Public Version

California Water Service Company

Water Supply and Facilities Master Plan

Rancho Dominguez District

- Dominguez District
- Hermosa-Redondo District
- Palos Verdes District

Volume I—FINAL REPORT

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Abbreviations

$/AF	dollars per acre-foot
AC	Asbestos Cement
AF	acre-feet
AFY	acre-feet per year
AWWA	American Water Works Association
bgs	below ground surface
BMP	best management practice
BO	biological opinion
BP	British Petroleum
Cal Water	California Water Service Company
CCP	Concrete Cylinder Pipe
CDM	Camp Dresser & McKee Inc.
cfs	cubic feet per second
CI	Cast Iron
CICL	Cast Iron Cement Lined
CLC	Cement Lined and Coated
CLW	Cement Lined and Wrapped
CU	Copper
CUWCC	California Urban Water Conservation Council
Delta	Sacramento-San Joaquin Delta
DI	Ductile Iron
DWR	California Department of Water Resources
ENR CCI	Engineering New Records Construction Cost Index
ESC	Emergency Storage Credit
F	Fahrenheit
fps	feet per second
ft	feet
FY	fiscal year
GALV	Galvanized Steel
GIS	geographic information system
gpd	gallons per day
gpm	gallons per minute
H_2S	hydrogen sulfide
HDPE	High Density Polyethylene

HGL	hydraulic gradeline
Hyperion	City of Los Angeles Hyperion Treatment Plant
IPCC	United Nations Intergovernmental Panel on Climate Change
LACFD	Los Angeles County Fire Department
LACSD	Los Angeles County Sanitation District
MCL	maximum contaminant level
MDD	Maximum Day Demand
MG	million gallons
mg/L	milligrams per liter
mgd	million gallons per day
MOU	Memorandum of Understanding
MWD	Metropolitan Water District of Southern California
NIU	Newport-Inglewood Uplift
NPV	net present value
O&M	operations and maintenance
PRV	pressure reducing valve
psi	pounds per square inch
PUC	California Public Utilities Commission
PVC	Polyvinyl Chloride
RO	reverse osmosis
SCAG	Southern California Association of Governments
SF	square feet
STL	Steel
SWP	State Water Project
TAZ	traffic analysis zone
TDH	Total dynamic head
TDS	total dissolved solids
TOC	total organic carbon
TR	Transite
UWMP	Urban Water Management Plan
WBMWD	West Basin Municipal Water District
WBWRF	West Basin Water Recycling Facility
WCBBP	West Coast Basin Barrier Project
WRD	Water Replenishment District of Southern California
WTP	water treatment plant

μg/L	micrograms per liter

Executive Summary

California Water Service Company (Cal Water) is the largest investor-owned water utility in the western United States serving over 1.7 million people in 75 communities, with 21 districts throughout California. Cal Water has provided water service to portions of the Rancho Dominguez District since 1926. The Rancho Dominguez District serves a combined population of more than 300,000 people in the communities that include large portions of the Cities of Carson and Torrance; small portions of the Cities of Compton, Lomita, Long Beach, and Los Angeles; portions of unincorporated Los Angeles County; and the entire cities of Hermosa Beach, Redondo Beach, Palos Verdes Estates, Rancho Palos Verdes, Rolling Hills, and Rolling Hills Estates.

Purpose of the Master Plan

Cal Water developed this master plan for its Dominguez, Hermosa-Redondo, and Palos Verdes Districts to identify district-level Capital Improvement Programs and to provide a comprehensive, strategic-level overview of water supply planning, leading to a more efficient and reliable use of the Districts' water supplies. The planning timeframe for this study extends to 2030.

Future Land Use and Water Demand Projections

See Sections 2 and 3 for more detailed information.

Table ES-1 presents 2005 average day demand in the each district.

Table ES-1
2005 Demands in the Rancho Dominguez District

District	Average Day Demand (million gallons per day [mgd])	Annual Demand (acre-feet per year [AFY])
Dominguez	36.0	40,320
Hermosa-Redondo	12.8	14,336
Palos Verdes	18.3	20,496
Total	67.1	75,152

Table ES-2 summarizes recommended planning-level 2030 demands for the Rancho Dominguez District. Multiple demand scenarios were developed based on various scenarios of service growth rates and unit demand rates. Table ES-2 also summarizes the lowest, average, and maximum demand projection for each district.

Table ES-2 Range of 2030 Demand Projections for the Rancho Dominguez District					
	District Demand (mgd)			Total Demand	
	Dominguez	Hermosa-Redondo	Palos Verdes	mgd	AFY
Lowest Projection	51.4	14.1	19.1	84.6	94,752
Average Projection	58.7	14.7	20.2	93.6	104,795
Highest Projection	67.1	15.5	21.2	103.8	116,256
Recommended Planning-Level Demand	**51.4**	**14.5**	**20.3**	**86.2**	**96,544**

The planning-level demand for this master plan is based on the 10-year average service growth rates, which best reflect recent growth trends, and the 5-year average unit demands, which reflect recent trends in customer water use.

The demand projections are informed by land use and development projections obtained from the local planning agencies of the cities and county included in the Rancho Dominguez District.

Current Water System Facilities

The Dominguez District water system has 4 pressure zones supplied from 7 turnouts from Metropolitan Water District of Southern California's (MWD) system, served through West Basin Management District's (WBMWD) system.

The Hermosa-Redondo District water system has 7 pressure zones supplied from 4 turnouts from MWD's system.

For more information, see:

- ***Section 4 for Dominguez District***
- ***Section 5 for Hermosa-Redondo District***
- ***Section 6 for Palos Verdes District***

The Palos Verdes District water system has 101 pressure zones supplied from 4 MWD turnouts.

Water Supply Strategy

It is recommended that Cal Water pursue a supply strategy for the Rancho Dominguez District that includes an array of supply options for flexibility and reliability. MWD imported water will continue to be the primary supply. Additional supplies of groundwater and increased amounts of recycled water and conservation will supplement MWD imported water supply.

For more information, see:

- ***Section 8 for Water Supply Requirements***
- ***Section 9 for Water Supply Strategy***

The recommended supply portfolio for the entire Rancho Dominguez District includes:

- Additional conservation (2.2 mgd): planned (2008-2010) conservation levels in each district and expanded conservation efforts in the Palos Verdes District
- Recycled water (4.1 mgd): existing and short-term (the next two to three years) recycled water
- Existing groundwater wells (10.1 mgd): increased efficiency in the short-term and reduced capacity in the long-term due to wells reaching their useful life
- Additional wells (8.7 mgd): five to seven new wells would be required, which may represent a challenge for land acquisition
- Imported supply (61.2 mgd): imported supply would be available under most hydrologic conditions, but it is estimated that in extreme drought conditions the supply would be limited and the Rancho Dominguez District's deficit could be around 8 percent.

The options considered for the future supply portfolios to meet 2030 demands include planned and expanded conservation, short-term and long-term recycled water, new groundwater wells to maximize use of Cal Water's groundwater rights, and additional imported supply from MWD. Water supply portfolios were developed by combining supply options and different levels of implementation for those supply options, and then adding those future options to the projected supply baseline.

For the water supply evaluation, six portfolios were developed all of which include imported water as the source that is used to meet the demands remaining after the inclusion of other sources:

- **Portfolio 1 – Current Mix**: This portfolio uses the current supply mix and levels and adds conservation to include Cal Water's planned 2008, 2009 and 2010 levels of conservation.
- **Portfolio 2 – Maximize Groundwater**: This portfolio builds upon Portfolio 1 by adding new wells to maximize groundwater rights.
- **Portfolio 3 – Maximize Groundwater and Recycled Water**: This portfolio is the same as Portfolio 2, with the addition of recycled water levels to the maximum level projected for the long-term.
- **Portfolio 4 – Maximize Local Sources**: This portfolio is based on the maximum use of groundwater, conservation and recycled water.

- **Portfolio 5 – Hybrid 1**: This portfolio maximizes the use of groundwater rights with new wells and assumes planned levels of conservation and short-term levels of recycled water.

- **Portfolio 6 (Recommended Strategy) – Hybrid 2**: This portfolio maximizes the use of groundwater, adds the expected short-term levels of recycled water, includes planned levels of conservation in the Dominguez and Hermosa-Redondo Districts, and maximizes conservation in levels in the Palos Verdes District. This portfolio is similar to Hybrid 1, but has an emphasis on conservation in the Palos Verdes District to evaluate potential benefits of managing the demands in the district with the most challenges for future supply infrastructure. This portfolio's emphasis on local supply options will also assist Cal Water in managing potential imported water shortages from MWD cutbacks.

The portfolios were evaluated based on reliability, cost, and implementation criteria, in order to select the recommended approach.

Water System Analysis

An analysis of each water system was conducted to determine required improvements. The analysis used a computerized hydraulic model of the water system that was developed and calibrated as part of this master plan study. In addition, reliability evaluations of each system were conducted, and replacement needs for aging facilities were identified.

The water system analyses were based on performance criteria as prescribed by California Public Utilities Commission General Order 103 that specifies rules governing water service for private water companies, and Cal Water's established criteria.

For more information, see:

- ***Section 7 for System Performance Criteria***
- ***Section 10 for Water Supply Analysis – Dominguez District***
- ***Section 11 for Water System Analysis – Hermosa-Redondo District***
- ***Section 12 for Water System Analysis – Palos Verdes District***

Key Analysis Findings for Dominguez District

Key findings from the water system analysis are summarized below for the Dominguez District.

- **Future Demands.** The 2030 average day demand is 51.4 mgd, 15.4 mgd higher than existing demand. Most of the increase in demand occurs in Zone II. Associated maximum day demand is estimated at 77.1 mgd, based on a maximum day to average day peaking factor of 1.5. This peaking factor is based on review of 2005 through 2007 daily records for MWD supply and weekly records for other supplies, which indicate that the peaking factor ranges from 1.27 to 1.45.

- **MWD Turnout Capacity.** The MWD turnouts have a total capacity of 90.5 mgd. Capacity improvements to the pipelines in the vicinity of turnout WB-10 are recommended to achieve the maximum capacity of the turnouts. In addition, the analysis assumes that the capacity of WB-36, currently 10 mgd, can be increased to 13 mgd. If capacity cannot be increased at this turnout, Cal Water may need additional piping improvements to maximize capacities of other turnouts in the system, particularly WB-14.

- **Pumping Capacity.** Existing firm pump station capacity is insufficient to meet 2030 peak hour demands for pump stations serving zones without gravity storage. An additional 8.1 mgd capacity is required; 3.2 mgd is needed for Zone I and 4.9 mgd is required for Zone III. (The evaluations assumed that Hermosa-Redondo Interties and WB-35 turnout are offline.)

  Pump Stations 203 and 232 have fixed speed pumps, pumping to zones with no storage on the discharge side of the pump station. Variable frequency drive motors are recommended for both stations. Remote pressure monitoring is also recommended for Station 232, so that the pump station can better control zone pressure.

- **Storage Capacity.** An additional 42.1 million gallons (MG) of storage is required in Zones I, II, and III (storage calculations combine Zones II and III) for 2030 conditions. Zone IV is assumed to not require storage, since the zone is fed by a pressure reducing valve (PRV) for local refinery use only. Zone I has a storage deficit of 3.4 MG. Zones II and III have a storage deficit of 38.7 MG, approximately half of which can be met by the addition of standby power at all well stations.

  The additional storage required is primarily needed for emergency supply. Installation of standby generation capacity at pump stations or wells that supply zones deficient in storage provides equivalent reliability to customers and reduces storage needs. Adding standby generators at all existing and future wells reduces the storage requirement from 42.1 MG to 22.1 MG.

- **PRV Capacity**. There is only one zone, Zone III, served solely by a PRV, which has adequate capacity to meet existing demands. Potable use is anticipated to decrease, as customers use more recycled water in the future.

- **Pipeline System.** In general, the hydraulic capacity of the existing distribution system is adequate for 2030 demand conditions. There are two pipeline capacity improvements needed to meet normal operating conditions, to improve hydraulic capacity in the vicinity of MWD turnouts. Pressure deficiencies are in the southern portion of Zone II, due to the inadequate hydraulic capacity from MWD turnouts, and from supply wells and Station 203 reservoir in the northeastern part of Zone II. The new supply wells will also be located in the northeastern part of the system. New transmission capacity is needed to distribute water more effectively from the wells, storage, and MWD turnouts.

Approximately 1.5 miles of transmission pipelines will be needed to meet 2030 maximum day demand. The pipeline improvements focus on increasing transmission capacity from MWD turnout WB-10 to the southern portion of Zone II.

- **Reliability Evaluation.** To increase the reliability of the supply to Zone II, an expansion of WB-36 turnout from 10 mgd to 13 mgd is required. If this turnout cannot be expanded, other pipeline improvements will be required to adequately serve Zone 2.

- **Replacement Evaluation.** Evaluation of installation date and visual assessment of existing pumping facilities inspected in the Dominguez District concluded that nine booster and well pump stations have condition related issues, and are in need of replacement of mechanical and/or electrical equipment. In general, the existing storage facilities inspected are in good working condition.

Key Analysis Findings for Hermosa-Redondo District

Key findings from the water system analysis are summarized below for the Hermosa-Redondo District.

- **Turnout Capacity**. There is excess peak capacity to meet maximum day demand from MWD turnouts and wells.

- **Pumping Capacity**. Existing firm pump station capacity is sufficient to meet 2030 maximum day demands for all pump stations.

- **Storage Capacity**. A combination of new storage (0.9 MG in Zone 300-2; replacement of existing Station 24 0.25 MG tanks with 0.65 MG) and standby generation capacity at four stations (Stations 9, 14, 23 and 28) is recommended to meet operational, fire, and emergency needs. Standby power should be added to all three existing wells to improve supply reliability during emergencies.

- **PRV Capacity**. There is only one pressure zone solely served by a PRV station, Zone 250. The existing PRV station does not meet existing or 2030 fire flow requirements. The network in this pressure zone does not have enough capacity to convey the required flow; therefore, an upgrade to the PRV station is not recommended.

- **Pipeline System**. In general, the hydraulic capacity of the existing distribution system is adequate for 2030 demand conditions; there are few capacity improvements needed to meet normal operating conditions. There is one recommendation for the pipeline system to improve the pressure in the line on 190th Street by installing a new 6-inch diameter pipe.

- **Reliability Evaluation**. No reliability improvements are recommended for the Hermosa-Redondo system, other than recommended locations for standby power, discussed in the Storage Capacity Evaluation.

- **Replacement Guidelines.** Evaluation of installation date and visual assessment of existing pumping facilities inspected in the Hermosa-Redondo District concluded that seven pump stations have condition related issues, and are in need of replacement of mechanical and/or electrical equipment. In general, the existing storage facilities inspected are in good working condition. Replacement is recommended for Reservoir 8 tanks that are very old redwood tanks with some wood deterioration around the base.

Key Analysis Findings for Palos Verdes District

Key findings from the water system analysis are summarized below for the Palos Verdes District.

- **Turnout Capacity**. There is adequate peak capacity to meet maximum day demand from MWD turnouts.

- **Pumping Capacity.** Additional pumping capacity is required in all subsystems with gravity storage, with the exception of the Reservoir 19 subsystem. In Zone P-1600, the combined capacity of the hydropneumatic pump stations (Stations 14 and 38) serving the zone have adequate firm capacity for peak hour demand.

- **Storage Capacity.** For the entire system, 20.3 MG additional storage is needed for existing conditions and 24.0 MG for 2030 conditions. This additional storage volume is assuming Time-of-Use pump operation conditions for Stations 22, 23, 30, and 37. Due to the limited number of locations available to site new storage within the District, a combination of 8.5 MG of new storage and standby power at key pump stations, to pump water from MWD's Palos Verdes Reservoir to distribution system service areas, is recommended

- **PRV Capacity.** For 23 pressure zones, the existing PRV capacity does not meet existing and 2030 supply requirements. Only eight of the 23 have adequate existing conveyance capacity for maximum day conditions.

- **Pipeline System**. The system analysis indicated eight areas where pressures during normal operation are below minimum levels. Additional piping and a change in pressure setting at a PRV station will resolve minimum pressure issues in the system.

  The system analysis indicated seven areas where the pressure is higher than maximum allowable levels. These high pressure areas are at the lowest elevations relative to the zone's hydraulic grade line, and occur due to the area's unique topography. New PRVs or adjustment of settings for existing PRVs are options to resolve maximum pressure issues in the system.

- **Reliability Evaluation**. Reservoir 20 could potentially be out-of-service due to unexpected events such as landslides or earthquakes. The planned Crenshaw and Ridge Supply Project addresses the lack of redundancy for the P-1450 cascade and providing a second feed to supply Reservoir 20.

- **Replacement Evaluation.** Evaluation of installation date and visual assessment of existing pumping facilities in the Palos Verdes District concluded that eight pump stations have condition related issues, and are in need of replacement of mechanical and/or electrical equipment. Existing storage facilities in the system are in generally good working condition.

Plan Recommendations

Two timeframes were used to phase the recommendations for the Rancho Dominguez District:

- Near-term (by 2015)

- Long-Term (2016 to 2030)

The phasing of the recommended plan is based on meeting the criteria established for the master plan. Actual implementation of specific projects will depend on Cal Water funding constraints.

For more information, see:

- ***Section 13.1 for Dominguez District – Recommended Improvements***
- ***Section 13.2 for Hermosa-Redondo District – Recommended Improvements***
- ***Section 13.3 for Palos Verdes District – Recommended Improvements***

Conceptual locations for future improvements are discussed at a conceptual master planning level of detail; siting studies have not been conducted as part of the master plan. The conceptual locations are generally assumed to be at existing Cal Water owned pump station or reservoir locations, where pipeline infrastructure already exists, or within public rights-of-way. Due to the developed nature of the districts, there are few potential new sites. Specific sites and alignments will be identified in subsequent Cal Water siting and predesign studies for project implementation.

In addition to other supply options that have been evaluated, it is recommended that desalination be assessed. Other water agencies in the Los Angeles area have already commenced feasibility studies of this source. To assess the feasibility of either participating in another agency's or developing a Cal Water desalination project to achieve reliability of supply objectives for the Dominguez, Hermosa-Redondo, and Palos Verdes Districts, it is recommended that a preliminary feasibility study be conducted during the coming year. If the initial analysis indicates that desalination appears feasible for Cal Water, then Cal Water should proceed with preparing a development plan outlining tasks, schedule and budget.

Dominguez District

The main sources of supply for the Dominguez District will continue to be imported surface water from MWD and groundwater wells. To maximize the use of Cal

Water's existing groundwater rights for all three districts in the West Coast and Central basins, a total of 5 to 7 new wells is needed. All wells are recommended to be constructed in the Dominguez District, due to its more favorable hydrogeology. Given the economic climate, it is likely that land costs in the Dominguez District have decreased, making potential groundwater sites more affordable. Cal Water should consider acquiring additional properties for future wells.

Some hydraulic capacity improvements will be needed to reinforce the existing distribution system due to anticipated growth within the district. The district is deficient in meeting emergency needs, and a combination of storage improvements and installation of standby power at several pump stations is recommended to provide supply reliability during emergencies. The district also includes aging facilities that will require replacement over time.

Table ES-3 summarizes the recommended improvements for the Dominguez District and the estimated capital costs and phasing for the improvements. Figure ES-1 shows the location of the recommended system improvements.

Hermosa-Redondo District

Supply for the Hermosa-Redondo District will continue to be imported surface water from MWD and wells. No supply improvements are recommended other than implementation of Cal Water's planned conservation and drought management programs.

In general, the hydraulic capacity of the existing distribution system is adequate through 2030, so there are few capacity improvements needed. The district is deficient in meeting emergency needs, and a combination of storage improvements and installation of standby power at several pump stations and all wells is recommended to provide supply reliability during emergencies. The Hermosa-Redondo District also includes aging facilities that will require replacement over time.

Table ES-4 summarizes the recommended improvements for the Hermosa-Redondo District and the estimated capital costs and phasing for the improvements. Figure ES-2 shows the location of the recommended system improvements.

Palos Verdes District

Supply for the Palos Verdes District will continue to be from imported surface water from MWD. No supply improvements are recommended for normal supply, other than implementation of Cal Water's planned conservation and drought management programs. In general, reinforcement of the existing Ridge system is required, both for system capacity and for reliability. The district is deficient in meeting emergency needs, and significant storage improvements are recommended. The Palos Verdes District also includes aging facilities that will require replacement over time.

Table ES-5 summarizes the recommended improvements for the Palos Verdes District and the estimated capital costs and phasing for the improvements. Figure ES-3 shows the location of the recommended system improvements.

Table ES-3
Summary of Recommendations for Dominguez District

Improvement ID	*Location/ Type of Improvement*	*Zone*	*Improvement Description*	*Estimated Total Capital Cost in 2009 Million $*	*Distribution of Costs by Timeframe ($ Million)*	
					Near Term (by 2015)	*Long-Term*
Local Supply Measures (see details in Sections 9.2 and 9.4)						
SU-01	Well ID1 - Walton Middle School	III	New well site at Walton Middle School in Zone 3. Conceptual location selected based on Supply Analysis (See Section 9.2.3)	$ 2.56	$ -	$ 2.56
SU-02	Well ID 3 - David Starr Jordan High School - Freshman Academy	II	New well site at David Starr Jordan High School - Freshman Academy in Zone 2.Conceptual location selected based on Supply Analysis (See Section 9.2.3)	$ 2.56	$ -	$ 2.56
SU-03	Well ID 7 - Canima Logistics Inc.	II	New well site at Canima Logistics Inc. in Zone 2.Conceptual location selected based on Supply Analysis (See Section 9.2.3)	$ 2.56	$ -	$ 2.56
SU-04	Station 215	II	New well at Station 215[1]	$ 2.06	$ -	$ 2.06
SU-05	Zone II location to be determined	II	New well site. Location in West Coast Basin to be determined.	$ 2.56	$ -	$ 2.56
SU-06	Zone 2 location to be determined	II	New well site. Location in West Coast Basin to be determined.	$ 2.56	$ -	$ 2.56
SU-07	Station 232	II	New well at Station 232[1]	$ 2.06	$ -	$ 2.06
SU-08	Long-term permanent conservation savings		Continue implementation of planned long-term conservation measures per Urban Water Management Plan. Evaluate implementation and effectiveness of planned conservation measures: modify as needed as part of Urban Water Management Plan update process.	Costs for these measures are not facility capital costs.	Implementation costs as determined in Urban Water Management Plan	
SU-09	Temporary demand reductions		Implement temporary demand reductions during emergencies and droughts as outline in Urban Water Management Plan (Water Shortage Contingency Plan), as needed to address temporary reductions in total supply.	Costs for these measures are not facility capital costs.	Implementation costs as determined in Urban Water Management Plan	
Subtotal - Local Supply Measures				**$ 16.91**	**$ -**	**$ 16.91**
System Capacity Improvements						
Additional Storage to Meet Buildout Storage Requirements [2] (see details in Section 10.4))						
S-01[3]	Station 232	I	Construct new 3.5 MG reservoir[4]. 2.5 MG is to meet existing deficiencies and 1.0 MG is to meet future growth.	$ 6.30	$ 6.30	$ -
S-02[5]	Station 203	II	Construct two new 3.5 MG reservoirs to help meet existing storage deficiencies of 7.8 MG[5].	$ 12.60	$ 12.60	$ -
S-03[6]	Zone II location to be determined	II	Construct new storage reservoirs for a total of 12 MG[6]. This improvement requires the installation of standby power at all existing and future well stations supplying the Zones II and III.	$ 21.60	$ -	$ 21.60
S-04	Zone II Wells	II	Standby power generator for Zone II Well Stations 215, 219, 275, 279, 294, 297, and 298 as an alternative to additional storage in Zone II	$ 1.67	$ 1.67	$ -
S-05	Zone III Wells	III	Standby power generator for Zone III Well Stations 290 as an alternative to additional storage in Zone II	$ 0.14	$ 0.14	$ -
S-06	Zone II Future Wells	II	Standby power generator for Zone II Future Well Stations (SU-02, SU-03, SU-04, SU-05, SU-06, and SU-07) as an alternative to additional storage in Zone II	$ 0.81	$ -	$ 0.81
S-07	Zone III Future Wells	III	Standby power generator for Zone III Well Station (SU-01) as an alternative to additional storage in Zone II	$ 0.14	$ -	$ 0.14
Subtotal				$ 43.25	$ 20.70	$ 22.55

Table ES-3
Summary of Recommendations for Dominguez District

Improvement ID	*Location/ Type of Improvement*	*Zone*	*Improvement Description*	*Estimated Total Capital Cost in 2009 Million $*	*Distribution of Costs by Timeframe ($ Million)*	
					Near Term (by 2015)	*Long-Term*
Additional Pumping Capacity						
PP-01	Station 232	I	Replace units 5-9 with new 1,400 gpm pumps and add VFDs. Replace units 11 and 12 with new 2,000 gpm pumps and add VFDs. Install remote system monitoring.	$ 0.56	$ -	$ 0.56
PP-02	Station 203	III	Replace units A through E with new 1,400 gpm pumps, replace unit F with a new 1,100 gpm pump, replace unit G with a new motor, and add VFDs to all pumps[7].	$ 0.37	$ 0.25	$ 0.12
Subtotal				$ 0.93	$ 0.25	$ 0.68
Pipe Improvements (see details in Section 10.6)						
P-01	Zone II pipeline improvement	II	New parallel 16-inch pipe on Avalon Boulevard from 223rd St. to E. Waston Center Road.	$ 0.74	$ -	$ 0.74
P-02	Zone II pipeline improvement	II	New parallel 24-inch pipe on E 223rd St. (from WB-10 to Catskill Ave.), along Catskill Ave. (from E. 223rd St to 229th Pl), along 229th Pl. (from Catskill Ave. to Dolores St.), along Dolores St. (from 229th Pl to Sepulveda Blvd.)	$ 4.67	$ -	$ 4.67
Subtotal				$ 5.41	$ -	$ 5.41
Subtotal - System Capacity Improvements				**$ 49.60**	**$ 20.96**	**$ 28.64**
System Reliability Projects						
Expansion of MWD WB-36 Turnout						
R-01[8]	Expand Turnout	II	Expansion of WB-36 turnout from 10 mgd to 13 mgd.	$ -	$ -	$ -
Subtotal - System Reliability Projects				**$ -**	**$ -**	**$ -**
Renewal and Replacement Projects						
Pump Station Upgrade Project (see details in Section 10.8)						
M-01	Station 215	II	Replace well pump, booster pump and motors by 2020.	$ 0.28	$ -	$ 0.28
M-02	Station 272	II	Replace well pump and motor by 2015.	$ 0.17	$ 0.17	$ -
M-03	Station 275	II	Replace well pump and motor by 2015.	$ 0.16	$ 0.16	$ -
M-04	Station 290	III	Replace well pump and motor by 2020.	$ 0.18	$ -	$ 0.18
M-06	Station 297	II	Replace booster pump and motor by 2015. Replace well pump and motor by 2020.	$ 0.28	$ 0.14	$ 0.14
M-07	Station 298	II	Replace high head booster by 2015.	$ 0.21	$ 0.21	$ -
M-09	PRV replacement at Stations 203, 272, and 275	-	Replace aged PRVs at pump stations	$ 0.16	$ 0.16	$ -
Subtotal - Renewal and Replacement Projects				**$ 1.46**	**$ 0.85**	**$ 0.61**
TOTAL				**$ 68.0**	**$ 21.8**	**$ 46.2**

[1] Assumes no new purchase of land.
[2] Additional storage location will be determined by Cal Water after appropriate siting studies.
[3] Additional storage for Zone 1 (1.2 MG) can be placed in the Hermosa-Redondo System. If storage is placed in the Hermosa-Redondo System, the total volume required for Zone 1 would be 2.2 MG.
[4] One tank is proposed to be built at Station 232, sized to meet buildout requirements. The tank is phased in the Near Term (by 2015) even though the total volume is not required until the Long-Term Scenario.
[5] Deficiencies are reduced from 18.8 MG assuming the installation of standby power at existing well stations.
[6] Existing storage deficiencies equal 18.8 MG and future storage deficiencies (including existing) equal 38.7 MG. Storage volume required is reduced to 18.8 MG assuming the installation of standby power at all existing and future well stations supplying Zones II and III.
[7] Sizing assumes pump station meets peak hour demand with MWD WB-35 turnout out of service.
[8] Hydraulic Analysis assumes MWD WB-36 can be expanded. If not, other capacity improvements are required. It is assumed that costs will be negotiated with MWD.

Table ES-4
Summary of Recommendations for Hermosa-Redondo District

Improvement ID	*Location/ Type of Improvement*	*Zone*	*Improvement Description*	*Estimated Total Capital Cost in 2009 Million $*	*Distribution of Costs by Timeframe ($ Million)*	
					Near Term (by 2015)	*Long-Term*
Local Supply Measures (see details in Section 9.4)						
SU-1	Long-term permanent conservation savings		Continue implementation of planned long-term conservation measures per Urban Water Management Plan. Evaluate implementation and effectiveness of planned conservation measures: modify as needed as part of Urban Water Management Plan update process.	Costs for these measures are not facility capital costs.	Implementation costs as determined in Urban Water Management Plan	
SU-2	Temporary demand reductions		Implement temporary demand reductions during emergencies and droughts as outline in Urban Water Management Plan (Water Shortage Contingency Plan), as needed to address temporary reductions in total supply.	Costs for these measures are not facility capital costs.	Implementation costs as determined in Urban Water Management Plan	
System Capacity Improvements						
Additional Storage and Standby Power Generators to Meet Buildout Storage Requirements [1] (see details in Section 11.4)						
S-01 [1]	Zone 300-2	300-2	Construct new 0.9 MG reservoir next to Reservoir 06, HGL = 221 ft. This improvement will require standby power at Sta 04 and Sta 09 to meet emergency storage needs in this pressure zone.	$ 2.43	$ -	$ 2.43
S-02	Zone 400	400	Construct new 0.65 MG reservoir, HGL = 400 ft, to replace existing 0.25 MG tank (Sta 24, Reservoir 08). This improvement will require the installation of standby power at Sta 23	$ 1.76	$ -	$ 1.76
S-03	Zone 300-1	300-1	Standby power generator for Sta 28, Unit A, as alternative to additional storage in Zone 300-1	$ 0.05	$ -	$ 0.05
S-04	Zone 300-1	300-1	Standby power generator for Sta 14, Unit D, as alternative to additional storage in Zone 300-1	$ 0.10	$ -	$ 0.10
S-05	Zone 300-2	300-2	Standby power generator for Sta 09, Units C and D, as alternative to additional storage in Zone 300-2	$ 0.08	$ -	$ 0.08
S-06	Zone 400	400	Standby power generator for Sta 23, Units D and E, as alternative to additional storage in Zone 400	$ 0.07	$ -	$ 0.07
Subtotal				$ 4.49	$ -	$ 4.49
Pipe Improvements (see details in Section 11.6)						
P-01 [2]	Change of service zone for existing pipe on 190th St (east of Flager Ln)	300-2	New pipe connecting existing 6-in on 190th St to existing 6-in on Flager Ln (approximately 85ft of new 6-in pipe). Close valve (Green Ln) to disconnect the existing pipe on 190th St from Zone 225-2	$ 0.02	$ 0.02	$ -
Subtotal - System Capacity Projects				**$ 4.51**	**$ 0.02**	**$ 4.49**

Table ES-4
Summary of Recommendations for Hermosa-Redondo District

Improvement ID	*Location/ Type of Improvement*	*Zone*	*Improvement Description*	*Estimated Total Capital Cost in 2009 Million $*	*Distribution of Costs by Timeframe ($ Million)*	
					Near Term (by 2015)	*Long-Term*
Renewal and Replacement Projects						
Pump Station Upgrade Projects (see details in Section 11.8)						
M-1	Station 09	225-1	Replace Units C and D (pump and motor) by 2020	$ 0.13	$ -	$ 0.13
M-2	Station 23	400	Replace Unit C (pump and motor, by 2015), Replace Unit D (pump and motor, by 2020), Replace Unit E(pump, by 2020)	$ 0.18	$ 0.09	$ 0.09
M-3	Station 24	500	Replace Units C and D (pump and motor) by 2020	$ 0.13	$ -	$ 0.13
M-4	Station 26	300-2	Replace Unit D (pump and motor), Replace Unit E (pump) by 2015	$ 0.15	$ 0.15	$ -
M-5	Station 28	300-2	Replace Units A and B (pump and motor) by 2020	$ 0.16	$ -	$ 0.16
M-6	Station 29	300-2	Replace Unit A (pump and motor, by 2020), Replace Unit B (pump and motor, by 2015)	$ 0.18	$ 0.09	$ 0.09
M-7	Station 08	300-1	Replace Well Pump 02 (pump and motor) by 2020	$ 0.14	$ -	$ 0.14
M-8	Pump Station Electrical Upgrades at Stations 23 and 29	various	Replacement of aged electrical systems that have exceeded their design useful lives. Replacement for Station 23 by 2015, Replacement for Station 29 by 2010	$ 0.42	$ 0.42	$ -
M-9	Install SCADA equipment at Stations 08, 09, 22, and 30	various	SCADA system improvements	$ 0.09	$ 0.09	$ -
M-10	PRV replacement at Stations 05, 26, 27, 29	various	Replace of aged PRVs at pump stations	$ 0.22	$ 0.22	$ -
M-11 [(3)]	Reservoir 08	400	Replacement of aged facility by 2020 - this replacement improvement is included in project S-02	Included in S-02	$ -	$ -
Subtotal - Renewal and Replacement Projects				**$ 1.81**	**$ 1.06**	**$ 0.75**
Improvements to Enhance System Operation						
O-1	Panel Board replacement	C-850	Pump Stations 09 and 29	$ 0.02	$ 0.02	$ -
TOTAL				**$ 6.33**	**$ 1.10**	**$ 5.24**

[1] Additional storage needed in Zone 300-2 assumes the connections to the Dominguez system open during normal operation

[2] New pipe will be required only if services are connected to the existing pipe

[3] Improvement S-02 includes the replacement of the existing storage tanks (aged, 0.25MG) and the additional storage recommended for the zone (0.4 MG)

Table ES-5
Summary of Recommended Improvements for Palos Verdes District

Improvement ID	Location/Type of Improvement	Zone	Description	Estimated Total Capital Cost in 2009 Million $	Distribution of Costs by Timeframe ($ million)	
					Near Term (By 2015)	Long-Term
Local Supply Measures (see details in Section 9.4)						
SU-1	Long-term permanent conservation savings		Continue implementation of planned long-term conservation measures per Urban Water Management Plan. Evaluate implementation and effectiveness of planned conservation measures: modify as needed as part of Urban Water Management Plan update process.	Costs for these measures are not facility capital costs.	Implementation costs as determined in Urban Water Management Plan	
SU-2	Temporary demand reductions		Implement temporary demand reductions during emergencies and droughts as outline in Urban Water Management Plan (Water Shortage Contingency Plan), as needed to address temporary reductions in total supply.	Costs for these measures are not facility capital costs.	Implementation costs as determined in Urban Water Management Plan	
System Capacity Improvements						
Additional Storage and Backup Power Generators to Meet Buildout Storage Requirements (see details in Section 12.4)						
S-1	C-850 Cascade		Backup power generators for pumps Sta 22 (Units A,B,C,D, and E)	$ 2.31	$ -	$ 2.31
S-2	D-500 Cascade		Backup power generators for pumps Sta 15 (Units A, B, and D)	$ 0.30	$ -	$ 0.30
S-3	P-1450 Cascade		Backup power generators for pumps Sta 23 (Units A,B, and C)	$ 1.32	$ -	$ 1.32
S-4	D-500 Cascade	J-600	Crenshaw Reservoir (3.0 MG – HGL 850 ft) at Crenshaw Blvd and Silver Spur Rd	$ 7.20	$ 7.20	$ -
S-5	D-500 Cascade	D-500	Via Olivera Reservoir (2.0 MG – HGL 500 ft) at Via Olivera and Via Zumaya	$ 5.00	$ 5.00	$ -
S-6	A Cascade		Ganado Reservoir (2.0 MG – HGL 850 ft) at Palos Verdes Dr and Ganado Dr	$ 5.00	$ -	$ 5.00
S-7	P-1450 Cascade	D-860	Hesse Reservoir (1.5 MG – HGL 860 ft) south of Indian Peak Rd and Crossfield Dr	$ 3.90		$ 3.90
Subtotal				$ 25.04	$ 12.20	$ 12.84
Additional Pumping Capacity (see details in Section 12.3)						
PP-1	New Via Olivera Station	D-860	New station pumping from new Via Olivera Reservoir to new Hesse Reservoir, 1,700 gpm (TDH=400ft)	$ 1.29	$ -	$ 1.29
PP-2	Sta 04	J-600	Replace the existing pumps (Units A and C) with 1,600 gpm pumps (TDH=160 ft)	$ 0.18	$ 0.18	$ -
PP-3	Sta 15	D-500	Replace the existing 1,300 pump (Unit B) and the existing 1,200 (Unit C) with 2,200 gpm pumps (TDH=250 ft)	$ 0.29	$ 0.29	$ -
Subtotal				$ 1.76	$ 0.47	$ 1.29
Pipe Improvements (see details in Section 12.6.3)						
P-1	Low Pressure Area L01 - Northwest of Zone P-1450, west of Highridge Dr and north of Crestridge Rd	P-1450	Replace the existing 8-inch pipeline with a new 12-inch along Highridge Rd, from Scotwood Dr to Whitley Collins Dr (approximately 1,400 ft)	$ 0.50	$ 0.50	$ -
P-2			Replace the existing 12-inch pipeline with a 16-inch along Highridge Rd, from from Armaga Spring Rd to Crestridge Rd (approximately 1,300 ft).	$ 0.61	$ 0.61	$ -
P-3			Replace the existing 8-inch pipeline with a new 20-inch along Crestridge Rd, from Crenshaw Blvd to Highridge Rd. This line will connect to the new 27-inch line along Crenshaw Blvd (project R-2), downstream of the New Crenshaw PS (approximately 3,000 ft)	$ 1.97	$ -	$ 1.97
P-4	Low Pressure Area L05 - Area in Zone C-480, around Palos Verdes Dr	C-480	Replace existing 12-inch with a new 18-inch from PRV station C140 (downstream of STA 22), south on Montecillo Dr to Palos Verdes Dr, then east on Palos Verdes Dr to Rolling Vista Dr (approximately 3,000 ft)	$ 1.59	$ 1.59	$ -
P-5	Hesse Res (S-7) inflow line from New Via Olivera Pump Station	D-860	New 16-inch pipeline from the proposed Via Olivera Pump Station to Verde Ridge Rd and Ave Anillo, connecting to proposed pipe P-7 (approximately 2,500 ft)	$ 1.16	$ -	$ 1.16

Table ES-5
Summary of Recommended Improvements for Palos Verdes District

Improvement ID	Location/Type of Improvement	Zone	Description	Estimated Total Capital Cost in 2009 Million $	Distribution of Costs by Timeframe ($ million)	
					Near Term (By 2015)	Long-Term
P-6	Hesse Res (S-7) inflow line from Res 25	D-860	New 16-inch pipeline from Hawthorne Blvd and Locklenna Ln, connecting to existing 18-inch, to Hesse Reservoir, along Locklenna Ln (approximately 1,700ft)	$ 0.79	$ -	$ 0.79
P-7	Hesse Res (S-7) connection to the D-860 zone	D-860	New 16-inch pipeline from Hesse Reservoir to Crest Rd and Ave Anillo (connecting to existing 12-inch), along Locklenna Dr, Verde Ridge Rd, and Golden Meadow Dr (approximately 5,000 ft)	$ 2.33	$ -	$ 2.33
P-8	Hesse Res (S-7) connection to the L-850 zone	L-850	New 16-inch pipeline from the proposed 18-inch (P-6) from Hesse Reservoir connecting to the existing 12-inch at Golden Meadow Dr and Abbottswood Dr (approximately 1,000ft)	$ 0.47	$ -	$ 0.47
Subtotal				$ 9.40	$ 2.69	$ 6.71
PRV Station Upgrades (see details in Section 12.5)						
V-1	PRV Station A130	A-970	Upgrade existing PRV Station to convey fire flow plus MDD flows (adding a 6-inch valve)	$ 0.02	$ -	$ 0.02
V-2	PRV Station B173	B-750		$ 0.02	$ -	$ 0.02
V-3	PRV Station P233	P-1300-7		$ 0.02	$ -	$ 0.02
V-4	PRV Station P240	P-1300-8		$ 0.02	$ -	$ 0.02
V-5	PRV Station P189	P-1300-3		$ 0.02	$ -	$ 0.02
V-6	PRV Station B177	B-340		$ 0.02	$ -	$ 0.02
V-7	PRV Station E117	E-1150-2		$ 0.02	$ -	$ 0.02
Subtotal				$ 0.15	$ -	$ 0.15
New PRV Stations (to reduce pressure in identified high pressure areas, see details in Section 12.6.1)						
V-8	Problem Area H01	E-1325	Upper Blackwater Canyon Rd and Appaloosa Ln, HGL Setting=1,010ft	$ 0.05	$ 0.05	$ -
V-9	Problem Area H02	C-850	Daladier Dr and La Vista Verde Dr, HGL=780 ft	$ 0.05	$ 0.05	$ -
V-10	Problem Area H03	P-1300-2	Ranchero Dr and Portuguese Bend Rd, HGL=1,110 ft	$ 0.05	$ 0.05	$ -
V-11	Problem Area H04	F-800	Strawberry Ln and Palos Verdes Dr, HGL=690 ft	$ 0.05	$ 0.05	$ -
V-12	Problem Area H05	F-800	Portuguese Bend and Palos Verdes Dr, HGL= 670 ft	$ 0.05	$ 0.05	$ -
V-13	Problem Area H06	P-1450	Southfield Dr and W Ringbit Dr, HGL=1,320 ft	$ 0.05	$ 0.05	$ -
V-14	Problem Area H07	C-635	Caddington Dr and Gunter Rd, HGL=540 ft	$ 0.05	$ 0.05	$ -
Subtotal				$ 0.38	$ 0.38	$ -
New FCV Station (Flow Control Valves/Altitude Valves to Regulate Inflow to Proposed Reservoirs)						
V-23	Hesse Reservoir (S-7)	D-860	New FCV Station on Hesse Reservoir inflow line (In Recommended Project S-7)	$ -	$ -	$ -
Subtotal - System Capacity Improvements				**$ 36.73**	**$ 15.74**	**$ 20.99**
System Reliability Projects						
Crenshaw and Ridge System Supply Project (see details in Section 12.7)						
R-1	New pipe	P-1450	New 30-inch pipeline from the pump station along Palos Verdes Dr North to Crenshaw Blvd, and then along Crenshaw Blvd to the new reservoir (15,000ft)	$ 12.30	$ 12.30	$ -
R-2	New pipe	P-1450	New 27-inch pipe from New pump station (R-3) to existing 27-inch in P-1450 Zone (4,400ft)	$ 3.45	$ 3.45	$ -
R-3	New pump station	P-1450	New Crenshaw Pump Station, pumps from Crenshaw Reservoir to P-1450 Zone: 750 hp, 4,700 gpm, 600 ft TDH	$ 4.22	$ 4.22	$ -
R-4	New PRV	J-600	PRV from the new 30-inch pipe (R-1) to the J-600 Zone connecting to the existing 12-inch at Palos Verdes Dr and Crenshaw Blvd (12-inch Valve)	$ 0.05	$ 0.05	$ -

Table ES-5
Summary of Recommended Improvements for Palos Verdes District

Improvement ID	Location/Type of Improvement	Zone	Description	Estimated Total Capital Cost in 2009 Million $	Distribution of Costs by Timeframe ($ million)	
					Near Term (By 2015)	Long-Term
S-4	Additional Storage	J-600	Crenshaw Reservoir (3.5 MG – HGL 850 ft) (Recommended Project S-4)	$ -		
Subtotal - System Reliability Projects				**$ 20.03**	**$ 20.03**	**$ -**
Renewal and Replacement Projects						
D-500 Distribution Project (see details in Section 12.8)						
M-1	Pipe replacement	D-500	Replace existing 20-inch with a new 24-inch from Sta 15 to Reservoir 05 (19,000ft)	$ 13.97	$ 13.97	$ -
M-2	Pipe replacement	D-500	Replace existing 16-inch with a new 20-inch from Reservoir 05 to new Reservoir Via Olivera (23,000ft). The new pipe alignment will follow the existing pipe alignment, along Via del Monte, Via Montemar, Palos Verdes Dr W, and Via Rivera	$ 15.07	$ 15.07	$ -
S-5	Additional Storage	D-500	Via Olivera Reservoir (2.0 MG – HGL 500 ft) (Recommended Project S-5)	$ -		
Subtotal				$ 29.03	$ 29.03	$ -
Reservoir 19 Feeding Line Project (see details in Section 12.8)						
M-3	Pipe Replacement	C-850	Replace existing 33-inch with a new 34-inch from Colt Rd to Reservoir 19	$ 1.3	$ 1.3	$ -
Booster Station Upgrade Project (see details in Section 12.9)						
M-4	Station 5 - Replace Unit A (by 2015)	H-675	Pump and motor replacements for existing pumps that have exceeded their design useful lives.	$ 0.08	$ 0.08	$ -
M-5	Station 14 - Replace Units A and B (by 2015)	P-600		$ 0.07	$ 0.07	$ -
M-6	Station 15 - Replace Unit D Pump (by 2015); Unit A Pump and Motor(by 2020)	D-500		$ 0.19	$ 0.03	$ 0.17
M-7	Station 22 - Replace Units B,C,D,E,F,G,H - Pump and Motor (by 2020)	C-850		$ 1.15	$ -	$ 1.15
M-8	Station 23 - Replace Units C, D and H Pump and Motor (by 2015); Units A, B and E (by 2020)	P-1450		$ 1.74	$ 0.87	$ 0.87
M-9	Station 30 - Replace Units C, D and E Pump and motor (by 2020)	C-850		$ 0.93	$ -	$ 0.93
M-10	Station 37 - Replace Units A and B Pump and Motor (by 2020)	P-1450		$ 0.26	$ -	$ 0.26
M-11	Station 38 - Replace Units A and B Pump and Motor (by 2015)	P-1600		$ 0.11	$ 0.11	$ -

Table ES-5
Summary of Recommended Improvements for Palos Verdes District

Improvement ID	Location/Type of Improvement	Zone	Description	Estimated Total Capital Cost in 2009 Million $	Distribution of Costs by Timeframe ($ million)	
					Near Term (By 2015)	Long-Term
M-12	Pump Station Electrical Upgrades at Station 14, Station 15, Station 22, Station 30, Station 37	various	Replacement of aged electrical systems that have exceeded their design useful lives.	$ 4.66	$ 4.66	$ -
M-13	SCADA system RTU upgrades at Station 4, Station 30, Station 37	various	Replacement of aged RTUs that have exceeded their design useful lives.	$ 0.12	$ 0.12	$ -
M-14	PRV replacement at Stations 15, 22, 23, 30, 37	various	Replace of aged PRVs at pump stations	$ 0.27	$ 0.27	$ -
Subtotal - Renewal and Replacement Projects				**$ 39.96**	**$ 36.58**	**$ 3.38**
Improvements to Enhance System Operation						
A Cascade Distribution Project (proposed to address A Cascade surge issues, see details in Section 12.8)						
O-1	New pipeline	A Cascade	New 16-inch pipe from New PRV (O-4) to new Ganado Reservoir (12,000ft)	$ 5.58	$ 5.58	$ -
O-2	New PRV station	A Cascade	New PRV from Sta 23 discharge line	$ 0.05	$ 0.05	$ -
O-3	New pipeline	A Cascade	New 12-inch pipe from the new Ganado Reservoir to PRV Station A85, located at Sea Claire Dr and Sea Glen Dr(1,400ft)	$ 0.50	$ 0.50	$ -
S-6	Additional Storage	A Cascade	Ganado Reservoir (2.0 MG – HGL 850 ft) (Recommended Project S-6)	$ -	$ -	$ -
O-4	PRV A130	A Cascade	Connect existing PRV Station to the new 16-in line (O-1)	$ 0.05	$ 0.05	$ -
O-5	PRV A108	A Cascade	Connect existing PRV Station to the new 16-in line (O-1)	$ 0.05	$ 0.05	$ -
O-6	PRV A37	A Cascade	Connect existing PRV Station to the new 16-in line (O-1)	$ 0.05	$ 0.05	$ -
Other Operational Improvements (see details in Section 12.8)						
O-7	Upgrade Pressure Monitoring Equipment	PV System	Replace existing pressure monitoring equipment in 5 locations	$ 0.01	$ 0.01	$ -
O-8	Panel Board replacement	C-850	Pump Stations 22 and 30	$ 0.02	$ 0.02	$ -
Subtotal - System Operation Improvements				**$ 6.31**	**$ 6.31**	**$ -**
TOTAL				**$ 103.03**	**$ 78.66**	**$ 24.37**

Parcels

* Well 203-1 located at Station 232

Figure ES-1
Dominguez District
Recommended System Improvements

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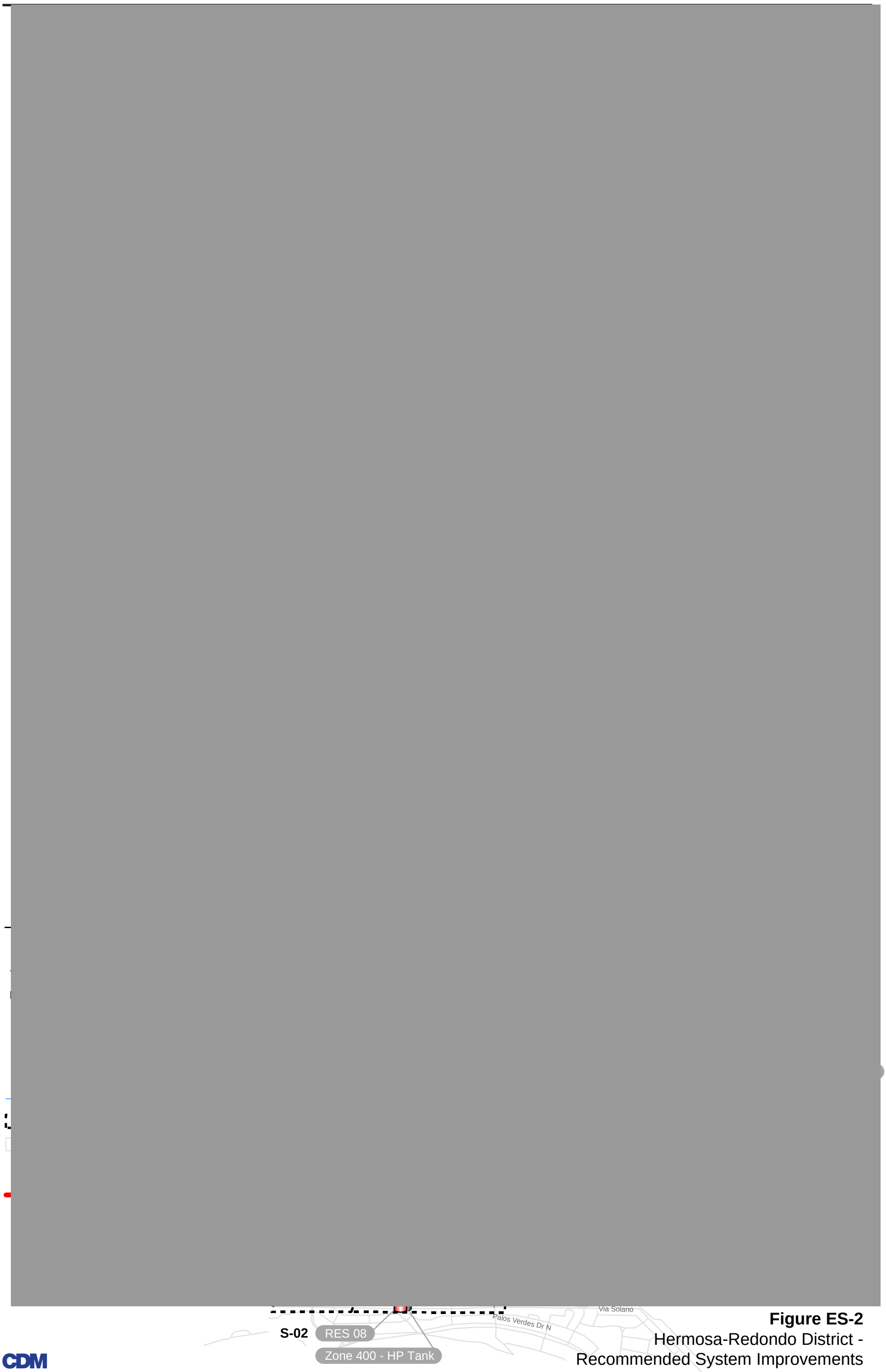

Figure ES-2
Hermosa-Redondo District -
Recommended System Improvements

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Figure ES-3
Palos Verdes District - Recommended System Improvements

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Section 1
Introduction

This section describes the purpose, organization and scope of the master plan, and lists acknowledgments.

1.1 Purpose of Master Plan

California Water Service Company (Cal Water) is the largest investor-owned water utility in the western United States serving over 1.7 million people in 75 communities, with 21 districts throughout California. Cal Water has provided water service to parts of the Rancho Dominguez area since 1926. The Rancho Dominguez District serves a combined population of more than 300,000 people in the communities that include large portions of the Cities of Carson and Torrance; small portions of the Cities of Compton, Lomita, Long Beach, and Los Angeles; portions of unincorporated Los Angeles County; and the entire cities of Hermosa Beach, Redondo Beach, Palos Verdes Estates, Rancho Palos Verdes, Rolling Hills, and Rolling Hills Estates.

Cal Water is preparing the Rancho Dominguez District Water Supply & Facilities Master Plan for the Dominguez, Hermosa-Redondo, and Palos Verdes Districts to identify district-level Capital Improvement Programs and to provide a comprehensive, strategic-level overview of water supply planning, leading to a more efficient and reliable use of the Districts' water supplies. The planning timeframe for this study extends to 2030.

1.2 Organization of Master Plan Report

This report highlights the key master plan findings. Detailed technical information is appended. The report is organized into 13 sections and 15 appendices, as described in Table 1-1. The Dominguez, Hermosa-Redondo, and Palos Verdes Districts are separate systems; however, some planning elements are common to both. This report addresses all three districts. Some sections are common to all districts, with separate information clearly identified with the section, as appropriate. Other sections individually describe each district. The information applicable to each district can be easily identified in these sections.

Table 1-1 Rancho Dominguez District Supply and Facilities Master Plan Report Organization	
Section	**Description**
1 – Introduction	Overview of the purpose, organization and scope of the Master Plan.
2 – Study Area	Pertinent information on the study area.
3 – Water Demands	Historical water use and water use projections used in the Master Plan.
4 – Existing Water Facilities – Dominguez District	Overview of the Dominguez District water system and key facilities
5 – Existing Water Facilities – Hermosa-Redondo District	Overview of the Hermosa-Redondo District water system and key facilities
6 – Existing Water Facilities – Palos Verdes District	Overview of the Palos Verdes District water system and key facilities
7 – Performance Criteria	Performance criteria used for the Master Plan evaluation
8 – Water Supply Requirements	Information on existing water supplies and comparison of water supply with projected demand.
9 – Water Supply Strategy	Evaluation of supply alternatives and recommended water supply strategy.
10 – Water System Analysis – Dominguez District	Results of the Dominguez District analysis to identify pump stations, storage tanks and pipelines required to meet existing and future demands.
11 – Water System Analysis – Hermosa-Redondo District	Results of the Hermosa-Redondo District analysis to identify pump stations, storage tanks and pipelines required to meet existing and future demands.
12 – Water System Analysis – Palos Verdes District	Results of the Palos Verdes District analysis to identify pump stations, storage tanks and pipelines required to meet existing and future demands.
13 – Plan Recommendations	Supply and system capacity improvement recommendations, including costs and phasing.
Appendices	Supplemental details on demands (A through D), supplies (E and F), Dominguez District model and analysis (G and H), Hermosa-Redondo District model and analysis (I and J), Palos Verdes District facilities information, model and analysis (K, L and M), Rancho Dominguez District Facilities Assessment (N), and pressure results (O).

1.3 Scope of Services

Cal Water retained Camp Dresser & McKee Inc. (CDM) to prepare the Water Supply & Facilities Master Plan for the Rancho Dominguez District. The scope of work included the following major elements:

- Prepare development and demand projections for the planning period for use in the supply and facilities evaluation.
- Evaluate alternative water supply sources to meet the recommended water demand projections over the planning period.
- Assess the condition and capacity of key system facilities. Cal Water identified the specific facilities to be included in the assessment.

- Develop and calibrate computerized hydraulic models for each of the district distribution systems to use as a planning and operational tool. New models were developed from GIS for Hermosa-Redondo and Dominguez Districts. Cal Water's existing model for Palos Verdes system was updated and calibrated.

- Prepare overall water supply and facilities master plan recommendations for the system.

1.4 Acknowledgments

This report would not have been possible without the valuable assistance of Cal Water staff. In particular, the following staff provided comprehensive information, significant input and important insights throughout the master plan development:

- John Foth, Engineering Manager, Southern California
- Carmelo Sorce, Senior Engineer, Southern California
- Ron Singer, Production Superintendent, Hermosa-Redondo District
- Rob Olsen, General Foreman, Palos Verdes District
- Frank Umekubo, General Foreman, Dominguez District
- Michael Bolzowski, Water Resources Planning
- Tom Salzano, Water Resources Planning Supervisor
- Jim Simunovich, Manager of Engineering Operations
- Jeff Yarne, Project Manager

Key CDM team members include:

- Dan Rodrigo, Project Manager
- Enrique Lopez-Calva, Task Leader, Demand Projections and Water Supply Assessment
- Don Schroeder, Groundwater
- Polly Boissevain, Facilities Plan
- Andria Loutsch, Facilities Plan
- Youssif Hussein, Task Leader, Hydraulic Modeling
- Phillippe Daniel, Technical Review
- Lisa House, Technical Review

Section 2
Study Area

This section describes the study area location and characteristics, and future land uses and development within the study area.

2.1 Location and Characteristics

The Cal Water Service Company (Cal Water) Rancho Dominguez District is made up of three separate districts, shown on Figure 2-1: Dominguez District, Hermosa-Redondo District, and Palos Verdes District.

The Rancho Dominguez District serves a combined population of more than 300,000 people in the communities that include large portions of the Cities of Carson and Torrance; small portions of the Cities of Compton, Lomita, Long Beach, and Los Angeles; portions of unincorporated Los Angeles County; and the entire cities of Hermosa Beach, Redondo Beach, Palos Verdes Estates, Rancho Palos Verdes, Rolling Hills, and Rolling Hills Estates.

The climate within the area characteristically has mild winters and summers. According to the nearest weather station in Torrance, temperatures typically range from 55.5° to 70.3° Fahrenheit (F), with a 58-year normalized temperature of 62.5°F. Average annual rainfall is 13.5 inches.

2.1.1 Dominguez Study Area

Figure 2-2 shows the Dominguez District boundary. The district is located in southern Los Angeles County, approximately 10 miles north of Los Angeles Harbor. The district serves most of the Cities of Carson and Torrance, and small sections of the Cities of Compton, Long Beach, Los Angeles, and Los Angeles County (the communities of West Carson and Rancho Dominguez). Cal Water has served the district since it merged with the Dominguez Services Corporation in the year 2000.

The service area is about 16,000 acres, about 25 square miles. The district is bordered by Redondo Beach, Torrance, Los Angeles, Carson, and Compton to the north; Long Beach to the east; Los Angeles and Torrance to the south; and Redondo Beach to the west. The area is part of the Los Angeles-Orange County coastal plain, and elevations range from 25 feet above sea level to 190 feet above sea level.

2.1.2 Hermosa-Redondo District

Figure 2-3 presents the Hermosa-Redondo District service area boundary. The district is located in southern Los Angeles County, about six miles south of the Los Angeles International Airport. The district serves the Cities of Hermosa Beach and Redondo Beach, and a small section of the City of Torrance. Cal Water has served the area since 1926.

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Figure 2-1
Rancho Dominguez Study Area

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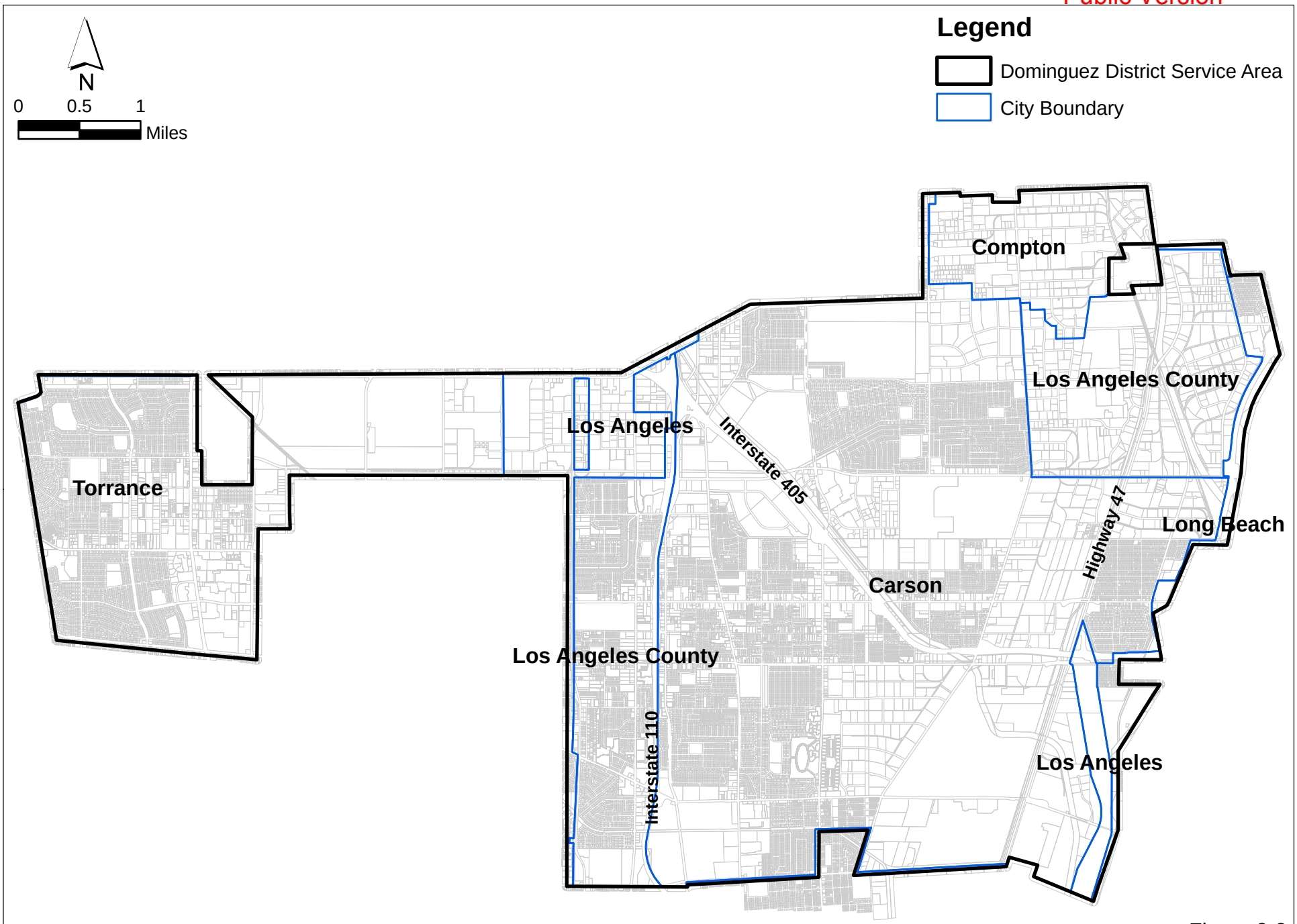

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Figure 2-2
Dominguez District Service Area

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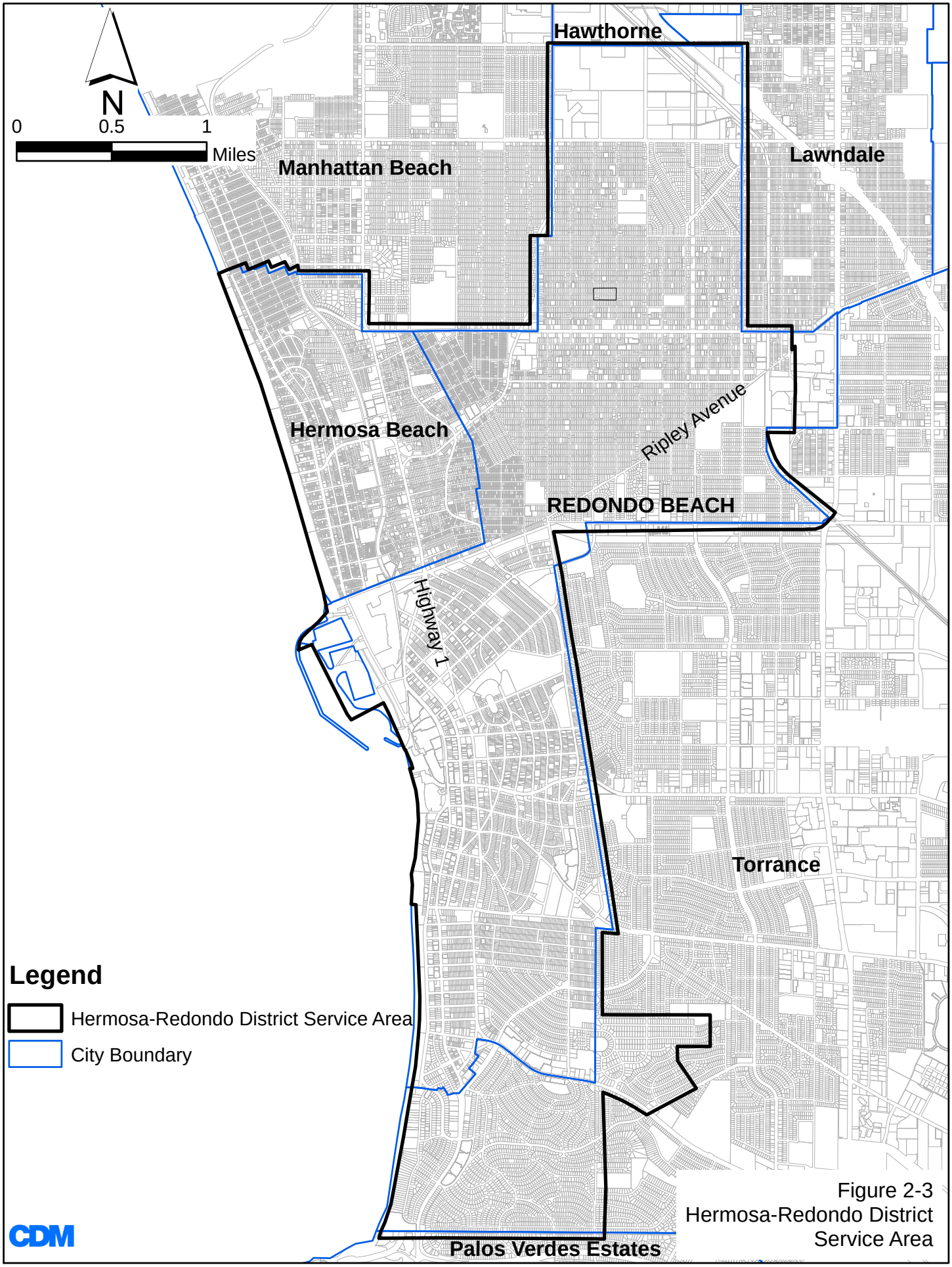

Figure 2-3
Hermosa-Redondo District
Service Area

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The service area is about 4,260 acres, or about 6.7 square miles. The district is bordered by Manhattan Beach and Hawthorne to the north; Lawndale and Torrance to the east; Palos Verdes Estates to the south; and the Pacific Ocean to the west. The area is part of the Los Angeles-Orange County coastal plain, and elevations range from sea level to 415 feet above sea level.

2.1.3 Palos Verdes District

The Palos Verdes District service area boundary is presented in Figure 2-4. The district is located in southern Los Angeles County, about 10 miles west of Long Beach Harbor. The district serves the Cities of Palos Verdes Estates, Rancho Palos Verdes, Rolling Hills, and Rolling Hills Estates, small portions of the Cities of Los Angeles and Lomita, and the Westfield area of Los Angeles County. Cal Water has served the area since 1970.

The service area is about 21,800 acres, or about 34 square miles. The district is bordered by Torrance and Lomita to the north; Los Angeles to the east; and the Pacific Ocean to the south and west. The area is part of the Palos Verdes Peninsula and elevations range from sea level to 1,460 feet above sea level.

2.2 Future Land Uses and Development

Information regarding future land uses and future growth due to development or redevelopment is needed to estimate future demands. General plan land uses for the Rancho Dominguez District were obtained from the local planning agencies.

2.2.1 Dominguez District

Figure 2-5 shows the ultimate land uses with the Dominguez District based on the information obtained from the local planning agencies at the Cities of Carson, Compton, Long Beach, Los Angeles, and Torrance, and Los Angeles County. The general plans do not give a specific date for build-out (ultimate development), likely because they are already at or close to build-out. Some cities did reference the built out nature of their land use without giving a specific date. Carson's general plan indicated that the city is "generally built out" and Torrance referred to the city as "mature."

The zoning and general plan land use categories used by the local planning agencies were grouped into simplified land use types to facilitate the master plan analysis. Table 2-1 shows the simplified land use types and the corresponding general plan categories. The simplified master plan land use types are used in Figure 2-5.

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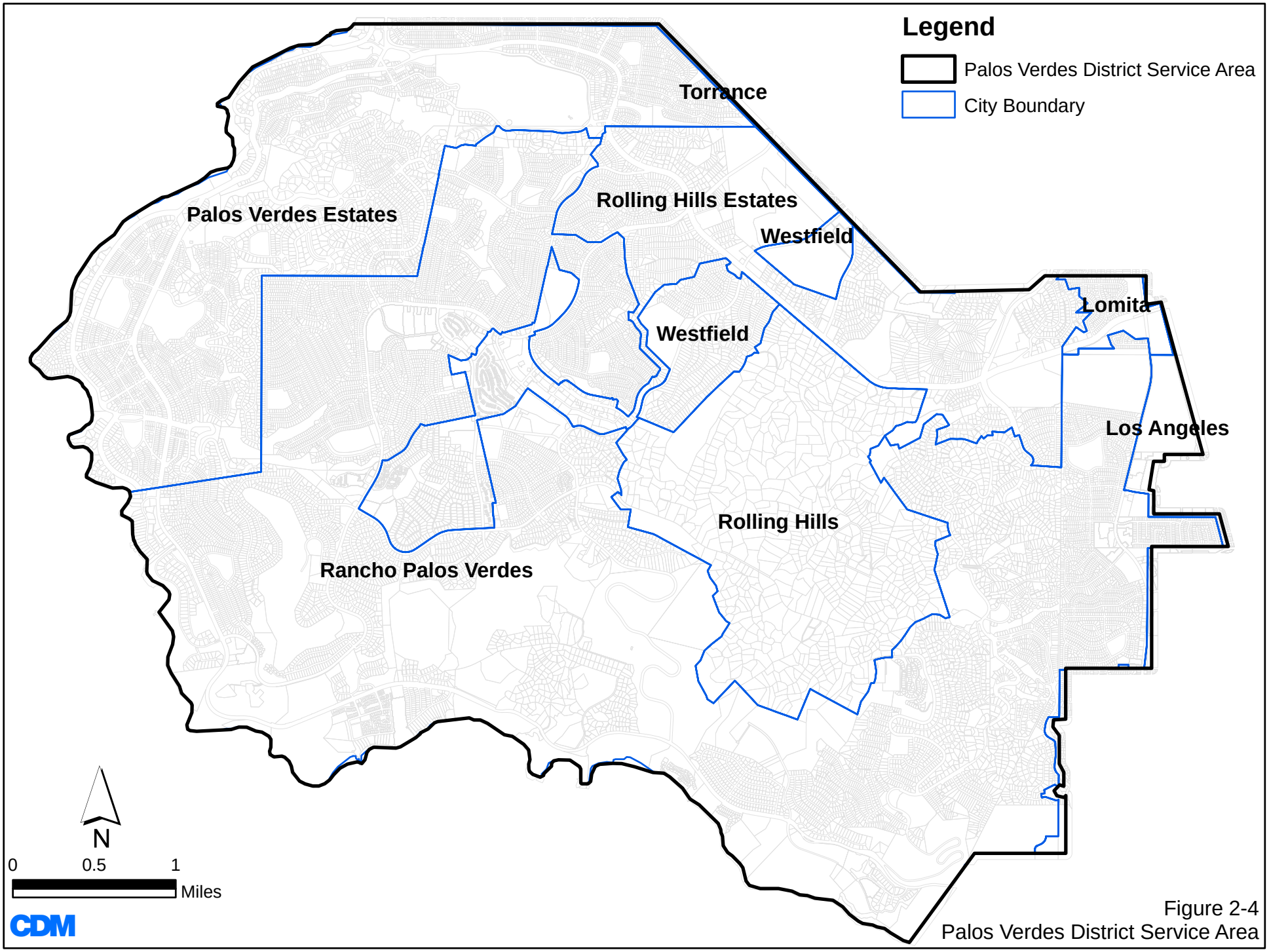

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Figure 2-4
Palos Verdes District Service Area

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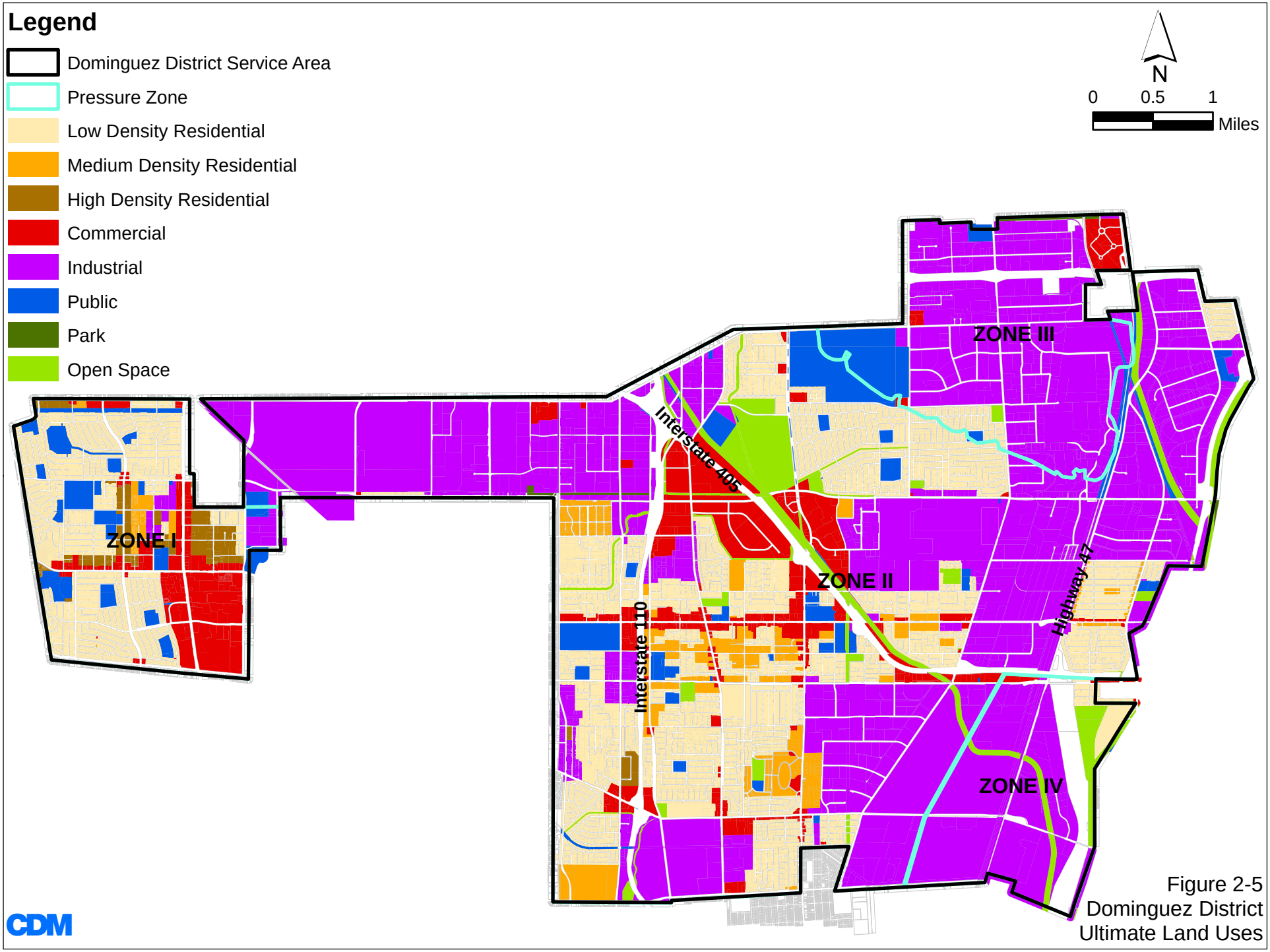

Figure 2-5
Dominguez District
Ultimate Land Uses

Table 2-1
Land Use Types Within the Dominguez District

Master Plan Land Use Type	Corresponding Carson General Plan Categories	Corresponding Compton General Plan Categories	Corresponding Long Beach General Plan Categories	Corresponding Los Angeles General Plan Categories	Corresponding Torrance General Plan Categories	Corresponding Los Angeles County General Plan Categories
Residential						
Low Density Residential	• Low Density RS, RA, RM-8 (1 to 8 units/acre)	---	• Single Family District LUD 1 (1 to 7 units/acre)	---	• Low Density R1 (1 to 9 units/acre)	• Low Density U9 (1 to 9 units/acre)
Medium Density Residential	• Medium Density RM-12 (9 to 12 units/acre) • High Density RM-25 (13 to 25 units/acre)	---	---	---	• Low-Medium Density R-2, R-TH (9 to 18 units/acre)	• Low-Medium Density (6 to 12 units/acre)
High Density	---	---	---	---	• Medium Density R-3 (18 to 28 units/acre) • Medium-High Density R-4 (28 to 44 units/acre) • High Density (unlimited, with an assumed density of 30 units/acre)	• Medium Intensity U18 (12 to 22 units/acre)
Non-Residential						
Commercial	• General Commercial • Regional Commercial • Mixed Use Commercial/ Residential • Mixed Use Business Park/ Commercial/ Light Industrial	• General Commercial	• Major Commercial • Traditional Retail Strip	• General Commercial	• Local Commercial • General Commercial • Commercial Center	• Commercial
Industrial	• Business Park • Light Industrial • Heavy Industry	• Industrial	• Industrial, Restricted • Industrial, General	---	• Light Industry • Heavy Industry • Business Park • Airport	• Industrial
Public	• Public Facilities	• Public and Quasi-Public	• Institutional and School District	---	• Public/Quasi-Public/Open Space	• Public/Semi Public Facilities • Transportation Corridor
Park	---	• Open Space/Parks	• Open Space and Park District	• Open Space	---	---
Open Space	• General Open Space • Recreational Open Space	---	• Rights of Way	---	---	• Open Space

The Dominguez District has few remaining vacant parcels for development. Much of the future growth will consist of in-fill development and redevelopment of existing uses. Examples of redevelopment include intensification of residential uses when an area is redeveloped with higher density housing and replacing existing single-family homes with larger homes, perhaps with secondary "in-law" units.

Appendix A-1 provides a detailed list of specific development and redevelopment projects within the Dominguez District that were in various stages of approval and completion as of January 2008. Figure 2-6 presents the location of the projects. Information on these projects was obtained from the local planning departments. These projects are typically further along in the planning process relative to other potential future development or redevelopment that would be allowed by the General Plan, but for which the planning agencies have not yet received any specific development proposals or applications.

Because of the significant development potential in the Dominguez District, Appendix A-1 also provides a March 2009 update on the status of the development/redevelopment projects that affect water use. A few of the projects have been completed, but several more have requested permit or planning extensions. This procedure allows the projects to remain in the Planning Department process, but allows more time for plans to finalize. Other Cal Water districts have seen similar slowdown in the timing of construction projects during the current economic downturn.

Table 2-2 summarizes acreages of the ultimate land use types within the Dominguez District. Residential uses comprise about 28 percent of the lands within the service area; commercial uses about 9 percent; industrial uses about 53 percent; public/institutional (governmental) about 6 percent; and open space and park uses the remaining 4 percent of land within the service area.

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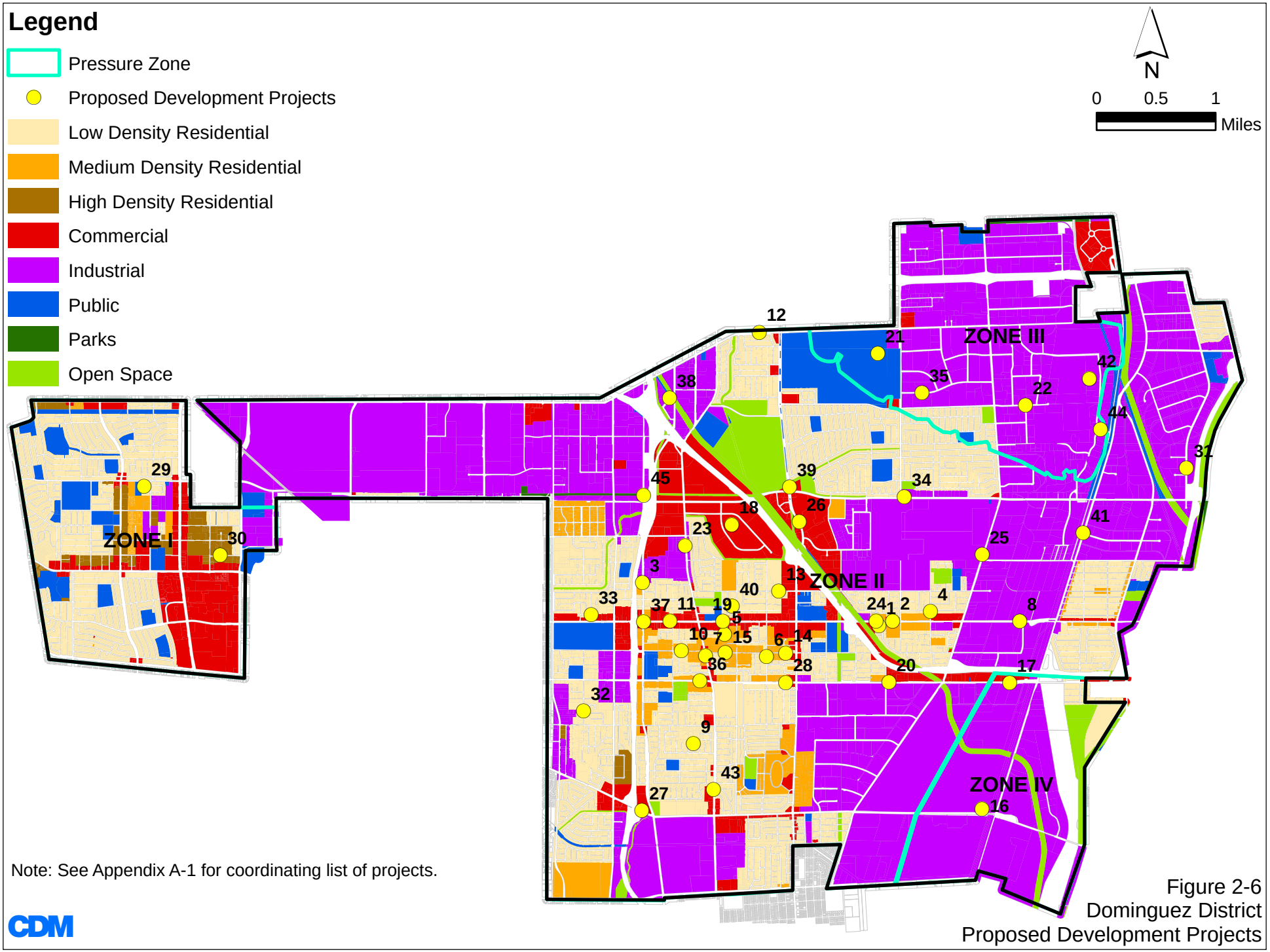

Note: See Appendix A-1 for coordinating list of projects.

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Figure 2-6
Dominguez District
Proposed Development Projects

Table 2-2 Summary of Ultimate Land Uses in the Dominguez District							
Land Uses	Acres[1]						
	Carson	Compton	Long Beach	Los Angeles	Torrance	Los Angeles County	Total
Residential							
Low Density Residential	2,133	0	98	0	837	544	3,611
Medium Density Residential	398	0	0	0	54	147	599
High Density Residential	0	0	0	0	164	25	189
Total Residential	2,531	0	98	0	1,054	716	4,399
Non-Residential							
Commercial/Office	860	67	1	29	432	73	1,462
Industrial	4,267	681	82	496	1,076	1,728	8,330
Public Facilities	550	0	18	0	273	153	995
Park/Recreation	0	16	0	14	0	0	29
Open Space	342	14	117	0	0	84	557
Total Non-Residential	6,019	778	218	538	1,781	2,039	11,373
Total Acreage in Dominguez District	8,550	778	316	538	2,835	2,755	15,772

[1] Acreage does not include streets or flood control facilities. Acreages were obtained from the ultimate land use maps using GIS tools.

2.2.2 Hermosa-Redondo District

Figure 2-7 shows the ultimate land uses with the Hermosa-Redondo District based on the information obtained from the planning agencies of the Cities of Hermosa Beach, Redondo Beach, and Torrance. The general plans do not give a specific date for build-out, likely because there are already at or close to build-out. Torrance referred to the city as "mature," without giving a specific date for build-out.

The zoning and general plan land use categories used by the local planning agencies were grouped into simplified land use types to facilitate the master plan analysis. Table 2-3 shows the simplified land use types and the corresponding general plan categories. The simplified master plan land use types are used in Figure 2-7.

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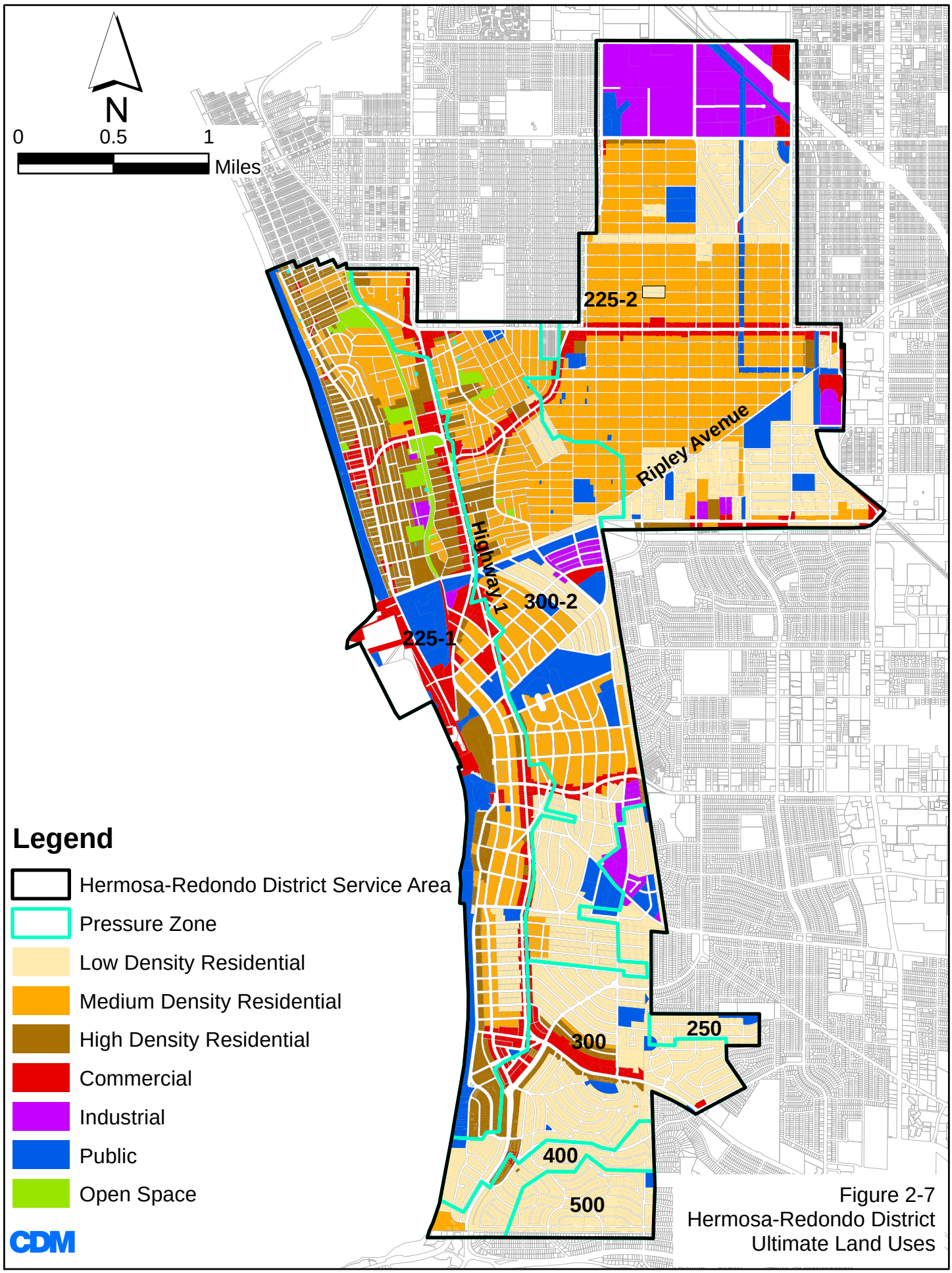

Figure 2-7
Hermosa-Redondo District
Ultimate Land Uses

Table 2-3 Land Use Types Within the Hermosa-Redondo District			
Master Plan Land Use Type	***Corresponding Hermosa Beach General Plan Categories***	***Corresponding Redondo Beach General Plan Categories***	***Corresponding Torrance General Plan Categories***
Residential			
Low Density Residential	---	• Single Family Residential R-1 (less than 8.8 units/acre)	• Low Density Residential (1 to 9 units/acre)
Medium Density Residential	• Low Density (1 to 13 units/acre) • Mobile Home Park	• Single Family Residential R-1-A (8.9 to 17.5 units/acre) • Single Family Residential R-2 (duplexes, townhomes, condos, apartments) (1 to 14.6 units/acre) • Single Family Residential R-3 (duplexes, townhomes, condos, apartments) (14.7 to 17.5 units/acre)	• Low-Medium Density (9 to 18 units/acre)
High Density Residential	• Medium Density (14 to 25 units/acre) • High Density (26 to 33 units/acre)	• Single Family Residential RMD (duplexes, townhomes, condos, apartments) (17.6 to 23.3 units/acre) • Single Family Residential RH (duplexes, townhomes) (23.4 to 28 units/acre)	• Medium Density (18 to 28 units/acre) • Medium-High Density (28 to 44 units/acre)
Non-Residential			
Commercial/Office	• General Commercial • Neighborhood Commercial • Commercial Corridor	• Retail Commercial C1, C2, C3, & C4 • Retail and Business Services C-5 • Commercial and Residential • Regional Serving Commercial • Coastal and Recreational Service Commercial	• Local Commercial • General Commercial • Commercial Center
Industrial	• Industrial	• Light Industrial • Light Industrial, Services	• Heavy Industry • Light Industry • Business Park
Public Facility, School	• Public Facilities	• Public Facilities	• Public/Quasi-Public/Open Space
Open Space	• Open Space/Public Facilities	---	---

Similar to the Dominguez District, the Hermosa-Redondo District has few remaining vacant parcels for development. Much of the future growth will consist of in-fill development and redevelopment of existing uses. Examples of redevelopment include intensification of residential uses when an area is redeveloped with higher density housing and replacing existing single-family homes with larger homes, perhaps with secondary "in-law" units.

Appendix A-2 provides a detailed list of specific development and redevelopment projects within the Hermosa-Redondo District, which are in various stages of

approval and completion as of January 2008. Figure 2-8 presents the location of the projects. Information on these projects was obtained from the local planning departments. These projects are typically further along in the planning process relative to other potential future development or redevelopment that would be allowed by the General Plan, but for which the planning agencies have not yet received any specific development proposals or applications.

Table 2-4 summarizes acreages of the ultimate land use types within the Hermosa-Redondo District. Residential uses comprise about 71 percent of the lands within the service area; commercial uses about 8 percent; industrial uses about 7 percent; public/institutional (governmental) about 11 percent; and open space and park uses the remaining 2 percent of land within the service area.

Table 2-4
Summary of Ultimate Land Uses in the Hermosa-Redondo District

Land Uses	***Acres[1]***			
	Hermosa Beach	***Redondo Beach***	***Torrance***	***Total***
Residential				
Low Density Residential	0	762	496	1,257
Medium Density Residential	238	1,146	10	1,395
High Density Residential	219	114	58	391
Total Residential	457	2,022	564	3,043
Non-Residential				
Commercial/Office	81	262	16	359
Industrial	7	299	0	305
Public Facilities	62	395	33	490
Open Space	66	0	0	66
Total Non-Residential	216	955	49	1,220
Total Acreage in Hermosa-Redondo District	673	2,977	612	4,262

(1) Acreage does not include streets. Acreages were obtained from the ultimate land use maps using GIS tools.

2.2.3 Palos Verdes District

Figure 2-9 shows the ultimate land uses with the Palos Verdes District based on the information obtained from the planning agencies at the Cities of Palos Verdes Estates, Rancho Palos Verdes, Rolling Hills, Rolling Hills Estates, and Los Angeles, and the County of Los Angeles. The general plans do not give a specific date for build-out, likely because there are already at or close to build-out. Rolling Hills Estates referred to the city as "urbanized," without giving a specific date for build-out.

The zoning and general plan land use categories used by the local planning agencies were grouped into simplified land use types to facilitate the master plan analysis. Table 2-5 shows the simplified land use types and the corresponding general plan categories. The simplified master plan land use types are used in Figure 2-9.

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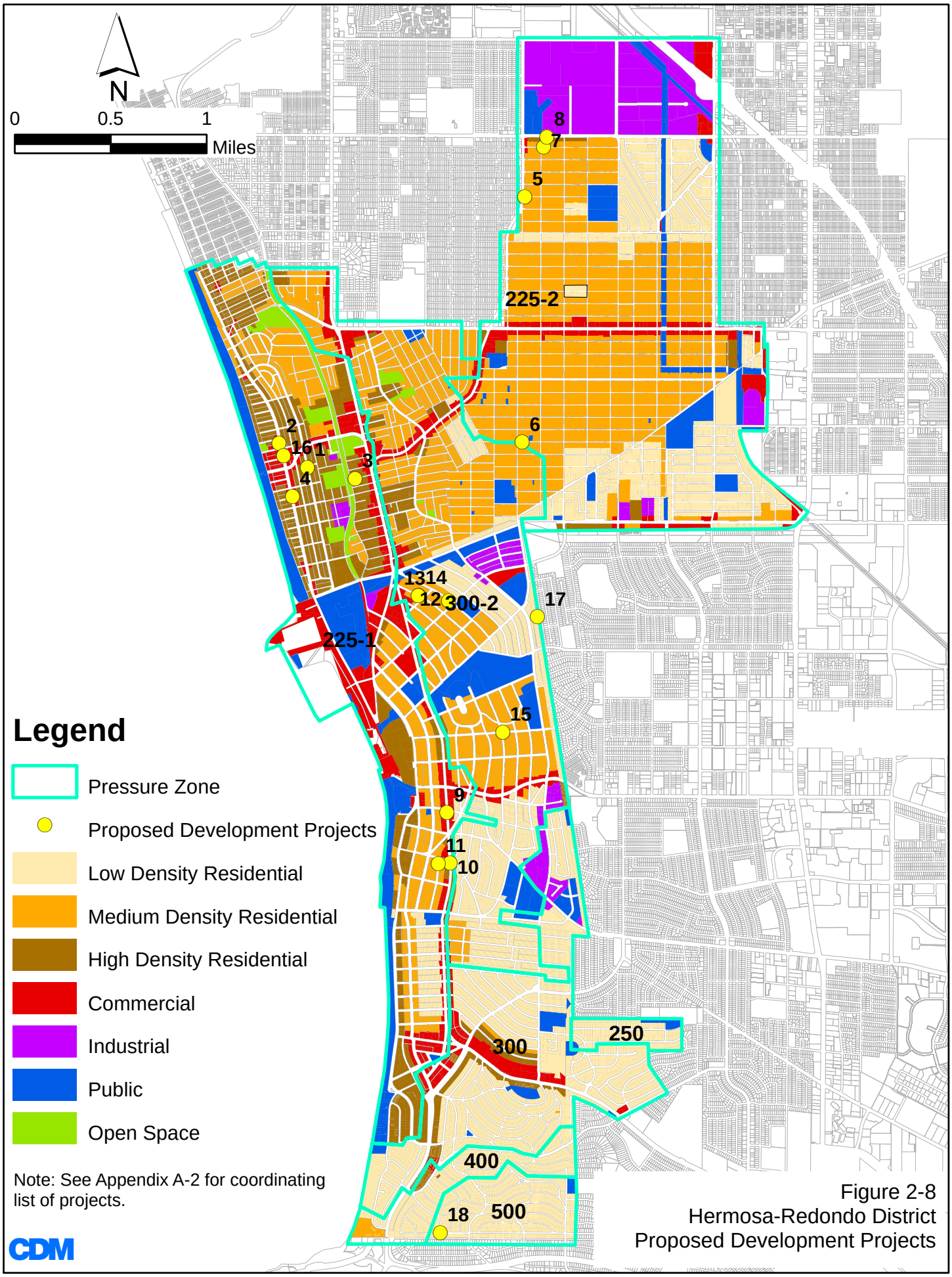

Note: See Appendix A-2 for coordinating list of projects.

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Figure 2-8
Hermosa-Redondo District
Proposed Development Projects

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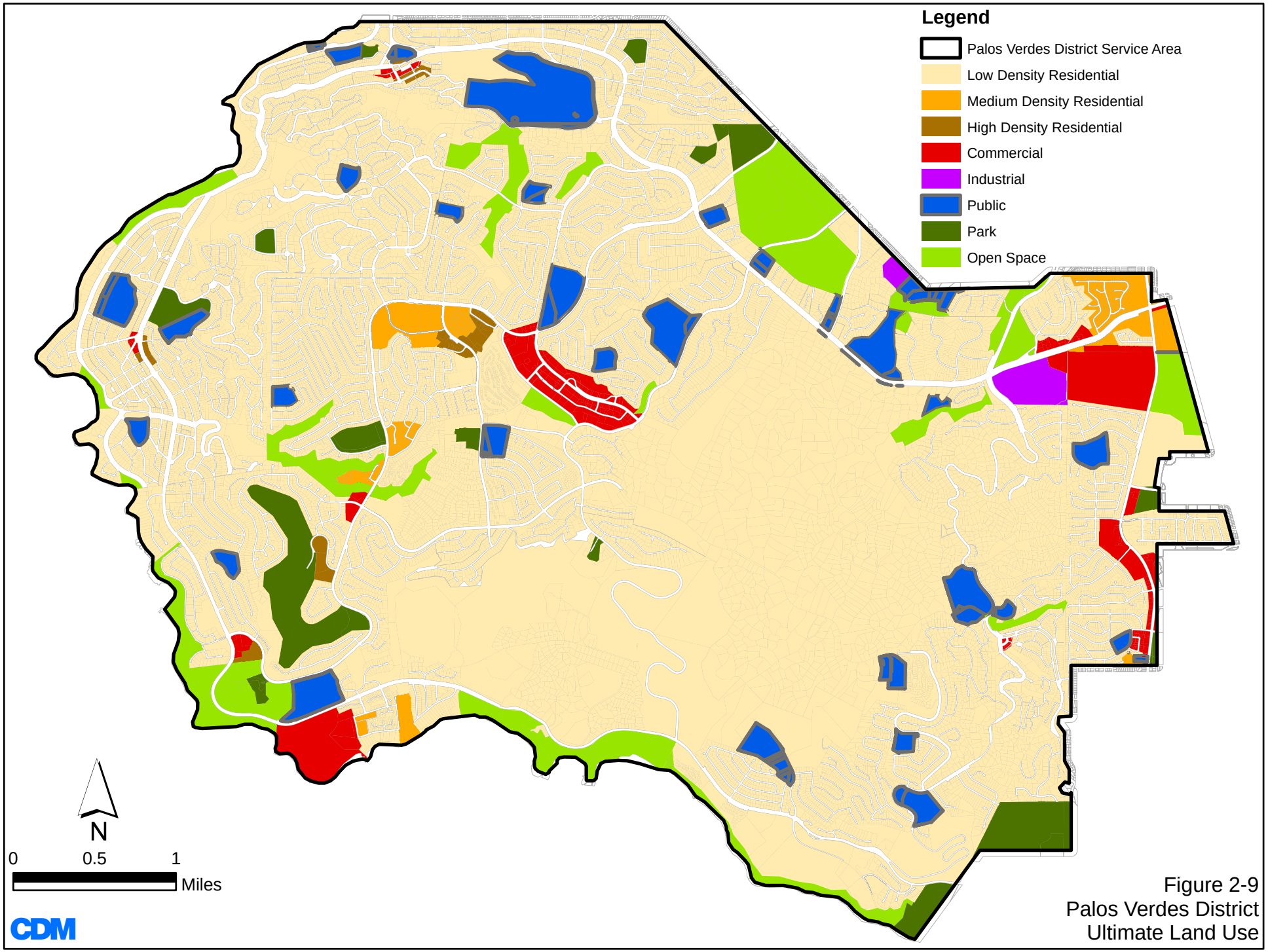

Figure 2-9
Palos Verdes District
Ultimate Land Use

Table 2-5
Land Use Types Within the Palos Verdes District

Master Plan Land Use Type	Corresponding Lomita General Plan Categories	Corresponding Los Angeles General Plan Categories	Corresponding Palos Verdes Estates General Plan Categories	Corresponding Rancho Palos Verdes General Plan Categories	Corresponding Rolling Hills General Plan Categories	Corresponding Rolling Hills Estates General Plan Categories	Corresponding Los Angeles County General Plan Categories
Residential							
Low Density Residential	---	• Single Family Low (up to 8.7 units/acre)	• Single Family Residential (no units/acre specified)	• Residential District, RS-A5 (0 to 0.2 units/acre) • Residential District, RS-1 (0.2 to 1 units/acre) • Residential District, RS-3 (2.2 to 3.4 units/acre) • Residential District, RS-4 (3.4 to 4.4 units/acre) • Residential District, RS-5 (4.4 to 5.4 units/acre) • Residential District, RS-6 (5.4 to 6 units/acre) • Residential District, RS-8 (6 to 8 units/acre)	• Residential Estate, RA-S-2 (0 to 0.5 units/acre) • Residential Estate, RA-S-1 (0.5 to 1 units/acre)	• Estate Density and Very Low Residential, RAE (0 to 1 units/acre) • Low Density, RA and RPD (1 to 2 units/acre) • Medium Density, RA and RPD (2 to 4 units/acre) • High Density (4 to 8 units/acre)	• Low Intensity (1 to 6 units/acre)
Medium Density Residential	• Medium Density (8.72 to 19.9 units/acre)	---	---	• Multi-Family, RM-10 (8 to 10 units/acre) • Multi-Family, RM-12 (10 to 12 units/acre)	---	---	---
High Density Residential	---	---	• Multi-Family (up to 24 units/acre)	• Multi-Family, RM-22 (13 to 22 units/acre)	---	---	---
Non-Residential							
Commercial	• Commercial	---	• Retail Commercial	• Commercial	---	• Commercial General • Commercial Office • Commercial Recreation • Neighborhood Commercial	---
Industrial	---	---	---	---	---	• Industrial	---
Public Facility	---	• Public Facilities	• Public Buildings	• Institutional • Cemetery	---	• Institutional	• Public and Semi Public Facilities
Park/ Recreation	---	---	• Park	• Park	---	• Park	---
Open Space	---	---	• Open Space	• Open Space Recreation • Open Space Hazard	---	• Open Space	• Open Space

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In contrast to the Dominguez and Hermosa-Redondo Districts, the Palos Verdes District has large undeveloped areas, but much of it is land that cannot be developed because of the steep terrain. There are several large developments planned in the district: golf course and resorts along the coast and a college campus expansion and Navy facility redevelopment inland.

Appendix A-3 provides a detailed list of specific development and redevelopment projects within the district, which are in various stages of approval and completion as of January 2008. Figure 2-10 presents the location of the projects. Information on these projects was obtained from the local planning departments. These projects are typically further along in the planning process relative to other potential future development or redevelopment that would be allowed by the General Plan, but for which the planning agencies have not yet received any specific development proposals or applications.

Table 2-6 summarizes acreages of the ultimate land use types within the Palos Verdes District. Residential uses comprise about 84 percent of the lands within the service area; commercial and public uses about 4 percent each; park and open space uses about 8 percent; and less than one percent for industry.

Table 2-6
Summary of Ultimate Land Uses in the Palos Verdes District[1]

Land Uses	*Acres*							
	Lomita	*Los Angeles*	*Palos Verdes Estates*	*Rancho Palos Verdes*	*Rolling Hills*	*Rolling Hills Estates*	*Los Angeles County*	*Total*
Residential								
Low Density Residential	0	62	2,015	6,314	1,913	2,897	259	13,460
Medium Density Residential	135	0	0	4,239	0	0	0	4,374
High Density Residential	0	0	45	420	0	0	0	465
Total Residential	135	62	2,060	10,973	1,913	2,897	259	18,300
Non-Residential								
Commercial/Office	6	0	8	865	0	101	0	979
Industrial	0	0	0		0	76	0	76
Public Facilities	0	0	250	374	0	157	47	829
Park/Recreation	0	0	54	474	0	59	0	586
Open Space	0	61	47	537	0	329	82	1,055
Total Non-Residential	6	61	359	2,249	0	722	129	3,526
Total Acreage in Study Area	141	123	2,419	13,223	1,913	3,620	388	21,826

[1] Acreage does not include streets. Acreages were obtained from the ultimate land use maps using GIS tools.

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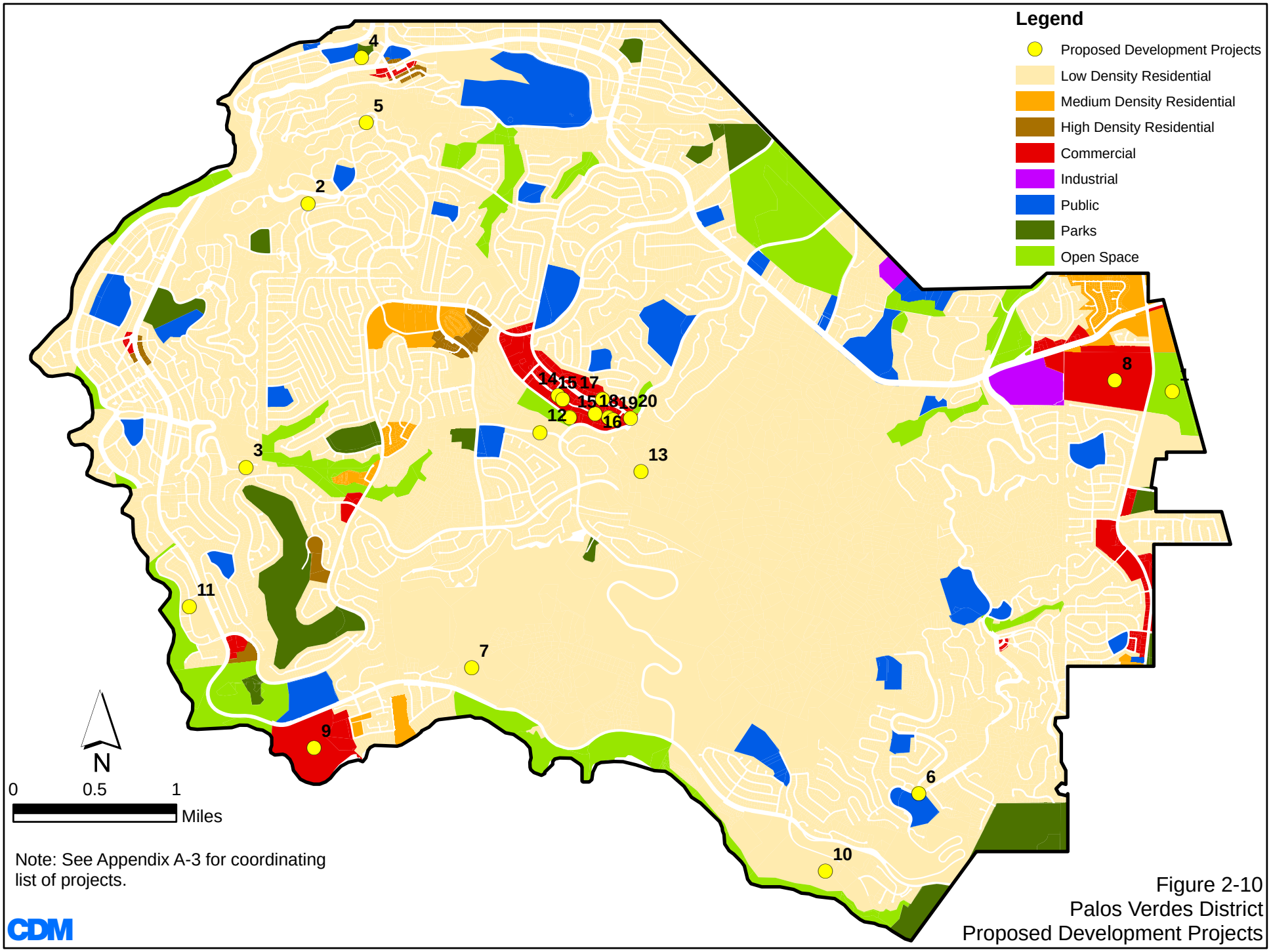

Note: See Appendix A-3 for coordinating list of projects.

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Figure 2-10
Palos Verdes District
Proposed Development Projects

Section 3
Water Demands

This section describes existing services and demands for the California Water Service Company (Cal Water) Dominguez, Hermosa-Redondo, and Palo Verdes Districts, and provides future service and demand projections based on planning information from the local city and county planning departments.

3.1 Dominguez District

3.1.1 Existing Services and Water Demand

Table 3-1 summarizes the Dominguez District's existing customer services and demand based on detailed customer billing records. As of 2005, the Dominguez District had a total of 32,506 customers (meters)[1]. About 87 percent of the services are single family residential customers, under 3 percent are multi-family residential customers, about 9 percent are commercial and industrial, and less than 1 percent are government, recycled water, and other customers.

Table 3-1 shows the existing water usage (consumption) by customer type, unaccounted-for water, and total demand. Total demand equals customer usage plus unaccounted-for water.

Table 3-1
Summary of 2005 Services and Demand by Customer Type for the Dominguez District

Customer Type	*Number of Services*	*Percent of Total Services*	*Total Annual Demand (MG)*	*Average Day Demand (mgd)*	*Percent of Total Demand*	*Average Daily Demand Per Service (gpd)*
Residential	28,136	86.6%	3,649	10.00	27.8%	355
Multi-Family Residential	920	2.8%	1,034	2.83	7.9%	3,080
Commercial	2,979	9.2%	2,651	7.26	20.2%	2,439
Industrial	160	0.5%	3,905	10.70	29.7%	66,860
Government	264	0.8%	608	1.67	4.6%	6,312
Recycled Water	10	<0.1%	1,257	3.44	9.6%	344,319
Other	37	0.1%	14	0.04	0.1%	1,067
Subtotal	**32,506**	**100.0%**	**13,118**	**35.94**	**99.8%**	**1,106**
Unaccounted-for Water	0	0.0%	26	0.07	0.2%	2
Total	**32,506**	**100.0%**	**13,145**	**36.01**	**100.0%**	**1,108**

Notes: MG = million gallons; mgd = million gallons per day; gpd = gallons per day

[1] Data from 2005 is presented because it was the most recent complete data set available at the time of the water demand analysis.

Figure 3-1 shows the distribution of existing services by customer type, as a percentage of total services.

Figure 3-2 shows the distribution of existing demands by customer type, as a percentage of total demand. The existing demand consists of about 36 percent residential uses, about 64 percent non-residential uses, and less than 1 percent unaccounted-for water. For non-residential uses, commercial comprised about 20 percent of total demand, industrial almost 30 percent, government about 5 percent, recycled water about 10 percent, and other uses less than 1 percent.

A comparison of Figures 3-1 and 3-2 shows that industrial accounts represent a very small percentage of total accounts but a significant percent of the water demands in the district, indicating that there are some large accounts with high water demands. This will be further illustrated below in the analysis of top water users.

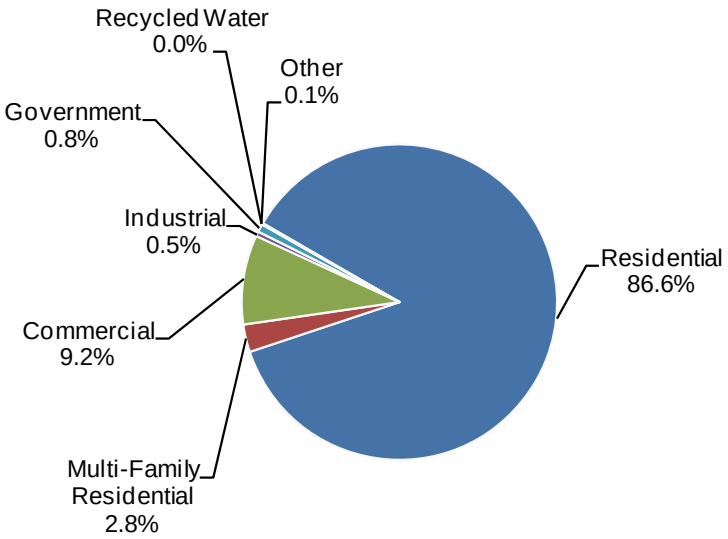

Figure 3-1
2005 Dominguez District Services by Customer Type (% of Total)

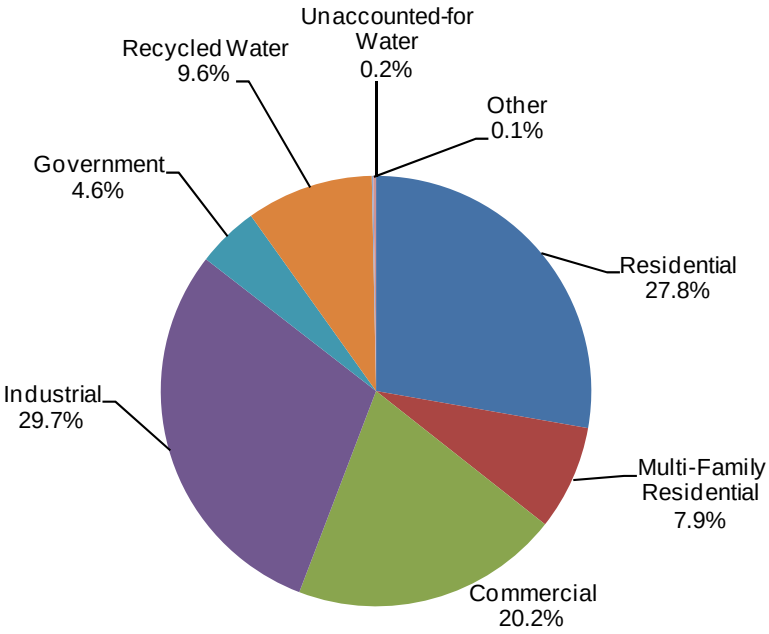

Figure 3-2
2005 Dominguez District Water Use by Customer Type (% of Total)

For an existing average day demand of about 36 mgd and an estimated service population of about 142,520, the 2005 per capita water demand for all uses is 253 gpd per capita. For residential uses only, the per capita demand is 90 gpd. Over the past 5

years, the total per capita demand has averaged about 256 gpd and the residential only per capita demand has averaged about 95 gpd.

Table 3-2 shows the top twenty water users in the Dominguez District in 2006. These top twenty users accounted for about 41 percent of the total average day water demand in the system. Based on customer class data included in the billing records, the large users are predominantly industrial customers, with a few business, recycled water, and public, and multiple-family users.

The largest single user had about 15 percent of the total average day system demand. The top five users made up 30 percent and the top 10 users about 36 percent of the total average day system demand. This data indicates that individual large users are a significant factor for system-wide facilities planning.

Table 3-2
2006 Top Twenty Largest Users in the Dominguez District [(1)]

Customer Type	City/County Area	Meter Size	Average Day Usage	
			gpd	gpm
Industrial	Carson	10"	5,424,764	3767
Recycled Water	Carson	16"	1,873,482	1301
Industrial	Carson	10"	1,506,788	1046
Industrial	Carson	6"	1,121,443	779
Industrial	Carson	10"	947,921	658
Business	Carson	6"	479,565	333
Recycled Water	Carson	10"	457,214	318
Industrial	East Rancho Dominguez	4"	390,867	271
Industrial	Compton	8"	362,115	251
Industrial	Carson	6"	335,833	233
Business	Carson	6"	298,396	207
Industrial	Long Beach	8"	267,027	185
Public Authority	Carson	8"	257,207	179
Industrial	Compton	8"	255,338	177
Industrial	Compton	8"	213,809	148
Multiple Residential	Carson	8"	198,786	138
Recycled Water	Carson	14"	180,434	125
Industrial	Compton	6"	160,423	111
Industrial	Gardena	3"	143,172	99
Multiple Residential	Carson	8"	128,364	89
TOTAL			15,002,947	10,419

[(1)] Demand data obtained from customer billing records.
Notes: gpm = gallons per minute

3.1.2 Historical Service Growth and Demand per Service

Information on historical service growth and the demand per service in the Dominguez District was based on historical customer data from 1980 through 2006 as obtained from updated Urban Water Management Plan (UWMP) tables provided by Cal Water staff.

Table 3-3 summarizes the historical percentage growth in number of services in the Dominguez District. Several time periods are considered for growth in services, which reflect economic and demographic conditions: 15-year average growth from 1992 through 2006; 10-year average growth from 1997 through 2006; and the recent 5-year average growth from 2002 through 2006.

Table 3-3
Historical Annual Percentage Growth in Number of Services for the Dominguez District [(1)]

Period	Average Percent Growth by Customer Type								
	Single Family Residential Services	Multi-Family Residential		Commercial Services	Industrial Services	Government Services	Recycled Water Services	Other Services	Total Services
		Services	Units						
15-Year Average (1992-2006)	0.35%	0.43%	0.40%	0.49%	1.70%	1.49%	39.17%	2.42%	0.38%
10-Year Average (1997-2006)	0.40%	0.55%	0.40%	0.70%	2.53%	1.58%	39.17%	3.16%	0.45%
5-Year Average (2002-2006)	0.39%	-0.52%	0.11%	0.82%	4.74%	1.28%	27.00%	-6.95%	0.42%

(1) Data based on updated UWMP tables.

As indicated in Table 3-3, the overall growth rate of total services has stayed relatively constant over the last 15 years, despite larger variations in multi-family residential, industrial, and recycled water services. The average percent growth per year in the number of single family residential services has remained between 0.35% and 0.40% per year over the last 15 years. Multi-family residential services have shown more volatility, with an increase in the growth rate from the 15-year to 10 year-average, but then negative growth in the last 5 years, which is generally inconsistent with an observed trend in which multi-family units are proliferating in the service area (an observation supported by the Southern California Association of Governments [SCAG] projections for the short-term, as well). Cal Water is reviewing its customer billing database to review some customer categorization potential discrepancies.

The industrial services growth rate has seen significant increases. The 15-year average growth rate was under 2%, but the 5-year growth rate is up to 4.7%. In the last 5 years, the industrial sector has gained about 30 services, for a 2006 total of 166 services. The recycled water category shows very high growth for all time periods, but that reflects just a small number of services. Recycled water service only began in 2000 with 2 services, and has increased to 11 services by 2006. The other services category fluctuates widely in growth rate, but is a very small number of services.

Table 3-4 summarizes the historical demand per service for the Dominguez District. Several time periods are considered for demand per service: 15-year average demand from 1992 through 2006; 10-year average demand from 1997 through 2006; and the recent 5-year average demand from 2002 through 2006.

Table 3-4
Historical Demand Per Service for the Dominguez District (gpd)

Period	Single Family Residential	Multi-Family Residential	Commercial	Industrial	Government	Recycled Water	Other	Unaccounted/ Total Services	Total Demand Per Service
15-Year Average (1992-2006)	361	3,237	2,764	63,804	7,917	446,825	2,584	15	1,056
10-Year Average (1997-2006)	369	3,230	2,843	62,007	7,479	446,825	2,843	15	1,087
5-Year Average (2002-2006)	374	3,185	2,683	63,523	6,832	406,182	2,342	17	1,134

As indicated in Table 3-4, the recent 5-year average shows that demand per service is increasing on a district-wide basis. The single family residential and multi-family residential categories have shown only small changes in demand per service over all three time periods. The recent 5-year average of single family service is at the highest level of the three period averages, while multi-family service demand is at the lowest. The demand per service for industrial users, the largest component of district demand, has stayed fairly consistent on an average basis. Commercial, government, and other demand per service has been trending down in recent years. Recycled water demand has also been decreasing on a per service basis, but the number of customers has been increasing, as shown in Table 3-3.

3.1.3 Unaccounted-for Water

Unaccounted-for water refers to system losses between production (supply) and consumption (customer usage). These losses may occur from fire flows, construction use, hydrant flushing, leaks, main breaks, metering inaccuracies, illegal connections or usage, and other types of un-metered water use. Unaccounted-for water typically ranges from about 5 to 10 percent of production for most water systems in California.

Table 3-5 presents the Dominguez District's historical unaccounted-for water and shows three years with negative estimates for unaccounted-for water. This is likely due to metering inaccuracies. Cal Water is investigating these data points. Since 1992, unaccounted for water has averaged about 2.2%, which is below the most typical figures for cities in Southern California. Records also show that there were three years where it ranged from 4 to 7%; otherwise, it has generally stayed below 2%. Over the last 5 years, the percentage of unaccounted-for water was also 2.2%, although it did reach 4.7% in 2005. For this master plan, a 5% allowance is recommended as a reasonable planning estimate for future demand projections.

Table 3-5
Unaccounted-For Water as a Percent of Total Demand for the Dominguez District [1]

	Unaccounted for Water (MG)	Total Demand (MG)	% of Unaccounted-For Water
1992	-204	10,940	-1.9%
1993	169	10,926	1.5%
1994	761	11,763	6.5%
1995	187	11,893	1.6%
1996	33	10,795	0.3%
1997	108	11,736	0.9%
1998	243	11,102	2.2%
1999	-229	11,824	-1.9%
2000	65	12,833	0.5%
2001	550	12,547	4.4%
2002	199	13,277	1.5%
2003	624	13,413	4.7%
2004	324	13,803	2.3%
2005	26	13,145	0.2%
2006	-187	13,184	-1.4%
15-year Average (1992-2006)	178	12,212	2.2% [1]
10-year Average (1997-2006)	172	12,686	2.1% [1]
5-year Average (2002-2006)	197	13,364	2.2% [1]

[1] Averages do not include years with negative unaccounted-for water.

3.1.4 Peaking Factors

Water system facilities are generally sized for peak demand periods. The peaking conditions of most concern for water facility sizing are maximum day demand with fire flow and peak hour demand on the maximum day. Average day demand refers to the average daily usage of water over a year. Maximum day demand is the maximum water usage for a 24-hour period during a year, which generally occurs during the maximum month of usage in the summer. Peak hour demand is the peak flow during a one-hour period on the day of maximum demand.

Table 3-6 summarizes historical demand data in the Dominguez District for the past ten years from Cal Water data, including total annual demand, average daily demand, and maximum day demand. Table 3-6 also shows the relationship (peaking factor) between maximum day demand and average daily demand.

Table 3-6
Summary of Historical Demand and Maximum Day Peaking Factors for the Dominguez District

Year	Annual Demand [2] (MG)	Average Daily Demand (mgd)[2]	Maximum Day Demand (mgd)	Maximum Day Peaking Factor[1]
1997	11,736	32.2	48.3	1.5
1998	11,102	30.4	45.6	1.5
1999	11,824	32.4	48.6	1.5
2000	12,833	35.2	52.8	1.5
2001	12,547	34.4	51.6	1.5
2002	13,277	36.4	54.6	1.5
2003	13,413	36.7	55.1	1.5
2004	13,803	37.8	56.7	1.5
2005	13,145	36.0	54.0	1.5
2006	13,184	36.1	54.2	1.5
Average Over Past 10-Year Period	12,686	34.8	52.1	1.5
Average Over Past 5-Year Period	13,364	36.6	54.9	1.5

(1) Estimated from review of daily production for MWD and peak week to average daily production for other sources from 2005 to 2007. Cal Water does not have daily production data for wells.
(2) Includes recycled water use.

Cal Water indicated the Dominguez District has weekly, not daily, production data. However, daily production data for the Metropolitan Water District of Southern California (MWD), the largest supply source, is available from an MWD website. Daily MWD production data and weekly production data for other sources for 2005 through 2007 indicate that peak week usage ranged from 1.27 to 1.45 times the average daily demand in these years. A peaking factor of 1.5 is recommended for the future system analysis.

Monthly demands are also of interest in water system planning, since the level of water use may vary significantly over the course of a year. Figure 3-3 shows the ratios of the monthly average day demand to the annual average day demand for the Dominguez District. The monthly ratios relate the monthly average daily flow to the annual average daily flow. The ratios are based on the 5-year average usage from 2002 through 2006.

As indicated on Figure 3-3, the monthly average demand ranges from about 0.8 times the annual average day demand in the winter to 1.2 times the annual average day demand in the summer. This relatively narrow range is typical of a coastal climate.

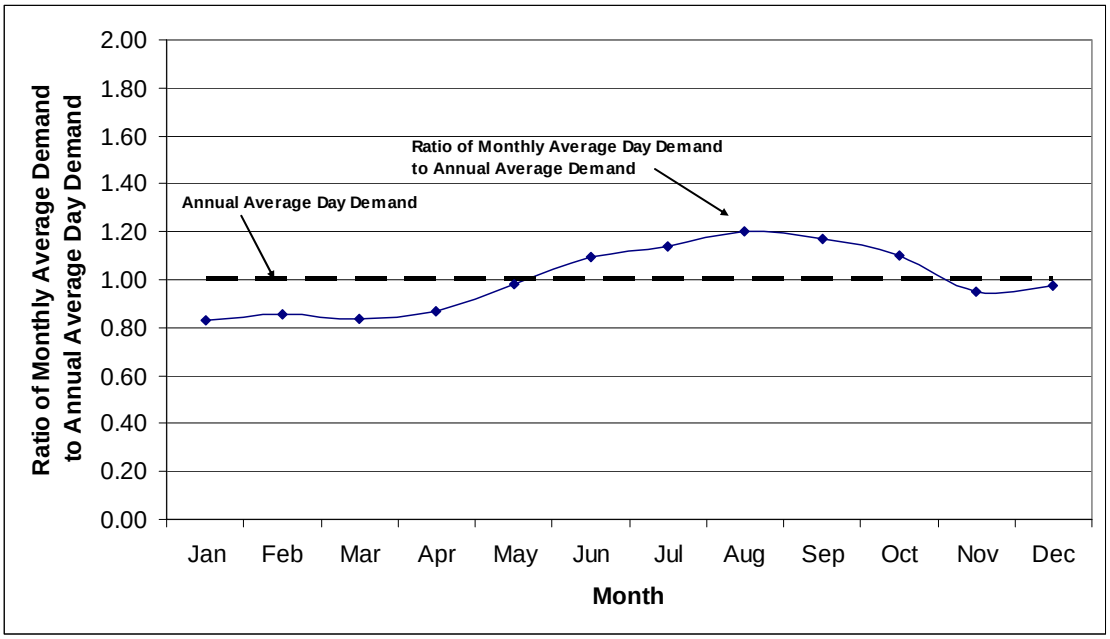

Figure 3-3
Dominguez District Monthly Demand Factors

3.1.5 Future Service and Demand Projections

The recommended planning-level demand projections for the Dominguez District are summarized first, followed by a discussion of the sensitivity analysis of low to high projection ranges.

Recommended Planning-Level Demands

Projections of future services and demands for the Dominguez District were developed using the Table 3-3 historical growth rates for services and the Table 3-4 historic demands per service. Individual growth rates were used for each customer type. Unaccounted-for water was assumed to be 5 percent of total water demand.

Table 3-7 summarizes the recommended planning-level service and demand projections developed for the Dominguez District to year 2030, a 25-year planning horizon. The projections were developed by determining the projected number of services for each 5-year interval based on continuation of historical growth rates, and then calculating the demand for each customer type by multiplying the projected number of services by the demand per service. For each customer type, individual growth rates (percent per year) and unit demands (gallons per day per service) were used. Table 3-7 summarizes the following by 5-year increments to year 2030:

- Total number of projected services based on the 10-year growth rate for each of the customer types, with the exception of recycled water and other services, which were set to zero growth, as discussed below.

- Demand projections, including average daily demands, total per service demand, and total per capita demand. Year 2030 demand of 51.4 mgd assumes no conservation savings beyond what is in place now[2], and is based on the 10-year growth rates in services and the 5-year average unit demands.

Table 3-7
Summary of Planning-Level Demand Projections for the Dominguez District

Year	Total Projected Services	Estimated Population in Service Area (1)	Projections Based on 10-Year Average Growth Rate and 5-Year Average Unit Demand Per Service			
			Average Day Demand (mgd)		Total Per Service Demand	Total Per Capita Demand
			(mgd)	(AF per year)	(gpd)	(gpd)
2005	32,506	142,400	36.0	40,340	1,108	253
2010	33,243	145,300	40.2	45,025	1,209	277
2015	34,000	148,200	42.6	47,716	1,253	287
2020	34,778	151,200	45.2	50,683	1,301	299
2025	35,578	154,200	48.2	53,960	1,354	312
2030	36,401	157,300	51.4	57,585	1,412	327

(1) The estimated population is calculated by multiplying the projected number of single family and multi-family residential units by Cal Water's estimate of 4.75 people per unit.

Potential conservation savings are discussed in Section 9, Water Supply Strategy. The demand projections also include demands that may potentially be met by future recycled water supply. Options for recycled water supply are discussed in Section 9.

Appendices B-1 and B-2 provide a detailed breakdown of the services and demands, respectively, by customer category for each 5-year increment. The year 2030 projected services include 31,065 single family services (equivalent to housing units) and 1,055 multi-family services (2,068 housing units). It is assumed that the number of multi-family units per service will remain constant at about 2 units per service.

As noted in Table 3-7, the master plan population projection is calculated by multiplying the projected number of residential (single family and multi-family) housing units by Cal Water's density estimate for the Dominguez District of 4.75 people per unit. The master plan projection is in line with Cal Water's estimate in the 2005 UWMP.

Sensitivity Analysis of Demand Projections

A sensitivity analysis was conducted to determine the potential future range in demands for various combinations of historical growth rates and unit demands. Based on the sensitivity analysis, demands may range from a low of 51.4 mgd to a

[2] Conservation savings are considered a component of local supply. Supply options are discussed in Section 9.

high of 67.1 mgd. This range of projections is useful to evaluate the potential impact of uncertainties regarding how future development will actually occur, and to identify whether assumptions may significantly affect the estimate. The sensitivity results helped to identify a reasonable estimate for long-term planning purposes.

Table 3-8 summarizes the total service and demand projections for the Dominguez District for the six sensitivity scenarios shown below using various combinations of historic growth rates and unit demands by customer category. The Table 3-8 demand projections represent normal (non-drought) conditions. Appendix B-1 contains detailed tables that show the breakdown by customer type of the service projections for each scenario, and Appendix B-2 contains demand projections breakdowns for each scenario. The demand scenarios include:

- *Scenario A*: 10-year growth rates and 10-year average unit demand per service for each customer category. The total demand for this scenario is 51.7 mgd.
- *Scenario B:* 10-year growth rates and 5-year average unit demand per service for each customer category. The total demand for this scenario of 51.4 mgd is similar to Scenario A. This is the recommended planning-level demand scenario.
- *Scenario C*: 5-year average growth rates and 10-year average unit demand per service for each customer category. The high five-year growth rate for industrial services (4.74%) is the primary cause of the 13 mgd difference in 2030 demand for this scenario compared to Scenarios A and B.
- *Scenario D*: 5-year average growth rates and 5-year average unit demand per service for each customer category. The total demand of 65.1 mgd for this scenario is similar to Scenario C.
- *Scenario E*: highest growth rate and highest average unit demand for each customer category. At 67.1 mgd, this is the high end of the projection range.
- *Scenario F*: 10-year average growth rates and 15-year average unit demand per service for each customer category. The total demand of 51.9 mgd for this scenario is similar to Scenarios A and B.

Figures 3-4 and 3-5 display the range of demand and service projections, respectively. Scenario B was chosen as the recommended planning-level demand because the 5-year average unit demands reflect recent trends in customer water use and the 10-year average growth rate has a more conservative level of industrial service growth.

Table 3-8
Summary of Sensitivity Analyses for Service and Average Day Demand Projections for the Dominguez District [1]

Year	Scenario A: 10-year Growth Rate 10-year Unit Demands		Scenario B: 10-year Growth Rate 5-year Unit Demands		Scenario C: 5-year Growth Rate 10-year Unit Demands		Scenario D: 5-year Growth Rate 5-year Unit Demands		Scenario E: [2] Highest Growth Rate Highest Unit Demands		Scenario F: 10-year Growth Rate 15-Year Unit Demands	
	Total Services	Total Average Day Demand (mgd)	Total Services	Total Average Day Demand (mgd)	Total Services	Total Average Day Demand (mgd)	Total Services	Total Average Day Demand (mgd)	Total Services	Total Average Day Demand (mgd)	Total Services	Total Average Day Demand (mgd)
2005	32,506	36.0	32,506	36.0	32,506	36.0	32,506	36.0	32,506	36.0	32,506	36.0
2010	33,243	40.5	33,243	40.2	33,243	41.8	33,243	41.5	33,283	42.6	33,243	40.5
2015	34,000	42.9	34,000	42.6	34,006	46.0	34,006	45.7	34,089	47.0	34,000	42.9
2020	34,778	45.6	34,778	45.2	34,801	51.1	34,801	50.9	34,929	52.4	34,778	45.6
2025	35,578	48.5	35,578	48.2	35,631	57.3	35,631	57.3	35,805	59.0	35,578	48.6
2030	36,401	51.7	36,401	51.4	36,502	65.0	36,502	65.1	36,725	67.1	36,401	51.9

[1] See Appendix B-1 for detailed information on service projections. See Appendix B-2 for detailed information on demand projections.
[2] Scenario E uses the highest growth rates and highest unit demands over the past 15 years.

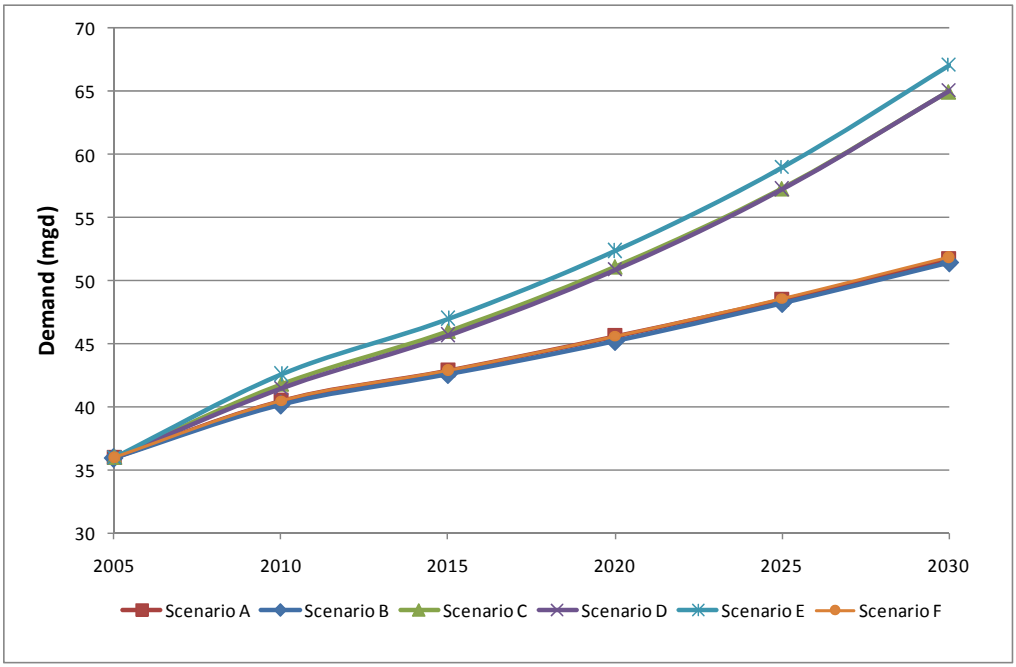

Figure 3-4
Range of Demand Projections for the Dominguez District

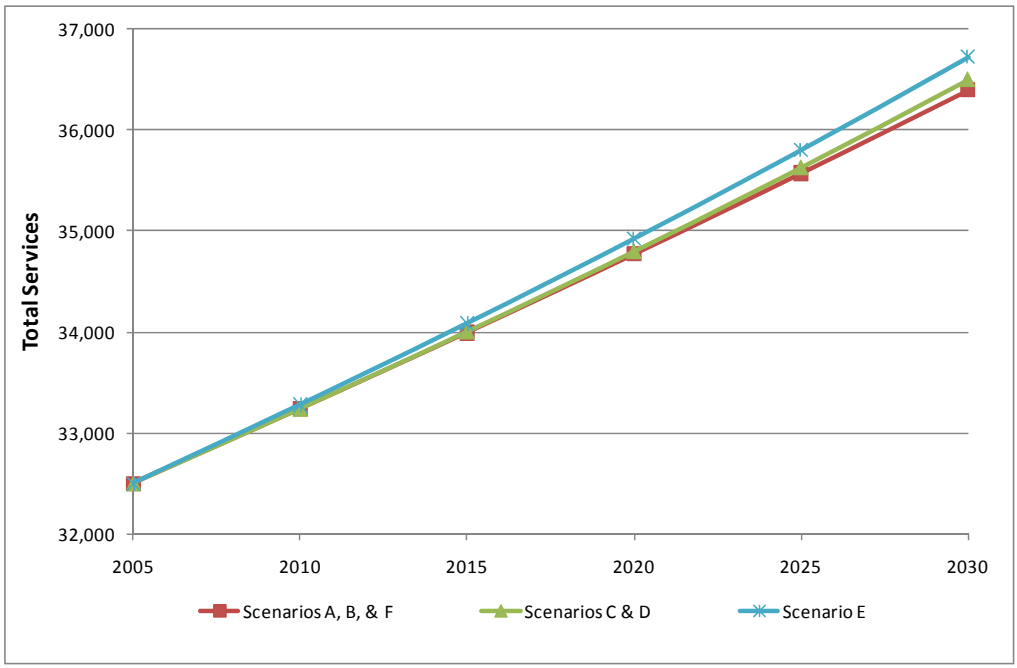

Figure 3-5
Range of Service Projections for the Dominguez District

The 5-year growth rate for multi-family residential customers was set to zero growth, instead of negative growth (shown in Table 3-3), due to questions about the validity of the multi-family customer data. Because of uncertainty in future recycled water supplies, the recycled water services are assumed to remain at the current level. Potential future recycled water customers and demand are discussed in Section 9. The "other" category fluctuates widely year by year, and was assumed to remain at the 2005 level. As mentioned above, the 5-year growth rate in services for industrial services is the main factor in the high demand projections in Scenarios C, D, and E. This rate of growth is likely not sustainable, and therefore not appropriate to use as a long-term trend.

As part of the sensitivity analysis, CDM obtained SCAG's demographic forecasts for the region and used GIS tools to determine the SCAG population projections for the Dominguez District. The master plan population projections shown in Table 3-7 and the SCAG projections have a similar growth rate, which indicates assumptions on growth trends are similar for both SCAG and Cal Water. However, the calculated SCAG projections were considerably higher than the master plan population projection for the Dominguez District. Two potential reasons for the differences are the spatial allocation method used by SCAG to forecast population and the nature of SCAG as a regional planning agency. First, the data from SCAG was obtained by traffic analysis zones (TAZ, the unit commonly used in transportation planning). This data does not provide an indication of the uniformity or nonuniformity of housing density (or other data) within a TAZ. When a TAZ is intersected with a pressure zone

to determine the population within that zone, the data allocated to the pressure zone was based on the percentage of area of the TAZ that overlapped the pressure zone. However, the overlapping area may actually have a lower housing density than the average for the TAZ, which would tend to cause the higher SCAG population estimates. Second, regional planning agencies such as SCAG often tend to have higher demographic estimates relative to historic growth or local agency planning. This has been the case with other regional planning organizations in Northern California, as well.

3.2 Hermosa-Redondo District

3.2.1 Existing Services and Water Demand

Table 3-9 summarizes the Hermosa-Redondo District's existing customer services and demand based on detailed customer billing records. As of 2006, the Hermosa-Redondo District had a total of 25,860 customers (meters)[3]. About 84 percent of the services are for single family residential customers, under 6 percent for multi-family residential customers, about 9 percent for commercial and industrial, and less than 2 percent for government, recycled water, and other customers.

Table 3-9 shows the existing water usage (consumption), unaccounted-for water, and total demand. Total demand equals customer usage plus unaccounted-for water.

Table 3-9
Summary of 2006 Services and Demand by Customer Type for the Hermosa-Redondo District

Customer Type	Number of Services	Percent of Total Services	Total Annual Demand (MG)	Average Day Demand (mgd)	Percent of Total Demand	Average Daily Demand Per Service (gpd)
Residential	21,795	84.3%	2,495	6.84	53.3%	314
Multi-Family Residential	1,461	5.6%	849	2.33	18.1%	1,593
Commercial	2,188	8.5%	695	1.91	14.8%	871
Industrial	40	0.2%	150	0.41	3.2%	10,242
Government	349	1.3%	187	0.51	4.0%	1,469
Recycled Water	18	0.1%	40	0.11	0.8%	6,030
Other	9	0.03%	1	0.00	0.0%	400
Subtotal	**25,860**	**100.0%**	**4,418**	**12.10**	**94.3%**	**468**
Unaccounted-for Water	0	0.0%	266	0.73	5.7%	28
Total	**25,860**	**100.0%**	**4,684**	**12.83**	**100.0%**	**496**

[3] Data from 2006 is presented because it was the most recent complete data set available at the time of the water demand analysis.

Figure 3-6 shows the distribution of existing services by customer type, as a percentage of total services.

Figure 3-7 shows the distribution of existing demands by customer type, as a percentage of total demand. The existing demand consists of about 71 percent residential uses, about 23 percent non-residential uses, and almost 6 percent unaccounted-for water. For non-residential uses, commercial comprised about 15 percent of total demand, industrial about 3 percent, government about 4 percent, recycled water les s than 1 percent, and other uses less than 1 percent.

For an existing average day demand of about 12.8 mgd and an estimated service area population of about 99,190, the 2006 per capita water demand for all uses is 129 gpd per capita, and for residential uses only is 92 gpd per capita. Over the past 5 years, the total per capita demand has averaged about 135 gpd and the residential only per capita demand has averaged about 95 gpd.

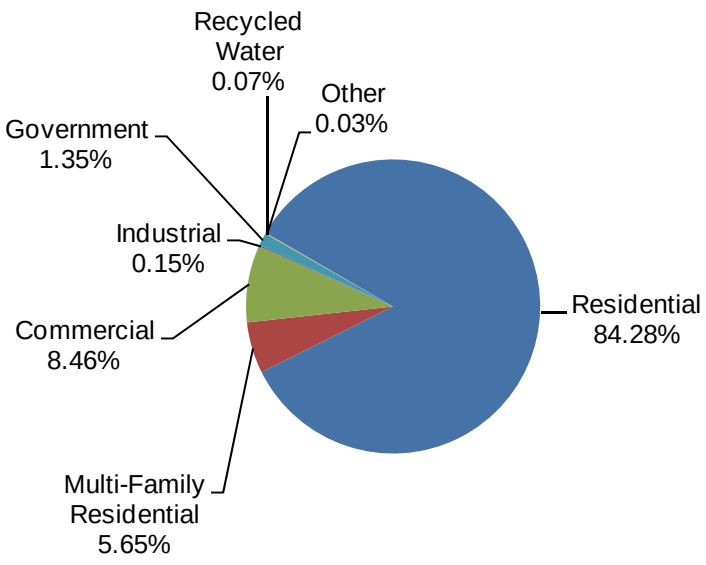

Figure 3-6
2006 Hermosa-Redondo District Services by Customer Type (% of Total)

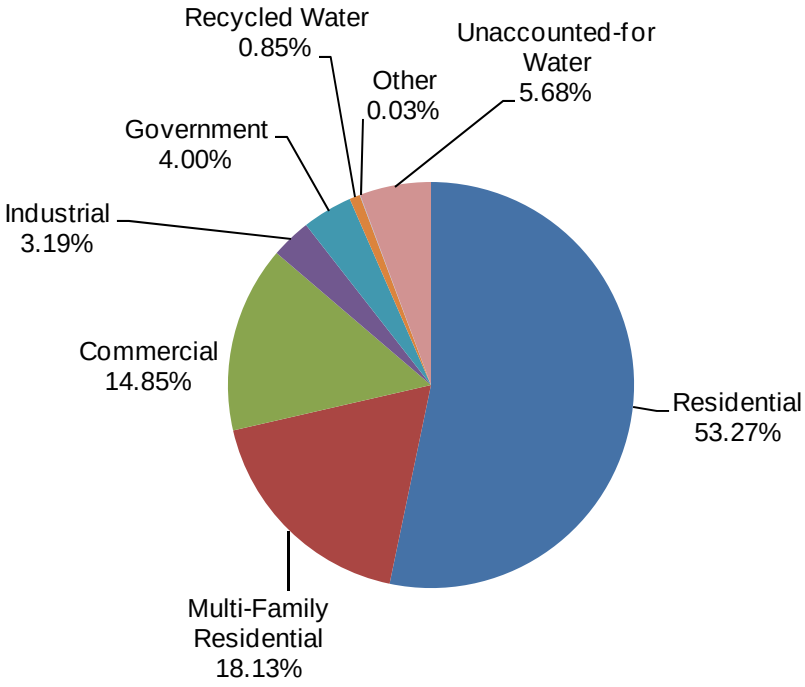

Figure 3-7
2006 Hermosa-Redondo District Water Use by Customer Type (% of Total)

Table 3-10 shows the top twenty water users in the Hermosa-Redondo District in 2006. These top twenty users accounted for about six percent of the total average day water demand in the system. Based on customer class data included in the billing records, the large users are a mix of industrial, business, and multi-family residences.

Table 3-10
2006 Top Twenty Largest Users in the Hermosa-Redondo District [1]

Customer Type	City	Meter Size	Average Day Usage	
			gpd	gpm
Industrial	Redondo Beach	8"	259,601	180
Industrial	Redondo Beach	6"	54,632	38
Business	Redondo Beach	6"	50,635	35
Public Authority	Redondo Beach	6"	43,757	30
Business	Redondo Beach	6"	38,424	27
Multiple Residential	Redondo Beach	4"	26,983	19
Multiple Residential	Redondo Beach	6"	26,124	18
Public Authority	Redondo Beach	4"	25,671	18
Public Authority	Redondo Beach	4"	25,011	17
Multiple Residential	Redondo Beach	4"	25,003	17
Business	Redondo Beach	not available	21,709	15
Business	Redondo Beach	6"	21,662	15
Business	Redondo Beach	2"	20,229	14
Multiple Residential	Hermosa Beach	4"	19,959	14
Multiple Residential	Redondo Beach	3"	19,389	13
Multiple Residential	Redondo Beach	6"	19,178	13
Business	Redondo Beach	2"	18,811	13
Public Authority	Redondo Beach	3"	18,309	13
Business	Redondo Beach	3"	17,850	12
Multiple Residential	Redondo Beach	4"	17,661	12
TOTAL			770,598	535

[1] Demand data obtained from customer billing records.

The largest single user had about 2 percent of the total average day system demand. The top five users made up 3.5 percent and the top 10 users about 4.5 percent of the total average day system demand. This data indicates that typical district customers are small water users and are not a significant factor for system-wide facilities planning.

3.2.2 Historical Service Growth and Demand per Service

Information on historical service growth and the demand per service in the Hermosa-Redondo District was based on historical customer data from 1980 through 2006 as obtained from updated UWMP tables provided by Cal Water staff.

Table 3-11 summarizes the historical percentage growth in number of services in the Hermosa-Redondo District. Several time periods are considered for growth in services, which reflect economic and demographic conditions: 20-year average growth from 1987-2006; 15-year average growth from 1992 through 2006; 10-year average growth from 1997 through 2006; and the recent 5-year average growth from 2002 through 2006.

Table 3-11
Historical Annual Percentage Growth in Number of Services for the Hermosa-Redondo District [1]

Period	Average Percent Growth by Customer Type								
	Single Family Residential Services	Multi-Family Residential		Commercial Services	Industrial Services	Government Services	Recycled Water Services	Other Services	Total Services
		Services	Units						
20-Year Average (1987-2006)	0.64%	0.41%	0.92%	-0.11%	-0.27%	-0.05%	52.16%	-0.88%	0.55%
15-Year Average (1992-2006)	0.49%	0.01%	0.94%	-0.16%	-0.52%	-0.33%	52.16%	5.86%	0.39%
10-Year Average (1997-2006)	0.57%	0.02%	1.41%	-0.14%	0.66%	-0.31%	17.38%	4.04%	0.47%
5-Year Average (2002-2006)	0.47%	-0.11%	2.36%	-0.29%	0.53%	0.23%	-2.05%	-1.96%	0.36%

[1] Data based on updated UWMP tables.

As indicated in Table 3-12, the overall average growth rate of total services in the Hermosa-Redondo District has stayed relatively stable over the four time periods (5-year, 10-year, 15-year, and 20-year averages), varying from 0.36% to 0.55% per year. The average percent growth per year in the number of single family residential services has remained between 0.47% and 0.64% over the last 20 years. Multi-family residential services have shown more volatility, with a reduction in service growth since 1987 to reach negative growth; however, the growth rate in multi-family units has actually been increasing. Cal Water is reviewing its customer billing database to evaluate some customer categorization issues, such as whether the current system is capturing all the multi-family services in the district.

Commercial service growth has been negative in each of four time periods. The industrial services have been growing since 1997, though the total number of industrial services is still less than 1% of total services in the district. The recycled water category shows very high growth for all time periods, but that reflects the small number of services. Recycled water service began in 1995 with one service, and increased to 18 services by 2006. The other services category fluctuates widely in growth rate, but is a very small number of services.

Table 3-12 summarizes the historical demand per service for the Hermosa-Redondo District. Several time periods are considered for demand per service: 20-year average demand from 1987-2006; 15-year average demand from 1992 through 2006; 10-year average demand from 1997 through 2006; and the recent 5-year average demand from 2002 through 2006.

Table 3-12
Historical Demand Per Service for the Hermosa-Redondo District (gpd)

Period	Single Family Residential	Multi-Family Residential	Commercial	Industrial	Government	Recycled Water [1]	Other	Unaccounted/ Total Services	Total Demand Per Service
20-Year Average (1987-2006)	311	1,729	889	16,016	1,735	6,662	931	37	531
15-Year Average (1992-2006)	313	1,678	871	14,516	1,657	6,662	1,009	36	521
10-Year Average (1997-2006)	320	1,679	882	12,464	1,604	6,213	887	39	525
5-Year Average (2002-2006)	318	1,644	886	9,995	1,464	5,888	869	37	514

[1] Recycled water service began in 1995.

As indicated in Table 3-12, the recent 5-year average shows that demand per service is decreasing on a district-wide basis. The average single family residential and commercial unit demands have remained fairly steady over the past 20 years. All other customer categories are showing decreasing average unit demand, especially in the industrial sector.

3.2.3 Unaccounted-for Water

Table 3-13 shows the Hermosa-Redondo District's historical unaccounted-for water. Since 1992 (15 years), it has averaged about 6.8%, within the industry average of 5-10%. Over the last 5 years, the percentage of unaccounted-for water was 7.2%, although it did reach 8.6% in 2005. For this master plan, a 7.5% allowance is recommended as a reasonable planning estimate for future demand projections.

3.2.4 Peaking Factors

Table 3-14 summarizes historical demand data in the Hermosa-Redondo District, including total annual demand, average daily demand, and maximum day demand. Table 3-14 also shows the relationship (peaking factor) between maximum day demand and average daily demand.

The maximum day peaking factor relates the maximum day average daily demand to the annual average day system demand. Over the last 5 years, the maximum day peaking factor ranged from 1.48 to 1.78, with an average of 1.57 over the 5-year period. For the master plan, a maximum day peaking factor of 1.6 is recommended as a reasonable value for master planning purposes.

Table 3-13
Unaccounted-For Water as a Percent of Total Demand for the Hermosa-Redondo District

	Unaccounted for Water (MG)	Total Demand (MG)	Percent of Unaccounted-For Water
1992	148	4,330	3.4%
1993	214	4,481	4.8%
1994	331	4,703	7.0%
1995	311	4,628	6.7%
1996	307	4,814	6.4%
1997	352	4,942	7.1%
1998	377	4,690	8.0%
1999	417	4,906	8.5%
2000	351	5,023	7.0%
2001	387	4,896	7.9%
2002	341	4,978	6.8%
2003	371	4,816	7.7%
2004	333	4,811	6.9%
2005	409	4,746	8.6%
2006	266	4,684	5.7%
15-year Average (1992-2006)	328	4,763	6.8%
10-year Average (1997-2006)	360	4,849	7.4%
5-year Average (2002-2006)	344	4,807	7.2%

Table 3-14
Summary of Historical Demand and Maximum Day Peaking Factors for the Hermosa-Redondo District

Year	Annual Demand (MG)	Average Daily Demand (mgd)	Maximum Day Demand (mgd)	Maximum Day Peaking Factor
1997	4,942	13.5	20.1	1.48
1998	4,690	12.8	19.6	1.53
1999	4,906	13.4	18.7	1.39
2000	5,023	13.8	22.5	1.64
2001	4,896	13.4	19.9	1.48
2002	4,978	13.6	21.6	1.58
2003	4,816	13.2	20.0	1.52
2004	4,811	13.2	23.5	1.78
2005	4,746	13.0	19.2	1.48
2006	4,684	12.8	19.3	1.50
Average Over Past 10-Year Period	4,849	13.3	20.4	1.54
Average Over Past 5-Year Period	4,807	13.2	20.7	1.57

Figure 3-8 shows the ratios of the monthly average day demand to the annual average day demand for the Hermosa-Redondo District. The monthly ratios relate the monthly average daily flow to the annual average daily flow. The ratios are based on the 5-year average usage from 2002 through 2006. As shown on Figure 3-8, the monthly average demand ranges from about 0.8 times the annual average day demand in the winter to 1.2 times the annual average day demand in the summer. This relatively narrow range is typical of a coastal climate.

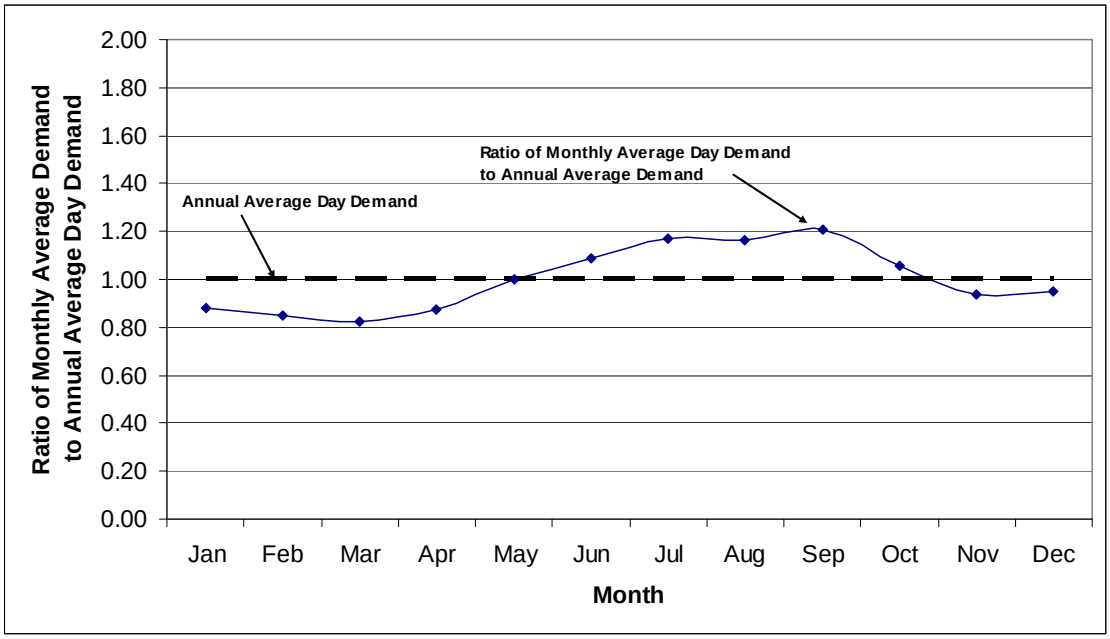

Figure 3-8
Hermosa-Redondo District Monthly Demand Factors

3.2.5 Future Service and Demand Projections

The recommended planning-level demand projections for the Hermosa-Redondo District are summarized first, followed by a discussion of the sensitivity analysis of low to high projection ranges.

Recommended Planning-Level Demands

Projections of future services and demands for the Hermosa-Redondo District were developed using the Table 3-11 historical growth rates for services and the Table 3-12 historical demands per service. Individual growth rates and unit demands were used for each customer type. Unaccounted-for water was assumed to be 7.5 percent of total water demand.

Table 3-15 summarizes the recommended planning-level service and demand projections developed for the Hermosa-Redondo District to year 2030, a 25-year planning horizon. The projections were developed by determining the projected number of services for each 5-year interval based on continuation of historical growth rates, and then calculating the demand for each customer type by multiplying the projected number of services by the demand per service. For each customer type, individual growth rates (percent per year) and unit demands (gallons per day per service) were used. Table 3-15 summarizes the following by 5-year increments to year 2030:

- Total number of projected services based on the 10-year growth rate for each of the customer types, with the exception of multi-family residential, recycled water, and other services, which were set to zero growth, as discussed below.
- Demand projections, including average daily demands, total per service demand, and total per capita demand. Year 2030 demand of 14.5 mgd assumes no conservation savings beyond what is in place now[4], and is based on the 10-year growth rates in services and the 5-year average unit demands.

Table 3-15
Summary of Planning-Level Demand Projections for the Hermosa-Redondo District

Year	Total Projected Services	Estimated Population in Service Area (1)	Projections Based on 10-Year Average Growth Rate and 5-Year Average Unit Demand Per Service			
			Average Day Demand (mgd)		Total Per Service Demand	Total Per Capita Demand
			(mgd)	(AF per year)	(gpd)	(gpd)
2005	25,774	98,400	13.0	14,564	504	132
2010	26,393	100,000	13.5	15,117	511	135
2015	27,031	101,700	13.7	15,375	508	135
2020	27,688	103,400	14.0	15,640	504	135
2025	28,364	105,100	14.2	15,913	501	135
2030	29,059	106,900	14.5	16,194	498	135

(1) The estimated population is calculated by multiplying the projected number of single family and multi-family residential units by Cal Water's estimate of 2.51 people per unit.

Potential conservation savings are discussed in Section 9, Water Supply Strategy. The demand projections also include demands that may potentially be met by future recycled water supply. Options for recycled water supply are discussed in Section 9.

The water supply evaluation will address providing supply flexibility from other sources, in the event that planned future savings are not realized. This flexibility will also help address other future uncertainties, such as if the future number of multi-family services is higher than projected due to the number of units per service that

[4] Conservation savings are considered a component of local supply. Supply options are discussed in Section 9.

ultimately occurs and if Cal Water revises the number of multi-family services and units after their customer billing evaluation is complete.

Appendices C-1 and C-2 provide a detailed breakdown of the services and demands, respectively, by customer category for each 5-year increment. The year 2030 projected services include 24,995 single family services (equivalent to housing units) and 1,473 multi-family services (24,993 housing units). It is assumed that the number of multi-family units per service will remain constant at about 12 units per service.

As noted in Table 3-15, the master plan population projection is calculated by multiplying the projected number of residential (single family and multi-family) housing units by Cal Water's density estimate for the Hermosa-Redondo District of 2.51 people per unit. The master plan projection is in line with Cal Water's estimate in the 2005 UWMP.

Sensitivity Analysis of Demand Projections

A sensitivity analysis was conducted to determine the potential future range in demands for various combinations of historical growth rates and unit demands for the Hermosa-Redondo District. Based on the sensitivity analysis, demands may range from a low of 14.1 mgd to a high of 15.5 mgd. This range of projections is useful to evaluate the potential impact of uncertainties regarding how future development will actually occur, and to identify whether assumptions may significantly affect the estimate. The sensitivity results helped to identify a reasonable estimate for long-term planning purposes.

Table 3-16 summarizes the total service and demand projections for the Hermosa-Redondo District for the six sensitivity scenarios shown below using various combinations of historic growth rates and unit demands by customer category. The Table 3-16 demand projections represent normal (non-drought) conditions. Appendix C-1 contains detailed tables that show the breakdown by customer type of the service projections for each scenario, and Appendix C-2 contains demand projections breakdowns for each scenario. The demand scenarios include:

- *Scenario A*: 10-year growth rates and 10-year average unit demand per service for each customer category. The total demand for this scenario is 14.7 mgd.
- *Scenario B*: 10-year growth rates and 5-year average unit demand per service for each customer category. The total demand for this scenario of 14.5 mgd is similar to Scenario A. This is the recommended planning-level demand scenario.
- *Scenario C*: 5-year average growth rates and 10-year average unit demand per service for each customer category. At 14.4 mgd, this scenario is close to both Scenarios A and B.

- *Scenario D*: 5-year average growth rates and 5-year average unit demand per service for each customer category. The total demand of 14.1 mgd for this scenario is just slightly lower than the other scenarios.

- *Scenario E*: highest growth rate and highest average unit demand for each customer category. At 15.5 mgd, this is the high end of the projection range. Most of the highest unit demands and service growth occurred in the 20-year average periods. It may not be suitable to assume that level of growth continuing in the future due to current infill development practices.

- *Scenario F*: 5-year average growth rates and 20-year average unit demand per service for each customer category. This scenario's total demand is 15.1 mgd and falls about in the middle of the projections.

Table 3-16
Summary of Sensitivity Analyses for Service and Average Day Demand Projections for the Hermosa-Redondo District [1]

Year	Scenario A: 10-year Growth Rate 10-year Unit Demands		Scenario B: 10-year Growth Rate 5-year Unit Demands		Scenario C: 5-year Growth Rate 10-year Unit Demands		Scenario D: 5-year Growth Rate 5-year Unit Demands		Scenario E: [2] Highest Growth Rate Highest Unit Demands		Scenario F: 5-year Growth Rate 20-Year Unit Demands	
	Total Services	Total Average Day Demand (mgd)	Total Services	Total Average Day Demand (mgd)	Total Services	Total Average Day Demand (mgd)	Total Services	Total Average Day Demand (mgd)	Total Services	Total Average Day Demand (mgd)	Total Services	Total Average Day Demand (mgd)
2005	25,774	13.0	25,774	13.0	25,774	13.0	25,774	13.0	25,774	13.0	25,774	13.0
2010	26,393	13.7	26,393	13.5	26,260	13.7	26,260	13.4	26,496	14.1	26,260	13.9
2015	27,031	14.0	27,031	13.7	26,760	13.9	26,760	13.6	27,243	14.5	26,760	14.2
2020	27,688	14.2	27,688	14.0	27,273	14.0	27,273	13.8	28,014	14.8	27,273	14.5
2025	28,364	14.5	28,364	14.2	27,800	14.2	27,800	14.0	28,810	15.2	27,800	14.7
2030	29,059	14.7	29,059	14.5	28,340	14.4	28,340	14.1	29,631	15.5	28,340	15.1

[1] See Appendix C-1 for detailed information on service projections. See Appendix C-2 for detailed information on demand projections.
[2] Scenario E uses the highest growth rates and highest unit demands over the past 20 years.

Scenario B was chosen as the recommended planning-level demand because the 5-year average unit demands reflect recent trends in customer water use and the 10-year average service growth rates best reflect recent growth trends. Figures 3-9 and 3-10 display the range of demand and service projections, respectively.

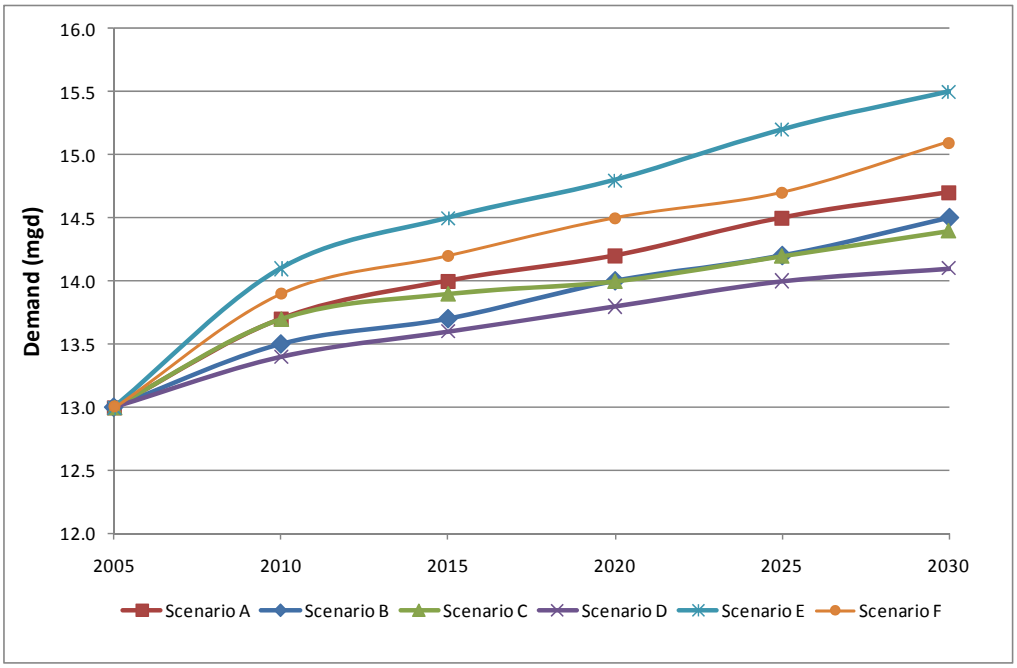

Figure 3-9
Range of Demand Projections for the Hermosa-Redondo District

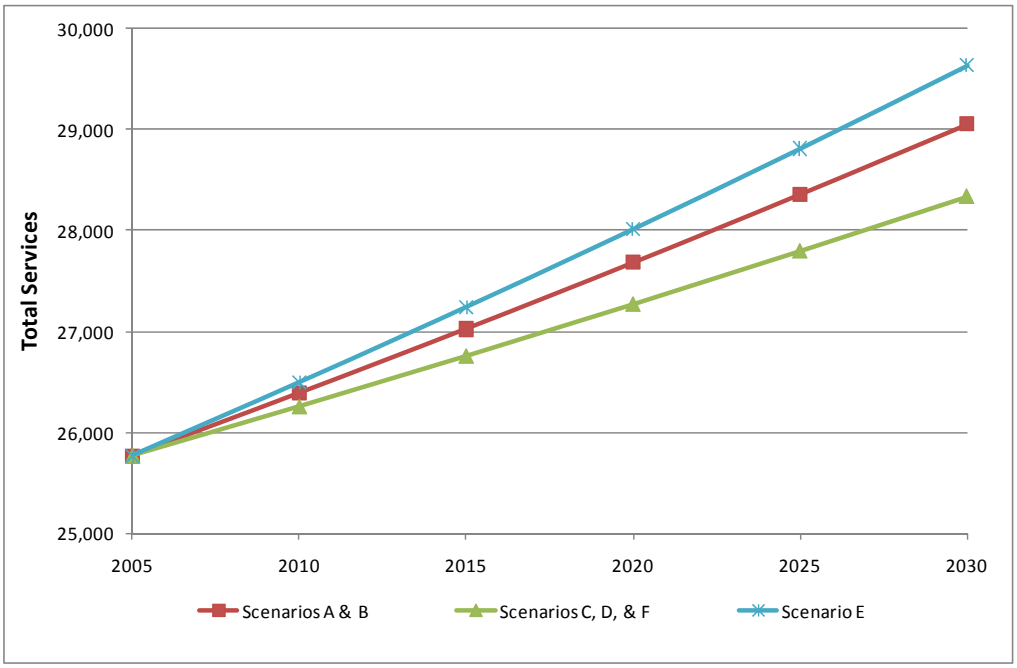

Figure 3-10
Range of Service Projections for the Hermosa-Redondo District

The 5-year growth rate for multi-family residential customers was set to zero growth, instead of negative growth (shown in Table 3-11), due to questions about the validity of the multi-family customer data. Because of uncertainty in future recycled water supplies, the recycled water services are assumed to remain at the current level. Potential future recycled water customers and demand are discussed in Section 9. The "other" category fluctuates widely year by year, and was assumed to remain at the 2005 level. The "other" category is very small and has a negligible impact on the projections.

As part of the sensitivity analysis, CDM obtained SCAG's demographic forecasts for the region and used GIS tools to determine the SCAG population projections for the Hermosa-Redondo District. The master plan population projections shown in Table 3-15 and the SCAG projections have a similar growth rate, which indicates assumptions on growth trends are similar for both SCAG and Cal Water, and the 2030 population estimates are within four percent of each other.

3.3 Palos Verdes District

3.3.1 Existing Services and Water Demand

Table 3-17 summarizes the existing customer services and demand for the Palos Verdes district based on detailed customer billing records. As of 2005, the Palos Verdes District had a total of 23,827 customers[5]. About 96 percent of the services are for single family residential customers, 2 percent for commercial, and less than 1 percent for each of the other customer categories. Table 3-17 shows the existing water usage (consumption) by customer type, unaccounted-for water, and total demand. Total demand equals customer usage plus unaccounted-for water.

Table 3-17
Summary of 2005 Services and Demand by Customer Type for the Palos Verdes District

Customer Type	Number of Services	Percent of Total Services	Total Annual Demand (MG)	Average Day Demand (mgd)	Percent of Total Demand	Average Daily Demand Per Service (gpd)
Residential	22,943	96.3%	5,356	14.67	80.1%	640
Multi-Family Residential	143	0.6%	201	0.55	3.0%	3,846
Commercial	495	2.1%	616	1.69	9.2%	3,410
Industrial	10	0.04%	5	0.01	0.1%	1,446
Government	212	0.9%	302	0.83	4.5%	3,908
Other	24	0.1%	10	0.03	0.2%	1,180
Subtotal	**23,827**	**100.0%**	**6,491**	**17.78**	**97.1%**	**746**
Unaccounted-for Water	0	0.0%	192	0.53	2.9%	22
Total	**23,827**	**100.0%**	**6,683**	**18.31**	**100.0%**	**768**

[5] Data from 2005 is presented because it was the most recent complete data set available at the time of the water demand analysis.

Figure 3-11 shows the distribution of existing services by customer type, as a percentage of total services.

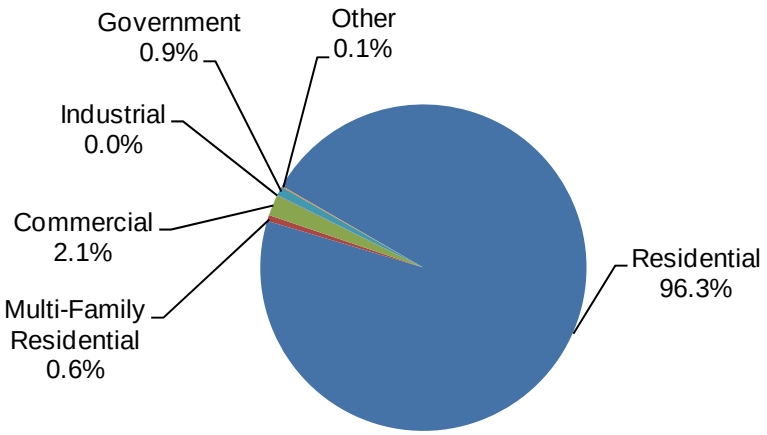

Figure 3-11
2005 Palos Verdes District Services by Customer Type (% of Total)

Figure 3-12 shows the distribution of existing demands by customer type, as a percentage of total demand. The existing demand consists of about 83 percent residential uses, about 14 percent non-residential uses, and about 3 percent unaccounted-for water. For non-residential uses, commercial comprised about 9 percent of total demand, government about 5 percent, and industrial and other uses less than 1 percent.

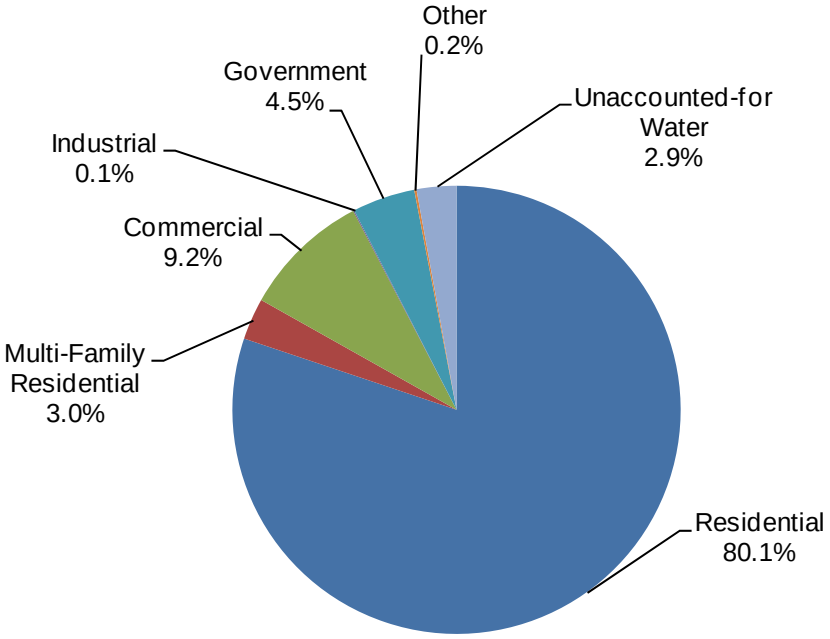

Figure 3-12
2005 Palos Verdes District Water Use by Customer Type (% of Total)

For an existing average day demand of about 18.3 mgd and an estimated service area population of about 68,800, the 2005 per capita water demand for all uses is 266 gpd and for residential uses only is 221 gpd. Over the past 5 years, the total per capita demand has averaged about 273 gpd and the residential only per capita demand has averaged about 230 gpd.

Table 3-18 shows the top twenty water users in the Palos Verdes District in 2006. These top twenty users accounted for almost 8 percent of the total average day water demand in the system. Based on customer class data included in the billing records, the large users are mostly business and public customers.

Table 3-18
2006 Top Twenty Largest Users in the Palos Verdes District [(1)]

Customer Type	City	Meter Size	Average Day Usage	
			gpd	gpm
Business	Palos Verdes Estates	6"	191,577	133
Business	Rancho Palos Verdes	6"	178,579	124
Business	Rancho Palos Verdes	8"	157,771	110
Business	Rancho Palos Verdes	6"	147,456	102
Business	Rancho Palos Verdes	3"	107,120	74
Public Authority	Rolling Hills Estates	6"	94,566	66
Public Authority	Lomita	4"	85,515	59
Business	Rancho Palos Verdes	4"	69,422	48
Multiple Residential	Rancho Palos Verdes	6"	42,121	29
Public Authority	Rancho Palos Verdes	6"	41,309	29
Business	Palos Verdes Peninsula	8"	34,800	24
Business	Rancho Palos Verdes	6"	33,099	23
Business	Rancho Palos Verdes	3"	32,008	22
Public Authority	Rancho Palos Verdes	6"	31,877	22
Public Authority	Rancho Palos Verdes	8"	27,245	19
Business	Rancho Palos Verdes	4"	25,835	18
Business	Rancho Palos Verdes	3"	22,560	16
Public Authority	Rolling Hills Estates	2"	22,129	15
Business	Rancho Palos Verdes	4"	21,250	15
Residential	Rancho Palos Verdes	3"	20,965	15
TOTAL			1,387,205	963

[(1)] Demand data obtained from customer billing records

The largest single user had just over 1 percent of the total average day system demand. The top five users made up about 4 percent and the top 10 users about 6 percent of the total average day system demand. This data indicates that typical district customers have relatively similar water uses and are not a significant factor for system-wide facilities planning.

3.3.2 Historical Service Growth and Demand per Service

Information on historical service growth and the demand per service in the Palos Verdes District was based on historical customer data from 1980 through 2005 as obtained from updated UWMP tables provided by Cal Water staff.

Table 3-19 summarizes the historical percentage growth in number of services in the Palos Verdes District over the past 25 years. Several time periods are considered for growth in services, which reflect economic and demographic conditions: 25-year average growth from 1981 through 2005; 20-year average growth from 1986 through

2005; 15-year average growth from 1991 through 2005; 10-year average growth from 1996 through 2005; and the 5-year average growth from 2001 through 2005.

Table 3-19
Historical Annual Percentage Growth in Number of Services for the Palos Verdes District [1]

Period	Average Percent Growth by Customer Type							
	Single Family Residential Services	Multi-Family Residential		Commercial Services	Industrial Services	Government Services	Other Services	Total Services
		Services	Units					
25-Year Average (1981-2005)	0.32%	-0.03%	0.41%	0.25%	-0.52%	0.33%	1.73%	0.31%
20-Year Average (1986-2005)	0.30%	-0.17%	0.27%	0.09%	-0.71%	0.13%	4.53%	0.29%
15-Year Average (1991-2005)	0.21%	-0.23%	0.10%	0.11%	-1.06%	0.20%	3.22%	0.20%
10-Year Average (1996-2005)	0.23%	-0.34%	0.09%	0.17%	-0.76%	0.64%	8.45%	0.23%
5-Year Average (2001-2005)	0.17%	-0.41%	0.46%	0.33%	-1.67%	0.78%	2.96%	0.17%

[1] Data based on UWMP tables.

As indicated in Table 3-19, the overall growth rate of total services in the Palos Verdes District has been declining over the last 25 years. The average percent growth per year in the number of single family residential services reached its lowest rate at the past 5-year average of 0.17% per year. Multi-family residential services have declined over the entire time period, while the growth rate in multi-family units has always been positive, and increased to almost 0.5% over the recent 5-year average. Cal Water is reviewing its customer billing database to review some customer categorization issues, such as whether the current system is capturing all the multi-family services in the district.

Commercial and government services are now experiencing their highest average annual growth rates over the 25-year period. The industrial services growth rate has seen changing, but consistently negative, growth. The other services category fluctuates widely in growth rate, but is a very small number of services.

Table 3-20 summarizes the historical demand per service for the Palos Verdes District. The recent 5 and 10-year averages shows that demand per service has increased over the entire time period on a district-wide basis. The 5-year average is the highest average annual demand for both single family residential and commercial customers. Multi-family residential demand has stayed steady. Industrial and government demand per service has decreased over time.

Table 3-20
Historical Demand Per Service for the Palos Verdes District (gpd)

Period	Single Family Residential	Multi-Family Residential	Commercial	Industrial	Government	Other	Unaccounted/ Total Services	Total Demand Per Service
25-Year Average (1981-2005)	607	4,091	3,065	2,554	5,208	2,480	42	767
20-Year Average (1986-2005)	617	4,106	3,077	2,198	4,811	2,890	43	774
15-Year Average (1991-2005)	617	4,050	3,053	1,727	4,341	3,398	40	765
10-Year Average (1996-2005)	647	4,102	3,231	1,519	4,176	4,656	38	795
5-Year Average (2001-2005)	658	4,008	3,271	1,562	3,934	3,365	21	786

3.3.3 Unaccounted-for Water

Table 3-21 presents the Palos Verdes District's historical unaccounted-for water. Since 1991 (15 years), it has averaged about 5.3 percent, within industry average. There were two years when it was over 8 percent; otherwise, it has generally stayed below 7 percent. Over the last 5 years, the percentage of unaccounted-for water has dropped to an average of 2.7 percent. In 2006, Cal Water's records show a negative reading for unaccounted-for water. This is likely due to metering inaccuracies. Cal Water is investigating this data point, along with those in the Dominguez District. For this master plan, a 5 percent allowance is recommended as a reasonable planning estimate for future demand projections.

Table 3-21 Unaccounted-For Water as a Percent of Total Demand for the Palos Verdes District [1]			
	Unaccounted for Water (MG)	Total Demand (MG)	% of Unaccounted-For Water
1991	344	5,312	6.5%
1992	400	5,839	6.8%
1993	400	6,079	6.6%
1994	342	6,448	5.3%
1995	440	6,263	7.0%
1996	451	6,593	6.8%
1997	451	6,850	6.6%
1998	533	6,417	8.3%
1999	614	7,275	8.4%
2000	258	7,242	3.6%
2001	209	6,536	3.2%
2002	172	7,139	2.4%
2003	262	6,726	3.9%
2004	93	6,952	1.3%
2005	192	6,683	2.9%
15-year Average (1991-2005)	344	6,557	5.3%
10-year Average (1996-2005)	323	6,841	4.7%
5-year Average (2001-2005)	185	6,807	2.7%

(1) Data obtained from UWMP tables.

3.3.4 Peaking Factors

Table 3-22 summarizes historical demand data in the Palos Verdes District for the past ten years from Cal Water data, including total annual demand, average daily demand, and maximum day demand. Table 3-22 also shows the relationship (peaking factor) between maximum day demand and average daily demand.

The maximum day peaking factor relates the maximum day average daily demand to the annual average day system demand. Over the last 5 years, the maximum day peaking factor for the Palos Verdes District ranged from 1.74 to 1.99, with an average of 1.90 over the 5-year period. For the master plan, a maximum day peaking factor of 2.0 is recommended as a reasonable value for master planning purposes.

Table 3-22
Summary of Historical Demand and Maximum Day Peaking Factors for the Palos Verdes District

Year	Annual Demand (MG)	Average Daily Demand (mgd)	Maximum Day Demand (mgd)	Maximum Day Peaking Factor
1996	6,593	18.1	27.3	1.51
1997	6,850	18.8	31.4	1.67
1998	6,417	17.6	27.7	1.58
1999	7,275	19.9	35.5	1.78
2000	7,242	19.8	40.0	2.02
2001	6,536	17.9	36.0	2.01
2002	7,139	19.6	38.5	1.97
2003	6,726	18.4	35.3	1.92
2004	6,952	19.0	37.9	1.99
2005	6,683	18.3	31.9	1.74
2006	6,655	18.2	39.4	1.89
Average Over Past 10-Year Period	6,847	18.8	34.9	1.86
Average Over Past 5-Year Period	6,831	18.7	35.6	1.90

Figure 3-13 shows the ratios of the monthly average day demand to the annual average day demand. The monthly ratios relate the monthly average daily flow to the annual average daily flow. The ratios are based on the 5-year average usage from 2001 through 2005.

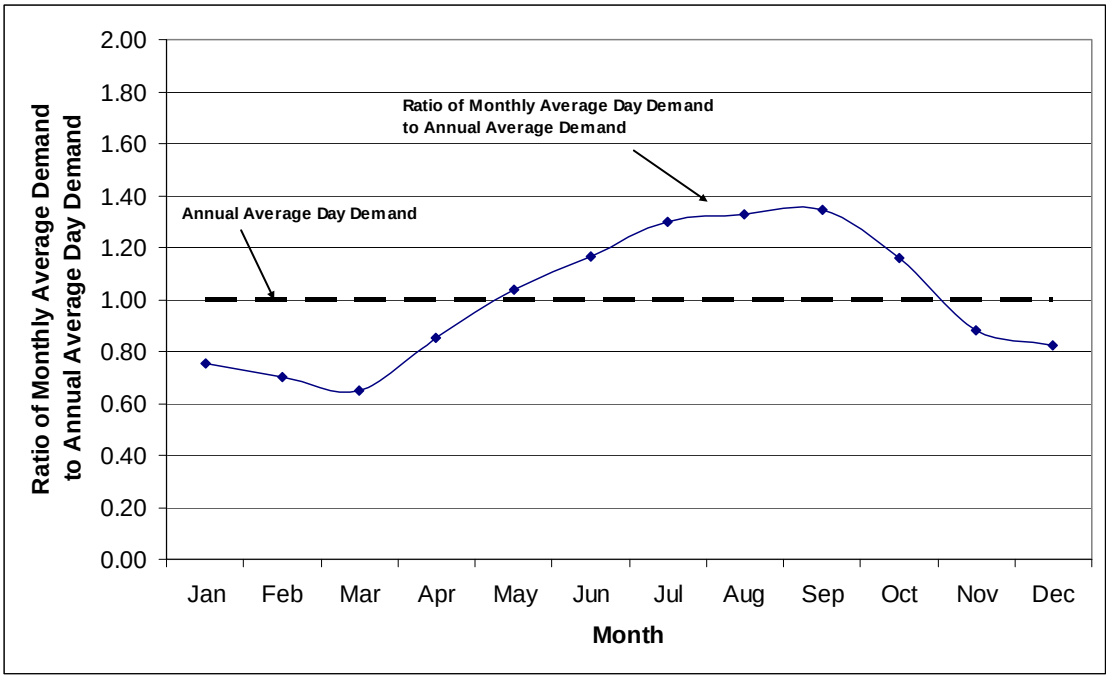

Figure 3-13
Palos Verdes Monthly Demand Factors

As indicated on Figure 3-13, the monthly average demand ranges from about 0.65 times the annual average day demand in the winter to 1.35 times the annual average day demand in the summer.

3.3.5 Future Service and Demand Projections

The recommended planning-level demand projections for the Palos Verdes District are summarized first, followed by a discussion of the sensitivity analysis of low to high projection ranges.

Recommended Planning-Level Demands

Projections of future services and demands for the Palos Verdes District were developed using the Table 3-18 historical growth rates for services and the Table 3-19 historic demands per service. Individual growth rates were used for each customer type. Unaccounted-for water was assumed to be 5 percent of total water demand.

Table 3-23 summarizes the recommended planning-level service and demand projections developed for the Palos Verdes District to year 2030, a 25-year planning horizon. The projections were developed by determining the projected number of services for each 5-year interval based on continuation of historical growth rates, and then calculating the demand for each customer type by multiplying the projected number of services by the demand per service. For each customer type, individual growth rates (percent per year) and unit demands (gallons per day per service) were used. Table 3-23 summarizes the following by 5-year increments to year 2030:

- Total number of projected services based on the 10-year growth rate for each of the customer types, with the exception of multi-family and other services, which were set to zero growth, as discussed below.

- Demand projections, including average daily demands, total per service demand, and total per capita demand. Year 2030 demand of 20.3 mgd assumes no conservation savings beyond what is in place now[6], and is based on the 10-year growth rates in services and the 5-year average unit demands.

Potential conservation savings are discussed in Section 9, Water Supply Strategy. The demand projections also include demands that may potentially be met by future recycled water supply. Options for recycled water supply are discussed in Section 9.

[6] Conservation savings are considered a component of local supply. Supply options are discussed in Section 9.

Table 3-23
Summary of Planning-Level Demand Projections for the Palos Verdes District

Year	Total Projected Services	Estimated Population in Service Area [1]	Projections Based on 10-Year Average Growth Rate and 5-Year Average Unit Demand Per Service			
			Average Day Demand (mgd)		Total Per Service Demand	Total Per Capita Demand
			(mgd)	(AF per year)	(gpd)	(gpd)
2005	23,827	68,800	18.3	20,508	768	266
2010	24,106	69,500	19.4	21,724	805	279
2015	24,388	70,300	19.6	21,983	805	279
2020	24,674	71,100	19.9	22,245	805	279
2025	24,963	71,800	20.1	22,511	805	280
2030	25,256	72,600	20.3	22,781	805	280

(1) The estimated population is calculated by multiplying the projected number of single family and multi-family residential units by Cal Water's estimate of 2.66 people per unit.

Appendices D-1 and D-2 provide a detailed breakdown of the services and demands, respectively, by customer category for each 5-year increment. The year 2030 projected services include 24,316 single family services (equivalent to housing units) and 143 multi-family services (3,027 housing units). It is assumed that the number of multi-family units per service will remain constant at about 20 units per service.

As noted in Table 3-23, the master plan population projection is calculated by multiplying the projected number of residential (single family and multi-family) housing units by Cal Water's density estimate for the Palos Verdes District of 2.66 people per unit. The master plan projection is in line with Cal Water's estimate in the 2005 UWMP.

Sensitivity Analysis of Demand Projections

A sensitivity analysis was conducted to determine the potential future range in demands for various combinations of historical growth rates and unit demands. Based on the sensitivity analysis, demands may range from a low of 19.1 mgd to a high of 21.2 mgd. This range of projections is useful to evaluate the potential impact of uncertainties regarding how future development will actually occur, and to identify whether assumptions may significantly affect the estimate. The sensitivity results helped to identify a reasonable estimate for long-term planning purposes.

Table 3-24 summarizes the total service and demand projections for the Palos Verdes District for the six sensitivity scenarios shown below using various combinations of historic growth rates and unit demands by customer category. The Table 3-24 demand projections represent normal (non-drought) conditions. Appendix D-1 contains detailed tables that show the breakdown by customer type of the service projections for each scenario, and Appendix D-2 contains demand projections breakdowns for each scenario. The demand scenarios include:

- *Scenario A*: 10-year growth rates and 10-year average unit demand per service for each customer category. The total demand for this scenario is 20.1 mgd.
- *Scenario B*: 10-year growth rates and 5-year average unit demand per service for each customer category. The total demand for this scenario is 20.3 mgd. This is the recommended planning-level demand scenario.
- *Scenario C*: 5-year average growth rates and 10-year average unit demand per service for each customer category. The total demand for this scenario is 20.0 mgd.
- *Scenario D*: 5-year average growth rates and 5-year average unit demand per service for each customer category. The total demand for this scenario is 20.2 mgd.
- *Scenario E*: highest growth rate and highest average unit demand for each customer category. At 21.2 mgd, this is the high end of the projection range.
- *Scenario F*: 5-year average growth rates and 25-year average unit demand per service for each customer category. The total demand for this scenario is 19.1 mgd.

Table 3-24
Summary of Sensitivity Analyses for Service and Average Day Demand Projections for the Palos Verdes District [1]

Year	Scenario A: 10-year Growth Rate 10-year Unit Demands		Scenario B: 10-year Growth Rate 5-year Unit Demands		Scenario C: 5-year Growth Rate 10-year Unit Demands		Scenario D: 5-year Growth Rate 5-year Unit Demands		Scenario E: [2] Highest Growth Rate Highest Unit Demands		Scenario F: 5-year Growth Rate 25-Year Unit Demands	
	Total Services	Total Average Day Demand (mgd)	Total Services	Total Average Day Demand (mgd)	Total Services	Total Average Day Demand (mgd)	Total Services	Total Average Day Demand (mgd)	Total Services	Total Average Day Demand (mgd)	Total Services	Total Average Day Demand (mgd)
2005	23,827	18.3	23,827	18.3	23,827	18.3	23,827	18.3	23,827	18.3	23,827	18.3
2010	24,106	19.2	24,106	19.4	24,040	19.2	24,040	19.4	24,212	19.8	24,040	18.3
2015	24,388	19.4	24,388	19.6	24,254	19.4	24,254	19.6	24,603	20.2	24,254	18.5
2020	24,674	19.7	24,674	19.9	24,471	19.6	24,471	19.8	25,001	20.5	24,471	18.7
2025	24,963	19.9	24,963	20.1	24,691	19.8	24,691	20.0	25,406	20.9	24,691	18.9
2030	25,256	20.1	25,256	20.3	24,912	20.0	24,912	20.2	25,817	21.2	24,912	19.1

[1] See Appendix D-1 for detailed information on service projections. See Appendix D-2 for detailed information on demand projections.
[2] Scenario E uses the highest growth rates and highest unit demands over the past 25 years.

Scenario B was chosen as the recommended planning-level demand because the 5-year average unit demands reflect recent trends in customer water use and the 10-year average service growth rates best reflect recent growth trends.

Figures 3-14 and 3-15 display the range of demand and service projections, respectively. The demand projections fall within a very narrow range, regardless of the assumptions used. Average day demands in 2030 range from 19.1 to 21.2 mgd,

which is a difference of only 2.1 mgd between the lowest and the highest projections. The narrow range is reasonable for an established area that is close to buildout.

The 5-year growth rate for multi-family residential customers was set to zero growth, instead of negative growth, due to questions about the validity of the multi-family customer data. The "other" category fluctuates widely year by year, as was assumed to remain at the 2005 level. The "other" category is very small and has a negligible impact on the projections.

As part of the sensitivity analysis, CDM obtained SCAG's demographic forecasts for the region and used GIS tools to determine the SCAG population projections for the Palos Verdes District. The master plan population projections shown in Table 3-23 and the SCAG projections have a similar growth rate, which indicates assumptions on growth trends are similar for both SCAG and Cal Water. However, the calculated SCAG projections were consistently higher than the master plan population projection for the Palos Verdes District. Two potential reasons for the differences are the spatial allocation method used by SCAG to forecast population and the nature of SCAG as a regional planning agency. First, the data from SCAG was obtained by TAZ. This data does not provide an indication of the uniformity or nonuniformity of housing density (or other data) within a TAZ. When a TAZ is intersected with a pressure zone to determine the population within that zone, the data allocated to the pressure zone was based on the percentage of area of the TAZ that overlapped the pressure zone. However, the overlapping area may actually have a lower housing density than the average for the TAZ, which would tend to cause the higher SCAG population estimates. Second, regional planning agencies such as SCAG often tend to have higher demographic estimates relative to historic growth or local agency planning. This has been the case with other regional planning organizations in Northern California, as well.

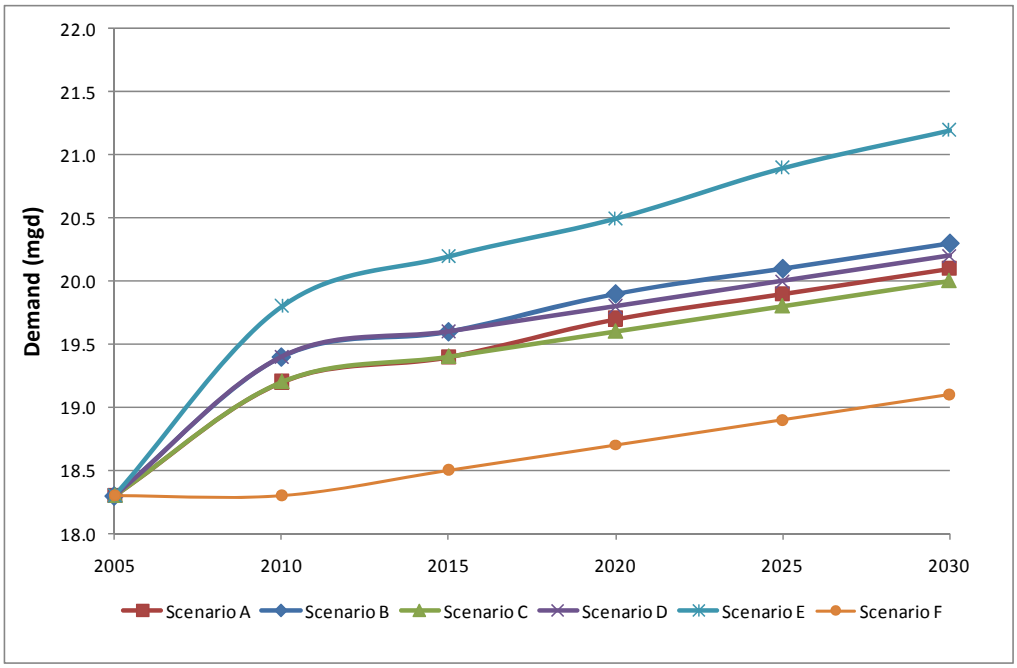

Figure 3-14
Range of Demand Projections for the Palos Verdes District

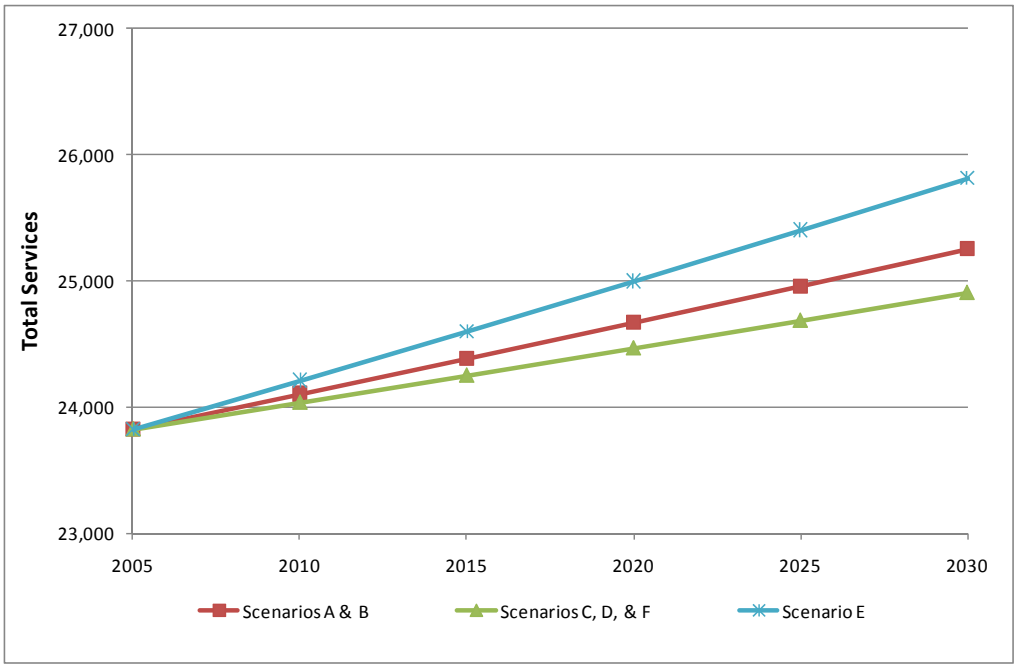

Figure 3-15
Range of Service Projections for the Palos Verdes District

Section 4
Existing Water Facilities – Dominguez District

This section provides a summary description of the existing California Water Service Company (Cal Water) Dominguez District water system and facilities.

4.1 System Configuration

The existing Dominguez District water system has four pressure zones supplied from seven turnouts from Metropolitan Water District of Southern California's (MWD) system served through West Basin Municipal Water District (WBMWD) facilities, and has five storage tanks. The system also has 10 well pump stations and two booster pump stations.

The system has four active interconnections to Zone I from the Hermosa-Redondo system, two of which connect to the Hermosa-Redondo Pressure Zone 300-2, and two of which connect to the supply line from WB 16 turnout. Additional sources of supply include a City of Torrance intertie and a desalter plant at Station 232. The district also has emergency interconnections with Golden State Water Company and the City of Compton.

Figure 4-1 provides an overview of the system pressure zones; each zone is shown in a different color. Figure 4-2 shows the existing system profile schematic, with the same colors for zones as used for Figure 4-1. Table 4-1 summarizes the system pressure zones and key facilities in the Dominguez system, including the supply source and which pressure reducing valves (PRVs) supply the zones.

4.2 Supplies

The Dominguez District has two primary sources of supply: imported water delivered through WBMWD turnouts in the MWD system and wells. Additional sources of supply include Hermosa-Redondo system interties, City of Torrance intertie, and a desalter plant at Station 232.

Table 4-2 summarizes the locations and hydraulic grade lines (HGL) for the WBMWD turnouts, including capacity in cubic feet per second (cfs). Two turnouts are on MWD's Palos Verdes Feeder, which supplies the west side of Zone II. One is on the Sepulveda Feeder, which supplies the tank at Station 232 and Northwest Zone II. Two turnouts are on MWD's Long Beach Lateral, which supplies Zone IV and central Zone II. One turnout is on MWD's Victoria to 223rd Street Cross Feeder, which supplies the Northeast part of Zone II. One turnout is on MWD's Victoria Street Lateral, which supplies Zone III.

Table 4-3 summarizes information on the wells, including design flow in gallons per minute (gpm) and design head. Of the twelve wells, Stations 219 and 294 are currently

Figure 4-1
Rancho Dominguez District - Pressure Zones

CDM

* Located at Station 232; pumps to reservoir. Connection to City of Torrance and desalter also supply reservoir.

Figure 4-2
Rancho Dominguez District - System Schematic

CDM

out of service and are expected to be brought on-line in 2010, after water quality testing is completed. Well 277's lease expires in 2010, and the well will be destroyed. Well 215-02 is out of service and planned to be destroyed.

Table 4-1
Pressure Zones and Facilities - Dominguez Water System

Pressure Zone	MWD Connection/Well Supply/Other Supply	PRVs Supplying Zone [2]	Pump Stations: Pumping into Pressure Zone	Pump Stations: Pumping Out of Pressure Zone	Tanks Serving Zone
I	Interconnection (IC)-1 from Hermosa-Redondo District (HR) zone 225-1	PRV-IC-1	Station 232		Station 232[1]
	IC-2 from HR zone 225-1)	PRV-IC-2			
	IC-3 from WB-16 connection to HR system	PRV-IC-3			
	IC-4 from WB-16 connection to HR system	PRV-IC-4			
	Torrance Connection [1]				
	Well Station 203 [1]				
	Desalter Plant [1]				
II	Well Sta 215			Station 203 (pumps from Station 203 Tank)	Station 203
	Well Sta 219				
	Well Sta 272				
	Well Sta 275				
	Well Sta 277				
	Well Sta 279				
	Well Sta 294				
	Well Sta 297				
	Well Sta 298			Station 232 (pumps from Station 232 Tank)	
	MET WB-10	FC-WB-10			
	MET WB-14	FC-WB-14			
	MET WB-21	FC-WB-21			
	MET WB-36	FC-WB-36			
	MET WB-39	FC-WB-39			
III	Well Sta 290		Station 203		
	MET WB-35				
IV	MET WB-9	PRV-WB-9			

(1) Station 232 Tank is filled from Zone II, the Desal Plant, the Torrance connection, and Well Station 203, which is located on Station 232 property. The tank is hydraulically independent from Zone I.

(2) Turnouts from the MWD system have downstream flow control valves to control flow to the zone, indicated by FC, except for WB-9, which is PRV-controlled.

Table 4-2
MWD Turnouts - Dominguez Water System

Turnout	Location	Capacity (cfs)	HGL[1] (ft)	Supply to Zone
WB-9		30	260	IV
WB-10		20	260	II
WB-14		25	310	II
WB-21		20	370	II
WB-35		20	325	III
WB-36		15	350	II
WB-39		10	380	II

(1) From MWD design drawings. HGL upstream of control valves.

Table 4-3
Wells - Dominguez Water System

Station	Location	Design Flow (gpm)	Design Head (ft)
Station 203 [1]		1,100	
Station 215 [2]		1,000	-
Station 219 [3]		600	360
Station 272		860	359
Station 275		1,350	-
Station 277 [4]		1,250	400
Station 279		1,200	198
Station 290		1,000	466
Station 294 [5]		1,500	375
Station 297		700	200
Station 298		2,600	215

(1) Well has been installed but is not expected to be on-line until 2010.
(2) Two wells at site. Well 215-02 is out of service and is planned to be destroyed.
(3) Well 219-01destroyed and well 219-02 has been installed but not expected to be on-line until 2010.
(4) On leased property. To be destroyed when lease expires in 2010.
(5) Currently out of service. Expected to be on-line in 2010.

4.3 Pipelines

Table 4-4 summarizes the existing pipelines in the Dominguez system by diameter and material. Figure 4-3 shows the water system facilities with the pipes color-coded by diameter and the pressure zone boundaries. There are about 198 miles of pipe in the entire system, ranging from 1 inch to 24 inches in diameter. Figure 4-4 shows the distribution of pipes by diameter and Figure 4-5 shows the distribution by material.

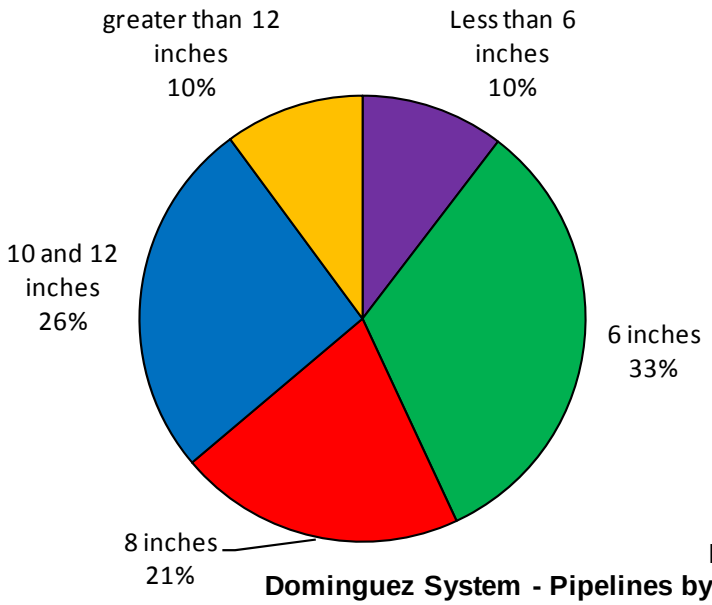

Figure 4-4
Dominguez System - Pipelines by Diameter

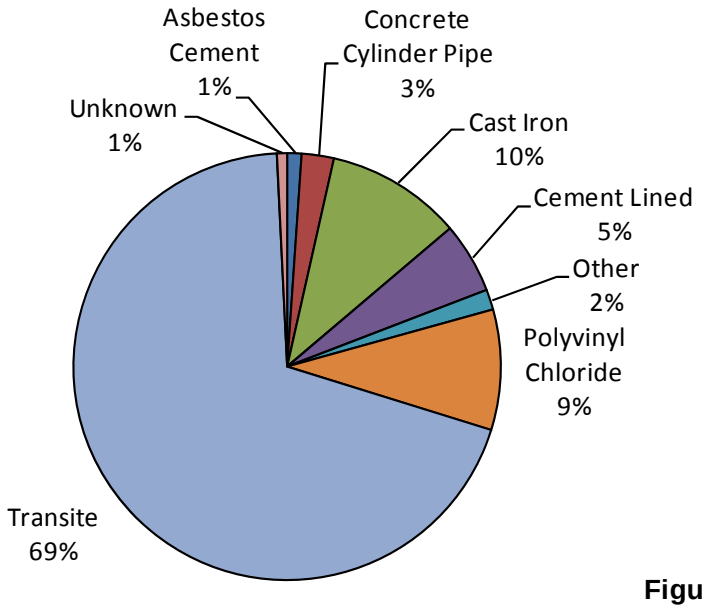

Figure 4-5
Dominguez System - Pipelines by Material

Figure 4-3
Rancho Dominguez District - Pipes by Diameter

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Table 4-4
Pipeline Summary by Diameter and Material - Dominguez Water System

Diameter (inch)	Length of Pipeline (feet)																
	Material															Total LF	% of Total
	AC [2]	CCP	CI	CICL	CLC	CLW	CU	DI	GALV	HDPE	PE	PVC	STL	TR (2)	Unknown		
1	-	-	-	-	40	-	836	-	130	-	-	-	-	324	55	1,384	0.07
1.5	-	-	-	-	-	-	823	-	195	-	-	-	-	-	20	1,038	0.05
2	-	10	91	-	121	-	1,127	-	4,313	-	353	1,230	-	635	1,295	9,175	0.48
3	-	-	-	-	-	-	188	-	23	-	145	623	-	27	86	1,092	0.06
4	245	70	21,317	81	114	27	18	34	1,121	-	384	2,957	807	156,240	1,813	185,229	9.72
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	61	61	0.00
5.5	-	-	-	-	30	-	-	-	-	-	-	-	-	-	24	54	0.00
6	4,810	92	97,553	4,734	3,940	23	-	102	-	-	9[2]	57,351	1,063	450,153	3,164	622,993	32.69
8	5,304	63	46,815	3,260	2,228	-	-	515	-	-	-	35,092	1,945	298,418	2,095	395,735	20.76
10	41	38	11,492	613	223	260	-	1,004	-	-	-	11,037	218	69,899	679	95,503	5.01
12	7,212	54	18,235	2,038	8,612	7	-	2,346	-	-	46[2]	54,492	6,228	298,052	3,653	400,975	21.04
14	2,833	139	10	396	3,566	-	-	-	-	-	-	10,540	761	30,698	86	49,031	2.57
16	33	12,825	237	20	11,338	-	-	-	-	543	-	336 [3]	460	18,307	500	44,599	2.34
18	-	4,497	-	1,737	20,953	-	-	-	-	-	-	-	831	525	243	28,786	1.51
20	-	11,591	-	-	19,579	-	-	-	-	10	-	28 [3]	2,325	-	20	33,554	1.76
21	100	2,328	-	-	-	-	-	-	-	-	-	-	-	-	-	2,428	0.13
24	100	9,329	-	-	17,323	-	-	-	-	-	-	14 [3]	322	-	825	27,912	1.46
30	-	30	-	-	40	-	-	-	-	-	-	-	-	-	-	70	0.00
32	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	10	0.00
33	-	1,197	-	10	437	-	-	-	-	-	-	-	-	-	9	1,654	0.09
34	-	-	-	378	-	-	-	-	-	-	-	-	-	-	-	378	0.02
42	-	4,233	-	-	-	-	-	-	-	-	-	-	-	-	-	4,233	0.22
Total LF	20,679	46,496	19,5748	13,268	88,555	316	2,992	4,002	5,782	553	936	173,699	1,496	132,328	14,627	1,905,894	100.00
% of Total	1.09	2.44	10.27	0.70	4.65	0.02	0.16	0.21	0.30	0.03	0.05	9.11	0.78	69.43	0.77	100.00	

(1) AC: Asbestos Cement; CCP: Concrete Cylinder Pipe; CI: Cast Iron; CICL: Cast Iron Cement Lined; CLC: Cement Lined and Coated; CLW: Cement Lined and Wrapped; CU: Copper; DI: Ductile Iron; GALV: Galvanized Steel; HDPE: High Density Polyethylene; PVC: Polyvinyl Chloride; STL: Steel; TR: Transite.

(2) Transite is an older form of asbestos cement. Cal Water GIS database distinguishes between the two pipe types.

(3) From Cal Water GIS database. Likely PVC

(4) From Cal Water GIS database. PVC not typically in this size.

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4.4 Booster Pump Stations

Table 4-5 summarizes the key hydraulic information for the pump stations in the Dominguez system. The system has 7 booster pump stations, 5 of which are located at wells and pump from day tanks supplied by the well pump.

Table 4-5
Booster Pump Stations - Dominguez Water System

Pump Station	Pump ID	Design Flow (gpm)	Design Head (ft)
203	PMP-203-A	250	128
	PMP-203-B	500	115
	PMP-203-C	500	115
	PMP-203-D	1,100	96
	PMP-203-E	1,100	96
	PMP-203-F	1,100	96
	PMP-203-G	800	132
215	PMP-215-A	1,000	200
	PMP-215-B	1,000	200
232	PMP-232-A	175	150
	PMP-232-B	1,250	165
	PMP-232-C	1,250	165
	PMP-232-D	1,250	165
	PMP-232-E	725	175
	PMP-232-F[(1)]	-	-
	PMP-232-G[(2)]	2,000	165
	PMP-232-H[(2)]	2,000	165
275	PMP-275-A	1350	228
277	PMP-277-A	1250	-
297	PMP-297-A	700	-
298	PMP-298-A	2600	208

[(1)] Pump abandoned in place

[(2)] Design point assumed based on test points and pump curves of other Station 232 pumps.

4.5 Reservoirs

The Dominguez system has a total of 9 storage tanks, 4 of which are day tanks at well stations. The total volume of usable storage excluding the day tanks is 19 million gallons (MG). The total volume, including the day tanks is 19.4 MG; however, storage volume at wells is only available when the well is operating. Table 4-6 summarizes the key hydraulic information for the reservoirs. Reservoir dimensions, bottom elevation, and overflow elevation were taken from the system profile schematic.

Table 4-6
Reservoirs - Dominguez System

Res ID	Location	Zone	Volume (gallons)	Tank Type	Bottom Elevation	Height (ft)	Overflow Elev (ft)	Diameter (ft)
STA-203-T1	Wilmington Ave. North of University Dr.	II/III [(1)]	3,500,000	Steel	189	40	229	123
STA-203-T2	Wilmington Ave. North of University Dr.	II	3,500,000	Steel	189	40	229	123
STA-203-T3	Wilmington Ave. North of University Dr.	II	3,500,000	Steel	189	40	229	123
STA-203-T4	Wilmington Ave. North of University Dr.	II	3,500,000	Steel	189	40	229	123
STA-215-T1[(2)]	North of 218th Pl. and Salmon Ave.	-- [(2)]	178,000	Steel	33	32	65	31
STA-232-T1	West of Maple Ave. and Columbia St.	I [(3)]	5,000,000	Steel	116	40	156	146
STA-275-T1[(2)]	Mill Valley Way	-- [(2)]	147,000	Steel	38	32	70	28
STA-277-T1[(2)]	End of S. Westward Ave.	-- [(2)]	56,000	Steel	27	24	51	20
STA-297-T1[(2)]	W. Victoria St., East of S. Susana Rd.	-- [(2)]	45,000	Steel	53	16	69	22
STA-298-T1[(2)]	Alameda St. and Carson Street	-- [(2)]	75,000	Steel	33	24	57	24

[(1)] Balancing storage for Zone II. Provides suction to Station 203 PS that serves Zone III.
[(2)] Day tank at well station. Not included in storage analysis.
[(3)] Filled from Zone II through altitude valve, but does not provide storage for Zone II. Supplies suction to Station 232 PS that serves Zone I.

4.6 Pressure Control Valves

Table 4-7 summarizes the location and hydraulic data for the PRVs in the Dominguez system. The pressure settings, in pounds per square inch (psi), were provided by Cal Water.

Table 4-7
Pressure Reducing Valves - Dominguez Water System

PRV	Location	Size (in)	Supply from	Delivery to	Elevation (ft)	Pressure Setting (psi)
PRV-WB-9		-	WBMWD	4	16	105
PRV-Z4-Z2-1		8	4	2	36	65
PRV-Z4-Z2-2		6	4	2	24	65

4.7 Connections to Other Systems

Table 4-8 summarizes the location, pressure settings, and capacity of connections to adjacent systems. The Dominguez system is connected to the Hermosa-Redondo system from Zone I. Connections consist of pressure sustaining-pressure reducing valves that supply the Dominguez system on a normal basis, provided there is adequate pressure in the Hermosa-Redondo system. There are also two standby connections to the Hermosa-Redondo District system and one interconnection with the City of Torrance.

Table 4-8
Connection to Adjacent Systems - Dominguez Water System

Connection	Location	Setting (psi)	Pressure Zone Served
Hermosa-Redondo District Interconnection (IC)-1[(1)]		74 psi	I
Hermosa-Redondo District IC-2[(1)]		76 psi	I
Hermosa-Redondo District IC-3[(1)]		64 psi	I
Hermosa-Redondo District IC-4[(1)]		58 psi	I
Hermosa-Redondo District		Standby	I
Hermosa-Redondo District		Standby	I
City of Torrance		--	I[(2)]
City of Compton		Emergency	III
Golden State Water Company		Emergency	II
Golden State Water Company		Emergency	III

(1) Flow to Dominguez District only

(2) Flows into Station 232 Tank which serves Zone I

Section 5
Existing Water Facilities – Hermosa-Redondo District

This section provides a summary description of the existing California Water Service Company (Cal Water) Hermosa-Redondo District water system and facilities.

5.1 System Configuration

The existing Hermosa-Redondo water system has seven pressure zones supplied from 4 turnouts from the Metropolitan Water District of Southern California's (MWD) system, and has 17 storage tanks. The system also has 13 pump stations: 7 pumping from storage tanks, 4 directly from the system, and 3 from wells. The system has four active interconnections to the Dominguez system, two of which connect to the Hermosa-Redondo Pressure Zone 300-2, and two of which connect to the supply line from the West Basin Municipal Water District (WBMWD) 16 turnout. The system has emergency connections with the Palos Verdes District system and with three neighboring cities.

Figure 5-1 provides an overview of the system pressure zones; each zone is shown in a different color. Figure 5-2 shows the existing system profile schematic, with the same colors for zones as used for Figure 5-1. Table 5-1 summarizes the system pressure zones and key facilities in the Hermosa-Redondo system, including the supply source and which pressure reducing valves (PRVs) supply the zones.

5.2 Supplies

The Hermosa-Redondo District has two sources of supply: imported water delivered through WBMWD turnouts in the MWD system, and wells.

Table 5-2 summarizes the locations and hydraulic grade line (HGL) for the WBMWD turnouts, including capacity in cubic feet per second (cfs). Three turnouts are on MWD's West Basin Feeder, which supplies the northern part of the Hermosa-Redondo system. One turnout is on MWD's Second Lower Feeder, which supplies the southeast part of the Hermosa-Redondo system.

Table 5-3 summarizes information on the wells, including design flow in gallons per minute (gpm) and design head. Of the three wells, only Station 8 is active. Stations 22 and 30 are expected to be returned to service in 2009.

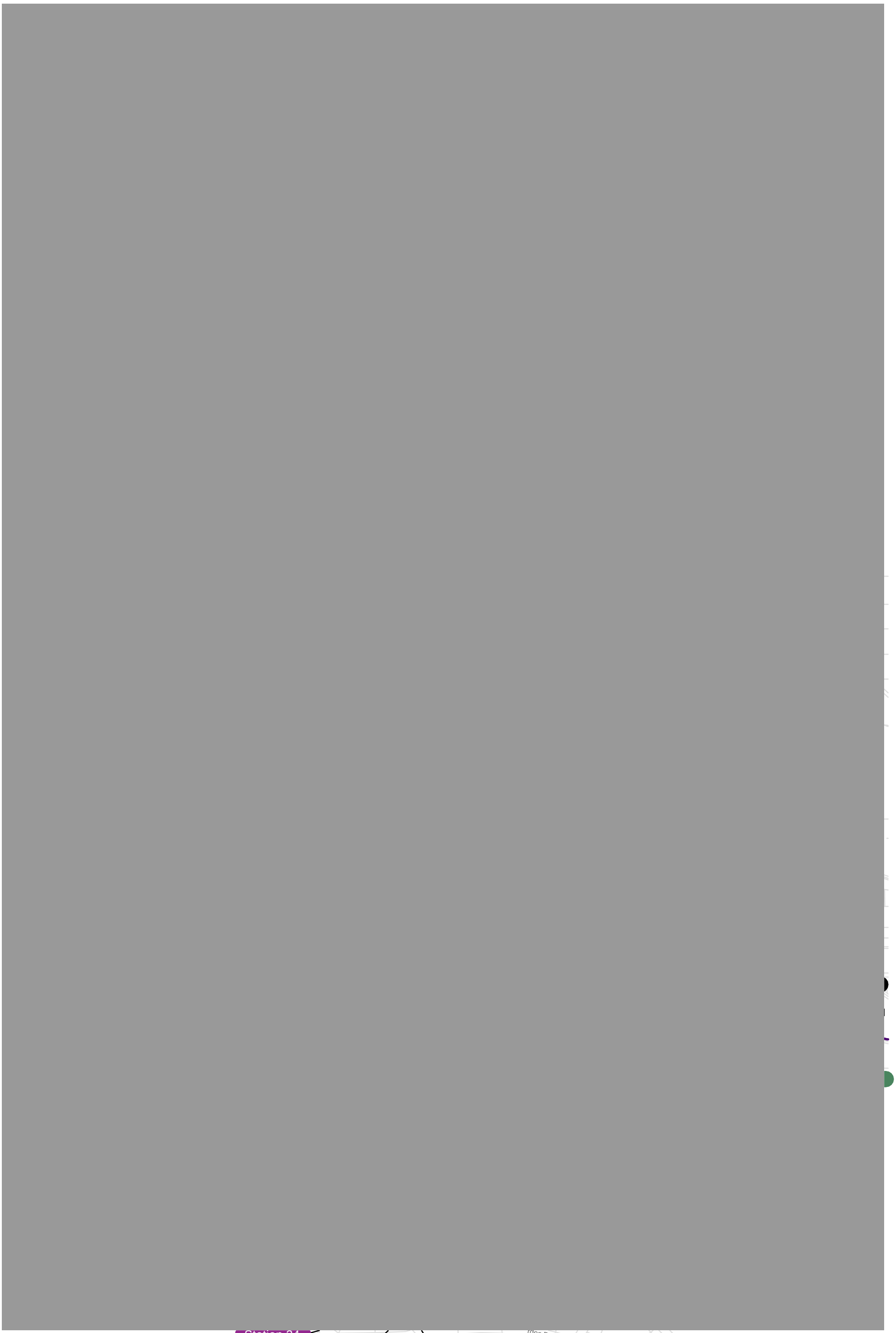

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Figure 5-1
Hermosa-Redondo District - Pressure Zones

Public Version

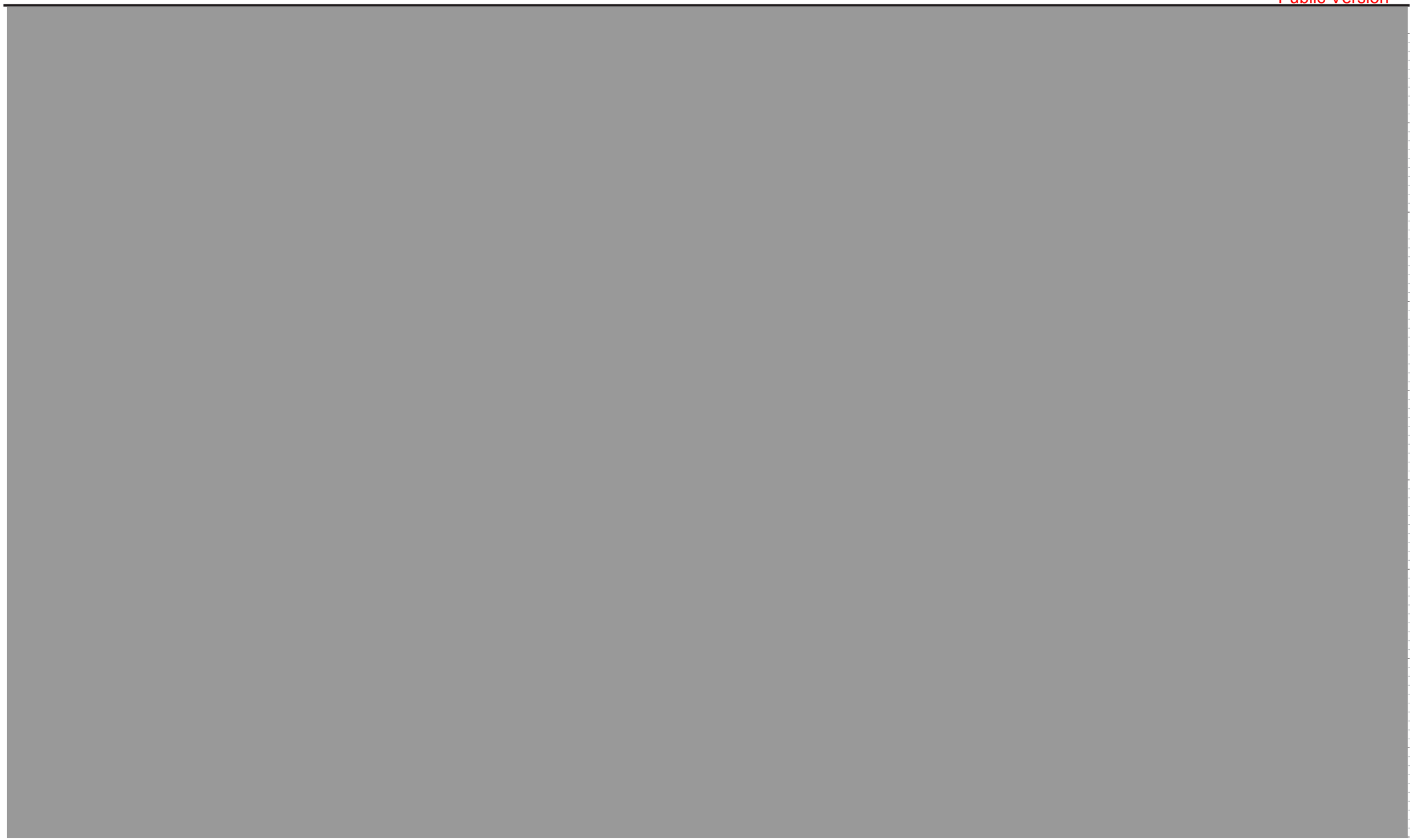

Figure 5-2a
Hermosa-Redondo District - System Schematic

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Figure 5-2b
Hermosa-Redondo District - System Schematic

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Table 5-1
Pressure Zones and Facilities - Hermosa-Redondo Water System

Pressure Zone	MWD Connection/ Well Supply	Emergency Supply	Tanks Serving Zone	Pump Stations		PRVs Supplying Zone	Supply to Dominguez System
				Pumping into Pressure Zone	Pumping Out of Pressure Zone		
225-1	WB-16	Interconnection with City of Torrance	STA 26 RES 2,3,4 STA 9 RES 9-1,2,3,4	STA 27-A	STA 4 STA 26 (2) STA 14 STA 9 STA 13 STA 27 (2)	PRV-300-2-1 PRV-300-2-2	Interconnection 1 (Sepulveda Blvd. & Ocean Ave.) Interconnection 2 (Sepulveda Blvd. & Del Amo Circle)
225-2	WELL STA 8-02 WELL STA 22-01 WELL STA 30-01 WB-29 WB-2B WB-5	Interconnection with Manhattan Beach (at WB-5) Interconnection with El Segundo (at WB-5)	STA 5 RES 10-1,2	STA 5		PRV-WB 29-1 PRV-WB 29-2 PRV-WB 29-3	
250						PRV-300-1-1 PRV-300-1-2	
300-1			STA 23 RES 5-2,3	STA 14 STA 26E STA 28	STA 23		
300-2			STA 27 RES 6 STA 29 RES 3B	STA 4 STA 9 STA 13 STA 26D STA 27-C STA 29(1)			Interconnection 3 (Torrance Blvd. & Prospect Ave.) Interconnection 4 (Del Amo Blvd. & Prospect Ave.)
400			STA 24 RES 8-1,2,3,4	STA 23	STA 24 (2)	PRV-PV-1 (Palos Verdes Blvd) PRV-PV-3 (Via Alameda)	
500		WB-PV (Via Alameda & Via La Selva)	HP-24-01	STA 24		PRV-PV-2 (Via Colusa)	

(1) STA 29 pumps from Reservoir 3 into Pressure Zone 300-2
(2) Pumps from tank at same station.

Table 5-2
MWD Turnouts - Hermosa-Redondo Water System

Turnout	Location	Capacity (cfs)	HGL (ft)	In Zone
WB-2B	[redacted]	5	371	225-2
WB-5	[redacted]	15	371	225-2
WB-16	[redacted]	25	350	300-2
WB-29	[redacted]	15	371	225-2

Table 5-3
Wells - Hermosa-Redondo Water System

Station	Location	Design Flow (gpm)	Design Head (ft)
STA 08	[redacted]	850	280
STA 22	[redacted]	900	317
STA 30	[redacted]	760	336

5.3 Pipelines

Table 5-4 summarizes the existing pipelines in the Hermosa-Redondo system by diameter and material. Figure 5-3 shows the water system facilities with the pipes color-coded by diameter and the pressure zone boundaries. There are about 198 miles of pipe in the entire system, ranging from 1 inch to 24 inches in diameter. Figure 5-4 shows the distribution of pipes by diameter and Figure 5-5 shows the distribution by material.

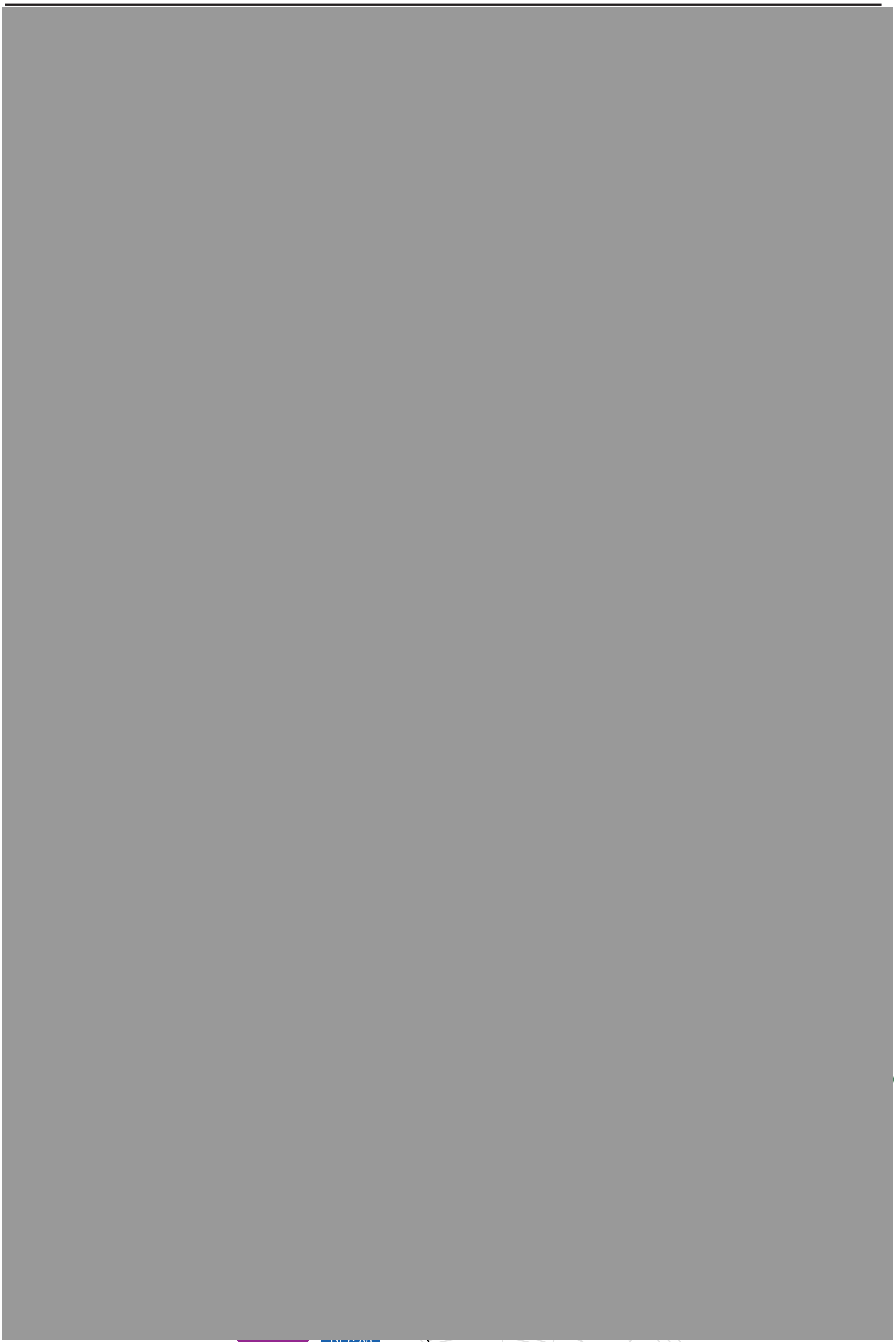

Figure 5-3
Hermosa-Redondo District - Pipes by Diameter

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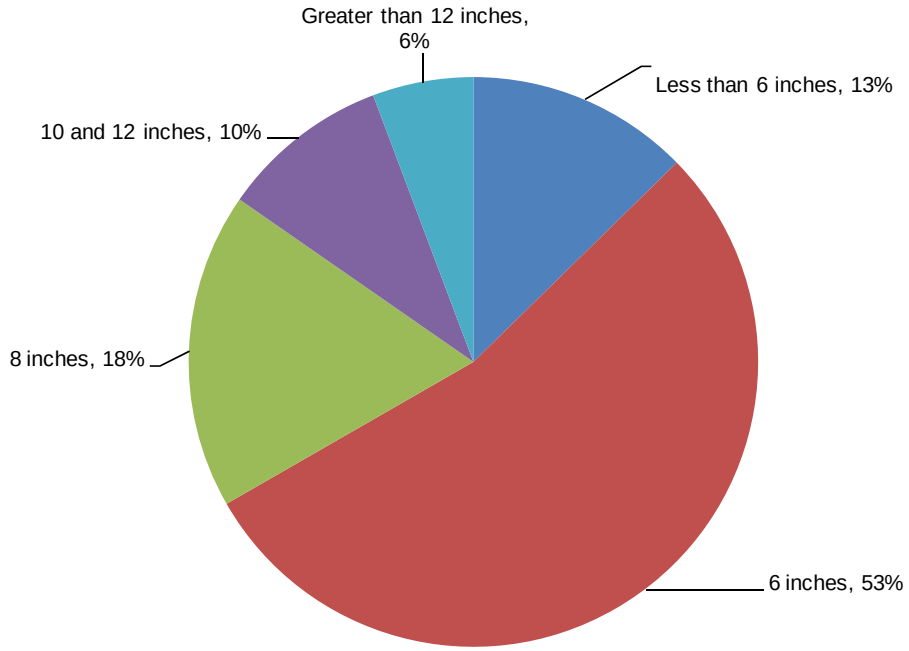

Figure 5-4
Hermosa-Redondo System – Pipelines by Diameter

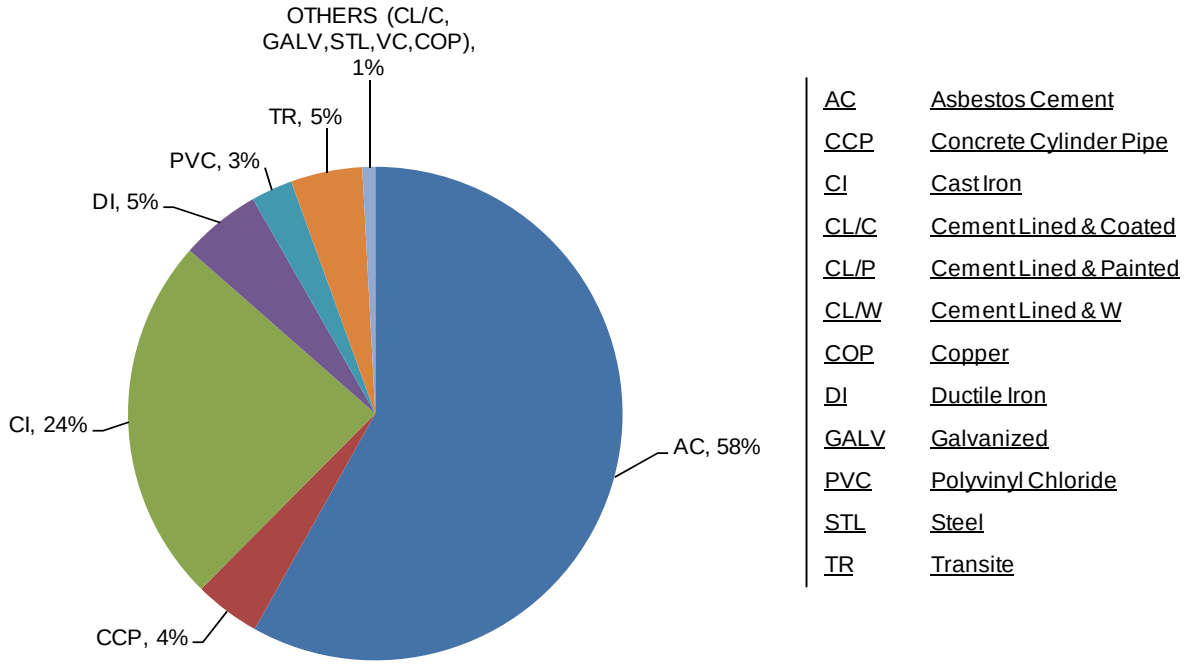

Figure 5-5
Hermosa-Redondo System – Pipelines by Material

Table 5-4
Pipeline Summary by Diameter and Material - Hermosa-Redondo Water System

	Length of Pipeline (feet)												
	Material[1]												
Diameter (Inch)	**Unknown**	**AC**	**CCP**	**CI**	**CICL**	**CLC**	**DI**	**GALV**	**PVC**	**STL**	**TR**	**Total (feet)**	**% of Total**
Unknown	160	-	-	-	-	-	-	-	-	-	-	160	0.02%
1	-	-	-	-	-	-	-	-	-	236	-	236	0.02%
2	26	12	-	14,824	-	-	-	257	719	2,087	-	17,925	2.0%
3	-	132	-	-	-	-	-	-	-	-	-	132	0.01%
4	60	33,032	-	61,059	3,417	-	917	-	648	3,467	11,070	113,670	11.0%
6	85	363,420	-	122,690	3,916	294	23,773	-	24,209	514	24,743	563,644	54.0%
8	107	146,359	105	4,51 2	4,393	460	16,085	122	2,772	428	11,897	187,240	18.0%
10	112	3,604	-	8,173	2,836	-	62	-	-	113	-	14,900	1.4%
12	-	51,535	-	19,032	554	99	12,964	-	-	171	1,050	85,405	8.0%
14	-	1,582	-	-	-	-	-	-	-	-	-	1,582	0.1%
15	-	-	2,520	-	-	-	-	-	-	-	-	2,520	0.2%
16	-	3,432	2,328	5,120	492	-	47	-	-	-	-	11,419	1.1%
18	-	2,984	-	-	-	-	1,114	-	-	-	-	4,098	0.4%
24	-	-	40,113	-	-	-	-	-	-	-	-	40,113	4.0%
Total LF	550	606,092	45,066	235,410	15,608	853	54,962	379	28,348	7,016	48,760	1,043,044	100%
% of Total	0.05	58	4	23	2	0.08	5	0.04	2.72	0.67	4.67		

(1) AC: Asbestos Cement, CCP: Concrete Cylinder Pipe, CI: Cast Iron, CICL: Cast Iron Cement Lined, CLC: Cement Lined and Coated , DI: Ductile Iron, GALV: Galvanized, PVC: Polyvinyl Chloride, STL: Steel, TR: Transite

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5.4 Pump Stations

Table 5-5 summarizes the key hydraulic information for the pump stations in the Hermosa-Redondo system. The system has 11 pump stations.

Table 5-5
Pump Stations- Hermosa-Redondo Water System

Pump Station	Pump ID	Design Flow (gpm)	Design Head (ft)
STA 04 [(1)]	PMP-004-E	1,300	190
	PMP-004-F	1,300	250
STA 05	PMP-005-A	2,400	140
	PMP-005-B	2,400	140
	PMP-005-C	2,300	150
STA 09	PMP-009-C	800	110
	PMP-009-D	1,050	110
STA 13	PMP-013-E	1,000	138
	PMP-013-F	1,000	138
STA 14	PMP-014-D	1,500	210
STA 23	PMP-023-C	1,000	125
	PMP-023-D	480	140
	PMP-023-E	650	123
STA 24	PMP-024-B	450	140
	PMP-024-C	625	146
	PMP-024-D	600	150
STA 26	PMP-026-D	1,200	139
	PMP-026-E	850	210
STA 27	PMP-027-A	3,100	45
	PMP-027-C	1,360	110
STA 28	PMP-028-A	1,400	120
	PMP-028-B	2,200	96
STA 29 [(1)]	PMP-029-A	1,200	100
	PMP-029-B	900	130

[(1)] Station has existing standby generator.

5.5 Reservoirs

The Hermosa-Redondo system has a total of 17 storage tanks, with a total volume of 20.1 million gallons. Table 5-6 summarizes the key hydraulic information for the reservoirs. Reservoir dimensions, bottom elevation, and overflow elevation were taken from the system profile schematic.

Table 5-6
Reservoirs- Hermosa-Redondo Water System

Station and Reservoir	Location	Zone	Volume (gallons)	Tank Type [1]	Bottom Elevation (ft)	Tank Height (ft)	Overflow Elevation (ft)	Diam (ft)
STA 5 (Res 10-1)	Carnegie Ln and Harkness Ln	WB 5	3,500,000	Steel Ground Level Tanks	105	27	132	150
STA 5 (Res 10-2)			3,500,000	Steel Ground Level Tanks	105	27	132	150
STA 9 (Res 9-1)	Ormond Ln and Harper Ave	225-2	1,000,000	Steel Ground Level Tanks	215	30	245	75.5
STA 9 (Res 9-2)			1,000,000	Steel Ground Level Tanks	215	30	245	74
STA 9 (Res 9-3)			1,000,000	Steel Ground Level Tanks	215	30	245	74
STA 9 (Res 9-4)			2,000,000	Steel Ground Level Tanks	215	30	245	108
STA 23 (Res 5-2)	Paseo de las Estrellas, east of Via Monte D'oro	300-1	246,000	Steel Ground Level Tanks	270	29	299	38
STA 23 (Res 5-3)			500,000	Steel Ground Level Tanks	268	31	299	52.5
STA 24 (Res 8-1)	Calle de Arboles and Via Alameda	400	50,000	Redwood Tanks	375	16	391	24
STA 24 (Res 8-2)			100,000	Redwood Tanks	373	18	391	34
STA 24 (Res 8-3)			100,000	Redwood Tanks	377	14	391	32
STA 24 (Res 8-4)			100,000	Redwood Tanks	375	16	391	35
STA 26 (Res 1-2)	S Lucia Ave, south of Pearl St	225-1	1,000,000	Steel Ground Level Tanks	167	30	197	75.5
STA 26 (Res 1-3)			1,500,000	Steel Ground Level Tanks	171	25	196	99
STA 26 (Res 1-4)			2,000,000	Steel Ground Level Tanks	160	36	196	96
STA 27 (Res 6)	Ormond Ln and Harper Ave	WB 5	1,000,000	Steel Ground Level Tanks	192	29	221	76
STA 29 (Res 3-2)	N Prospect Ave, south of Anita St	300-2	1,500,000	Steel Ground Level Tanks	208	26	234	100

[1] All tanks are circular unless otherwise noted. If non-circular tank, the diameter of circle with equivalent area is shown.

5.6 Pressure Control Valves

Table 5-7 summarizes the location and hydraulic data for the PRVs in the Hermosa-Redondo system. The pressure settings (pounds per square inch [psi]) were provided by Cal Water.

Table 5-7
Pressure Reducing Valves - Hermosa-Redondo Water System

PRV	Location	Size (in)	Supply from	Delivery to	Elevation (ft)	Pressure Setting (psi)
PRV-WB29-1		8	MWD WB 29	225-2	75	85
PRV-WB29-2		6	MWD WB 29	225-2	75	85
PRV-WB29-3		8	MWD WB 29	225-2	75	85
PRV-WB-2B-1		8	MWD WB 2-B	225-2	62	Normally Closed
PRV-300-1-1		4	300-1	250	73	68
PRV-300-1-2		4	300-1	250	59	85
PRV-WB-5-1		8	MWD WB 5	225-2	120	Flow Control Valve
PRV-WB-5-2		4	MWD WB 5	300-2	150	Flow Control Valve
PRV-300-2-1		4	300-2	225-1	95	35
PRV-300-2-2		6	300-2	225-1	83	43
PRV-PV-1		4	500	400		70
PRV-PV-2		4	600	500		36
PRV-ST-27		6	300-2	225-1		58

5.7 Connections to Other Systems

Table 5-8 summarizes the location, pressure settings, and capacity (in million gallons per day [mgd]) of connections to adjacent systems. The Hermosa-Redondo system is connected to the Dominguez system from Zone 300-2. Connections consist of pressure sustaining-pressure reducing valves that supply the Dominguez system on a normal basis, provided there is adequate pressure in the Hermosa-Redondo system. There are also two standby connections to the Dominguez District system and emergency interconnections with the adjacent cities of Manhattan Beach, Torrance, and El Segundo, and the Palos Verdes District system.

Table 5-8
Connections to Adjacent Systems - Hermosa-Redondo Water System

Connection	Location	Setting (psi)/ Capacity (mgd)	Pressure Zone
Dominguez District Connection I-1[1]		80 psi	WB-16
Dominguez District Connection I-2[1]		60 psi	WB-16
Dominguez District Connection I-3[1]		68 psi	300-2
Dominguez District Connection I-4[1]		72 psi	300-2
Dominguez District		Standby	225-2
Dominguez District		Standby	WB-16
City of Manhattan Beach		Emergency (4 mgd)	WB-5
City of El Segundo		Emergency (8 mgd)	WB-5
City of Torrance		Emergency (4 mgd)	WB-16
Palos Verdes District		Standby (PRV)	400
Palos Verdes District		Emergency	500
Palos Verdes District		Standby (PRV)	500

[1] Flow to Dominguez District only

Section 6
Existing Water Facilities – Palos Verdes District

This section provides a summary description of the existing California Water Service Company (Cal Water) Palos Verdes District water system and facilities.

6.1 System Configuration

The existing water system has 101 pressure zones supplied from 4 turnouts from the Metropolitan Water District of Southern California's (MWD) system, and has 18 storage tanks and 9 pump stations. The system has three standby connections to the Hermosa-Redondo system.

Figure 6-1 provides an overview of the system pressure cascades and individual pressure zones. The system has very hilly topography. Figure 6-1 illustrates the different pressure reducing valve (PRV) pressure cascades, PRV-regulated zones that are hydraulically interconnected, with different colors. The District can be divided into two sub-systems, the Ridge system, and the D-500 system. The Ridge system includes Stations 22 and 30, located at the MWD turnouts, which boost water to Reservoir 19, and Station 23 that boosts water to Reservoir 20. This system supplies just under 90 percent of the service area, with water regulated down to lower elevation areas through PRVs. The figure also shows the individual pressure zones. Appendix K shows the existing system profile schematic.

The other principal service area within the District system, the D-500 system, is supplied from the MWD WB-40 turnout, and runs along the north and west side of the service area.

6.2 Supply

The Palos Verdes District's sole source of supply is imported water supply, delivered from West Basin Municipal Water District (WBMWD) turnouts in the MWD system. The WBMWD turnouts are located on MWD's Second Lower Feeder and Palos Verdes Feeder. All turnouts are in the vicinity of the Palos Verdes Reservoir, a terminal storage reservoir in the MWD system. Turnouts WB- 6A, WB-6B, and WB-32 have a hydraulic grade line (HGL) based on the reservoir water surface. Turnout WB-40 is upstream of MWD's Oak Street Pressure Control Station that supplies the reservoir.

Table 6-1 summarizes the location and hydraulic information for turnouts from the MWD system, the normal HGL and delivery zone, and capacity in cubic feet per second (cfs).

Figure 6-1
Palos Verdes District - Pressure Zones

CDM

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Table 6-1 Turnouts – Palos Verdes System				
Turnout	**Location**	**Capacity (cfs)**	**HGL**	**Delivers to Zone**
WB 6A		30	320	C-850 (STA 22, STA 15)
WB 6B		5	320	C-850 (STA 22, STA 15)
WB 32		40	320	C-850 (STA 22, STA 15)
WB 40		40	520	D-500-1

6.3 Pipelines

Table 6-2 summarizes the existing pipelines in the Palos Verdes system by diameter and material. Figure 6-2 shows the water system facilities with the pipes color-coded by diameter and the pressure zone boundaries. There are about 330 miles of pipe in the entire system, ranging from 1 inch to 36 inches in diameter. Figure 6-3 shows the distribution of pipes by diameter Figure 6-4 shows the distribution by material.

Figure 6-2
Palos Verdes District - Pipes by Diameter

CDM

Table 6-2
Pipeline Summary by Diameter and Material - Palos Verdes System

Diameter (Inches)	Length of Pipe (Feet)															
	Material [1]														Total (Feet)	% of Total
	Unknown	ABS	AC	CCP	CI	CL/C	CL/P	CL/W	COP	DI	GALV	PVC	STL	TR		
1	160								447						607	0.03%
1.5									742						742	0.04%
2	5,152	286							165	19	2,380	708			8,711	0.5%
3.5			1,643											2,606	4,249	0.2%
4	4,824		6,072		6,379					514	6,455	4,694		48,201	77,138	4.4%
5			988											775	1,763	0.1%
6	5,254		162,429		18,068	3,293				8,114	7,052	14,251	73	551,589	770,121	44.2%
8	2,043		139,021		2,224	9,614	2,175	543		10,339	5,042	17,326		343,686	532,013	30.5%
10	762		2,381		275	4,518							696	17,021	25,652	1.5%
12	1,688		39,142		1,881	38,181				13,638	550	1,997	878	96,677	194,631	11.2%
14	211														211	0.01%
16	2				322	26,143								3,480	29,948	1.7%
18	460		2,711			22,621				354				6,188	32,334	1.9%
20	726					16,925									17,651	1.0%
24	47			12,656		2,168									14,871	0.9%
27						6,603									6,603	0.4%
30	197					3,347									3,544	0.2%
33				4,661		11,279									15,940	0.9%
36	309					6,424									6,732	0.4%
Total Feet	21,834	286	354,387	17,317	29,149	151,114	2,175	543	1,354	32,977	21,479	38,976	1,648	1,070,222	1,745,451	100%
% of Total	1.25%	0.02%	20.33%	0.99%	1.67%	8.67%	0.12%	0.03%	0.08%	1.89%	1.23%	2.24%	0.09%	61.38%		

(1) ABS: Acrylonitrile butadiene styrene, AC: Asbestos Cement, CCP: Concrete Cylinder Pipe, CI: Cast Iron, CL/C:Cement Mortar Lined and Coated Steel
CL/P: Cement Mortar Lined and Painted Steel, CL/W: Cement Mortar Lined and Wrapped Steel, COP: Copper, DI: Ductile Iron, GALV: Galvanized, PVC: Polyvinyl Chloride,
STL: Steel, TR: Transite

Public Version

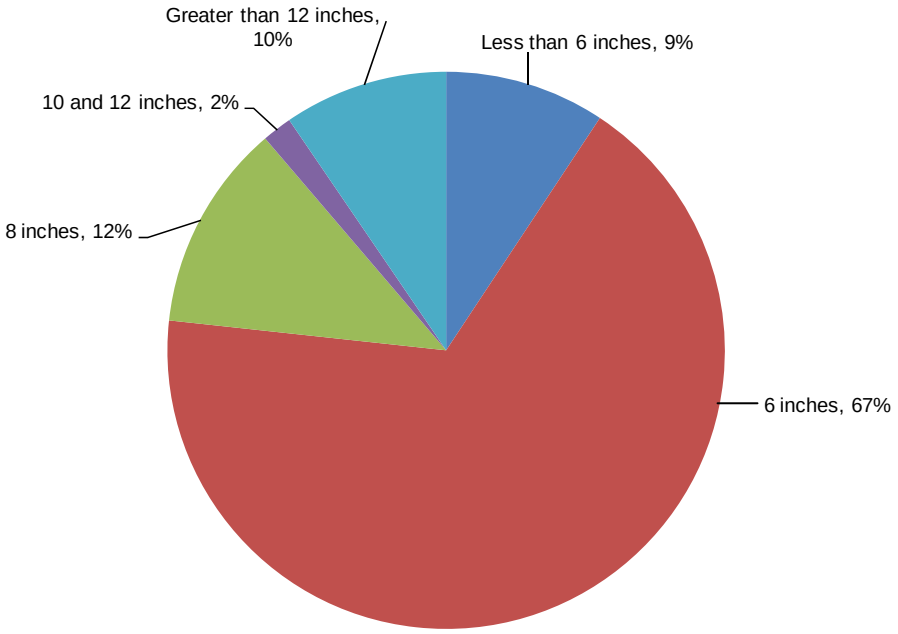

Figure 6-3
Palos Verdes System – Pipelines by Diameter

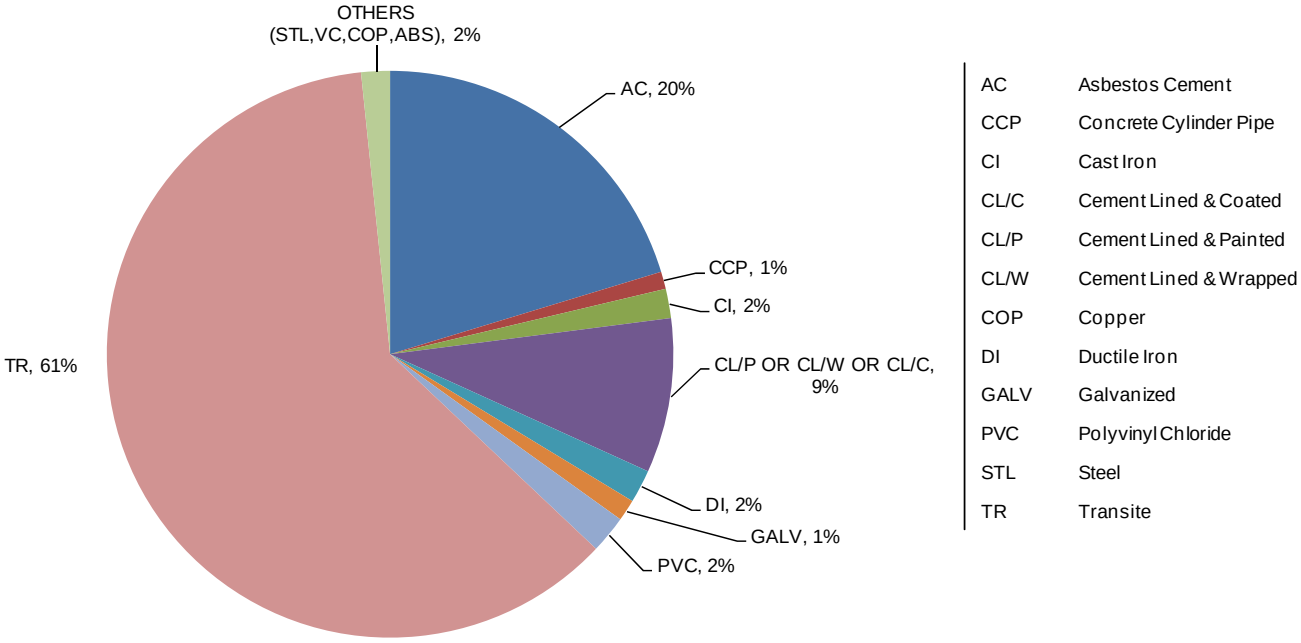

Figure 6-4
Palos Verdes System – Pipelines by Material

6.4 Pump Stations

The system has 9 pump stations. Table 6-3 summarizes the key hydraulic information for the pump stations and individual pumps in the Palos Verdes system, including design flow in gallons per minute (gpm) and design head.

Table 6-3
Pump Stations – Palos Verdes System

Pump Station ID	Pump ID	Design Flow (gpm)	Design Head (ft)
STA 04	4A	1200	160
	4C	500	160
STA 05	5B	440	225
STA 14	14A	237	117
	14B	277	117
STA 15	15A	1650	250
	15B	1280	250
	15C	1200	250
	15D	2750	50
STA 22	22A	2625	600
	22B	2300	600
	22C	2625	600
	22D	2625	600
	22E	3833	375
	22F	3733	375
	22G	3800	360
	22H	3325	110
STA 23	23A	2400	600
	23B	2400	600
	23C	2400	600
	23D	2400	600
	23E	2400	600
	23F	2400	600
	23G	3700	600
	23H	3700	600
STA 30	30B	2400	600
	30C	2650	600
	30D	2650	600
	30E	3688	600
STA 37	37A	1750	280
	37B	1900	280
STA 38	38A	500	150
	38B	500	150

6.5 Reservoirs

The Palos Verdes system has 18 reservoirs, with a total storage volume of 30.5 million gallons. Table 6-4 summarizes the key information for the reservoirs.

Table 6-4
Reservoirs – Palos Verdes System

Res ID	Location	Zone	Volume (gallons)	Tank Type	Bottom Elevation (ft)	Tank Height (ft)	Overflow Elev. (ft)	Diam (ft)
RES 1	Trotters Terrace	C-480	100,000	Concrete	481	20	501	30
RES 2	Via Campesina & Graylog	J-600	100,000	Concrete	598	20	618	32
RES 5	P.V.E. Golf Course & Campesina	D-500-1	1,500,000	Concrete	481	17	498	130
RES 6	Via Rincon	H-675	50,000	Concrete	662	14.5	676.5	24
RES 7[1]	-	L-625	100,000	Concrete	612	15	627	36
RES 8	Eastvale & Sunnyridge N.	J-600	100,000	Concrete	597	20	617	30
RES 11[1]	Narissa & Peppertree	B-500-4	100,000	Concrete	481	20	501	29
RES 12	Eastfield & Hackamore	E-1250	100,000	Concrete	1233	20	1253	30.5
RES 13	Crest & Eastfield	P-1450	200,000	Concrete	1436	20	1456	50
RES 17	Sunnyridge & Eastvale South	J-980	100,000	Concrete	965	20	985	32
RES 19-1	P.V.D.E. & Crownview	C-850	3,000,000	Concrete	836	32	868	135
RES 19-2	P.V.D.E. & Crownview	C-850	3,000,000	Steel	835	32	867	132
RES 20-1	Crest E. & Eastfield	P-1450	5,000,000	Concrete	1431	35	1466	160
RES 20-2	Crest E. & Eastfield	P-1450	7,500,000	Steel	1430	38	1468	192
RES 21	Tallyhand Rd.	F-800	100,000	Concrete	802	18	820	33
RES 22	Crest near Portuguese Bend Rd.	F-1325	118,673	Concrete	1326	18	1344	33.5
RES 25[2]	Crest near Highridge	H-1175	9,500,000	Concrete	1153	40	1193	260
RES 26	Crenshaw S. & Seacrest	B-1030	50,000	Steel	1020	11	1031	26.6

(1) Out of service
(2) Variable area tank

6.6 Pressure Reducing Valves

The majority of the pressure zones in the Palos Verdes system are supplied by PRVs. There are a total of 193 PRV stations. Table 6-5 summarizes the hydraulic data (pressure settings) for the PRVs by pressure zone, including PVR settings in pounds per square inch (psi).

Table 6-5
Palos Verdes District PRV Settings by Pressure Zone

Cascade Subarea	Pressure Zone	PRV ID	Elevation (ft)	HGL Setting (ft)	Main PRV Setting (psi)	Bypass PRV Setting (psi)
A	A-570	A156	446	568	53	53
		A155	450	566	50	43
	A-500	A191	420	545	54	54
	A-850-1	A85	735	868	58	58
	A-1000-1	A88	880	989	47	43
		A137	900	1022	53	53
	A-1150-1	A87	1047	1166	52	52
	A-1000-2	A105	900	1010	48	39
		A70	883	1005	53	
	A-970	A130	775	980	89	89
	A-1000-3	A37	900	1010	48	48
	A-1000-4	A108	850	1010	69	69
	A-1150-2	A76	1037	1137	43	
		A46	1030	1149	52	52
		A55	1054	1168	49	49
		A106	1035	1166	57	57
		A69	1030	1145	50	50
	A-1300	A90	1190	1320	56	56
		A56	1175	1330	67	67
		A167	1192	1288	42	53
		A68	1178	1318	61	61
	A-700	A131	570	708	60	
		A180	593	683	39	39
		A182	600	716	50	50
		A244	420	700	121	121
B	B-690	B175	500	690	82	82
	B-750	B173	500	750	108	
	B-700	B51	556	700	62	62
	B-850-1	B53	707	850	62	62
	B-1030	B52	1006	1156	65	10
	B-500-3	B127	325	500	76	76
	B-550	B128	400	550	65	65
	B-550-2	J45	385	468	36	
		B229	410	510	43	43
	B-500-1	B54	400	500	43	43
		A86	400	510	48	48
C	C-350	C197	230	340	48	52
		C198	257	347	39	
	C-385	C80	236	365	56	
		C20	191	385	84	84
	C-640	C168	500	640	61	61
	C-750	C169	640	750	48	48
	C-500	C141	415	500	37	37
	C-700-2	C145	620	700	35	35
	C-550	C44	464	550	37	37

Table 6-5
Palos Verdes District PRV Settings by Pressure Zone

Cascade Subarea	Pressure Zone	PRV ID	Elevation (ft)	HGL Setting (ft)	Main PRV Setting (psi)	Bypass PRV Setting (psi)
C (cont.)	C-635	C36	502	615	49	
		C165	450	635	80	80
		C172	540	645	45	
		C84	530	635	45	45
	C-700-1	C38	523	700	77	77
	C-585	C72	504	585	35	35
		C129	490	575	37	
	C-480	C140	289	510	96	78
		C248	286	486	87	
		C250	320	460	61	61
		C123	300	460	69	
		C210	280	378	42	
	C-850	E243	774	850	33	33
		E235	780	850	30	30
		C239	775	850	32	32
		A147	702	850	64	64
D	D-280	D263	130	280	65	
		D16	119	280	70	70
	D-400	D164	220	400	78	78
	D-530	D260		#N/A		
	D-710	D63	521	698	77	77
	D-850-1	D23	709	839	56	
		D57	734	851	51	51
	D-860-3	D112	694	810	50	50
	D-1175	D107	1025	1131	46	46
	D-500-1	D59	276	436	69	74
		D116	297	413	50	50
		D29	294	399	45	45
		B134	308	368	26	
		D252	340	433	40	
	D-800	D64	597	803	89	89
		D22	577	804	98	
	D-550	D181	445	535	39	39
		D60	432	542	48	48
		D31	448	548	43	43
		D97	453	553	43	43
	D-1010	D58	900	1010	48	
		D98	846	986	61	61
		D39	882	1011	56	56
E	E-1150-1	E7	975	1140	71	76
	E-1250	E4	1220	1250	13	
F	F-1325	F5	1200	1325	54	54
	F-800	F188	802	810	3	
		F13	700	800	43	43
		F186	340	798	199	0
	F-600-2	F132	445	615	74	74
	F-600-1	F71	410	590	78	
		F135	358	600	105	105
	F-820	F10	680	819	60	60
	F-1050	F9	910	1050	61	61
		F265	950	1090	61	61
	F-975	F231	860	975	50	50

Table 6-5
Palos Verdes District PRV Settings by Pressure Zone

Cascade Subarea	Pressure Zone	PRV ID	Elevation (ft)	HGL Setting (ft)	Main PRV Setting (psi)	Bypass PRV Setting (psi)
F (cont)	F-1150-1	F2	1050	1150	43	43
	F-1300	F3	1200	1300	43	43
	F-1160	F251	1030	1160	56	56
H	H-675	H73	570	660	39	
		H242	562	662	43	43
	H-850-2	H237	749	850	44	44
	H-850-1	H238	732	850	51	51
	H-920	H262	759	930	74	74
		H94	749	920	74	74
	H-1300	H93	1093	1290	85	90
		H159	1054	1284	100	
	H-1025	H179	873	1015	61	61
		H40	870	1015	63	
		H114	870	1015	63	
		H89	873	1025	66	66
		H236	890	1025	58	58
	H-1175	H121	1035	1140	45	
J	J-675	J241	522	685	71	71
	J-700-1	J142	567	677	48	48
	J-850-1	J24	750	850	43	43
		J30	748	840	40	
	J-850-2	J162	750	865	50	50
		J104	745	855	48	
		J27	745	865	52	52
	J-1000	J35	887	1000	49	49
		J83	900	983	36	32
	J-980	J245	965	970	2	
	J-1300	J65	1154	1290	59	
		J66	1078	1300	96	96
	J-775	J81	600	755	67	67
		J206	597	613	7	
	J-1150	J158	1054	1144	39	
		J67	974	1150	76	76
		J48	1050	1146	42	42
		J118	1023	1140	51	
	J-1025	J25	884	1015	57	
		J113	885	1015	56	
		J163	900	1025	54	
		J92	885	1015	56	56
		J160	888	1015	55	
		J77	870	1015	63	
	J-600	J138	418	605	81	81
		J78	515	610	41	
		F195	460	624	71	60
L	L-550	L208	412	550	60	60
	L-700	L47	575	700	54	54
		L227	600	690	39	
		L228	600	693	40	
	L-850	L204	732	850	51	
		L26	752	840	38	38
		L115	755	840	37	
		L120	743	850	46	46
		L34	747	840	40	

Table 6-5
Palos Verdes District PRV Settings by Pressure Zone

Cascade Subarea	Pressure Zone	PRV ID	Elevation (ft)	HGL Setting (ft)	Main PRV Setting (psi)	Bypass PRV Setting (psi)
L (cont)	L-850 (cont)	L100	745	850	45	45
		L28	750	840	39	
		L43	742	840	42	42
		L139	724	840	50	50
		L91	750	840	39	
		L15	750	830	35	39
	L-1025	L124	893	1025	57	57
		L82	897	1025	55	55
		L41	899	1015	50	
		L12	890	1005	50	54
	L-1000	L32	855	990	58	
		L33	890	1000	48	48
	L-980	L176	880	980	43	43
		L109	900	1030	56	
	L-625	L230	550	615	28	
		L50	165	330	71	71
	L-1175	P101	1040	1145	45	
		H126	1015	1140	54	54
		L246	1050	1155	45	
P	P-1300-2	P11	1200	1290	39	39
	P-1300-1	P8	1200	1290	39	39
	P-1300-6	P232	1164	1300	59	59
	P-1300-7	P233	1185	1327	61	56
	P-1300-8	P240	1130	1275	63	63
	P-1300-4	P102	1167	1300	58	58
		P49	1190	1290	43	
	P-1300-3	P157	1180	1313	58	62
		P189	1140	1313	75	71
	P-1300-5	P192	1145	1300	67	67
		P193	1153	1300	64	64
N	N-600	N171	480	600	52	52

6.7 Emergency Connections to Other Systems

The Palos Verdes system has connections to the Cal Water Hermosa-Redondo system to provide backup emergency supply to the Hermosa-Redondo system. Table 6-6 summarizes the location and pressure zone of the emergency standby connections.

Table 6-6
Connection to Adjacent Systems – Palos Verdes System

Connection to System	Location	Setting	Palos Verdes Pressure Zone
Hermosa-Redondo[1]		Standby (PRV)	J-600
Hermosa-Redondo[1]		Standby (PRV)	D-500-1
Hermosa-Redondo[1]		Emergency	D-500-1

[1] Flow to Hermosa-Redondo system only.

Section 7
Performance Criteria

As a private water company, California Water Service Company (Cal Water) is regulated by the California Public Utilities Commission (PUC) of the State of California. PUC General Order 103 specifies rules governing water service including minimum standards for design and construction. The performance criteria are based on the PUC requirements, Cal Water's established water system criteria, and March 2008 adopted revisions to the California Health and Safety Code Waterworks Standards (Chapter 16 of Title 22, California Code of Regulations). In addition, information is provided on current American Water Works Association (AWWA) guidelines, current practices of similar water utilities, and CDM engineering experience.

7.1 Summary of Performance Criteria

Table 7-1 summarizes the proposed performance criteria to use as the starting point for the system analysis of the Rancho Dominguez District. The remainder of the section provides a more detailed discussion of each criterion including relevant standards and Cal Water's established criteria, criteria used by other agencies, and the recommended values for the master plan.

Table 7-1
Summary of Performance Criteria for the Rancho Dominguez District

Element	*Description*
Supply to Distribution System	Supply capacity sufficient to meet maximum day demand with fire flow and peak hour flow. Storage may be used to provide fire flow and peak hour flow in excess of the average maximum day demand. Per the March 2008 adopted AWWA standards, systems with 1,000 or more service connections must be able to meet four hours of peak hourly demand with source capacity, storage capacity, and/or emergency source connections.
Water Transmission Main Sizing (pipelines 18-inch or greater in diameter)	• Minimum pressures: o 50 pounds per square inch (psi) for average day demand condition o 40 psi during maximum day and peak hour demand conditions • Maximum pressure: 125 psi for average day demand condition [Note: maximum pressure under minimum hourly demand conditions of not more than 150 psi. • Maximum velocities: o 3 feet per second (fps) for average day demand condition o 5 fps for maximum day and peak hour demand condition • Maximum headloss: o 3 ft per 1,000 ft for maximum day and peak hour demand conditions • Hazen-Williams "C" Factor = 130 • Allowable pipeline materials: ductile iron, concrete cylinder or steel Note: Sizing criteria are requirements for new development. Existing transmission mains are evaluated on a case-by-case basis considering age, material, velocity, headloss, and pressure.

Table 7-1
Summary of Performance Criteria for the Rancho Dominguez District

Element	Description
Water Distribution Main Sizing (pipelines less than 18-inch in diameter)	• Minimum pressures: o 40 psi during peak hour demand condition o ~20 psi residual at fire node during maximum day plus fire flow • Maximum velocities: o 7 fps for peak hour demand condition o 10 fps for maximum day demand plus fire flow • Maximum headloss: o 10 ft per 1,000 ft for maximum day plus fire and peak hour demand conditions • Hazen-Williams "C" Factor = 120 for ductile iron or steel; 130 for polyvinyl chloride (PVC) • Allowable pipeline materials: PVC, ductile iron, or steel Note: Sizing criteria are requirements for new development. Existing distribution mains are evaluated on a case-by-case basis considering age, material, velocity, headloss, and pressure.
Minimum Distribution Pipeline Sizes	Pipes are sized to meet the minimum pressure requirements noted above or the following minimum pipe diameters, whichever is greater. • Low density residential: 12-inch on square mile grid, 8-inch on quarter mile grid, 6-inch for all other • Commercial: 12-inch on square mile grid; 8-inch for all other • Industrial: 12-inch • Cul-de-sac or dead-end street: 8-inch • Distribution to fire hydrants: 8-inch The maximum number of residential lots that can be served by a non-looped pipeline = 25 lots. If a non-looped line goes out-of-service, all associated residences lose water.
Fire Flows	• All areas except for small portions of Dominguez District are under the jurisdiction of Los Angeles County Fire Department (LACFD). Fire flow requirements are summarized in LACFD's Regulation 8. Fire flow rates and durations used for the analysis are: o Single family residential < 1 acre lot size = 1,250 gallons per minute (gpm) for 2 hours o Medium density multiple family residential = 2,500 gpm for 2 hours o Commercial = 3,000 gpm for 3 hours o Industrial = 3,000 gpm for 3 hours o Large Industrial = 5,000 gpm for 5 hours Note: Flows may be reduced by up to 25% if buildings are sprinklered. • One fire at a time in zone (no simultaneous fires in the same pressure zone).
Reservoir Storage	• Storage provides the following three functions: o Operational (or balancing storage) to meet daily fluctuations in demand in excess of the water supply production capacity on the maximum day. For all systems, this component is estimated as 25 percent of the maximum day demand. o ~Fire storage to provide a reserve for fire fighting. The amount varies and is estimated as the most critical (highest) fire flow required in a zone times the required duration. o Emergency storage to provide an emergency reserve in case of planned or unplanned outages of equipment or facilities, including power or supply outages. For the Palos Verdes District, this component is estimated as one maximum demand day due to the unique characteristics of this system. For Hermosa-Redondo and Dominguez Districts, this component is estimated at Cal Water's standard criterion of one average demand day. • The total required storage is the sum of the above three components. • An emergency storage credit is computed if wells or booster have standby power that can be used to meet emergency needs. The emergency storage credit is computed as the firm capacity of wells or boosters with standby power (total capacity with the largest pump in the zone off-line). Installation of standby power is also considered to reduce total storage requirement. The emergency storage credit cannot exceed the emergency storage required.

Table 7-1 Summary of Performance Criteria for the Rancho Dominguez District	
Element	**Description**
Pumping Facilities	• Firm pump station capacity is with the largest pump considered to be out of service. If there are multiple pump stations serving the same service zone, only one pump is considered to be out of service for all the stations combined, i.e., not one pump at each station. • Total pump station capacity equals the firm capacity plus a standby (out-of-service) pump equal in size to the largest pump. • Pump stations pumping into zones with gravity reservoir storage are sized to have firm capacity equal to the maximum day zone demand (average rate over 24-hours). Fire flows are provided by gravity from the zone storage. • Hydropneumatic pump stations are sized for firm capacity for domestic flows equal to the peak hour flow into the zone (or into the portion of the zone served by the pump station). Hydropneumatic stations must also have a fire flow capacity to provide required fire flows in the zone. Hydropneumatic stations should have back-up capabilities. Stations not designed to current fire standards would only be upgraded as part of developer-funded projects based on the specific fire flow requirements for the development. • For all zones, pump stations must also have the ability to pump any flow that must be lifted through to subsequent higher zones. • Backup power should be provided equal to the firm capacity of the pump station by means of an on-site generator for critical stations or a plug-in portable generator for less critical stations. • Critical pumping facilities – a pumping facility is defined as critical if it meets any of the following criteria: o Largest facility that provides water to a particular pressure zone and/or service area. o Facility that provides sole source of water to multiple pressure zones and/or service areas. o Facility that provides water from a supply turnout into pressure zones and/or service areas. o Facility that provides water from key groundwater supply wells into a pressure zone and/or service area. Key depends on capacity, quality and location of the well.

7.2 Supply to Distribution System

PUC General Order 103 requires that the quantity of water delivered to the distribution system from all source facilities be sufficient to supply adequately, dependably and safely the total requirements of all customers under maximum consumption, while meeting the pressure requirements described below. The combined flow from sources of supply and storage capacity should be adequate for four consecutive days of maximum use.

Many water agencies, particularly those with surface water supply such as the Rancho Dominguez District, provide supply capacity equal to the maximum day demand, and then meet peak hour needs from storage. In some cases, it may be appropriate to meet some peaking needs from the supply source, e.g., if there is available peaking capacity from the surface water source, or from wells in systems with groundwater supply.

The March 2008 adopted revisions to the AWWA Standards require that a system's water sources must have the capacity to meet the maximum day demand at all times. For systems with 1,000 or more service connections, the system must be able to meet four hours of peak hourly demand with source capacity, storage capacity, and/or emergency source connections. Both the maximum day and peak hour requirements must be met in the system as a whole and in each individual pressure zone.

For the Rancho Dominguez District, the criterion will be to meet maximum day demand from supply sources and peak hour demands in excess of the average maximum daily demand from storage.

7.3 Distribution System Pressures

Per PUC General Order 103, the utility must maintain the following operating pressures at the service connection:

- Normal operating pressures of not less than 40 psi or more than 125 psi at the service connection;
- Minimum pressures under peak hourly seasonal demands of at least 30 psi;
- Maximum pressures under minimum hourly demand conditions of not more than 150 psi; and
- Residual pressure of 20 psi in the distribution system under fire flow conditions.

Per PUC General Order 103, under normal operating conditions, variations in pressure are not to exceed 50 percent of the average operating pressure, determined as the arithmetical average of at least 24 hourly pressure readings.

Cal Water has established the following pressure requirements, which are used for the master plan analysis:

- Transmission Pipelines (18-inch or greater in diameter)
  - Minimum pressures:
    - 50 psi for average day demand condition
    - 40 psi during maximum day and peak hour demand conditions
  - Maximum pressures: 125 psi for average day demand condition
- Distribution Pipelines (less than 18-inch diameter)
  - Minimum pressures:
    - 40 psi during peak hour demand condition
    - 20 psi residual at fire node during maximum day plus fire flow

The March 2008 adopted revisions to the AWWA Standards require that each distribution system be operated in a manner to assure that the minimum operating

pressure in the water main at the user service line connection is not less than 20 psi at all times throughout the distribution system. This minimum pressure criterion applies for fire flow and other emergency conditions, such as temporary outages of pumping facilities.

The new AWWA Standards also require that each new distribution system that expands existing service connections by 20 percent or more, or that may otherwise adversely affect distribution system pressure, must be designed to provide a minimum normal operating pressure throughout the new distribution system of not less than 40 psi at all times (excluding fire flow or other emergency conditions).

The Uniform Plumbing Code requires individual pressure reducing valves if pressures exceed 80 psi for new installations.

7.4 Water Main Sizing

PUC General Order 103 requires new and replacement mains be sized to accommodate the pressure requirements in the order as described above, or minimum of 6-inch diameter, whichever is larger. The transmission pipelines from sources of supply must be designed to deliver, in combination with related storage facilities and to the limits of the capacity of those sources of supply, the maximum requirements of that portion of the system dependent upon those transmission pipelines.

Cal Water requires that new pipelines be sized to meet its pressure criteria as discussed above. In addition, Cal Water has established the following additional requirements for sizing new pipelines, which are used for the master plan analysis:

- Transmission Pipelines (18-inch or greater in diameter)
  - Maximum velocities:
    - 3 fps for average day demand condition
    - 5 fps for maximum day and peak hour demand condition
  - Maximum headloss:
    - 3 ft per 1000 ft for maximum day and peak hour demand conditions
  - Hazen Williams “C” factor: 130
  - Allowable pipe materials: ductile iron, concrete cylinder, steel
- Distribution Pipelines (less than 18-inch in diameter)
  - Maximum velocities:
    - 7 fps for peak hour demand condition
    - 10 fps for maximum day demand plus fire flow

- Maximum headloss:
  - 10 ft per 1000 ft for maximum day plus fire and peak hour demand conditions
- Hazen Williams "C" factor: 120 for ductile iron or steel, 130 for PVC
- Allowable pipe materials: PVC, ductile iron, steel
- Minimum pipe sizes:
  - Low density residential: 12-inch on square mile grid, 8-inch on quarter mile grid, 6-inch for all other
  - Commercial: 12-inch on square mile grid
  - Industrial: 12-inch
  - Cul-de-sac or dead-end street: 8-inch
  - Distribution to fire hydrant: 8-inch
- The maximum number of residential lots served by a non-looped pipeline is 25 lots, since all associated residences would lose water service due to a break.

The sizing criteria are requirements for new pipeline improvements and new development. Existing transmission mains are evaluated for improvement on a case-by-case basis considering age, material, velocity, headloss, and pressure. New and/or replacement pipelines should be looped to the greatest extent possible to improve hydraulics and water quality in the system.

Velocity and headloss information from the modeling analysis is used to identify hydraulic bottlenecks in the existing system and determine the best locations for hydraulic improvements. Existing pipelines that exceed the established criteria are identified, and are evaluated on a case-by-case basis. If existing pipelines must be improved, then improvements would be designed to meet the established criteria.

Many water agencies have main sizing criteria that include system pressures, as discussed above, as well as pipe velocities and headlosses. Typical velocity ranges used by other agencies are from a desirable level of 5 fps up to a maximum of 12 fps under peak hour or maximum day plus fire flow. The typical range for headlosses is from 5 feet per 1,000 feet under maximum day demand up to a maximum of 10 feet per 1,000 feet for peak hour demand. A maximum of 10 feet per 1,000 feet under any non-fire demand condition is a typically used head loss criterion, and is equivalent to 4.3 psi pressure loss per 1,000 feet.

Typically, high velocities and/or high headlosses may manifest as a reduction in pressure. However, high velocities and corresponding high headlosses are also a concern for water hammer. According to AWWA Manual M32 – "Distribution Network Analysis for Water Utilities" (AWWA, 1989), velocities are acceptable up to a maximum of about 10 fps to minimize such problems, while velocities of about 5 fps are desirable. Under fire flow conditions, the most likely cause of water hammer would be from rapid closure of a hydrant following use. This infrequent scenario may not warrant applying the same velocity and headloss criteria for fire flow conditions.

7.5 Fire Flows

PUC General Order 103 provides fire flow standards considered appropriate on an average statewide basis, but acknowledges that there are widely varying conditions for the urban, suburban and rural areas in the state. The order states that the standards prescribed by the local fire protection agency or other prevailing local governmental agency govern. Such local flow standards are to be provided whether greater or lesser than those set forth in the order, except that mains designed for and capable of providing flows in excess of the requirements set forth are to be considered mains providing excess flow for the purpose of the application of the utility's main extension rule.

The majority of the Dominguez and Hermosa-Redondo systems, and all of the Palos Verdes water systems are served by LACFD. LACFD fire flow requirements are detailed in its Regulation 8. The Dominguez and Hermosa-Redondo systems also include portions under the jurisdiction of the City of Torrance, which uses the California Fire Code to establish flow requirements. Requirements are similar, except single family residential, which has a minimum requirement of 1,500 gpm for 2 hours.

Based on the fire code, the required fire flow protection for the different land use types and square footages are shown in Table 7-2.

Table 7-2
Fire Protection Requirements by Land Use Type for the Rancho Dominguez District

Land Use Type	*Fire Flow (gpm)*	*Duration (hours)*
Single Family Residential (less than one acre lots) [(1)]	1,250	2
Multifamily Residential, Commercial, Industrial, (5,000 to 14,999 square feet [SF])	1,250 to 2,500	2
Multifamily Residential, Commercial, Industrial, (15,000 to 24,999 SF)	3,000 to 3,500	3
Multifamily Residential, Commercial, Industrial, (25,000 to 34,999 SF)	4,000 to 4,500	4
Multifamily Residential, Commercial, Industrial, (> 35,000 SF)	5,000 to 8,000	4

(1) City of Torrance minimum single family residential fire flow is 1,500 gpm for 2 hours

Water system planning analyses typically assume that only one fire will occur at a time within a pressure zone or service subarea.

7.6 Reservoir Storage

PUC General Order 103 does not contain any specific requirements regarding storage amounts. The combined flow from sources of supply and storage capacity must be adequate for four consecutive days of maximum use.

Water system storage is typically sized based on the following three components:

- operational storage (also called equalizing or balancing storage);
- fire reserve storage; and,
- emergency storage.

Water storage capacity may also be provided in equivalent ways, other than tanks. For example, some agencies provide backup generators at pump stations to provide some of the reliable emergency supply. In some cases, a water system may be able to peak off the supply source, which can reduce the in-system operational storage requirement. Water systems with groundwater supply may use wells with backup power to provide some or all of these components.

Operational (equalizing or balancing) storage is the volume of water required to meet daily fluctuations in demand in excess of the water supply production capacity on the maximum day. This storage volume is determined by the variation in the hourly demand during the day of maximum demand. When supply capacity is provided to meet the maximum day demand, operational storage requirements typically range from 25 to 50 percent of the maximum day demand. If peaking capacity is available from the supply system, then the operational storage requirement may be lower.

For the Rancho Dominguez District, operational storage at 25 percent of the maximum day demand is recommended, which is a typical industry standard. This criterion is based on system diurnal curve patterns that were developed for the hydraulic model from system-specific information and complies with the new Waterworks Standard requirement to be able to meet 4 hours of peak hourly demand from a combination of supply sources and storage (maximum day is provided from supply sources and the peak hourly demand in excess of the average hourly on the maximum day is met from storage).

Fire reserve storage is the amount of storage volume necessary to supply fire flow for the most critical land use within a pressure zone. The fire reserve storage is typically computed for each pressure zone or service area, based on the most restrictive (highest) fire flow requirement times the duration for which it must be supplied. The fire reserve storage should always be available for fire protection to every part of the distribution system.

Emergency storage is the volume of water required to supply the service area during planned or unplanned equipment outages, power outages, or well shutdowns for unexpected mechanical difficulties or quality issues. This storage needs to be sufficient to provide a reasonable level of uninterrupted service under such circumstances. The minimum recommended emergency storage generally represents a 6-hour power outage on the maximum demand day (25 percent of maximum day demand). A typical assumption for emergency storage is that there may be a supply outage and/or power outage for 8 to 12 hours on the maximum demand day, which

would represent about 35 to 50 percent of the maximum day demand. An outage of this duration on the maximum demand day would be equivalent to requiring emergency storage equal to about 0.7 to 1.0 average demand day.

For the Hermosa-Redondo District and for the Dominguez District, one average day demand of emergency storage is recommended, which is based on Cal Water's typical criterion. For the Palos Verdes District, emergency storage equal to one maximum day demand is used based on direction from Cal Water. The selection of maximum day demand for the Palos Verdes District rather than one average day demand is due to Metropolitan Water District of Southern California's (MWD) suggestion of seven days storage for systems with a single supply source. Although there turnouts from the MWD system on two feeders, both are in close proximity and at the end of the MWD system, where portions of the system could be isolated for extended periods. Using the maximum day demand criterion is more consistent with the MWD suggestion, particularly since customers could be asked to reduce demands during a major emergency.

The storage criteria for the Rancho Dominguez District are summarized below in Table 7-3. Total storage equals the sum of the operational storage, emergency storage, and fire reserve.

Table 7-3
Reservoir Storage Criteria for Rancho Dominguez District

Storage Component	*Criterion*
Operational Storage (also called equalizing or balancing storage)	25 percent of maximum day demand
Emergency Storage	One maximum day demand (Palos Verdes District) One average day demand (Hermosa-Redondo and Dominguez District)
Fire Reserve	For each zone, based on most critical land use within zone and required fire flow amount and duration.
TOTAL REQUIRED STORAGE	Sum of all three components

The storage criteria identified above do not include additional storage capacity that may be required to allow time-of-use pumping. For storage facilities in system areas where the pumping supply operates in time-of-use, additional reservoir storage is needed to store the water for use during the "pumps off" period. In the Palos Verdes District system, pump stations that supply the Ridge system are operated on time-of-use electric rate schedules. Reservoir storage requirements were computed for the Ridge area by taking the difference between storage used for 24-hour pumping and time-of-use pumping, based on the Palos Verdes system diurnal curve, and adding this difference to the total storage requirement.

If wells or booster stations within a pressure zone are equipped with standby power, then the emergency storage requirement can be reduced. Cal Water provides for an Emergency Storage Credit (ESC), where the credit is calculated as a volume equivalent to the emergency storage volume required:

ESC = Firm Well or Booster Station Capacity for Facilities with Standby Power

Firm well or booster capacity is defined as the capacity of all facilities supplying a pressure zone with standby power, with the largest unit assumed to be off-line.

Installation of standby power in lieu of storage can also be considered, since installation of standby generating capacity is typically much less expensive than construction of new storage.

Another consideration is minimizing water quality impacts, such as potential for nitrification, at storage reservoirs due to low turnover during low demand periods. Water age is a general indicator for other water quality problems, such as loss of disinfectant residual, or potential for nitrification. Water age in reservoirs is often used to identify reservoirs with potential problems, i.e., higher water age typically means lower turnover and potential for water quality problems. The March 2008 revisions to the Waterworks Standards require that tanks must be constructed with a separate inlet and outlet (internal or external) to improve turnover for water quality purposes.

7.7 Pumping Facilities

PUC General Order 103 does not contain any specific requirements regarding pumping capacities. The transmission system from sources of supply must be designed to deliver, in combination with related storage facilities and to the limits of the capacity of those sources of supply, the maximum requirements of that portion of the system dependent upon those transmission pipelines.

Cal Water has established the following criteria for pumping capacities:

- Zones with reservoir storage should provide firm pumping capacity or gravity supply capacity that is sufficient to meet maximum day demand. For zones with storage, fire reserves are provided from storage.
- Zones without storage in the zone should have firm pumping capacity or gravity supply capacity to meet the peak hour demand on the maximum day, plus a fire pump or other means of providing fire flows to the zone. Stations that were not designed to current fire standards would only be upgraded as part of developer-funded projects based on specific fire flow requirements for the development.
- For all zones, the pump station must also have the ability to pump any flow that would be lifted through to supply subsequent higher zones.
- Firm capacity is defined as the capacity with the largest pumping unit at the pump station out of service.
- For zones supplied by facilities operating on time-of-use electric rate schedules (Stations 22, 23 and 30 in the Palos Verdes District system), the firm capacity of the pump station must be 130 percent of the maximum day demand. This allows for

operating the pump station during an 18-hour period, and keeping the pumps off for 6 hours during the day (6-hour peak energy cost period). With time-of-use pumping, additional reservoir storage is needed to store the water for use during the "pumps off" period.

Backup power should be provided equal to the firm capacity of the pump station by means of an on-site generator for critical stations or a plug-in portable generator for less critical stations. Critical pumping facilities are those that meet any one or more of the following criteria:

1) largest facility that provides water to a particular pressure zone and/or service area;

2) facility that provides the sole source of water to multiple pressure zones and/or service areas;

3) facility that provides water from a supply turnout into pressure zones and/or service areas; and/or

4) facility that provides water from key (depend on capacity, quality, location) groundwater supply wells into a pressure zone and/or service area.

7.8 Main Replacement Program Objectives

Cal Water, as a company, has an established Main Replacement Program for all its districts to replace all undersized mains and bare steel mains (uncoated, unlined or both). The goal of the program is to replace all mains of these categories within a 25 to 50 year period. The specific length of the replacement period for a given district is determined by:

1) The total footage of mains that fall within the following replacement program categories:

   - Undersized mains that are smaller than 6-inch diameter
   - Steel mains (bare) that are 6-inches or larger in diameter

2) The severity of the leak or fire protection problems in the district.

Undersized mains with a diameter smaller than 6 inches are replaced to improve fire protection, distribution within the system, and service pressure to customers. Under PUC General Order 103, the current policy is to install mains with a minimum 6-inch diameter, in order to provide adequate system pressure and flows to all services. The highest priorities for replacement are the smallest diameter mains that provide the weakest pressure and flow conditions and those mains with the greatest history of leaks. While not required by the PUC General Order, mains that are 6-inch diameter or larger are also evaluated as the need arises to determine if such mains should be considered for replacement with larger diameter mains.

Steel mains that are 6-inch and larger diameter are included in the targeted mains as needed to reduce and control leaks. Many steel mains were originally installed over forty years ago and these mains can routinely, yet randomly, develop leaks. The objective in any one-year is to replace those mains which have generated the greatest leak problems during recent years.

The soils in some regions are more corrosive than in other regions. These soils can accelerate leak occurrence in certain main materials. Where appropriate, these affected main types are included in the replacement program.

Cal Water has implemented a leak tracking system that uses leak repair report cards submitted by repair crews following any leak repair action. Using these cards, a leak history is generated for individual mains. Cal Water annually determines the number of leak for each district on the basis of leaks per one hundred miles of main. This information along with the actual length of targeted mains in a district is used to set the annual target main replacement length.

Section 8
Water Supply Requirements

This section describes existing water supply sources available to the California Water Service Company (Cal Water) Rancho Dominguez District and compares demand projections and available supplies to determine supply requirements. Some of the supply sources are described specifically for each District, while others (specifically groundwater and imported water) are presented for the overall Rancho Dominguez District. Section 9 discusses future water supply options and supply and water supply strategy for future planning.

8.1 Existing Water Supply Sources

The Rancho Dominguez District provides water service to three separate Districts: Dominguez, Hermosa-Redondo, and Palos Verdes. As shown in Table 8-1, the existing water sources are imported water, recycled water, and groundwater. All three sources are not provided to each district in the same proportion, as illustrated in Table 8-1.

Table 8-1
Summary of Water Supply by Source for Fiscal Year 2005-2006

District	Water Supply Source (acre-feet per year)		
	Imported Water	Groundwater	Recycled Water[1]
Dominguez District	27,805	6,744	3,665
Hermosa-Redondo District	13,240	1,756	119
Palos Verdes District	20,545	0	0
TOTAL	61,590	8,500	3,784

[1] Source: West Basin Municipal Water District Water Use Report, Fiscal Year 2005-2006.

8.1.1 Existing Recycled Water

Recycled water is served by Cal Water to the Dominguez and Hermosa-Redondo Districts. The Palos Verdes District does not receive recycled water at this time, although there are plans to provide this service within the next few years.

Cal Water purchases recycled water from West Basin Municipal Water District (WBMWD), whose responsibilities regarding recycled water production and delivery are summarized as:

- Determine the technical and economic feasibility of supporting recycled water use;
- Encourage the use and optimization of recycled water; and
- Extend recycled water systems to serve users.

WBMWD produces recycled water at the West Basin Water Recycling Facility (WBWRF). The WBWRF receives secondary effluent from the City of Los Angeles'

Hyperion Treatment Plant (Hyperion) and provides additional levels of treatment based on the ultimate use of the recycled water. Recycled water from WBMWD is used for groundwater replenishment, landscape irrigation, and industrial processes. Five types of recycled water are produced by the WBWRF:

- **Disinfected Tertiary Water –** Secondary treated water from Hyperion treated to Title 22 standard for use in general industrial and irrigation purposes.
- **Nitrified Water –** Tertiary treated water with ammonia removed by nitrification for use in industrial cooling towers.
- **Softened Reverse Osmosis Water –** Secondary treated water from Hyperion pretreated with microfiltration and lime softeners and then reverse osmosis (RO) for use in the seawater barrier.
- **Pure RO Water –** Secondary treated water from Hyperion pretreated with microfiltration and additional treatment with RO for use in low pressure boiler feeds in industrial sites and refineries.
- **Ultra Pure RO Water –** Secondary treated water from Hyperion pretreated with microfiltration and then treated twice with RO to ensure minerals are removed for use in high pressure boilers.

The Los Angeles County Sanitation District's Joint Water Pollution Control Plant provides secondary treatment to the wastewater generated in the Dominguez District. Although this plant does not currently produce recycled water, it is being considered as a potential source of recycled water in the future.

Cal Water provided a total of nearly 23,000 acre-feet (AF) of recycled water to its customers during the 10-year period from 1996 to 2006, as shown in Table 8-2. The annual use of recycled water has increased significantly from 67 acre-feet per year (AFY) in fiscal year (FY) 1996-1997 to 3,785 AFY by FY 2005-2006. This expansion has mostly occurred in the Dominguez District for industrial purposes.

Table 8-2
Historical Recycled Water Use in the Rancho Dominguez District

Fiscal Year	District (AFY)		Total (AFY)
	Dominguez	Hermosa-Redondo	
96-97	0	67	67
97-98	0	88	88
98-99	4	128	132
99-00	1,317	141	1,459
00-01	3,297	133	3,430
01-02	3,165	130	3,296
02-03	3,092	130	3,223
03-04	3,639	144	3,783
04-05	3,616	107	3,722
05-06	3,665	119	3,784
Total (AF)	**21,796**	**1,187**	**22,984**
Ten-Year Average (AFY)	**2,180**	**119**	**2,298**

Source: WBWMD Water Use Report Fiscal Year 2005-2006

Recycled water rates charged by Cal Water to its customers depend on the quality of recycled water being served, power consumption, and location. Rates are set to recover operation and maintenance expenses for production and delivery with rates lower than imported water, except for highly treated water used by refineries. Rates are either fixed or vary by tier block with costs declining for higher volumes delivered. A recycled water standby charge is collected from all parcels in the service area to pay for debt-service obligations on the WBWRF. Assessment amounts vary based on the existing land use and range between $16 and $120 per parcel for recycled water. Table 8-3 illustrates the commodity rate structure for recycled water as of July 1, 2008.

Table 8-3
WBWMD Recycled Water Rates per Acre-Foot(1)

Volume (AF/Month)	WBWMD Service Area	Industrial RO Ultra in Service Area	Palos Verdes Zone Rate
0-25	$438	$954	$676
25-50	$428	$954	$666
50-100	$418	$954	$656
100-200	$408	$954	$646
200+	$398	$954	$636

Source: WBWMD Operating Budget FY 2008-2009

8.1.2 Existing Imported Water

Cal Water receives imported water from the Colorado River and the State Water Project (Sacramento-San Joaquin Delta) from WBMWD, which in turn obtains its water from the Metropolitan Water District of Southern California (MWD). WBMWD purchases Non-Interruptible Water (treated full service) and Seasonal Treated Replenishment Water (in-lieu replenishment) from MWD. Approximately 150,000 AFY are delivered by WBMWD to its member agencies, including Cal Water.

8.1.2.1 Non-interruptible Water

Table 8-4 summarizes non-interruptible supply by district for FY 1996-1997 through FY 2005-2006. The total supply of imported water for the Rancho Dominguez District increased by 23 percent during this period. The supply was fairly constant during the last four years.

Cal Water and WBMWD have a purchase agreement (amended in November 2004) that establishes a Base Allocation of 71,790 AFY, a Tier 1 Annual Maximum of 64,611 AFY, and a Purchase Commitment of 212,466 AFY. The “Base Allocation” refers to Cal Water’s share of WBMWD’s share of MWD water. The Base Allocation is used to calculate the Tier 1 Annual Maximum amount (90% of Base Allocation) and the Purchase Commitment amount (60% of Base Allocation times five).

Table 8-4 Historical Non-Interruptible Imported Water for the Rancho Dominguez District				
	Supply by District (AFY)			Total (AFY)
	Dominguez	Hermosa-Redondo	Palos Verdes	
FY 96-97	14,088	14,801	21,091	49,980
FY 97-98	17,701	13,684	18,645	50,030
FY 98-99	20,179	14,162	21,682	56,023
FY 99-00	19,291	13,753	22,996	56,040
FY 00-01	21,526	12,862	20,877	55,265
FY 01-02	21,911	12,508	21,390	55,809
FY 02-03	25,190	13,146	21,052	59,388
FY 03-04	27,836	13,696	22,106	63,638
FY 04-05	29,379	12,888	19,371	61,638
FY 05-06	27,805	13,240	20,545	61,590

The allocations established in the purchase agreement with WBMWD are for all Cal Water districts combined. Cal Water in turn has developed allocations for each district as follows:

- Dominguez – 20,675 AFY
- Hermosa-Redondo – 15,507 AFY
- Palos Verdes – 23,906 AFY

The imported water rates paid by Cal Water to WBMWD for Tier 1 and Tier 2 allocations are summarized below in Table 8-5.

Table 8-5 2009 Imported Water Rate Structure		
	January 2009	
	Tier 1 ($/AF)	Tier 2 ($/AF)
MWD rates	**579**	**695**
WBMWD rates		
Administrative surcharge	41	41
Readiness to serve surcharge	69	69
WBMWD charges	***110***	***110***
Total rate	**689**	**805**

In addition to the full service treated volumetric rates summarized above, both MWD and WBMWD apply the following charges:

- **Capacity charge:** $6,800 per cubic foot per second (cfs) charged by MWD. WBMWD is able to lower this to $6,000 per cfs to its customers.
- **Readiness-to-serve charge (MWD):** $82 per cfs
- **Water service charge (WBMWD):** $23 per cfs

8.1.2.2 Seasonal Treated Replenishment Water (In-lieu Replenishment)

Although all the imported water purchased by Cal Water is un-interruptible treated water, MWD has a different rate for seasonal replenishment water used for groundwater replenishment. This replenishment water is sold at a discount over Tier 1 rates, but can be interrupted at any time. WBMWD provides replenishment water to some of its customers, but not to Cal Water at this time. In 2008, the WBMWD rate for replenishment water was $258/AF for untreated water and $390/AF for treated water.

8.1.2.3 Imported Water Turnouts

The Rancho Dominguez District purchases imported water from WBMWD, which is a member agency of MWD. WBMWD is located in MWD's Central Pool service area which can receive water supply from MWD's Jensen, Weymouth, and Diemer water filtration plants. The Central Pool system is the most interconnected part of MWD's system resulting in fairly high reliability during system outages from emergencies and routine maintenance. Figures 8-1, 8-2, and 8-3 present the MWD turnout locations for the Dominguez, Hermosa-Redondo and Palos Verdes Districts, respectively.

Table 8-6 presents the water purchases at each of the turnouts and the turnout capacity, in cfs and million gallons per day (mgd). No turnout capacity limitations are currently anticipated for the future (into the year 2030).

8.1.3 Existing Groundwater

This section summarizes major hydrogeologic characteristics of the West Coast and Central Basins, Cal Water groundwater rights, Cal Water production facilities and historic groundwater use in the Dominquez and Hermosa-Redondo Districts. Appendix E includes more detailed information and figures about the geologic and hydrogeologic characteristics of the area, groundwater levels, well data, and production.

Public Version

Figure 8-1
Dominguez District
Imported Water Turnouts

CDM

Public Version

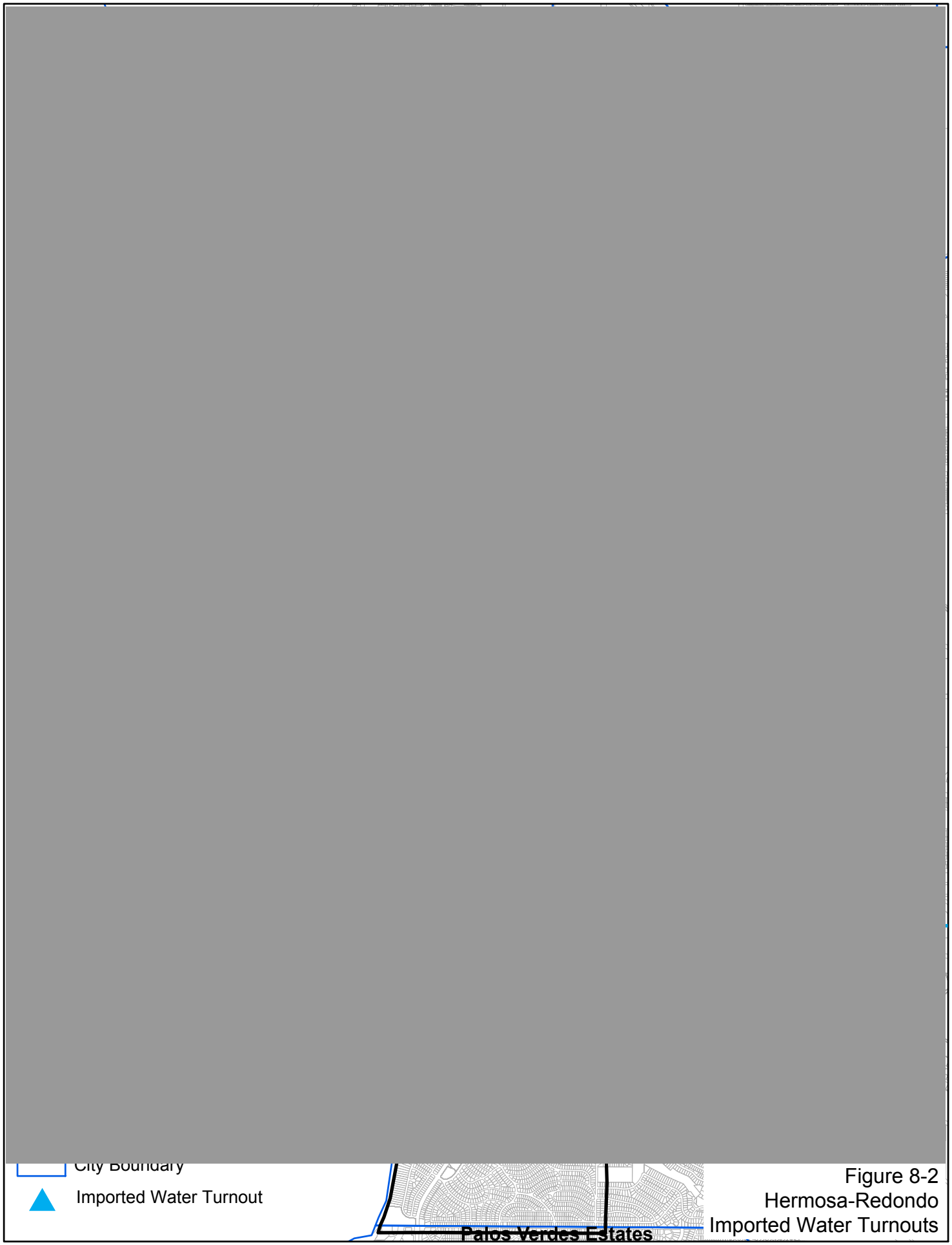

Figure 8-2
Hermosa-Redondo
Imported Water Turnouts

Public Version

CDM

Figure 8-3
Palos Verdes
Imported Water Turnouts

Table 8-6 Rancho Dominguez District Turnout Summary				
Connection	Capacity		MWD Feeder	2006 Purchased Water (cfs) Average Daily/Maximum Monthly
	cfs	mgd		
Dominguez District				
WB-9	30	19	Long Beach Lateral	13.22/15.12
WB-10	20	13	Long Beach Lateral	5.14/8.37
WB-14	25	16	Victoria to 223rd St Cross Feeder	5.61/10.28
WB-21	20	13	Palos Verdes Feeder	3.72/4.72
WB-35	20	13	Victoria St Lateral	4.65/6.00
WB-36	15	10	Palos Verdes Feeder	3.74/5.00
WB-39	10	6	Sepulveda Feeder	3.95/7.25
Hermosa-Redondo District				
WB-2B	5	3	West Basin Feeder	0.00
WB-5	15	10	West Basin Feeder	8.66/10.70
WB-16	25	16	Second Lower Feeder	7.57/11.65
WB-29	15	10	West Basin Feeder	1.92/1.96
Palos Verdes District				
WB-6A	30	19	Palos Verdes Feeder	3.80/11.37
WB-6B	5	3	Palos Verdes Feeder	0.72/1.49
WB-32	40	26	Palos Verdes Feeder	5.13/12.43
WB-40	40	26	Second Lower Feeder	18.60/26.06

8.1.3.1 Hydrogeological Characterization

The Rancho Dominguez District falls within the Los Angeles Basin at the northern end of the Peninsular Ranges geomorphic Province. The Peninsular Ranges province is characterized by northwest to west-northwest trending faults. One such fault system, the Newport-Inglewood Uplift (NIU), separates two structural blocks – the central and southwestern structural blocks of the Los Angeles Basin. The Cherry Hill and Avalon-Compton Faults, which are part of the NIU, intersect the northeastern portion of the Dominguez District. The NIU also forms the boundary between the Central and West Coast groundwater basins, shown in Figure 8-4. The Recent (Holocene and Pleistocene age) aquifer system of the West Coast and Central Basins is comprised of the semiperched aquifer, the Bellflower aquiclude, the Gaspur aquifer, and the Bellona aquifer.

Groundwater elevation contours generated by the Water Replenishment District of Southern California for spring and fall 2006 show that groundwater in Central Basin flows from the Montebello Forebay towards the NIU in a southwesterly direction. In the West Coast Basin, as expected, water levels are highest along the West Coast Basin Barrier Project (WCBBP), a line of over 140 injection wells operated by Los Angeles County Department of Public Works. Groundwater levels continue to drop in an easterly direction, towards a low point in Gardena.

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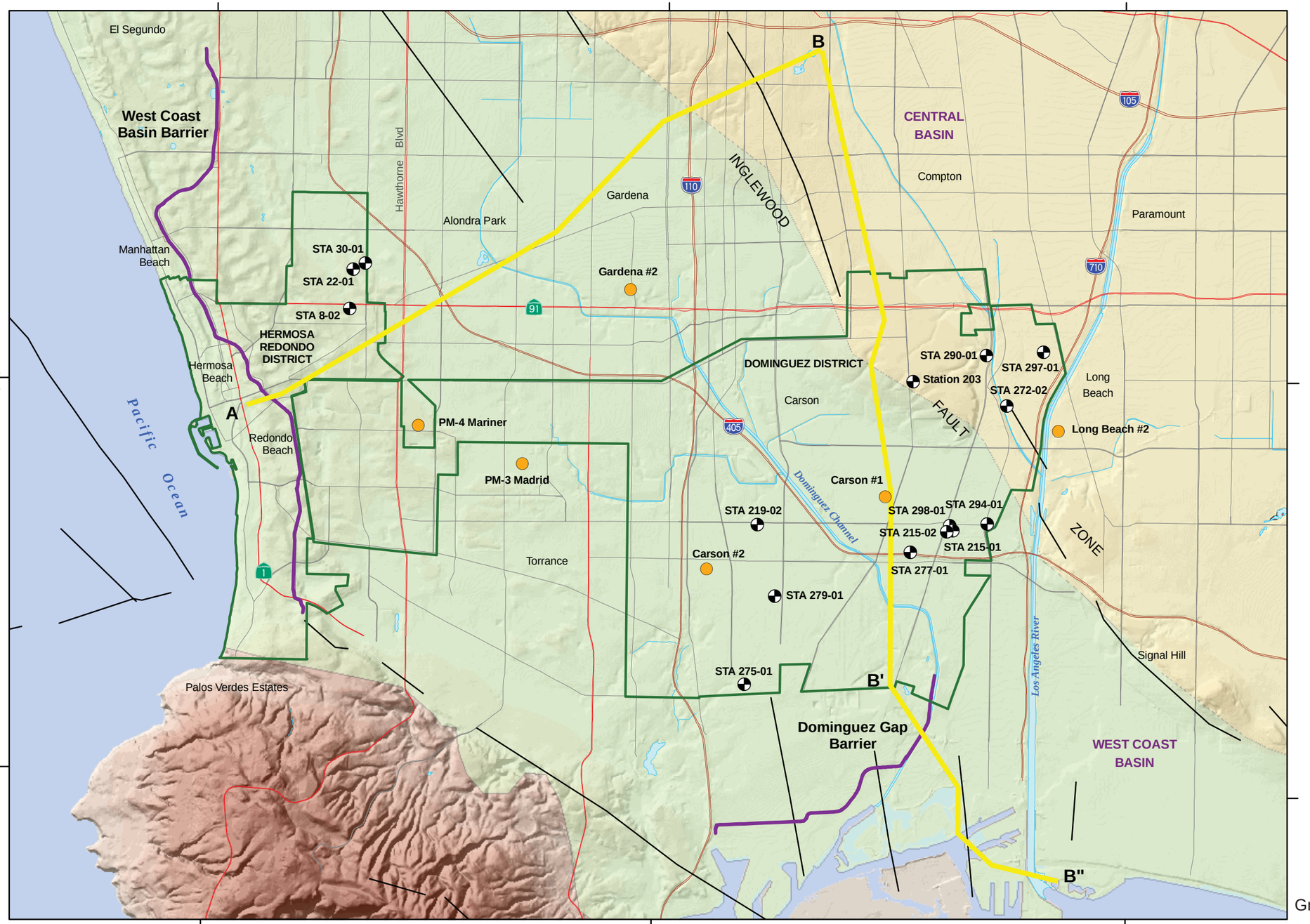
WATER SUPPLY AND FACILITIES MASTER PLAN FOR THE RANCHO DOMINGUEZ DISTRICT



WELLS AND CROSS-SECTION LOCATIONS

EXPLANATION

- Rancho Dominguez District Boundary
- California Water Service Well
- Water Replenishment District Monitoring Well Location
- Geohydrologic Cross-Section (See Figures 3 and 4)
- Sea Water Barriers

DWR Ground Water Basins

- Central Basin
- West Coast Basin

- River
- Reproduced with permission, California Division of Mines and Geology CD-ROM 2000-006 (2000), Digital Database of Faults from the Fault Activity Map of California and Adjacent Areas, (2000).

Figure 8-4
Groundwater Basin and Well Locations

8-Aug-08

NORTH

0 1 2 Miles

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Prepared by: DWB

Map Projection:
UTM Zone 11, NAD27
Central Meridian: -117 degrees

GIS_proj/CDM_CWS_8-08/0_cdw-cws_Fig_2_wells_x-sec_8-08.mxd

Water levels in the fall are generally lower than in spring because of greater pumping and reduction of natural recharge in the summer months. The groundwater flow directions, however, remain very similar except in the southern portion of the Central Basin in Long Beach where a change in groundwater production patterns in 2006 caused a pumping depression to form.

The groundwater storage capacity of the West Coast and Central Basins is summarized in Table 8-7. Of this total capacity, there is a certain portion that is considered currently unused. Also, because it is not possible to store water in the entire unused portion of storage, a more realistic amount for available storage has been estimated, taking into account leaving the groundwater level at 75 feet below ground surface (bgs) in order to protect against potential liquefaction.

Table 8-7
Summary of Groundwater Storage Volumes in the West Coast and Central Basins

Basin	Storage Capacity (AF)	Unused Storage (AF)	Available Storage With Water Level Up to 75 feet bgs (AF)
Central	13.8 million	1.1 million	330,000
West Coast	6.5 million	1.1 million	120,000
Total	20.3 million	2.2 million	450,000

Source: MWD (2007)

8.1.3.2 Groundwater Rights

Cal Water pumps groundwater from the West Coast and the Central Basins. Both basins are adjudicated and the California Department of Water Resources (DWR) serves as the Watermaster for both basins. In total, Cal Water has rights to 22,849 AF per fiscal year in the West Coast and Central Basins. The pumping rights in both basins are essentially "fixed." There are no provisions for routine allowable overproduction with replenishment obligations and costs. The following sections describe Cal Water's groundwater rights by basin.

West Coast Basin

The West Coast Basin has a history of sea water intrusion as a result of excessive pumping. Cal Water, City of Torrance, and Palos Verdes Water Company took legal action in 1945 to control pumping to prevent further damage to the basin. WBMWD was formed in 1947 to prevent overdraft by providing supplemental water to the basin. In 1955, an Interim Agreement was implemented to limit pumping, and DWR was appointed the Watermaster. In 1961, the courts signed the final West Coast Basin Judgment, which represents the final adjudication of groundwater rights in the basin and maintains DWR as the Watermaster to monitor groundwater levels and extractions.

Cal Water owns 14,487.45 AFY of adjudicated rights to the West Coast Basin. Of this amount, 10,417.45 AFY were obtained as part of the merger of Cal Water with the Dominguez Water Company, and the remaining 4,070 AFY are held by the Hermosa-Redondo District. Cal Water also has a lease agreement with the City of Hawthorne

for 1,882 AFY through 2010. Although acquired at different times, Cal Water's combined pumping rights in the basin are aggregated – they can be produced by any Cal Water well in the West Coast Basin.

Central Basin

Population growth in the early 1960s resulted in significant overdraft conditions in the Central Basin. In 1962, the Central and West Basin Water Replenishment District filed suit to define water rights in the basin and regulate withdrawals to prevent further overdraft. In late 1962, an Interim Agreement was signed to control groundwater pumping and DWR was appointed as the Watermaster. The final Judgment for adjudication of water rights in the Central Basin was signed in 1965, retaining DWR as the Watermaster.

Cal Water owns 6,480 AFY of adjudicated water rights in the Central Basin, obtained as part of the merger of Cal Water with the Dominguez Water Company.

8.1.3.3 Groundwater Facilities

Cal Water has 11 existing wells in the West Coast Basin; three are in the Hermosa-Redondo District and the remaining eight are in the Dominguez District. Cal Water also has three wells in the Central Basin. Figure 8-4 shows the well locations. Table 8-8 presents major issues relative to the wells. Appendix E provides further details regarding well and water quality conditions.

West Coast Basin

Well Conditions

The Hermosa-Redondo District wells are in the northeastern portion of the district and are Cal Water's closest wells to the ocean and the WCBBP. The wells range from 24 to 61 years old.

Station 8-02 had some rehabilitation in 1991 which included chemical treatment for iron bacteria and removal of encrusting materials and scale. Historical static and pumping water levels, as well as the discharge rate, have remained fairly consistent for nearly 20 years.

Station 22-01's specific capacity and discharge rate declined significantly following rehabilitation in 2001. Additionally, the well is filled with sediment from its original depth of 600 feet to a depth of 368 feet, indicating possible casing collapse; the well is expected to be reactivated by relining the casing. Once back online, the well is expected to produce 600 to 800 gallons per minute (gpm).

Station 30-01 was rehabilitated in 2001 and 2006. The 2006 effort included the use of the Aqua Freed process. By April 2008, the well has not been returned to service due to issue with the filter media. Once back on line, the well is expected to produce 800 gpm.

Table 8-8
West Coast Basin and Central Basin Well Data

District and Basin	Station	Well Age (years)	Completion Date	Well Depth (feet bgs)	Well Status	Sanding Issues	Water Quality Issues	Well Issues
Hermosa-Redondo West Coast Basin	HR 08-02	38	Feb-71	360	Active / Operational	Minimal	Iron and Manganese Treatment	Rehab in 1991, removed sludge in 2006
	HR 22-01	61	Dec-47	600	Inactive / Non-operational	Yes	Iron and Manganese Treatment	Casing patched during 1950s; fill to 368 ft in 2006; damaged casing with sand infiltration
	HR 30-01	24	May-84	435	Inactive / Operational	No	Iron and Manganese; Organic Odor	Rehab in 2006; not back on line as of September 2007
Dominguez West Coast Basin	DOM 215-01	64	Nov-44	1,054	Active / Operational	Yes	H_2S, Methane, and Color Treatment	Well 298-01 impacts water levels during pumping
	DOM 215-02	63	Sep-45	975	Inactive / Non-Operational	Yes	Occasional High Bacteria Counts	A lot of resources spent on trying to rehabilitate; hole in casing
	DOM 219-02	8	Jan-01	710	Inactive / Operational	Yes	H_2S and Color	Liner installed 2006/2007
	DOM 275-01	18	Feb-91	570	Active / Operational	Yes	Color and H_2S Treatment; total organic carbon (TOC)	None
	DOM 277-01	31	Sep-77	952	Active / Operational	No	Color Treatment	Partial liner in 2000, not straight; settlement issues at surface; lease expires in 2010; no additional renewal options.
	DOM 279-01	29	Feb-80	922	Inactive / Operational	No	H_2S and Color Treatment	Currently off line
	DOM 294-01	15	Feb-94	1,000	Inactive / Operational	Yes	Iron, Manganese, Color, TOC	Treatment for color to be constructed in 2009
	DOM 298-01	9	Jul-99	1,020	Active / Operational	No	Methane and H_2S Treatment	None
Dominguez Central Coast Basin	DOM 272-01	16	Apr-93	580	Active / Operational	No	None	None
	DOM 290-01	18	Jan-91	430	Active / Operational	No	None	Lease expires in 2011; no additional renewal options.
	DOM 297-01	11	Jul-97	770	Active / Operational	No	Color and H_2S Treatment	Declining production; lease expires in 2021 with two 54-month renewal options.

Iron is generally below the maximum contaminant level (MCL) of 300 micrograms per liter (μg/L) at these wells, while manganese is over twice the MCL of 50 μg/L, particularly at Station 8-02. For this reason, the three Hermosa-Redondo District wells have onsite iron and manganese treatment.

The Dominguez District wells range from 8 to 64 years old. Station 215-01 is the oldest of the Rancho Dominguez wells at 64 years. The well continues to produce some sand upon start up and must discharge to waste approximately 20 to 30 minutes each time it resumes pumping and currently pumps at 800 gpm. Station 215-02 is 63 years old; and Cal Water plans to destroy the well.

Station 219-02 is the newest Dominguez District well online. Excessive sand production resulted in rapidly declining pumping water levels and capacity. Station 277-01 is currently operating at 30 percent of past peak production levels. The well is reported to be crooked with settlement of the ground occurring around the well. The lease on the property ends in 2010. Cal Water will not renew the lease and is planning to destroy the well at that time.

Stations 275-01, 279-01, 294-01, and 298-01 have some sanding issues or decreased pumping capacity, but generally do not have any structural issues. Cal Water should continue with regularly scheduled maintenance and rehabilitation programs to maintain production.

A new high-capacity production well was drilled in the Dominguez District at Station 203 (see Figure 2-4), capable of producing 1,100 gpm. Due to water quality issues, the well is not yet online and a treatment system is under design.

Groundwater Quality

Groundwater quality in the vicinity of the Hermosa-Redondo District wells is characterized as calcium/magnesium-chloride water. The Hermosa-Redondo District wells have the highest total dissolved solid (TDS) and chloride concentration of Cal Water's 11 wells in the basin, as shown in Figure 8-5. TDS concentrations in the Hermosa-Redondo District wells have been increasing, with the levels in Stations 8-02 and 22-01 are starting to reach the secondary MCL upper level of 1,000 milligrams per liter (mg/L). Closer towards the coast, groundwater quality is influenced by the ocean and injection wells of the WCBBP, and, as such, TDS within four miles of the coast can vary from 280 mg/L to more than 12,600 mg/L (Reichard, et al., 2003).

Water quality in the West Coast Basin underlying the Dominguez District has different characteristics based on location. For example, Station 219-02, located in the central portion of the district, has calcium-bicarbonate type water, while wells two miles to the east of Station 219-02 have a sodium-bicarbonate character. Five of the eleven Dominguez wells have onsite treatment facilities for hydrogen sulfide (H_2S) and/or methane gases, and five wells have a treatment facility, or one under design, for color.

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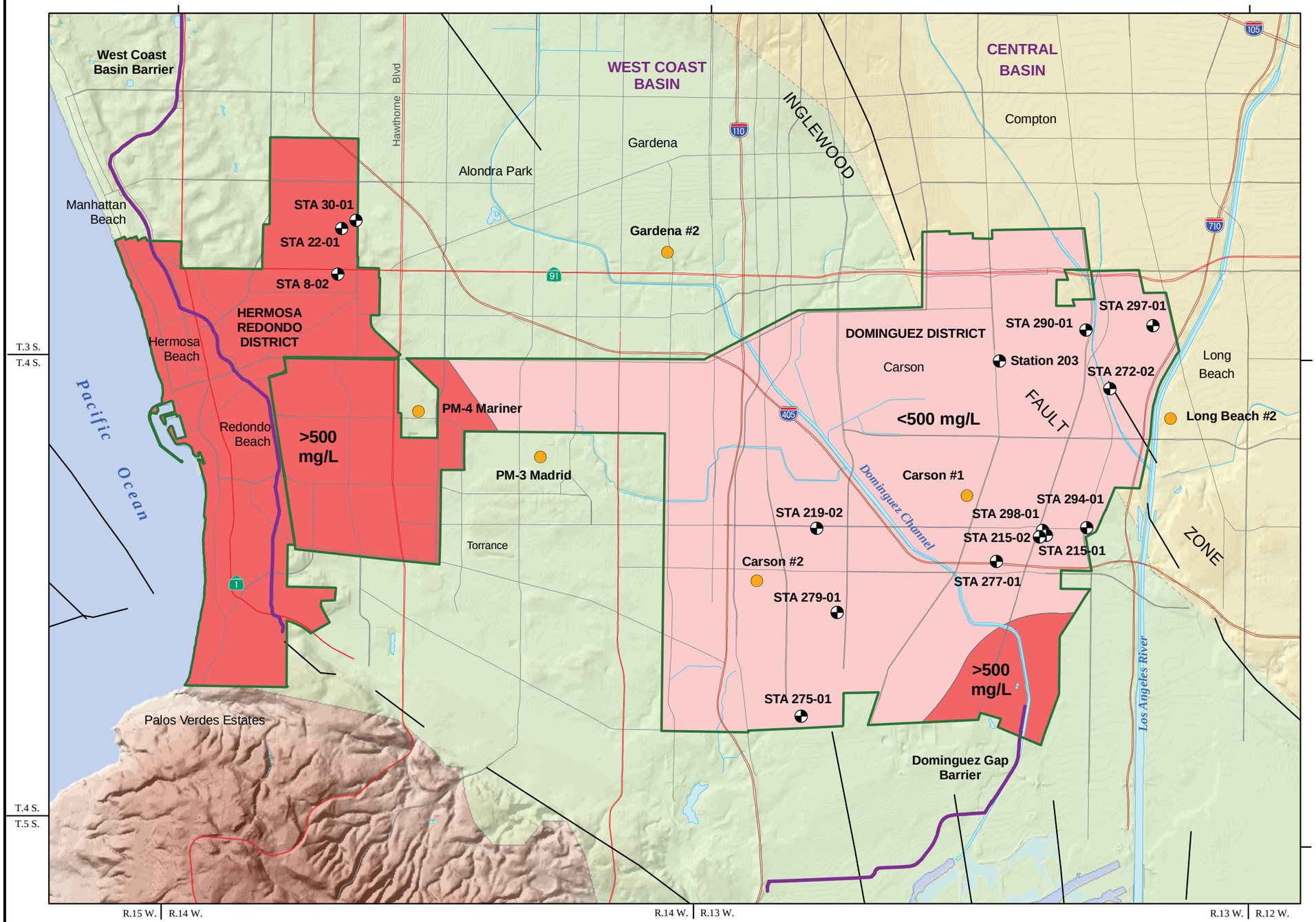

GENERALIZED DISTRIBUTION OF TOTAL DISSOLVED SOLIDS IN THE RANCHO DOMINGUEZ DISTRICT

EXPLANATION

Rancho Dominguez District Boundary

Total Disolved Solids (mg/L)

< 500 mg/L

> 500 mg/L

California Water Service Well

Water Replenishment District Monitoring Well Location

Sea Water Barriers

DWR Ground Water Basins

Central Basin

West Coast Basin

River

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Figure 8-5
Rancho Dominguez District Groundwater TDS Levels

Prepared by: DWB

Map Projection:
UTM Zone 11, NAD27
Central Meridian: -117 degrees

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The Dominguez District wells are characterized as having lower TDS concentrations with depth. This is reflected in the low TDS concentrations (usually less than 500 mg/L) in the production wells which are screened in the Lower aquifer systems. Iron and manganese in the Lower aquifer systems in the eastern portion of Dominguez District are generally below their respective MCLs, as shown in Figure 8-6. Station 219-02, is the only well in this portion of the Dominguez District that has elevated iron and manganese concentrations.

Central Basin

Well Conditions

Cal Water has three wells in the Central Basin that range from 11 to 18 years old, as shown in Table 8-8. Wells are in the west portion of the Central Basin, south of Highway 91.

Station 272-02 was not operated from 2002 to 2006 due to lengthy rehabilitation efforts. Recently, elevated water levels and improved discharge rates may be the result of several nearby wells being removed from service and destroyed. Currently, the well is expected to produce 700 gpm. It is recommended that Cal Water continue with regularly scheduled maintenance and rehabilitation programs for this well to maintain production.

Station 290-01 underwent rehabilitation in 1997 and 2003, which resulted in little improvement in either production rate or specific capacity. Minimal sand production is reported, yet the pump discharges to waste for approximately 15 minutes before being diverted to the system. No wellhead treatment is required at this site.

Station 297-01 was not in production from early 2005 to early 2007. An H_2S treatment facility has been constructed at the site and sand pumping is not an issue with this well.

Water Quality

The Central Basin wells have a range of water quality characteristics where the types of water range from calcium/sodium-bicarbonate to sodium-bicarbonate types. The Upper aquifer system is reported to be a calcium-chloride type water, probably a result of local recharge of the upper aquifer (Reichard, et al., 2003).

TDS in the Lower aquifer system of the Central Basin in the vicinity of the three Cal Water is generally below 500 mg/L, as shown in Figure 8-5. The Upper aquifer system TDS is usually higher than 1,000 mg/L. Iron and manganese concentrations in these three wells and vicinity are generally below their respective MCLs (300 µg/L for iron and 50 µg/L for manganese), with the exception of the Upper aquifer system which has elevated manganese that ranges from 150–350 µg/L, as shown in Figure 8-6. Station 272-01 in the Central Basin appears to have elevated levels of manganese (over five times the MCL of 50 µg/L).

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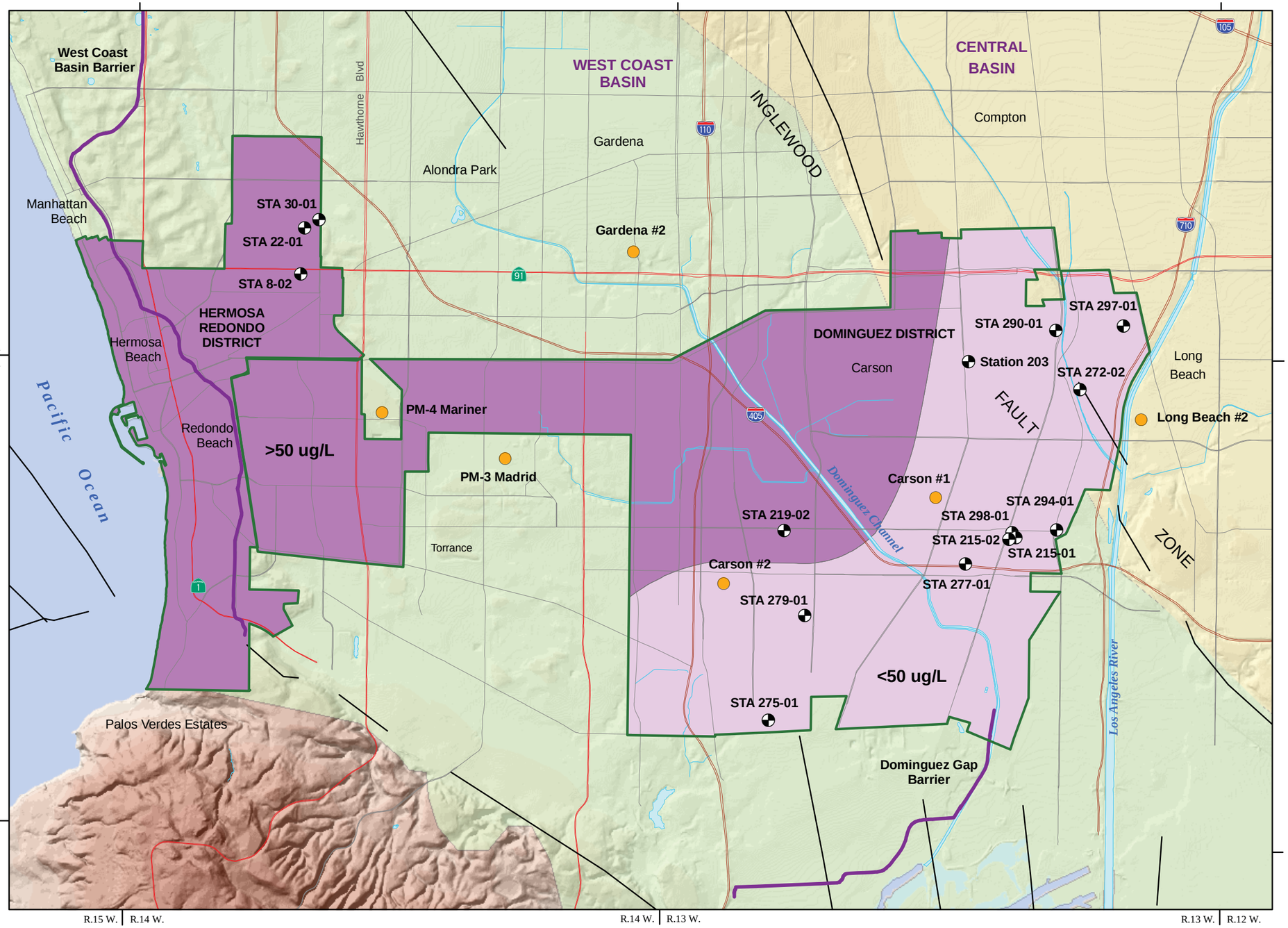

GENERALIZED DISTRIBUTION OF MANGANESE IN THE RANCHO DOMINGUEZ DISTRICT

EXPLANATION

Rancho Dominguez District Boundary

Manganese (mg/L)

< 50 mg/L

> 50 mg/L

California Water Service Well

Water Replenishment District Monitoring Well Location

Sea Water Barriers

DWR Ground Water Basins

Central Basin

West Coast Basin

River

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Figure 8-6
Rancho Dominguez District
Groundwater Manganese Levels

Prepared by: DWB

Map Projection:
UTM Zone 11, NAD27
Central Meridian: -117 degrees

NORTH

0 1 2 Miles

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8.1.3.4 Groundwater Production versus Groundwater Rights

As noted previously, Cal Water has rights to 16,369 AFY in the West Coast Basin and 6,480 AFY in the Central Basin. Table 8-9 summarizes past groundwater production from 1999 to 2006 on a fiscal year basis. In all years, Cal Water has produced less than its rights, and groundwater production has had a decreasing trend over the years. In the West Coast Basin, groundwater production decreased by almost 7,000 AFY and in the Central Basin production decreased about 3,500 AFY over the seven-year period. Figure 8-7 shows the groundwater production over the years relative to the water rights. Aging infrastructure and poor water quality are contributing factors in Cal Water's decrease in groundwater production.

Table 8-9
West Coast Basin and Central Basin Groundwater Production

District	Rights (AFY)	Fiscal Year Production (AF)						
		99-00	00-01	01-02	02-03	03-04	04-05	05-06
West Coast Basin								
Dominguez	10,417	11,638	8,618	6,068	6,891	6,037	4,912	4,992
Hermosa-Redondo	4,070	1,653	2,181	1,300	2,358	2,653	2,454	1,756
Hawthorne[1]	1,882	585	902	465	399	78	539	208
Subtotal	16,369	13,877	11,701	7,833	9,647	8,768	7,906	6,956
Central Basin								
Dominguez	6,480	5,197	4,106	3,027	1,300	1,324	1,474	1,752
Total	22,849	19,074	15,808	10,860	10,948	10,092	9,379	8,708

[1] leased through 2010

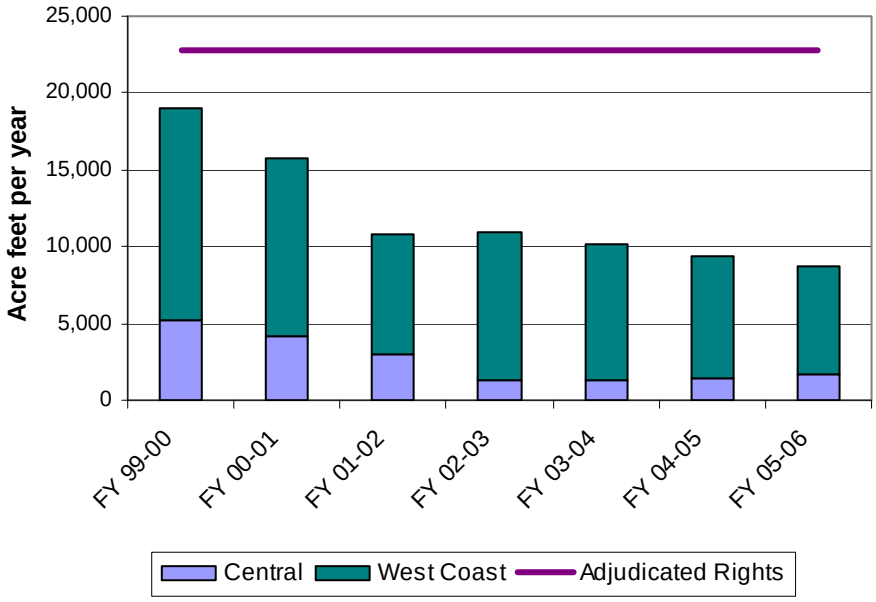


Figure 8-7
Cal Water Groundwater Production 1999-2006

8.1.4 Existing Conservation Program

Cal Water is a signatory of the Memorandum of Understanding (MOU) regarding Urban Water Conservation in California administered by the California Urban Water Conservation Council (CUWCC). As a signatory of the MOU, Cal Water has agreed to implement cost-effective best management practices (BMPs) defined in the MOU and file biennial reports to the CUWCC. Conservation measures implemented in the past or ongoing include:

- BMP 01 – Water Survey Programs for Single-Family Residential and Multi-Family Residential Customers
- BMP 02 – Residential plumbing retrofit
- BMP 06 – High-efficiency washing machine rebate programs
- BMP 07 – Public information programs
- BMP 08 – School education
- BMP 09 - Conservation Programs for Commercial, Industrial, and Institutional Accounts
- BMP 14 – Residential ultra low flow toilet replacement programs

Cal Water conducts annual prescreening system audits to evaluate the level of unaccounted-for water. Based on the results of the prescreening audit, Cal Water would conduct full-scale system audits if the level of unaccounted-for water exceeds 10 percent. Since 2004, unaccounted-for water is estimated to be less than 10 percent of total production.

In addition to conservation programs being implemented by Cal water, the three districts have entered into cost-sharing agreements with WBMWD each year for conservation programs. Funding levels on behalf of Cal Water vary by district. Cal Water's funding for conservation programs also requires approval of the California Public Utilities Commission (PUC). The budget and level of expenditures approved by the PUC for each district cannot be used by a different district within Cal Water.

Based on Cal Water's conservation estimates sent to CUWCC, conservation represents a demand offset of about 9 percent in Hermosa-Redondo District and 3 percent in Palos Verdes District. No reports on conservation estimates are available for the Dominguez District. Cal Water anticipates that a new method to estimate savings will be implemented in the future through additional analysis and closer collaboration with WBMWD.

8.2 Supply and Demand Comparison

In Section 3, a range of service and demand projections were developed for each district at 5-year intervals to 2030, using various assumptions regarding past growth rates in services and water use. The recommended future planning-level demands are based on:

- *10-year average growth rate in services* – Reflects fairly recent trends in services without certain anomalies seen in the 5-year average service growth rates (which included negative growth in multi-family services in Dominguez and Hermosa-Redondo Districts, where denser housing can be expected, and unsustainable growth in industrial services in the Dominguez District).

- *5-year average unit demands* – Reflects most recent water use practices.

The ultimate planning-level demand projection for each district is shown in Table 8-10.

Table 8-10
2030 Planning-Level Demand Projections for the Rancho Dominguez District

District	Average Day Demand (mgd)	Annual Demand (AFY)
Dominguez	51.4	57,590
Hermosa-Redondo	14.5	16,190
Palos Verdes	20.3	22,780
Total	86.2	96,560

8.2.1 Future Groundwater Production from Existing Wells

Based on existing conditions of the wells and past production data, estimates were developed of the probable future life and discharge rates of the existing Cal Water wells. The wells are described in more detail in Appendix E.

Table 8-11 presents the remaining life of the wells, based on an assumed 50-year life expectancy, and the expected and long-term discharge rates for each well. In recent years, Cal Water has been operating all wells at about 50 percent of total production potential.

Table 8-11
Projected Groundwater Production from Existing Wells

District and Basin	Station	Remaining Life (of 50-year life expectancy)	Expected Average Discharge Rate[1] (gpm)	Expected Long-Term Sustainable Discharge Rate[2] (gpm)
Hermosa-Redondo District - West Coast Basin	HR 08-02	12	700	560
	HR 22-01	-11	600	0
	HR 30-01	26	800	800
Dominguez District - West Coast Basin	DOM 215-01	-14	600	0
	DOM 215-02	-13	0	0
	DOM 219-02	42	600	600
	DOM 203-01	50	1,100	900
	DOM 275-01	32	600	600
	DOM 277-01	19	0	0
	DOM 279-01	21	1,000	800
	DOM 294-01	35	1,000	800
	DOM 298-01	41	2,100	1,680
Dominguez District - Central Coast Basin	DOM 272-02	34	700	700
	DOM 290-01	32	700	700
	DOM 297-01	39	400	400

(1) Average discharge rate was obtained by examining the long-term historical capacities.
(2) The long-term sustainable discharge rates were calculated based on the remaining life expectancy of the well. For wells producing 1,000 gpm or more, it was assumed they would reduce production over time (through 2030) to about 80 percent of their maximum production capacity. This reduction was imposed linearly.

Of the 14 Cal Water wells in both basins, four are expected to be taken out of service in the long-term, four are anticipated to produce at lower average discharge rates, and six would maintain average discharge rates over the long-term:

- Three of the wells in the West Coast basin exceed 50 years in age and are assumed not to produce any water over the long-term.
- Four wells in West Coast Basin have average discharge rates of 1,000 gpm or greater. These wells are assumed to reduce production by 20 percent through the planning period due to reduced pump efficiencies over time and general production decreases in the basin.

The wells in the Central Basin are expected to maintain average discharge rates in the future, ranging from 400 to 700 gpm.

8.2.2 Future Demand and Supply Comparison

Key assumptions regarding future supplies include:

- Recycled water supplies are assumed to stay constant at the FY 2005-2006 levels, 3.3 mgd for the Dominguez District and 0.1 mgd for the Hermosa-Redondo District. Potential future recycled water customers and demand are discussed in Section 9 under future supply options.

- Estimates of future groundwater supply were made as described above.
- Groundwater and recycled water are the first supplies applied to meet future demands.
- Imported water is assumed to provide any additional supply necessary to meet demands, under the base case.

Table 8-12 presents the baseline level of supplies needed to meet projected future demands. The data combines the groundwater supply estimates with current recycled and groundwater use, and incorporates the imported supply required to meet projected demands. Figure 8-8 presents these baseline supplies by source. The figure shows the assumed groundwater improvements in the short-term and the groundwater decline due to loss of capacity as presented in Table 8-11.

Table 8-12
Projected 2030 Demands and Baseline Supplies for the Rancho Dominguez District

	2010	*2015*	*2020*	*2025*	*2030*	*2010*	*2015*	*2020*	*2025*	*2030*
	mgd					*AFY*				
Demand	73.1	75.9	79.1	82.5	86.2	81,856	85,063	88,557	92,372	96,547
Supplies										
Groundwater	13.6	11.7	11.4	10.3	10.1	15,197	13,154	12,763	11,588	11,273
Recycled Water	3.4	3.4	3.4	3.4	3.4	3,784	3,784	3,784	3,784	3,784
Imported Water	56.1	60.8	64.3	68.8	72.8	62,874	68,125	72,010	77,000	81,490
Total	73.1	75.9	79.1	82.5	86.2	81,856	85,063	88,557	92,372	96,547

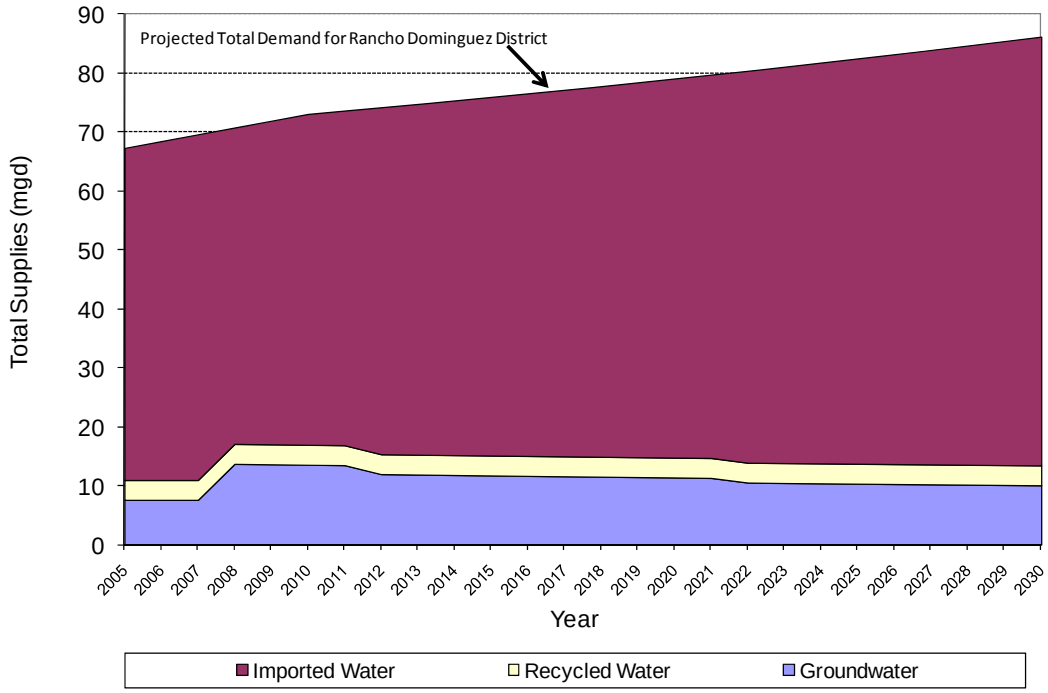


Figure 8-8
Rancho Dominguez District Baseline Supply Projection

Section 9
Water Supply Strategy

This section presents information on the development of future supply options for conservation, recycled water, and groundwater supplies. These options are combined with imported water into six potential supply portfolios to address projected future demands in California Water Service Company's (Cal Water) Rancho Dominguez District. This section presents an evaluation of the supply portfolios and the recommended future supply scenario.

9.1 Approach to Develop Supply Portfolios

The overall approach for the evaluation of future supply scenarios for the Rancho Dominguez Districts involved the following steps:

- Evaluate the water supply needs in 2030 by comparing demand projections from Section 3 with a baseline of supply projected for the existing sources, as described in Section 8.2;
- Define potential future supply options and characterize those options in terms of costs and potential supply;
- Develop a list of criteria for supply portfolio evaluations;
- Combine supply options into supply portfolios;
- Characterize the performance of supply portfolios according to the evaluation criteria;
- Rank the supply portfolios using a multi-criteria score card tool; and
- Recommend the supply portfolio to be used as the basis for the evaluation of Cal Water's Rancho Dominguez District under future conditions.

The following sections describe each one of these steps.

9.2 Future Supply Options

The supply options considered for the development of future supply portfolios and discussed in this section include:

- planned and expanded conservation
- short-term and long-term recycled water
- new groundwater wells, and

- additional imported supply from the Metropolitan Water District of Southern California (MWD).

9.2.1 Conservation Options

This section describes two levels of increased future conservation and potential coordination of conservation efforts with West Basin Municipal Water District (WBMWD).

9.2.1.1 Planned Conservation

Cal Water has developed forecast budgets and water savings for 2008 through 2010 for programmatic best management practices (BMPs) identified by the California Urban Water Conservation Council (CUWCC). The BMPs are:

- BMP 1 – Residential Survey Programs
- BMP 2 – Residential Plumbing Retrofit
- BMP 6 – High Efficiency Washing Machine Rebate Programs
- BMP 9 – Conservation Programs for Commercial, Industrial, and Institutional Accounts
- BMP 14 – Residential Ultra Low Flow Toilet Replacement Program

All of the measures are hardware BMPs except a portion of BMP 9, and will continue to offer conservation savings into the future without further investment by Cal Water. Thus, the true cost of the program in dollars per acre-foot needs to take into account the cumulative savings over time. Appendix F presents the costs of conservation on average, accounting for savings over time and economic benefits, per Cal Water's 2005 Urban Water Management Plan (UWMP). Additionally, there will be programs associated with BMPs 7 and 8, Public Information Programs and School Education Programs, respectively, for each district. These programs do not have measurable conservation savings, but are expected to enhance other conservation measures being implemented while educating individuals on their actions and their relation to water consumption.

Table 9-1 summarizes the planned levels of conservation for each district for 2008 through 2010, in acre-feet (AF). The 2010 level of planned conservation is assumed to stay constant into the future due to BMP measures that will continue to offer water savings. Therefore, in the supply scenarios, the planned conservation supply option continues the 2010 level water savings (249 AF for the entire Rancho Dominguez District) as annual savings for years 2011 through 2030.

Table 9-1 Summary of Planned Conservation Option for the Rancho Dominguez District			
	Water Savings (AF)		
District	2008	2009	2010
Dominguez	22	48	79
Hermosa-Redondo	14	32	56
Palos Verdes	10	21	40
Total	46	100	175

Funding levels and expected forecast water savings are discussed for each district below.

Dominguez District

Table 9-2 illustrates funding and incremental and cumulative water conservation, on an annual basis, for 2008 through 2010 for the Dominguez District. In 2008, 2009, and 2010, the Dominguez District's projected budget for conservation programs with measurable savings ranges from $62,000 to $77,000 per year, with a total water savings by 2010 of about 80 AF per year (AFY). The majority of BMPs implemented will continue to offer conservation savings into the future without further investments by the Dominguez District.

Table 9-2 Dominguez District Projected Annual Conservation Savings						
	BMP 1	BMP 2	BMP 6	BMP 9	BMP 14	Total
2008						
Budget	$5,000	$10,000	$10,000	$30,000	$17,000	$72,000
Incremental Water Savings (AF)	1.4	1.5	1.5	6.9	11.1	22.4
2009						
Budget	$10,000	$12,000	$5,000	$30,000	$5,000	$62,000
Incremental Water Savings (AF)	2.8	5.0	0.8	13.0	3.7	25.3
Cumulative Water Savings (AF)	4.2	6.5	2.3	19.9	14.8	47.7
2010						
Budget	$15,000	$12,000	$5,000	$35,000	$10,000	$77,000
Incremental Water Savings (AF)	4.2	5	0.8	14.3	7.4	31.7
Cumulative Water Savings (AF)	8.4	11.5	3.1	34.2	22.2	79.4

Hermosa-Redondo District

Table 9-3 displays projected funding and incremental and cumulative water conservation, on an annual basis, for 2008-2010 for the Hermosa-Redondo District. The district's planned conservation efforts will result in a savings of about 56 AFY by 2010. The majority of BMPs implemented will continue to offer conservation savings into the future without further investments by the Hermosa-Redondo District.

Table 9-3 Hermosa-Redondo District Projected Annual Conservation Savings						
	BMP 1	BMP 2	BMP 6	BMP 9	BMP 14	Total
2008						
Budget	$5,000	$10,000	$15,000	$20,000	$5,000	$55,000
Incremental Water Savings (AF)	1.4	1.5	2.3	5.2	3.2	13.6
2009						
Budget	$10,000	$12,000	$10,000	$10,000	$2,500	$44,500
Incremental Water Savings (AF)	2.8	5.9	1.5	5.9	1.8	17.9
Cumulative Water Savings (AF)	4.2	7.4	3.8	11.1	5.0	31.5
2010						
Budget	$15,000	$12,000	$10,000	$15,000	$7,500	$59,500
Incremental Water Savings (AF)	4.2	5.9	1.5	7.1	5.4	24.1
Cumulative Water Savings (AF)	8.4	13.3	5.3	18.2	10.4	55.6

Palos Verdes District

Table 9-4 illustrates projected funding and water conservation, on an annual basis, for 2008-2010 for the Palos Verdes District. The district's planned conservation efforts will result in a total savings of about 40 AFY by 2010. The majority of BMPs implemented will continue to offer conservation savings into the future without further investments by the Palos Verdes District.

Table 9-4 Palos Verdes District Projected Annual Conservation Savings						
	BMP 1	BMP 2	BMP 6	BMP 9	BMP 14	Total
2008						
Budget	$5,000	$5,500	$20,000	$10,000	$2,500	$43,000
Incremental Water Savings (AF)	1.4	0.8	3.0	2.6	1.8	9.6
2009						
Budget	$10,000	$7,500	$10,000	$5,000	$2,500	$35,000
Incremental Water Savings (AF)	2.8	3.6	1.5	1.9	1.8	11.6
Cumulative Water Savings (AF)	4.2	4.4	4.5	4.5	3.6	21.2
2010						
Budget	$15,000	$7,500	$10,000	$10,000	$7,500	$50,000
Incremental Water Savings (AF)	4.2	3.6	1.5	3.8	5.4	18.5
Cumulative Water Savings (AF)	8.4	8.0	6.0	8.3	9.0	39.7

9.2.1.2 Expanded Conservation

This master plan also considers a potential expanded level of conservation, beyond the measures discussed above under Section 9.2.1.1, Planned Conservation, based on an objective of reaching a level of 10 percent conservation by 2030. To achieve this level of demand reduction, additional conservation measures would be implemented over time, starting in 2008. For example, in 2008, the goal for "expanded conservation" levels would be would be 0.4 percent of demand, increasing to 1.3 percent in 2010 and 5.7 percent in 2020, to the maximum of 10 percent of demand in 2030. These additional conservation measures have not been identified at this time.

For the supply scenarios, this "expanded conservation" option would provide conservation savings that make up the difference between the supply provided by planned conservation (see Table 9-1) and the applicable yearly conservation goal for "expanded conservation" (ranging from 0.4 percent of demand in 2008 to the maximum of 10 percent of demand in 2030). These expanded conservation supplies are summarized in Table 9-5.

Table 9-5
Summary of Expanded Conservation Option in the Rancho Dominguez District

District	Annual Supply (AF)					
	2008	2010	2015	2020	2025	2030
Dominguez	165	508	1,580	2,785	4,143	5,678
Hermosa-Redondo	51	142	479	828	1,190	1,564
Palos Verdes	80	234	719	1,209	1,709	2,222
Total	296	883	2,779	4,822	7,042	9,464

Since the commencement of the master planning process, Cal Water has identified the goal of a 20 percent reduction in per capita consumption by 2020. Additional conservation measures are planned over time in order to achieve a 20 percent reduction in per capita demand by 2020. These additional conservation measures have not been identified at this time.

In 2009, Cal Water hired a consultant to update the cost-effectiveness analysis for the Rancho Dominguez Districts for each of the quantifiable BMPs identified in the CUWCC memorandum of understanding; determine reasonable coverage requirements for cost-effective BMPs; identify least-cost schedule of implementation of BMPs, designed to meet the Cal Water conservation goal of a 1.5 percent annual reduction in per capita demand and a total per capita reduction of 20 percent by 2020; and develop a three-year budget to implement the programs identified in the analysis. The results of this analysis will be available in the summer of 2009.

9.2.1.3 Coordination with West Basin Municipal Water District

Cal Water plans to coordinate and align its conservation efforts with WBMWD, which has developed an aggressive water conservation program through its Conservation Master Plan developed in 2006. As part of this plan, a five-year implementation program for water conservation measures was developed to meet conservation goals identified in WBMWD's 2005 UWMP. WBMWD's Conservation Master Plan calls for conservation savings in its service area to increase from 7 percent in 2005 (a savings of approximately 14,500 AFY), to 16 percent in 2030 (a savings of approximately 42,800 AFY).

The recommended five-year program mix in which Cal Water could participate to meet the identified WBMWD water conservation goals includes:

Residential

- Targeted high-efficiency toilet distributions

- Smart controller distributions
- Residential ultra low flush toilets/high efficiency clothes washer rebates
- High-efficiency toilet rebates
- Residential and professional landscape workshops

Commercial

- Save-a-buck incentives
- Complete restroom retrofits
- Pre-rinse spray valve installs
- Comprehensive laundromat program
- Conductivity controllers incentive
- Industrial process improvement
- Comprehensive supermarket retrofit program

Outdoor

- Irrigation equipment/water budget

These program could be implemented as part of the expanded conservation measures described in Section 9.2.1.2.

9.2.2 Recycled Water Options

WBMWD, which currently supplies all recycled water used in the Rancho Dominguez District, is continuing to expand its system to serve potential needs throughout its service area. Based on WBMWD's 2005 UWMP, the total recycled water supply provided by WBMWD in its service area is projected to increase 46 percent from about 47,400 AFY in 2010 to about 69,300 AFY in 2030. Industrial and irrigation demands in the WBMWD service area are expected to double driving the projected increase.

WBMWD's Harbor/South Bay Recycling Project is a partnership with the U.S. Army Corps of Engineers to construct over 60 miles of recycled water distribution pipelines throughout the Harbor and South Bay areas. In 2008, WBMWD completed an upgrade to the West Basin Water Reclamation Facility to increase output capacity to 50 million gallons per day (mgd) to serve the Harbor/South Bay Recycling Project. As part of this project, the Palos Verdes Extension lateral is expected to be completed in the next five years providing recycled water to multiple potential large irrigation users in Cal Water's Palos Verdes District.

Two options for future recycled water service from WBMWD in the Rancho Dominguez District have been developed – short-term recycled water and long-term recycled water. These potential supplies are summarized in Table 9-6 for each of the districts and described in more detail below.

Table 9-6
Summary of Recycled Water Options in the Rancho Dominguez District

District	Projected Annual Supply (AF)	
	Short-Term Recycled Water Option	Long-Term Recycled Water Option
Dominguez	60	2,240
Hermosa-Redondo	70	0
Palos Verdes	683	347
Total	813	2,587

Recycled water supply use is expected to increase in the future in the three Cal Water Districts, particularly as service is extended to the Palos Verdes District, which is currently not served with recycled water. The recycled water projections shown in Table 9-6 were based on reasonable assumptions of future recycled water use in coordination with WBMWD, and using the location of the top Cal Water water users in each of the three districts in relation to the current location of WBMWD's recycled water pipelines. These projections were derived after meetings with WBMWD. Further coordination with WBMWD could result in some adjustments to the estimates presented here but are not likely to significantly impact the districts' hydraulic systems.

9.2.2.1 Dominguez District

WBMWD projects an increase in recycled water supply use for the Dominguez District in the short- and long-term. As shown in Table 9-6, in the short-term, one to two years, recycled water use is projected to increase by an additional 60 AFY over existing use. In the long-term, beyond two years, recycled water use is projected to increase by an additional 2,240 AFY.

Figure 9-1 presents 15 of the Dominguez District's top 20 water users in 2006 and their location in relationship to existing WBMWD recycled water pipelines. Using this data, potential recycled water use in the district was calculated at an average of 6 mgd, or 6,700 AFY. Supplying recycled water to all of these users would require the extension of existing pipelines, including an extension of the system to the east of the Alameda corridor that may be technically challenging. This "upper bound" estimate is therefore not included as a scenario.

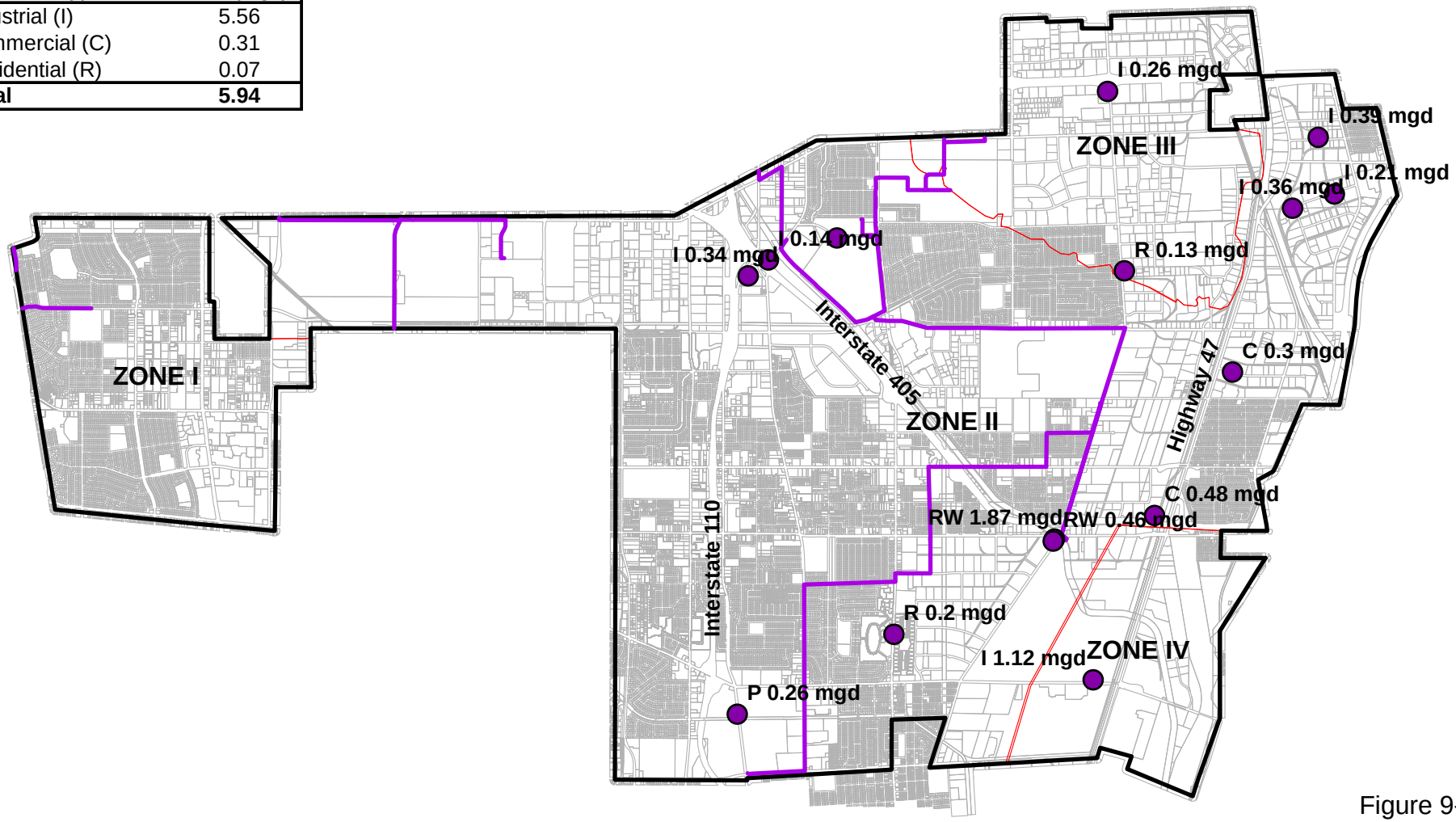
Additionally, none of the estimates of recycled water use presented here account for a potential significant increase in recycled water use by British Petroleum (BP). This potential increase in BP's recycled water use is not likely to change the facilities needed to supply potable water to the same location due to the desire of BP to count

Public Version

Legend

- WBMWD Recycled Water Pipelines
- Largest Users: customer type and average day demand (mgd)
- Dominguez District Service Area
- Pressure Zone

Potential Recycled Water Use	
Land Use Type	*Flow (mgd)*
Industrial (I)	5.56
Commercial (C)	0.31
Residential (R)	0.07
Total	**5.94**



CDM

Figure 9-1
Dominguez District
2006 Top 20 Customers

on backup capacity and the ability of Cal Water to supply that water with existing facilities.

9.2.2.2 Hermosa-Redondo District

In the short-term, WBMWD has projected that recycled water demand in the Hermosa-Redondo District will increase by approximately 60 to 70 AFY, as shown in Table 9-6. This increase is attributed to demand from the Redondo Unified School District. There are no additional prospective users identified for the long-term.

Figure 9-2 presents the top 20 water users in the Hermosa-Redondo District in 2006 and their location in relationship to existing WBMWD recycled water pipelines. Potential recycled water use in district was calculated at approximately 0.28 mgd, or about 290 AFY.

Similar to the Dominguez District, pipeline extensions would be required to serve all the identified potential users, but some of the current top users may be able to be hooked up to the recycled system with minor investments. Further coordination between Cal Water and WBMWD could result in additional recycled water use being possible in the mid-term. Additional customers have not been identified for the long-term.

9.2.2.3 Palos Verdes District

Currently, the Palos Verdes District is not served with recycled water. Completion of the Palos Verdes lateral by WBMWD will allow existing large water users to switch to recycled water. WBMWD has identified four potential short-term users: Los Angeles County Landfill (150 AFY), Green Hills Memorial Park (230 AFY), Rolling Hills Country Club (100 AFY), and Palos Verdes Golf Course (200 AFY).

As shown in Table 9-6, total projected short-term (2010-2011) recycled water is expected to be about 680 AFY. In the long-term, there is potential to serve the southern end of the peninsula with an extension of the system on the east side.

Figure 9-3 shows top water users in the Palos Verdes District that could potentially use recycled water. If this scenario were to occur, recycled water use could increase by about 350 AFY.

9.2.3 Groundwater Options

For the development of water supply portfolios, low and high groundwater production options were developed for the Rancho Dominguez District:

- At the low end, Cal Water would construct no new wells, except for Station 203-01 which has been constructed but is not yet online. Cal Water would rehabilitate existing wells with a life expectancy longer than the planning period and operate the wells at or up to 85 percent of the time. During the remaining 15 percent of the time, the wells would not be operated for periodic resting, routine maintenance and inspection, and occasional extended servicing.

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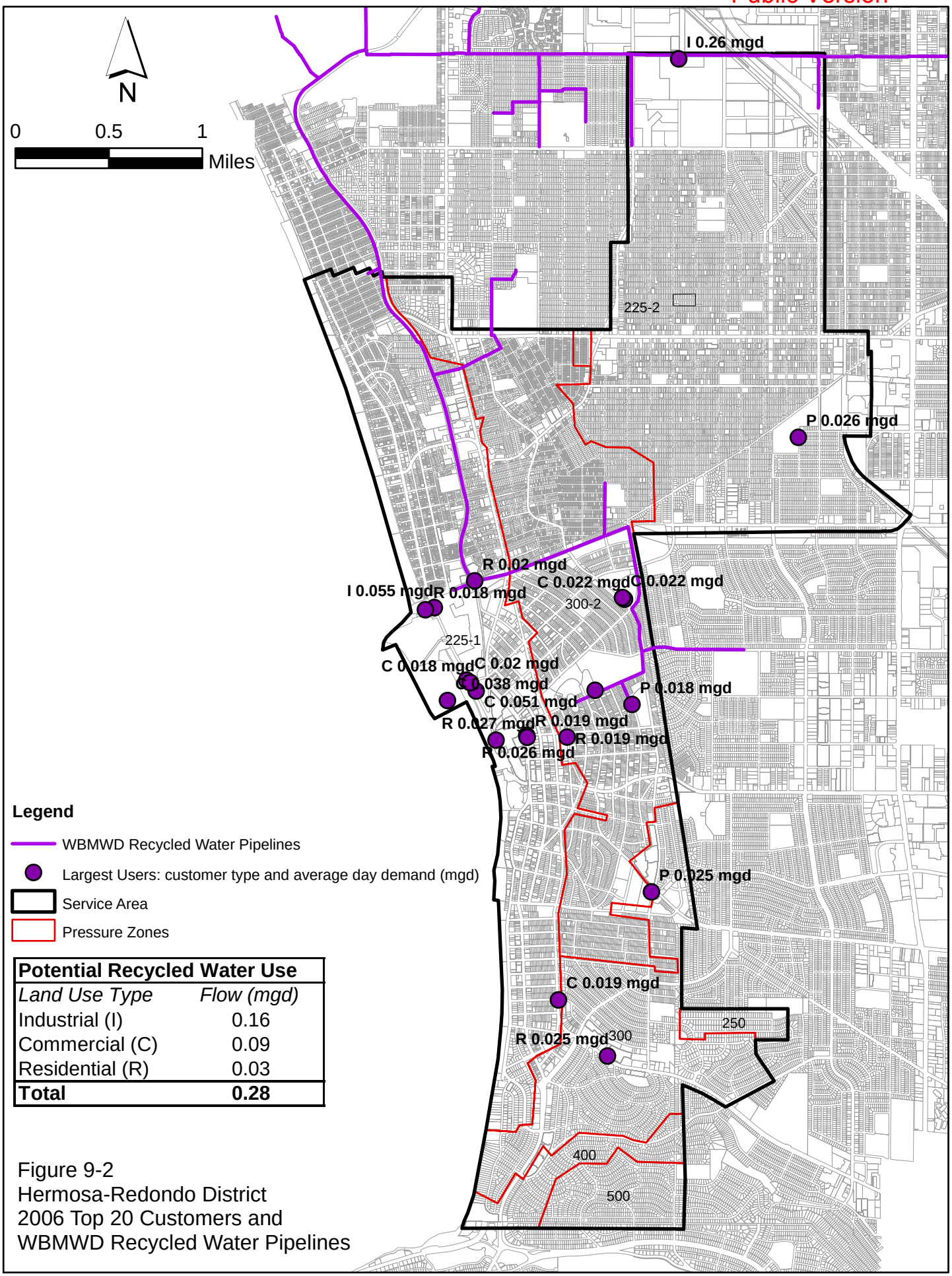


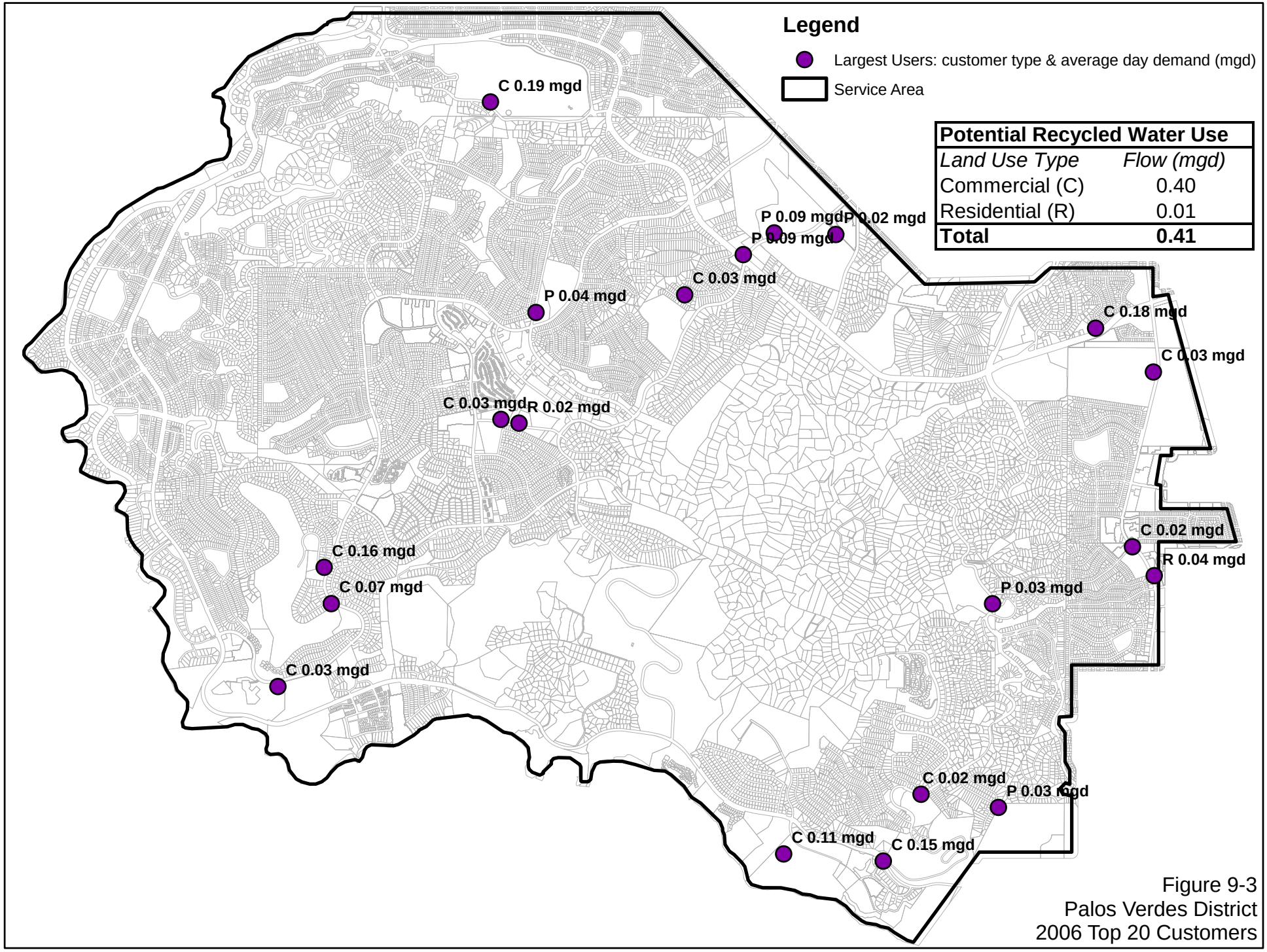
Legend

- WBMWD Recycled Water Pipelines
- Largest Users: customer type and average day demand (mgd)
- Service Area
- Pressure Zones

Potential Recycled Water Use	
Land Use Type	*Flow (mgd)*
Industrial (I)	0.16
Commercial (C)	0.09
Residential (R)	0.03
Total	**0.28**

Figure 9-2
Hermosa-Redondo District
2006 Top 20 Customers and
WBMWD Recycled Water Pipelines

Public Version



Potential Recycled Water Use	
Land Use Type	*Flow (mgd)*
Commercial (C)	0.40
Residential (R)	0.01
Total	**0.41**

Figure 9-3
Palos Verdes District
2006 Top 20 Customers

- At the high end, Cal Water would install a sufficient number of new wells to maximize groundwater production up to their total groundwater rights in the West Coast and Central Basins.

The following sections further detail these scenarios and estimate future groundwater production over a 20-year planning period. These scenarios will be integrated with conservation, recycled water, and imported water supplies to evaluate the complete Rancho Dominguez District water supply portfolio to meet future needs.

9.2.3.1 No New Wells (Except Station 203-01)

Under this scenario, Cal Water would rehabilitate existing wells to increase pumping capacity and maintain online production time to deliver up to 85 percent of maximum well production capacity. As discussed in Section 8.1.3, Cal Water currently operates wells at about 50 percent of production capacity.

Figures 9-4 and 9-5 compare future groundwater production in the West Coast and Central Basins under this scenario relative to Cal Water's groundwater rights in each basin. The figures assume that Cal Water could bring its production to 85 percent of maximum capacity per well immediately. In total, Cal Water would produce 11,273 AFY of groundwater in 2030 under this scenario, or about 9,700 AFY less than combined long term water rights.

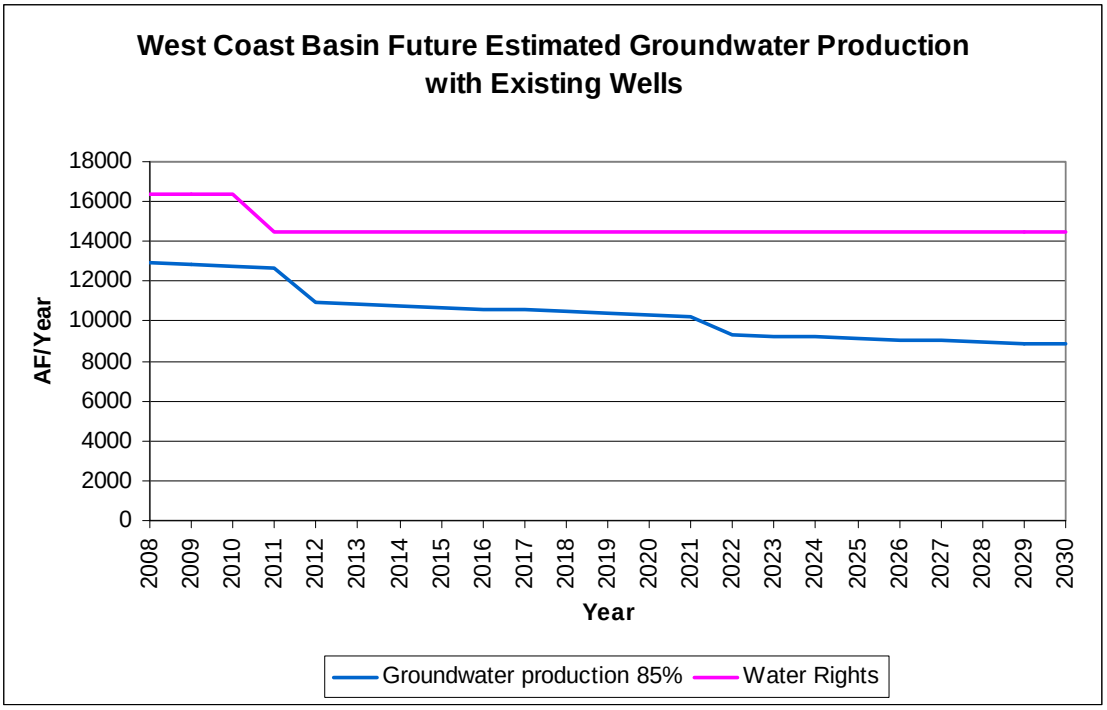


Figure 9-4
Projected West Coast Basin Production

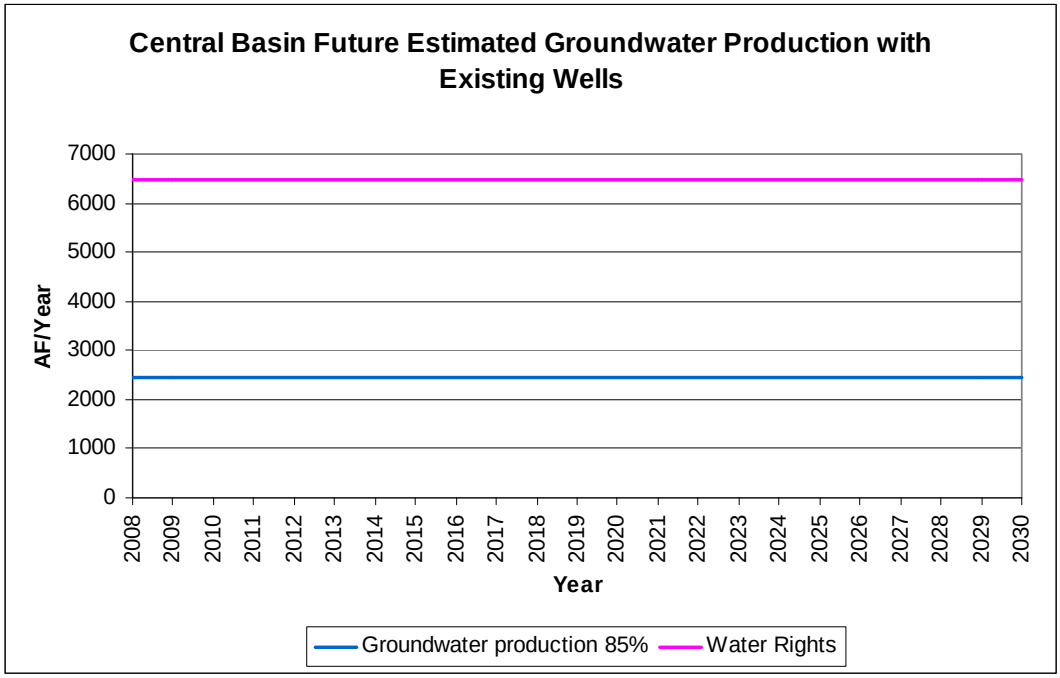


Figure 9-5
Projected Central Basin Production

In the West Coast Basin, the consistent decrease in production represents the assumed decline in discharge rates of the larger wells. The steeper drops in production occur when a well would be expected to go off-line because it exceeds the 50-year life expectancy. In 2030, expected groundwater production in the West Coast Basin under this scenario would be 8,825 AF, which would be 5,662 AFY less than the long-term groundwater rights.

As shown in Figure 9-5, groundwater production in the Central Basin is expected to remain constant through the planning period. Cal Water would operate the three wells in this basin at 85 percent capacity, which would produce 2,448 AFY, 4,032 AF less than the Central Basin groundwater right.

Both the West Coast and Central Basin Judgments have provisions for short-term exchanges (short-term year-by-year agreements) and short-term or long-term leases (long-term arrangements) and sales of water rights. In theory, if Cal Water were to continue to significantly underproduce its water rights in both basins for the foreseeable future and rely more heavily on imported and recycled water to meet its demands, it will have water rights that could be exchanged or leased or sold. Any arrangements for leases or sales are negotiated between individual parties, and recorded with the Watermaster.

If Cal Water were to elect to not substantially increase its future investment in new wells, it could seek out parties for continued or new longer-term leases, to the extent

possible. There is potentially a greater market for leases in the Central Basin compared to the West Coast Basin. In the West Coast Basin, there are generally fewer opportunities for leasing, due in part to water quality limitations, overall lowered production for a number of producers, and a significant shift towards greater recycled water use by the refineries.

9.2.3.2 Add Wells to Maximize Water Rights

This scenario represents the upper limit of groundwater production, where Cal Water would produce at the maximum groundwater rights per year. Implementation of this scenario would require a significant number of new wells and rehabilitation of existing wells. This scenario assumes Cal Water would operate new and existing wells at up to 85 percent of maximum capacity on an annual basis.

Table 9-7 summarizes groundwater production assumptions in 2030 under this scenario. As noted previously, if Cal Water operates existing wells at 85 percent of estimated long-term production capacity, it could produce about 11,300 AFY, which leaves approximately 9,700 AF of the total ground water right (West Coast and Central Basins combined) unused. To produce the maximum groundwater rights, Cal Water would need to install 5 new wells operating at 1,500 gallons per minute (gpm) or 7 new wells operating at 1,000 gpm at 85 percent capacity. Three to four of the new wells would be in the West Coast Basin and 2 to 3 new wells in the Central Basin.

Table 9-7
New Wells Needed to Maximize Groundwater Rights in 2030

Basin	Expected Groundwater production in 2030[1] (AFY)	Additional Annual Production Rate to Maximize Groundwater Rights (AFY)	Additional Annual Production Rate to Maximize Groundwater Rights (gpm)	Additional well capacity needed to maximize groundwater right[2] (gpm)	Number of new 1,000-gpm wells needed[3]	Number of new 1,500-gpm wells needed[3]
West Coast	8,825	5,660	3,500	4,100	4	3
Central	2,448	4,030	2,500	2,900	3	2
Total	11,273	9,690	6,000	7,000	7	5

(1) assumes existing wells would operate at 85 percent maximum production potential
(2) assumes new wells operate at 85 percent maximum production potential
(3) number of new wells needed to produce up to the total groundwater rights

There are currently no significant identified issues relative to long-term trends and management activities in the West Coast or Central Basin that would limit the ability of Cal Water to produce up to its full rights in the basins from a quantity point of view, based on knowledge of conditions and discussions with staff at the Water Replenishment District of Southern California (WRD). The only potential concerns include:

- **Water Quality –** As has been evident from Cal Water's experience with existing wells and general water quality conditions, particularly in the West Coast Basin, the quality of water produced from the basin can potentially require treatment to meet drinking water standards, including contaminants such as total dissolved solids (TDS), manganese or iron, hydrogen sulfide and methane. The prioritized

mapping for well locations discussed below provides some general guidance for new well siting to reduce the potential for the need for treatment at new wells sites.

- **Replenishment Costs –** Water is purchased by WRD to supplement natural runoff in order to maintain basin water levels. This includes purchasing treated imported water and highly treated recycled water for injection at the barriers in the West Coast Basin, and purchasing untreated imported water and advanced but less highly treated recycled water for surface spreading in the Montebello Forebay. Historically, WRD has spread the costs of all sources of replenishment water uniformly across all production in its entire district that encompasses both basins, and has set a single replenishment assessment rate for WRD. In recent years, some Central Basin producers have advocated restructuring of the replenishment charges that would shift a much greater cost burden on the producers in the West Coast basin since the source water purchased for replenishment at the barriers is substantially more expensive. This may not occur, but if the allocation were to shift in the future, it would have a substantial cost implication for this supply scenario since the majority of Cal Water's rights are in the West Coast Basin.

Given there are no limitations to groundwater production, Cal Water would need to install 3 to 4 new wells in the West Coast Basin and 2 to 3 new wells in the Central Basin to maximize groundwater rights. The location of these new wells is important to reduce operation costs and maintain maximum groundwater production in the future. Water quality and distance from existing pipelines are factors that must be considered in selecting well locations. It is preferable to select well sites that have lower TDS levels (i.e., less than 500 milligrams per liter) and lower manganese concentrations (i.e., less than 50 microgramps per liter). Sites that are at least a mile away from the West Coast Basin Barrier Project are preferred, in order to minimize interference with operation of the barrier.

Another issue for Cal Water to consider when selecting new well sites is distance from existing distribution system pipelines. A review of Cal Water's existing well distance from pipelines revealed that most wells are within 250 feet of a transmission pipeline. To keep construction costs down, well sites closer to water pipelines are more favorable than well sites further away.

As part of a past study, Cal Water identified potential well sites within and outside of their property area. Figure 9-6 shows the potential well sites, which are mainly in the Central Basin. In addition to the new sites, Stations 203-01 and 215 likely have the space needed for construction of a new well. Station 215 has space for a new well to replace Station 215-01, but will probably require a temporary easement north of Lot 12, on which Station 215-01 is located, to provide for the space needed by a drilling contractor. The feasibility of constructing an additional well site on Station 203-01 (which has a recently completed well) would be contingent on aquifer parameter and yield results of the first well, and potential interference impacts should two wells be operated in close proximity to one another.

The existing potential well sites were prioritized based on meeting the above water quality and distance criteria. An additional three to four wells sites would need to be identified in the West Coast Basin. Figure 9-6 shows the results on the existing site prioritization and general area recommendations for other well sites. Appendix E further explains the well site selection and recommendation process.

Existing well sites that resulted in higher prioritization based on water quality and distance include:

- Well ID 1 – Walton Middle School
- Well ID 3 – David Starr Jordan High School – Freshman Academy
- Well ID 7 – Canima Logistics Inc
- Well ID 8 – Chase Industries
- Well ID 10 – General Area
- Well ID 215-01 – Replacement well at Station 215-01
- Well ID 203-01 – Additional well at Station 203-01

9.2.4 Imported Water Considerations

Additional imported water is one option used for the development of future water supply portfolios. As described below, the availability of imported supplies is based on normal conditions. This level of supply is used as the base case for imported supplies. However, the reliability of imported water is affected by several factors, including population growth, rainfall timing, location, anticipated environmental flow rulings, and potential impacts on supply and demand due to climate change. The influence these factors will have on the availability of imported water supplies is uncertain as explained below.

MWD provides imported water to customers in southern California from two primary sources; the Sacramento-San Joaquin Delta (Delta) in northern California and the Colorado River. Projections of the reliability of supplies from northern California, managed by the State Water Project (SWP), were completed by the California Department of Water Resources (DWR) by developing and implementing the CALSIM II model for a variety of potential future water supply and demand scenarios. The results of this work are summarized in the 2007 SWP Delivery Reliability Report (DWR, 2007). MWD also provides water from the Colorado River to customers in southern California. The reliability of this supply is threatened by many of the same factors as the SWP; however, projections of reliability have not yet been estimated.

During periods of drought in future years, lower rainfall in the Sacramento River and San Joaquin River watersheds could result in runoff that is less than the total demand

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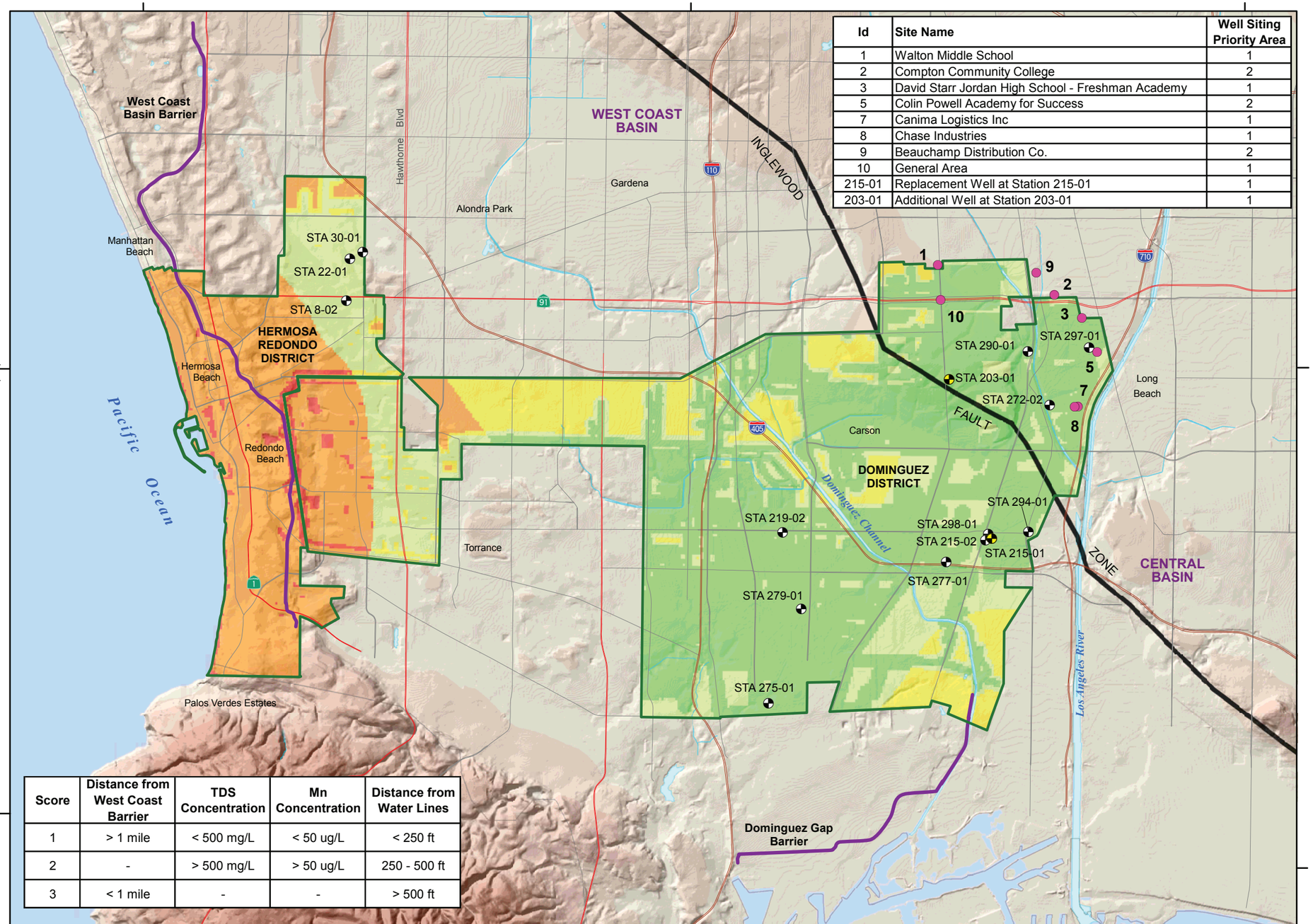
WELL SITING PRIORITY AREAS



Id	Site Name	Well Siting Priority Area
1	Walton Middle School	1
2	Compton Community College	2
3	David Starr Jordan High School - Freshman Academy	1
5	Colin Powell Academy for Success	2
7	Canima Logistics Inc	1
8	Chase Industries	1
9	Beauchamp Distribution Co.	2
10	General Area	1
215-01	Replacement Well at Station 215-01	1
203-01	Additional Well at Station 203-01	1

Score	Distance from West Coast Barrier	TDS Concentration	Mn Concentration	Distance from Water Lines
1	> 1 mile	< 500 mg/L	< 50 ug/L	< 250 ft
2	-	> 500 mg/L	> 50 ug/L	250 - 500 ft
3	< 1 mile	-	-	> 500 ft

EXPLANATION

Rancho Dominguez District Boundary

Well Siting Priority

- 1 - Highest
- 2
- 3
- 4
- 5 - Lowest

Sites Previously Investigated by CWS for Possible Acquisition

California Water Service Well

Potential New Well Site on CWS Property

Water Replenishment District Monitoring Well Location

Sea Water Barriers

River

NORTH

0 1 2 Miles

Prepared by: DWB

Map Projection:
UTM Zone 11, NAD27
Central Meridian: -117 degrees

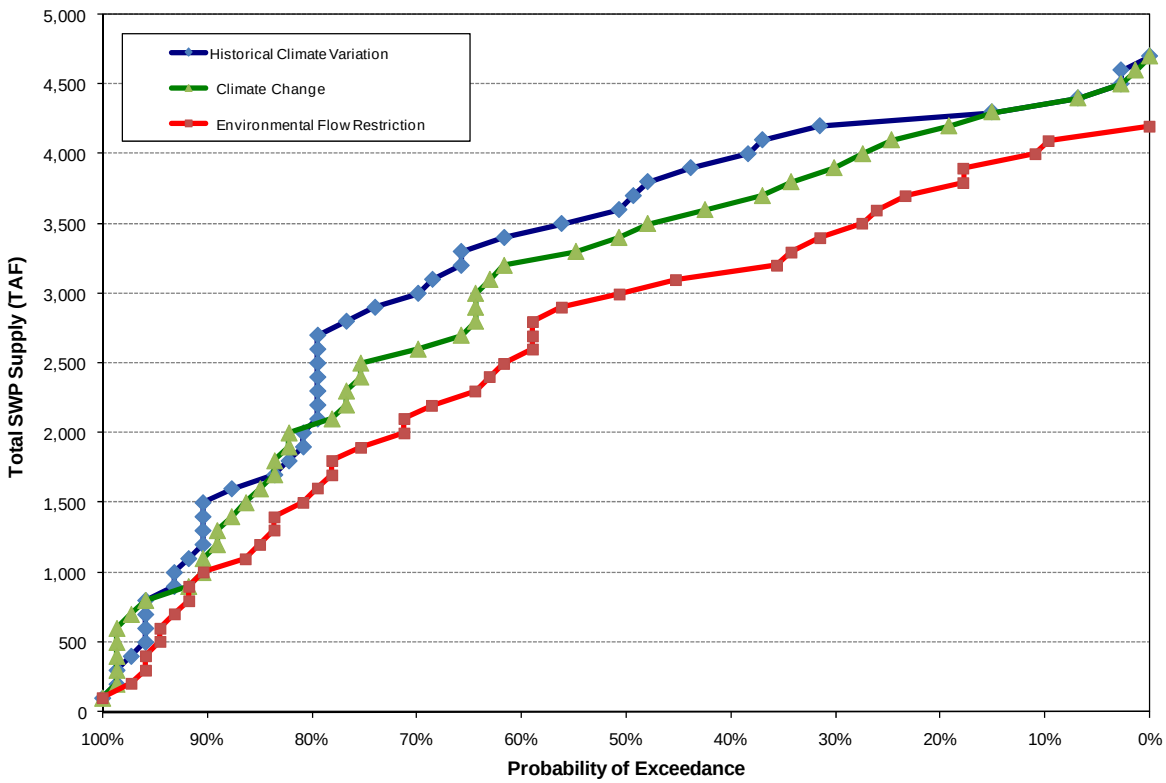
GEOSCIENCE

GEOSCIENCE Support Services, Inc.
P.O. Box 220, Claremont, CA 91711
Tel: (909) 920-0707 Fax: (909) 920-0403
www.gssiwater.com

Figure 9-6
Priority Future Well Locations

GIS_proj/CDM_CWS_2-08/0_cdw-cws_Fig_22_well_siting_areas_2-08.mxd

for water, which includes a variety of uses from municipal supply to agricultural irrigation to sustaining beneficial uses in the Delta. During these periods, water from large surface storage reservoirs and/or groundwater banking projects can be used to provide supplies; however, these sources may not be sufficient to meet demand. To estimate the role of spatial and temporal variation in precipitation, DWR evaluates long-term historical climatic data to determine the range of hydrologic conditions that could be seen in future years. These values are used as input data to the CALSIM II model. Projections of the total SWP supply availability given historical climatic variations are shown in Figure 9-7.



Source: SWP Delivery Reliability Report, 2007

Figure 9-7
SWP Supply Reliability from Select CALSIM II Scenarios

The United Nations Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report on Climate Change shows that the earth's temperature is increasing and predicts that changes in the earth's climate will continue through the 21st century and that the rate of change may increase significantly in the future because of human activity (IPCC, 2007). The effects of global climate change upon California's water resources could result in reduced snowpack, altered timing, location, intensity, and amount of precipitation, changes to the intensity and timing of surface runoff, and changes to urban and agricultural water demands (DWR, 2006).

Projected changes to hydrologic conditions based on several different global climate models were incorporated into the CALSIM II input data to assess the impact of climate change upon imported water supply reliability. This revised SWP reliability is represented in Figure 9-7 as "climate change".

The availability of imported water from the SWP may also be impacted by flow requirements in the Old and Middle Rivers to protect delta smelt and other pelagic organisms. A recent court ruling found the 2005 US fish and Wildlife Services' biological opinion (BO) of the proposed SWP operating and criteria plan for protection of pelagic organisms to be inconsistent with the Federal Endangered Species Act and required the BO be rewritten. In the interim, minimum flow requirements were set for the Old and Middle Rivers. These flow requirements limit the amount of water that can be pumped into the SWP system. CALSIM II scenarios were developed to represent two potential Old and Middle River flow requirements based on the interim ruling. The reduction in imported water supply reliability due to the more restrictive flow target is shown in Figure 9-7 as the "environmental flow restriction."

These potential and likely restrictions on imported water supply were taken into account in the analysis of the supply portfolios, as discussed below in Section 9.3.

9.3 Water Supply Portfolios and Evaluation Criteria

9.3.1 Summary of Portfolios

Water supply portfolios were developed by combining future supply options and different levels of implementation for those supply options, and then adding those future options to the projected baseline described in Section 8.2.2. The supply options and level of implementation used as building blocks for the supply portfolios were:

- Planned Conservation expected by 2010
- Expanded Conservation levels
- Recycled water expected in the short-term
- Potential recycled water in the long-term, maximizing its use to most of the current top water users
- Additional wells to maximize groundwater rights
- Additional imported supply

Portfolios were developed around the strategies of local water supply and groundwater use, at different levels of implementation. Six portfolios were developed all of which include imported water as the source that is used to meet the demands remaining after the inclusion of other sources:

- **Portfolio 1 – Current Mix**: this portfolio uses the current supply mix and levels; and adds conservation to include Cal Water's planned 2008, 2009 and 2010 levels of conservation.
- **Portfolio 2 – Maximize Groundwater**: this portfolio builds upon Portfolio 1 by adding new wells to maximize groundwater rights.
- **Portfolio 3 – Maximize Groundwater and Recycled Water**: this portfolio is the same as Portfolio 2, with the addition of recycled water levels to the maximum level projected for the long-term.
- **Portfolio 4 – Maximize Local Sources**: this portfolio is based on the maximum use of groundwater, conservation and recycled water.
- **Portfolio 5 – Hybrid 1**: this portfolio maximizes the use of groundwater rights with new wells and assumes planned levels of conservation and short-term levels of recycled water.
- **Portfolio 6 – Hybrid 2**: this portfolio maximizes the use of groundwater, adds the expected short-term levels of recycled water, includes planned levels of conservation in the Dominguez and Hermosa-Redondo Districts, and maximizes conservation in levels in the Palos Verdes District. This portfolio is similar to Hybrid 1, but has an emphasis on conservation in the Palos Verdes District to evaluate potential benefits of managing the demands in the district with the most challenges for future supply infrastructure.

The six portfolios and the supply provided by each option are summarized in Table 9-8.

Table 9-8 Summary of Water Supply Portfolios for the Rancho Dominguez District						
	2030 Water Supply (mgd) by Portfolio					
	1	2	3	4	5	6
Supply Options	Current Mix	Maximize Ground-water	Maximize Groundwater & Recycled Water	Maximize Local Sources	Hybrid 1	Hybrid 2
Groundwater – Current Wells	10.1	10.1	10.1	10.1	10.1	10.1
Groundwater – Maximize Rights	-	8.7	8.7	8.7	8.7	8.7
Planned Conservation – Dominguez District	0.1	0.1	0.1	0.1	0.1	0.1
Expanded Conservation – Dominguez District	-	-	-	5.1	-	-
Planned Conservation – Hermosa-Redondo District	0.05	0.05	0.05	0.05	0.05	0.05
Expanded Conservation – Hermosa-Redondo District	-	-	-	1.4	-	-
Planned Conservation – Palos Verdes District	0.04	0.04	0.04	0.04	0.04	0.04
Expanded Conservation – Palos Verdes District	-	-	-	2.0	-	2.0
Recycled Water – Existing Levels	3.4	3.4	3.4	3.4	3.4	3.4
Recycled Water – Short-Term Level	-	-	0.7	0.7	0.7	0.7
Recycled Water – Long-Term Level	-	-	2.3	2.3	-	-
Imported Supply	72.6	63.9	60.9	52.5	63.2	61.2
Total Supply	86.2	86.2	86.2	86.2	86.2	86.2
Total Rancho Dominguez Demand (see Table 8-10)	86.2	86.2	86.2	86.2	86.2	86.2

9.3.2 Criteria to Evaluate Future Options and Portfolios

The future supply portfolios were evaluated using criteria relevant to the Rancho Dominguez District related to reliability, costs, and implementation potential.

9.3.2.1 Reliability Criteria

The reliability criterion was defined as the ability of the portfolio to meet demands not only in **average** hydrologic conditions but also during **extreme** droughts (or any restriction applicable as described in Section 9.2.4). As explained in Section 9.2.4, imported supply is currently subject to shortages during droughts, and into the future, additional stressors including climate change and environmental considerations related to pelagic organisms in the Delta may make the shortages more likely or frequent.

The reliability performance of a portfolio in extreme conditions was estimated by assuming a 20 percent reduction in imported supply. The 20 percent reduction is applied to a "base" or normal imported supply equal to the volume necessary to meet the entire Rancho Dominguez District demands if no additional projects are

implemented. This is equivalent to the imported water supply required under Portfolio 1 – Current Mix.

The rationale behind this criterion of extreme condition reliability is that in such conditions, MWD would apply an allocation scheme based on a base imported use and some estimated reduction. For the purposes of this analysis, this reduction is assumed to be 20 percent, which is consistent with the order of magnitude applied to interruptible agricultural supplies and the percent reduction in drought contingency plans in Southern California agencies wholesaling MWD supplies.

9.3.2.2 Cost Criterion

The cost evaluation criterion used was the net present value (NPV) unit costs of the portfolio estimated in dollars per acre-foot ($/AF). To estimate this figure, supplies from each source are estimated over time and a unit cost per source is multiplied by that volume (unit costs used in the cost analysis are discussed in more detail in Appendix F). Operation and maintenance (O&M) costs are escalated at 2.5 percent per year.

Capital costs are estimated and the Cal Water capital recovery factor of 0.15 is used in the present value analysis to estimate the cost of capital per year (as the product of the capital cost times the recovery factor). This capital cost per year is added to the escalated O&M costs and imported water costs. The total annual costs for the entire planning period are discounted using a discount rate of 8.8 percent (same rate used in the Cal Water UWMP).

In the methodology used for the unit cost of water for the portfolios, not only the dollars are discounted but also the cumulative volume of water over the planning period, to account for the value of water into the future compared to the current value of water (see Appendix F). This methodology of discounting both dollars and cumulative water volume has been applied by MWD to other water agencies in recent planning efforts.

9.3.2.3 Implementation Potential Criteria

Some of the portfolios include options for which implementation would be less certain. Those options include the long-term estimates of recycled water use and long-term estimates in conservation ("expanded conservation"), as well as maximum use of groundwater.

The two main elements that could impact implementation of some of the portfolios are:

- The need to acquire land for new facilities, specifically new wells;
- The reliance on consumers for the successful implementation of recycled water and conservation options.

These two elements were measured by using a qualitative score for each one of the portfolios. The qualitative scales used in scoring are:

Land Acquisition Score
1 = portfolio requires significant land acquisition
2 = some property purchases are required
3 = no land purchases are required

Consumer Effectiveness Score
1 = portfolio relies significantly on recycled water use and conservation
2 = significant reliance on recycled water or conservation but not both
3 = medium reliance on conservation or recycled water
4 = minimum reliance on conservation and recycled water in some districts with some targeted districts
5 = minimum reliance on recycled water and conservation

These scales were applied to the portfolios based on the level of implementation of recycled water and conservation and based on the number of new sites required for groundwater wells. Higher scores indicate the option would be easier to implement.

9.3.2.4 Summary

In summary, the evaluation criteria applied are:

- Reliability
  - Under average conditions
  - Under extreme conditions
- Costs (NPV estimate of $/AF for the portfolio)
- Implementation Potential Scores
  - Land acquisition
  - Consumer effectiveness

9.3.3 Performance of Water Supply Portfolios

The performance of the water supply portfolios is summarized in Table 9-9. The table includes the quantitative estimates on reliability and costs and the qualitative score given to the portfolios for the implementation potential criteria. The extreme conditions deficit is presented as a percent of the total projected 2030 demand of 86.2 mgd (96,550 AFY).

Table 9-9
Portfolio Evaluation Summary

	Portfolio 1 - Current Mix	Portfolio 2 - Maximum Groundwater	Portfolio 3 - Maximum Groundwater and Recycled Water	Portfolio 4 - Maximize Local Sources	Portfolio 5 - Hybrid 1	Portfolio 6 - Hybrid 2
Extreme Condition Deficit	21%	11%	7%	0%	10%	8%
NPV $/AF	$1,769	$1,634	$1,639	$1,561	$1,630	$1,611
Land Acquisition Score (Implementation)	3	1	1	1	1	1
Consumer Effectiveness Score (Implementation)	5	5	2	1	5	4

High scores for the implementation factors indicate the portfolio would be easier to implement.

Table 5-2 shows that the only portfolio which would provide all the supply required under extreme conditions is Portfolio 4, Maximize Local Sources, which assumes the highest levels of recycled water and conservation and maximizes the use of groundwater. That same portfolio, however, scores the lowest in terms of implementation potential, i.e., may be more difficult to implement.

Portfolio 1, Current Supply Mix, is the least reliable under extreme conditions (potential 21 percent deficient under extreme hydrologic conditions) and is also projected to be the most expensive portfolio due projected increases in imported water costs (see Appendix F). This portfolio, however, has the highest scores in terms of implementability (easier to implement), since it requires no additional projects or programs. Portfolio 1 assumes there is an improvement in groundwater production efficiency from about 50 percent to 85 percent.

Hybrids 1 and 2 perform very similarly (as expected), and have a balanced performance in terms of cost, reliability and implementation potential.

All portfolios except for the current mix received a low score in terms of land acquisition because the portfolios try to maximize the use of groundwater up to the water rights held by Cal Water. This is an expressed goal of Cal Water in the Rancho Dominguez District and additional wells were assumed in all of the portfolios for that reason. Given the value of land in the Los Angeles basin and the uncertainty in the actual land costs for a given site, a cost comparison was performed between groundwater supply and imported water supply.

The cost of producing 1,000 gpm of groundwater was estimated for different land purchase cost assumptions, with and without treatment requirements. This range of costs (from low property costs to high property costs) was plotted against the cost of imported water for the same volume of water. Results are presented in Figure 9-8.

In 2008, the cost of a 20,000-square foot site was about $500,000. Figure 9-8 indicates that even under a scenario requiring groundwater treatment, the cost of a site for a new well (assuming 20,000 square-feet) would have to be approximately $11.5 million to make groundwater not competitive with imported water from a cost perspective. The treatment assumed for this calculation was ion exchange, which is actually a relatively expensive technology unlikely to be required in the Rancho Dominguez District (where nitrates are not a concern).

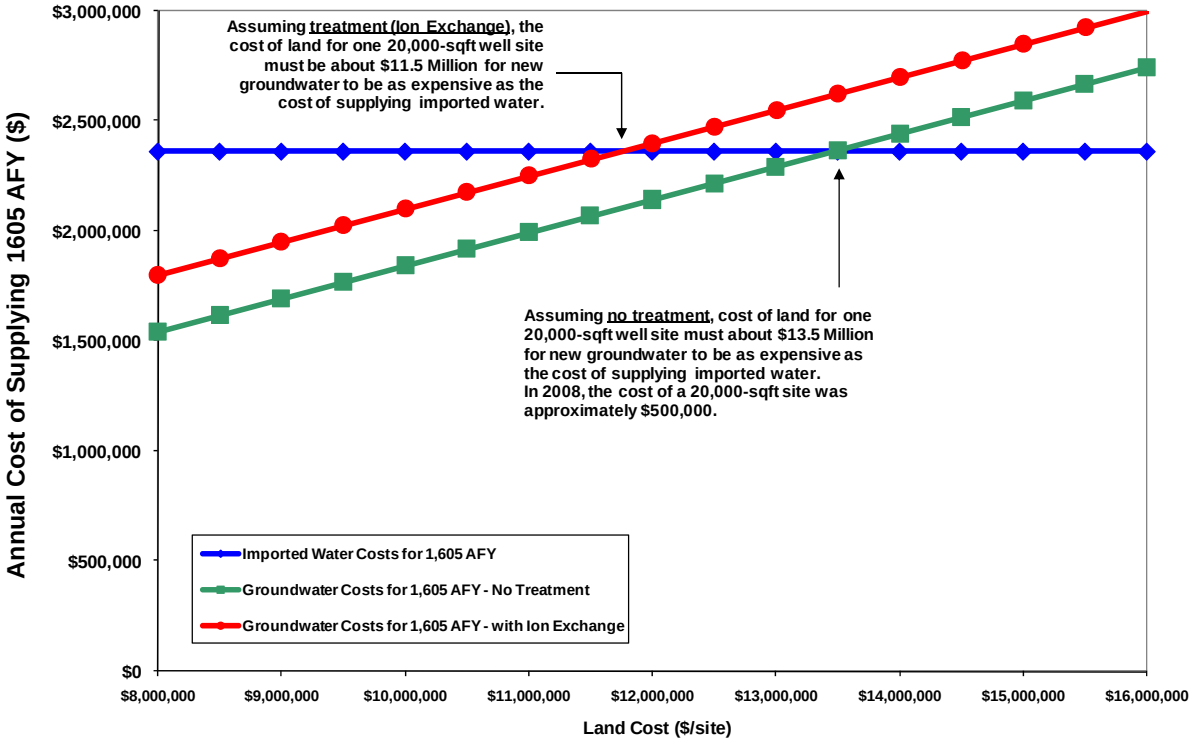


Figure 9-8
Annual Cost Comparison for Groundwater Well Development vs. Imported Water Purchase

Given the economic climate in late 2008 and 2009, it is likely that site costs have decreased, making potential groundwater sites more affordable. Cal Water should consider acquiring additional properties for future wells.

9.4 Future Supply Recommendations

The results of the portfolio evaluation presented in the previous section were used in a multi-criteria ranking tool to determine the portfolio that is preferable as a basis for the analysis of the Rancho Dominguez District under future conditions.

Results of the multi-criteria ranking tool are presented in Figure 9-9. In the figure, each color in the stack bar represents how well a portfolio performed for a given criterion. The larger the bar is for a given color, the better the performance for the

criterion represented by that color. The scale in the figure is the normalized and weighted score of the portfolios. The "perfect" portfolio would score 1.0.

Figure 9-9 indicates, for example, that Portfolio 4 – Maximize Local Sources presents the best performance in terms of reliability (red bar) but it is the lowest scoring portfolio in terms of implementability (no blue bar).

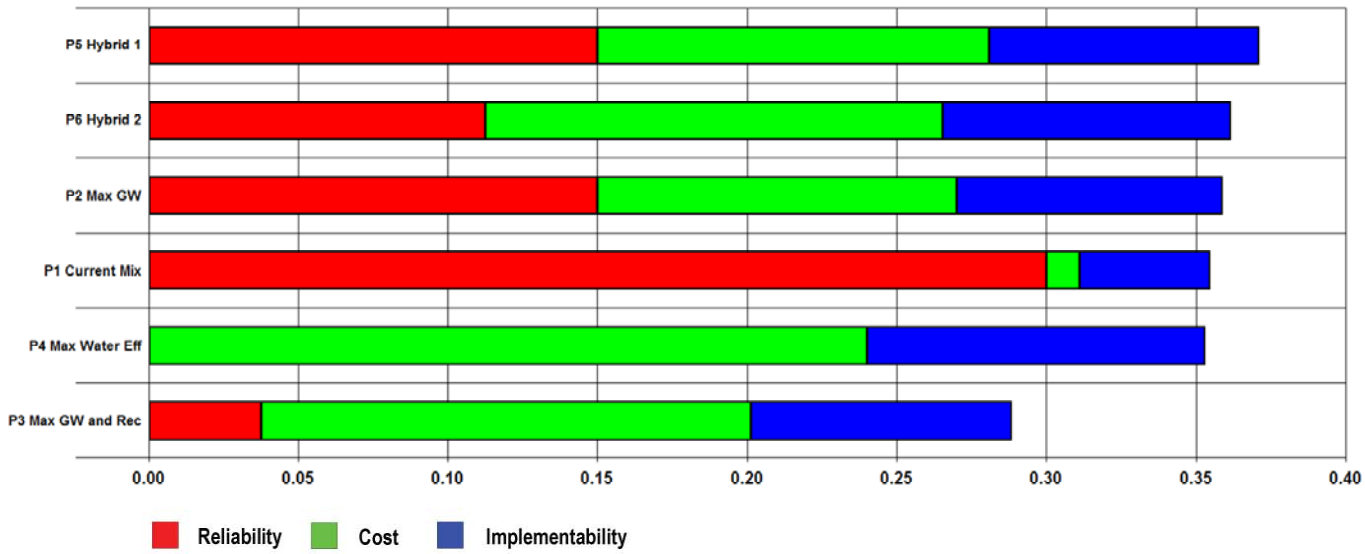


Figure 9-9
Portfolio Performance Summary

Hybrids 1 and 2 are the top portfolios based on their performance according to all three criteria. Hybrid 2 is slightly more reliable but it has a lower implementation potential score.

Given the similarity between the two portfolios (see Section 9.3.1), CDM recommends Portfolio 6 – Hybrid 2 to serve as the basis for the system analysis. The only difference between Portfolio 5 – Hybrid 1 and Portfolio 6 – Hybrid 2 is that the latter includes additional conservation efforts in the Palos Verdes District, which is more likely and more prudent given the current imported water reliability issues and future imported water reliability issues which could be more severe.

Portfolio 6 – Hybrid 2 includes the following supply assumptions:

- **Additional conservation:** planned (2008-2010) conservation levels in each district and expanded conservation efforts in the Palos Verdes District
- **Recycled water:** existing and short-term (the next two to three years) recycled water

- **Existing groundwater wells:** increased efficiency in the short-term and reduced capacity in the long-term due to wells reaching their useful life
- **Additional wells:** five to seven new wells would be required, which may represent an challenge for land acquisition
- **Imported supply:** imported supply would be available under most hydrologic conditions, but it is estimated that in extreme drought conditions the supply would be limited and the Rancho Dominguez District's deficit could be around 8 percent.

Table 9-10 summarizes the volume provided by each supply source in each district for the recommended supply portfolio.

Table 9-10
Summary of Recommended Supply Portfolio to Meet 2030 Demands [(1)]

	Dominguez District		*Hermosa-Redondo District*		*Palos Verdes District*	
	mgd	*AFY*	*mgd*	*AFY*	*mgd*	*AFY*
District Demand	*51.4*	*57,577*	*14.5*	*16,192*	*20.3*	*22,778*
District Supplies						
Groundwater - No New Wells	9.1	10,185	1.0	1,088	0.0	0
Groundwater - Maximize Rights	8.7	9,694	0.0	0	0.0	0
Recycled Water - Existing Level	3.3	3,665	0.1	119	0.0	0
Recycled Water - Short-Term	0.1	60	0.1	70	0.6	683
Recycled Water - Long-Term	0.0	0	0.0	0	0.0	0
Conservation - Planned	0.1	79	0.05	56	0.04	40
Conservation - Expanded	0.0	0	0.0	0	2.0	2,222
Imported Supply	30.3	33,894	13.3	14,859	17.7	19,833
Total Supply	*51.4*	*57,577*	*14.5*	*16,192*	*20.3*	*22,778*

[(1)] Recommended Supply Portfolio = Portfolio 6 (Hybrid 2)

This portfolio's emphasis on local sources of supply (groundwater, recycled water, and conservation) will assist Cal Water in managing potential imported water shortages. In April 2009, MWD voted to reduce water supply deliveries by 13 percent starting July 1, 2009, based on the current drought conditions and regulatory restrictions on water supplies from northern California. This new water supply allocation will be in effect through June 30, 2010. MWD has also approved an average rate increase of 19.7 percent effective September 2009. MWD may also institute penalty rates if contractors go over their allotments. Those penalty rates have not been published at this time, but could be up to three times the normal rates. Developing additional local supplies will continue to be important for Cal Water.

This portfolio is used in the evaluation of the each district's system performance under future conditions, presented in Sections 10, 11, and 12.

9.5 Potential Desalination Feasibility

Reliability of water supply is an issue Cal Water must address as a result of MWD's new policy on reduced deliveries during drought periods. In addition to other supply options that have been evaluated, it is recommended that desalination be assessed in the Rancho Dominguez District. Other water agencies in the Los Angeles area have already commenced feasibility studies of this source. Several years ago, MWD solicited proposals for alternative water supplies from member agencies and offered to pay $250/AF for development of new local supplies. Five desalination projects were submitted including those from Los Angeles Department of Water and Power, WBMWD, and Municipal Water District of Orange County. All were funded by MWD.

To assess the feasibility of either participating in another agency's or developing a Cal Water desalination project to achieve reliability of supply objectives for the Dominguez, Hermosa-Redondo, and Palos Verdes Districts, it is recommended that a feasibility study be conducted during the coming year.

The following topics should be addressed:

1. Identify key issues and challenges associated with desalination

2. Assess and compare local brackish water sources with seawater

3. Identify and assess desalination projects within the Los Angeles area in which Cal Water could participate. Evaluate institutional, legal and regulatory requirements, preliminary cost estimates plans for availability.

4. Identify and assess a desalination project that Cal Water could develop, operate and produce water for either its districts only or other local agencies as well. Address institutional, legal and regulatory requirements, preliminary cost estimates and availability timeframe.

6. Determine whether desalination is a viable supply option and which desalination alternative appears to best meet Cal Water objectives and constraints.

7. If there is a viable desalination alternative, prepare a project participation or development plan with specific actions and tasks, schedule and preliminary budget for accomplishing work.

Some suggested tasks to be completed in the feasibility study include:

1. Review information on local desalination programs (WBMWD, Scattergood, Huntington Beach, Long Beach) on key issues including siting.[1]

2. Prepare a list of questions and a summary of preliminary analyses for discussion. Questions will include:

   a. What minimum desalination capacity is needed for a project be cost-effective? There are fixed costs associated with implementation - engineering, environmental, permitting, intake, site acquisition and development and operation.

   b. Where and when is the desalinated water to used? How much will the required infrastructure to convey water to intended users cost? Could Cal Water provide surplus water to the MWD system? What would they pay for this water?

   c. Is there opposition to desalination projects from environmental groups?

   d. Are there brackish water desalination opportunities? Can these be developed as reliable long term supplies or will seawater desalination be necessary?

   e. What are the capital, operating, and life-cycle costs for other projects being developed? What is the maximum acceptable cost per acre-foot for a desalination supply?

   f. What is the timing and need for additional supply by Cal Water and how quickly can a new desalination project be implemented?

3. Conduct one or two workshops to identify and discuss issues, key questions to be addressed, priorities for investigation and approach and level of effort to be made.

Since there is strong local interest in desalination by other water agencies, contacting and obtaining information on their plans, program, and progress is recommended. MWD, WBMWD, and Long Beach appear to be strong candidates for Cal Water to explore participation on desalination projects.

[1] Siting issues are extremely challenging. The West Basin Seawater demonstration plant (0.1 mgd) has received Coastal Commission approval for a temporary plant in Redondo Beach. WBMWD has not identified the location of their future full scale plant; however, there are a limited number of sites available. Potential sites include the port, the Redondo Beach power plant, or the El Segundo power plant.

Suggested tasks include:

1. Meet with WBMWD and MWD:

    a. Determine circumstances under which Cal Water could own and operate and sell water.

    b. Evaluate whether WBMWD would be interested in purchasing water from Cal Water.

    c. Assess various project issues such as siting and electric power source.

2. Evaluate supply arrangements or agreements (e.g., Cal Water purchases water from WBMWD or other agencies producing desalinated water).

3. Estimate preliminary costs and benefits to Cal Water for differing options.

4. Meet and determine whether to proceed with participation on desalination projects with local agencies.

If participation with other water agencies appears attractive, obtain available environmental, engineering and cost and other information. The type of information to be collected:

1. Identified sites which appear most cost effective regarding proximity to existing transmission facilities for supplying specific locations in the Rancho Dominguez District and/or WMBWD/MWD turnouts.

2. Identified desalination facilities including extraction wells, treatment plants, brine discharge systems, and conveyance system connections.

3. Legal, institutional, environmental, permitting, organizational, and coordination requirements, and approvals.

4. Geotechnical, water quality assessments, seawater intake, brine disposal, and fisheries evaluations that may be required by the Coastal Commission and the National Oceanic and Atmospheric Administration.

5. Estimates of capital, O&M, and annualized total costs per acre-foot.

6. Plans and schedules for negotiations, permitting, design, environmental documentation, construction, and testing.

7. Review information internally and assess whether proceeding in partnership with other agencies continues to appear beneficial and desirable.

With respect to Cal Water developing its own desalination project, a preliminary assessment of the factors previously discussed would be made to determine whether it was feasible or not. If so, the following work plan could be developed to determine tasks, budget and schedule required for more detailed feasibility analysis, preliminary engineering, permitting, and environmental evaluation necessary to move the project to the detailed design stage.

Suggested work plan contents:

- Feasibility analysis - 10% design
  - Identification of engineering studies, sampling, or pilot testing that might be required.
  - Initial characterization of raw water quality.
  - Development of planning level treatment processes.
  - Preliminary site plan and layout for major facilities, including (if required):
    - Intake and outfall structures for desalination facilities
    - Wells (if source is brackish water)
    - Pipeline alignments
    - Pump stations
    - Treatment facilities
  - Development of preliminary capital cost and operating cost estimates.
- Preliminary engineering - 25% design including updated costs and schedule.
- Basis of Design Report
- Environmental documentation
- Public outreach
- Additional planning or other investigations
- Negotiations with other agencies
- Property acquisition issues and costs
- Permitting
- Detailed design
- Construction
- Testing, startup and operation

Section 10
Water System Analysis – Dominguez District

This section describes the results of the water system analysis conducted for the California Water Service Company (Cal Water) Dominguez District system. The system capacity analysis includes evaluation of turnout capacity, pumping capacity, storage capacity, pressure reducing valve (PRV) capacity, and pipeline capacity. The analysis is based on the performance criteria described in Section 7.

This section also includes a reliability evaluation discussion for the Dominguez District and a summary of the condition assessment for key facilities in the system.

10.1 Summary of Key Analysis Findings for Dominguez District

Hydraulic model results and facilities assessment results were compared to the system requirements described in Section 7, Performance Criteria. Each analysis is discussed in detail later in this section.

The key findings of the water system analysis are:

- The 2030 average day demand is 51.4 million gallons per day (mgd), 15.4 mgd higher than existing demand. Most of the increase in demand occurs in Zone II. Associated maximum day demand is estimated at 77.1 mgd, based on a maximum day to average day peaking factor of 1.5. This peaking factor is based on review of 2005 through 2007 daily records for Metropolitan Water District of Southern California (MWD) supply and weekly records for other supplies, which indicate that the peaking factor ranges from 1.27 to 1.45.

- MWD turnouts have a total capacity of 90.5 mgd. Capacity improvements to the pipelines in the vicinity of turnout WB-10 are recommended to achieve the maximum capacity of the turnouts. In addition, the analysis assumes that the capacity of WB-36, currently 10 mgd, can be increased to 13 mgd. If capacity cannot be increased at this turnout, Cal Water may need additional piping improvements to maximize capacities of other turnouts in the system, particularly WB-14.

- Existing firm pump station capacity is insufficient to meet 2030 peak hour demands for pump stations serving zones without gravity storage. An additional 8.1 mgd capacity is required; 3.2 mgd is needed for Zone I and 4.9 mgd is required for Zone III. (The evaluations assumed that Hermosa-Redondo Interties and WB-35 turnout are offline.)

- Pump Stations 203 and 232 have fixed speed pumps, pumping to zones with no storage on the discharge side of the pump station. Variable frequency drive motors

are recommended for both stations. Remote pressure monitoring is also recommended for Station 232, to that the pump station better control zone pressure.

- An additional 21.3 million gallons (MG) of storage are required in Zones I, II, and III for existing conditions and 42.1 MG for 2030 conditions. Zone IV is assumed to not require storage, since the zone is PRV-fed for local refinery use only. Zone I has a storage deficit of 3.4 MG. Zones II and III have a storage deficit of 38.7 MG.

- The additional storage required for the existing system is primarily needed for emergency supply. Installation of standby generation capacity at pump stations or wells that supply zones deficient in storage provides equivalent reliability to customers and reduces storage needs. Adding standby generators at nine existing wells reduces the existing storage requirement from 21.3 MG to 10.3 MG. With the installation of standby power at all future wells, the 2030 storage requirement is reduced from 42.1 MG to 22.1 MG.

- In general, the hydraulic capacity of the existing distribution system is adequate for 2030 demand conditions. There are two pipeline capacity improvements needed to meet normal operating conditions, to improve hydraulic capacity in the vicinity of MWD turnouts. Pressure deficiencies are in the southern portion of Zone II, due to the inadequate hydraulic capacity from MWD turnouts, and from supply wells and Station 203 reservoir in the northeastern part of Zone II. The new supply wells will also be located in the northeastern part of the system. New transmission capacity is needed to distribute water more effectively from the wells, storage, and MWD turnouts.

- Approximately 1.5 miles of transmission pipelines will be needed to meet 2030 maximum day demand. The pipeline improvements focus on increasing transmission capacity from MWD turnout WB-10 to the south portion of Zone II.

- To increase the reliability of the supply to Zone I, a dedicated line from MWD turnout WB-16 to the southern portion of Zone I (location of current Hermosa-Redondo Interties) is recommended. This will also improve reliability of deliveries to the reservoirs at Station 26 in the Hermosa-Redondo District.

- Evaluation of installation date and visual assessment of existing pumping facilities inspected in the Dominguez District concluded that nine booster and well pump stations have condition related issues, and are in need of replacement of mechanical and/or electrical equipment.

- In general, the existing storage facilities inspected are in good working condition.

10.2 Turnout Capacity Evaluation

The Dominguez District has two main sources of supply: imported water from the West Basin Municipal Water District (WBMWD), which is a member agency of MWD, and wells. Other smaller sources of supply to the Dominguez District include:

Interties to the Hermosa-Redondo System, an intertie to the Torrance system, and a desalter plant located at Station 232.

Section 8 evaluates water supply requirements for each of three districts comprising Rancho Dominguez District and assesses imported water supply requirements. The hydraulic evaluation later in this section evaluates distributing water within the system. This section evaluates peak turnout capacity and well capacity, and compares this with projected 2030 system maximum day demand.

Table 10-1 summarizes MWD turnouts and wells and their capacities, in cubic feet per second (cfs) and mgd. Dominguez District has seven turnouts on six feeders, and also has twelve wells. No hydraulic information is available for the MWD system other than turnout capacity. The analysis assumes that there is adequate hydraulic capacity within the MWD system to meet turnout capacities, if needed.

Based on a comparison of 2030 maximum day demand with maximum turnout capacity and well capacity, there is excess peak capacity to meet maximum day demand from MWD turnouts and wells. The hydraulic analysis, discussed later in this section, indicates that while individual turnouts can be operated within their rated capacity under 2030 conditions, using WB-14 turnout at higher flow rates (but within its rated capacity) would necessitate transmission improvements to move water to the south part of Zone II. Therefore, CDM recommends that Cal Water work with MWD to increase turnout capacity in the southern portion of Zone II, to minimize transmission improvements that are required.

10.3 Pumping Capacity Evaluation

Table 10-2 compares the existing pump station capacities with existing and 2030 pumping requirements for maximum day demand conditions. The table shows the total capacity of the existing pump stations and the firm capacity with the largest pump serving the zone out of service. If there are multiple pump stations serving a zone, only one standby pump is required for the zone.

Table 10-1
Comparison of Dominguez District Turnouts and Well Capacity with Maximum Day Demand

Turnout	Capacity cfs	Capacity mgd	Notes
WB-9	30	19.4	Supplies Zone IV
WB-10	20	12.9	Supplies Zone II
WB-14	25	16.2	Supplies Zone II
WB-21	20	12.9	Supplies Zone II
WB-35	20	12.9	Supplies Zone III
WB-36	15	9.7	Supplies Zone II
WB-39	10	6.5	Supplies Zone II
Subtotal	140	90.5	
Hermosa-Redondo Interties	***Capacity (mgd)***		***Notes***
Connection-1	0.1		Intertie capacities assumed from Existing Maximum Day Flow
Connection-2	0.3		
Connection-3	0.3		
Connection-4	0.4		
Subtotal	1.1		
Well Station	***Capacity (mgd)***		***Notes***
215	0.86		
219	0.86		
272	1.01		
275	0.86		
277	1.80		
279	1.15		
290	1.01		Zone III well
294	1.15		
297	0.58		
298	3.02		
Future Wells	10.08		Seven future 1,000 gallons per minute (gpm) wells assumed
Subtotal	22.39		
Other Supply Sources	***Capacity (mgd)***		***Notes***
Torrance Intertie	1.35		Torrance Intertie Capacity assumed from max flow during July and August 2006
Desalter Plant	1.15		Desalter capacity assumed from max flow during July and August 2007
Subtotal	2.5		
Total Supply	116.5		
2030 Maximum Day Demand	77.1		

Table 10-2
Pump Station Capacity Analysis - Dominguez Water Distribution System

Zone (supply to)	Supply Pump Station	Pump ID	Design Flow (gpm)	Firm Capacity[1] (gpm)	Pumping Condition	Existing			2030			Additional Capacity Required
						Maximum Demand (gpm)	Peak Hour Demand (gpm)	Required Supply Through Pump Station (gpm)	Maximum Demand (gpm)	Peak Hour Demand (gpm)	Required Supply Through Pump Station (gpm)	
I	Station 232	PMP-232-A (#5)	175	6,650	Peak Hour	4,700	7,500	7,500	5,490	8,790	8,790	2,200
		PMP-232-B (#6)	1,250									
		PMP-232-C (#7)	1,250									
		PMP-232-D (#8)	1,250									
		PMP-232-E (#9)	725									
		PMP-232-G (#11)	2,000									
		PMP-232-H (#12)	2,000									
III [2]	Station 203	PMP-203-A	250	6050 [3]	Peak Hour	4,890	5,870	5,870	7,850	9,420	9,420	3,400
		PMP-203-B	500									
		PMP-203-C	500									
		PMP-203-D	1,100									
		PMP-203-E	1,100									
		PMP-203-F	1,100									
		PMP-203-G	800									
	Station 290	PMP-290-01	1,000									

[1] Firm capacity: total pump station capacity assuming the largest pump serving the zone is out of service.
[2] Assumed entire demand in Zone III is met through pumping (i.e. WB-35 turnout is not operating)
[3] Firm capacity in Zone III is assumed to be total pump capacity, since WB-35 is not operating.

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For zones with storage, firm pump station capacity to supply the zone must be sufficient to meet the maximum day demand of the zone it is pumping into and also the maximum day demand for all the zones served through that zone. For zones with no storage, the pump capacity must be sufficient to meet the peak hour demand.

Key conclusions of the pumping capacity analysis are:

- Existing firm pump station capacity is inadequate to serve 2030 maximum day demand plus fire flow in Zone I, not including supply from the Hermosa-Redondo system interconnections.

- Existing firm pump station capacity is insufficient to meet 2030 maximum day demand plus fire flow in Zone III, not including supply from the WB-35 turnout.

Based on the pump station capacity analysis, the following pump stations will require an upgrade to meet 2030 service requirements:

- **Station 203:** To upgrade to a firm capacity of 9,400 gpm, it is recommended to Replace Units A through E with new 1,400 gpm pumps (total dynamic head [TDH] = 155 ft). This pump station currently has fixed speed pumps, and no zone storage. In addition to capacity upgrades, CDM also recommends replacing fixed speed pumps with pumps with variable frequency drives to better control pressure within the zone.

- **Station 232:** To upgrade to a firm capacity of 8,800 gpm, it is recommended to Replace Units 5 (A) through 9 (E) with new 1,400 gpm pumps (TDH = 155 ft). In addition to capacity upgrades, CDM also recommends replacing fixed speed pumps with pumps with variable frequency drives, and remote pressure monitoring, to better control pressure within the zone.

The operating conditions of the interconnections to the Dominguez system do not affect the recommended pumping improvements for the Hermosa-Redondo system.

10.4 Storage Capacity Evaluation

The storage capacity required for a distribution system is comprised of the following three components: operational (balancing) storage, emergency supply storage, and fire reserve storage. The operational storage is estimated as 25 percent of the maximum day demand, and the emergency storage at 100 percent of average day demand.

Tables 10-3 and 10-4 describe by zone the existing storage, the storage requirements for existing and 2030 conditions, and the additional storage needed to meet those requirements. There is a significant difference in the additional storage required for existing versus 2030 demands due to the future increase in demands.

Table 10-3
Dominguez District – Existing Storage Capacity Analysis

Zone	Existing Reservoirs Serving Zone	Average Day Demand (mgd)	Maximum Day Demand (mgd)	Maximum Fire Flow Requirement (gpm)	Storage Requirements (MG)				Additional Storage Needed (MG)
					Operational (at 25% of max day demand)	Emergency (as one average day demand)	Fire Reserve	Total Storage Needed	
I	Sta-232-T1	5.27	5.8	3,000	1.7	5.3	0.54	7.5	2.5
II and III	Sta-203-T1	22.75	40.37	5,000	8.6	22.8	1.5	32.8	18.8
	Sta-203-T2								
	Sta-203-T3								
	Sta-203-T4								
TOTAL		28.02	46.17		11.5	28.0	2.0	41.6	22.6

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Table 10-4
Dominguez District – 2030 Storage Capacity Analysis

Zone	Existing Reservoirs Serving Zone	Average Day Demand (mgd)	Maximum Day Demand (mgd)	Maximum Fire Flow Requirement (gpm)	Storage Requirements (MG)				Additional Storage Needed (MG)
					Operational (at 25% of max day demand)	Emergency (as one average day demand)	Fire Reserve	Total Storage Needed	
I	Sta-232-T1	5.88	7.87	3,000	2.0	5.9	0.54	8.4	3.4
II and III	Sta-203-T1	36.91	57.30	5,000	14.3	36.9	1.5	52.7	38.7
	Sta-203-T2								
	Sta-203-T3								
	Sta-203-T4								
TOTAL		42.79	65.17		16.3	42.8	2.0	61.1	42.1

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As discussed in Section 7 (Performance Criteria), the emergency storage is the volume of water required to supply the service area during planned or unplanned equipment outages, or power outages. An alternative for emergency storage is to provide standby generators for the wells or pumps serving zones where the existing gravity storage is deficient for emergency conditions. The pumps are expected to supply average demand.

Table 10-5 presents the storage analysis for existing conditions, assuming standby power is added at nine existing wells (Station 215, Station 219, Station 272, Station 275, Station 279, Station 290, Station 294, Station 297, and Station 298). With standby power at these locations, the additional storage needed would be reduced from 21.3 MG to 10.3 MG. Table 10-6 presents the storage analysis for 2030 conditions, assuming standby power is added at the nine above-mentioned existing wells and all future wells. With standby power at all existing and future well pump stations, the additional storage needed under existing conditions would decrease from 42.1 MG to 22.1 MG.

The conclusions of the storage capacity analysis are:

- Additional storage is needed for existing and 2030 conditions in Zones I, II, and III. The total storage volume needed in the system to meet existing and 2030 requirements is 21.3 and 42.1 MG, respectively, without considering installation of standby power at pump stations.
  - **Zone I:** This zone requires additional storage volume of 2.5 MG for existing conditions and 3.4 MG for future 2030 conditions. The current storage for this zone is ground-level storage. Therefore, no credit can be given for standby power. The booster pump station should be outfitted with standby power to meet peak hour demands as indicated in the pump station capacity analysis.
  - **Zones II and III:** These zones require additional storage volume of 19 MG for the existing conditions and 39 MG for the future 2030 conditions. There are four 3.5 MG tanks at station 203 with possible room for another two 3.5 MG tanks. Locations for the additional 32 MG would need to be determined by Cal Water.
- The additional storage required for the existing system is primarily needed for emergency supply. Cal Water allows installation of standby generation capacity at pump stations or wells that supply a zone where storage is required, to provide equivalent reliability to customers and reduce storage needs. Adding standby generators at nine existing wells reduces the existing requirement for additional storage from 21.3 MG to 10.3 MG, and with the installation of standby power at all future wells, reduces the 2030 requirement for additional storage from 42.1 MG to 22.1 MG.

Table 10-5
Dominguez District – Existing Storage Capacity Analysis, Standby Power Alternative

Zone	Existing Storage (MG)	Operational and Fire Storage (MG)		Emergency Storage (MG)					
		Storage Required to Meet Operational and Fire Flow	Additional Storage Needed	Existing Storage Available for Emergency	Emergency Storage Required	Additional Storage Needed for Emergency	Emergency Storage Credit if Standby Power Installed		Additional Storage Needed after Credit
I	5	2.23	0.00	2.77	5.27	2.5		0.00	2.5
II and III	14	10.08	0.00	3.92	22.75	18.83	PMP-215-01	0.86	7.74
							PMP-219-02	0.86	
							PMP-272-01	1.01	
							PMP-275-01	0.86	
							PMP-279-01	1.44	
							PMP-290-01	1.01	
							PMP-294-01	1.44	
							PMP-297-01	0.58	
							PMP-298-01	3.02	
							Total	**11.08**	
TOTAL	**19**	**12.31**	**0.00**	**6.69**	**28.02**	**21.33**	**of equivalent storage**		**10.24**

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Table 10-6
Dominguez District – 2030 Storage Capacity Analysis, Standby Power Alternative

		Operational and Fire Storage (MG)		Emergency Storage (MG)					
Zone	**Existing Storage (MG)**	**Storage Required to Meet Operational and Fire Flow**	**Additional Storage Needed**	**Existing Storage Available for Emergency**	**Emergency Storage Required**	**Additional Storage Needed for Emergency**	**Emergency Storage Credit if Standby Power Installed**		**Additional Storage Needed after Credit**
I	5	2.51	0.00	2.49	5.88	3.38		0.00	3.38
II and III	14	15.82	1.82	0.00	36.91	36.91	PMP-215-01	0.86	18.75
							PMP-219-02	0.86	
							PMP-272-01	1.01	
							PMP-275-01	0.86	
							PMP-279-01	1.44	
							PMP-290-01	1.01	
							PMP-294-01	1.44	
							PMP-297-01	0.58	
							PMP-298-01	3.02	
							Future Wells	10.08	
							Total	**11.08**	
TOTAL	**19**	**18.33**	**1.82**	**2.49**	**42.79**	**40.29**	**of equivalent storage**		**22.13**

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- Recommended improvements include construction of storage without standby power at the well pump stations, to provide a conservative budget estimate for planning purposes. Recommendations also indicate how installation of standby generators would reduce storage volumes and associated costs.

10.5 PRV Capacity Evaluation

There is only one pressure zone solely served by a PRV station: Zone IV. The supply PRV station has an existing capacity of 19.4 mgd (based on WB-9 turnout capacity). Potable demand is expected to decrease in this zone, as customers use more recycled water supply in the future. Therefore, no capacity improvements are required for the PRV station.

10.6 Pipeline System Evaluation

A hydraulic evaluation of the existing distribution system was performed using a computerized hydraulic model of the Dominguez system. This model was developed for the Master Plan analysis and for Cal Water operational analysis. The model was developed from the ArcGIS geodatabase provided by Cal Water using InfoWater software version 6.0 by MWHSoft. InfoWater is a stand-alone GIS-based program that combines spatial analysis tools and mapping functions with a hydraulic model.

The model was calibrated for static conditions using hydrant test data provided by Cal Water, and calibrated for extended period simulation using tank level and pressure information provided by Cal Water. The model calibrations show that the model provides a reasonable planning and operational evaluation tool for the Dominguez system. Appendix G provides a detailed description of the hydraulic model development and calibration.

The hydraulic model was used to assess the distribution system's ability to meet:

- Normal Demand Conditions. Normal demands are tested with simulations of system operation at peak hour on the maximum demand day.

- Fire Flows. The system's ability to provide fire flow is tested under maximum day demand conditions.

This section describes these two evaluations.

10.6.1 Normal Demand Conditions

The capacity evaluation of the existing pipeline system was based on the pressure, velocity and headloss criteria presented in Section 7.

A steady state simulation was conducted to check peak hour conditions, for existing and 2030 demands. This analysis was based on normal supply conditions, pump stations operating, and reservoirs operating within the top 25 percent of capacity.

Pressures were evaluated at all nodes with demands, i.e., service nodes. Velocity and head loss were evaluated for all pipelines in the system.

For peak hour of existing conditions, Figure 10-1 shows locations of pipes with high head loss and high velocity that exceed the performance criteria and junctions that do not meet Cal Water's pressure requirements. For peak hour at 2030 conditions, Figure 10-2 shows locations that do not meet Cal Water's pressure criteria. Figure 10-3 shows locations of pipes with high head losses and high velocities that exceed the performance criteria.

For the 2030 hydraulic analysis, future wells were included in Zone II and Zone II. As discussed in Section 9, five to seven new wells with a total capacity of 10 mgd are recommended to maximize Cal Water's water rights for the West Coast Basin (3 to 4 wells) and Central Basin (2 to 3 wells) for all three districts. The hydraulic analysis assumed that seven new 1,000 gpm wells would be added: four in the West Coast Basin (at Station 215-01, a second well at Station 232, a well in the vicinity of 215th Street and Main Street; and one in the vicinity of Westwood Ave and 220th Street), and three in the Central Basin (Walton Middle School, David Starr Jordan High School and Canima Logistics Inc [see Section 9, figure 9-6]). Wells were placed based on recommended locations from the supply analysis, potential locations identified by Cal Water, and other locations near existing wells.

Because the location and amount of future storage is unknown, MWD turnout flow rates were increased to supply the system for 2030 demand conditions to confirm adequate hydraulic capacity for peaking. To maintain flow rates within the reported capacities at Zone II turnouts WB-10, WB-21, WB-36, and WB-39, the flow rate at WB-14 had to be increased to 10 mgd (less than its hydraulic capacity of 16 mgd). However, CDM found that increasing flow rates from this turnout, which is in the north part of Zone II, generated significant pressure deficiencies in the southern portion of Zone II, which necessitated significant transmission improvements to move water to the southern portion of Zone II. If the hydraulic capacity of one or more turnouts in the southern portion of Zone II can be increased, the required pipeline improvements are significantly reduced. For the analysis, WB-36 flow was increased from its 10 mgd capacity to 13 mgd. All other turnouts were operated at equal to or less than their reported MWD capacity. With this re-distribution of flows, pipeline improvements were significantly reduced. Cal Water has indicated that MWD has previously been willing to increase turnout capacity, upon request.

Pressure is the key criterion for evaluating the existing pipeline system. Existing pipes that provide adequate pressures in the system are not identified for improvement solely due to not meeting the maximum velocity and head loss criteria. Cal Water uses the headloss/velocity information if the pipes require replacement for leaks or breaks, to evaluate whether a larger diameter pipe may be warranted to reduce head losses. Key findings regarding pressures include:

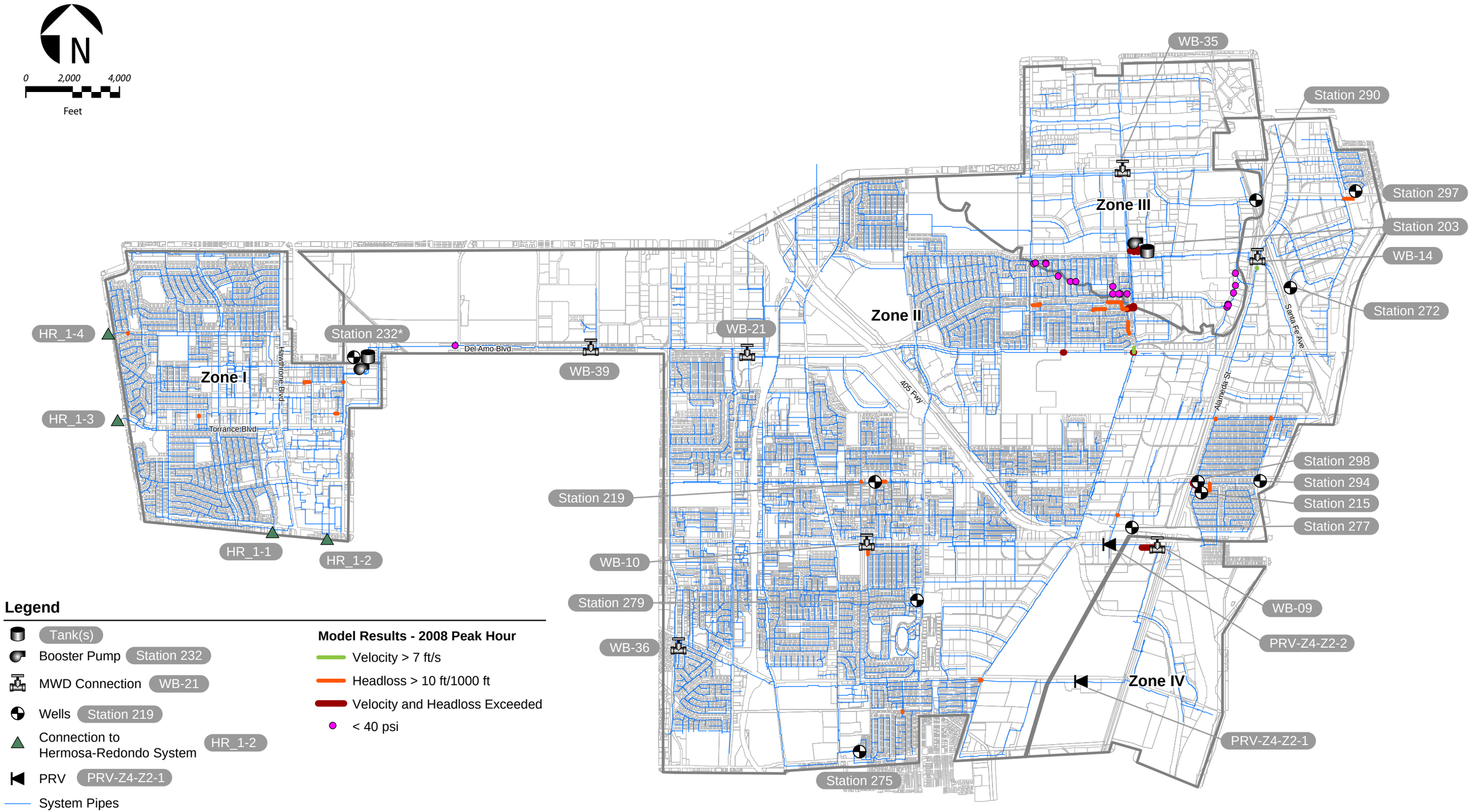

Figure 10-1
Dominguez District - Hydraulic Model Results
Existing Peak Hour of Maximum Day

CDM

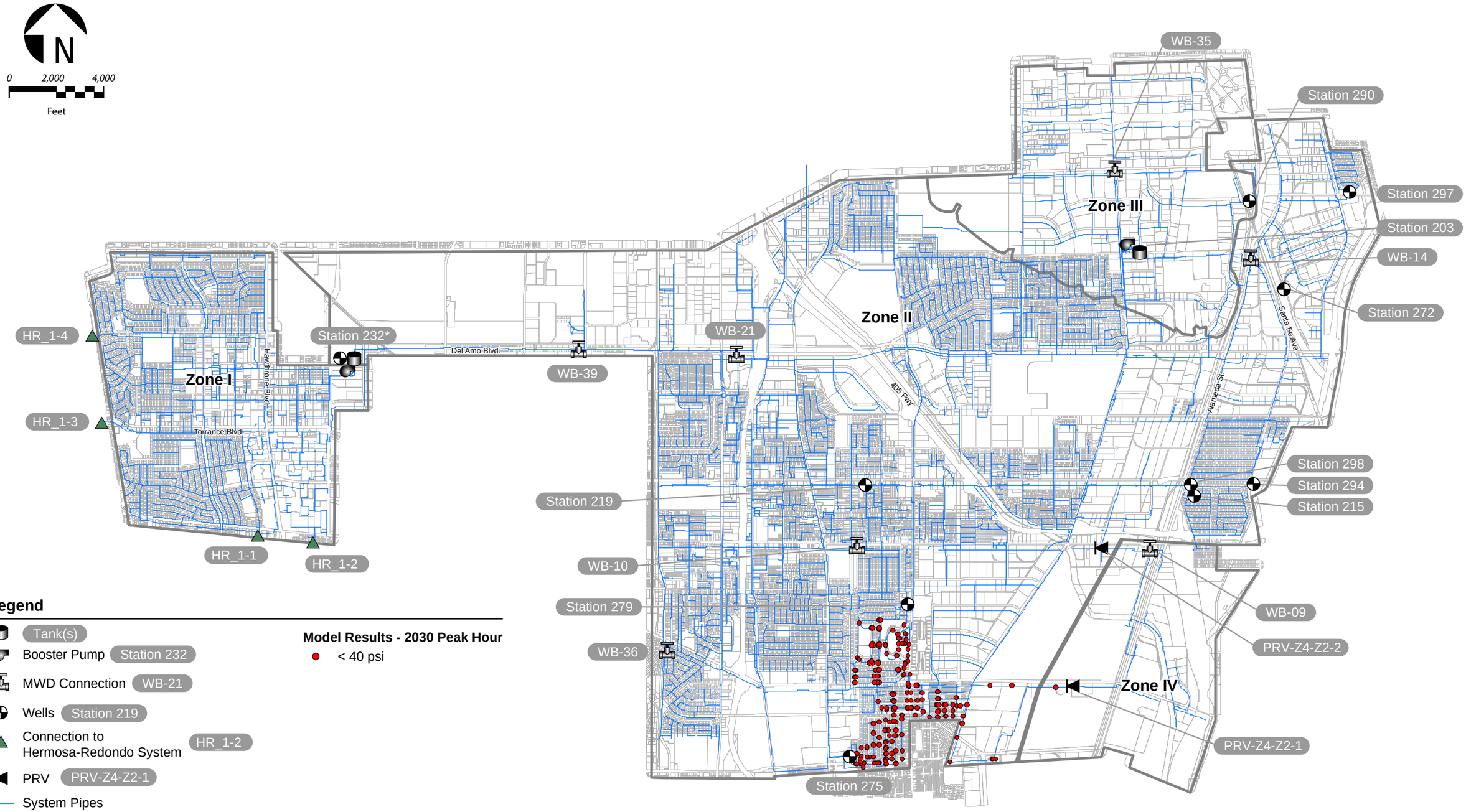

Figure 10-2
Dominguez District - Hydraulic Model Results
Locations with Low Pressure - 2030 Peak Hour of Maximum Day

CDM

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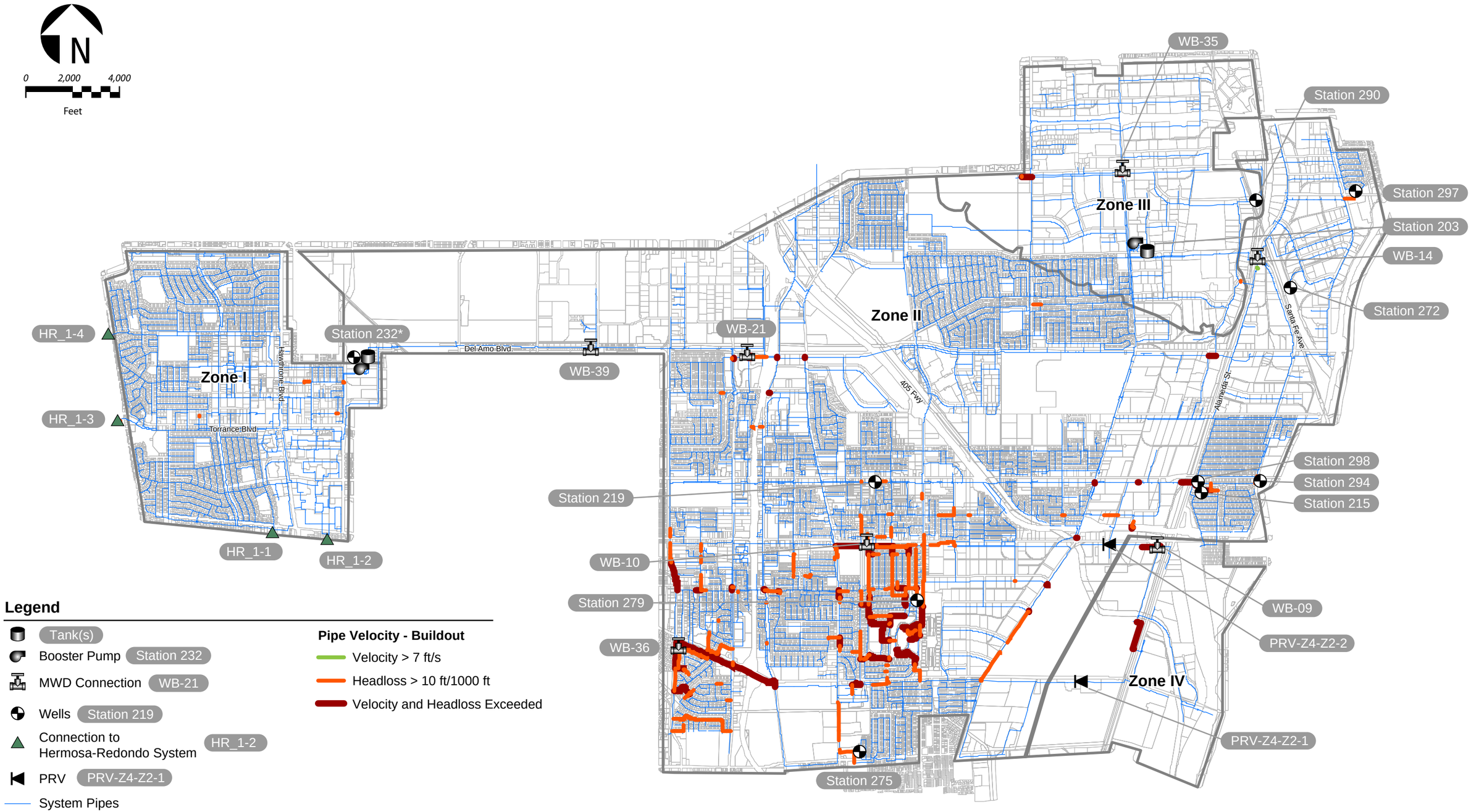

Figure 10-3

Dominguez District - Hydraulic Model Results

Pipelines Exceeding Velocity and Headloss Criteria - 2030 Peak Hour of Maximum Day

CDM

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- The areas with pressures lower than 40 pounds per square inch (psi) during peak hour of existing maximum day demands are presented in Figure 10-1. The areas that do not meet the velocity and headloss criteria of peak hour of existing maximum day demands are also presented in Figure 10-1. The only locations that are deficient are near zone gates.

- The areas with pressures lower than 40 psi during peak hour of 2030 maximum day demands are presented in Figure 10-2. The areas that do not meet the velocity and headloss criteria during peak hour of future maximum day demands are presented in Figure 10-3.

- The southern portion of Zone II does not meet the low pressure criteria for the Future 2030 scenario. This is due to a lack of transmission capacity from supply sources to this area.

If customer complaints about localized low pressures should occur in the future, a case-by-case investigation should be undertaken to field check actual service pressures and ground elevations, and to determine the most effective solution for the specific location. If near a higher zone, it may be possible to re-connect the service connection to a higher zone pipeline, or re-zone the distribution system pipeline. If the number of affected customers at a location is very small, Cal Water could negotiate a "low pressure" agreement with the customer based on high service elevation, and/or recommend that the homeowner install a small customer-owned booster pump at the service.

The model results indicate that all service pressures are below the acceptable maximum limit (125 psi), for existing and 2030 conditions.

For more detailed pressure results for existing and 2030 conditions, see maps in Appendix O.

10.6.2 Maximum Day with Fire Flow

A fire flow analysis of the entire system was conducted using the InfoWater fire flow simulator module. The analysis was done for 2030 maximum day conditions with the reservoirs at 75% full, and pump stations operating to meet maximum day demand.

Appendix H contains a report of the results for the Dominguez system showing the available fire flow at 20 psi residual pressure at all service nodes. It should be noted that these analysis results are based on model calculations, where the maximum available flow is limited by minimum pressure requirements, and does not consider velocities. The model analysis does not account for minor losses at hydrants or supply availability.

The existing system was developed prior to the current fire flow standards. Cal Water would not undertake upgrades to the existing system to meet the new standards.

However, Cal Water does use the information on the available fire flow when designing replacement projects.

Pressure at fire flow locations depends on the available head in the zone as well as the head loss in the system and the flow required. However, in general, the required fire flow amounts would likely not be met in areas with:

- Small diameter dead-end pipes, generally less than 6-inch diameter;
- 8-inch diameter dead-end pipes serving high ground elevation areas or very long dead-end segments;
- Loops of 4-inch diameter pipes at the zone periphery located away from supply sources.
- Pressure zones served by PRVs or pump stations, with no storage available, when the capacity of the PRV or the pump station does not meet the maximum fire flow requirements based on the land use of the pressure zone.

10.6.3 Recommended Pipe Capacity Improvements

To improve the pressure in Zone II, new pipe improvements are required to improve hydraulic capacity from turnouts in the southern portion of Zone II, as shown in Figure 10-4. The analysis found that the following lines would be required:

- 1,600 feet of 16-inch pipeline along Avalon Boulevard.
- 50 feet of 24-inch pipeline along E. 223rd Street.
- 2,500 feet of 24-inch pipeline along Catskill Avenue.
- 300 feet of 24-inch pipeline along 229th Place.
- 3,500 of 24-inch pipeline along Dolores Street.

The Zone II pipeline improvements assume the turnout capacity at MWD WB-36 can be expanded from 10 mgd to 13 mgd. Without this expansion, additional pipeline improvements are required.

Other than in Zone II, no other pipeline improvements are required.

10.7 Reliability Evaluation

MWD plans for disruption of imported water from both emergencies and routine maintenance of its distribution system. For emergencies (such as seismic events), MWD has developed storage, both surface and groundwater. For routine

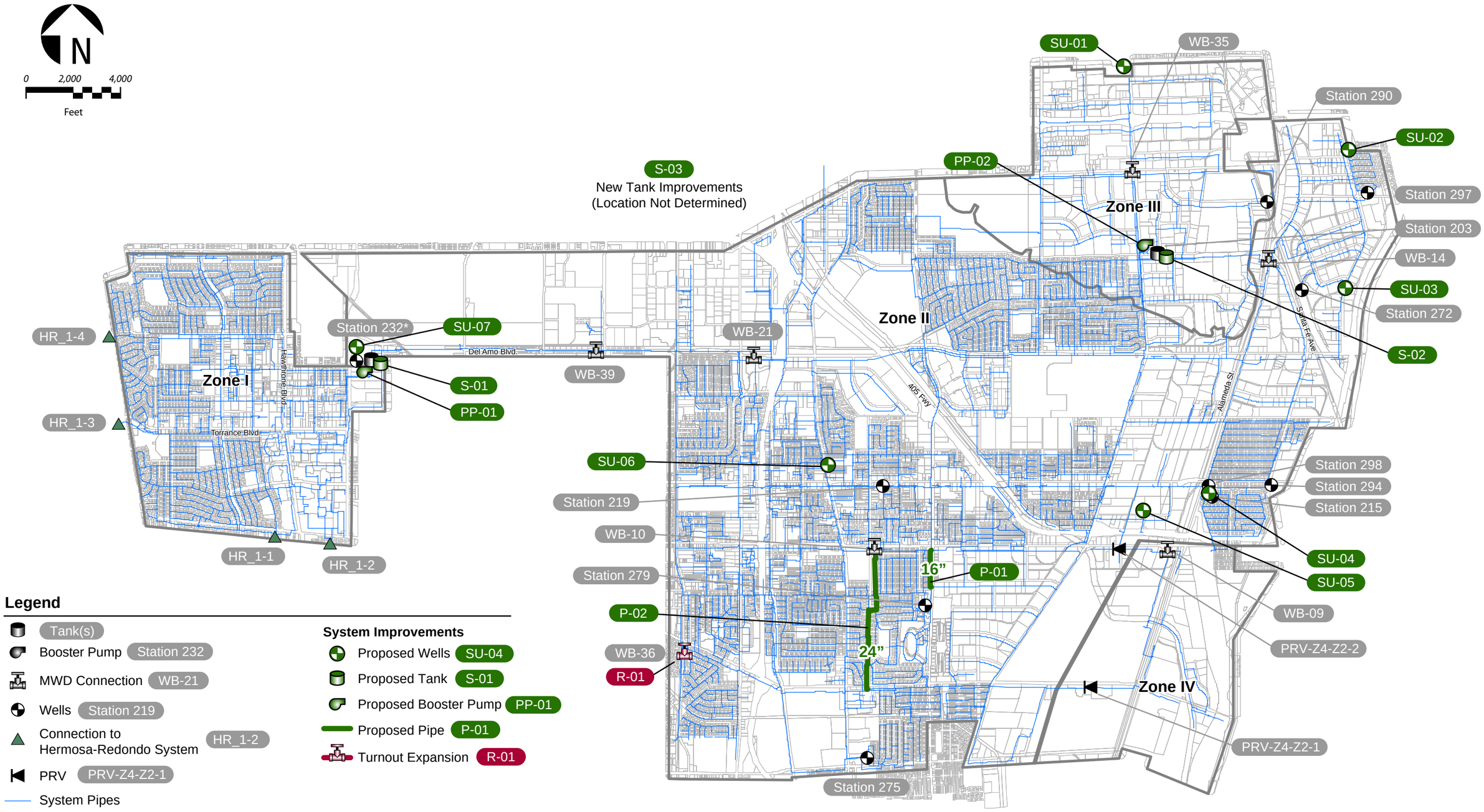

Figure 10-4
Dominguez District
Recommended System Improvements

CDM

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maintenance of its distribution system, MWD's administrative code **§ 4503. Suspension of Deliveries, part (b)** states:

> *Each member agency shall have sufficient resources such as local reservoir storage, groundwater production capacity, system interconnections or alternate supply source to sustain a seven-day interruption in Metropolitan deliveries based on annual average demands.*

This section provides a conceptual-level evaluation of the reliability due to imported supply outages or system outages for the Dominguez District, with a focus of the analysis on routine outages or localized supply disruptions, not major regional emergencies.

Table 10-7 presents the normal supply for each pressure zone and the alternative supply. The Dominguez District has flexibility to provide service from other sources (groundwater, interconnections with other agencies, turnouts on multiple feeders) for localized or limited outages and should be able to shift to alternate MWD sources or local sources during a localized or limited outage affecting one of their MWD feeder supplies.

Table 10-7
Reliability Evaluation – Dominguez Water Distribution System

Service Zone	***Normal Supply***	***Alternative Supply***
Zone I	Station 232 Hermosa-Redondo (HR) Interconnection (IC) 1 HR IC 2 HR IC 3 HR IC 4 City of Torrance Intertie (served through Station 232) Desalter Plant (served through Station 232) Well Station 203 (served through Station 232)	Hermosa-Redondo Intertie (Pruitt and 190th St.) Hermosa-Redondo Intertie (Sepulveda Blvd. and Ellinwood Dr.)
Zone II	Turnout WB-10 (Flow Control Valve) Turnout WB-14 (Flow Control Valve) Turnout WB-21 (Flow Control Valve) Turnout WB-36 (Flow Control Valve) Turnout WB-39 (Flow Control Valve) Station 215 Station 272 Station 275 Station 277 Station 279 Station 294 Station 297 Station 298	Southern California Water Company (Emergency Connection)
Zone III	Turnout WB-35 (Flow Control Valve) Station 203 Station 290	City of Compton (Emergency Connection)
Zone IV	Turnout WB-9 (Pressure Reducing Valve)	Zone II PRV Bypass (Sepulveda Blvd., East of Wilmington Ave.) Zone II PRV Bypass (E 223rd Street, East of Wilmington Ave.)

The Dominguez District receives imported water from seven different MWD connections off five feeders. Two turnouts are on MWD's Palos Verdes Feeder (WB-21 and WB-36), which supplies the west side of Zone II. One is on the Sepulveda Feeder (WB-39), which supplies the tank at Station 232 and Northwest Zone II. Two turnouts are on MWD's Long Beach Lateral (WB-9 and WB-10), which supplies Zone IV and central Zone II. One turnout is on MWD's Victoria Street Lateral to 223rd Street Cross Feeder (WB-14), which supplies the Northeast part of Zone II. One turnout is on MWD's Victoria Street Lateral (WB-35), which supplies Zone III. All of the MWD feeders are in MWD's Central Pool area which can receive water from MWD's three regional water treatment plants (WTPs) in the area: Jensen WTP, Weymouth WTP and Diemer WTP. Interconnections with other feeders provide redundancy within the MWD system.

Dominguez District has the largest local groundwater supply with approximately 9 mgd in existing well capacity. This master plan recommends development of another 9 mgd of well capacity, to maximize use of Cal Water's groundwater rights, all located within the Dominguez District. The Dominguez District also has regular connections with the Hermosa-Redondo District system, and emergency interconnections with the City of Torrance, City of Compton, and Southern California Water Company.

As shown in Table 10-7, each zone has alternative supply sources. Zone I has multiple supply sources served through Station 232, and also has interconnections to Hermosa-Redondo system, two from Zone 225-1 and two on the pipeline that supplies the system from MWD turnout WB-16. These interconnections are PRV connections which operate during peak demand periods during the day. Cal Water reports problems filling storage in the Hermosa-Redondo system when PRVs on the WB-16 supply line are operating. Cal Water also reports that the turnout appears to operate at less than its reported hydraulic capacity.

To increase the reliability of the supply to Zone I and to the Hermosa-Redondo system, a dedicated line from WB-16 turnout to the southern portion of Zone I was proposed. However, according to MWD, the hydraulic grade line at MWD turnout WB-16 ranges from 280 feet to 350 feet. The hydraulic grade line of the zone typically ranges from 265 feet to 320 feet. When the hydraulic grade line of the turnout is low at 280 feet, the turnout may not be able to serve Zone I. Therefore, the turnout cannot reliably supply Zone I at all times and this project is no longer recommended.

The recommended pipeline improvements in Zone II require an increase in the capacity of MWD WB-36 turnout from 10 mgd to 13 mgd, which is considered a reliability improvement.

The system is considered to have adequate flexibility during short-term, localized outages. No other reliability improvements are recommended for the Dominguez system, other than recommended locations for standby power, discussed in the

Section 10.4, Storage Capacity Evaluation, and the pipeline from MWD turnout WB-16, discussed above. Other zones have multiple sources of supply.

10.8 Replacement Evaluation

CDM conducted a focused assessment of the general condition of the existing pumping, storage, and treatment facilities. Nine stations in the Dominguez District were included in the assessment, based on input from Cal Water. The analysis found that in general, the Rancho Dominguez system facilities are well maintained, although some facilities are close to or beyond the end of their design useful life expectancies.

This section summarizes the findings of the replacement/renewal evaluation for the Dominguez District facilities. The assessment consisted of visual observations of facilities and discussion with the operations staff. Table 10-8 summarizes the key findings from the facilities assessment. Appendix N presents the Facilities Assessment Evaluation for the entire Rancho Dominguez District, including the Dominguez facilities.

Table 10-8
Dominguez District Facilities Assessment

Facility	*General Assessment*
Well and Booster Pump Stations	
Station 203	Likely in last 25% of service life; serious stuffing box, packing gland, pump head and pump base corrosion issues; significant cracking in concrete base pad, new motors in booster pumps 2, 3, and 6, new pump in booster pump 7; aged PRV
Station 215	Well and booster pumps 16 (215-02 and 215-B) out of service, Well and booster pumps 15 (215-01 and 215-A) likely in last 25% of service life; moderate vibration; signs of motor upper bearing oil leak
Station 232	New installation on well pump. Booster pumps likely in last 25% of service life; moderate corrosion; significant discharge piping corrosion
Station 272	Likely in last 25% of service life; moderate vibration; flow meter not working properly; aged PRV
Station 275	Booster pump in good condition; drainage from packing area must be improved to reduce chance of serious corrosion; well pump likely in last 25% of service life; potential seal damage; Aged PRV
Station 277	Likely in middle of service life; minor corrosion; aged PRV
Station 290	Likely in middle of service life; slight vibration
Station 297	Likely in middle/last 25% of service life; slight vibration and noise; signs of motor upper bearing oil leak
Station 298	Low head booster in good condition. High head booster likely in middle of service life; significant vibration; aeration and filter blowers likely in middle of service life;
Reservoirs	
Station 203 Reservoirs 1, 2, 3, and 4	Aged but exterior in good condition
Station 215 Reservoir 1	Aged but exterior in good condition; interior epoxy coated June 2002; exterior acrylic coated June 2002

Recommended improvements for the Dominguez system based on the facility assessment are:

- **Station 203:** Replace booster pumps and motors for units A, D, and E (1, 4 and 5) by 2015; replace booster pumps for units B and C (2 and 3) by 2015, replace booster pump for unit F (6) by 2020 and motor for unit G (7) by 2020.
- **Station 215:** Replace well and booster pump and motor for unit 215-02 and 215-B (16) by 2010; replace well and booster pump and motor for units 215-01 and 215-A (15) by 2020.
- **Station 232:** Replace all booster pumps and motors (5, 6, 7, 8, 9, 11, and 12) by 2020.
- **Station 272:** Replace well pump and motor by 2015
- **Station 275:** Replace well pump and motor by 2015
- **Station 290:** Replace well pump and motor by 2020
- **Station 297:** Replace booster pump and motor by 2015; replace well pump and motor by 2020
- **Station 298:** Replace high head booster pump and motor by 2015
- **Station 298:** Replace aeration and filter blowers by 2020
- **Stations 203, 272, and 275:** Replace pressure relief valves

Section 11
Water System Analysis – Hermosa-Redondo District

This section describes the results of the water system analysis conducted for the California Water Service Company (Cal Water) Hermosa-Redondo District. The system capacity analysis includes evaluation of turnout capacity, pumping capacity, storage capacity, pressure reducing valve capacity, and pipeline capacity. The analysis is based on the performance criteria described in Section 7.

This section also includes a reliability evaluation discussion for the Hermosa-Redondo District and a summary of the condition assessment for key facilities in the system.

11.1 Summary of Key Analysis Findings for Hermosa-Redondo District

Hydraulic model results and facilities assessment results were compared to the system requirements described in Section 7, Performance Criteria. Each analysis is discussed in detail later in this section.

The key findings of the water system analysis are:

- In general, the hydraulic capacity of the existing distribution system is adequate for 2030 demand conditions; few capacity improvements are needed to meet normal operating conditions.
- Existing firm pump station capacity is sufficient to meet 2030 maximum day demands for all pump stations.
- A combination of new storage (0.9 million gallons [MG] in Zone 300-2; replacement of existing Station 24 0.25 MG tanks with 0.65 MG) and standby generation capacity at four stations (Stations 9, 14, 23 and 28) is recommended to meet operational, fire, and emergency needs. Standby power should be added to all three existing wells to improve supply reliability during emergencies.
- The facilities assessment included a focused assessment at 9 stations (5, 8, 9, 23, 24, 26, 27, 28, and 29) identified for inspection by Cal Water:
    - Evaluation of installation date and visual assessment of existing pumping facilities inspected in the Hermosa-Redondo District concluded that seven pump stations have condition-related issues, and are in need of replacement of mechanical and/or electrical equipment.

- In general, the existing storage facilities inspected are in good working condition. Replacement is recommended for Reservoir 8 tanks that are very old redwood tanks with some wood deterioration around the base.

11.2 Turnout Capacity Evaluation

The Hermosa-Redondo District has two sources of supply: imported water from the West Basin Municipal Water District (WBMWD), which is a member agency of the Metropolitan Water District of Southern California (MWD), and wells.

Section 8 evaluates water supply requirements for each of three districts comprising Rancho Dominguez District and assesses imported water supply requirements. The hydraulic evaluation later in this section evaluates distributing water within the system. This section evaluates peak turnout capacity and well capacity, and compares this with projected 2030 system demand.

Table 11-1 summarizes MWD turnouts and wells and their capacities, in cubic feet per second (cfs) and million gallons per day (mgd). Hermosa-Redondo District has four turnouts on two feeders and has three wells. No hydraulic information is available for the MWD system other than turnout capacity. The analysis assumes that there is adequate hydraulic capacity within the MWD system to meet turnout capacities, if needed.

Based on a comparison of peak supply capacity and 2030 maximum day demand, there is excess peak capacity to meet maximum day demand from MWD turnouts and wells. The hydraulic analysis, discussed later in this section, indicates that individual turnouts can be operated within their rated capacity under 2030 conditions.

Table 11-1
Comparison of Hermosa-Redondo District Turnouts and Well Capacity with Maximum Day Demand

Turnout	*Capacity*		*Notes*
	cfs	*mgd*	
WB-2B	5	3	Supplies Zone 225-2
WB-5	15	10	Supplies Station 5
WB-16	25	16	Supplies Station 26
WB-29	15	10	Supplies Zone 225-2
Subtotal	60	39	
Well Station	***Capacity (mgd)***		***Notes***
08	1.0		
22	0.9		Currently off-line. Planned to be in service by end of 2009
30	1.2		Currently off-line. Planned to be in service by end of 2009
Subtotal	3.1		
Total Wells and Turnouts	42		
2030 Maximum Day Demand	23.9		Includes 22.9 mgd for Hermosa-Redondo System, 1.0 mgd served to Dominguez District via Zone 300-2 and WB-16 turnout.

11.3 Pumping Capacity Evaluation

Table 11-2 compares the existing pump station capacities with existing and 2030 pumping requirements for the system pump stations for maximum day demand conditions (assuming a 600 gallons per minute [gpm] average supply to the Dominguez System over a 24-hour period, based on field data provided by Cal Water). The table shows the total capacity of the existing pump stations and the firm capacity with the largest pump serving the zone out of service. If there are multiple pump stations serving a zone, only one standby pump is required for the zone.

The Hermosa-Redondo water distribution system was analyzed using existing configuration regarding the interconnections with the Dominguez distribution system. Zone 1 in the Dominguez system is partially supplied by the interconnections from Hermosa-Redondo system during normal operation conditions.

For zones with storage, firm pump station capacity to supply the zone must be sufficient to meet the maximum day demand of the zone it is pumping into and also the maximum day demand for all the zones served through that zone. For zones served by hydropneumatic pump stations, the pump capacity must be sufficient to meet peak hour demand.

Key conclusions of the pumping capacity analysis are:

- Existing firm pump station capacity is adequate to serve 2030 demand in Zone 300-2, including supply to the Dominguez System.
- Existing firm pump station capacity is sufficient to meet 2030 maximum day demands for pump stations serving zones with gravity storage.
- In Zone 500, the hydropneumatic pump station (Sta 24) has adequate firm capacity to meet existing and 2030 peak hour demand.

Table 11-2
Pump Station Capacity Analysis - Hermosa-Redondo Water Distribution System

Zone Supply	Supply Pump Station	Pump ID	Design Flow (gpm)	Firm Capacity[1] (gpm)	Pumping Condition	Existing			2030			Additional Capacity Required (gpm)
						Maximum Demand (gpm)	Peak Hour Demand (gpm)	Required Supply Through Pump Station (gpm)	Maximum Demand (gpm)	Peak Hour Demand (gpm)	Required Supply Through Pump Station (gpm)	
300-1 RES 01	STA.14	PMP-014-D	1,500	4,150	Maximum Demand Day (MDD)	2,200	NA	2,200	2,310	NA	2,310	None
	STA.26E	PMP-026-E	850									
	STA.28	PMP-028-A	1,800									
		PMP-028-B	2,200									
300-2 RES 03	STA.4	PMP-004-E	1,300	11,050	MDD	3,890 (no supply to Dominguez system) 4,590 (with supply to Dominguez system)	NA	7,590	4,100 (no supply to Dominguez system) 4,800 (with supply to Dominguez system)	NA	7,800	None
		PMP-004-F	1,300									
	STA.9	PMP-009-C	600									
		PMP-009-D	1,200									
	STA.13	PMP-013-E	1,000									
		PMP-013-F	1,000									
	STA.26D	PMP-026-D	1,200									
	STA.27	PMP-027-A	3,100									
		PMP-027-C	1,350									
	STA.29	PMP-029-A	1,200									
		PMP-029-B	900									
400 RES 08	STA.23	PMP-023-C	1,000	1,050	MDD	630	NA	630	630	NA	630	None
		PMP-023-D	400									
		PMP-023-E	650									
500	STA.24	PMP-024-B	450	1,050	Peak Hour Demand	300	590	590	300	590	590	None
		PMP-024-C	617									
		PMP-024-D	600									

[1] Firm capacity: total pump station capacity assuming the largest pump serving the zone out of service

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11.4 Storage Capacity Evaluation

The storage capacity required for a distribution system is comprised of the following three components: operational (balancing) storage, emergency supply storage, and fire reserve storage. The operational storage is estimated as 25 percent of the maximum day demand, and the emergency storage at 100 percent of average day demand.

Tables 11-3 and 11-4 describe by sub-area (based on the main reservoirs) the existing storage, the storage requirements for existing and 2030 conditions, and the additional storage needed to meet those requirements. There is little difference in the additional storage required for existing versus 2030 demands due to the small future increase in demands.

As discussed in the Pumping Capacity Evaluation section, the Hermosa-Redondo water distribution system was analyzed using the existing configuration regarding the interconnections with the Dominguez District. The storage capacity analysis for Zone 300-2 (where Interconnections 3 and 4 are located) considered the connection to the Dominguez System open during normal operation. Tables 11-3 and 11-4 show the results for existing and 2030 conditions, respectively.

New storage requirements for the Hermosa-Redondo District are dictated by emergency needs, for planned or unplanned equipment outages, or power outages. According to District staff, land limitations restrict locations for new storage. The only location identified is Zone 300-2 where there is space for up to 1.5 MG of storage adjacent to existing Reservoir 6. Therefore, CDM evaluated providing standby generators to those pumps serving zones where the existing gravity storage is deficient for emergency conditions, in lieu of new storage. The pumps would supply average demand, which, pumped over 24 hours, would provide the same volume as emergency storage. Table 11-5 presents the storage analysis for the Hermosa-Redondo system, and the standby power recommendations. The analysis (for 2030 conditions) shows that standby power generators are needed for four pump stations. The additional storage needed would be reduced from 6.9 MG to 1.7 MG. The additional recommended storage in Zone 300-2 is 0.9 MG. Therefore, the system improvements include a mix of storage and standby generation improvements.

Table 11-3
Hermosa-Redondo District – Existing Storage Capacity Analysis

Service Area	Existing Reservoirs Serving Area	Existing Storage (MG)	Maximum Day Demand (mgd)	Maximum Fire Flow Requirement (gpm)	Storage Requirements (MG)				Additional Storage Needed (MG)
					Operational (at 25% of max day demand)	Emergency (as one average day demand)	Fire Reserve	Total Storage Needed	
225-1 225-2	RES 01 RES 09 RES 10	4.5 5.0 7.0	12.4	3,000	3.1	7.8	0.54	11.5	None
	TOTAL	16.5							
300-1	RES 05	0.75	2.4	3,000	0.6	1.5	0.54	2.7	2.0
300-2 (1)	RES 06 RES 03	1.0 1.5	6.4	3,000	1.6	4.0	0.54	6.1	3.6
	TOTAL	2.5							
400 500	RES 08	0.35		3,000	0.2	0.6	0.54	1.3	1.0
TOTAL		20.1	20.2		5.6	13.9	2.2	21.7	6.6

(1) Zone 300-2 demand includes supply to Dominguez system through interconnections.

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Table 11-4
Hermosa-Redondo District – 2030 Storage Capacity Analysis

Service Area	Existing Reservoirs Serving Area	Existing Storage (MG)	Maximum Day Demand (mgd)	Maximum Fire Flow Requirement (gpm)	Storage Requirements (MG)				Additional Storage Needed (MG)
					Operational (at 25% of max day demand)	Emergency (as one average day demand)	Fire Reserve	Total Storage Needed	
225-1 225-2	RES 01	4.5	14.4	3,000	3.6	9.0	0.54	13.1	None
	RES 09	5.0							
	RES 10	7.0							
	TOTAL	16.5							
300-1	RES 05	0.75	2.4	3,000	0.6	1.5	0.54	2.7	2.0
300-2 [1]	RES 06	1.0	6.8	3,000	1.7	4.2	0.54	6.4	3.9
	RES 03	1.5							
	TOTAL	2.5							
400 500	RES 08	0.35	0.8	3,000	0.2	0.6	0.54	1.3	1.0
TOTAL		20.1	24.4		6.1	15.3	2.2	23.5	6.9

(1) Zone 300-2 demand includes supply to Dominguez system through interconnections.

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Table 11-5
Hermosa-Redondo District – Reduction in 2030 Storage Needs with Standby Power Added at Key Pump Stations

Zone	Existing Storage per Service Area(MG)	Operational and Fire Storage (MG)		Emergency Storage (MG)			Standby Pumping Capacity Required (gpm)		
		Storage Required to meet operational and fire flow (MG)	Additional Storage - to meet operational and fire flow(MG)	Existing Storage Available for Emergency (MG)	Emergency (as one average day demand)	Additional Storage Needed for Emergency (MG)	Emergency Storage Credit if Standby Power Installed (MG)[1]		Additional Storage Needed after Credit (MG)
300-1	0.7	1.2	0.4	None	1.5	1.5	PMP 028-A (2.0)[2] PMP 014-D (2.2)	1.5	0.4
300-2 [3]	2.7	2.2	None	0.5	4.2	3.7	PMP 004-E (1.9) [4] PMP 004-F(1.9) [4] PMP 009-C (0.9)	2.8	0.9
400 500	0.4	0.8	0.4	None	0.6	0.6	PMP 023-D (0.7) PMP 023-E (0.9)	0.6	0.4
TOTAL	3.8	4.2	0.8	0.5	6.3	5.8		4.9	1.7

(1) Standby power sized so that the firm generation capacity to a zone (total generation capacity less generation capacity of largest pumping unit) equals the required capacity to provide and equivalent storage volume over 24 hours. Maximum credit cannot exceed emergency storage needed.
(2) Station 28 and Station 14 will supply zones 300-1, 400, and 500 for emergency conditions
(3) Zone 300-2 includes supply to Dominguez through interconnections
(4) Site has existing permanent generator.

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The conclusions of the storage capacity analysis are:

- Without consideration of standby generation at pump stations, additional storage for existing and 2030 conditions is needed in Zones 300-1, 300-2, and 400. The total storage volume needed in the system to meet 2030 requirements is 6.9 MG.

- The additional storage requirements are very similar for existing and 2030 conditions.

Installation of standby generation capacity at pump stations that supply a zone where storage is required can provide equivalent reliability to customers and reduce storage needs. The existing standby generator at Station 4, along with 0.9 MG of new storage will meet emergency needs in Zone 300-2. Adding standby generators at pump stations 9, 14, 23, and 28 would meet emergency needs in other zones.

- Zone 225-1 benefits from the surplus storage available in Zone 225-2; both pressure zones are connected through a transmission pipe along Ormond Lane.

Based on the storage capacity analysis, the following additional storage is recommended in each subsystem:

- **Zone 300-1:** This zone requires an additional storage volume of 0.4 MG for operational and fire flow needs. The fire flow reserve can be met existing pump stations using storage available in lower zones, so no new storage is recommended. Emergency needs can be met by installing standby generating capacity at Stations 28 and 14. Both locations should be equipped with a switchgear for connection to a portable generator hookup. Cal Water has plans to purchase a portable generator. Purchase of one portable generator is included in recommended improvements.

- **Zone 300-2:** Zone 300-2 requires installation of generation capacity at Station 9, and 0.9 MG of new storage to meet emergency needs. Station 9 should be equipped with a switchgear for connection to a portable generator.

- **Zone 400:** This zone requires an additional storage volume of 0.4 MG for operational needs. The existing Station 24 reservoirs serving this zone are in poor condition, based on the condition assessment study performed for the master plan. Therefore, a replacement of the existing tanks is recommended, with a total storage capacity of 0.65 MG. Station 23 should be equipped with a permanent generator.

11.5 PRV Capacity Evaluation

For the pressure reducing station evaluation, existing capacity available in the zone served by pressure reducing valves (PRVs) was compared with the required capacity. The total valve capacity for zones that are supplied by PRVs and have no storage must be adequate to supply the peak hour on the maximum day, and also fire flow during the average hour on the maximum day. Typically, one or more smaller valves are used to meet normal demands, with a larger valve or additional valves to provide fire flow if needed. The fire flow valve(s) operate infrequently and serve as backup for the normal duty valves. The capacity analysis assumes that all valves are available to supply the zone.

There is only one pressure zone solely served by a PRV station: Zone 250. The supply PRV station has an existing capacity of 1,600 gpm (two 4-inch valves, capacity based on a Cla-Val globe valve maximum continuous capacity chart). The existing and 2030 capacity required to meet fire flow plus maximum day demand, is 3,100 gpm. Therefore, the existing PRV station does not meet existing or 2030 fire flow requirements. The network in this pressure zone does not have enough capacity to convey the required flow; therefore, an upgrade to the PRV station is not recommended.

11.6 Pipeline System Evaluation

A hydraulic evaluation of the existing distribution system was performed using a computerized hydraulic model of the Hermosa-Redondo system. This model was developed for the Master Plan analysis and for Cal Water operational analysis. The model was developed from the ArcGIS geodatabase provided by Cal Water using InfoWater software version 4.0 by MWHSoft. InfoWater is a stand-alone GIS-based program that combines spatial analysis tools and mapping functions with a hydraulic model.

The model was calibrated for static conditions using hydrant test data provided by Cal Water, and calibrated for extended period simulation using tank level and pressure information provided by Cal Water. The model calibrations show that the model provides a reasonable planning and operational evaluation tool for the Hermosa-Redondo system. Appendix I provides a detailed description of the hydraulic model development and calibration.

The hydraulic model was used to assess the distribution system's ability to meet:

- Normal Demand Conditions. Normal demands are tested with simulations of system operation at peak hour on the maximum demand day.
- Fire Flows. The system's ability to provide fire flow is tested under maximum day demand conditions.

This section describes these two evaluations.

11.6.1 Normal Demand Conditions

The capacity evaluation of the existing pipeline system was based on the pressure, velocity and headloss criteria presented in Section 7.

A steady state simulation was conducted to check peak hour conditions, for existing and 2030 demands. This analysis was based on normal supply conditions, pump stations operating, and reservoirs operating within the top 25% of capacity. Pressures were evaluated at all nodes with demands, i.e., service nodes. Velocity and head loss were evaluated for all pipelines in the system.

For peak hour at 2030 conditions, Figure 11-1 shows locations of pipes with high head loss and high velocity that exceed the performance criteria. The results for existing and 2030 conditions are very similar, due to the small incremental increase in demand (11%)[1]; the existing Hermosa-Redondo service area is considered close to buildout.

Pressure is the key criterion for evaluating the existing pipeline system. Existing pipes that provide adequate pressures in the system are not identified for improvement solely due to not meeting the maximum velocity and head loss criteria. Cal Water uses the headloss/velocity information if the pipes require replacement for leaks or breaks, to evaluate whether a larger diameter pipe may be warranted to reduce head losses. The areas with pressures lower than 40 pounds per square inch (psi) during peak hour (existing and 2030 conditions) are presented in Figure 11-1. Table 11-6 presents the low pressure areas in the system and the recommendations in each case. (See Appendix O for more detailed pressure results for existing and 2030 conditions).

Table 11-6
Hermosa-Redondo District Low Pressure Areas Identified in 2030 Peak Hour of Maximum Demand Day Hydraulic Analysis

Area ID (1)	Location	Reason for Pressure Problem	Minimum Pressure (psi)	Recommended Improvement
L01	South end of Zone 225-1, Paseo Miramar	High Ground Elevation	33-39 psi	None
L02	West end of 190th St, in Zone 225-2	Pipe Diameter and Elevation	25-27 psi	Connect to Zone 300-2
L03	Pacific Coast Hwy and 21st St, Zone 225-1	High Ground Elevation	30-38 psi	None
L04	Lines around Prospect Ave and Sepulveda Blvd, and along Pearl St from Lucia Ave to Francisca Ave	Transmission line outside of normal zone boundary	20 psi	none

(1) See Figure 11-1 for location.

[1] Facilities planning for the 2030 scenario considers demand projections without Cal Water's planned conservation programs, to provide flexibility in facilities sizing. Implementation of planned conservation would reduce projected demands.

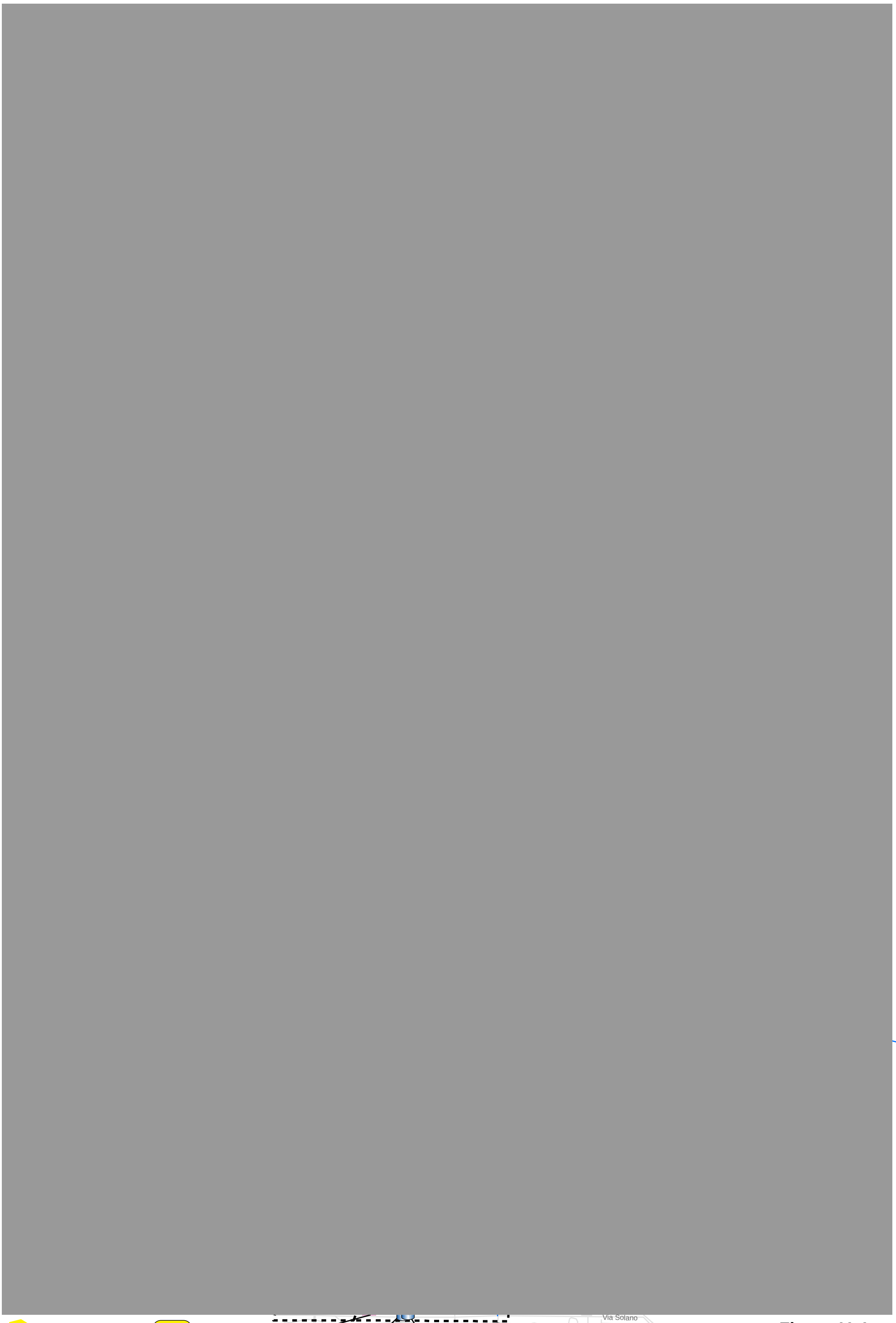

Figure 11-1
Hermosa-Redondo District - Hydraulic Model Results
2030 Peak Hour of Maximum Day

CDM

If customer complaints about localized low pressures should occur in the future, a case-by-case investigation should be undertaken to field check actual service pressures and ground elevations, and to determine the most effective solution for the specific location. If near a higher zone, it may be possible to re-connect the service connection to a higher zone pipeline, or re-zone the distribution system pipeline. If the number of affected customers at a location is very small, Cal Water could negotiate a "low pressure" agreement with the customer based on high service elevation, and/or recommend that the homeowner install a small customer-owned booster pump at the service.

The model results indicate that all service pressures are below the acceptable maximum limit (125 psi), for existing and 2030 conditions. For more detailed pressure results for existing and 2030 conditions, see maps in Appendix O.

11.6.2 Maximum Day with Fire Flow

A fire flow analysis of the entire system was conducted using the InfoWater fire flow simulator module. The analysis was done for 2030 maximum day conditions with the reservoirs at 75% full, and pump stations operating to meet maximum day demand.

Appendix J contains a report of the results for the Hermosa-Redondo system showing the available fire flow at 20 psi residual pressure at all service nodes. It should be noted that these analysis results are based on model calculations, where the maximum available flow is limited by minimum pressure requirements, and does not consider velocities. The model analysis does not account for minor losses at hydrants or supply availability.

The existing system was developed prior to the current fire flow standards. Cal Water would not undertake upgrades to the existing system to meet the new standards. However, Cal Water does use the information on the available fire flow when designing replacement projects.

Pressure at fire flow locations depends on the available head in the zone as well as the head loss in the system and the flow required. However, in general, the required fire flow amounts would likely not be met in areas with:

- Small diameter dead-end pipes, generally less than 6-inch diameter;
- 8-inch diameter dead-end pipes serving high ground elevation areas or very long dead-end segments;
- Loops of 4-inch diameter pipes at the zone periphery located away from supply sources.
- Pressure zones served by PRVs or pump stations, with no storage available, when the capacity of the PRV or the pump station does not meet the maximum fire flow requirements based on the land use of the pressure zone.

11.6.3 Recommended Pipe Capacity Improvements

To improve the pressure in the line on 190th St (east of Flager Ln), 85 feet of new 6-inch pipe is recommended. The pipeline would connect to the existing 6-inch on 190th St (currently in Zone 225-2) and to the existing 6-in on Flager Ln (currently in Zone 300-2), to re-zone the pipe on 190th Street to the 300-2 zone. The existing valve (Green Ln) must be closed, to re-zone the existing pipe along 190th St to the 300-2 Zone.

11.7 Reliability Evaluation

MWD plans for disruption of imported water from both emergencies and routine maintenance of its distribution system. For emergencies (such as seismic events), MWD has developed storage, both surface and groundwater. For routine maintenance of its distribution system, MWD's administrative code **§ 4503. Suspension of Deliveries, part (b)** states:

> *Each member agency shall have sufficient resources such as local reservoir storage, groundwater production capacity, system interconnections or alternate supply source to sustain a seven-day interruption in Metropolitan deliveries based on annual average demands.*

This section provides a conceptual-level evaluation of the reliability due to either imported supply outages or system outages for the Hermosa-Redondo District. The focus of the analysis is on routine outages or localized supply disruptions, not major regional emergencies.

Table 11-7 presents the normal supply for each pressure zone and the alternative supply. For the Hermosa-Redondo District, all the service zones have the ability to be supplied from an alternative source.

Hermosa-Redondo system is supplied by local wells and MWD turnouts from two different MWD feeders. MWD's West Basin Feeder supplies turnouts on the northern side of the system (WB-2B, WB-29 and WB5). WB-29 and WB-2B supply Zone 225-2, which is also supplied by Well 30 and Well 8. WB-5 supplies Zone 225-1. MWD's Second Lower Feeder supplies the turnout on the southeast side of the system (WB-16), which supplies 225-1. Both of the MWD feeders are in MWD's Central Pool area that can receive water from MWD's three regional water treatment plants (WTPs) in the area: Jensen WTP, Weymouth WTP, and Diemer WTP. Interconnections with other feeders provide redundancy within the MWD system.

Table 11-7 Reliability Evaluation – Hermosa-Redondo Water Distribution System		
Service Zone	**Normal Supply**	**Alternative Supply**
Zone 225-1	Turnout WB 16	Connection to Zone 225-2, Reservoir 09 Emergency PRV from Zone 300-1 (Paseo de la Concha) Emergency PRV from Zone 300-2 (Francisca Ave) City of Torrance emergency interconnection
Zone 225-2	Turnout WB 5, Sta 05 (pumping from Reservoir 10) Turnout WB 29 (Flow Control Valve) Well Field	Emergency PRV from Zone 300-1 (Wollacott Ave) Emergency PRV from Turnout WB 5 (Aviation & Carnegie Ln) City of El Segundo emergency interconnection City of Manhattan Beach emergency interconnection Dominguez District emergency interconnection (190th Street and Pruitt) Turnout WB 2
Zone 300-1	Sta 28 and Sta 26E	Sta 14
Zone 300-2	Sta 09 and Sta 26D	Sta 04 and Sta 13
Zone 400	Sta 23	Standby PV Connection (Via Alameda) Standby PV Connection (Palos Verdes Blvd)
Zone 500	Sta 24	Standby PV Connection (Via Colusa)

Cal Water also maintains emergency interconnections with other agencies adjacent to the WB-16 and WB-5 turnouts, and normal and emergency interconnections with the Palos Verdes District system. From Zones 225-1 and 225-1, Cal Water pumps to other zones within the Hermosa-Redondo system. As shown in Table 11-7, each zone has alternative supply sources. In the event of a disruption in MWD supply, only the emergency connection with Cal Water's Dominguez system, the City of Torrance and the one with the City of Manhattan Beach can deliver groundwater, and their ability to do so would depend on their having excess production capacity beyond their own system demands.

To increase supply reliability, standby generators should be installed at the existing three wells. No other reliability improvements are recommended for the Hermosa-Redondo system, other than recommended locations for standby power, discussed in the Storage Capacity Evaluation.

11.8 Replacement Evaluation

CDM conducted a focused assessment of the general condition of the existing pumping, storage and treatment facilities. Nine stations were included in the assessment, based on input from Cal Water. The analysis found that in general, the Rancho Dominguez system facilities are well maintained, although some facilities are close to or beyond the end of their design useful life expectancies.

This section summarizes the findings of the replacement/renewal evaluation for the Hermosa-Redondo District facilities. The assessment consisted of visual observations of facilities and discussion with the operations staff. Table 11-8 summarizes the key findings from the facilities assessment. Appendix N presents the Facilities Assessment Evaluation for the entire Rancho Dominguez District, including the Hermosa-Redondo facilities.

Recommended improvements to the system based on the facility assessment are:

- **Station 9:** Replace Units C and D (pump and motor) by 2020. Install SCADA equipment. Cal Water has also identified a need for a switchgear for portable generator hookup.
- **Station 23:** Replace Unit C (pump and motor, by 2015), Replace Unit D (pump and motor, by 2020), Replace Unit E (pump, by 2020). Replace electrical system.
- **Station 26:** Replace Unit D (pump and motor), Replace Unit E (pump) by 2015. Install SCADA equipment. Cal Water has also identified a need for a switchgear for portable generator hookup.
- **Station 28:** Replace Units A and B (pump and motor) by 2020
- **Station 29:** Replace Unit A (pump and motor, by 2020), Replace Unit B (pump and motor, by 2015). Replace electrical system.
- **Station 08:** Replace Well Pump No 2 (pump and motor) by 2020. Install SCADA equipment.
- **Station 24:** Replacement of Reservoirs 08-1, 08-2, 08-3, and 08-4, by 2020.

Table 11-8 Hermosa-Redondo District Facilities Assessment	
Facility	***General Assessment***
Pump Stations	
Sta 05	Likely in middle of service life, mechanical equipment appears in reasonable condition; electrical equipment in average condition; SCADA system recently installed.
Sta 09	Likely in middle of expected life, moderate corrosion; electrical equipment in average condition; no SCADA system. Recommend replacement of units C and D pumps and motors by 2020.
Sta 23	Likely in middle of expected life (Unit C likely in last 25% of service life), moderate corrosion, Unit E new motor installed in last year; The electrical equipment is in average condition, but is reaching the end of it useful life; SCADA system in site. Recommend replacement of unit C pump and motor by 2015, unit D pump and motor by 2020 and unit E pump by 2020, electrical system by 2015.
Sta 24	Likely in middle of expected life; moderate corrosion. Unit B Pump and motor recently rebuilt and running smoothly.
Sta 26	Likely in last 25% of service life; moderate corrosion; Unit E motor rebuilt March 2005; electrical equipment in average condition; no SCADA system. Recommend replacement of unit D pump and motor, and unit E pump by 2015.
Sta 27	Unit A: well past expected service life; not used often because of high pumping rate; Unit C: New pump and motor in last 6 months. Recommend replacement of unit A pump and motor by 2010.
Sta 28	Likely in middle of expected life; moderate corrosion; electrical equipment is in average condition; SCADA system in site. Recommend replacement of units A and B pumps and motors by 2020.
Sta 29	Likely in middle of expected life; moderate pump head corrosion; the electrical equipment has exceeded its useful life; SCADA system in site. Recommend replacement of unit A pump and motor by 2015, unit B motor by 2020, and electrical system by 2010.
Wells	
Sta 8	Likely in middle of expected life; moderate surface corrosion, ammonia system appears in good condition; electrical equipment in average condition; no SCADA system.
Reservoirs	
Reservoir 01 (Sta 26)	Aged but exterior in good condition; interior epoxy-urethane coated November 1998.
Reservoir 05 (Sta 23)	Aged but exterior in good condition; interior epoxy-urethane coated November 2005.
Reservoir 06 (Sta 27)	Aged; out of service for interior cleaning and coating.
Reservoir 08 (Sta 24)	Very old redwood tank; interior fiberglass coated; exterior alkyd coated October 2003; some wood deterioration around base.
Reservoir 09 (Sta 9)	Aged but exterior in good condition.
Reservoir 10 (Sta 5)	Aged but appears in good condition.

Section 12
Water System Analysis – Palos Verdes District

This section describes the results of the water system analysis conducted for the California Water Service Company (Cal Water) Palos Verdes District system. The system capacity analysis includes evaluation of turnout capacity, pumping capacity, storage capacity, pressure reducing valve (PRV) capacity, and pipeline capacity. The analysis is based on the performance criteria described in Section 7.

This section also includes a reliability evaluation and a summary of the condition assessment for the facilities in the Palos Verdes District system.

12.1 Summary of Key Analysis Findings for Palos Verdes District

Hydraulic model results and facilities assessment results were compared to the system requirements described in Section 7, Performance Criteria. Each analysis is discussed in detail later in this section.

For analysis purposes, the system was divided into the following subareas:

- D-500 Cascade consisting of the area served by Reservoirs 01 and 05 (Zone D-500 and other zones served through PRVs from D-500);
- Zone J-600: area served by Reservoirs 02 and 08;
- C-850 Cascade consisting of the area served by Reservoir 19 (Zone C-850 and other pressure zones served through PRVs from C-850); and
- P-1450 Cascade consisting of the area served by Reservoir 20 (Zone P-1450 and other pressure zones and reservoirs served through PRVs from P-1450).

The key findings of the water system analysis are:

- For the entire system, 20.3 million gallons (MG) additional storage is needed for existing conditions and 24.0 MG for 2030 conditions. This additional storage volume is assuming Time-of-Use pump operation conditions for Stations 22, 23, 30, and 37. Due to the limited number of locations available to site new storage within the District, a combination of 8.5 MG of new storage and standby power at key pump stations, to pump water from Metropolitan Water District of Southern California's (MWD) Palos Verdes Reservoir to distribution system service areas, is recommended.
- Additional pumping capacity is required in all subsystems with gravity storage, with the exception of the Reservoir 19 subsystem.

- In Zone P-1600, the combined capacity of the hydropneumatic pump stations (Stations 14 and 38) serving the zone have adequate firm capacity for peak hour demand.

- For 23 pressure zones, the existing PRV capacity does not meet existing and 2030 supply requirements. Only 8 of the 23 have adequate existing conveyance capacity for maximum day conditions.

- The system analysis indicated eight areas where pressures during normal operation are below minimum levels. Additional piping and a change in pressure setting at a PRV station will resolve minimum pressure issues in the system.

- The system analysis indicated seven areas where the pressure is higher than maximum allowable levels. These high pressure areas are at the lowest elevations relative to the zone's hydraulic grade line (HGL), and occur due to the area's unique topography. New PRVs or adjustment of settings for existing PRVs are options to resolve maximum pressure issues in the system.

- The facilities assessment included a focused assessment at 9 stations (4, 5, 14, 15, 22, 23, 30, 37, and 38) identified for inspection by Cal Water.

    - Evaluation of installation date and visual assessment of existing pumping facilities in the Palos Verdes District concluded that eight pump stations have condition related issues, and are in need of replacement of mechanical and/or electrical equipment.

    - Existing storage facilities in the system are, in general, in good working condition.

12.2 Turnout Capacity Evaluation

The Palos Verdes District has a single source of supply: imported water from the West Basin Municipal Water District (WBMWD), which is a member agency of MWD.

Section 8 evaluates water supply requirements for each of three districts comprising the Rancho Dominguez District and assesses imported water supply requirements. The hydraulic evaluation later in this section evaluates distributing water within the system. This section evaluates peak turnout capacity and well capacity, and compares this with projected 2030 system demand.

Table 12-1 summarizes turnouts that supply the Palos Verdes District, in cubic feet per second (cfs) and million gallons per day (mgd). Palos Verdes District has four turnouts on two feeders. No hydraulic information is available for the MWD system other than turnout capacity. The analysis assumes that there is adequate hydraulic capacity within the MWD system to meet turnout capacities, if needed.

Table 12-1
Comparison of Palos Verdes District Turnouts and Well Capacity with Maximum Day Demand

Turnout	Capacity cfs	Capacity mgd	Notes
WB-6A	30	19	Supplies MWD's Palos Verdes Reservoir
WB-6B	5	3	Supplies MWD's Palos Verdes Reservoir
WB-32	40	26	Supplies MWD's Palos Verdes Reservoir.
WB-40	40	26	Supplies Stations 15D and 22.
Total	115	74	
2030 Maximum Day Demand	--	39.5	Based on average daily demand of 19.7 mgd, and a peaking factor of 2.0. Assumes that 0.6 mgd of average daily supply met from future recycled water project based on supply projections developed in this study.
Difference		30.5	

Turnouts WB-6A, WB-6B and WB-32 supply Palos Verdes Reservoir. Cal Water facilities draw from the reservoir. Turnout WB-22 directly supplies Station 15 (D pump only) and Station 22. Based on the comparison of peak supply capacity and maximum day 2030 demand, there is adequate peak capacity to meet maximum day demand from MWD turnouts.

12.3 Pumping Capacity Evaluation

Table 12-2 compares the existing pump station capacities with existing and 2030 pumping requirements for the system's pump stations. The table shows the total capacity of the existing pump stations and the firm capacity with the largest pump serving the zone out of service. If there are multiple pump stations serving a zone, only one standby pump is required for the zone.

For zones with storage, and pump stations operated on time-of-use electric rate schedules (Stations 22, 23 and 30), firm pump station capacity must be sufficient to meet 130 percent of maximum day demand of the zone it is pumping into and also 130 percent of maximum day demand for all the zones served through that zone. For all other pump stations, pump station capacity must be sufficient to meet maximum day demand of the zones supplied by the pump station. Table 12-2 indicates the operating condition (24-hour or 18-hour pumping) that must be met by each pump station.

For zones served by hydropneumatic pump stations, pump capacity must be sufficient to meet peak hour demand.

Key conclusions of the pumping capacity analysis are:

- Additional pumping capacity is required in all subsystems with storage, with the exception of the Reservoir 19 subsystem.
- In Zone P-1600, the combined capacity of the hydropneumatic pump stations (Stations 14 and 38) serving the zone have adequate capacity for peak hour demand.

Based on the pump station capacity analysis, and considering time-of-use operation conditions for stations supplying Reservoirs 19 and 20, the following pump stations will require an upgrade to meet 2030 service requirements:

- **Station 04:** upgrade to a firm capacity of at least 1,600 gallons per minute (gpm), it is recommended to replace both pumps with 1,600 gpm (total dynamic head [TDH]=160 feet) pumps, for redundancy.
- **Station 15:** upgrade to a firm capacity of at least 5,700 gpm, requires an additional 1,600 gpm. It is recommended to replace the existing 1,300 gpm and 1,200 gpm with two 2,200 gpm pumps (TDH=250 ft). This improvement is recommended assuming the Zone J-600 main supply is Pump Station 04.

With the current configuration of the system, Station 23 is deficient in serving the P-1450 Cascade. Recommended reliability improvements for the Crenshaw project (see Section 12.6) will address this deficiency.

Table 12-2
Pump Station Capacity Analysis – Palos Verdes Water Distribution System

						Existing Scenario					2030 Scenario					
						Demands			Operation Condition		Demands			Operation Condition		
									Pumping 24 hrs	Pumping 18 hrs				Pumping 24 hrs	Pumping 18 hrs	
Sub-system Supplied	Supply Pump Station	Pump ID	Design Flow (gpm)	Firm Capacity[1] (gpm)	Supply Scenario	Average Demand (gpm)	Max Demand (gpm)	Peak Hour Demand (gpm)	Required Supply Through Pump Station (gpm)	Required Supply Through Pump Station (gpm)	Average Demand[2] (gpm)	Max Demand (gpm)	Peak Hour Demand (gpm)	Required Supply Through Pump Station (gpm)	Required Supply Through Pump Station (gpm)	Additional Capacity Required (gpm)
RES 02&08	04	4A	1,200													
		4C	500	500	Max Day Demand (MDD)	800	1,590	N/A	1,590	N/A	800	1,590		1,590	N/A	1,100
D-500	15	15A	1,700													
		15B	1,300													
		15C	1,200													
		15D	2,800	4,200	MDD	2,290	4,570	N/A	4,570	N/A	2,870	5,740		5,740	N/A	1,600
RES 19	22	22A	2,700													
		22B	2,300													
		22C	2,700													
		22D	2,700													
		22E	3,800													
		22F	3,700													
		22G	3,800													
		22H	3,300													
	30	30B	2,400													
		30C	2,700													
		30D	2,700													
		30E	3,700	32,700	MDD	10,530	21,060	N/A	21,060	28,080	10,860	21,710		21,710	28,950	None
P-1600 (hydro-pneumatic)	14	14A	240													
		14B	280													
	38	38A	500													
		38B	500	1,020	Peak Hour Demand	130	250	540	540	N/A	130	250	540	540	N/A	None
RES 20 & 26	23	23A	2,400													
		23B	2,400													
		23C	2,400													
		23D	2,400													
		23E	2,400													
		23F	2,400													
		23G	3,700													
		23H	3,700	18,100	MDD	8,730	17,460	N/A	17,460	23,280	8,550	17,090		17,090	22,790	4,700

(1) Capacity with largest unit out of service

(2) Future average daily demand is total future demand of 20.3 mgd (see Table 3-26), less 0.6 mgd future demand met from recycled supply.

12.4 Storage Capacity Evaluation

The storage capacity required for a distribution system is comprised of the following three components: operational (balancing) storage at 25 percent of the maximum day demand; emergency storage at 100 percent of the maximum day demand; and fire reserve storage. The emergency storage for the Palos Verdes District is based on one maximum day (rather than Cal Water's typical average day) due to the supply vulnerabilities discussed in Section 9.4

Tables 12-3 and 12-4 describe by service area (named after the highest service area in each cascade): the existing storage, the total storage requirements for existing and 2030 conditions, and the additional storage needed to meet those requirements.

Storage requirements were increased by 2.0 MG in the C-850 and P-1450 areas to accommodate time-of-use pumping; this adjustment was based on taking the difference in total cumulative volume required to supply the service area when operating on time-of-use pumping, compared with 24-hour pumping. Key findings of the storage capacity analysis are:

- D-500 Cascade: For existing conditions, this area requires additional storage capacity of 4.4 MG. For 2030 conditions, this area requires an additional storage of 6.1 MG.
- Zone J-600: For existing and 2030 conditions, this area requires additional storage capacity of 3.1 MG.
- C-850 Cascade: For existing conditions, the area served by Reservoir 19 requires an additional storage of 2.0 MG. For 2030 conditions, this area requires additional storage capacity of 3.6 MG.
- P-1450 Cascade: For existing conditions, this area served by Reservoir 20 requires additional storage capacity of 10.8 MG. For 2030 conditions, the additional storage required is 11.1 MG.

For the entire system, 20.3 MG additional storage is needed for existing conditions and 24.0 MG for 2030 conditions. Storage is needed to meet emergency needs. Due to the developed nature of the Palos Verdes area, there are few potential new sites for such uses. The District has, as part of past master planning efforts, identified potential storage locations for up to four new reservoirs with a total of 8.5 MG.

Table 12-3
Palos Verdes District – Existing Storage Capacity Analysis

Service Area	Existing Reservoirs Serving Area	Existing Storage Capacity (MG)	Average Day Demand (mgd)	Maximum Day Demand (mgd)	Maximum Fire Flow Requirement (gpm)	Storage Requirements (MG)					Additional Storage (MG)
						Operational (at 25% of max day demand)	Emergency (as one maximum day demand)	Fire Reserve	Additional Storage for Time-Of-Use Operation	Total Storage Needed	
D-500 Cascade											
RES 01&05	RES 01	0.1									
	RES 05	1.5									
	Subtotal	1.6	2.2	4.4	3,000	1.1	4.4	0.5	N/A	6.0	4.4
J-600 Zone											
RES 02&08	RES 02	0.1									
	RES 08	0.1									
	Subtotal	0.2	1.1	2.2	3,000	0.6	2.2	0.5	N/A	3.3	3.1
C-850 Cascade											
		6.0									
	RES 19	6.0	2.6	5.2	3,000	1.3	5.2	0.5	1.0	8.0	2.0
P-1450 Cascade											
	RES 20 & 26	12.5									
	RES 12	0.1									
	RES 13	0.2									
	RES 17	0.1									
	RES 21	0.1									
	RES 22	0.1									
	RES 25	9.5									
	RES 06	0.1									
	Subtotal	22.7	12.4	24.7	5,000	6.2	24.7	1.5	1.0	33.4	10.8
TOTAL		**30.5**	**18.3**	**36.5**		**9.1**	**36.5**	**3.1**	**2.0**	**50.8**	**20.3**

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Table 12-4
Palos Verdes District – 2030 Storage Capacity Analysis

Service Area	Existing Reservoirs Serving Area	Existing Storage (MG)	Average Day Demand (1) (mgd)	Maximum Day Demand (1) (mgd)	Maximum Fire Flow Requirement (gpm)	Storage Requirements (MG)					Additional Storage (MG)
						Operational (at 25% of max day demand)	Emergency (as one maximum day demand)	Fire Reserve	Additional Storage for Time-Of-Use Operation	Total Storage Needed	
D-500 Cascade RES 01&05	RES 01	0.1									
	RES 05	1.5									
	Subtotal	1.6	2.9	5.7	3,000	1.4	5.7	0.5	N/A	7.7	6.1
J-600 Zone RES 02&08	RES 02	0.1									
	RES 08	0.1									
	Subtotal	0.2	1.1	2.2	3,000	0.6	2.2	0.5	N/A	3.3	3.1
C-850 Cascade RES 19	RES 19	6.0	3.2	6.5	3,000	1.6	6.5	0.5	1.0	9.6	3.6
P-1450 Cascade RES 20	RES 20 & 26	12.5									
	RES 12	0.1									
	RES 13	0.2									
	RES 17	0.1									
	RES 21	0.1									
	RES 22	0.1									
	RES 25	9.5									
	RES 06	0.1									
	Subtotal	22.7	12.5	25.0	5,000	6.3	25.0	1.5	1.0	33.8	11.1
TOTAL		**30.4**	**19.7**	**39.5**		**9.9**	**39.5**	**3.1**	**2.0**	**54.4**	**24.0**

(1) Future demand is based on a total average daily demand of 20.3 mgd (see Table 3-26) less 0.6 mgd of future demand to be met by recycled water supply.

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Depending upon the specific system, Cal Water considers standby power as an alternative to emergency storage, to meet customer reliability during emergencies. The Palos Verdes system is supplied from MWD's 350 MG Palos Verdes Reservoir, which could be used during emergencies provided that water could be distributed to the system. Therefore, if standby power can be provided to pump stations serving areas that have emergency needs, emergency storage can be eliminated in these areas.

A combination of storage and standby power improvements are recommended, based on storage projects already identified by the District and an analysis of pump stations that could be used to move water from MWD's Palos Verdes Reservoir to various service areas within the district:

- D-500 Cascade: Due to the demand growth expected in this area, the District already identified a location for additional storage, a new 2.0 MG reservoir near the intersection of Via Olivera and Via Zumaya. To meet customer demands during emergencies, this cascade will require backup power generators in Stations 15-A, 15-B, and 15-D pumps as an alternative to additional storage (4.1 MG for 2030 conditions).

- Zone J-600: Due to reliability issues of Zone P-1450, the District already indentified a location for additional storage, a new 3.0 MG reservoir located at the intersection of Crenshaw Blvd and Silver Spur Rd. This new tank will meet the zone requirements for 2030 conditions.

- C-850 Cascade: The existing storage in this zone is adequate to serve operational and fire flow requirements. For emergency conditions, this cascade will require backup power generators in Stations 22-A and 22-C pumps as an alternative to additional storage (3.6 MG for 2030 conditions).

- P-1450 Cascade: Recommended storage in this cascade includes a new 1.5MG reservoir (Hesse) located south of Indian Peak Rd and Crossfield Dr, and a new 2.0 MG Ganado Reservoir in the A-Cascade. For emergency conditions, this cascade (P-1450) will require backup power generators in Stations 22-B, 22-D, 22-E, 23-A, 23-B, and 23-C pumps as an alternative to additional storage (7.1 MG for 2030 conditions). Backup generators are needed in Station 22 to pump from the MWD Palos Verdes Reservoir to Reservoir 19, and generators in Station 23 to pump from Res 19 to Res 20.

12.5 PRV Capacity Evaluation

For the pressure reducing station evaluation, existing capacity available in each zone served by PRVs was compared with the required capacity. The total valve capacity for zones that are supplied by PRVs and have no storage must be adequate to supply the peak hour on the maximum day, and also fire flow during the average hour on the maximum day. Typically, one or more smaller valves are used to meet normal

demands, with a larger valve or additional valves to provide fire flow if needed. The fire flow valve(s) operate infrequently and serve as backup for the normal duty valves. The capacity analysis assumes that all valves are available to supply the zone.

Appendix K presents the existing valve capacity for all pressure zones served by PRVs, and compares it with existing and 2030 demands under various demand conditions. The capacity of the existing valves was calculated using Cla-Val globe-style valve flow chart for maximum continuous flow through the valve. Appendix K also presents the supply condition that must be met through the PRV station: Maximum Day Demand (MDD) if peak hour and fire flow are provided from reservoir storage within the PRV zone; or MDD plus fire flow if the PRV zone does not have reservoir storage.

Table 12-5 summarizes the pressure zones served solely by PRVs where existing PRV capacity does not meet existing and 2030 supply requirements. The table also indicates if the existing conveyance system is adequate to serve the maximum supply condition. A PRV upgrade is not be recommended for those locations where the distribution system is not able convey the maximum required flow through the valve station. PRV stations to be upgraded will require a new large (6-inch) reducing valve, to meet existing and 2030 maximum day plus fire flow requirements.

Table 12-5
Pressure Zones with Deficient Existing PRV Capacity

Pressure Zone	*PRV ID*	*Existing Distribution System Capacity to Convey Maximum Flow Through PRV* [(1)]
A-970	A130	Adequate
B-340	B177	Adequate
B-750	B173	Adequate
E-1150-2	E117	Adequate
P-1300-3	P189	Adequate
P-1300-7	P234	Adequate
P-1300-8	P240	Adequate
B-280	B154	Deficient
B-500-3	B127	Deficient
B-700	B51	Deficient
C-585	C72	Deficient
C-640	C168	Deficient
C-700-1	C38	Deficient
C-750	C169	Deficient
D-280	D263	Deficient
F-1150-2	F1	Deficient
F-600-2	F132	Deficient
F-820	F10	Deficient
J-675	J241	Deficient
N-600	N171	Deficient

(1) Based on fire flow analysis using hydraulic model.

12.6 Pipeline System Evaluation

A hydraulic evaluation of the existing distribution system was performed using a computerized hydraulic model of the Palos Verdes system. This model was updated for the Master Plan analysis and for Cal Water operational analysis. An existing model (developed for the 2001 Master Plan) was updated using the ArcGIS geodatabase provided by Cal Water and current demands. The selected software was InfoWater version 4.0 by MWHSoft. This is a stand-alone GIS-based program that combines spatial analysis tools and mapping functions with a hydraulic model.

The model was calibrated for static conditions using hydrant test data provided by Cal Water, and calibrated for extended period simulation using tank level and pressure information provided by Cal Water. The model calibrations show that the model provides a reasonable planning and operational evaluation tool for the Palos Verdes system. Appendix L provides a detailed description of the hydraulic model development and calibration.

The hydraulic model was used to assess the distribution system's ability to meet:

- Normal Demand Conditions. Normal demands are tested with simulations of system operation at peak hour on the maximum demand day. A combination of static and extended period simulation runs was used to identify deficiencies and size improvements.

- Fire Flows. The system's ability to provide fire flow is tested under maximum day demand conditions.

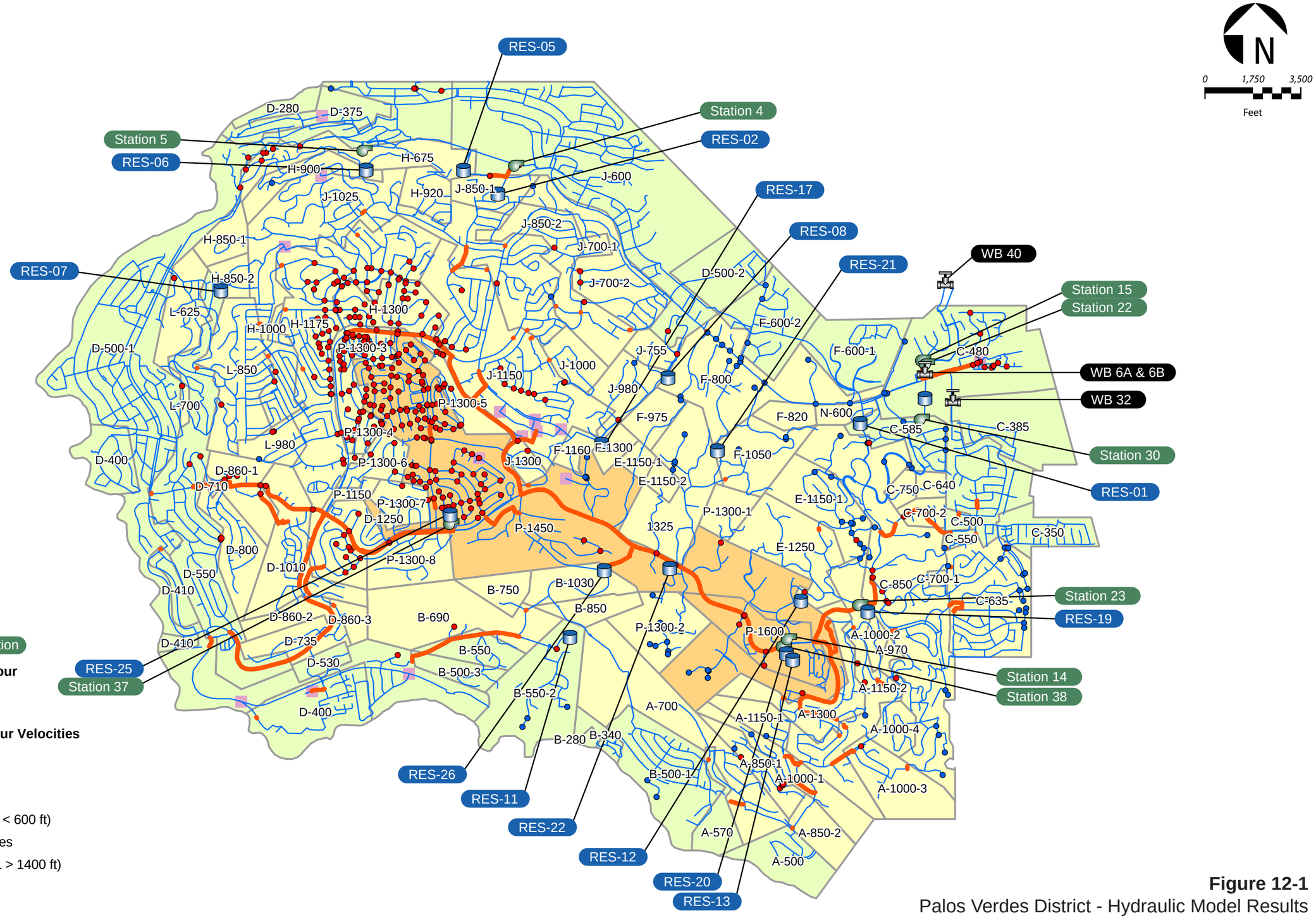
Each of the scenario evaluations is described below.

12.6.1 Normal Demand Conditions

The capacity evaluation of the existing pipeline system was based on the pressure, velocity and headloss criteria presented in Section 7.

A steady state simulation was conducted to check peak hour conditions (for existing and 2030 demands). This analysis was based on normal supply conditions, pump stations operating, and reservoirs operating within the top 25 percent of capacity. Pressures were evaluated at all nodes with demands, i.e., service nodes. Velocity and headloss were evaluated for all pipelines in the system.

For peak hour on the maximum day at 2030 demand conditions, Figure 12-1 shows locations of pipes with high headloss and high velocity that exceeded the performance criteria. The results for existing and 2030 conditions are very similar, due



Legend

Cascade Subsystems

- RES-01
- Turnout WB 40
- Pump Station Pump Station

Model Results - 2030 Peak Hour

- < 40 psi
- > 125 psi

System Pipes - 2030 Peak Hour Velocities

- < = 7 ft/s
- > 7 ft/s

Pressure Zones

- Low Pressure Zones (HGL < 600 ft)
- Intermediate Pressure Zones
- High Pressure Zones (HGL > 1400 ft)
- Future Developments

Figure 12-1

Palos Verdes District - Hydraulic Model Results

2030 Peak Hour of Maximum Day Conditions

CDM

to the small increment in demand (11 percent)[1]; the existing Palos Verdes service area is considered close to built out.

Pressure is the key criterion for evaluating the existing pipeline system. Existing pipes that provide adequate pressures in the system are not identified for improvement solely due to not meeting the maximum velocity and headloss criteria. Cal Water can use the headloss/velocity information if the pipes require replacement for leaks or breaks, to evaluate whether a larger diameter pipe may be warranted to reduce headlosses.

Figure 12-2 and Table 12-6 show low and high pressure areas (existing and 2030 conditions) identified in the analysis. In addition to the low pressure areas shown on Figure 12-2, a few localized lower pressure areas occur at high elevations in the system near zone boundaries or at tops of hills/ridges during the peak hour on the maximum day. (See Appendix O for more detailed pressure results for existing and 2030 conditions). Typically, the pressures are marginally lower than the target criterion of 40 pounds per square inch (psi), which may not adversely affect customers. Due to the steep topography, very few customers would be affected at these locations. Actual services may also be at un-modeled service connections located at lower elevations that provide higher pressure. For such isolated locations, the marginal pressures are due to high elevation, not pipeline restrictions, so pipeline improvements to address these locations are not recommended.

If customer complaints about localized low pressures should occur in the future, a case-by-case investigation should be undertaken to field check actual service pressures and ground elevations, and to determine the most effective solution for the specific location. If near a higher zone, it may be possible to re-connect the service connection to a higher zone pipeline, or re-zone the distribution system pipeline. If the number of affected customers at a location is very small, Cal Water could negotiate a "low pressure" agreement with the customer based on high service elevation, and/or recommend that the homeowner install a small customer-owned booster pump at the service.

Figure 12-2 shows the areas with pressures higher than 125 psi during peak hour (existing and 2030 conditions). These high pressure areas are at the lowest elevations relative to the zone's HGL, and occur due to the area's unique topography. These areas are described on Table 12-6, and are broken into two categories: 1) areas with maximum pressures over 150 psi; and 2) areas with maximum pressures greater than 125 psi.

[1] Facilities planning for the 2030 scenario considers demand projections without Cal Water's planned conservation programs, to provide flexibility in facilities sizing. Implementation of planned conservation would reduce projected demands.

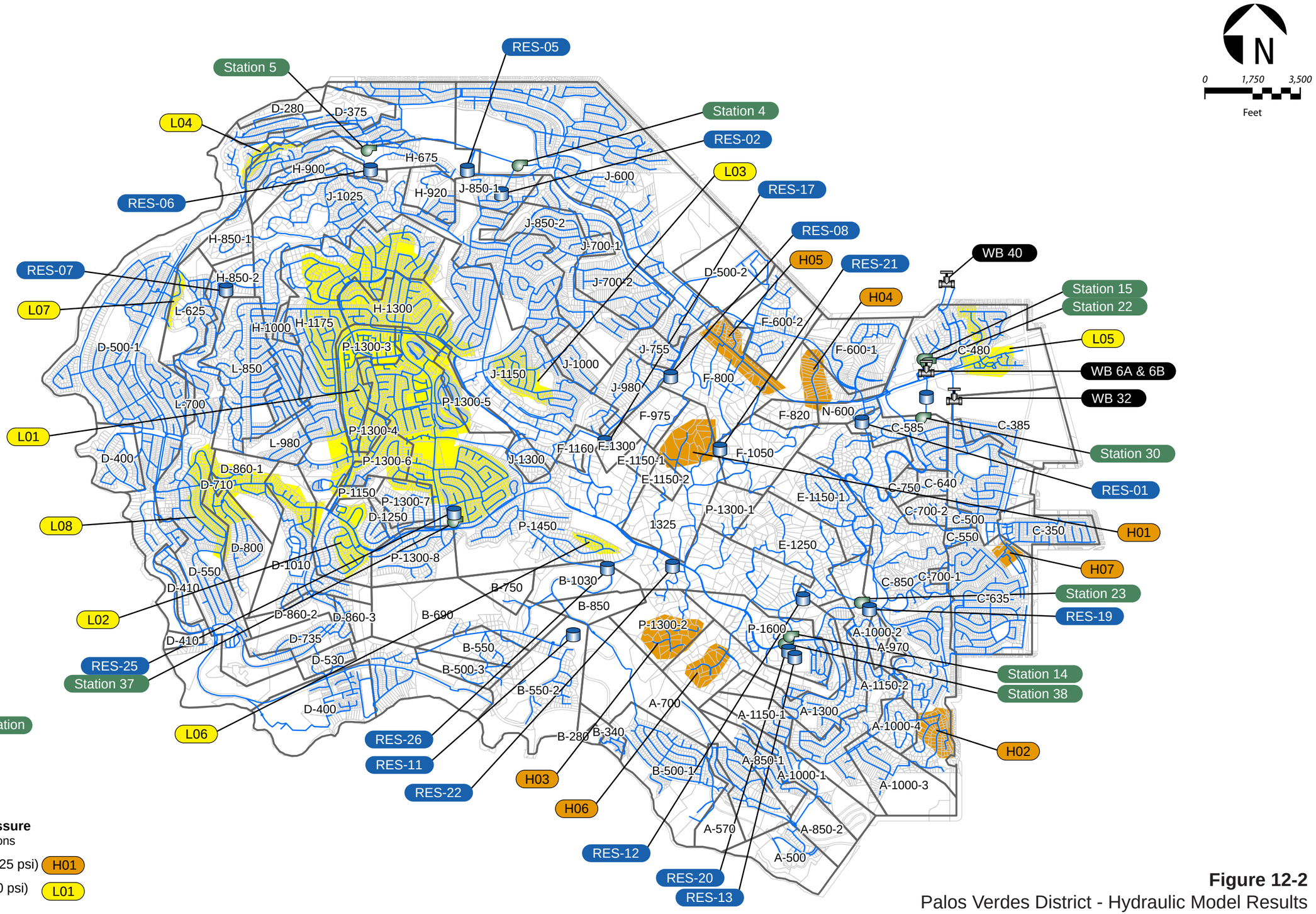


Figure 12-2
Palos Verdes District - Hydraulic Model Results
Low and High Pressure Areas

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Table 12-6
Palos Verdes District High and Low Pressure Areas Identified in 2030 Peak Hour of Maximum Demand Day Hydraulic Analysis

Area ID (1)	Location	Pressure Issue	Reason for Pressure Problem	Pressure Range of Problem Area	Recommended Improvement
L01	Northwest of Zone P-1450, west of Crenshaw Blvd and north of Crest Rd.	< 40 psi	High losses in distribution pipes	10 - 35 psi	Pipe replacement.
L02	Area around Crest Rd, from Chartres Dr and Cresta Verde Dr. This area is currently fed from Reservoir 25, with the option to be fed through a PRV from the Zone P-1450.	< 40 psi	High losses in distribution pipes	10-35 psi	Supply from PRV D107, instead of directly from RES 25
L03	Area in Zone J-1150, around Longhill Dr, south of Silver Arrow Dr	< 40 psi	High losses in distribution pipes	20-39 psi	No local improvements required. Pressures adequate with P-1450 transmission projects.
L04	Area in D-500-1, south of Palos Verdes Dr W, around Via Arriba	< 40 psi	High losses in distribution pipes	20-39 psi	
L05	Area in Zone C-480, around Palos Verdes Dr	< 40 psi	High losses in distribution pipes	30-39 psi	Pipe replacement
L06	Area in Zone P-1450, around Coveview Dr	< 40 psi	High losses in distribution pipes	25-39 psi	No local improvements required. Pressures adequate with P-1450 transmission projects.
L07	West of Zone L-625, along Via Boronada	< 40 psi	High losses in distribution pipes	35-39 psi	
L08	Corridor along Crest Rd, west of Hawthorne Blvd, in Zones D-860-1, D-710, D-550	< 40 psi	High losses in distribution pipes	10-35 psi	Pipe replacement
H01	North of Zone E-1325	> 150 psi	Low Elevation for Zone HGL	120 – 200 psi	Potential options to address high pressure areas include: adjust settings of PRVs; reconfiguration of zone boundaries; new PRV locations to isolate the high areas; and/or individual PRVs at customer services
H02	South of Zone C-850	> 125 psi	Low Elevation for Zone HGL	125-150 psi	
H03	South end of Zone P-1300-2	> 150 psi	Low Elevation for Zone HGL	120 - 200 psi	
H04	Strawberry Ln in Zone F-800	> 150 psi	Low Elevation for Zone HGL	125-170 psi	
H05	Palos Verdes Dr in Zone F-800	> 125 psi	Low Elevation for Zone HGL	125 -140 psi	
H06	End of Southfield Dr, in Zone P-1450	> 150 psi	Low Elevation for Zone HGL	155 - 160 psi	
H07	East of Zone C-635	> 125 psi	Low Elevation for Zone HGL	130 - 150 psi	

(1) See Figure 12-2 for locations.

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For the areas with high pressure, options to correct this issue include: changing the PRV settings, changing the current pressure zone boundaries, construction of a new PRV station for the subarea, or having customers install individual PRVs at services. For the most part, these high pressure areas are small and affect relatively few customers. If there are customer complaints about high pressures in any of these areas, the best option for each area would be determined on a case-by-case basis depending on the specific location and need.

Area L02 is currently fed from Reservoir 25, with the option to be fed through a PRV from the Zone P-1450. To increase the pressure in this area (area around Crest Rd, from Chartres Dr and Cresta Verde Dr), it is recommended to disconnect it from Reservoir 25, close the connection to the existing 18-inch line along Crest Rd, and allow the operation of the Pressure Reducing Station D107. This recommendation is considered an operation improvement, not a capital improvement; therefore, there is no capital cost for the district.

For more detailed pressure results for existing and 2030 conditions, see maps in Appendix O.

12.6.2 Maximum Day with Fire Flow

A fire flow analysis of the entire system was conducted using the InfoWater fire flow simulator module. The analysis was done for 2030 maximum day demand conditions, existing system facilities, with the reservoirs at 75% full, with pump stations operating to meet maximum day demand. For the analysis, all nodes were tested.

Appendix M contains a report of the results for the Palos Verdes system showing the available fire flow at 20 psi residual pressure at all service nodes. It should be noted that these analysis results are based on model calculations, where the maximum available flow is limited by minimum pressure requirements, not by maximum velocity allowed in pipes. The model analysis does not account for minor losses at hydrants or supply availability.

Because the existing system was developed prior to the current fire flow standards, Cal Water is not required to undertake upgrades to the existing system to meet the new standards. However, Cal Water does use the information on the available fire flow when designing pipeline replacement projects.

Pressure at fire flow locations depends on the available head in the zone as well as the head loss in the system and the flow required. However, in general, the required fire flow amounts would likely not be met in areas with:

- Small diameter dead-end pipes, generally less than 6-inch diameter;
- 8-inch diameter dead-end pipes serving high ground elevation areas or very long dead-end segments;

- Loops of 4-inch diameter pipes at the zone periphery located away from supply sources.
- Zone periphery located away from supply sources.
- Pressure zones served by PRVs or pump stations, with no storage available, when the capacity of the PRV or the pump station does not meet the maximum fire flow requirements.

12.6.3 Pipe Capacity Improvements

Based on the capacity analysis, three pressure areas require a pipe replacement to improve local pressures (L01, L05, and L08). Projects are shown on Figure 12-3.

Area L01: To increase the pressure in this area (Northwest of Zone P-1450, west of Crenshaw Blvd and north of Crest Rd), it is recommended to replace the existing 8-inch pipeline with a new 12-inch along Highridge Rd, from Scotwood Dr to Whitley Collins Dr (approximately 1,400 feet); to replace the existing 12-inch pipeline with a 16-inch along Highridge Rd, from Armaga Spring Rd to Crestridge Rd (approximately 1,300 feet); and to replace the existing 8-inch pipeline along Crestridge Rd, from Crenshaw Blvd to Highridge Rd, with a new 20-inch. This line will connect to the new 27-inch line along Crenshaw Blvd (project R-2), downstream of the new pump station located at the new Crenshaw reservoir (approximately 3,000 feet). The new pump station (discussed under Reliability Improvements) will also contribute significantly to resolve low pressure issues in this area. Pressure in Area L08 is also improved by these projects.

Area L05: Significant future growth is expected in this area, particularly from the proposed development Ponte Vista. To increase pressure for 2030 demand conditions, it is recommended to replace the existing 12-inch from PRV station C140 (downstream of Station 22), south on Montecillo Dr to Palos Verdes Dr, then east on Palos Verdes Dr to Rolling Vista Dr with a new 18-inch (approximately 3,000 feet).

Other piping improvements are necessary to connect the proposed Hesse Reservoir to the network. These pipe improvements are:

- Hesse Reservoir inflow pipeline from new Via Olivera Pump Station: 16-inch pipeline from the proposed Via Olivera Pump Station to Verde Ridge Rd and Ave Anillo, connecting to proposed pipe P-7 (approximately 2,500 feet)
- Hesse Reservoir inflow pipeline from Reservoir 25: 18-inch pipeline from Hawthorne Blvd and Locklenna Ln (connecting to existing 18-inch) to Hesse Reservoir, along Locklenna Ln (approximately 1,700 feet). The inflow line will connect to the reservoir through a Flow Control Valve station.

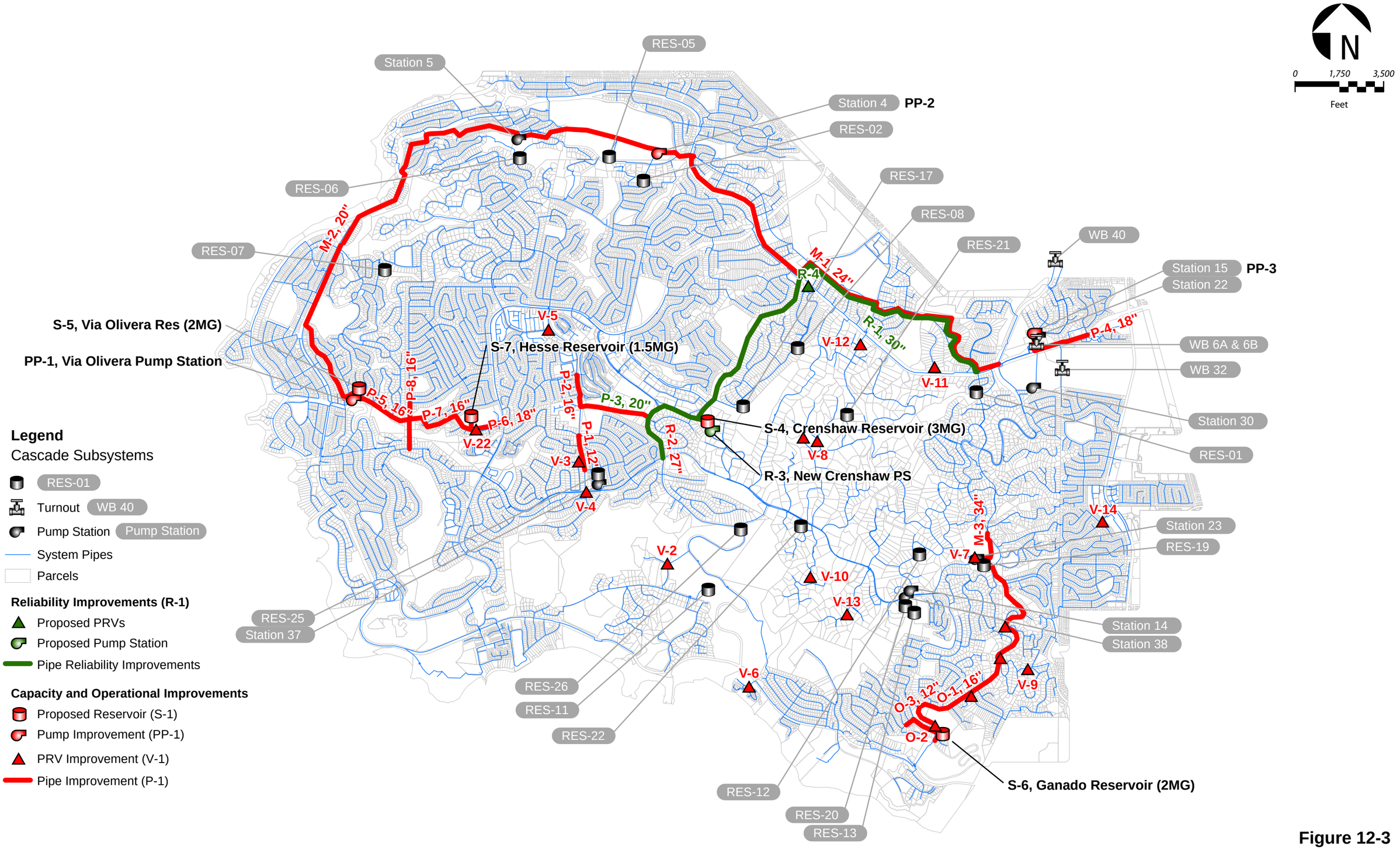

Figure 12-3
Palos Verdes District - Recommended System Improvements

CDM

- Hesse Reservoir connection to Zone D-860: 18-inch pipeline from the reservoir to Crest Rd and Ave Anillo (connecting to existing 12-inch), along Locklenna Dr, Verde Ridge Rd, and Golden Meadow Dr (approximately 5,000 feet).

- Hesse Reservoir connection to Zone L-850: 16-inch pipeline from the proposed 18-inch (from Hesse Reservoir to Zone D-860) connecting to the existing 12-inch at Golden Meadow Dr and Abbottswood Dr (approximately 1,000 feet).

12.7 Reliability Evaluation

MWD plans for disruption of imported water from both emergencies and routine maintenance of its distribution system. For emergencies (such as seismic events), MWD has developed storage, both surface and groundwater. For routine maintenance of its distribution system, MWD's administrative code **§ 4503 Suspension of Deliveries, part (b),** states:

> *Each member agency shall have sufficient resources such as local reservoir storage, groundwater production capacity, system interconnections or alternate supply source to sustain a seven-day interruption in Metropolitan deliveries based on annual average demands.*

This section provides a conceptual-level evaluation of the reliability due to either imported supply outages or system outages for the Palos Verdes District. The focus of the analysis is on routine outages or localized supply disruptions, not major regional emergencies.

The Palos Verdes District receives imported water mainly from three MWD connections off two feeders. The feeders also supply water to MWD's Palos Verdes Reservoir. All of MWD's connections, as well as the feeders, are in very close proximity. There are no local groundwater wells for this District, and no emergency interconnections. Although MWD would work very hard to avoid taking down two feeders at the same time, it is likely that at some point the Palos Verdes Feeder would be out of service for several days. As discussed in Section 12.4, MWD's Palos Verdes Reservoir could supply emergency storage to the system, provided that standby power is added at key pump stations to distribute water within the Palos Verdes District system. Recommendations for standby power are included in Section 12.4

Table 12-7 presents the main supply for each subarea, and the alternative supply, to enter in operation in the case of an emergency situation. In general, all the subareas have the ability to be supplied from an alternative source, except for the P-1450 cascade.

Table 12-7
Reliability Evaluation – Palos Verdes District

Service Area	Normal Supply	Alternative Supply	Comments
D-500 Cascade	Station 15, 16-inch transmission line	PRVs from P-1450 Cascade system and from C-850 Cascade system	PRVs from upper zones are able to fill Res 01 and Res 05
J-600 Zone	Station 04	PRVs from P-1450 Cascade system	PRVs from upper zones are able to fill Res 02 and Res 08
C-850 Cascade	Station 22 (33-inch transmission line) and Station 30 (24-inch transmission line)	PRVs from P-1450 Cascade system	Stations 22 and 30 are independent, transmission line are almost independent (last 1,400 feet are shared)
P-1450 Cascade	Station 23, 27-inch transmission line	Station 37 (pumps from Reservoir 25). No way to re-fill Reservoir 25 if Station 23 out of service.	Improvements to fill Res 20 and Res 25 during an emergency situation are needed.
P-1600 Zone	Station 14 and Station 38	Stations 14 and 38 are independent.	Stations 14 and 38 are independent

Reservoir 20 is supplied by a single-feed, a 27-inch diameter pipe from Reservoir 19 to Reservoir 20. This pipeline supplies about 80 percent of the District's service area, runs through canyons and steep ridges, and could potentially be out-of-service due to unexpected events such as landslides or earthquakes. Without this pipeline, the only other significant source of supply is the available water in Reservoir 25 that could be pumped from Station 37; however, there would be no replenishment source to re-fill the reservoir.

The planned Crenshaw and Ridge Supply Project provides several benefits: addresses the lack of redundancy for the P-1450 cascade; provides a second feed to supply Reservoir 20; utilizes available existing pumping capacity; and provides flexibility for planned maintenance. The project, as identified in previous planning efforts, was used as a starting point, and updated based on projected 2030 demands.

The recommended improvements for the Crenshaw and Ridge Supply Project are:

- New Crenshaw Reservoir: Cal Water is planning to implement a project consisting of constructing a new 3.0 MG Crenshaw Reservoir near Crenshaw Boulevard and Silver Spur Road, which will be supplied by both Stations 22 and 30. This reservoir would be added in the 850 zone at the same hydraulic elevation as the existing Reservoir 19 with transmission capacity to replenish storage.

- New 30-inch transmission line: A new 30-inch pipeline will be constructed from the pump station along a combination of Palos Verdes Drive North and horse trail to Crenshaw Blvd, and then along Crenshaw Blvd to the new reservoir.

- New Crenshaw Pump Station: new pump station to draw suction from the new Crenshaw Reservoir to the P-1450 Zone. The recommended firm capacity for this pump station is 4,700 gpm (TDH=600 feet).

- New 27-inch transmission line from new Crenshaw pump station to the existing 27-inch along Crest Rd.

- These improvements would complete the loop and increase system reliability by providing redundant ways to re-fill storage for the 1450 cascade.

12.8 Projects to Address Operational Issues

District staff provided information on two projects that are currently part of the District's Capital Improvement Program planning. These projects complement those recommended to improve capacity in the system and were verified using the hydraulic model. The location of these operational improvements is shown on Figure 12-3. These projects are:

D-500 Distribution Project:

The existing 20-inch pipeline supplying the D-500 area is old and in poor condition. It is recommended that this existing pipeline be replaced with a new 24-inch pipeline along a combination of horse trail and Palos Verdes Drive North from Station 15 to Reservoir 05.

As discussed in the Storage Capacity Analysis, more storage capacity is needed to serve the western area of the D-500 Zone. To meet storage requirements, a new 2.0 MG via Olivera Reservoir is recommended. To supply this reservoir, it is recommended the replacement of an existing 16-inch with a new 20-inch from Reservoir 05 to the new reservoir (23,000 feet). The new pipe will follow the existing pipe alignment, along Via del Monte, Via Montemar, Palos Verdes Dr W, and Via Rivera. The last component of the D-500 Distribution Project is a pump station pumping from the new Via Olivera Reservoir to the new Hesse Reservoir. The recommended firm capacity for this pump station is 1,700 gpm (TDH=400 feet).

A Cascade Distribution Project:

The purpose of this project is to reduce the hydraulic losses in the 27-inch diameter pipeline supplying Reservoir 20 and to provide buffering storage in the A Cascade system, to minimize pressure surges that propagate through the system, due to the large number of PRV stations feeding the area. Currently, the entire A-system, a collection of pressure zones in the southeast portion of the system (see Figure 12-1), is supplied from Reservoir 20 via PRVs in series. In addition to minimizing surges, the new reservoir storage would provide fire storage for the Ocean Trails Condominiums.

The improvements include a new 2.0 MG Ganado Reservoir at hydraulic grade line of 850 feet, a new pressure reducing station at Station 23 to break head from the

discharge side of Pump Station 23, and a new 16-inch transmission pipeline from Station 23 to Ganado Reservoir. The new Ganado Reservoir will be located east of the intersection of Palos Verdes Dr and Ganado Dr. A new 12-inch pipeline connects the reservoir to the existing PRV Station A85 (at Sea Claire Dr and Sea Glen Dr). The supply pipeline would need to be connected to the discharge piping of Pump Station 23 – there is inadequate hydraulic head to fill the proposed tank from Pump Station 22. This pipeline would also serve, through PRVs, zones A-970 (PRV Station A130), A-1000 (PRV Station A108), and A-1150-2 (PRV Station 37).

Reservoir 19 Supply Line Project

Currently a 24-inch and a 33-inch pipeline convey water from Stations 22 and 30 to Colt Rd, at which point the 24-inch terminates and the 33-inch continues to Reservoir 19. This segment from Colt Rd to the reservoir runs cross-country, on an alignment subject to earth movement. The alignment crosses an existing retaining wall. A new 34-inch line will replace this segment, moving the line to public right-of-way, along Palos Verdes Dr East. This new alignment will increase the access to the pipeline for maintenance.

Other Operational Improvements

Based on input from the District's operations personnel, the following improvements to the system were identified:

- New SCADA System for the Palos Verdes Distribution System. A SCADA system for the District has been designed but not installed.
- Maintenance and replacement if necessary for five monitoring pressure locations. Operation personnel reported problems with the phone lines or with the existing equipment.
- Panel board replacement for Stations 22 and 30: replacement parts for the panel boards cannot be obtained. Currently, one pump is not operating because of this issue.

12.9 Replacement Evaluation

CDM conducted an assessment evaluation of the general condition of the existing pumping, storage and treatment facilities. In the Palos Verdes District, the mechanical condition assessment evaluated equipment at Stations 4, 5, 14, 15, 22, 23, 30, 37, and 38, and Reservoir 19. The analysis found that in general, the District facilities are well maintained, although some facilities are close to or beyond the end of their design useful life expectancies.

This section summarizes the findings of the replacement/renewal evaluation for the Palos Verdes District facilities. The assessment consisted of visual observations of

facilities and discussion with the operations staff. Table 12-8 summarizes the key findings from the facilities assessment. Appendix N presents the Facilities Assessment Evaluation for the entire Rancho Dominguez District, including Palos Verdes District facilities.

Table 12-8
Palos Verdes District Mechanical Equipment Assessment

Facility	*Condition Assessment*
Station 04	Aged but appears in reasonable condition, moderate corrosion; electrical system is in average condition; SCADA system in site.
Station 05	Appears past expected service life, significant pump base corrosion, suction piping cracked and corroded; electrical system is in good condition; replacement for SCADA system recommended.
Station 14	Both units pump and motor very old; electrical equipment has exceeded its useful life.
Station 15	Likely in middle/nearing end of service life; minor to significant corrosion. Unit D motor replaced 2006; electrical equipment has exceeded its useful life for Units A, B, C. For Unit D, electrical equipment is in average condition; SCADA system on-site; problems with the telephone lines.
Station 22	Likely in middle of service life, minor to moderate corrosion, Unit A Replaced within last year; Parts for the electrical equipment are difficult to find; SCADA system on-site, problems with the telephone lines.
Station 23	Likely in middle/nearing end of service life; minor to significant corrosion; Units F and G recently rebuilt; The electrical system for Boosters A, B, C, D, and E is in very good condition. The electrical system for Boosters G and H is in average condition; SCADA on-site, problems with the telephone lines.
Station 30	Likely in middle of service life; minor corrosion; Unit B was replaced within last year; SCADA system on-site, problems with the telephone lines.
Station 37	Likely in middle of service life; minor pump head corrosion; electrical equipment has exceeded its useful life and it is difficult to get replacement parts; SCADA on-site, problems with the telephone lines.
Station 38	Likely in last 25% of service life; minor noise, significant pump casing pump base and suction piping corrosion; electrical system is in average condition; SCADA on-site, problems with the telephone lines.
Reservoir 19	Likely in middle of service life; epoxy-urethane coated 09/01; built 1964.

The renewal and replacement improvements to the Palos Verdes system recommended based on this analysis are:

- **Station 5:** Replace Unit A, pump and motor by 2015
- **Station 15:** Replace Unit D, pump (by 2015); Unit A, pump and motor(by 2020)
- **Station 22:** Replace Units B, C, D, E, F, G, and H, pump and motor (by 2020)
- **Station 23***:* Replace Units C, D and H, pump and motor (by 2015); Units A, B and E, pump and motor (by 2020)
- **Station 30:** Replace Units C, D and E, pump and motor (by 2020)
- **Station 37**: Replace Units A and B, pump and motor (by 2020)
- **Station 38:** Replace Units A and B, pump and motor (by 2015)

- Replacement of aged electrical systems that have exceeded their design useful lives: Station 14, 15, 22, 30, and 37.
- Replacement of aged PRVs at Stations 15, 22, 23, 30, 37.
- Install SCADA equipment at Stations 01, 30, and 37.

Section 13
Plan Recommendations

This section presents the recommended plan recommendations for the Cal Water Service Company (Cal Water) Dominguez, Hermosa-Redondo, and Palos Verdes Districts. These recommendations are an integrated summary of the water supply recommendations from Section 9 and the distribution system recommendations based on the water system analysis findings from Section 10 for the Dominguez District system, Section 11 for the Hermosa-Redondo District system, and Section 12 for the Palos Verdes District system.

These recommendations are based on the supply analysis, facilities assessments, and water system capacity analysis findings. Each discussion includes an estimate of the capital costs for proposed facility improvements. The basis for the capital cost estimates is provided at the end of this section.

Two timeframes were used to phase the recommendations:

- Near-term (by 2015)
- Long-Term (2016 to 2030)

The phasing of the recommended plan is based on meeting the criteria established for the master plan. Actual implementation of specific projects will depend on Cal Water funding constraints.

Conceptual locations for future improvements are discussed at a conceptual master planning level of detail; siting studies have not been conducted as part of the master plan. The conceptual locations are generally assumed to be at existing Cal Water owned pump station or reservoir locations, where pipeline infrastructure already exists, or within public rights-of-way. Due to the developed nature of the districts, there are few potential new sites. Specific sites and alignments will be identified in subsequent Cal Water siting and pre-design studies for project implementation.

In addition to other supply options that have been evaluated, it is recommended that desalination be assessed. Other water agencies in the Los Angeles area have already commenced feasibility studies of this source. To assess the feasibility of either participating in another agency's or developing a Cal Water desalination project to achieve reliability of supply objectives for the Dominguez, Hermosa-Redondo, and Palos Verdes Districts, it is recommended that a preliminary feasibility study be conducted during the coming year. If the initial analysis indicates that desalination appears feasible for Cal Water, then Cal Water should proceed with preparing a development plan outlining tasks, schedule and budget.

13.1 Dominguez District - Recommended Improvements

This section presents the recommended system improvements for the Dominguez water distribution system.

The main sources of supply for the Dominguez District will continue to be imported surface water from Metropolitan Water District of Southern California (MWD) and groundwater wells. To maximize the use of Cal Water's existing groundwater rights for all three districts in the West Coast and Central basins, a total of 5 to 7 new wells are needed. All wells are recommended to be constructed in the Dominguez District, due to its more favorable hydrogeology. In 2008, land costs for a 20,000-square foot site in the Dominguez District were estimated to be $500,000. Given the economic climate in late 2008 and 2009, it is likely that land costs in the Dominguez District have decreased, making potential groundwater sites more affordable. Cal Water should consider acquiring additional properties for future wells.

Some hydraulic capacity improvements will be needed in the southern part of Zone II to reinforce the existing distribution system due to anticipated growth within the district. The district is deficient in meeting emergency needs, and a combination of storage improvements and installation of standby power at several pump stations is recommended to provide supply reliability during emergencies. The district also includes aging facilities that will require replacement over time.

Table 13-1 summarizes the recommended improvements for Dominguez system, and the estimated capital costs and phasing for the improvements. Figure 13-1 shows the location of the recommended system improvements. Key findings regarding the identified improvements are summarized below:

- Additional storage in Zones I, II and III. An additional 42.1 million gallons (MG) is required to meet 2030 requirements. Total storage requirements could be reduced from 22.2 MG with the installation of standby generators at all well pump station facilities.

- Upgrade of two booster pump stations (Stations 203 and 232) to meet demand and redundancy requirements. The pumps, motors, and electrical equipment at these booster pump stations are at the end of their useful life.

- Approximately 1.5 miles of new 16-inch and 24-inch pipeline is required.

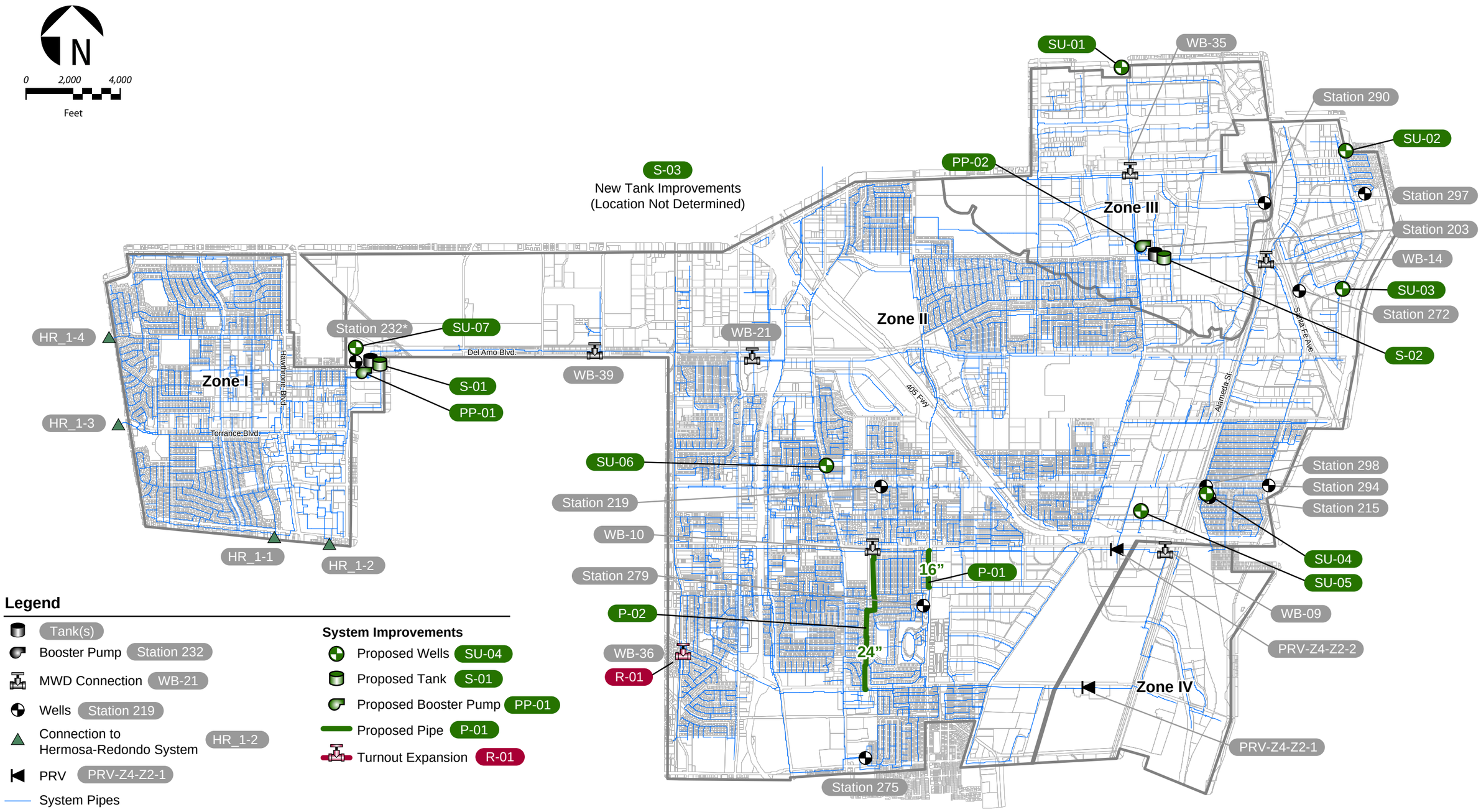

Figure 13-1
Dominguez District
Recommended System Improvements

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Table 13-1
Summary of Recommendations for Dominguez District

Improvement ID	*Location/ Type of Improvement*	*Zone*	*Improvement Description*	*Estimated Total Capital Cost in 2009 Million $*	*Distribution of Costs by Timeframe ($ Million)*	
					Near Term (by 2015)	*Long-Term*
Local Supply Measures (see details in Sections 9.2 and 9.4)						
SU-01	Well ID1 - Walton Middle School	III	New well site at Walton Middle School in Zone 3. Conceptual location selected based on Supply Analysis (See Section 9.2.3)	$ 2.56	$ -	$ 2.56
SU-02	Well ID 3 - David Starr Jordan High School - Freshman Academy	II	New well site at David Starr Jordan High School - Freshman Academy in Zone 2.Conceptual location selected based on Supply Analysis (See Section 9.2.3)	$ 2.56	$ -	$ 2.56
SU-03	Well ID 7 - Canima Logistics Inc.	II	New well site at Canima Logistics Inc. in Zone 2.Conceptual location selected based on Supply Analysis (See Section 9.2.3)	$ 2.56	$ -	$ 2.56
SU-04	Station 215	II	New well at Station 215[1]	$ 2.06	$ -	$ 2.06
SU-05	Zone II location to be determined	II	New well site. Location in West Coast Basin to be determined.	$ 2.56	$ -	$ 2.56
SU-06	Zone 2 location to be determined	II	New well site. Location in West Coast Basin to be determined.	$ 2.56	$ -	$ 2.56
SU-07	Station 232	II	New well at Station 232[1]	$ 2.06	$ -	$ 2.06
SU-08	Long-term permanent conservation savings		Continue implementation of planned long-term conservation measures per Urban Water Management Plan. Evaluate implementation and effectiveness of planned conservation measures: modify as needed as part of Urban Water Management Plan update process.	Costs for these measures are not facility capital costs.	Implementation costs as determined in Urban Water Management Plan	
SU-09	Temporary demand reductions		Implement temporary demand reductions during emergencies and droughts as outline in Urban Water Management Plan (Water Shortage Contingency Plan), as needed to address temporary reductions in total supply.	Costs for these measures are not facility capital costs.	Implementation costs as determined in Urban Water Management Plan	
Subtotal - Local Supply Measures				**$ 16.91**	**$ -**	**$ 16.91**
System Capacity Improvements						
Additional Storage to Meet Buildout Storage Requirements [2] (see details in Section 10.4))						
S-01[3]	Station 232	I	Construct new 3.5 MG reservoir[4]. 2.5 MG is to meet existing deficiencies and 1.0 MG is to meet future growth.	$ 6.30	$ 6.30	$ -
S-02[5]	Station 203	II	Construct two new 3.5 MG reservoirs to help meet existing storage deficiencies of 7.8 MG[5].	$ 12.60	$ 12.60	$ -
S-03[6]	Zone II location to be determined	II	Construct new storage reservoirs for a total of 12 MG[6]. This improvement requires the installation of standby power at all existing and future well stations supplying the Zones II and III.	$ 21.60	$ -	$ 21.60
S-04	Zone II Wells	II	Standby power generator for Zone II Well Stations 215, 219, 275, 279, 294, 297, and 298 as an alternative to additional storage in Zone II	$ 1.67	$ 1.67	$ -
S-05	Zone III Wells	III	Standby power generator for Zone III Well Stations 290 as an alternative to additional storage in Zone II	$ 0.14	$ 0.14	$ -
S-06	Zone II Future Wells	II	Standby power generator for Zone II Future Well Stations (SU-02, SU-03, SU-04, SU-05, SU-06, and SU-07) as an alternative to additional storage in Zone II	$ 0.81	$ -	$ 0.81
S-07	Zone III Future Wells	III	Standby power generator for Zone III Well Station (SU-01) as an alternative to additional storage in Zone II	$ 0.14	$ -	$ 0.14
Subtotal				$ 43.25	$ 20.70	$ 22.55

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Table 13-1
Summary of Recommendations for Dominguez District

Improvement ID	*Location/ Type of Improvement*	*Zone*	*Improvement Description*	*Estimated Total Capital Cost in 2009 Million $*	*Distribution of Costs by Timeframe ($ Million)*	
					Near Term (by 2015)	*Long-Term*
Additional Pumping Capacity						
PP-01	Station 232	I	Replace units 5-9 with new 1,400 gpm pumps and add VFDs. Replace units 11 and 12 with new 2,000 gpm pumps and add VFDs. Install remote system monitoring.	$ 0.56	$ -	$ 0.56
PP-02	Station 203	III	Replace units A through E with new 1,400 gpm pumps, replace unit F with a new 1,100 gpm pump, replace unit G with a new motor, and add VFDs to all pumps[7].	$ 0.37	$ 0.25	$ 0.12
Subtotal				$ 0.93	$ 0.25	$ 0.68
Pipe Improvements (see details in Section 10.6)						
P-01	Zone II pipeline improvement	II	New parallel 16-inch pipe on Avalon Boulevard from 223rd St. to E. Waston Center Road.	$ 0.74	$ -	$ 0.74
P-02	Zone II pipeline improvement	II	New parallel 24-inch pipe on E 223rd St. (from WB-10 to Catskill Ave.), along Catskill Ave. (from E. 223rd St to 229th Pl), along 229th Pl. (from Catskill Ave. to Dolores St.), along Dolores St. (from 229th Pl to Sepulveda Blvd.)	$ 4.67	$ -	$ 4.67
Subtotal				$ 5.41	$ -	$ 5.41
Subtotal - System Capacity Improvements				**$ 49.60**	**$ 20.96**	**$ 28.64**
System Reliability Projects						
Expansion of MWD WB-36 Turnout						
R-01[8]	Expand Turnout	II	Expansion of WB-36 turnout from 10 mgd to 13 mgd.	$ -	$ -	$ -
Subtotal - System Reliability Projects				**$ -**	**$ -**	**$ -**
Renewal and Replacement Projects						
Pump Station Upgrade Project (see details in Section 10.8)						
M-01	Station 215	II	Replace well pump, booster pump and motors by 2020.	$ 0.28	$ -	$ 0.28
M-02	Station 272	II	Replace well pump and motor by 2015.	$ 0.17	$ 0.17	$ -
M-03	Station 275	II	Replace well pump and motor by 2015.	$ 0.16	$ 0.16	$ -
M-04	Station 290	III	Replace well pump and motor by 2020.	$ 0.18	$ -	$ 0.18
M-06	Station 297	II	Replace booster pump and motor by 2015. Replace well pump and motor by 2020.	$ 0.28	$ 0.14	$ 0.14
M-07	Station 298	II	Replace high head booster by 2015.	$ 0.21	$ 0.21	$ -
M-09	PRV replacement at Stations 203, 272, and 275	-	Replace aged PRVs at pump stations	$ 0.16	$ 0.16	$ -
Subtotal - Renewal and Replacement Projects				**$ 1.46**	**$ 0.85**	**$ 0.61**
TOTAL				**$ 68.0**	**$ 21.8**	**$ 46.2**

[1] Assumes no land purchase.
[2] Additional storage location will be determined by Cal Water after appropriate siting studies.
[3] Additional storage for Zone 1 (1.2 MG) can be placed in the Hermosa-Redondo System. If storage is placed in the Hermosa-Redondo System, the total volume required for Zone 1 would be 2.2 MG.
[4] One tank is proposed to be built at Station 232, sized to meet buildout requirements. The tank is phased in the Near Term (by 2015) even though the total volume is not required until the Long-Term Scenario.
[5] Deficiencies are reduced from 18.8 MG assuming the installation of standby power at existing well stations.
[6] Existing storage deficiencies equal 18.8 MG and future storage deficiencies (including existing) equal 38.7 MG. Storage volume required is reduced to 18.8 MG assuming the installation of standby power at all existing and future well stations supplying Zones II and III.
[7] Sizing assumes pump station meets peak hour demand with MWD WB-35 turnout out of service.
[8] Hydraulic Analysis assumes MWD WB-36 can be expanded. If not, other capacity improvements are required. It is assumed that costs will be negotiated with MWD.

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13.2 Hermosa-Redondo District - Recommended Improvements

This section presents the recommended system improvements for the Hermosa-Redondo water distribution system.

The Hermosa-Redondo District service area is close to build-out. There is little difference in the requirements for the existing and 2030 demand scenarios due to the small increase in demands. The average day 2030 demand for the Hermosa-Redondo system is projected to increase about 11 percent over existing demand.

Supply for the Hermosa-Redondo District will continue to be imported surface water from MWD and groundwater wells. No supply improvements are recommended other than implementation of Cal Water's planned conservation and drought management programs.

In general, the hydraulic capacity of the existing distribution system is adequate through 2030, so few capacity improvements are needed. The district is deficient in meeting emergency needs, and a combination of storage improvements and installation of standby power at several pump stations is recommended to provide supply reliability during emergencies. The district also includes aging facilities that will require replacement over time.

Table 13-2 summarizes the recommended improvements for the Hermosa-Redondo system, and the estimated capital costs and phasing for the improvements. Figure 13-2 shows the location of the recommended system improvements.

Key findings regarding the identified improvements are summarized below:

- Construct a combination of new storage (0.9 MG in Zone 300-2; replacement of existing Station 24 0.25 MG tanks with 0.65 MG) and standby generation capacity at four stations (Stations 9, 14, 23 and 28) to meet operational, fire and emergency needs.
- Add standby power at all wells to improve supply reliability during emergencies
- Upgrade of seven pump stations to replace aging pumps, motors, and electrical equipment.
- Replacement of aging redwood tanks at Station 24.

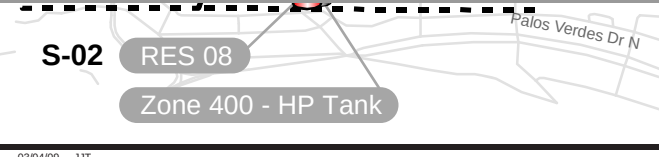

Figure 13-2
Hermosa-Redondo District - Recommended System Improvements

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Table 13-2
Summary of Recommendations for Hermosa-Redondo District

Improvement ID	*Location/ Type of Improvement*	*Zone*	*Improvement Description*	*Estimated Total Capital Cost in 2009 Million $*	*Distribution of Costs by Timeframe ($ Million)*	
					Near Term (by 2015)	*Long-Term*
Local Supply Measures (see details in Section 9.4)						
SU-1	Long-term permanent conservation savings		Continue implementation of planned long-term conservation measures per Urban Water Management Plan. Evaluate implementation and effectiveness of planned conservation measures: modify as needed as part of Urban Water Management Plan update process.	Costs for these measures are not facility capital costs.	Implementation costs as determined in Urban Water Management Plan	
SU-2	Temporary demand reductions		Implement temporary demand reductions during emergencies and droughts as outline in Urban Water Management Plan (Water Shortage Contingency Plan), as needed to address temporary reductions in total supply.	Costs for these measures are not facility capital costs.	Implementation costs as determined in Urban Water Management Plan	
System Capacity Improvements						
Additional Storage and Standby Power Generators to Meet Buildout Storage Requirements [1] (see details in Section 11.4)						
S-01 [1]	Zone 300-2	300-2	Construct new 0.9 MG reservoir next to Reservoir 06, HGL = 221 ft. This improvement will require standby power at Sta 04 and Sta 09 to meet emergency storage needs in this pressure zone.	$ 2.43	$ -	$ 2.43
S-02	Zone 400	400	Construct new 0.65 MG reservoir, HGL = 400 ft, to replace existing 0.25 MG tank (Sta 24, Reservoir 08). This improvement will require the installation of standby power at Sta 23	$ 1.76	$ -	$ 1.76
S-03	Zone 300-1	300-1	Standby power generator for Sta 28, Unit A, as alternative to additional storage in Zone 300-1	$ 0.05	$ -	$ 0.05
S-04	Zone 300-1	300-1	Standby power generator for Sta 14, Unit D, as alternative to additional storage in Zone 300-1	$ 0.10	$ -	$ 0.10
S-05	Zone 300-2	300-2	Standby power generator for Sta 09, Units C and D, as alternative to additional storage in Zone 300-2	$ 0.08	$ -	$ 0.08
S-06	Zone 400	400	Standby power generator for Sta 23, Units D and E, as alternative to additional storage in Zone 400	$ 0.07	$ -	$ 0.07
Subtotal				$ 4.49	$ -	$ 4.49
Pipe Improvements (see details in Section 11.6)						
P-01 [2]	Change of service zone for existing pipe on 190th St (east of Flager Ln)	300-2	New pipe connecting existing 6-in on 190th St to existing 6-in on Flager Ln (approximately 85ft of new 6-in pipe). Close valve (Green Ln) to disconnect the existing pipe on 190th St from Zone 225-2	$ 0.02	$ 0.02	$ -
Subtotal - System Capacity Projects				**$ 4.51**	**$ 0.02**	**$ 4.49**

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Table 13-2
Summary of Recommendations for Hermosa-Redondo District

Improvement ID	*Location/ Type of Improvement*	*Zone*	*Improvement Description*	*Estimated Total Capital Cost in 2009 Million $*	*Distribution of Costs by Timeframe ($ Million)*	
					Near Term (by 2015)	*Long-Term*
Renewal and Replacement Projects						
Pump Station Upgrade Projects (see details in Section 11.8)						
M-1	Station 09	225-1	Replace Units C and D (pump and motor) by 2020	$ 0.13	$ -	$ 0.13
M-2	Station 23	400	Replace Unit C (pump and motor, by 2015), Replace Unit D (pump and motor, by 2020), Replace Unit E(pump, by 2020)	$ 0.18	$ 0.09	$ 0.09
M-3	Station 24	500	Replace Units C and D (pump and motor) by 2020	$ 0.13	$ -	$ 0.13
M-4	Station 26	300-2	Replace Unit D (pump and motor), Replace Unit E (pump) by 2015	$ 0.15	$ 0.15	$ -
M-5	Station 28	300-2	Replace Units A and B (pump and motor) by 2020	$ 0.16	$ -	$ 0.16
M-6	Station 29	300-2	Replace Unit A (pump and motor, by 2020), Replace Unit B (pump and motor, by 2015)	$ 0.18	$ 0.09	$ 0.09
M-7	Station 08	300-1	Replace Well Pump 02 (pump and motor) by 2020	$ 0.14	$ -	$ 0.14
M-8	Pump Station Electrical Upgrades at Stations 23 and 29	various	Replacement of aged electrical systems that have exceeded their design useful lives. Replacement for Station 23 by 2015, Replacement for Station 29 by 2010	$ 0.42	$ 0.42	$ -
M-9	Install SCADA equipment at Stations 08, 09, 22, and 30	various	SCADA system improvements	$ 0.09	$ 0.09	$ -
M-10	PRV replacement at Stations 05, 26, 27, 29	various	Replace of aged PRVs at pump stations	$ 0.22	$ 0.22	$ -
M-11 (3)	Reservoir 08	400	Replacement of aged facility by 2020 - this replacement improvement is included in project S-02	Included in S-02	$ -	$ -
Subtotal - Renewal and Replacement Projects				**$ 1.81**	**$ 1.06**	**$ 0.75**
Improvements to Enhance System Operation						
O-1	Panel Board replacement	C-850	Pump Stations 09 and 29	$ 0.02	$ 0.02	$ -
TOTAL				**$ 6.33**	**$ 1.10**	**$ 5.24**

[1] Additional storage needed in Zone 300-2 assumes the connections to the Dominguez system open during normal operation

[2] New pipe will be required only if services are connected to the existing pipe

[3] Improvement S-02 includes the replacement of the existing storage tanks (aged, 0.25MG) and the additional storage recommended for the zone (0.4 MG)

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13.3 Palos Verdes District - Recommended Improvements

This section presents the recommended system improvements for the Palos Verdes water distribution system.

The Palos Verdes District is close to build-out. There is little difference in the requirements for the existing and 2030 demand scenarios due to the small increase in demands. The average day potable water demand for 2030 for the Palos Verdes District system is projected to increase about 7 percent over existing demand.

Supply for the Palos Verdes District will continue to be from imported surface water from MWD. No supply improvements are recommended for normal supply, other than implementation of Cal Water's planned conservation and drought management programs. In general, reinforcement of the existing Ridge system is required, both for system capacity and for reliability. The district is deficient in meeting emergency needs, and significant storage improvements are recommended. The district also includes aging facilities that will require replacement over time.

Table 13-3 summarizes recommended improvements for the Palos Verdes District, the estimated capital costs and phasing for the improvements. Figure 13-3 shows the location of the recommended improvements. Key findings regarding the identified improvement needs are summarized below:

- A combination of additional storage of 8.5 MG and standby power at key pump stations to pump water from MWD's Palos Verdes Reservoir to the system, to meet operational, fire and emergency needs.
- Upgrades for three pump stations (Sta 04, Sta 14, and Sta 15) to meet redundancy and fire flow requirements.
- Upgrades for seven pressure reducing valve (PRV) stations to meet existing and 2030 fire flow requirements.
- Potential improvements at seven high pressure areas which may consist of changes of PRV settings, reconfiguring zone boundaries, installing new PRV stations, or requiring customers to install individual PRVs. Several pipe upgrades to improve pressures in Zone P-1450.
- Pipe upgrades to accommodate future growth in Zone C-385 (Ponte Vista Project).
- Supply reliability improvements including: new 3.0 MG Crenshaw Reservoir and new supply pipeline between pump stations and reservoir; new Crenshaw Pump Station and transmission line to the P-1450 Zone.
- Operational improvements to improve pressure problems in the A Cascade.

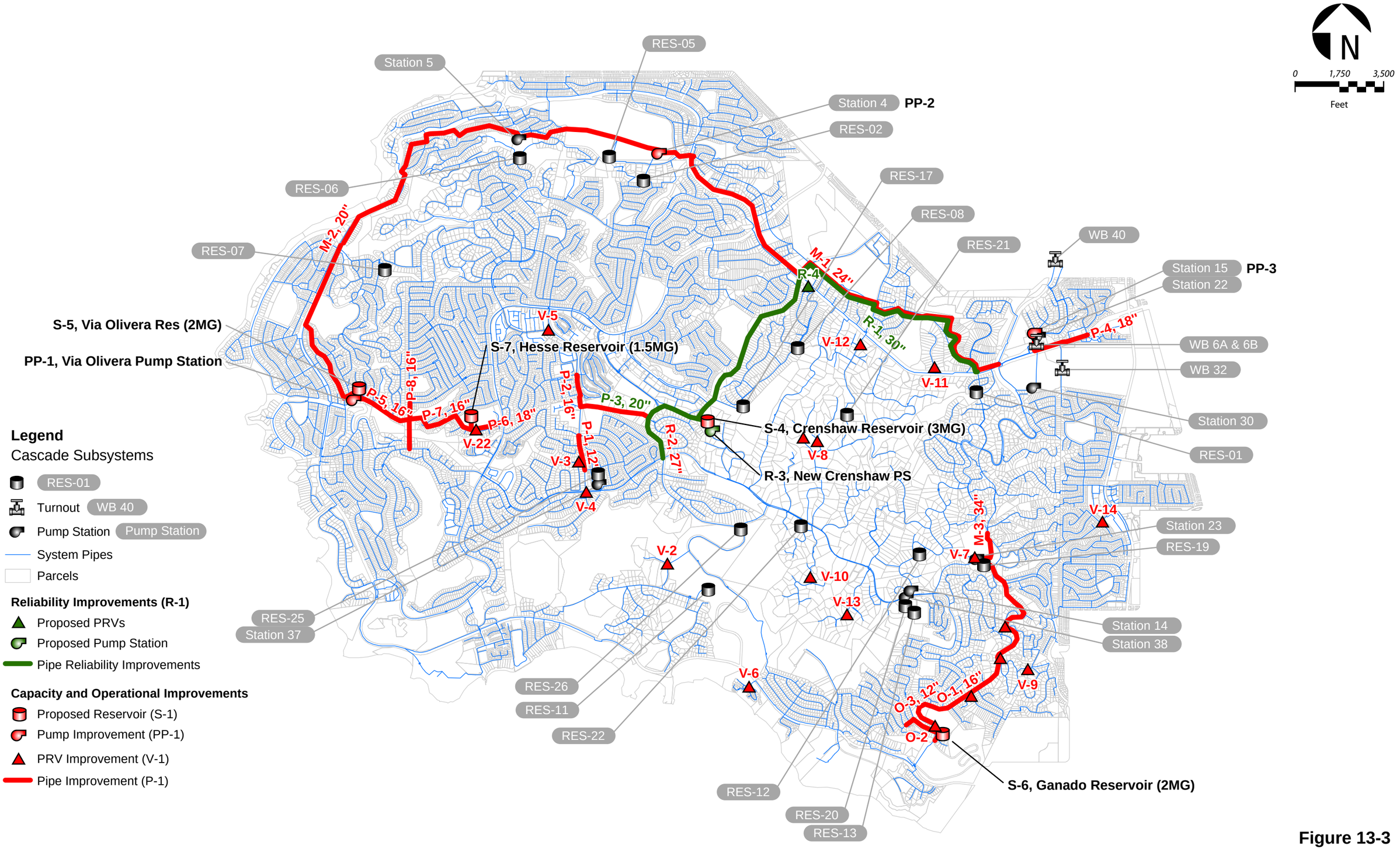

Figure 13-3
Palos Verdes District - Recommended System Improvements

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Table 13-3
Summary of Recommended Improvements for Palos Verdes District

Improvement ID	Location/Type of Improvement	Zone	Description	Estimated Total Capital Cost in 2009 Million $	Distribution of Costs by Timeframe ($ million)	
					Near Term (By 2015)	Long-Term
Local Supply Measures (see details in Section 9.4)						
SU-1	Long-term permanent conservation savings		Continue implementation of planned long-term conservation measures per Urban Water Management Plan. Evaluate implementation and effectiveness of planned conservation measures: modify as needed as part of Urban Water Management Plan update process.	Costs for these measures are not facility capital costs.	Implementation costs as determined in Urban Water Management Plan	
SU-2	Temporary demand reductions		Implement temporary demand reductions during emergencies and droughts as outline in Urban Water Management Plan (Water Shortage Contingency Plan), as needed to address temporary reductions in total supply.	Costs for these measures are not facility capital costs.	Implementation costs as determined in Urban Water Management Plan	
System Capacity Improvements						
Additional Storage and Backup Power Generators to Meet Buildout Storage Requirements (see details in Section 12.4)						
S-1	C-850 Cascade		Backup power generators for pumps Sta 22 (Units A,B,C,D, and E)	$ 2.31	$ -	$ 2.31
S-2	D-500 Cascade		Backup power generators for pumps Sta 15 (Units A, B, and D)	$ 0.30	$ -	$ 0.30
S-3	P-1450 Cascade		Backup power generators for pumps Sta 23 (Units A,B, and C)	$ 1.32	$ -	$ 1.32
S-4	D-500 Cascade	J-600	Crenshaw Reservoir (3.0 MG – HGL 850 ft) at Crenshaw Blvd and Silver Spur Rd	$ 7.20	$ 7.20	$ -
S-5	D-500 Cascade	D-500	Via Olivera Reservoir (2.0 MG – HGL 500 ft) at Via Olivera and Via Zumaya	$ 5.00	$ 5.00	$ -
S-6	A Cascade		Ganado Reservoir (2.0 MG – HGL 850 ft) at Palos Verdes Dr and Ganado Dr	$ 5.00	$ -	$ 5.00
S-7	P-1450 Cascade	D-860	Hesse Reservoir (1.5 MG – HGL 860 ft) south of Indian Peak Rd and Crossfield Dr	$ 3.90		$ 3.90
Subtotal				$ 25.04	$ 12.20	$ 12.84
Additional Pumping Capacity (see details in Section 12.3)						
PP-1	New Via Olivera Station	D-860	New station pumping from new Via Olivera Reservoir to new Hesse Reservoir, 1,700 gpm (TDH=400ft)	$ 1.29	$ -	$ 1.29
PP-2	Sta 04	J-600	Replace the existing pumps (Units A and C) with 1,600 gpm pumps (TDH=160 ft)	$ 0.18	$ 0.18	$ -
PP-3	Sta 15	D-500	Replace the existing 1,300 pump (Unit B) and the existing 1,200 (Unit C) with 2,200 gpm pumps (TDH=250 ft)	$ 0.29	$ 0.29	$ -
Subtotal				$ 1.76	$ 0.47	$ 1.29
Pipe Improvements (see details in Section 12.6.3)						
P-1	Low Pressure Area L01 - Northwest of Zone P-1450, west of Highridge Dr and north of Crestridge Rd	P-1450	Replace the existing 8-inch pipeline with a new 12-inch along Highridge Rd, from Scotwood Dr to Whitley Collins Dr (approximately 1,400 ft)	$ 0.50	$ 0.50	$ -
P-2			Replace the existing 12-inch pipeline with a 16-inch along Highridge Rd, from from Armaga Spring Rd to Crestridge Rd (approximately 1,300 ft).	$ 0.61	$ 0.61	$ -
P-3			Replace the existing 8-inch pipeline with a new 20-inch along Crestridge Rd, from Crenshaw Blvd to Highridge Rd. This line will connect to the new 27-inch line along Crenshaw Blvd (project R-2), downstream of the New Crenshaw PS (approximately 3,000 ft)	$ 1.97	$ -	$ 1.97
P-4	Low Pressure Area L05 - Area in Zone C-480, around Palos Verdes Dr	C-480	Replace existing 12-inch with a new 18-inch from PRV station C140 (downstream of STA 22), south on Montecillo Dr to Palos Verdes Dr, then east on Palos Verdes Dr to Rolling Vista Dr (approximately 3,000 ft)	$ 1.59	$ 1.59	$ -
P-5	Hesse Res (S-7) inflow line from New Via Olivera Pump Station	D-860	New 16-inch pipeline from the proposed Via Olivera Pump Station to Verde Ridge Rd and Ave Anillo, connecting to proposed pipe P-7 (approximately 2,500 ft)	$ 1.16	$ -	$ 1.16

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Table 13-3
Summary of Recommended Improvements for Palos Verdes District

Improvement ID	Location/Type of Improvement	Zone	Description	Estimated Total Capital Cost in 2009 Million $	Distribution of Costs by Timeframe ($ million)	
					Near Term (By 2015)	Long-Term
P-6	Hesse Res (S-7) inflow line from Res 25	D-860	New 16-inch pipeline from Hawthorne Blvd and Locklenna Ln, connecting to existing 18-inch, to Hesse Reservoir, along Locklenna Ln (approximately 1,700ft)	$ 0.79	$ -	$ 0.79
P-7	Hesse Res (S-7) connection to the D-860 zone	D-860	New 16-inch pipeline from Hesse Reservoir to Crest Rd and Ave Anillo (connecting to existing 12-inch), along Locklenna Dr, Verde Ridge Rd, and Golden Meadow Dr (approximately 5,000 ft)	$ 2.33	$ -	$ 2.33
P-8	Hesse Res (S-7) connection to the L-850 zone	L-850	New 16-inch pipeline from the proposed 18-inch (P-6) from Hesse Reservoir connecting to the existing 12-inch at Golden Meadow Dr and Abbottswood Dr (approximately 1,000ft)	$ 0.47	$ -	$ 0.47
Subtotal				$ 9.40	$ 2.69	$ 6.71
PRV Station Upgrades (see details in Section 12.5)						
V-1	PRV Station A130	A-970	Upgrade existing PRV Station to convey fire flow plus MDD flows (adding a 6-inch valve)	$ 0.02	$ -	$ 0.02
V-2	PRV Station B173	B-750		$ 0.02	$ -	$ 0.02
V-3	PRV Station P233	P-1300-7		$ 0.02	$ -	$ 0.02
V-4	PRV Station P240	P-1300-8		$ 0.02	$ -	$ 0.02
V-5	PRV Station P189	P-1300-3		$ 0.02	$ -	$ 0.02
V-6	PRV Station B177	B-340		$ 0.02	$ -	$ 0.02
V-7	PRV Station E117	E-1150-2		$ 0.02	$ -	$ 0.02
Subtotal				$ 0.15	$ -	$ 0.15
New PRV Stations (to reduce pressure in identified high pressure areas, see details in Section 12.6.1)						
V-8	Problem Area H01	E-1325	Upper Blackwater Canyon Rd and Appaloosa Ln, HGL Setting=1,010ft	$ 0.05	$ 0.05	$ -
V-9	Problem Area H02	C-850	Daladier Dr and La Vista Verde Dr, HGL=780 ft	$ 0.05	$ 0.05	$ -
V-10	Problem Area H03	P-1300-2	Ranchero Dr and Portuguese Bend Rd, HGL=1,110 ft	$ 0.05	$ 0.05	$ -
V-11	Problem Area H04	F-800	Strawberry Ln and Palos Verdes Dr, HGL=690 ft	$ 0.05	$ 0.05	$ -
V-12	Problem Area H05	F-800	Portuguese Bend and Palos Verdes Dr, HGL= 670 ft	$ 0.05	$ 0.05	$ -
V-13	Problem Area H06	P-1450	Southfield Dr and W Ringbit Dr, HGL=1,320 ft	$ 0.05	$ 0.05	$ -
V-14	Problem Area H07	C-635	Caddington Dr and Gunter Rd, HGL=540 ft	$ 0.05	$ 0.05	$ -
Subtotal				$ 0.38	$ 0.38	$ -
New FCV Station (Flow Control Valves/Altitude Valves to Regulate Inflow to Proposed Reservoirs)						
V-23	Hesse Reservoir (S-7)	D-860	New FCV Station on Hesse Reservoir inflow line (In Recommended Project S-7)	$ -	$ -	$ -
Subtotal - System Capacity Improvements				**$ 36.73**	**$ 15.74**	**$ 20.99**
System Reliability Projects						
Crenshaw and Ridge System Supply Project (see details in Section 12.7)						
R-1	New pipe	P-1450	New 30-inch pipeline from the pump station along Palos Verdes Dr North to Crenshaw Blvd, and then along Crenshaw Blvd to the new reservoir (15,000ft)	$ 12.30	$ 12.30	$ -
R-2	New pipe	P-1450	New 27-inch pipe from New pump station (R-3) to existing 27-inch in P-1450 Zone (4,400ft)	$ 3.45	$ 3.45	$ -
R-3	New pump station	P-1450	New Crenshaw Pump Station, pumps from Crenshaw Reservoir to P-1450 Zone: 750 hp, 4,700 gpm, 600 ft TDH	$ 4.22	$ 4.22	$ -
R-4	New PRV	J-600	PRV from the new 30-inch pipe (R-1) to the J-600 Zone connecting to the existing 12-inch at Palos Verdes Dr and Crenshaw Blvd (12-inch Valve)	$ 0.05	$ 0.05	$ -

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Table 13-3
Summary of Recommended Improvements for Palos Verdes District

Improvement ID	Location/Type of Improvement	Zone	Description	Estimated Total Capital Cost in 2009 Million $	Distribution of Costs by Timeframe ($ million)	
					Near Term (By 2015)	Long-Term
S-4	Additional Storage	J-600	Crenshaw Reservoir (3.5 MG – HGL 850 ft) (Recommended Project S-4)	$ -		
Subtotal - System Reliability Projects				**$ 20.03**	**$ 20.03**	**$ -**
Renewal and Replacement Projects						
D-500 Distribution Project (see details in Section 12.8)						
M-1	Pipe replacement	D-500	Replace existing 20-inch with a new 24-inch from Sta 15 to Reservoir 05 (19,000ft)	$ 13.97	$ 13.97	$ -
M-2	Pipe replacement	D-500	Replace existing 16-inch with a new 20-inch from Reservoir 05 to new Reservoir Via Olivera (23,000ft). The new pipe alignment will follow the existing pipe alignment, along Via del Monte, Via Montemar, Palos Verdes Dr W, and Via Rivera	$ 15.07	$ 15.07	$ -
S-5	Additional Storage	D-500	Via Olivera Reservoir (2.0 MG – HGL 500 ft) (Recommended Project S-5)	$ -		
Subtotal				$ 29.03	$ 29.03	$ -
Reservoir 19 Feeding Line Project (see details in Section 12.8)						
M-3	Pipe Replacement	C-850	Replace existing 33-inch with a new 34-inch from Colt Rd to Reservoir 19	$ 1.3	$ 1.3	$ -
Booster Station Upgrade Project (see details in Section 12.9)						
M-4	Station 5 - Replace Unit A (by 2015)	H-675	Pump and motor replacements for existing pumps that have exceeded their design useful lives.	$ 0.08	$ 0.08	$ -
M-5	Station 14 - Replace Units A and B (by 2015)	P-600		$ 0.07	$ 0.07	$ -
M-6	Station 15 - Replace Unit D Pump (by 2015); Unit A Pump and Motor(by 2020)	D-500		$ 0.19	$ 0.03	$ 0.17
M-7	Station 22 - Replace Units B,C,D,E,F,G,H - Pump and Motor (by 2020)	C-850		$ 1.15	$ -	$ 1.15
M-8	Station 23 - Replace Units C, D and H Pump and Motor (by 2015); Units A, B and E (by 2020)	P-1450		$ 1.74	$ 0.87	$ 0.87
M-9	Station 30 - Replace Units C, D and E Pump and motor (by 2020)	C-850		$ 0.93	$ -	$ 0.93
M-10	Station 37 - Replace Units A and B Pump and Motor (by 2020)	P-1450		$ 0.26	$ -	$ 0.26
M-11	Station 38 - Replace Units A and B Pump and Motor (by 2015)	P-1600		$ 0.11	$ 0.11	$ -

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Table 13-3
Summary of Recommended Improvements for Palos Verdes District

Improvement ID	Location/Type of Improvement	Zone	Description	Estimated Total Capital Cost in 2009 Million $	Distribution of Costs by Timeframe ($ million)	
					Near Term (By 2015)	Long-Term
M-12	Pump Station Electrical Upgrades at Station 14, Station 15, Station 22, Station 30, Station 37	various	Replacement of aged electrical systems that have exceeded their design useful lives.	$ 4.66	$ 4.66	$ -
M-13	SCADA system RTU upgrades at Station 4, Station 30, Station 37	various	Replacement of aged RTUs that have exceeded their design useful lives.	$ 0.12	$ 0.12	$ -
M-14	PRV replacement at Stations 15, 22, 23, 30, 37	various	Replace of aged PRVs at pump stations	$ 0.27	$ 0.27	$ -
Subtotal - Renewal and Replacement Projects				**$ 39.96**	**$ 36.58**	**$ 3.38**
Improvements to Enhance System Operation						
A Cascade Distribution Project (proposed to address A Cascade surge issues, see details in Section 12.8)						
O-1	New pipeline	A Cascade	New 16-inch pipe from New PRV (O-4) to new Ganado Reservoir (12,000ft)	$ 5.58	$ 5.58	$ -
O-2	New PRV station	A Cascade	New PRV from Sta 23 discharge line	$ 0.05	$ 0.05	$ -
O-3	New pipeline	A Cascade	New 12-inch pipe from the new Ganado Reservoir to PRV Station A85, located at Sea Claire Dr and Sea Glen Dr(1,400ft)	$ 0.50	$ 0.50	$ -
S-6	Additional Storage	A Cascade	Ganado Reservoir (2.0 MG – HGL 850 ft) (Recommended Project S-6)	$ -	$ -	$ -
O-4	PRV A130	A Cascade	Connect existing PRV Station to the new 16-in line (O-1)	$ 0.05	$ 0.05	$ -
O-5	PRV A108	A Cascade	Connect existing PRV Station to the new 16-in line (O-1)	$ 0.05	$ 0.05	$ -
O-6	PRV A37	A Cascade	Connect existing PRV Station to the new 16-in line (O-1)	$ 0.05	$ 0.05	$ -
Other Operational Improvements (see details in Section 12.8)						
O-7	Upgrade Pressure Monitoring Equipment	PV System	Replace existing pressure monitoring equipment in 5 locations	$ 0.01	$ 0.01	$ -
O-8	Panel Board replacement	C-850	Pump Stations 22 and 30	$ 0.02	$ 0.02	$ -
Subtotal - System Operation Improvements				**$ 6.31**	**$ 6.31**	**$ -**
TOTAL				**$ 103.03**	**$ 78.66**	**$ 24.37**

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13.4 Basis for Capital Cost Estimates

This section provides the basis of the capital cost estimates for the Rancho Dominguez District system recommendations (all three districts). Conceptual planning-level capital cost estimates were developed for facility improvements. All costs are in March 2009 dollars and are indexed to the Engineering New Records Construction Cost Index for Los Angeles (ENR CCI of 9799).

The estimated capital costs include:

- Construction Cost: Calculated using unit construction costs based on cost data from other Cal Water master plans in California, indexed to the Los Angeles area. The unit costs assume a normal (average) construction environment, and do not include such things as significant rock excavation or dewatering, unusual working hours, or exotic construction methods.

- Construction Contingency: Markup of 30 percent of the construction cost, which is intended to account for additional work that may be identified during final design, uncertainties in the bidding climate, and change orders during construction.

- Project Implementation Allowance: Allowance of 40 percent of the total construction cost (construction cost plus construction contingency) to cover the following items:
  - Feasibility and siting studies (4%),
  - Preliminary and final design engineering, preparation of construction plans and specifications (12%),
  - Environmental documentation and permitting (4%),
  - Construction services including construction management, construction inspection, engineering support during construction, construction surveying, start-up services, and as-built drawings (10%),
  - Project administration, legal support (2%) and Cal Water overhead (8%).

- Land costs are included for future well sites. It may also be possible to utilize existing Cal Water-owned properties, sites dedicated as part of new development agreements, or public properties by agreement with local agencies for emergency supply sites. The estimated costs for wells include land purchase, since no existing sites have been identified and all future wells may require land purchase/easements.

Table 13-4 summarizes unit capital costs for water system improvements. These unit capital costs are based on the construction cost times a total markup of 1.82 for construction contingency and project implementation (markups are compounded).

Table 13-4
Unit Capital Costs for Water System Improvements

Unit capital costs include construction costs times 1.82 total markup for contingencies (30% of construction cost) and project implementation (40% of total construction cost with contingencies). Unit costs are in March 2009 dollars, ENR CCI of **9799** for Los Angeles.

CONCRETE RESERVOIRS [(1)]		
Capacity (MG)	***Unit Capital Cost ($ per gallon)***	***Total Capital Cost ($ per Reservoir)***
0.25	$ 2.9	$ 713,000
0.5	$ 2.7	$ 1,372,000
0.75	$ 2.7	$ 2,029,000
1	$ 2.7	$ 2,690,000
1.5	$ 2.6	$ 3,877,000
2	$ 2.5	$ 4,960,000
2.5	$ 2.4	$ 6,064,000
3	$ 2.4	$ 7,120,000
3.5	$ 2.3	$ 8,121,000
4	$ 2.3	$ 9,071,000
5	$ 2.2	$ 10,813,000
STEEL RESERVOIRS [(1)]		
Capacity (MG)	***Unit Capital Cost ($ per gallon)***	***Total Capital Cost ($ per Reservoir)***
0.25	$ 2.2	$ 553,000
0.5	$ 2.2	$ 1,083,000
0.75	$ 2.1	$ 1,596,000
1	$ 2.1	$ 2,111,000
1.5	$ 2.1	$ 3,087,000
2	$ 2.0	$ 4,009,000
2.5	$ 2.0	$ 5,010,000
3	$ 1.9	$ 5,697,000
3.5	$ 1.8	$ 6,461,000
4	$ 1.8	$ 7,174,000
5	$ 1.7	$ 8,703,000
PUMP STATIONS [(2)]		
Total HP	***Unit Capital Cost ($ per HP)***	***Total Capital Cost ($ per Station)***
20	$ 18,200	$ 364,000
40	$ 13,700	$ 546,000
60	$ 11,800	$ 708,000
80	$ 9,500	$ 757,000
100	$ 8,100	$ 801,000
150	$ 6,100	$ 903,000
200	$ 5,300	$ 1,057,000
300	$ 4,900	$ 1,449,000
400	$ 4,800	$ 1,906,000
500	$ 4,800	$ 2,353,000
600	$ 4,700	$ 2,814,000
700	$ 4,500	$ 3,105,000
800	$ 4,200	$ 3,356,000
1,000	$ 4,100	$ 4,008,000
1,100	$ 3,900	$ 4,221,000
1,200	$ 3,700	$ 4,384,000
1,300	$ 3,600	$ 4,570,000
1,400	$ 3,400	$ 4,721,000
1,700	$ 3,100	$ 5,207,000
2,000	$ 2,900	$ 5,738,000
2,700	$ 2,800	$ 7,457,000

Cost Percentages for Replacement Projects
Replacement costs estimated as a percentage of the total cost for a new pump station:
Pumps & motors – 20%
Pump - (no motor) 5%
Electrical/instrumentation – 30%
Pipes, fittings, valves – 20%
Building, site work – 30%

Table 13-4
Unit Capital Costs for Water System Improvements

Unit capital costs include construction costs times 1.82 total markup for contingencies (30% of construction cost) and project implementation (40% of total construction cost with contingencies). Unit costs are in March 2009 dollars, ENR CCI of **9799** for Los Angeles.

PIPELINES [3] ***(Within Existing Paved Right-of-Way)***	
Diameter (inch) (inches)	***Unit Capital Cost ($ per foot)***
6	$ 190
8	$ 255
10	$ 335
12	$ 355
16	$ 465
18	$ 530
20	$ 655
24	$ 735
27	$ 785
30	$ 820
34	$ 890

VALVES		
Valve Type	***Diameter (inch) (inches)***	***Unit Capital Cost ($ per unit)***
Pressure Reducing Valve	16	$ 54,600
	8	$ 29,200
	6	$ 21,900
New PRV Station (1- 6-inch Valve, 1- 4-inch Valve)	6,4	$ 54,600

WELLS [4]	
Capacity (gpm)	***Total Capital Cost per Well at New Site***
1,000	$ 2,559,000

STANDBY POWER GENERATORS	
Capacity (kW)	***Total Capital Cost per kW***
20	$ 1,350
40	$ 1,350
60	$ 1,150
80	$ 1,150
100	$ 1,150
150	$ 1,050
200	$ 1,050
400	$ 1,050
500	$ 1,050

OTHER IMPROVEMENTS	
Improvement	***Total Capital Cost per Site***
Panel Board Replacement	$ 9,100

[1] Reservoir construction costs assume aboveground structures and include average site work, valve vault, telemetry, piping and appurtenances. Steel reservoirs have a lower initial capital cost than concrete reservoirs; however, steel reservoirs incur higher life cycle maintenance costs due to the need for periodic re-coating and cathodic protection. Cost estimates are based on concrete reservoirs.

[2] Pump station construction costs are based on an aboveground structure with standby pump, backup power capability, and telemetry.

[3] Pipeline unit construction costs include valves and appurtenances, pavement removal and replacement, traffic control, and an average allowance for correction of utility interferences.

[4] Well construction costs include drilling, equipping, standby power, and up to 1,000 LF discharge piping to connect into distribution system. For new sites, the costs also include land purchase (at $500,000 per well site). Existing sites may be Cal Water-owned properties, sites dedicated as part of new development agreements, or public properties through agreements between Cal Water and local agencies for emergency supply sites. The cost estimates in Table 13-1 are based on new sites.