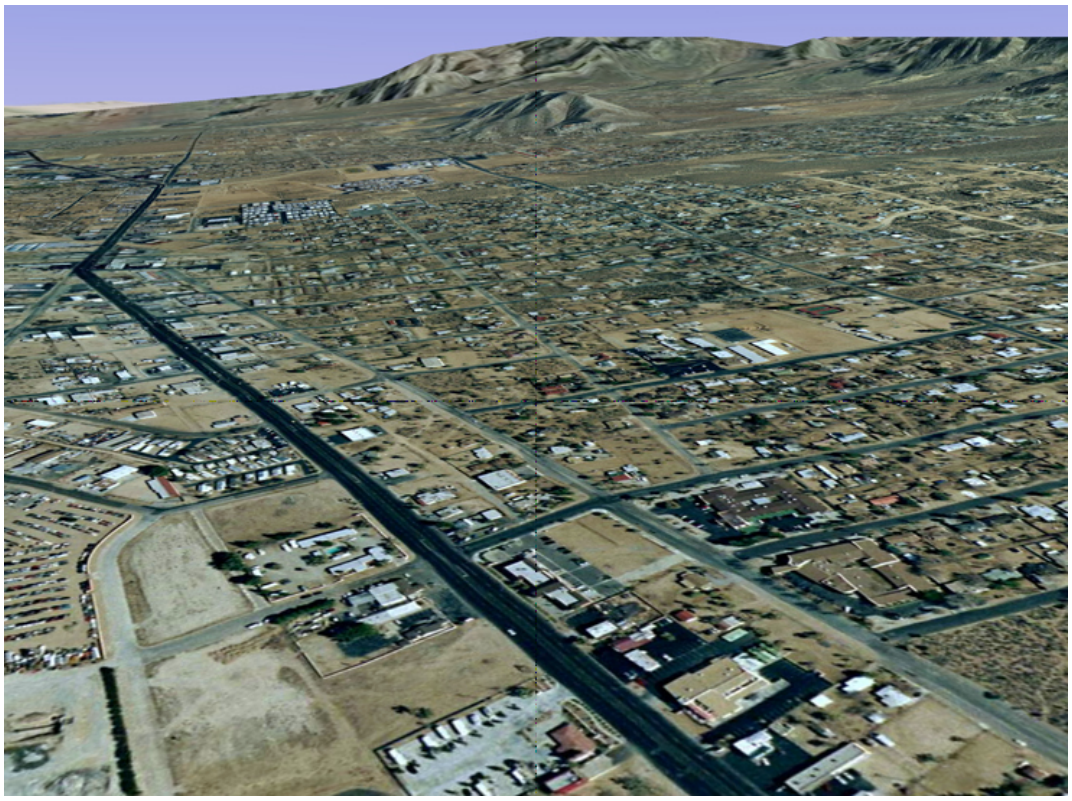


Hi-Desert Water District

Final Report

Water System Master Plan

July 2007

MWH

HI-DESERT WATER DISTRICT

Section 2
Summary of Existing Water System

This section describes the existing water system facilities and MWH's understanding of the existing water system based on the information provided by the District.

SUMMARY OF EXISTING SYSTEM

The District provided detailed information for many facilities such as reservoirs, boosters, wells etc. MWH also extracted pertinent information from the District's 2001 Water Master Plan prepared by John Egan and Associates Inc. Based on this information a summary of the existing system is prepared and presented below.

The existing water system consists of 16 storage reservoirs, 26 booster pumps at 10 booster stations, 18 groundwater wells, 21 pressure-reducing valves, and approximately 312 miles of pipeline. A summary of the water system components is shown in **Table 2-1**. The locations of the water facilities are shown on **Figure 2-1**. A hydraulic schematic representation of all of the facilities is presented on **Figure 2-2**.

Table 2-1
Table Summary of Water Distribution System Components

Facility Type	Count
Storage Reservoirs	16
Booster Pump Stations	10
Groundwater Wells (active)	14
Groundwater Wells (inactive/standby)[1]	4
Emergency Inter-agency Connections	2
Pipeline (miles)	312
Pressure Reducing Valves	16

(1) Information is compiled from data provided by the District

Pressure Zones

The current water system is divided into 17 pressure zones. The hydraulic gradient for each pressure zone is determined by the high water level of the reservoirs feeding the zone. The names of the pressure zones and their respective hydraulic characteristics are listed in **Table 2-2** and the pressure zone boundaries are shown on **Figure 2-1**.

Table 2-2
Hi-Desert Water District Pressure Zones

Pressure Zone Name	Hydraulic Grade Line (feet)	Ground Elevation Range (feet)	Static Pressure Range[(1)] (psi)
3300	3300	-	-
3350	3350	-	-
3495	3495	3260-3400	41-102
3589	3589	3360-3500	39-100
3600	3600	3362-3540	26-104
3682	3682	3380-3580	44-131
3690	3690	3300-3600	39-169
3715	3715	3430-3600	50-123
3797	3797	3480-3735	27-137
3827	3827	3520-3680	63-133
3854	3854	3540-3754	43-130
3891	3891	3560-3860	13-143
3930	3930	3560-3760	74-160
4010	4010	3700-3900	47-138
4028	4028	3680-3940	38-150
4153	4153	3880-4000	66-118
4200	4200	3890-4100	43-134

Source: All information in Table 2 is derived from the hydraulic schematic provided by the District.
(1) Calculated based on HGL and ground elevation range

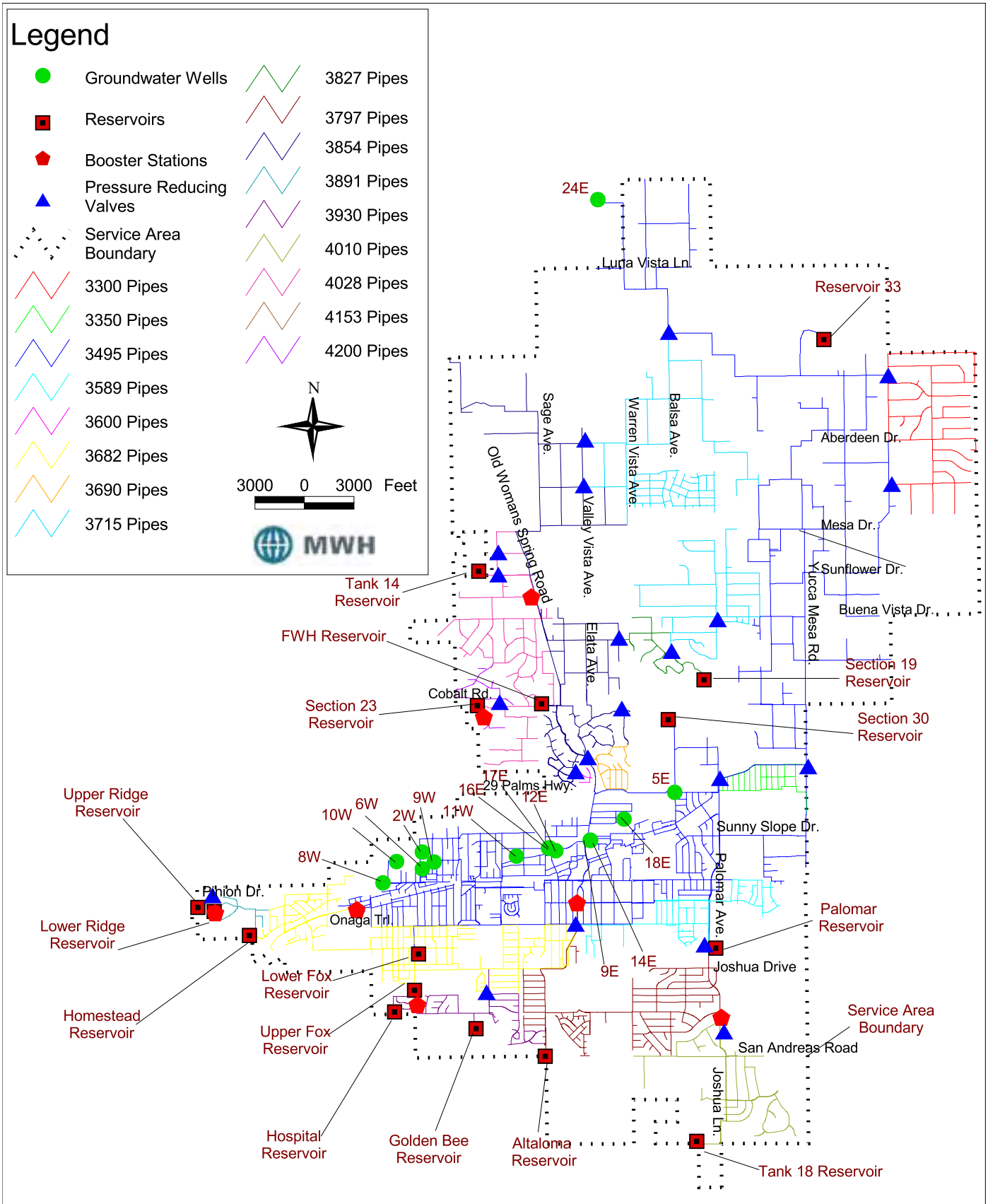
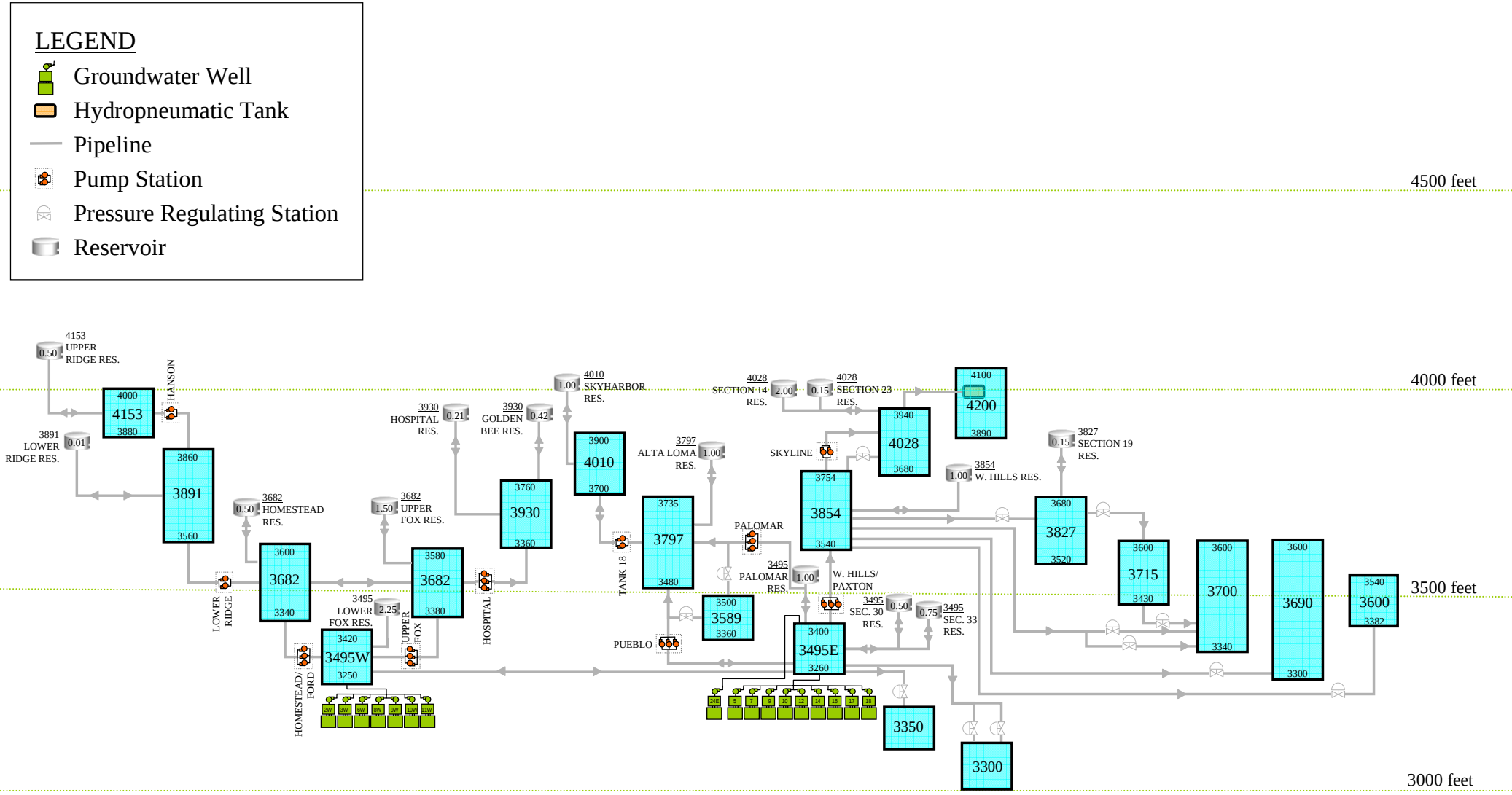


Figure 2-1
Existing Water System Facilities and Service Area Map



Approximate Elevation
Above Mean Sea Level

MWH

Figure 2-2
Existing System Hydraulic Schematic

Groundwater Wells

There are 18 groundwater wells within the District's water system. Fourteen of these 18 groundwater wells are active. The physical and operational data of the District's wells are summarized in **Table 2-3,** and the location of the groundwater wells are shown on **Figure 2-1**. The total capacity of the 14 active wells is approximately 6,500 gpm (10.8 mgd).

As the District did not have manufacturer's curves for any of the groundwater wells, all information presented in Table 3, except for design well capacities, is obtained from the Southern California Edison (SCE) pump efficiency test points. Ten of the 18 groundwater wells in the District's water system are located in the 3495E Zone, while the remaining wells are located in the 3495W Zone. The SCE test capacities and total head data are used in the model for system analysis.

Table 2-3
Groundwater Well Characteristics

No	Location	Status	Capacity (gpm)[1]	Capacity (gpm)[2]	Total Head (feet)[2]
Pressure Zone 3495 East					
#5E	Balsa Ave and Paxton Rd	Active	150	157	474
#7E	Theatre Rd	Inactive	700	700[3]	-
#9E	District Yard	Active	400	357	202
#10E	Mesa Dr.	Inactive	100	100[3]	-
#12E	Cassia Dr.	Active	1,200	1,467	217
#14E	District Yard	Active	700	658	240
#16E	Sage Ave. South of Little League Dr.	Active	270	219	301
#17E	Sage Ave. South of Little League Dr.	Active	400	380	220
#18E	Crestview Dr.	Active	270	269	616
#24E	Warren Vista	Active	800	689	653
Capacity for Zone 3495E			**4,990**	**4,996**	n/a
Pressure Zone 3495 West					
#2W	Pioneer Town Rd. & Sunland Dr.	Active	100	96	ND[4]
#3W	Off of Church St., N. of 29 Palms Hwy.	Inactive	80	80[3]	ND
#5W	Luna Vista Ln.	Inactive	90	90[3]	ND
#6W	Coyote Tr.	Active	425	428	547
#8W	Yucca Tr.	Active	250	238	ND
#9W	Sunland Dr., W. of Cherokee Tr.	Active	800	837	556
#10W	Sunland Dr., W. of Miami Tr.	Active	220	251	551
#11W	Cassia Dr.	Active	550	1,017	539
Capacity for Zone 3495W			**2,515**	**2,947**	-
Total Well Capacity for the System (active wells)			**6,535**	**7,063**	-
Total Well Capacity for the System (all wells)			**7,505**	**8,033**	-

(1) Design capacities provided by the District.
(2) Information obtained from SCE pump test points.
(3) Design capacities used where SCE test capacities were not available.
(4) ND = No Data.

Inter-Agency Connections

The District's water system is connected with the Bighorn-Desert View Water District with a pump intertie, which is no longer functional. The pumps at this intertie were decommissioned in 1995. There is a valve at this location, through which the District can transfer water to Bighorn-Desert View Water District. The District also has an emergency intertie arrangement with the Joshua Basin Water District. Water can be transferred from Joshua Basin Water District to HDWD through hydrant transfer via temporary pump and hose connections. **Table 2-4** summarizes the attributes of the inter-agency connections and their locations are shown on **Figure 2-1**.

Table 2-4
Emergency Inter-Agency Connections

No.	General Location	From	To
1	One mile N. of northern boundary of District's Service Area on Old Woman Springs Road.	HDWD	Bighorn Desert View Water Distirct
2	On Marvin Dr., S. of Security Drive and 1 mile E. of Yucca Mesa Rd.	Joshua Basin Water District	HDWD

Source: 2001 WMP Update (John Egan and Associates, 2000).

Booster Pumping Stations

The District operates 10 booster pumping stations comprising of 26 pumping units. The individual booster pump capacities vary from about 80 gpm to 525 gpm. Details of each booster station are summarized in **Table 2-5**. The booster pump locations are shown on **Figure 2-1.**

Table 2-5
Booster Pumping Stations Characteristics

Booster Pump	Pump (hp)	Total Head (ft)	Avg. Cap. (gpm)	Suction Zone	Discharge Zone
Upper Ridge Booster 1	10	255	82	3891	4153
Upper Ridge Booster 2	10	254	94	3891	4153
Homestead Booster 1	40	226	374	3495	3682
Homestead Booster 2	40	228	365	3495	3682
Homestead Booster 3	40	222	334	3495	3682
Hospital Booster 1	40	240	291	3682	3930
Hospital Booster 2	40	238	287	3682	3930
Hospital Booster 3	30	223	234	3682	3930
Lower Ridge Booster 1	ND[2]	230	113	3682	3891
Lower Ridge Booster 2	ND	222	86	3682	3891
Alta Loma Booster 4	40	261	185	3495	3797
Alta Loma Booster 5	40	277	207	3495	3797
Alta Loma Booster 6	40	251	308	3495	3797
Alta Loma Booster 1	40	282	237	3495	3797
Alta Loma Booster 2[1]	40	282	237	3495	3797
Alta Loma Booster 3	40	282	101	3495	3797
Tank 14 Booster 1	25	185	336	3854	4028

Table 2-5 (Cont'd)
Booster Pumping Stations Characteristics

Booster Pump	Pump (hp)	Total Head (ft)	Avg. Cap. (gpm)	Suction Zone	Discharge Zone
Tank 14 Booster 2[(1)]	25	185	336	3854	4028
Tank 18 #1	ND	234	307	3797	4010
Tank 18 #2	ND	233	320	3797	4010
Upper Fox Booster 1	ND	192	459	3495	3682
Upper Fox Booster 2	ND	194	427	3495	3682
Upper Fox Booster 3	ND	169	309	3495	3682
FWH Booster 1	75	298	379	3495	3854
FWH Booster 2	75	314	474	3495	3854
FWH Booster 3	75	323	523	3495	3854
Nitrate Plant Booster 1	ND	250	780	3495	3854
Nitrate Plant Booster 2	ND	263	760	3495	3854
Blending Tank Pump 1	ND	260	400	3495	3854
Blending Tank Pump 2	ND	260	1,000	3495	3854
#26 Pneumatic	ND	182	200	4028	4200

Source: SCE Pump Test Points provided by the District
(1) Assumed values based on other pump units at the site
(2) ND = No Data

Water Storage Reservoirs

There are sixteen storage reservoirs within the District with capacities ranging from 0.15 million gallons (MG) to 2.2 MG as shown in **Table 2-6**.

Table 2-6
Storage Reservoir Characteristics

Reservoir Name	Pressure Zone	Bottom Elev. (feet)	Diameter (feet)	Height (feet)	Capacity (MG)	Year of installation
Tank 14	4028	4,004	120	24.8	2.00	1983
Tank 18	4010	3,986	85	24	1.00	1986
Section 19	3827	3,803	34	23	0.15	1966
Section 23	4028	3,999	24	33	0.15	2003
Section 30	3495E	3,477	70	18	0.50	1969
Section 33	3495E	3,456	75	24	0.75	1973
Palomar	3495E	3,471	85	24	0.98	1978
FWH	3854	3,830	85	24	0.98	1978
Alta Loma	3797	3,773	85	24	1.00	1977
Golden Bee	3930	3,906	55	24	0.42	1988
Hospital	3930	3,906	39	24	0.21	ND[(1)]
Homestead	3682	3,643	60	24	0.50	2000
Lower Fox	3495W	3,455	98	40	2.22	1992
Upper Fox	3682	3,643	80	40	1.50	1992
Lower Ridge	3891	3,880	18.5	16	0.01	1992
Upper Ridge	4153	4,129	60	24	0.50	ND
Total Capacity					**12.9**	

Source: Data provided by the District and 2001 Water Master Plan
(1) ND = No Data

The District has a total reservoir storage capacity of approximately 13 MG. The hydraulic gradient in each pressure zone is controlled by the high water elevation of the reservoirs that feed the zone. **Table 2-6** shows the details of the District's storage reservoirs. Their locations are shown on **Figure 2-1.**

In addition to these storage reservoirs, there is a 500-gallon hydropneumatic tank that serves the 4200 pressure zone.

Nitrate Removal Plant and Blending Facility

Water from Wells 12E and 17E is treated at the nitrate removal facility. The facility has a capacity of 2,500 gpm, and consists of a raw water holding tank (62,000 gal), ion-exchange units, a finished water tank (62,000 gal.), and booster pumps. The treated water is blended with water from Well 16E in the finished water tank before being pumped into the system by # booster pumps with a combined capacity of about 1,600 gpm.

The District also operates a blending facility (42,000 gal.) to blend water from Wells 9E and 14E. Two booster pumps, downstream of the blending tank, with a combined capacity of 1,400 gpm, pumps the water into the system.

Pressure Regulating Stations

There are 16 active pressure-regulating stations in the District's water service area as shown in **Table 2-7**. Most pressure-regulating stations have two or more pressure reducing valves (PRV's); a main valve and one or more bypass valve(s).

Table 2-7
Pressure Regulating Stations

Station No.	Address	From Zone	To Zone	Diameter (inch)	Pres. Setting (psi)
PRS2	Olympic Rd. and Sunny Sands Dr.	3495	3300	6, 2	45
PRS3	Aberdeen Dr. and Valley Vista Ave.	3854	3715	6	32
PRS4	Campanula St. & Valley Vista Ave.	3854	3715	6	30
PRS7	Chipmunk Tr. & Faith Ln.	3854	3827	6, 2	106
PRS8	Balsa Ave. & Hilton Ave.	3827	3715	4	50
PRS10	Suerte Rd. & Old Woman Springs Rd.	3854	3690	4, 2	65
PRS12	Onaga Tr. & Joshua Ln.	3797	3589	1.5, 4	75
PRS13	Palomar Ave. at Palomar Reservoir	3797	3589	1.5, 4	32
PRS14	Avalon Ave. & Barron Dr.	3495	3350	8, 2	48
PRS15	Campanula St. & Olympic Rd.	3495	3300	6, 2	30
PRS16	Barron Dr., & Yucca Mesa Rd.	3495	3350	8, 2	82
PRS17	Farrelo Rd.	3854	3600	4	50
PRS18	Cholla Ave. & Carlyle Dr.	3930	3682	4	60
PRS20	Pinon Dr. & Ridge Rd.	4153	3891	4	32
PRS21	Manzanita Dr. & Bandera Rd.	3854	3854	6, 2	62
PRS22	At Tank 23 (Hydropneumatic)	4200	4028	12	90

Source: Data provided by the District

Table 2-7 summarizes the details of all pressure regulating stations. The pressure regulating stations are shown on **Figure 2-1**. The diameters shown in the table are diameters of the PRVs, and the pressures shown are pressures at the discharge end of the PRVs.

Distribution System Network

The District's distribution system network consists of approximately 312 miles of pipeline, which range from 2-inches to 12-inches in diameter. The distribution of pipeline diameters is summarized in the numbers presented in **Table 2-8**. It should be noted that the numbers presented in **Table 2-8**, are based on the pipelines included in the hydraulic model only. They do not include all service laterals and the majority of the pipelines of less than 4-inch in diameter.

As shown in **Table 2-8**, about 72 percent of the distribution system network consists of 6-inch and 8-inch diameter pipes, while approximately 15 percent of the distribution system network is comprised of pipes that are greater than 8-inches in diameter. All pipes that have a diameter of 12-inch are defined as transmission mains. Approximately 9 percent of the distribution system network is characterized as transmission mains. All pipelines whose diameters are not known are assigned diameters based on MWH's engineering judgement and by consultation with the District staff wherever possible.

Table 2-8
Summary of Pipelines by Diameter

Diameter (inches)	Total Length (feet)	Total Length (miles)	Percentage of Total Length (%)
Less than 4	39,748	7.5	2.4%
4	186,245	35.3	11.3%
6	544,508	103.1	33.0%
8	642,166	121.6	38.9%
10	96,319	18.2	5.8%
12	139,399	26.4	8.4%
Unknown	1,805	0.3	0.1%
Total	**1,650,191**	**312.5**	**100.0%**

Source: Data provided by the District GIS

Majority of the pipes in the District's water distribution system network is installed between year 1960 and year 2005. The distribution of pipe age is shown in **Table 2-9**.

Table 2-9
Summary of Pipelines by Installation Period

Installation Period	Length (feet)	Length (miles)	Total (percent)
1961-1970	89,673	17.0	5.4%
1971-1980	292,037	55.3	17.7%
1981-1990	198,149	37.5	12.0%
1991-2000	89,752	17.0	5.4%
2001-present	51,641	9.8	3.1%
Unknown	928,940	175.9	56.3%
Total Length	**1,650,191**	**312.5**	**100.0%**

Source: Data provided by the District GIS

As shown in **Table 2-9** approximately 56 percent of the pipelines have an unknown year of installation. **Table 2-10** summarizes the total lengths of pipelines by material type. Approximately 0.3 percent of the pipelines are of unknown material. These pipelines will be assigned a material by consultation with the District staff wherever possible.

Table 2-10
Summary of Pipelines by Material

Material	Total Length (feet)	Total Length (miles)	Total Length (percent)
Asbestos Cement	602,364	114.1	36.5%
Concrete Mortar Lined and Wrapped Steel	2,765	0.5	0.2%
Ductile Iron	4,249	0.8	0.3%
Galvanized Steel	517	0.1	0.0%
Plastic	33,683	6.4	2.0%
Poly Vinyl Chloride	219,888	41.6	13.3%
Steel	778,956	147.5	47.2%
Welded Steel	2,112	0.4	0.1%
Unknown	5,655	1.1	0.3%
Total Length	**1,650,191**	**312.5**	**100.0%**

Source: Data provided by the District GIS

CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis of data collected for the District's existing system, the following observations and recommendations are made:

- District's Geographical Information System (GIS) has some deficiencies in terms of accuracy of data for street centerlines and ground elevations. It is recommended that the District update their GIS and perform a thorough quality assurance/check to improve the accuracy of the GIS database.
- Some of the District owned facilities such as booster station, PRVs, wells, etc. are not entirely integrated with the SCADA system. Monitoring and recording flow rate and

pressure at these facilities is critical to understanding the system operations. It is recommended that the District enhance their SCADA system with the above improvements.