/02 Start time________ End time________

Party requesting test Sheri Pfleiger
Phone Number________________

Address of property Light house Town homes

apn # 438-220-016 & 017

Hydrant location	Static press	Residual	G.P.M.
Cornell St N/Acacia	75	20	1,000

Distance –flowed hydrant to driveway________________

Hydrant Type – Super ✓ Standard____ Dry Barrel____

Be sure to mark map with driveway & hydrant locations

I certify that at the time of test these flows were available.

LHMWD Employee [signature]
LHMWD Employee assisting [signature]

17

FAX 927-8165
487-9114

Supt. "Axel"

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date 12/5/02 Start time ________ End time ________

Party requesting test Valle Vista Assm of God.

Address 45252 E. Florida, Hemet

Phone Number Cl 453-1506 (Armando Pirelli)

Person(s) doing test C. Ludke

Hydrant location	Static press	Residual	G.P.M.
Parking Lot	55	45	750

Distance –flowed hydrant to driveway ________

I certify that at the time of test these flows were available.

LHMWD Employee [signature] Ernest Contreras

LHMWD Employee assisting [signature]

Lake Hemet Municipal Water District

2480 E. Florida Ave., Hemet, CA. 92544
(909) 658-3241

HYDRANT FIRE FLOW TESTING

Date 9/29/04 Start time ________ End time ________

Party requesting test OSBORNE

Phone Number ________________

Address of property OSBORNE Devel. Phase I

apn # PARK AVE.

Hydrant location	Static press	Residual	G.P.M.
S/S of Agape	85 PSI	75 PSI	1095

Distance –flowed hydrant to driveway 75'

Hydrant Type – Super ____ Standard ✓ Dry Barrel ____

Be sure to mark map with driveway & hydrant locations

I certify that at the time of test these flows were available.

LHMWD Employee [signature]

LHMWD Employee assisting [signature]

APPENDIX B

PRESENTATION NO. 1
HYDRAULIC WATER MODEL, 2009

Lake Hemet Municipal Water District

Hydraulic Water Model

2009

Hydraulic Water Model

- Overview
  - Existing Distribution System
  - Hydraulic Water Model - Update
  - Analysis of Existing System
  - Observations
  - Summary
  - Recommendations
  - Identify Ultimate Facilities

Existing Distribution System

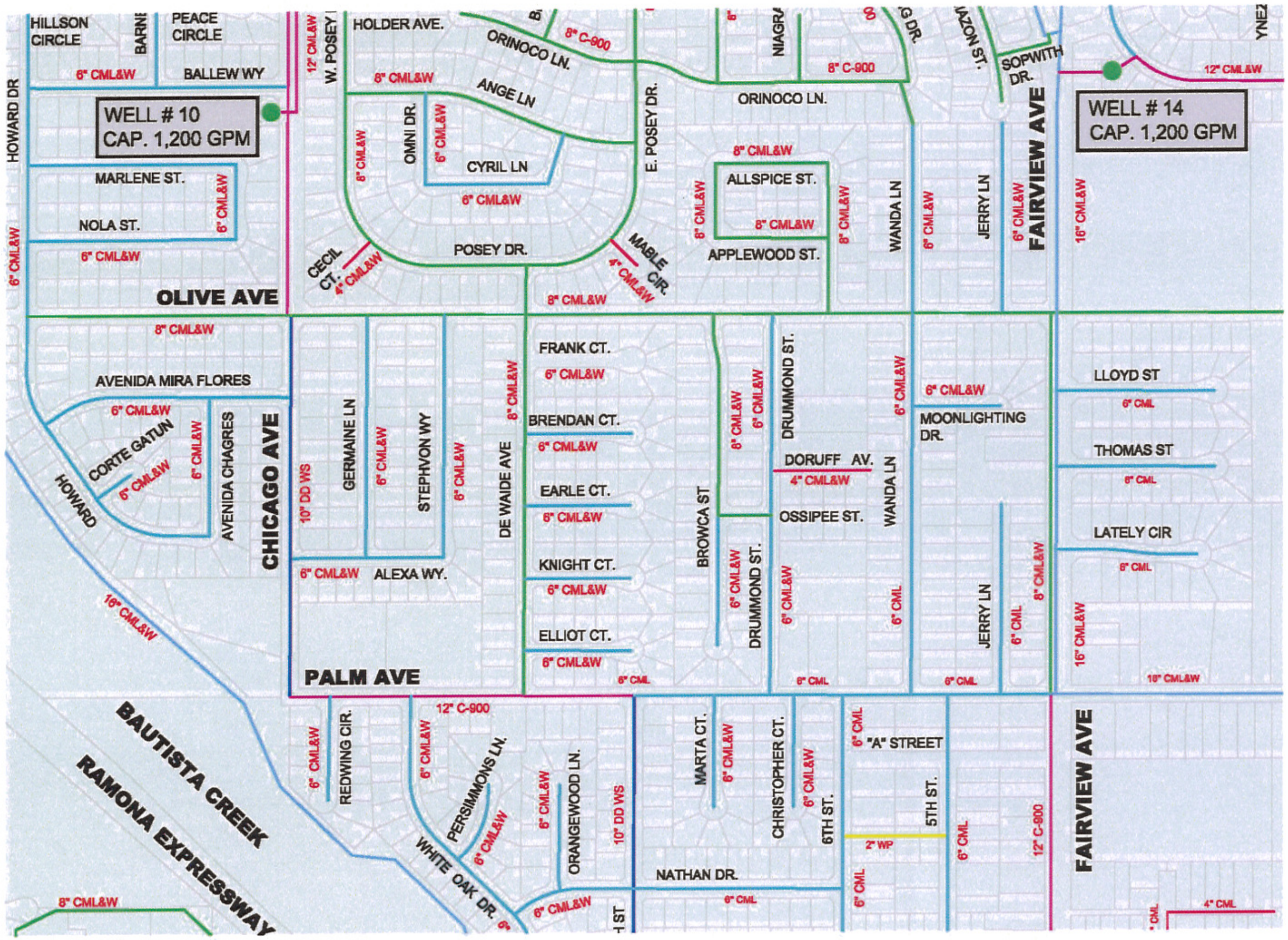
- Water Supply
  - Ground Water Wells Located in the Lower and Upper Systems
  - Water Treatment Plant
  - Connections to EMWD
- Water is lifted to the Higher Pressure Zones by Booster Pumps or dropped through Pressure Reducing Valves
- 13 Storage Reservoirs with over 12 Million Gallons
- 2 Hydro Pneumatic Tanks
- Over 200 miles of Pipeline – 2" to 20" Diameter
- The System is comprised of 16 Pressure Zones

Existing Pressure Zones

Hydraulic Water Model -Update

- Existing Distribution System
  - Input all waterlines 2” through 20” into the Model
  - From Billing Data provided by the District, current Water Demands were incorporated into the Model
  - Demands were broken out by Pressure Zone based on Street Addresses
  - Booster Pumps Modeled based on Pump Curves
  - Fire Flow Simulations were performed at several locations throughout the system

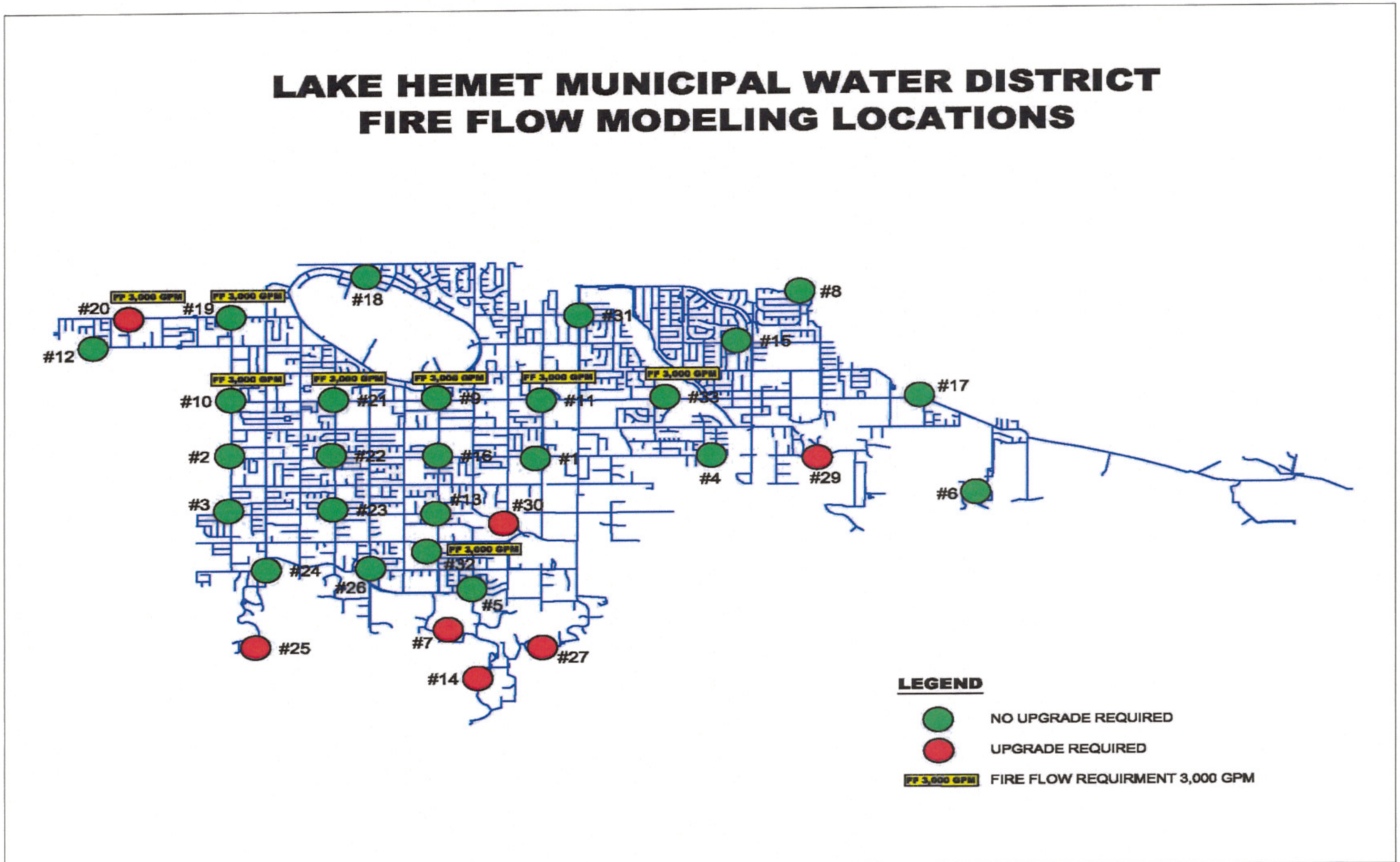
Existing Waterlines



Analysis of Existing System

- Fire Flow Simulations
  - Residential Fire Flow – 1,500 gpm
  - Commercial Fire Flow – 3,000 gpm
  - Maintaining a Residual Pressure of 20 psi
  - Simulated on Peak Day with Reservoirs ¾ Full
  - 33 Initial Sites were Simulated
  - Of the 33 Sites - 7 Sites Require Upgrades
    - Additional areas were then analyzed around locations requiring upgrades

Fire Flow Modeling Locations

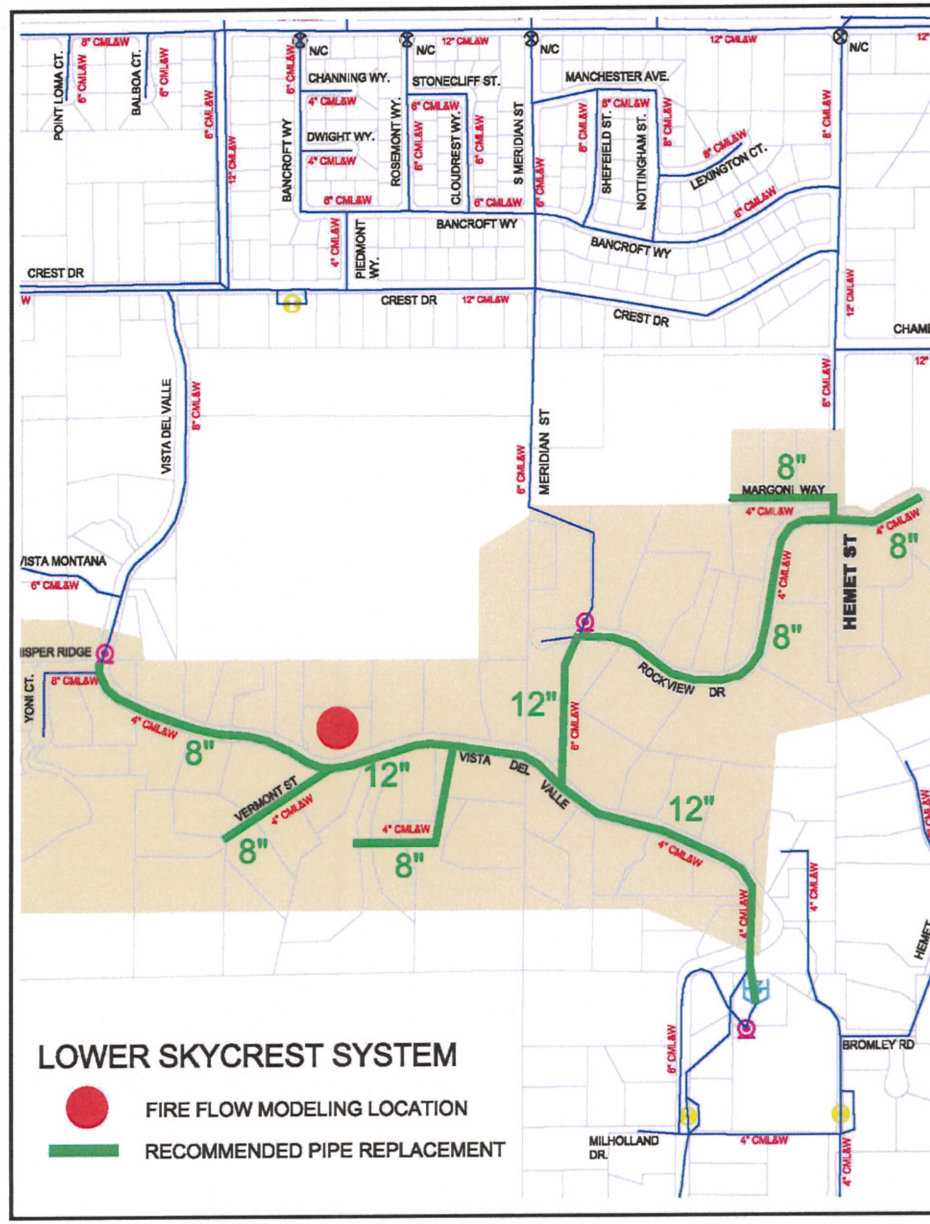


Simulation #7

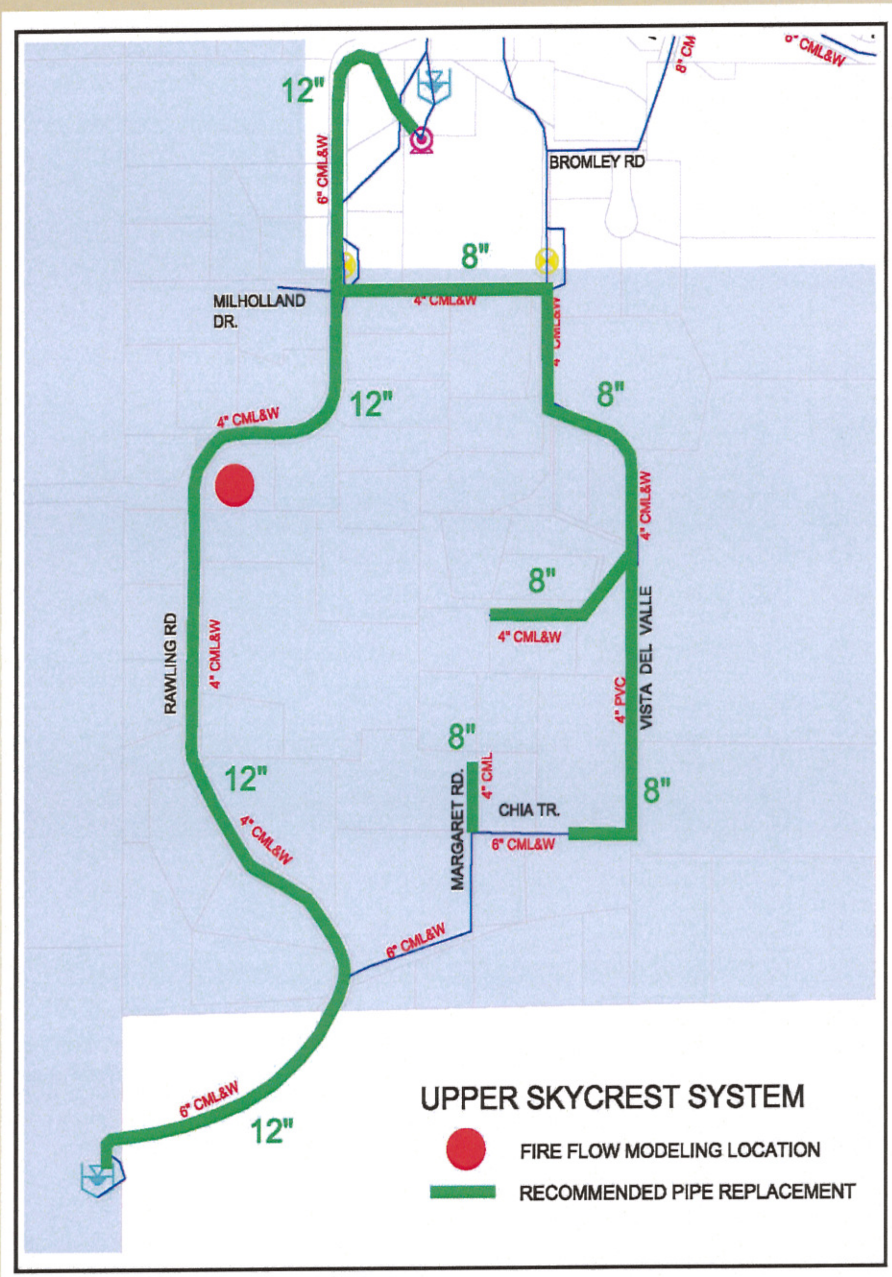
Lower Skycrest System

- Fire Flow 1,500 gpm
  - Recommended Upgrades (Minimum)

  - 5,000 Feet of 8” Pipe
  - 3,150 Feet of 12” Pipe



Simulation #14



Upper Skycrest System

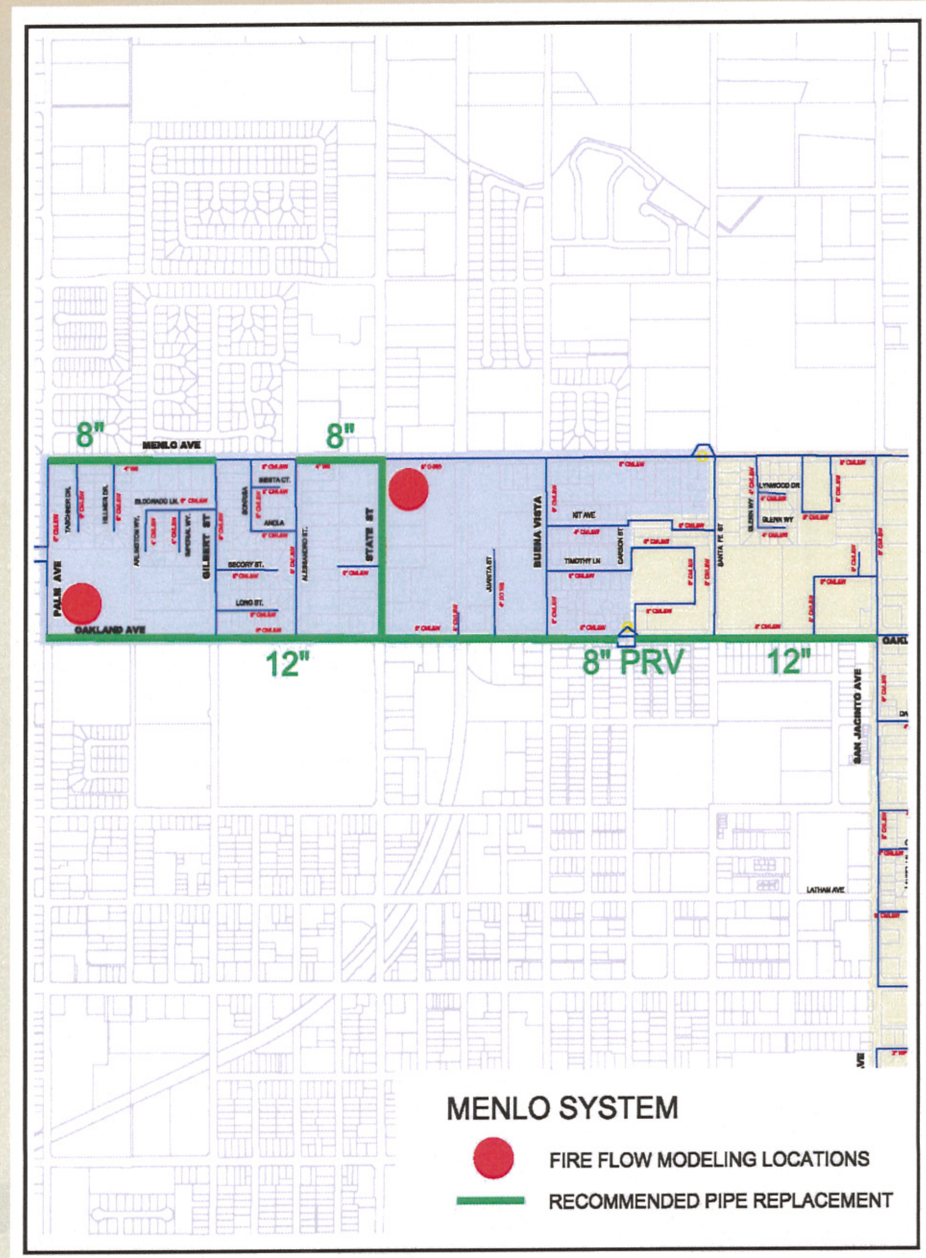
- Fire Flow 1,500 gpm
  - Recommended Upgrades (Minimum)
  - 3,600 Feet of 8" Pipe
  - 4,700 Feet of 12" Pipe

Simulation #20

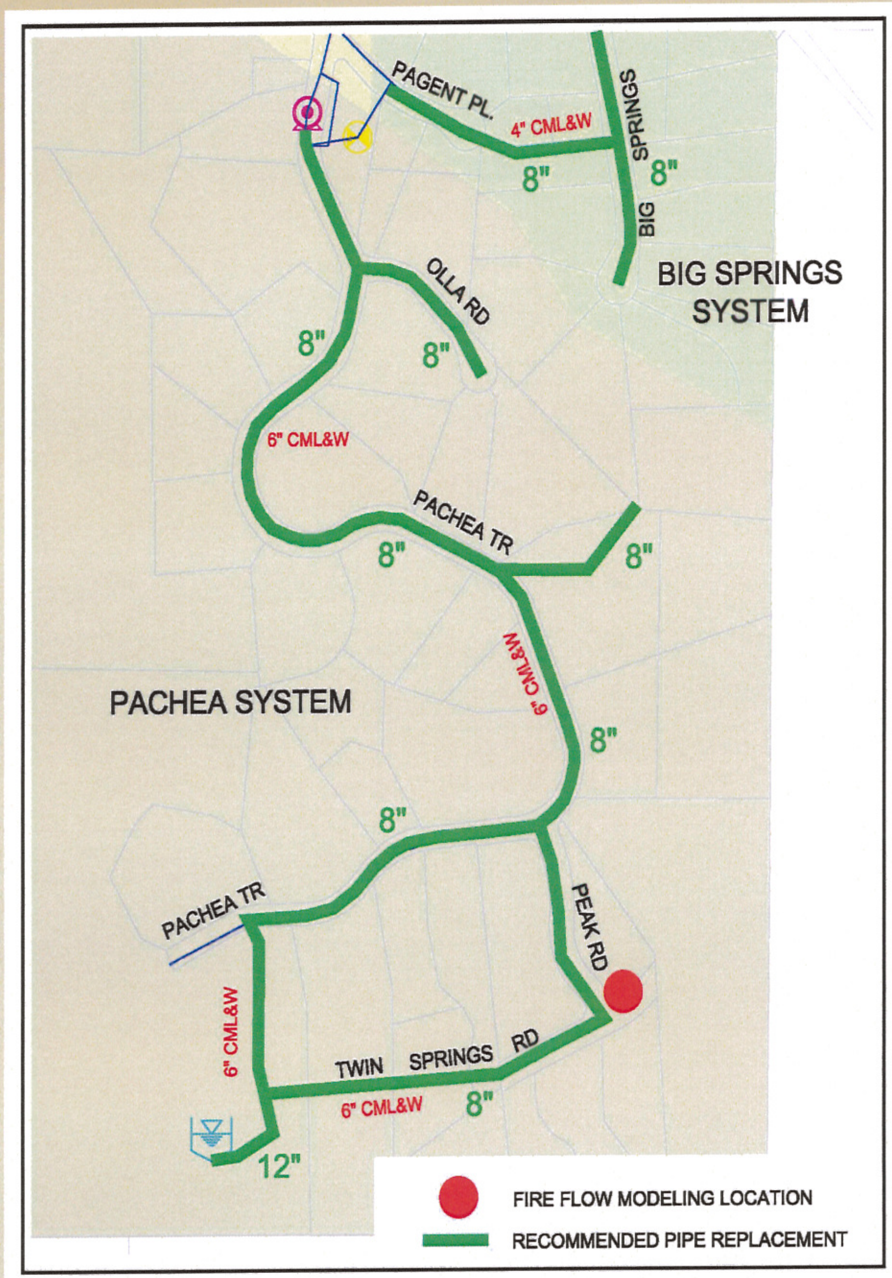
Menlo System

- Fire Flow 3,000 gpm
  - Recommended Upgrades (Minimum)

  - 3,350 Feet of 8" Pipe
  - 6,450 Feet of 12" Pipe



Simulation #25



Pachea System/

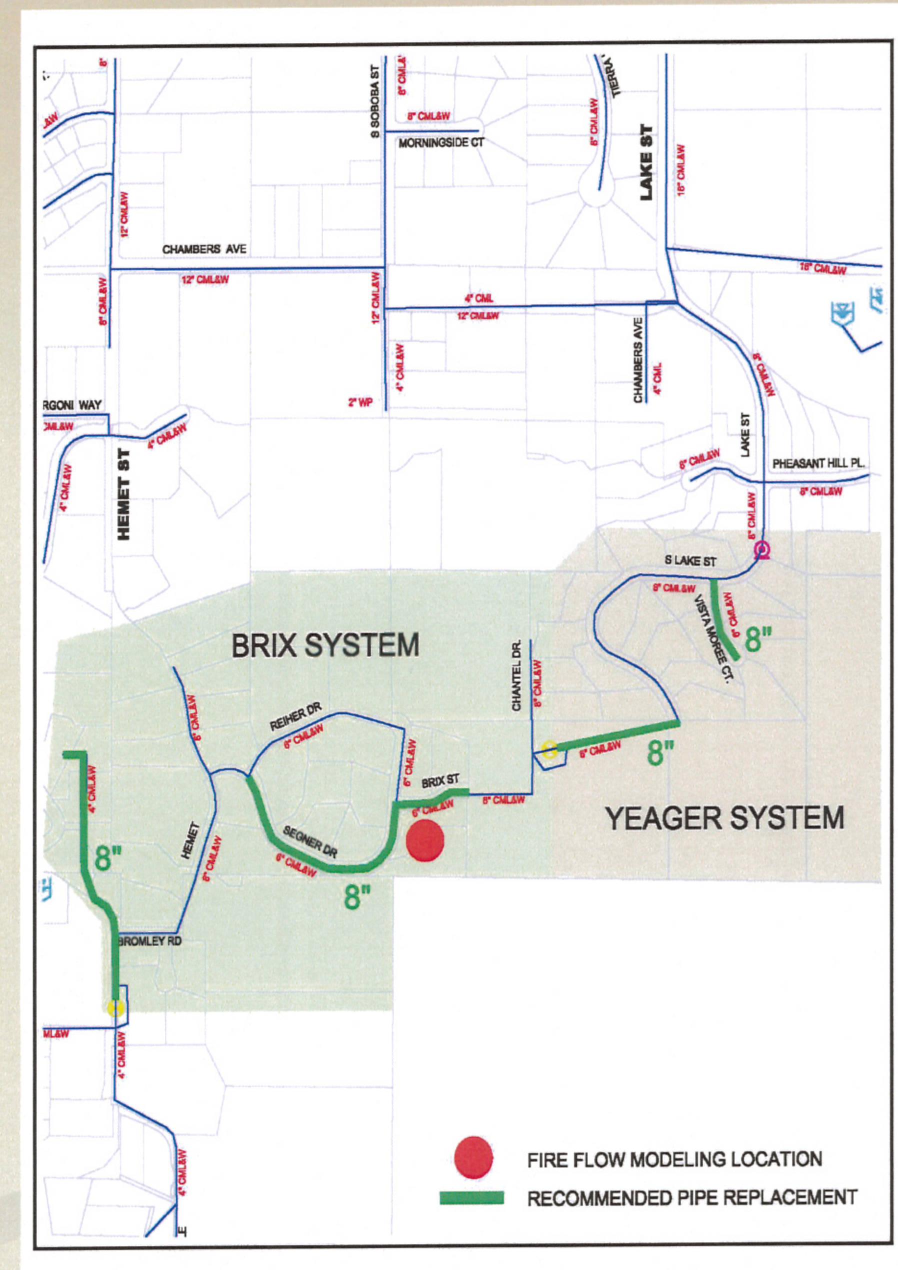
Big Springs System

- Fire Flow 1,500 gpm
  - Recommended Upgrades (Minimum)
  - 9,650 Feet of 8" Pipe
  - 300 Feet of 12" Pipe

Simulation #27

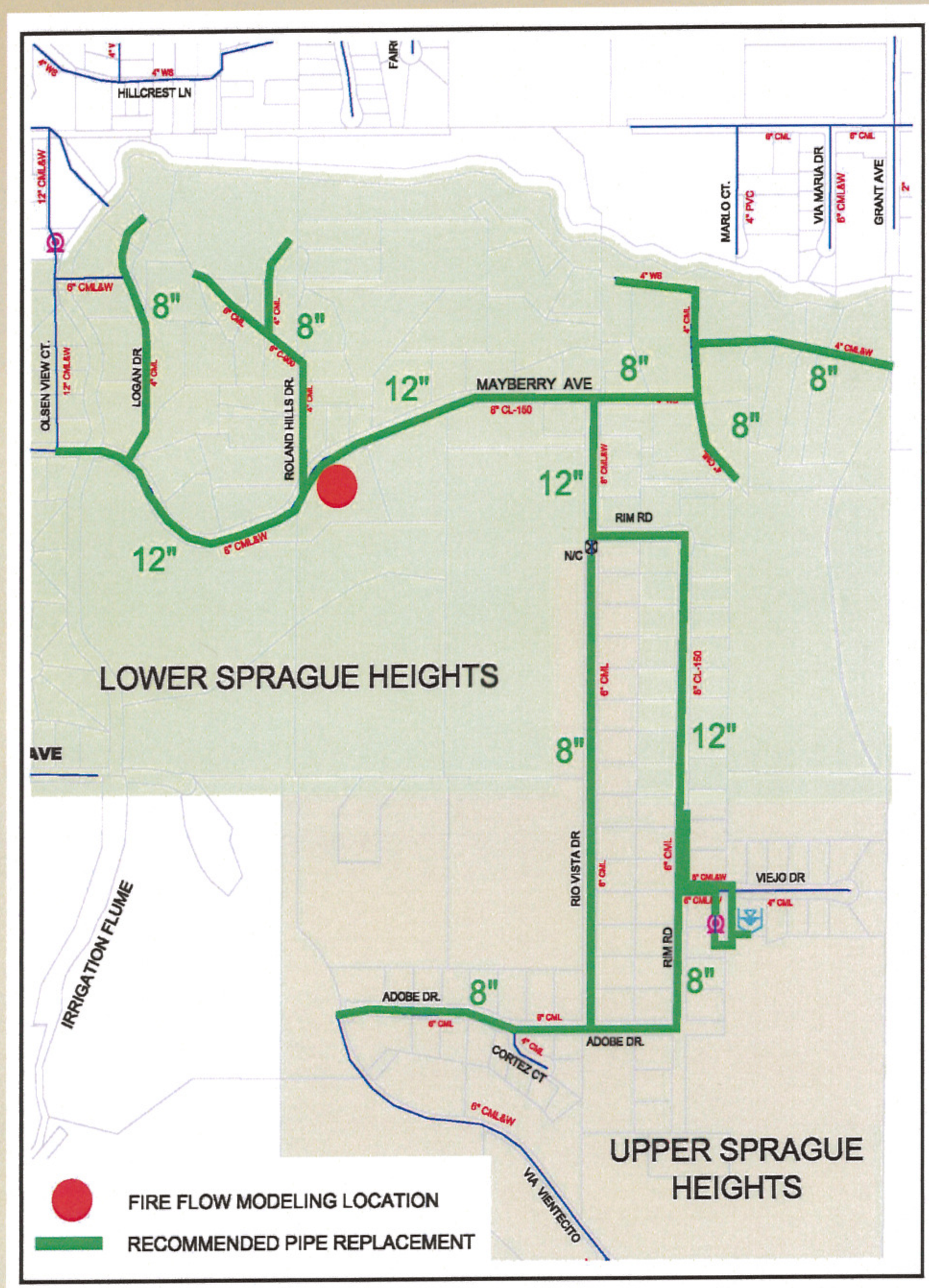
Yeager System and Brix System

- Fire Flow 1,500 gpm
  - Recommended Upgrades (Minimum)
  - 3,700 Feet of 8" Pipe



Simulation #29

Lower Sprague Heights/
Upper Sprague Heights

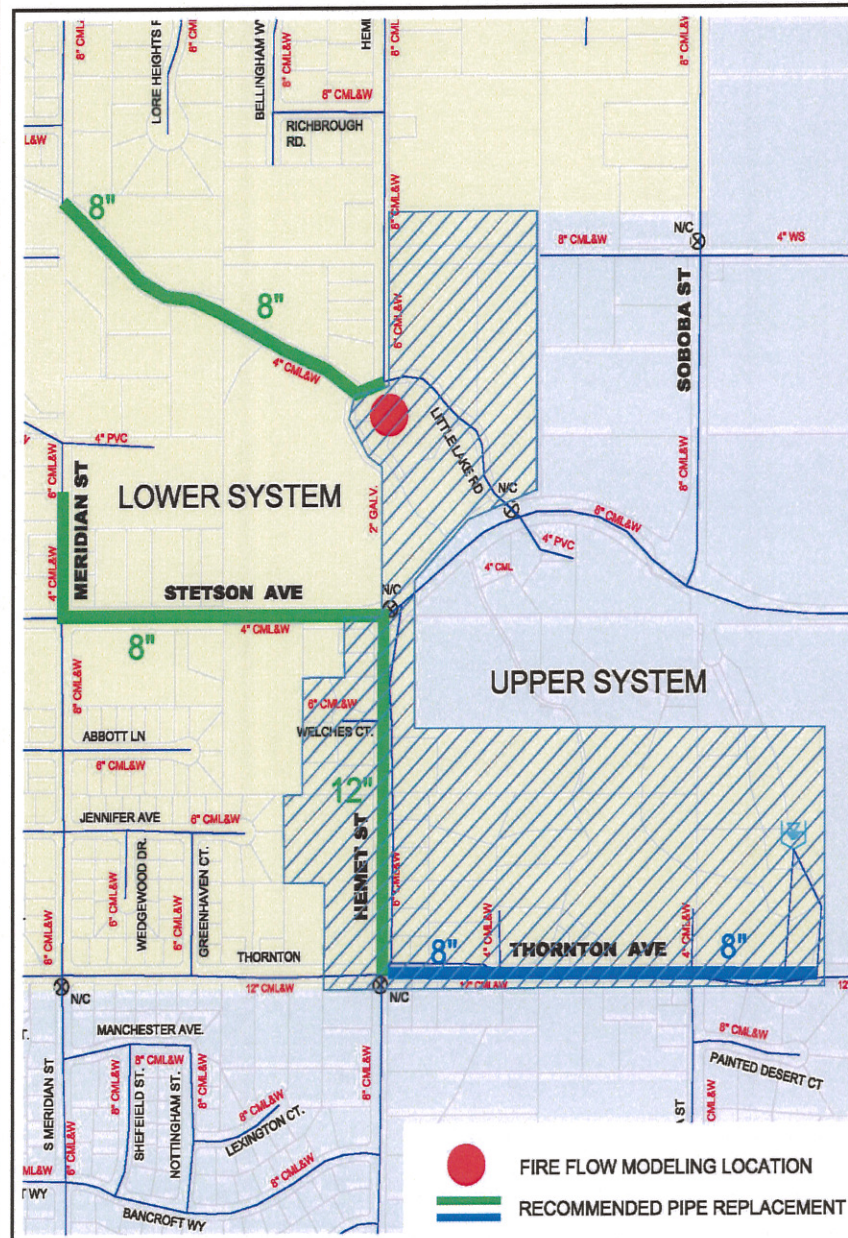


- Fire Flow 1,500 gpm
  - Recommended Upgrades (Minimum)
  - 10,000 Feet of 8" Pipe
  - 5,700 Feet of 12" Pipe

Simulation #30

Lower System and Upper System

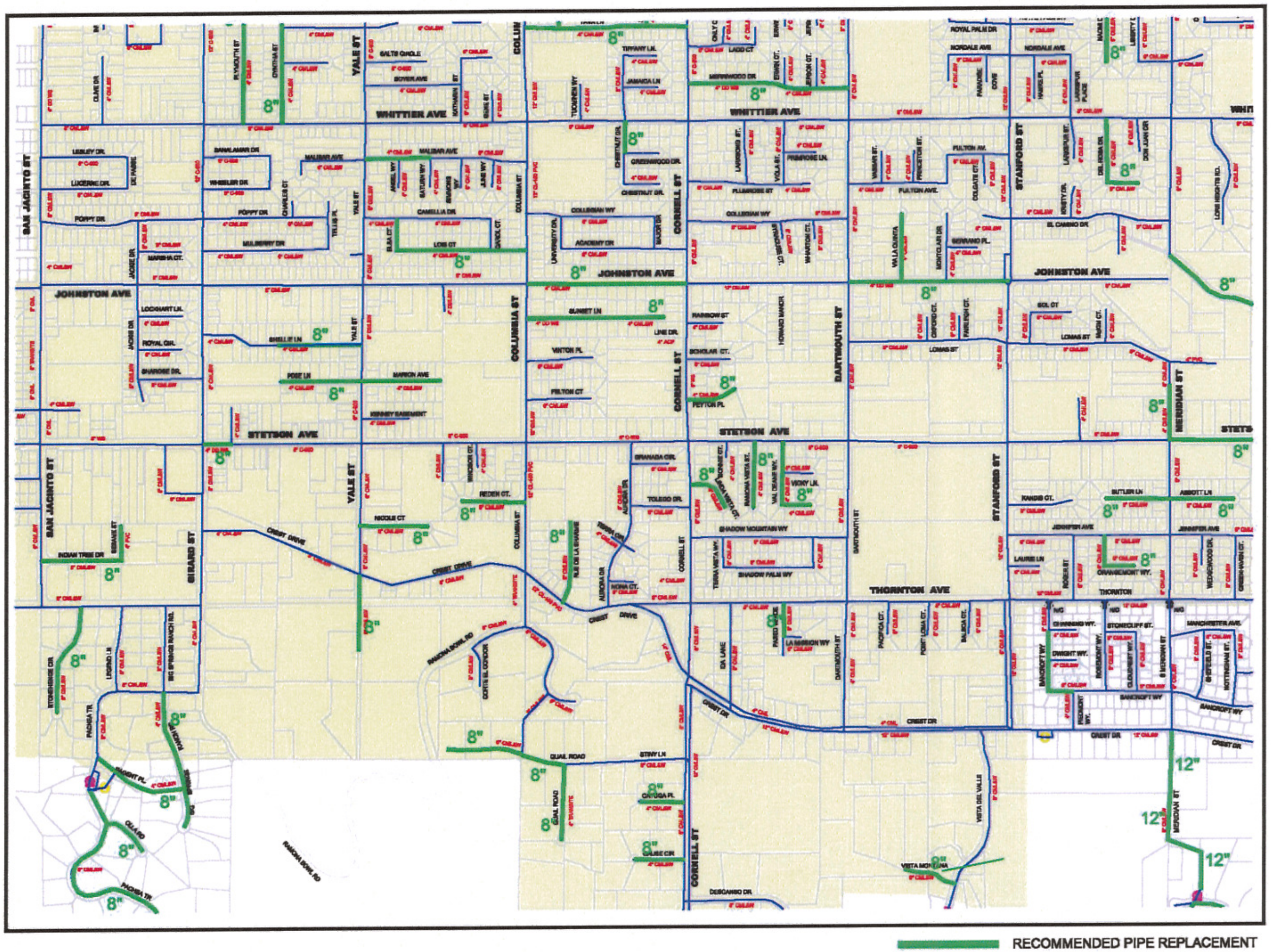
- Fire Flow 1,500 gpm
  - Recommended Upgrades (Minimum)
  - Revise Pressure Zone
  - 5,200 Feet of 8" Pipe
  - 1,400 Feet of 12" Pipe

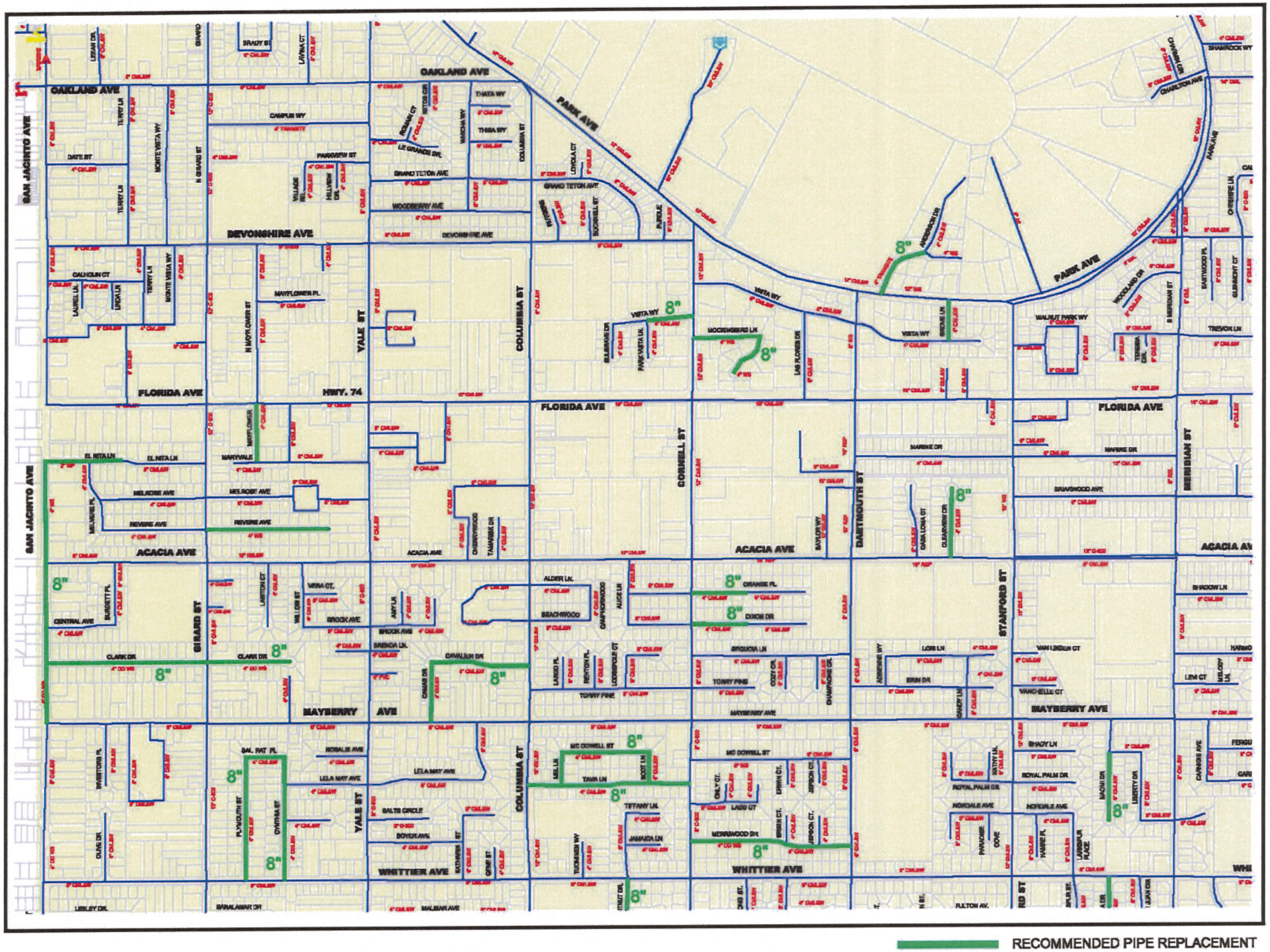


Observations

- Fire Flow of 1,500 gpm can not be obtained in several areas throughout the system
- Most of these locations are in the Southern Hills where the Terrain is steep
  - Pipeline diameters are small – Limits Flow
  - Connections are close to the Reservoir serving them
    - Limits Pressure
- The remainder are mainly cul-de-sacs and dead end lines
  - Some of these locations can provide 1,000 gpm

Other Locations Requiring Upgrades





RECOMMENDED PIPE REPLACEMENT
SAN JACINTO AVE
OAKLAND AVE
DEVONSHIRE AVE
FLORIDA AVE
HWY. 74
ACACIA AVE
MAYBERRY AVE
WHITTIER AVE
PARK AVE
COLUMBIA ST
CORNELL ST
DARTMOUTH ST
STANFORD ST
MERIDIAN ST
YALE ST
GIRARD ST
8"

Summary

- All waterlines should be looped when possible
- Dead end lines should be limited to 600 feet
- New waterlines should be 8" minimum
- Most of the Existing Pipelines 2", 3" and 4" should be replaced with 8" Pipelines
- Existing pipelines not able to provide Fire Flow should be upgraded
  - Not all Fire Flow locations can be solved with upsizing lines

Estimated Pipeline Lengths and Costs

- Pipeline Costs for the Simulated Areas
  - 40,500 Feet of 8" Pipeline - **$4,050,000**
  - 21,700 Feet of 12" Pipeline - **$3,255,000**

Total = $7,305,000

- 8" Pipeline - $100 per foot
- 12" Pipeline - $150 per foot
  - Price per foot includes pipe, installation, valves and pavement

Reservoir Storage

- Each Pressure Zone should have one Peak Day Demand storage plus Fire Flow storage
  - Peak Day Demand = 1.9 x Average Day Demand
  - Fire Flow Storage
    - Residential = 1,500 gpm for 2 hours
    - Commercial/Schools = 3,000 gpm for 4 hours
  - The current storage capacity in several of the Districts Pressure Zones does not meet this criteria

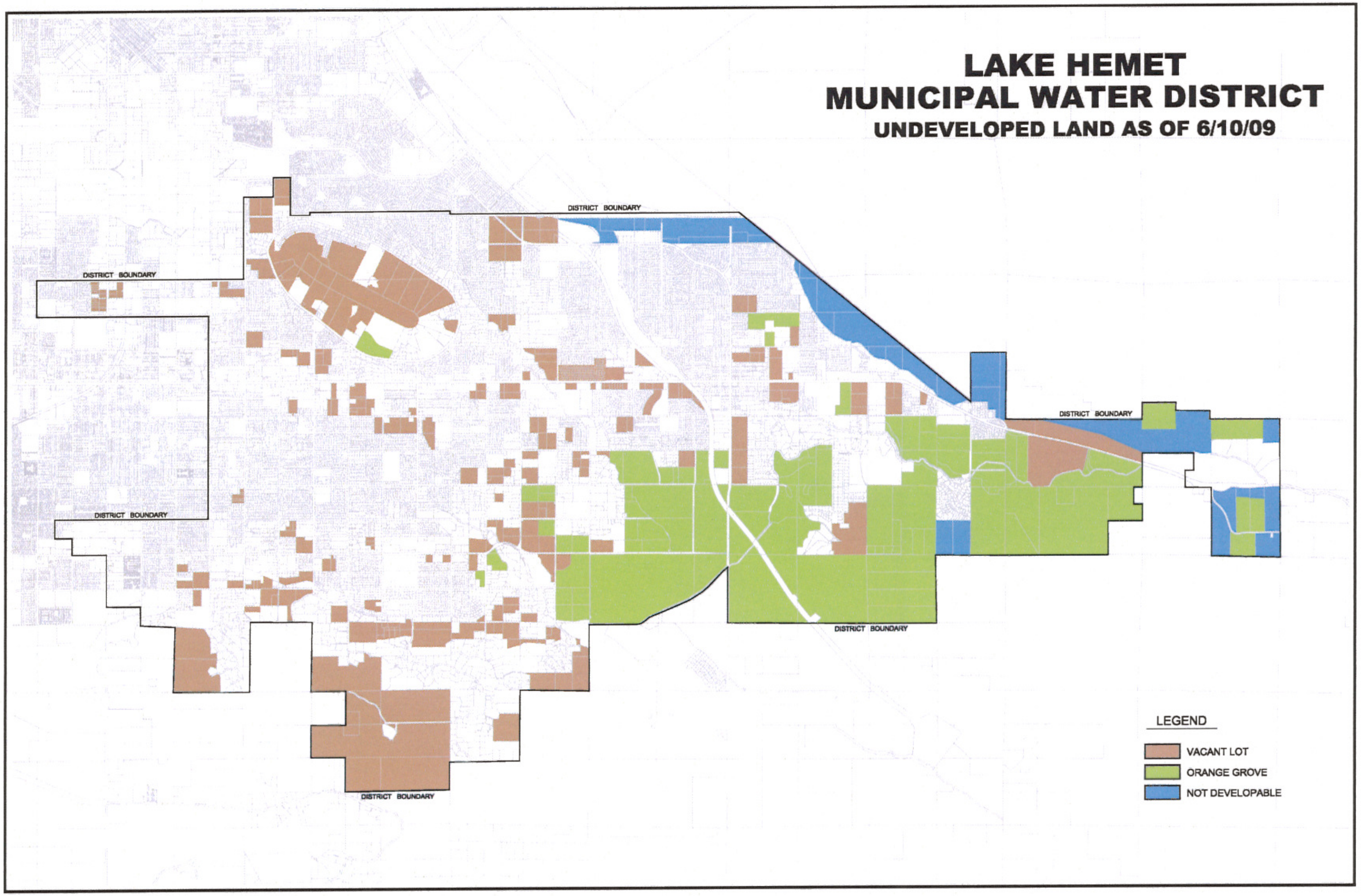
Recommendations

- Upgrade Piping in Southern Hills
- Increase Reservoir Storage Capacity in each Pressure Zone to include Peak Day Demand plus the required Fire Flow storage

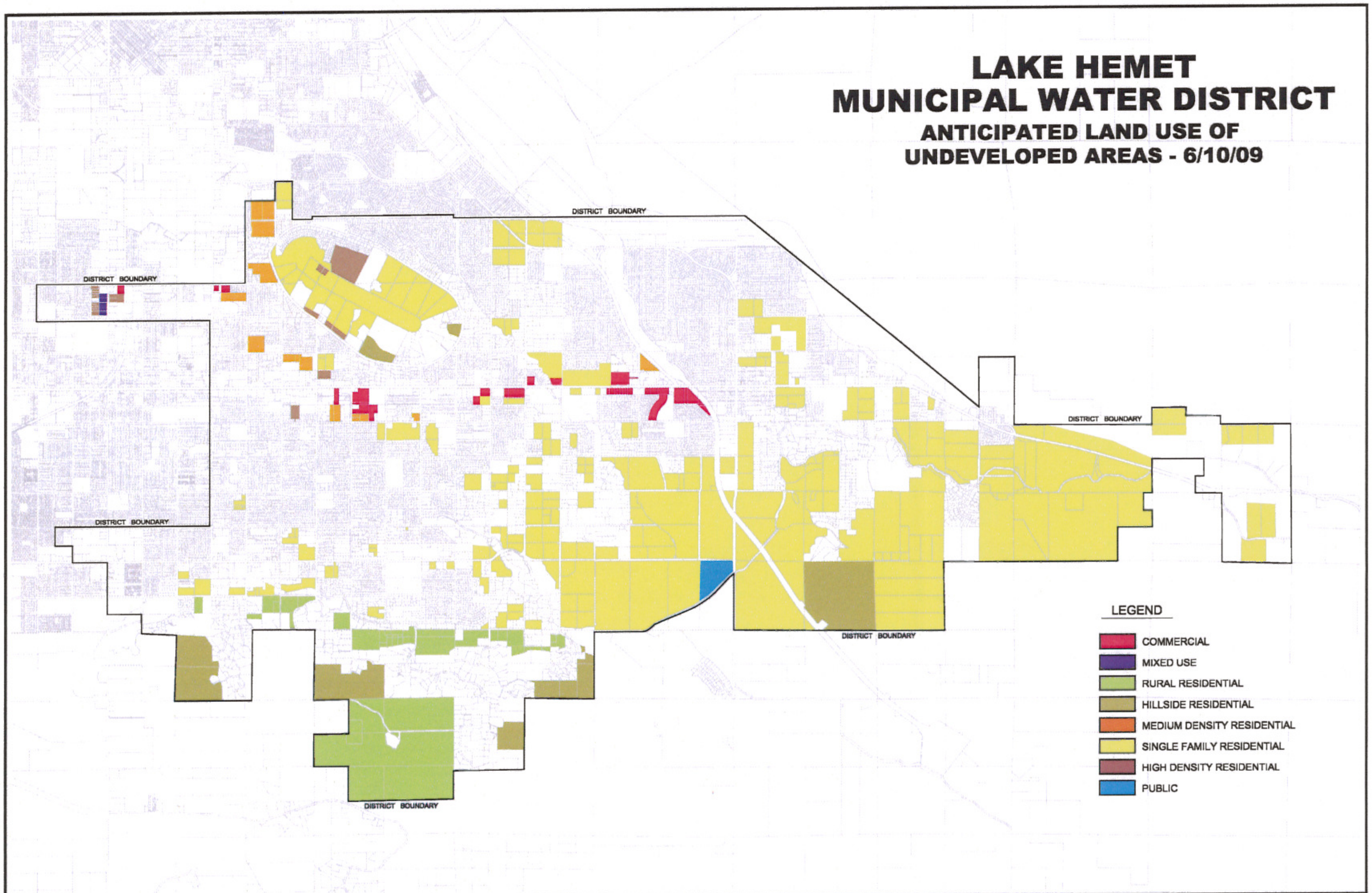
Identify Ultimate Facilities

- Calculate Ultimate Demands
  - Areas of Undeveloped Land
    - Vacant or Undeveloped Properties
    - Existing Areas with Orange Groves
    - Areas within the District that will not be developed
  - Anticipated Land Use of Undeveloped Land
  - Potential Sphere of Influence
    - Undeveloped Areas

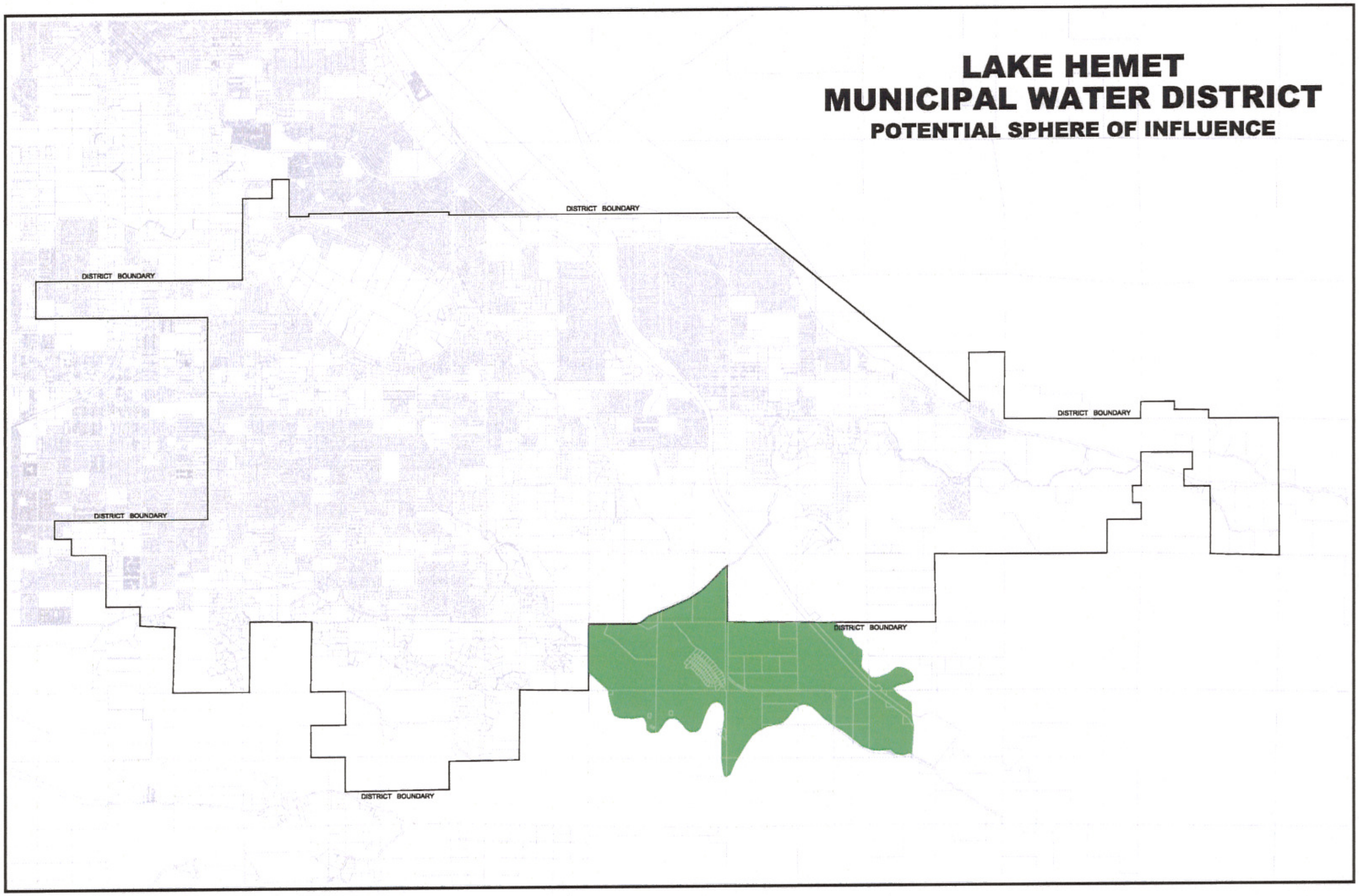
Areas of Undeveloped Land



Anticipated Land Use



Potential Sphere of Influence



APPENDIX C

PRESENTATION NO. 2
RECOMMENDED SYSTEM UPGRADES

Presented to the Lake Hemet Municipal Water District Board of Directors

Recommended System Upgrades

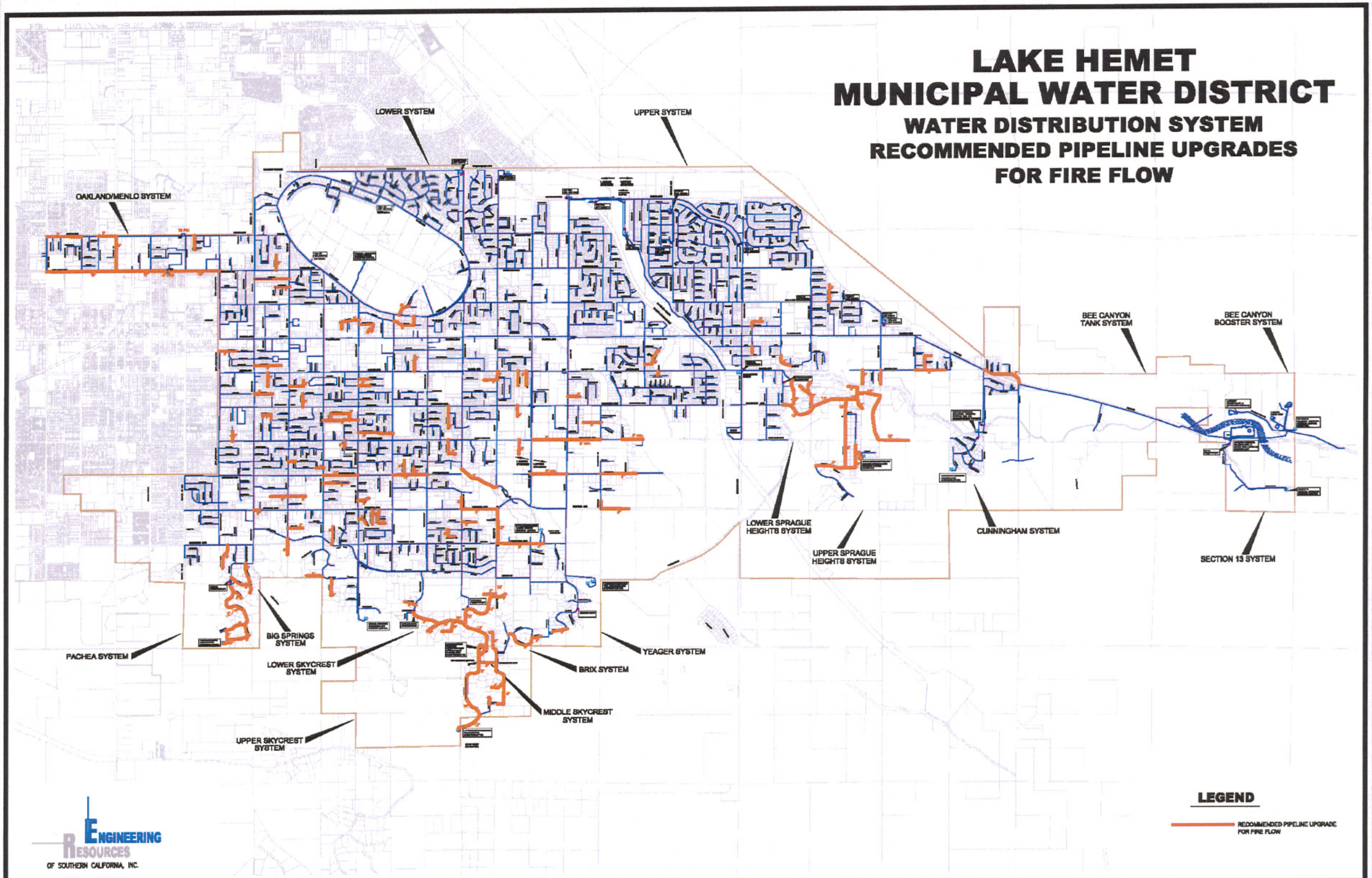
October 15, 2009

Overview of Upgrades

- Replace Pipelines to achieve Fire Flow
- Replace Aging Pipelines
- Replace Small Diameter Pipelines
- Replace Pipelines with Frequent Repairs
- Increase Storage Capacity
- Upgrade Booster Pump Stations/Pipeline Upgrades
- Recommendations
- Estimated Project Costs

Replace Pipelines to achieve Fire Flow

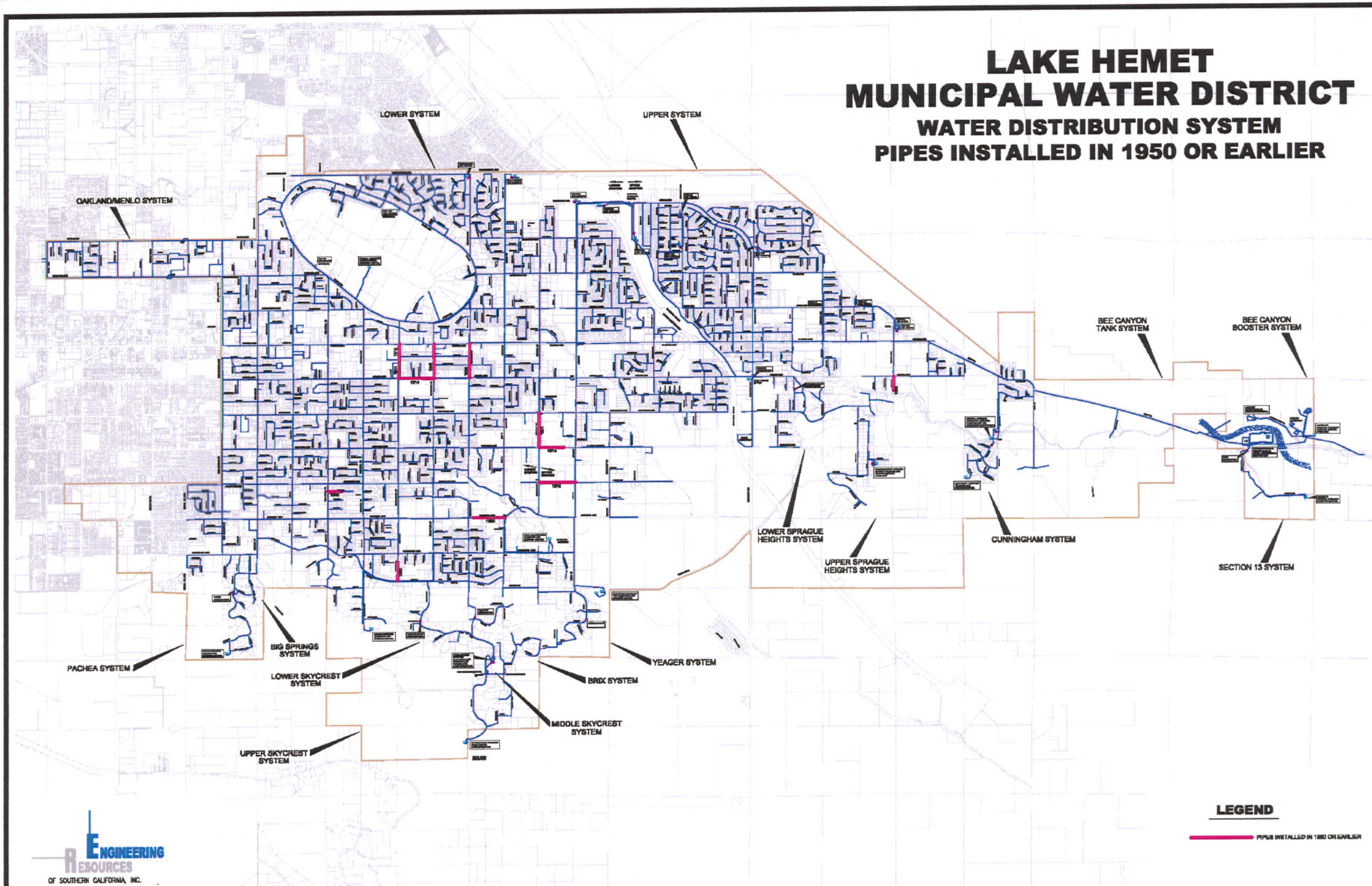
- Fire Flow Simulations
  - Residential Fire Flow – 1,500 gpm
  - Commercial Fire Flow – 3,000 gpm
  - Maintaining a Residual Pressure of 20 psi
- Pipes recommended to be upgraded based on Fire Flow
- New waterlines should be 8" minimum


LAKE HEMET
MUNICIPAL WATER DISTRICT
WATER DISTRIBUTION SYSTEM
RECOMMENDED PIPELINE UPGRADES
FOR FIRE FLOW
LOWER SYSTEM
UPPER SYSTEM
OAKLAND/MENLO SYSTEM
BEE CANYON TANK SYSTEM
BEE CANYON BOOSTER SYSTEM
LOWER SPRAGUE HEIGHTS SYSTEM
UPPER SPRAGUE HEIGHTS SYSTEM
CUNNINGHAM SYSTEM
SECTION 13 SYSTEM
BIG SPRINGS SYSTEM
PACHEA SYSTEM
LOWER SKYCREST SYSTEM
YEAGER SYSTEM
BRIX SYSTEM
MIDDLE SKYCREST SYSTEM
UPPER SKYCREST SYSTEM
LEGEND
RECOMMENDED PIPELINE UPGRADE FOR FIRE FLOW
ENGINEERING RESOURCES
OF SOUTHERN CALIFORNIA, INC.

Replace Aging Pipelines

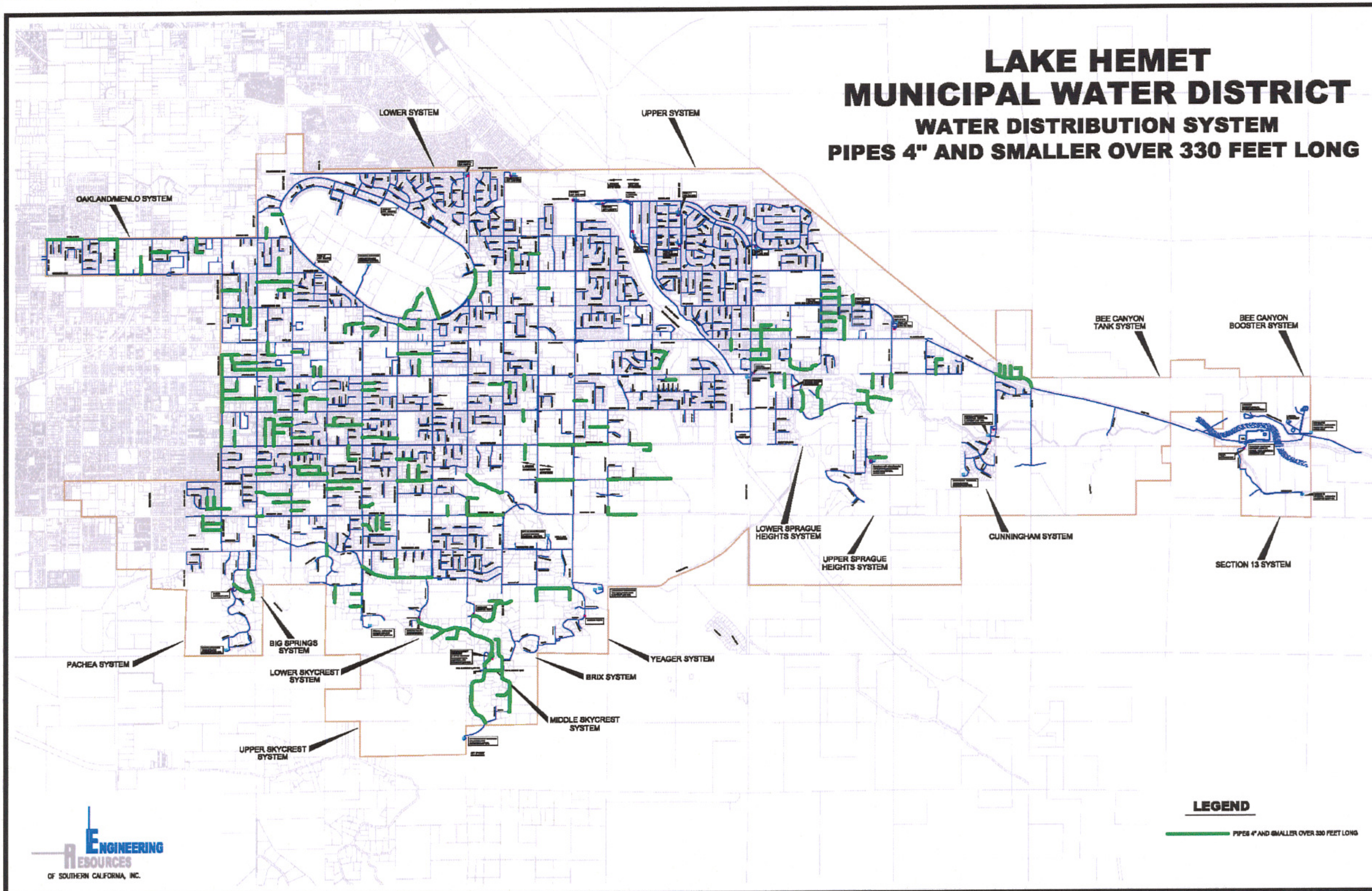
- Pipes installed in 1950 or earlier
  - Pipes 59 years of age and older
  - Over 11,000 feet of pipeline
  - Most of this pipeline was built between 1901 and 1914

LAKE HEMET MUNICIPAL WATER DISTRICT
WATER DISTRIBUTION SYSTEM
PIPES INSTALLED IN 1950 OR EARLIER



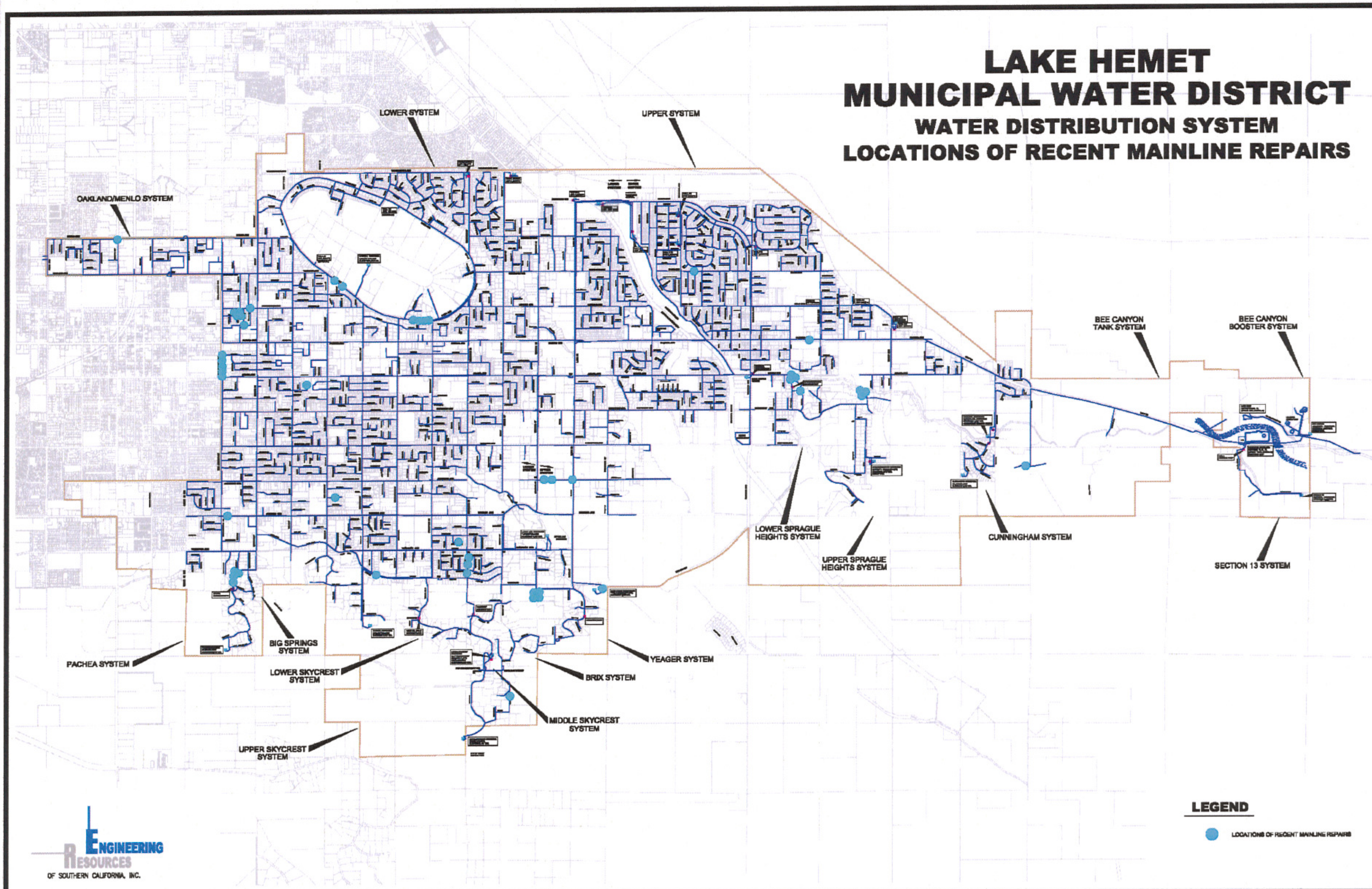
Replace Small Diameter Pipelines

- Pipelines 2-inch and 4-inch in diameter
  - Over 330 feet in length
  - Improves System Flow
  - Provides Fire Flow


LAKE HEMET
MUNICIPAL WATER DISTRICT
WATER DISTRIBUTION SYSTEM
PIPES 4" AND SMALLER OVER 330 FEET LONG
LOWER SYSTEM
UPPER SYSTEM
OAKLAND/MENLO SYSTEM
BEE CANYON TANK SYSTEM
BEE CANYON BOOSTER SYSTEM
LOWER SPRAGUE HEIGHTS SYSTEM
UPPER SPRAGUE HEIGHTS SYSTEM
CUNNINGHAM SYSTEM
SECTION 13 SYSTEM
PACHEA SYSTEM
BIG SPRINGS SYSTEM
LOWER SKYCREST SYSTEM
YEAGER SYSTEM
BRIX SYSTEM
MIDDLE SKYCREST SYSTEM
UPPER SKYCREST SYSTEM
LEGEND
PIPES 4" AND SMALLER OVER 330 FEET LONG
ENGINEERING RESOURCES
OF SOUTHERN CALIFORNIA, INC.

Replace Mainline Pipes with Frequent Repairs

- The remainder are areas identified by the District that have required recent repairs
- Eliminates future unplanned repairs
- Minimizes system water losses


LAKE HEMET
MUNICIPAL WATER DISTRICT
WATER DISTRIBUTION SYSTEM
LOCATIONS OF RECENT MAINLINE REPAIRS
LOWER SYSTEM
UPPER SYSTEM
OAKLAND/MENLO SYSTEM
BEE CANYON TANK SYSTEM
BEE CANYON BOOSTER SYSTEM
LOWER SPRAGUE HEIGHTS SYSTEM
UPPER SPRAGUE HEIGHTS SYSTEM
CUNNINGHAM SYSTEM
SECTION 13 SYSTEM
BIG SPRINGS SYSTEM
PACHEA SYSTEM
LOWER SKYCREST SYSTEM
YEAGER SYSTEM
BRIX SYSTEM
MIDDLE SKYCREST SYSTEM
UPPER SKYCREST SYSTEM
LEGEND
LOCATIONS OF RECENT MAINLINE REPAIRS
ENGINEERING RESOURCES OF SOUTHERN CALIFORNIA, INC.

Increase Storage Capacity

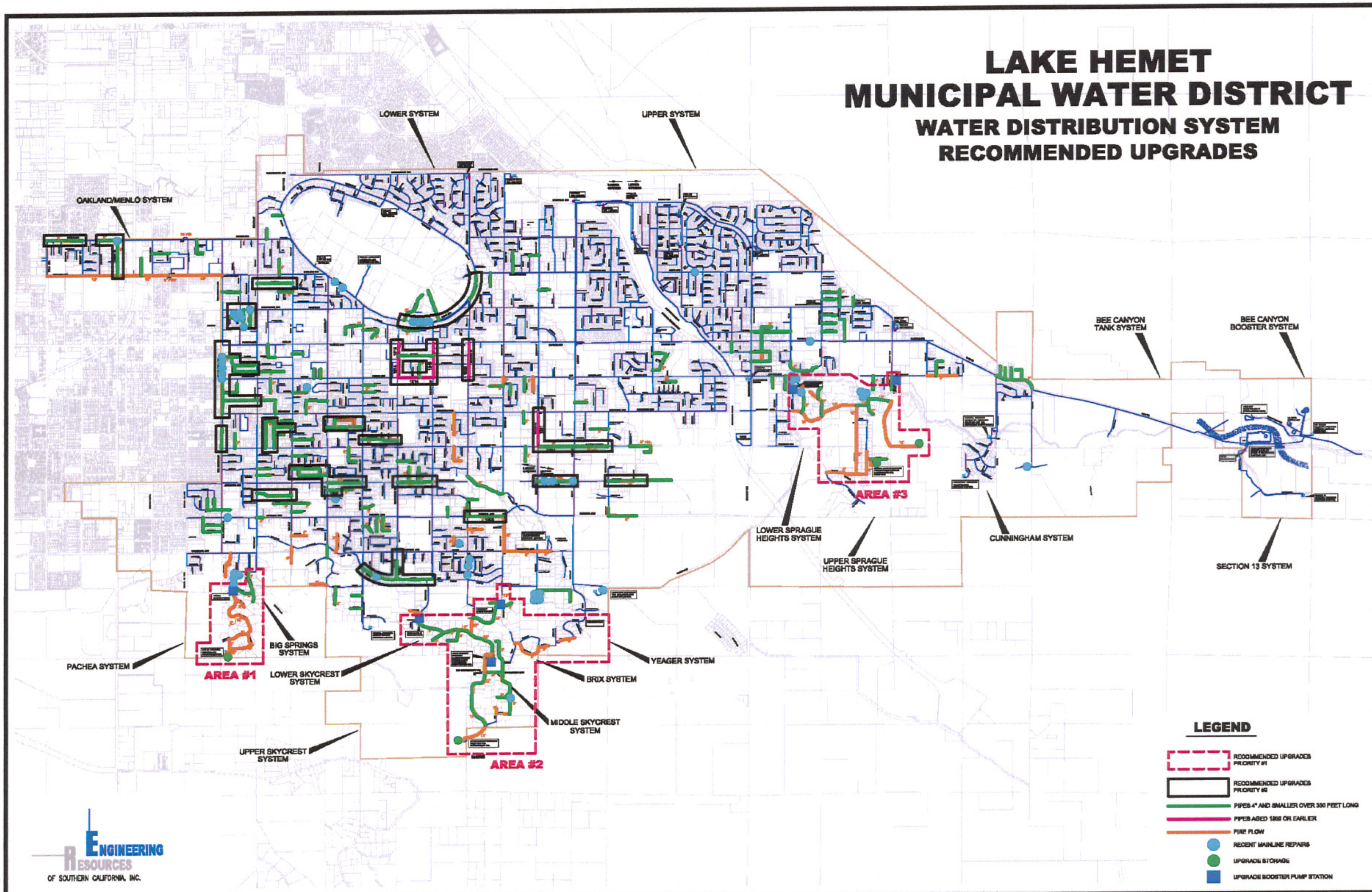
- Each Pressure Zone should have enough storage for one Peak Day Demand plus Fire Flow
  - Peak Day Demand = 1.9 x Average Day Demand
  - Fire Flow Storage
    - Residential = 1,500 gpm for 2 hours or 180,000 gallons
  - The current storage capacity in several of the Districts Pressure Zones does not meet this criteria
  - Increased storage capacity in upper pressure zones can be utilized by lower pressure zones

Upgrade Booster Pump Stations/ Pipeline Upgrades

- Upgrade Booster Pump Stations
  - Aging Facilities
- Pipeline Upgrades
  - Pipelines Identified to be Replaced due to Fire Flow requirements may also fall into the category of Aging Pipelines, Small Diameter Pipelines or Pipelines with Frequent Repairs

Recommendations

- Priority #1 – Areas 1, 2 and 3
  - Upgrade Piping, Storage Capacity and Booster Pump Stations in the Southern Hills
- Priority #2
  - Replace Aging Pipelines
  - Increase Circulation in the System
- Priority #3
  - All Other Identified Pipelines


LAKE HEMET
MUNICIPAL WATER DISTRICT
WATER DISTRIBUTION SYSTEM
RECOMMENDED UPGRADES
LOWER SYSTEM
UPPER SYSTEM
OAKLAND/MENLO SYSTEM
BEE CANYON TANK SYSTEM
BEE CANYON BOOSTER SYSTEM
LOWER SPRAGUE HEIGHTS SYSTEM
UPPER SPRAGUE HEIGHTS SYSTEM
CUNNINGHAM SYSTEM
SECTION 13 SYSTEM
AREA #3
PACHEA SYSTEM
BIG SPRINGS SYSTEM
AREA #1
LOWER SKYCREST SYSTEM
YEAGER SYSTEM
BRIX SYSTEM
MIDDLE SKYCREST SYSTEM
UPPER SKYCREST SYSTEM
AREA #2
LEGEND
RECOMMENDED UPGRADES PRIORITY #1
RECOMMENDED UPGRADES PRIORITY #2
PIPES 4" AND SMALLER OVER 330 FEET LONG
FIRE FLOW
RECENT MAINLINE REPAIRS
UPGRADE STORAGE
UPGRADE BOOSTER PUMP STATION
ENGINEERING RESOURCES OF SOUTHERN CALIFORNIA, INC.

Estimated Project Costs

Reservoir Storage for Southern Hills

	Existing Storage (gallons)	Peak Day Demand (gallons)	Fire Flow Storage (gallons)	Peak Day plus Fire Flow (gallons)	Projected Ultimate Storage (gallons)	Recommended Storage (gallons)	Storage Costs
Area #1 Pachea System	60,000	71,100	180,000	251,100	280,000	**220,000**	**$440,000**
Area #2 Skycrest System	342,000	276,222	180,000	456,222	520,000	**178,000**	$311,500
							$311,500
Area #3 Lower Sprague	150,000	284,544	180,000	464,544	590,000	**600,000**	$1,050,000
Upper Sprague						**60,000 Fire Pump**	$200,000
							$1,250,000

Estimated Project Costs

Booster Pump Stations for Southern Hills

	Booster Pump Station	Pressure Zone	Booster Station Costs
Area #1	2-25 HP Pumps	Pachea	**$275,000**
Pachea System			
Area #2	2-25 HP Pumps	Vista Del Valle	$275,000
Skycrest System	2-25 HP Pumps	Rockview	$275,000
	2-40 HP Pumps	Upper Skycrest	$370,000
			$920,000
Area #3	2-25 HP Pumps	Sprauge Heights	$275,000
Lower Sprague	2-25 HP Pumps	Grant Ave.	$275,000
Upper Sprague			
			$550,000

Estimated Project Costs

Pipelines for Southern Hills

	8" Pipe Length (feet)	8" Pipe Cost $100 per foot	12" Pipe Length (feet)	12" Pipe Cost $150 per foot	Pipeline Costs	Total Costs
Area #1 Pachea System	5,400	$540,000	2,600	$390,000	**$930,000**	**$1,645,000**
Area #2 Skycrest System	10,235	$1,023,500	10,900	$1,635,000	$2,658,500	
					$2,658,500	**$3,890,000**
Area #3 Lower Sprague	8,400	$840,000	8,800	$1,320,000	$2,160,000	
Upper Sprague						
					$2,160,000	**$3,960,000**
Projected Cost for Storage, Booster Pump Stations and Pipelines for the Southern Hills						**$9,495,000**

Estimated Project Costs

Priority 2 Projects

8" Pipe Length (feet)	8" Pipe Cost $100 per foot	12" Pipe Length (feet)	12" Pipe Cost $150 per foot	Total Pipe Cost
39,640	$3,964,000	9,240	$1,386,000	**$5,350,000**

Priority 3 Projects

8" Pipe Length (feet)	8" Pipe Cost $100 per foot	12" Pipe Length (feet)	12" Pipe Cost $150 per foot	Total Pipe Cost
75,075	$7,507,500	7,950	$1,192,500	**$8,700,000**

Estimated Project Costs

Priority 1 Projects	$9,495,000
Priority 2 Projects	$5,350,000
Priority 3 Projects	$8,700,000
Total	$23,545,000

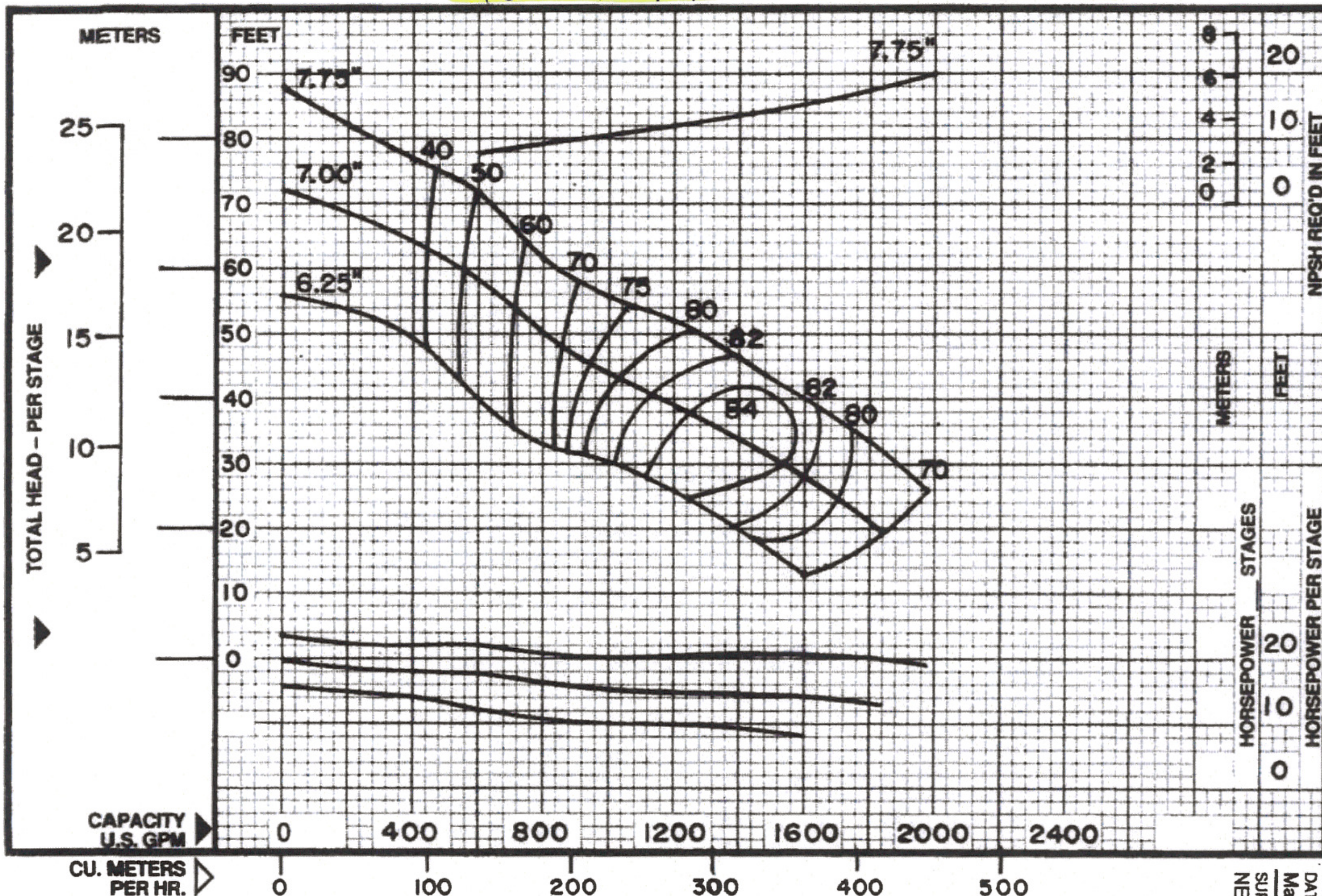
APPENDIX D

PUMP INFORMATION

GOULDS PROPOSAL NO.	GOULDS S.O. NO.	INQUIRY NO.	CUSTOMER P.O. NO.	P.O. DATE	ITEM NO.	CUSTOMER

PROJECT	SERVICE	GPM CAPACITY	F.T. TDH	% EFFICIENCY	RPM
		800	603'		

ESTIMATED WELL 9



Curve No: E6412DEPCO

Model: 12DHLC

RPM: 1770

EFFICIENCY CORRECTION

STGS. 1	-3.0
STGS. 2	-2.0
STGS. 3	-1.0
STGS. 4	0

PERF BASED ON STD. MTL'S

Impeller= A3109

N_S= 3930

K= 15 LBS/FT 22 KG/M

K (Bal.)=

GOULDS PUMPS
TURBINE DIVISION
LUBBOCK, TEXAS

Characteristics based upon pumping clear, non-aerated water. Rating point only is guaranteed. Column losses not included.

MODEL
12DHLC

DATE
March 1995

SUPERCEDES
NEW

PUMP DATA SHEET Turbine 60 Hz

Company: Universal Pump & Controls, LLC
Name: Robert H. Meredith
Date: 04/11/08

Customer: Lake Hemet MWD
Mr. Will Carter
Quote No: 208154

Pump:

Size: 11CLC (3 stages)
Type: Lineshaft — Speed: 1770 rpm
Synch speed: 1800 rpm — Dia: 7.875 in
Curve: E3142-2
Specific Speeds: — Ns: 2230
Pump Notes for Standard Sizes:
Suction Size-8" Discharge Sizes-6",8"
Vertical Turbine: — Bowl size: 11 in
Max lateral: 0.75 in
Thrust K factor: 7 lb/ft

Pump Limits for Standard Construction:

Temperature: 120 °F — Pressure: 380 psi g
Sphere size: 0.68 in

Search Criteria:

Flow: 750 US gpm — Head: 150 ft

Fluid:

Water — Temperature: 60 °F
SG: 1 — Vapor pressure: 0.2563 psi a
Viscosity: 1.105 cP — Atm pressure: 14.7 psi a
NPSHa: --- ft

Motor:

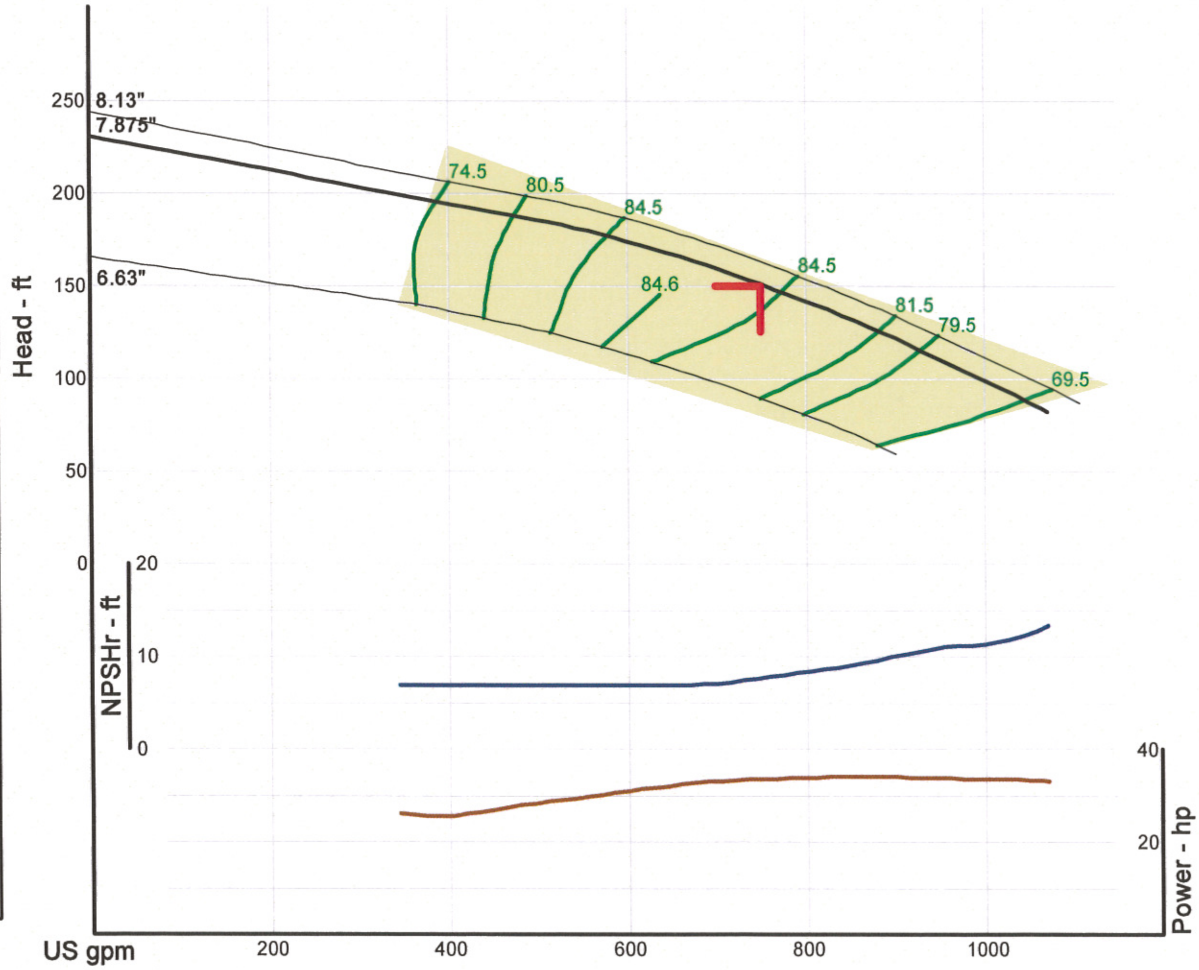
Standard: NEMA — Size: 40 hp
Speed: 1800

Sizing criteria: Max Power on Design Curve

---- Data Point ----
Flow: 750 US gpm
Head: 151 ft
Eff: 84.5%
Power: 33.6 hp
NPSHr: 7.77 ft

-- Design Curve --
Shutoff Head: 230 ft
Shutoff dP: 99.5 psi
Min Flow: --- US gpm
BEP: 84.6% eff
@ 679 US gpm
NOL Pwr: 34.2 hp
@ 882 US gpm

-- Max Curve --
Max Pwr: 37.2 hp
@ 901 US gpm



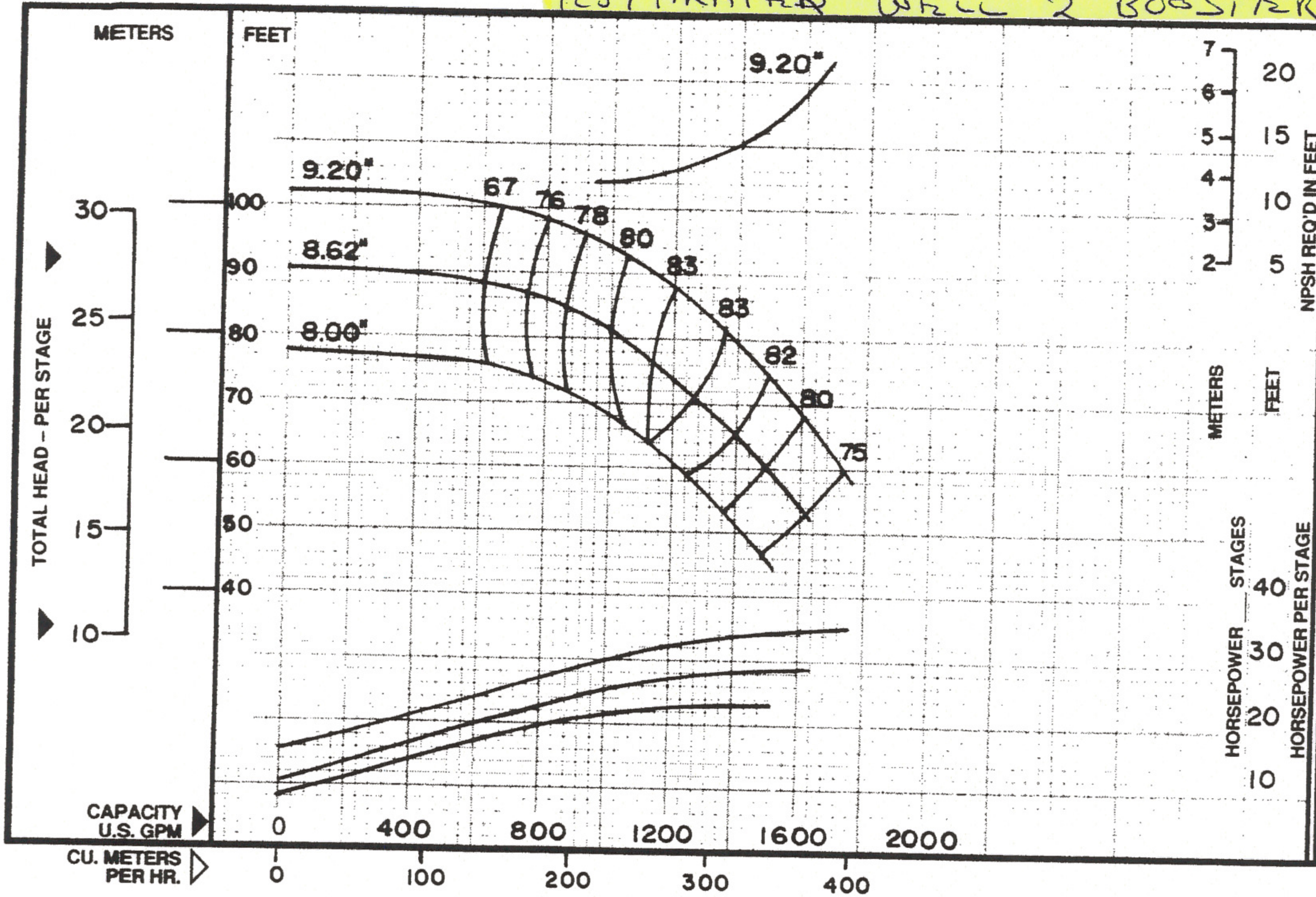
Performance Evaluation:

Flow US gpm	Speed rpm	Head ft	Pump %eff	Power hp	NPSHr ft
900	1770	122	80.7	34.1	10.1
750	1770	151	84.5	33.6	7.77
600	1770	174	84.5	31	7
450	1770	190	78.8	27.3	7
300	1770	---	---	---	---

GOULDS PROPOSAL NO.	GOULDS S.O. NO.	INQUIRY NO.	CUSTOMER P.O. NO.	P.O. DATE	ITEM NO.	CUSTOMER

PROJECT	SERVICE	GPM CAPACITY	FT. TDH	% EFFICIENCY	RPM
		1100	214		

ESTIMATED WELL 2 BOOSTER



Curve No. 3135-1

Model: 13CHC

RPM: 1770

EFFICIENCY CORRECTION

STGS. 1	-2.0
STGS. 2	-1.0
STGS. 3	-0.5
STGS. 4	0

PERF BASED ON STD. MTL'S

Impeller= CLOSED

N_S= 2270

K= 9.50 LBS/FT 13.14 KG/M

K (Bal.)=

GOULDS PUMPS

TURBINE DIVISION
LUBBOCK, TEXAS

Characteristics based upon pumping clear, non-aerated water. Rating point only is guaranteed. Column losses not included.

MODEL
13CHC

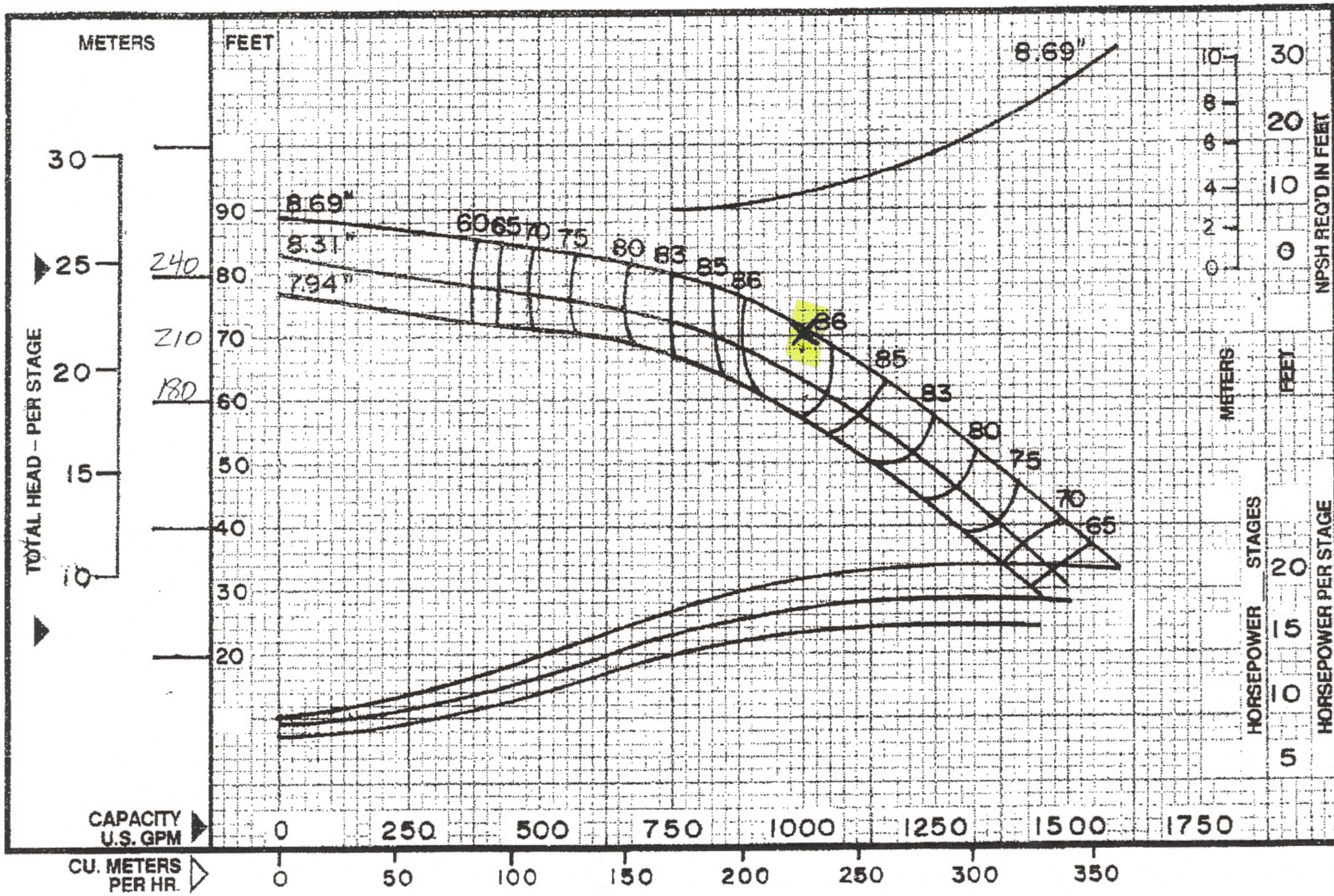
DATE
April 1999

SUPERCEDES
June 1993

C13CHC

GOULDS PROPOSAL NO	GOULDS S.O. NO.	INQUIRY NO.	CUSTOMER P.O. NO.	P.O. DATE	ITEM NO	CUSTOMER
						LHMWD

PROJECT	SERVICE	GPM CAPACITY	F.T. TDH	% EFFICIENCY	RPM
WED COR		1000	210	85 1/2	1770



Curve No: E6412CGPCO

Model: 12CMC

RPM: 1770

EFFICIENCY CORRECTION	
STGS. 1	-3.0
STGS. 2	-2.0
STGS. 3	-0.5
STGS. 4	0.0

PERF BASED ON STD. MTL'S

Impeller= CLOSED

N_s= 2240

K= 7.40 LBS/FT 11.0 KG/M

K (Bal.)=

GOULDS PUMPS

TURBINE DIVISION
LUBBOCK, TEXAS

Characteristics based upon pumping clear, non-aerated water. Rating point only is guaranteed. Column losses not included.

MODEL 12CMC

DATE June 2000

SUPERCEDES NEW

WEBCOR BOOSTER 2/04

LOWER SPRAGUE HTS. VERTICAL T

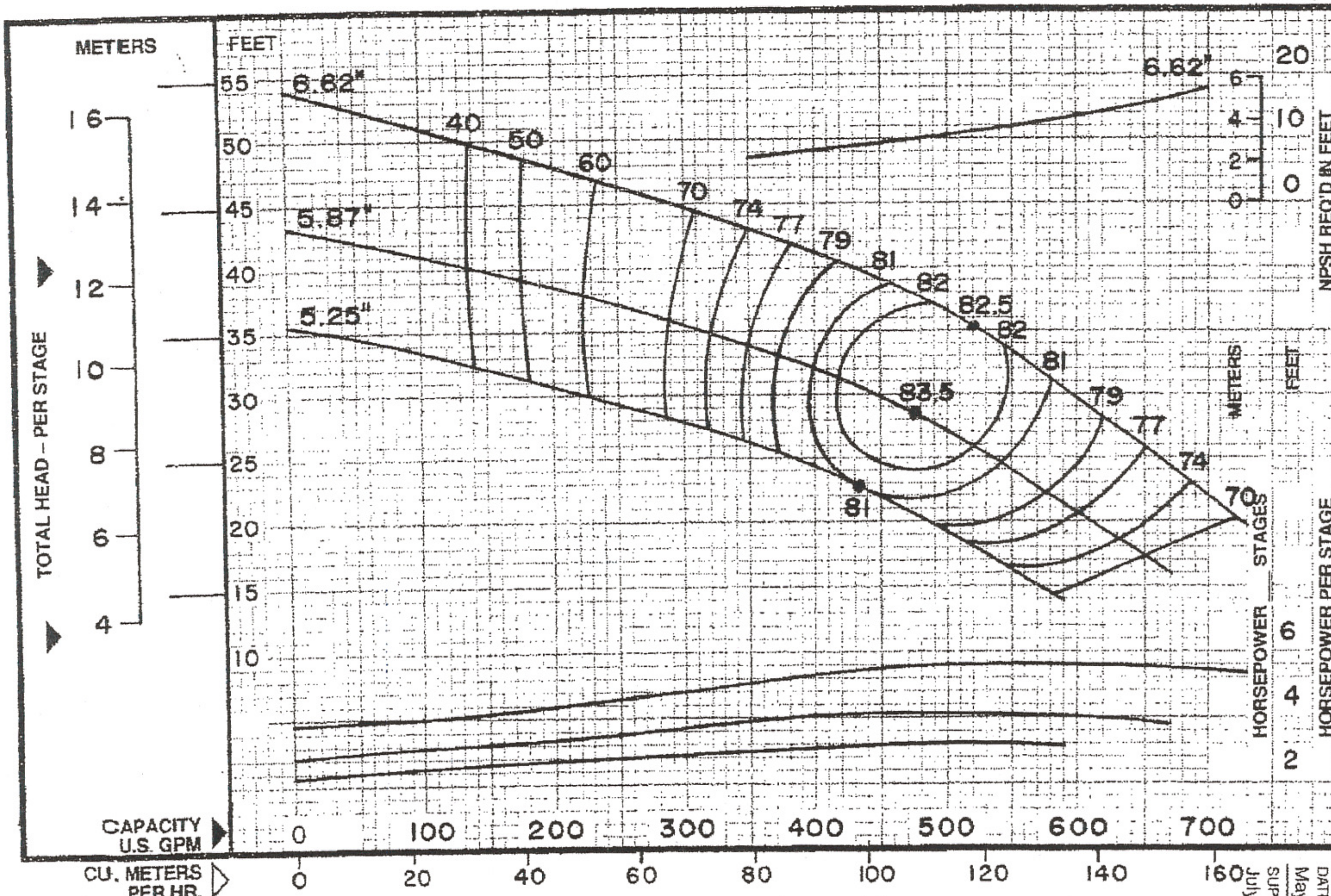
6 STAGE

ATTN. WILL CARTER

THIS PUMP WAS INSTALLED 100803

GOULDS PROPOSAL NO	GOULDS S.O. NO.	INQUIRY NO.	CUSTOMER P.O. NO.	P.O. DATE	ITEM NO.	CUSTOMER
						LHMWD

PROJECT	SERVICE	GPM CAPACITY	F.T. TDH	% EFFICIENCY	RPM
SPAGUE HTS. #5		500	220		1800



Curve No. 3110

Model: 10RJLC

RPM: 1760

EFFICIENCY CORRECTION

PERF BASED ON STD. MTL'S

Impeller= A7742

N_S= 2760

K= 7.0 LBS/FT
10.4 KG/M

K (Bal.)=

GOULDS PUMPS
TURBINE DIVISION
LUBBOCK, TEXAS

Characteristics based upon pumping clear, non-aerated water. Rating point only is guaranteed. Column losses not included.

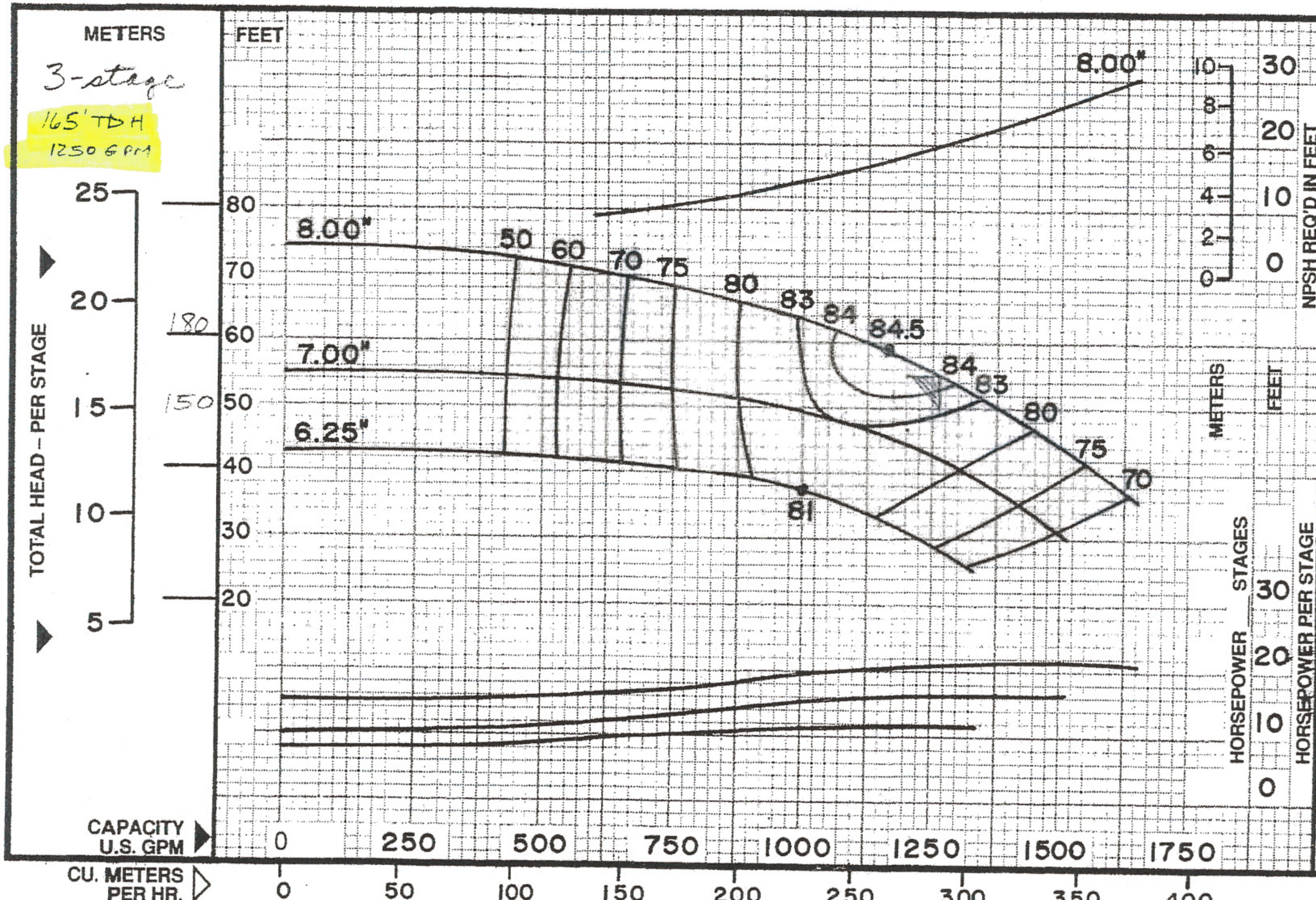
MODEL 10RJLC
DATE May 2, 1988
SUPERCEDES July 22, 1977

MARSHALL 3

INSTALLED MAY 2002

GOULDS PROPOSAL NO.	GOULDS S.O. NO.	INQUIRY NO.	CUSTOMER P.O. NO.	P.O. DATE	ITEM NO.	CUSTOMER

PROJECT	SERVICE	GPM CAPACITY	F.T. TDH	% EFFICIENCY	RPM



Curve No. 3121
Model: 12RJHO
RPM: 1760

EFFICIENCY CORRECTION

PERF BASED ON STD. MTL'S

Impeller= B01170B
N_S= 2840
K= 13.7 LBS/FT / 20.4 KG/M
K (Bal.)=

GOULDS PUMPS
TURBINE DIVISION
LUBBOCK, TEXAS

Characteristics based upon pumping clear, non-aerated water. Rating point only is guaranteed. Column losses not included.

MODEL
12RJHO
DATE
May 1988
SUPERCEDES
July 1977

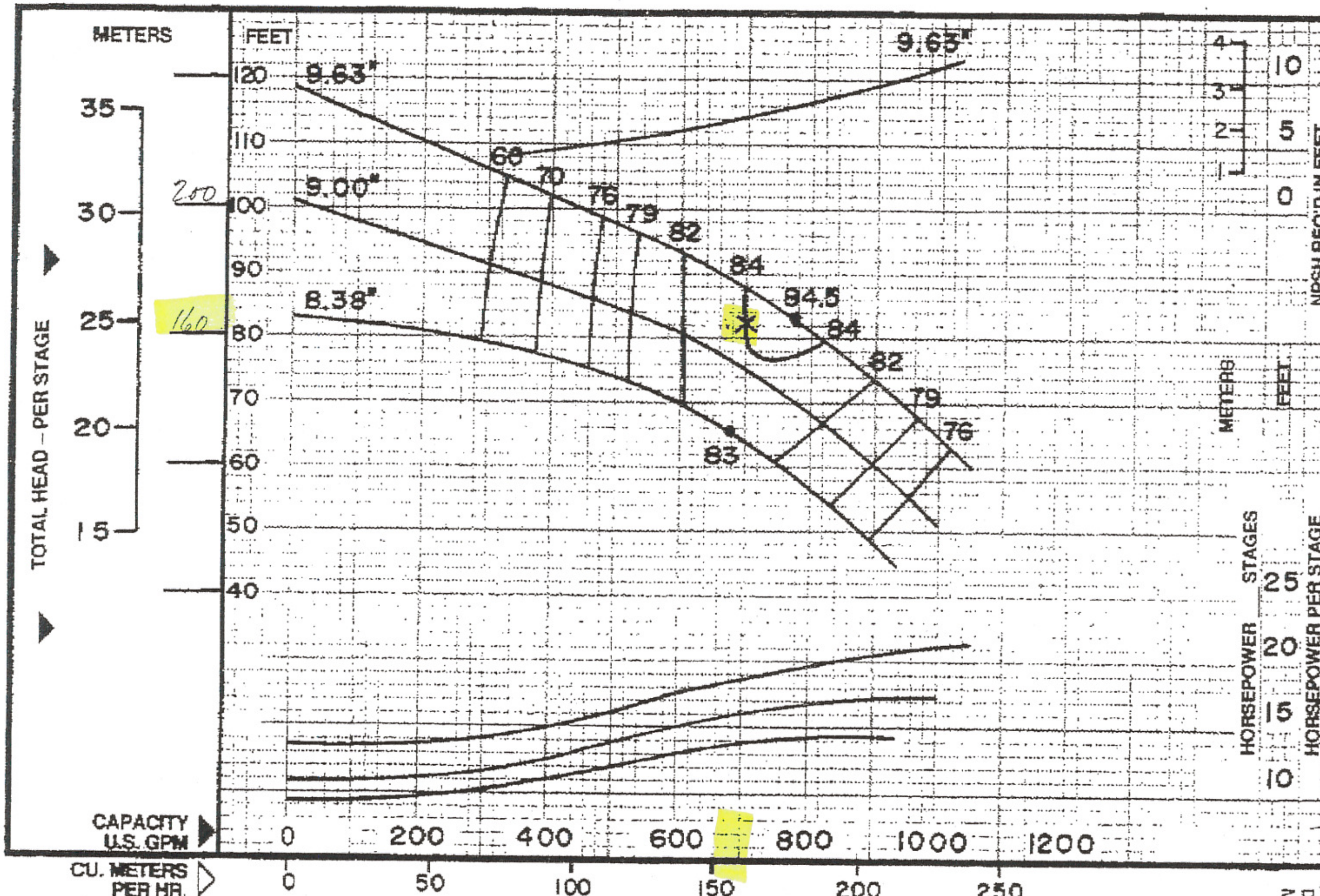
C12RJHO

INSTALLED BY MILLER PUMP 1/14/02 MARSHALL # 4

GOULDS PROPOSAL NO.	GOULDS S.O. NO.	INQUIRY NO.	CUSTOMER P.O. NO.	P.O. DATE	ITEM NO.	CUSTOMER
						LAKE HEMET MUNICIPAL WATER

PROJECT	SERVICE	GPM CAPACITY	FT. TDH	% EFFICIENCY	RPM
MARSHALL SUTA		760	165	82	1770

2 STAGES 9.4 TRIM 38 BHP



Curve No. 1195-4
Model: 13RAHC
RPM: 1770

EFFICIENCY CORRECTION

STGS. 1	-5.0
STGS. 2	-2.0
STGS. 3	-1.0

PERF BASED ON STD. MTL'S

Impeller= C2215
N_s= 1790
K= 7.90 LBS/FT 11.8 KG/M
K (Bal.)=

GOULDS PUMPS
TURBINE DIVISION
LUBBOCK, TEXAS

Characteristics based upon pumping clear, non-aerated water. Rating point only is guaranteed. Column losses not included.

MODEL 13RAHC
DATE May 1990

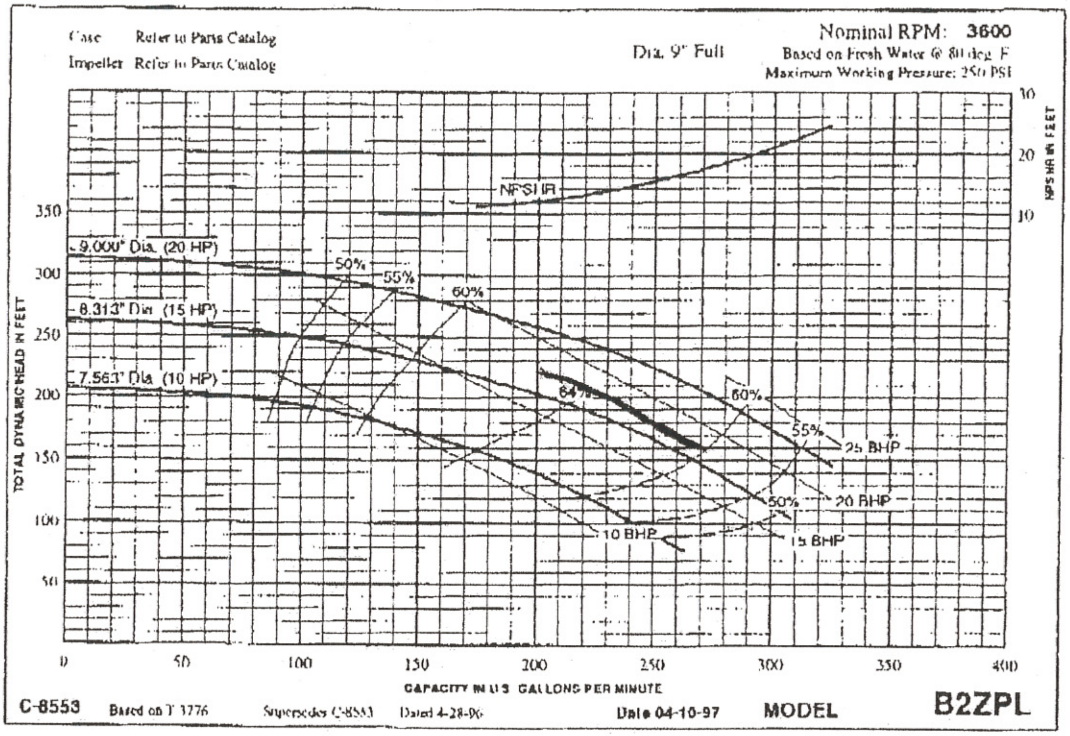
LAYNE

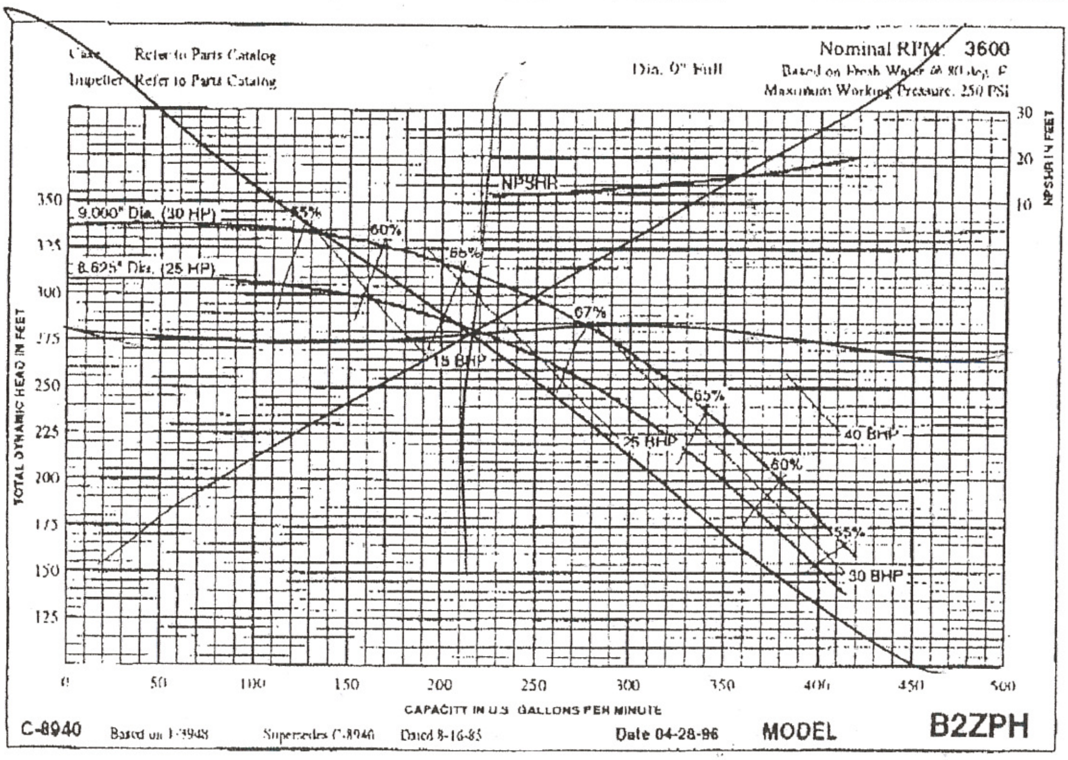
CURVE	4075
DATE	04-11-97
PAGE	3.01
SUPERSEDES	
Curve 4075	Page 3.01
Dated 05-01-96	

BERKELEY®

MOTOR DRIVE

BEE CYN PRESSURE VESSELS





Base Model: 6SV
General Pump Description

Construction	304 or 316 stainless steel
Capacities:	130 – 340 gallons per minute (30 – 77 m^3/hr)
Heads:	80 – 470 feet TDH (25 – 140 meters)
Staging:	2 – 6
Maximum working pressure:	175 PSI (12 bar) for the 6SVB or 275 psi (19 bar) for 6SVD
Temperatures:	Standard liquid temperature from -13°F (-25°C) to 250°F (120°C)

Design options:

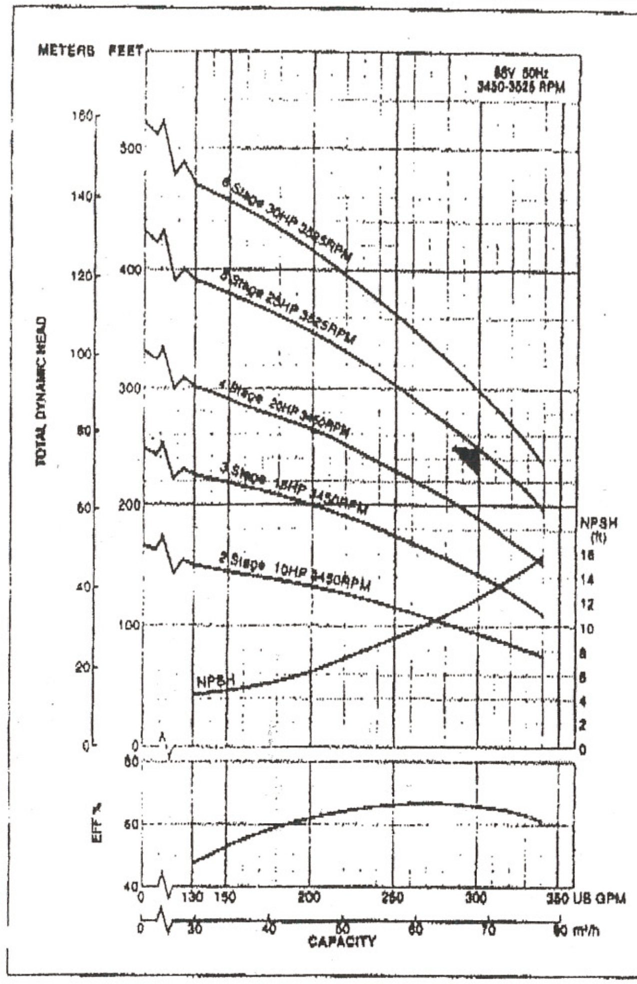
Type	Material 304	Material 316	Stages	Connections	Location
6SVB	·		2 – 5	ANSI flange	In-line
6SVD			2 – 6	ANSI flange	In-line

Piping Connections: Suction and discharge openings are 4". ANSI class 125 cast iron or class 150 steel flanges.

Component Materials	304 Version	316 Version
Casing O-rings	Viton	Same
Tie-rods and nuts	Zinc-coated steel	Same
Pump shaft	431 stainless steel	316 SS
Pump casing	304 stainless steel	316L SS
Seal housing	Cast iron	316L SS
Inner bowls	316L stainless steel	Same
Diffusers	316L stainless steel	Same
Impellers	316L stainless steel	Same
Shaft spacers	316L stainless steel	Same
Shaft bushing	Ceramic	Same
Shaft sleeve	Tungsten carbide	Same
Seal spring and retainer clip	316L stainless steel	Same
Mechanical seal	Standard with silicon carbide/carbon faces, 316L stainless steel sleeve and EPR elastomers	Same
Prime and drain plugs	Nickel plated brass	316 SS
NEMA motor adapter	Cast iron	Same
Coupling guards	304 stainless steel	Same
Motor shaft coupling	Cast iron	Same
Pump body/base	Cast iron	Cast 316 SS

6SV Performance Curves

CUNNINGHAM SECONDARY



300 GPM at 250' TDH

6SV Motors

NEMA standard TC frame vertical motors with open drip proof, or totally enclosed fan cooled enclosures. 60 Hz, 3500 RPM, three phase (208–230/460 V). 6 SV horsepowers from 10 to 30. Above motors are 1.15 S.F.

PUMPING CLEAR, FRESH
NON-AERATED WATER AT
85 DEGREES F TEMPERATURE.

PUMP
GLENDALE, ARIZONA

PAGE -

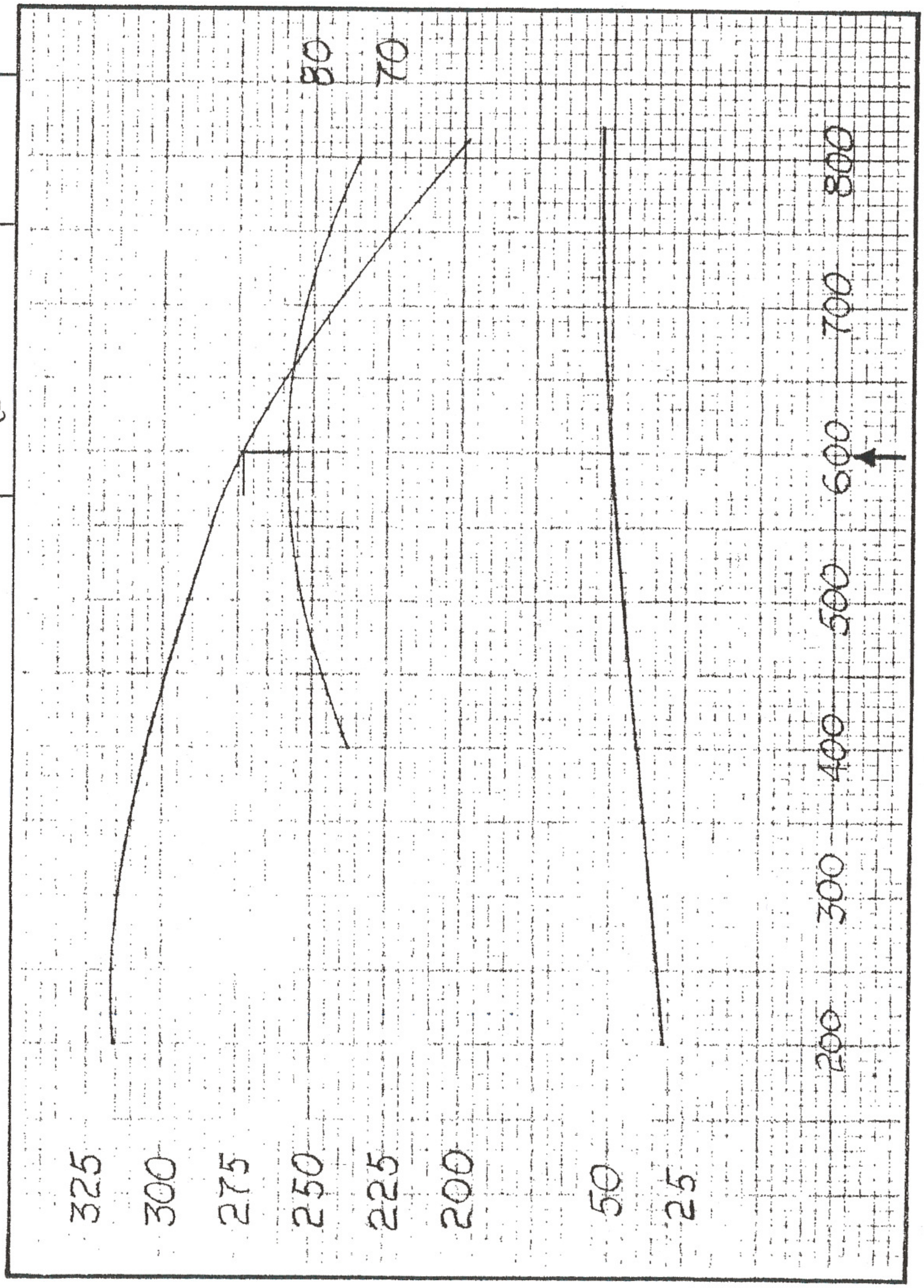
EFFICIENCY

NPSH IN FEET

CHANGE	
NO. OF POINTS	
EFFICIENCY	NO. OF STAGES
IMPELLER DIAMETER	A= B= C=

CUNNINGHAM PRIMARY INSTALLED 1983
600 GPM 274' TDH

ONE STAGE PERFORMANCE
5 STAGE M10HC



U.S. GALLONS PER MINUTE

TOTAL HEAD IN FEET

BRAKE HORSEPOWER

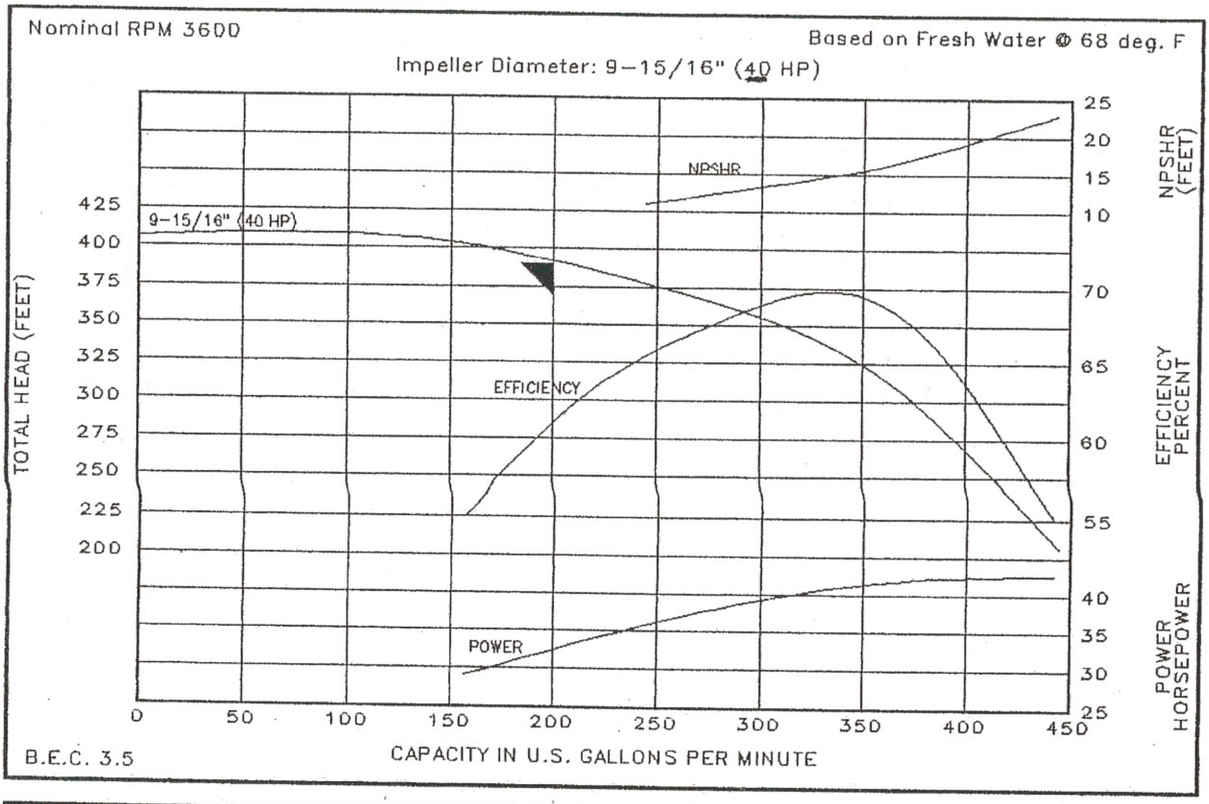
PACHEA HORIZONTAL

INSTALLED JANUARY 2000

BERKELEY®

MOTOR DRIVE

B2EPBLS



SELECTION CONDITIONS

Flow:	200.0 GPM	Priming Type:	Standard
Total Dynamic Head:	390.0 feet	Motor Loading:	Standard

PUMP DESCRIPTION

Pump Model:	B2EPBLS	Priming Type:	Standard
Impeller Diameter:	9.938 in.	Impeller Material:	Bronze Fitted
Suction:	3"NPT	Discharge:	2"NPT
Shaft Seal:	Mechanical		

PUMP PERFORMANCE

Flow:	200.0 GPM	Power:	32.5 BHP
Total Dynamic Head:	392.2 feet	Efficiency:	61.0 %
Nominal Speed:	3600 RPM	NPSHR:	11.0 feet
Shut-Off Head:	406.6 feet	Max Power:	42.6 BHP
Best Eff:	69.8 @ 333.7 GPM		

MOTOR

Size:	40 HP	Enclosure:	ODP
Voltage:	Consult Catalog/Factory	Hz/Phase:	60/3

PRICE/ORDER INFORMATION

Catalog No.:	B74341	List Price:	$ 4489
Weight:	555 lbs.		

QUOTED BY:

L. O. Lynch Quality Wells
1015 South State St.
San Jacinto, CA 92583
909-654-7724
909-654-2060

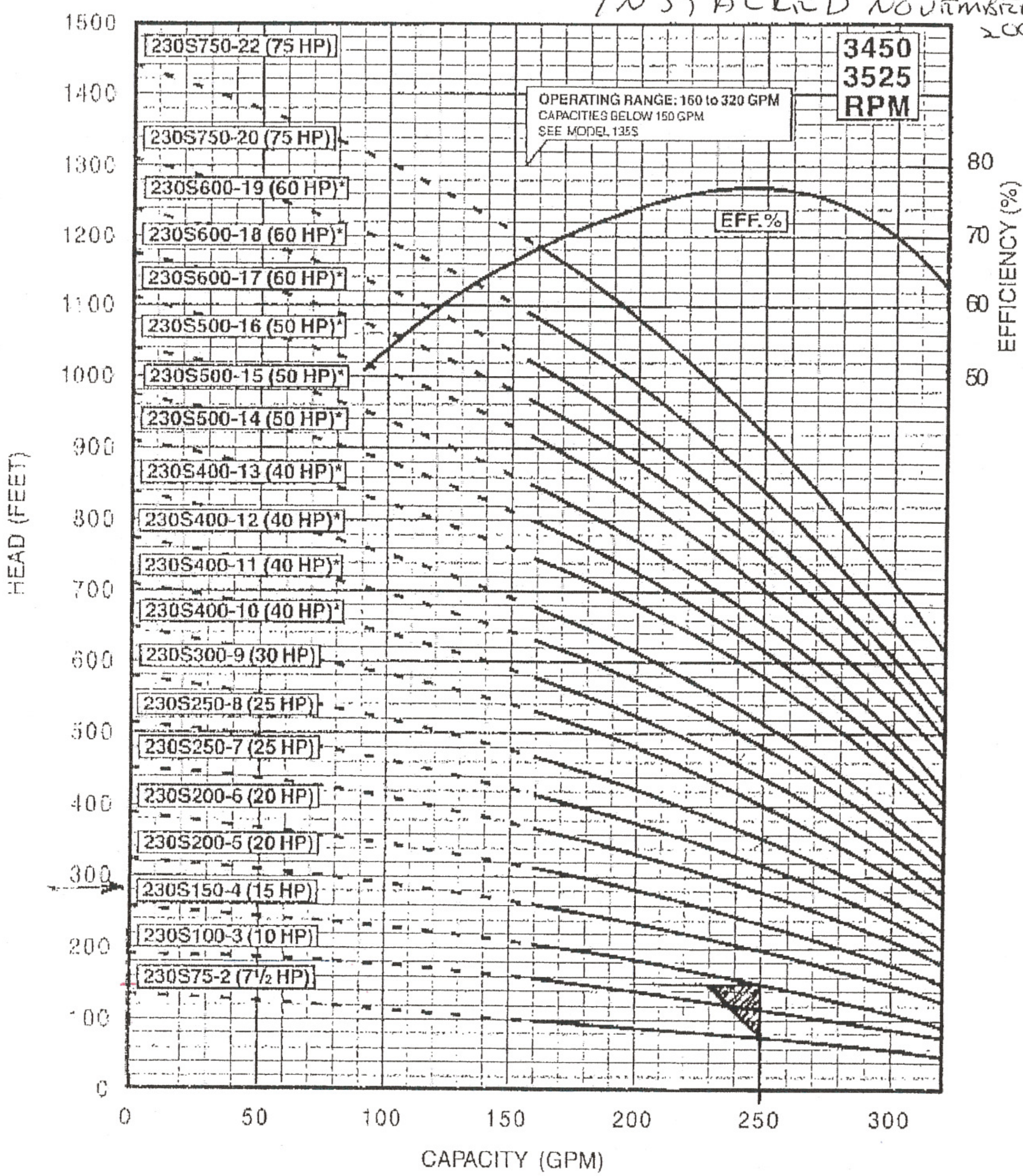
QUOTED TO:

Prices: U.S. Dollars

Performance Curves 230 GPM Model 230S

FLOW RANGE: 160 -320 GPM **OUTLET SIZE: 3" NPT** **NOMINAL DIA. 6"**

PACHECA SUBMERSIBLE
INSTALLED NOVEMBER 2000



SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.
4" MOTOR STANDARD, 7.5 HP/3450 RPM.
6" MOTOR STANDARD, 10-40 HP/3450 RPM.
8" MOTOR STANDARD, 50-75 HP/3525 RPM.
* Alternate motor sizes available.

Performance conforms to ISO 2548 Annex B
@ 8 ft. min. submergence.

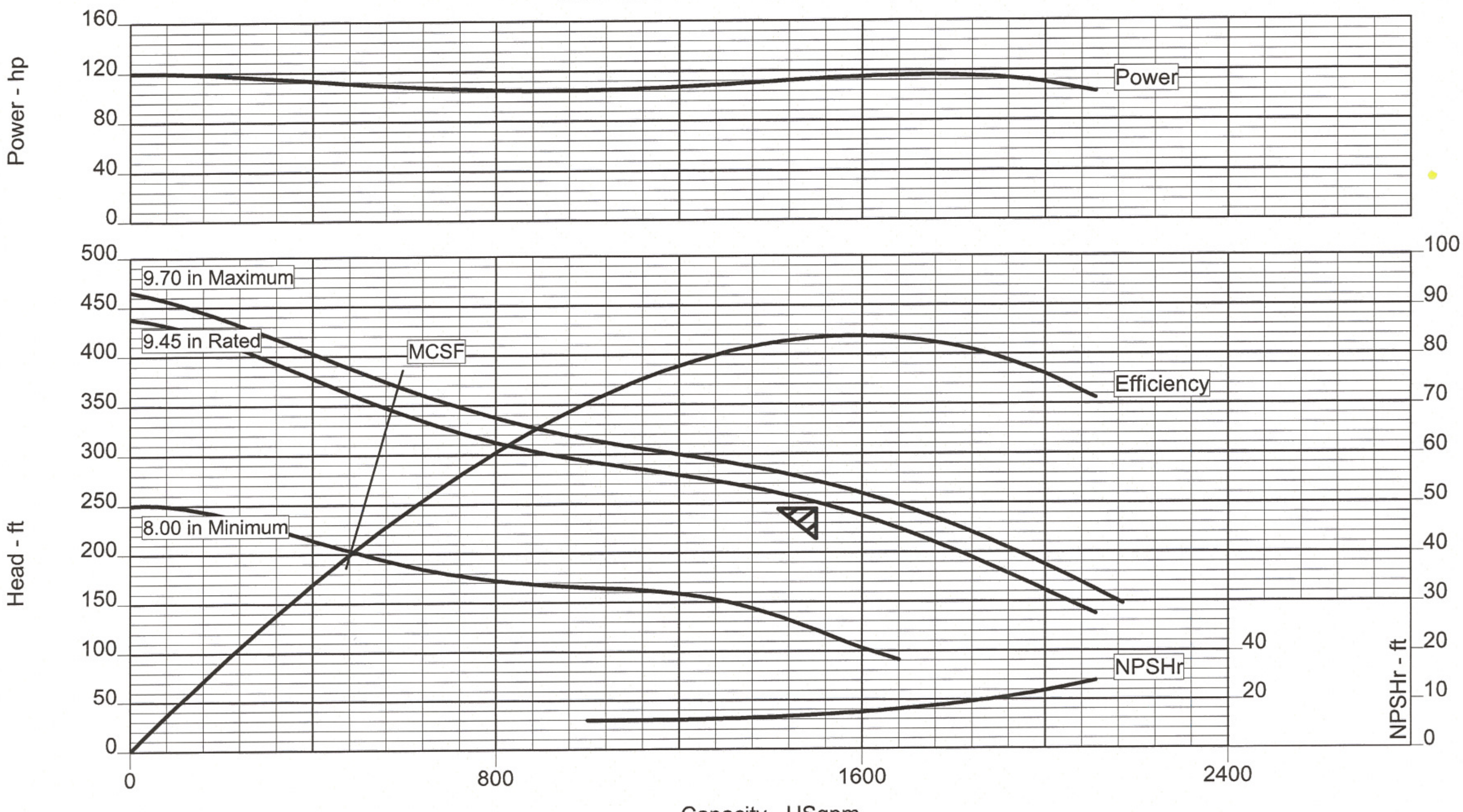
GRUNDFOS

Customer	:	Capacity	: 1500.0 USgpm	Pump size & type	: 12ENL
Item number	: SWPD, Inc	Head	: 244.00 ft	Based on curve no.	: EC-1389
Service	: Lake Hemet	Specific gravity	: 1.000	Number of stages	: 5
Vendor reference	: 9999-W0000	Pump speed	: 1770 rpm		
Date	: May 4, 2007				

FLOWSERVE Pump Division

CURVES ARE APPROXIMATE, PUMP IS GUARANTEED FOR ONE SET OF CONDITIONS, CAPACITY, HEAD, AND EFFICIENCY.

Bowl performance shown below is corrected for materials, viscosity and construction.



Bowl head of 250.5 ft corresponds with 244.0 ft head at discharge flange adjusted for elevation and friction losses.

WinPROS+ V3.2.2

FLOWSERVE Pump Division

Hydraulic Datasheet

Customer	:	Pump / Stages	: 12ENL / 5
Customer reference	:	Based on curve no.	: EC-1389
Item number	: SWPD, Inc	Vendor reference	: 9999-W0000
Service	: Lake Hemet	Date	: May 4, 2007

Operating Conditions

Capacity	: 1500.0 USgpm
Water Capacity (CQ=1.00)	: -
Normal capacity	: -
Total Developed Head	: 244.00 ft
Water head (CH=1.00)	: -
NPSH available (NPSHa)	: Ample
NPSHa less NPSH margin	: -
Maximum suction pressure	: 0.0 psig

Liquid

Liquid type	: Other
Liquid description	:
Temperature	: 60 °F
Specific gravity / Viscosity	: 1.000 / 1.0 cSt

Materials / Specification

Material column code	: B30
Pump specification	:

Other Requirements

Hydraulic selection : No specification

Construction : No specification

Test tolerance : Hydraulic Institute Level A

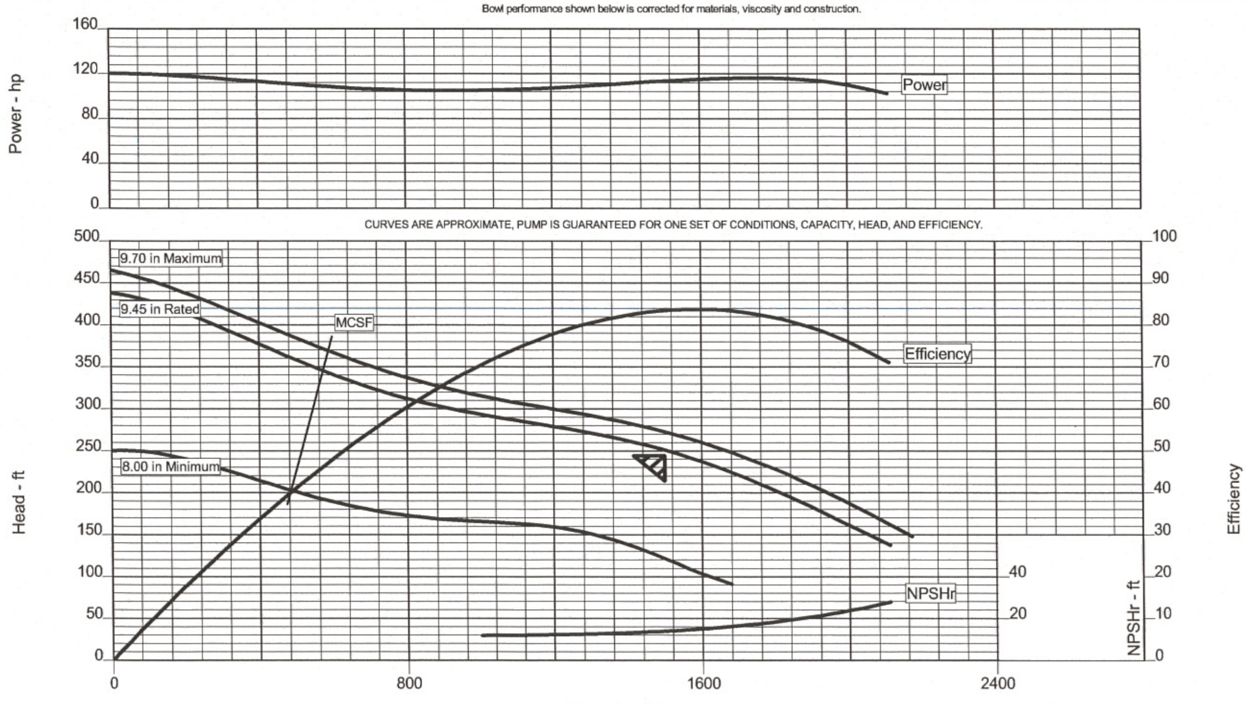
Speed Set : 1770 rpm

Driver Sizing : Max Power(MCSF to EOC)with SF

Performance

Hydraulic power	: 94.6 hp	Impeller diameter	
Pump speed	: 1770 rpm	Rated	: 9.45 in
Efficiency (CE=1.00)	: 82.8 %	Maximum	: 9.70 in
NPSH required (NPSHr)	: 13.8 ft	Minimum	: 8.00 in
Rated power	: 114 hp	Suction specific speed	: 9150 US units
Maximum power	: 119 hp	Minimum continuous flow	: 570.7 USgpm
Driver power	: 150 hp / 112 kW	Maximum head @ rated dia	: 437.8 ft
Casing working pressure	: 189.5 psig	Flow at BEP	: 1584.0 USgpm
(based on shut off @ cut dia)		Flow as % of BEP	: 94.7 %
Maximum allowable	: 189.5 psig	Efficiency at normal flow	: -
Bowl & column hydrotest	: 236.9 psig	Impeller dia ratio (rated/max)	: 97.4 %
Minimum submergence	: 24.00 in	Head rise to shut off	: 74.8 %
Pump thrust at rated flow	: 3154.7 lbf	Total head ratio (rated/max)	: 92.0 %

Bowl performance shown below is corrected for materials, viscosity and construction.



Bowl head of 250.5 ft corresponds with 244.0 ft head at discharge flange adjusted for elevation and friction losses.

WinPROS+ V3.2.2

FLOWSERVE Pump Division

Construction Datasheet

Customer	:	Pump / Stages	: 12ENL / 5
Customer reference	:	Based on curve no.	: EC-1389
Item number	: SWPD, Inc	Vendor reference	: 9999-W0000
Service	: Lake Hemet	Date	: May 4, 2007

Construction

Bowl construction / lined	: Flanged / Lined bowls
Impeller type	: Enclosed
Impeller fastening	: Colleted
Suction strainer	: None supplied
Column construction	: Flanged
Column flange spec'n	: Taneytown Specification
Column dia (nominal)	: 10.00 in
Column pipe length	: 3.08 ft
Column section length	: -
Lineshaft brg spacing	: 120.00 in
Lineshaft diameter	: 1.69 in
Lineshaft coupling type	: Threaded coupling
Lineshaft bearings, qty	: 1
Lineshaft construction	: Open
Lineshaft lubrication	: Pumpage
Enclosing tube diameter	: N/A
Disch size/rating/face	: 10 inch / 150# ANSI / RF
Pump/driver coupling	: -1
"LF" - Fab'd / Above grade Dschg/ ANSI base	

Driver Information

Manufacturer	: Flowserve Choice
Power / SF (Req' / Act')	: 150 hp / 112 kW 1.15 / -
Vertical shaft type	: Hollow
Hollow shaft coupling	
Driver Type	: Electric motor
Frame size / Base dia	: -
Enclosure	: -
Duty type	
Efficiency type	
Hazardous area class	: -
Explosion 'T' rating	: -
Volts / Phase / Hz	: - / - / -
Amps-full load/locked rotor	: - / -
Motor starting	: Direct on line (DOL)
Insulation	: -
Temperature rise	: -
Bearings / Lubrication	: - / -
Motor mounted by	: Customer
Thrust rating down/up	: - / -

Materials

Bowl	: Cast iron (A48 CL30)
Impeller	: Bronze
Bowl bearing	: Bronze (C84400)
Bowl shaft	: 416SS (A582 Gr 416)
Bowl wear ring	: None supplied
Impeller wear ring	: None supplied
Suction strainer	
Column	: Steel A53 Type E GrB
Lineshaft	: 416 stainless steel
Enclosing tube	
Bearing retainer	
Lineshaft bearing	: Rubber (Buna-N)
Lineshaft sleeve	
Discharge head	: Steel A53 Type E GrB
Head shaft	
Mounting plate	: None supplied

Seal Information

Arrangement	: Single mechanical
Size	: -
Manufacturer / Type	: - / Single
Material code (Man'f/API)	: - / -
Gland material	: -
Auxiliary seal device	: -
Seal flush plan	: -
Seal flush construction	: - -

Weights (Approx.)

Complete pump	: -
Mounting plate	: -
Driver(nett)	: -

Paint and Package

Pump paint	: -
Mounting plate paint	: -
Shipment type	: -

Additional Information

Pit / sump depth	: -
Pump length (TPL) surface to brg hub/strainer)	: 9.53 ft
Available well diameter	: -1.00 in
Max dia below mtg surface	: 13.50 in

Testing

Hydrostatic test	: None
Performance test	: None
NPSH test	: None

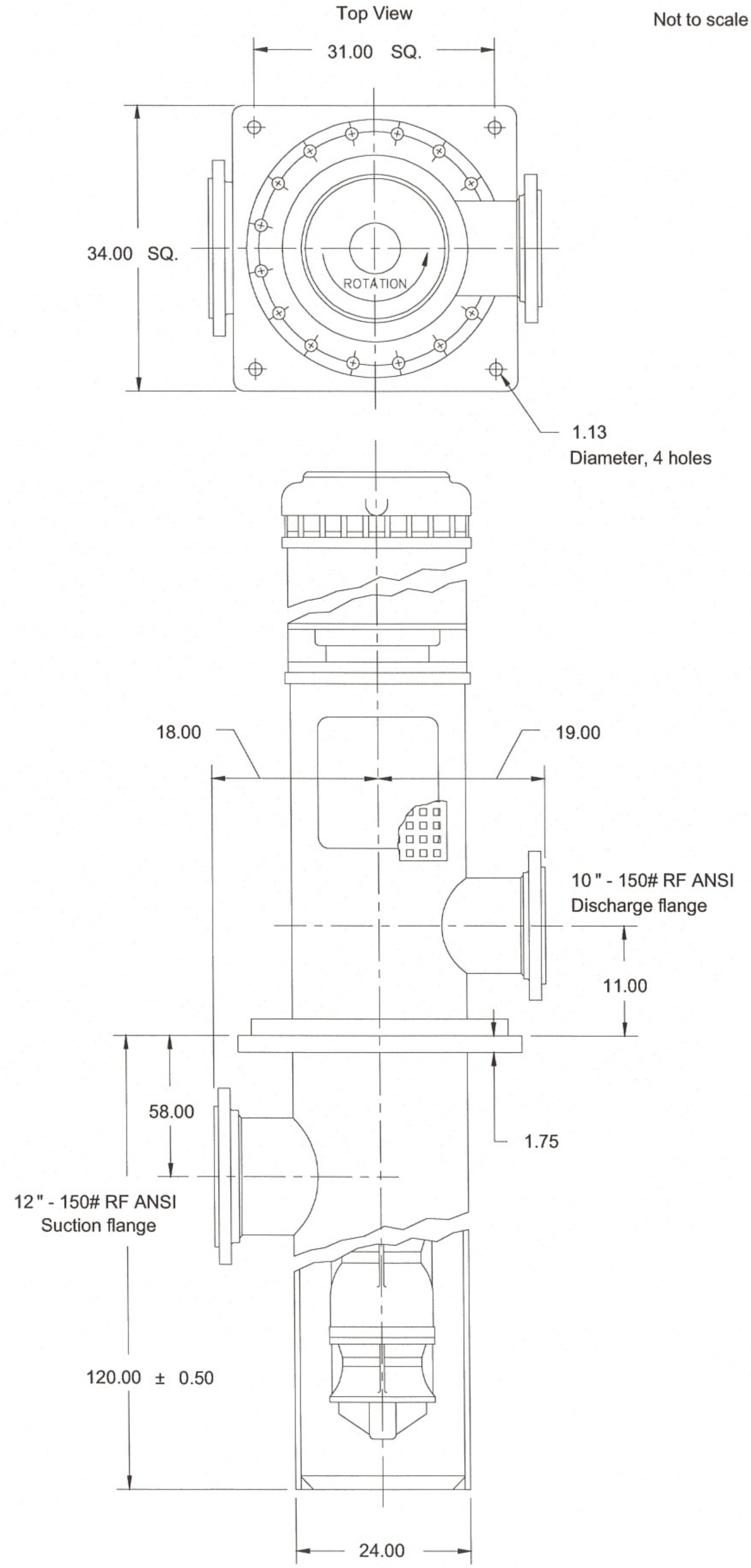
Notes

-

WinPROS+ V3.2.2

Full Page GA Drawing

FLOWSERVE Pump Division



All dimensions are in inches unless otherwise specified

Customer	:
Item number	: SWPD, Inc
Service	: Lake Hemet
Customer PO #	:
Vendor reference	: 9999-W0000 Rev. A

Pump size & type	: 12ENL
Pump speed / Stages	: 1770 rpm / 5
Flow / Head	: 1500.0 USgpm / 244.00 ft
Driver power / Frame	: 150 hp / 112 kW / -
Volts / Phase / Hz	: - / - / -

Drawing number	
Date	: May 4, 2007
Certified by / Date :	
Seal type	: Single
Seal flush plan	: -

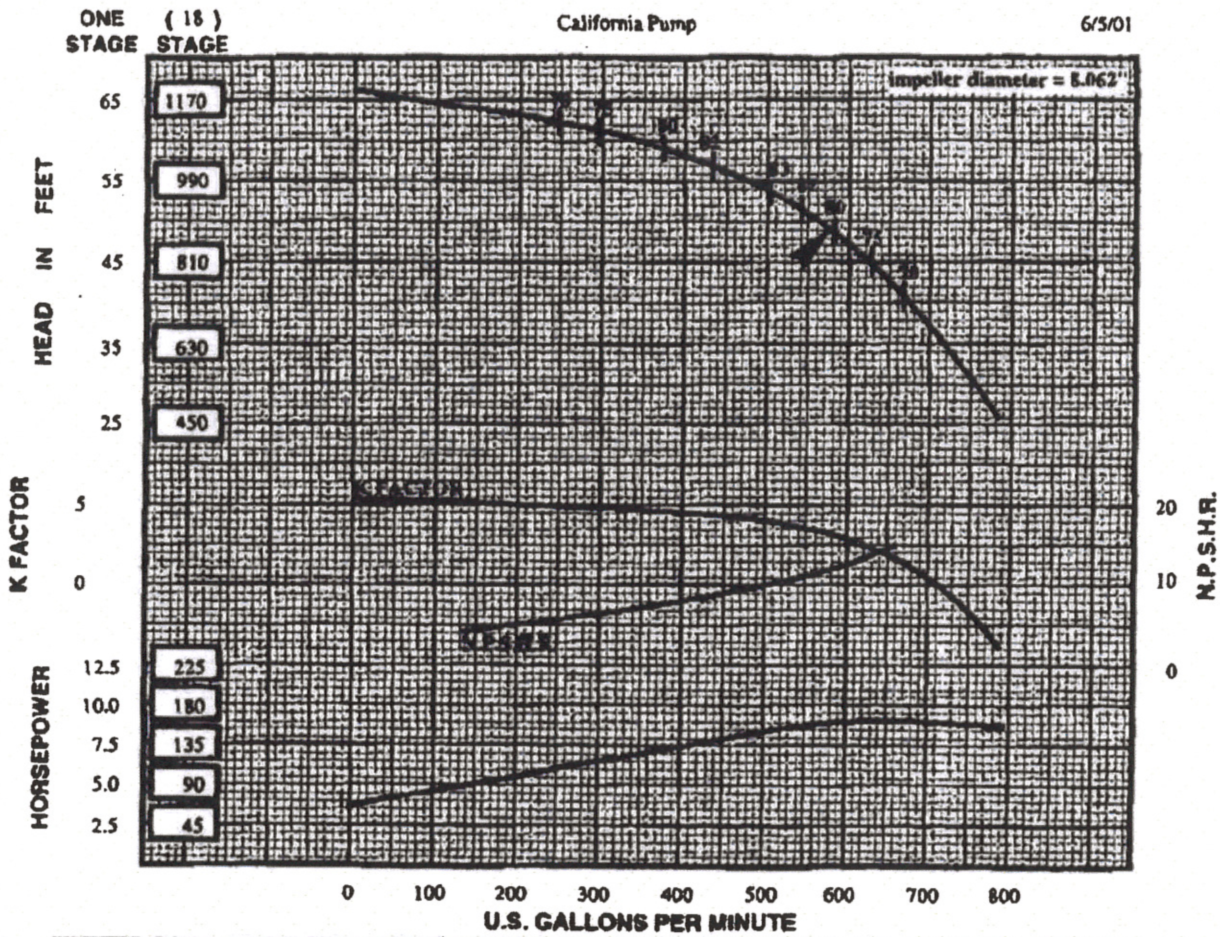
WinPROS+ V3.2.2

SECTION 202
PAGE 24
DATE
SUPERCEDES

~~WELL #6~~
WELL 11 -

SH10C 1770 R.P.M.

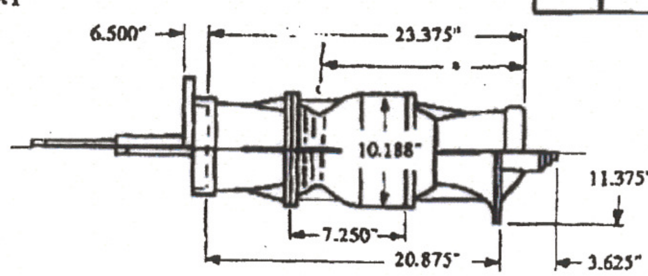
SIMFLO PUMPS



IMPELLER TYPE	=	ENCLOSED	STD. SHAFT DIA.	=	1.500"
IMPELLER NO.	=	SP10H	MAX. SHAFT DIA.	=	1.500"
IMPELLER WT. - LBS.	=	9.0	STD. LATERAL	=	.750"
ONE STAGE WT. - LBS.	=	190.0	DISCHARGE SIZES	=	6"
ADD'L STAGE WT. - LBS.	=	75.0	SUCTION SIZES	=	6"
MAX. SPHERE SIZE	=	.625"	ONE STAGE WR²	=	.315
MIN. SUBMERGENCE*	=	14"		=	

Δ CONSULT FACTORY

NO. STAGES	EFF. CHANGE	MATERIAL	B.E.P. EFF. CHANGE
1	-4	IMP. - C.I.	-3
2	-3	IMP. - NI-RI	-2
3	-2	IMP. - S.S.	-2
4	-1	BOWL - BRZ.	-3
5	0	BOWL - NI-RI	-1
		BOWL - S.S.	-3

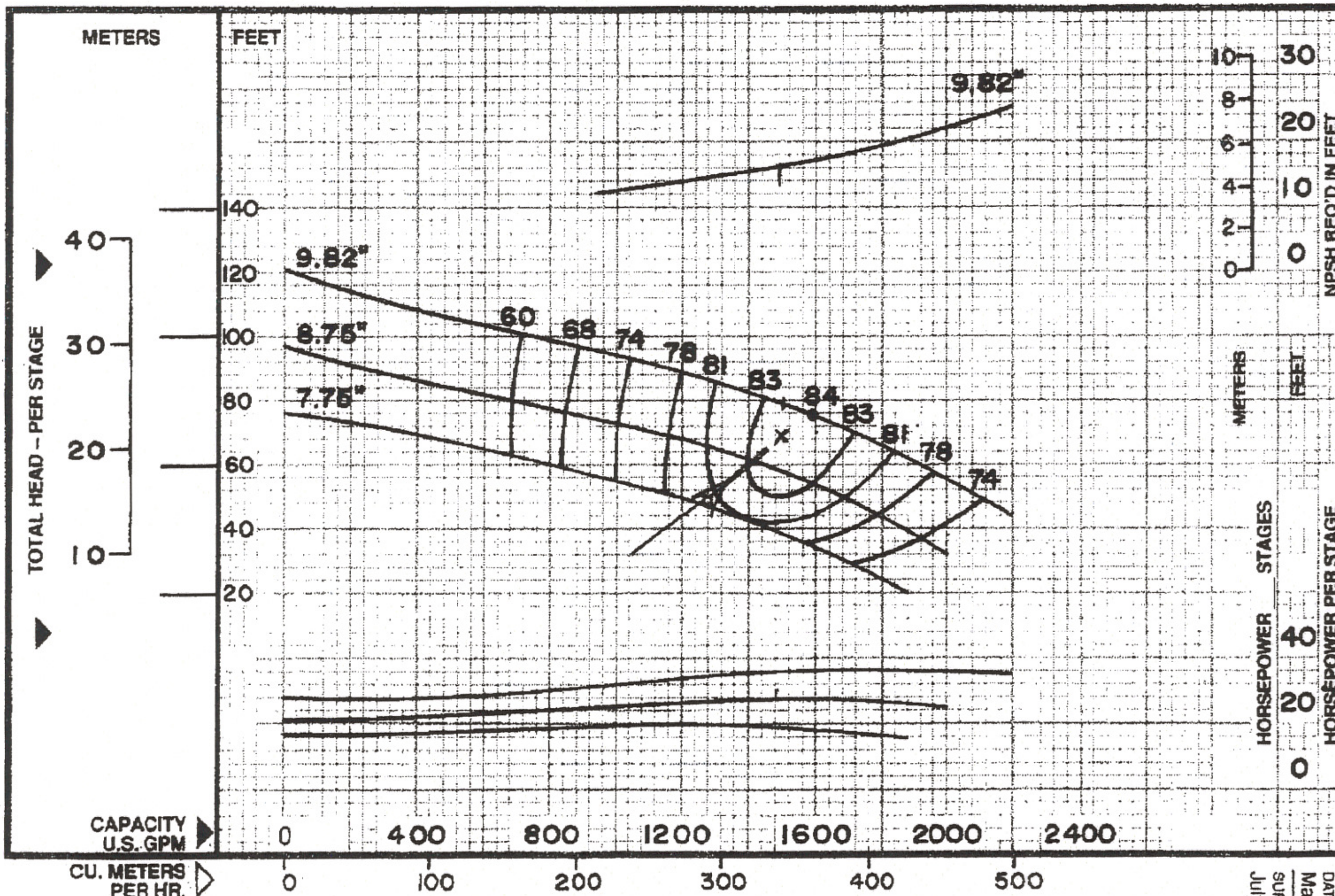


LINESHAFT TURBINE

NOTE: Curve represents bowl performance only.

GOULDS PROPOSAL NO.	GOULDS S.O. NO.	INQUIRY NO.	CUSTOMER P.O. NO.	P.O. DATE	ITEM NO.	CUSTOMER
						LAKE Hemet Municipal Water Dist.

PROJECT	SERVICE	GPM CAPACITY	F.T. TDH	% EFFICIENCY	RPM
WELL # 14 Booster	9.2" Trim	1500	200	84	1770



Curve No. 3124
Model: 14RJLC
RPM: 1770

EFFICIENCY CORRECTION	
STGS. 1	-3.0
STGS. 2	-1.0

PERF BASED ON STD. MTL'S

Impeller= B01241B
N_S= 2750
K= 13.7 LBS/FT
20.4 KG/M
K (Bal.)=

GOULDS PUMPS
TURBINE DIVISION
LUBBOCK, TEXAS

Characteristics based upon pumping clear, non-aerated water. Rating point only is guaranteed. Column losses not included.

MODEL
14RJL(

DATE
May 2, 1988
SUPERCEDES
July 22, 197

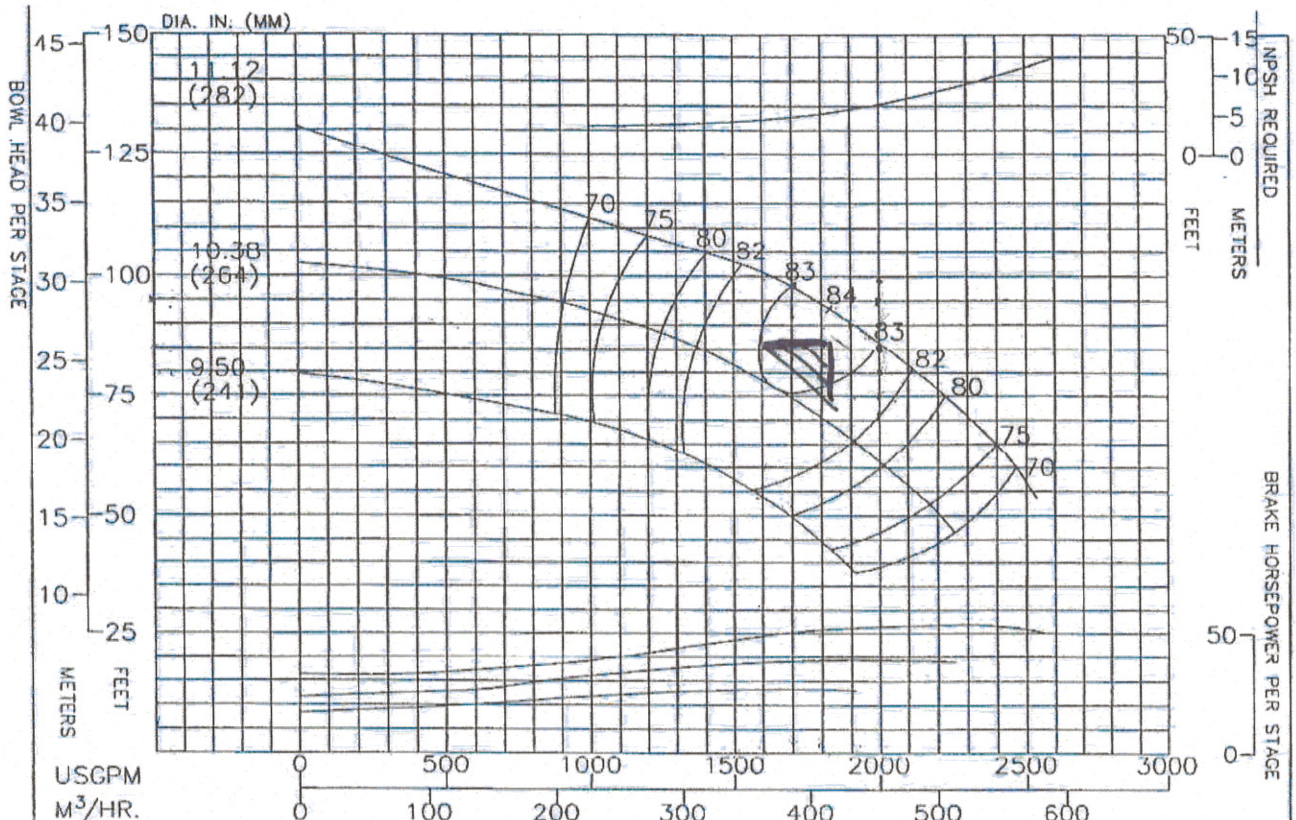
FLOWSERVE

32.57.00

WLB WELL

01-Apr-2001
NEW SHEET

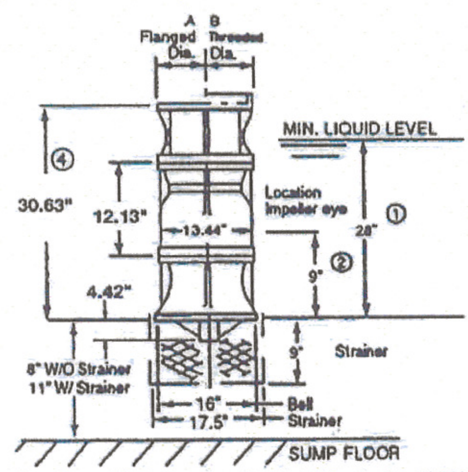
14EMM IMPELLER CURVES



PERFORMANCE BASED ON PUMPING CLEAR WATER BELOW 85F. WITH LISTED MATLS. COLUMN LOSSES NOT INCLUDED.	CHANGE STAGES	IN EFF. POINTS	Ingersoll-Dresser Pumps	THRUST FACTORS AT BEP			RPM	PUMP
				IMPELLER	LBS/FT	KG/M	1775	14EMM
BOWL – CAST IRON – LINED	1	-4		STANDARD	8.41	12.5	ENCLOSED IMPELLER	CURVE NO.
IMPELLER – BRONZE	2	-2		BALANCED	---	---		87028718
	3	0		EYE AREA– 25.3 SQ. IN.			N_s = 2450	

Column	Nom. Size	Max. GPM	"A" Flanged	"B" Threaded
Optional	8"	1500	11.50"	11.50"
Standard	10"	3000	15.00"	11.62"
Optional	12"	5000	16.00"	13.75"
RATINGS				
Max. Pressure = 392 psi based on Class 30 Iron bowls				
Impeller and Shaft Weight = 37.0 pounds per stage				
Pump Shaft	Diameter = 1.94 inches			
	Max. HP. = 293 with 416 SS Pump Shaft			
Line Shaft Size	1.25	1.50	1.69	1.94
Line Shaft H.P.	77	133	192	293

Additional Data	
Max. Operating Speed.	2100
Max. No. of Stages	10
Max. Sphere Size	.50
End Play	.75
WR 2 Per Stage	2.61
Bowl Ring Clearance	.004 - .006
Impeller Running Clearance (3)	.250



(1) Minimum submergence required to prevent vortex formation. The submergence needed to provide adequate NPSH to the first stage. Impeller may be greater or less than shown. The larger of the two values must be used to determine actual minimum allowable submergence.

(2) Location of eye of first stage impeller. Used to calculate NPSH. This is also the minimum priming submergence. (See note 1).

(3) Vertical Impeller to Bowl running clearance after shaft stretch.

(4) For Suction Case dimensions see sheets 20.26 and 20.29.

All Prices FOB Hastings, Ne and Subject to Change Without Notice.

7 STAGES TO PRODUCE [illegible] 170' TDH