Water System Master Plan

City of East Palo Alto

Respectfully Submitted by:

Integrated Resource Management, LLC

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List of Abbreviations

ADD	Average Day Demand
AL	Action Level
CDPH	California Department of Public Health
CIP	Capital Improvement Projects
ccf	100 cubic feet
CCR	Consumer Confidence Report
CDPH	California Department of Public Health
DWR	Department of Water Resources
DWSAP	Drinking Water Source Assessment and Protection
FFD	Fire Flow Demands
ft	Feet
gpd	Gallons per Day
gpm	Gallons per Minute
LF	Linear Feet
MCL	Maximum Contaminant Level
MDD	Maximum Day Demand
MG	Million Gallons
MGD	Million Gallons per Day
mg/L	Milligrams per Liter
PDD	Peak Day Demand
PHD	Peak Hour Demand
PRV	Pressure Reducing Valve
psi	Pounds per Square Inch
RBD	Ravenswood Business Development
SDWA	Safe Drinking Water Act
SFPUC	San Francisco Public Utilities Commission
SWRCB	State Water Resources Control Board
µg/L	Micrograms per Liter
USEPA	United States Environmental Protection Agency

1.0 EXECUTIVE SUMMARY

1.1 Background

American Water Services Company operates the City of East Palo Alto's water system via an operating agreement with the City. The City of East Palo Alto serves approximately 30,000 people in the city and a small section in the City of Menlo Park.

1.2 Water Supply

The existing water supply provided by the San Francisco Public Utilities Commission (SFPUC) through the regional Hetch Hetchy system is adequate to meet current demands. Presently, the water system is completely dependant on the Hetch Hetchy system for potable water. The City of East Palo Alto fluctuates around the 1.96 MGD Supply Assurance from SFPUC. In the future, SFPUC may not be able to meet the demands of the City of East Palo Alto., which are expected to increase by 63% over the next 20 years, mainly due to the Ravenswood Business District. To meet future demands and provide service during times of drought and emergencies, the City of East Palo Alto needs to explore other water sources.

The City also owns a groundwater well at Gloria Way and Bay Road (Gloria Bay Well), which is used exclusively for non-potable purposes (e.g. street cleaning and construction) because of the groundwater's high iron and manganese concentrations.

The City of East Palo Alto should install an iron and manganese treatment system for the Gloria Bay groundwater well, including an emergency backup power system. This will assist in the current demands that fluctuate around the SFPUC Supply Assurance. Construction of additional groundwater wells will also be needed, increasing water supply reliability by at least 1,000 gpm to meet future demands over the next 20 years.

Although the City of East Palo Alto maintains interties with the Palo Alto Mutual Water Company and the O'Connor Tract Mutual Water Company, these connections serve only as emergency supplies for the two mutual water companies; the emergency interties are not bidirectional and cannot provide water to the City water system. The City of East Palo Alto should commence negotiations for emergency interties with the City of Palo Alto and the City of Menlo Park. The proposed interties with the neighboring municipal water systems would ensure the City of East Palo Alto could meet the demands if SFPUC were to issue a reduction in supply order or if power outages or other water supply disruptions were to occur. Water quality analysis should be conducted on the systems that are supplied by groundwater in order to evaluate the impacts on compatibility with the Hetch Hetchy supply.

1.3 Water Distribution System

The existing water distribution system is a network of 1½- to 12-inch diameter pipes. There are three supply turnouts with the SFPUC for supply as well as two emergency interties that may serve water only to the two mutual water companies. The water system has nearly 300 fire hydrants. Treated water comes from the Hetch Hetchy Aqueduct at pressures ranging from 105 to 140 psi. The water supply turnouts are located on the aqueduct near its location at Willow Road, O'Brien Drive and University Avenue. Pressure-regulating valves at each water supply turnout reduce the pressure in the water distribution system. The valves are set to the following pressures: 70 psi at Willow Road, 75 psi at O'Brien Drive, and 75 psi at University Avenue.

The minimum standard pipeline diameter for the water distribution system should be eight inches. Presently, the water system has nearly 90,000 linear feet of six-inch pipelines. Upgrades to these pipelines are planned in accordance with long-term budget projections. As part of upgrading the water distribution system, and to account for future system demands, pipelines will need to be replaced with larger-diameter pipes to maintain adequate system pressures. In addition, upgrading all pipe sizes will increase the available fire flow to the water system.

Proposed pipeline replacements have been divided into five groups based upon the disparity between necessary fire flows, current fire flow availability, and size of pipe. The total pipeline replacement program includes approximately 201,000 LF of pipeline at a total estimated cost of $32,100,000.

1.4 Water Storage

The City of East Palo Alto relies solely on the Hetch Hetchy water system for storage; there are no storage facilities located within the City's own water system. To meet water system demands, it is estimated the City would need 4.2 MG of capacity for system equalization, fire flow, and emergency storage. Due to the area's topography, the system will need booster station facilities to boost water into the distribution system from the storage facility.The Ravenswood Business District is planning to construct a 1.8 MG water storage tank to provide system equalization, fire flow, and emergency storage to provide for the growth from the development.

1.5 Funding Sources

Funding for water projects can come from a wide variety of sources. Utility rate charges are the most straightforward ways of increasing revenue. Highly flexible, they can be structured to uniformly spread cost among water users or to charge users in proportion to the water they use. Another option is the use of system development fees, which are designed to recover at least part of project costs. System development fees are governed by Impact Fee Nexus Requirements, established by AB 1600. These mandate that the governing agency defend the need for and use of such fees.

In addition to these direct funding sources, a number of financing options at both the state and federal levels are available to fund water system projects. Within California, the Department of Water Resources (DWR) California Department of Public Health (CDPH), and State Water Resources Control Board (SWRCB) oversee the vast majority of disbursements for public water systems. Funding from federal agencies and acts, such as the American Reinvestment and Recovery act of 2009, tends to be funneled through these state agencies.

Programs likely to be applicable to EPA's aims include SWRCB's Water Recycling Funding Program and both DWR's Local Groundwater Assistance program and Integrated Regional Water Management Program. These agencies also offer revolving funds designed to finance water projects. Nevertheless, as grant programs vary widely in their application dates and restrictions on types of projects, consulting the appropriate departmental website is advised.

At the time of this report, the City of East Palo Alto has already secured some funding sources. Five grants have been appropriated which total $3,034,500 with a match of $2,482,272. The City is utilizing one appropriation which leaves $2,928,400 with a match of $2,395,463 to be awarded. The total remaining project cost is $5,517,272.

The City of East Palo Alto (City) needs to determine how these funds will be used, request Congress revise the appropriation language so all funds can be applied for through a single, consolidated application (if appropriate), and submit the project work plan and grant application to US EPA. If the language cannot be satisfactorily changed such that one application is sufficient, the City should submit separate work plans and grant applications for each of the separate appropriations. Requesting Congress revise the existing appropriation language to a broad purpose such as “water infrastructure improvements” would provide flexibility and consistency for the City.

Though some funding has been secured, there nevertheless remain opportunities to increase the amount.

2.0 INTRODUCTION

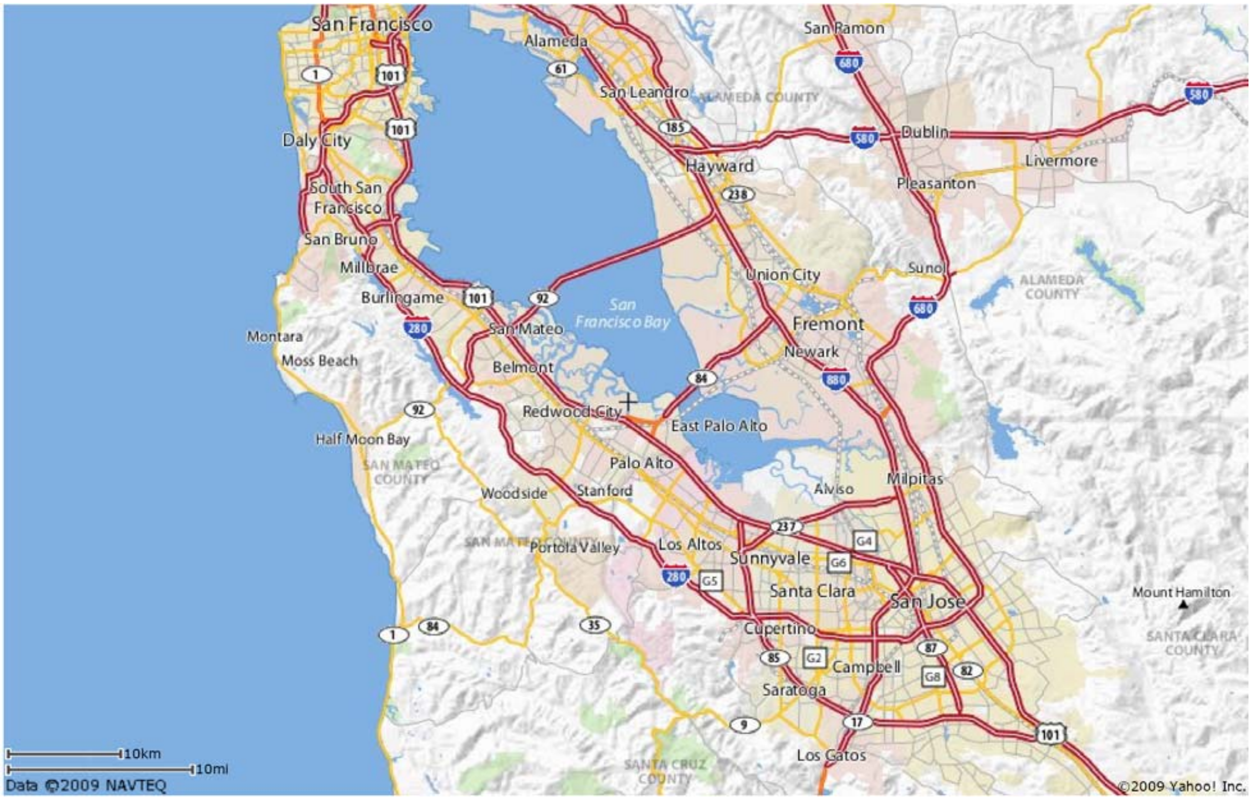
2.1 Background

The City of East Palo Alto is located in the southeast corner of San Mateo County along the southwestern shore of San Francisco Bay's South Bay (see Figure 2-1). The City of East Palo Alto, including areas to both the west and east of Highway 101, is bound on the north by the City of Menlo Park, on the west by the City of Palo Alto, on the east by the San Francisco Bay, and on the south by sloughs leading to San Francisquito Creek and the San Francisco Bay.

Founded in 1849, East Palo Alto was part of unincorporated San Mateo County for most of its history and did not have an official boundary until its incorporation in 1983 (after failed attempts in 1966, '78, and '81 to annex all or portions of East Palo Alto into Menlo Park and Palo Alto). As a result, distinct neighborhoods have grown to have their own identity, including University Village, Palo Alto Gardens, Woodland Place, Palo Alto Park, Bayshore Park, etc. The City of East Palo Alto is sometimes mistakenly thought to be part of the City of Palo Alto, although the two cities reside in different counties and have always been separate entities.

The City of East Palo Alto water system is subject to an operating agreement between the City of East Palo Alto and American Water Services Company. The City of East Palo Alto's public water system (PWS ID No. 4110024) is operated by the City of East Palo Alto's Department of Public Works. A major portion of the City of East Palo Alto's water system was once operated by the County of San Mateo under the identity of East Palo Alto County Waterworks District. The City of East Palo Alto assumed operation of the water distribution system from San Mateo County in 2001. Currently, American Water Services Company manages the distribution, operation, and maintenance of the municipal water system on behalf of, and under contract with, the City of East Palo Alto. This Water System Master Plan has been developed with the input and cooperation of both the City of East Palo Alto and American Water Services Company.

Figure 2-1 City of East Palo Alto Location



(Source: Yahoo.com; http://maps.yahoo.com)

2.2 Scope of Work

The primary objective of the City of East Palo Alto 2009 Water System Master Plan is to identify and present capital improvements required to upgrade the existing distribution system to meet the current water demand and to expand the distribution system to meet demand associated with future development, specifically the Ravenswood Business Development (RBD). Further, the Plan serves as a guide for long-range planning for improvements to ensure the community has a reliable water supply going forward. The 2009 Water System Master Plan documents the conditions under which the City of East Palo Alto was operating in 2008.

Generally, the Scope of Services addresses the following areas:

- Identification of current and future water demand
- Assessment of the adequacy of existing supply sources to meet current and future demands
- Identification of additional supply sources to meet expected demands
- Calibration and update of the water distribution system model
- Evaluation of the water distribution system capability to provide adequate operating pressures and reliable service to the community

- Identification of necessary improvements to correct deficiencies
- Preparation of a Capital Improvement Program

2.3 Report Organization

The Water System Master Plan provides a comprehensive assessment of the water supply service and issues confronting the City of East Palo Alto. The Water System Master Plan is intended to assist City of East Palo Alto staff in making strategic and facility planning decisions.

The City of East Palo Alto Water System Master Plan is organized as follows:

- Chapter 1 provides an executive summary to the Water System Master Plan.
- Chapter 2 introduces the Water System Master Plan.
- Chapter 3 describes the existing water supply sources and the current demands.
- Chapter 4 reviews the various water quality requirements.
- Chapter 5 identifies potential water supply sources.
- Chapter 6 presents the results of a computer modeling of the distribution system.
- Chapter 7 recommends Capital Improvement Projects.

3.0 WATER SUPPLY AND DEMANDS

3.1 Water Supply

The City of East Palo Alto supplies water to residential, commercial, and industrial customers over approximately two and a half square miles, incorporating most of the City of East Palo Alto and a small section of the City of Menlo Park east of Highway 101. The City of East Palo Alto receives all potable water from the City and County of San Francisco's regional system, operated by the San Francisco Public Utilities Commission (SFPUC). The City of East Palo Alto water system currently receives all of its potable water through three turnouts off the SFPUC Bay Division Pipelines (BDPLs) 1 and 2.

The City of East Palo Alto owns and operates one groundwater well located at the intersection of Gloria Way and Bay Road, thus named the Gloria Bay Well. The groundwater well is currently used for non-potable purposes (e.g. street cleaning and construction).

While there are two emergency water system connections equipped with pressure-reducing valves to serve the Palo Alto Park Mutual Water Company and the O'Connor Tract Mutual Water Company, they are not bidirectional and cannot provide water to the City of East Palo Alto.

3.1.1 San Francisco Public Utilities Commission

The SFPUC water supply is predominantly from the Sierra Nevada; delivered through the Hetch Hetchy aqueducts. The SFPUC water supply also includes treated water produced from local watersheds and facilities in Alameda and San Mateo Counties.

The City of East Palo Alto is one of 27 local agencies that are wholesale water customers of the SFPUC, served under terms of a Water Supply Agreement together with individual Water Supply Contracts.

The United States Congress granted the City and County of San Francisco the rights to develop Hetch Hetchy Water and Power Project on Tuolumne River through the Raker Act of 1913. The Hetch Hetchy Reservoir, located in Yosemite National Park, provides approximately 85% of the SFPUC's total water needs. Spring snowmelt runs down the Tuolumne River and fills Hetch Hetchy, the largest reservoir in the SFPUC system. Two other reservoirs are located in the Hetch Hetchy system: Eleanor Reservoir, which collects water from Eleanor Creek, and the Cherry Reservoir, fed by the Cherry River. Water collected at Cherry and Eleanor Reservoirs is utilized only as a backup supply, primarily during drought situations.

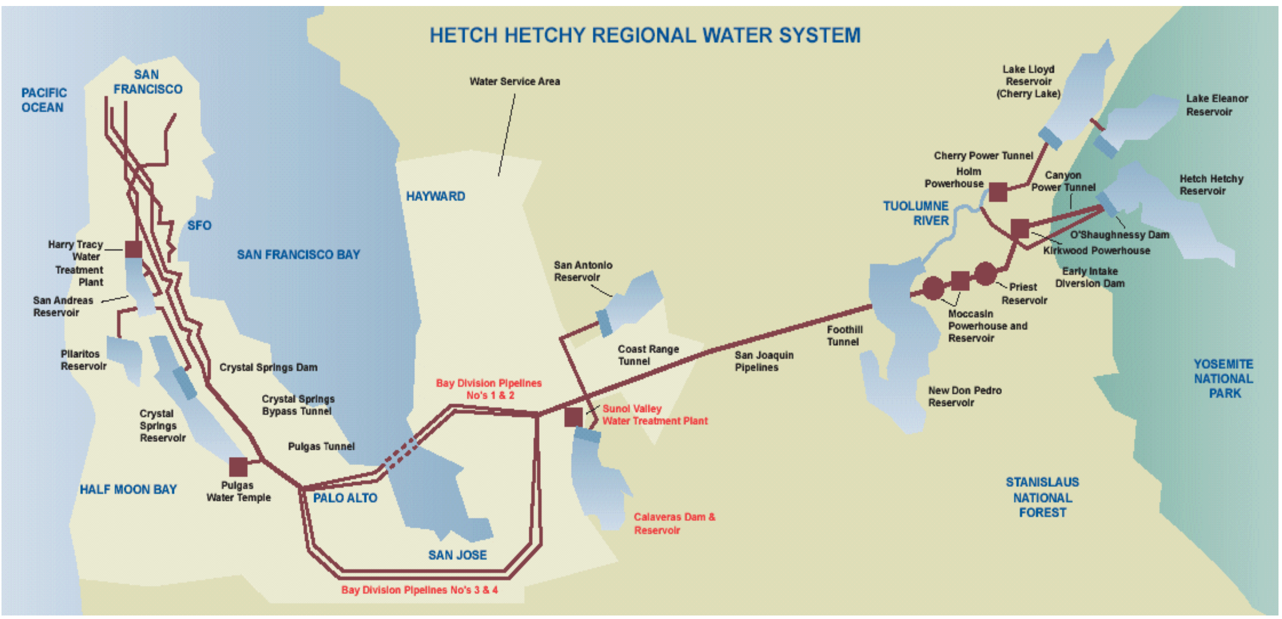
The Hetch Hetchy water supply meets all federal and state criteria for watershed protection, disinfection treatment, bacteriological quality, and operational standards. As a result, the United States Environmental Protection Agency (USEPA) and California Department of Health Services (CDHS) granted the Hetch Hetchy water source a filtration exemption. This exemption is contingent upon the Hetch Hetchy water quality continuing to meet all regulatory criteria.

The Alameda watershed, located in Alameda and Santa Clara Counties, contributes surface water supplies captured and stored in two reservoirs, Calaveras and San Antonio. The Sunol Filter Galleries near the Town of Sunol are groundwater sources supplying less than 1% of the water supply. These local water sources and groundwater from the Sunol Filter Galleries are treated and filtered before delivery.

The amount of imported water available to the SFPUC retail and wholesale customers is constrained by hydrology, physical facilities, and the institutional parameters that allocate the water supply of the Tuolumne River. Due to these constraints, the SFPUC is very dependent on reservoir storage to ensure its water supplies.

The SFPUC serves its retail and wholesale water demands by combining local Bay Area water production and imported water from Hetch Hetchy. In practice, the local watershed facilities are operated to capture local runoff.

Figure 3-1 Hetch Hetchy Regional Water System



3.1.1.1 Water Supply Agreement

The relationship between SFPUC and its wholesale customers is largely defined by the Water Supply Agreement (Agreement) executed in 2009 (Appendix 1). The Agreement replaces the Settlement Agreement and Master Water Sales Contract executed in 1984. The Agreement describes the rate-making methodology used by the City in setting water rates for its wholesale customers, and it addresses water supply and water shortages for the regional water system. The Agreement has a term of 25 years and expires on June 30, 2034.

In terms of water supply, the SFPUC's Agreement provides 184 million gallons per day (expressed on an annual average basis) as a "Supply Assurance" to the SFPUC's wholesale customers. The amount is subject to reduction in the event of drought, water shortage, emergencies, or by malfunctioning or rehabilitation of facilities in the Regional Water System. The Agreement does not guarantee that San Francisco will meet peak daily or hourly customer demands when their annual usage exceeds the Supply Assurance. The SFPUC's wholesale customers have agreed to allocate of the 184 MGD Supply Assurance amongst themselves, with each entity's share set forth in Attachment C of the Agreement. This Supply Assurance survives the termination of the Agreement in 2034.

The City of East Palo Alto has a supply assurance of 957,539 ccf per day, or 1.963 MGD.

In order to define operations in drought years, the Interim Water Shortage Allocation Plan (IWSAP) between the SFPUC and its wholesale customers was adopted in 2000, updated in 2009, and included in the Agreement.

3.1.1.2 Interim Water Shortage Allocation Plan

The SFPUC can meet the demands of its retail and wholesale customers in years of average and above-average precipitation. During periods of water shortage, the Agreement allows the SFPUC to reduce water deliveries to wholesale customers. Under the Agreement, reductions to wholesale customers are to be based on each agency's proportional purchases of water from the SFPUC during the year immediately preceding the shortage, unless this formula is supplanted by a water conservation plan agreed to by all parties.

The formula's reliance on preceding-year purchase amounts discourages SFPUC's wholesale customers from reducing purchases from SFPUC during periods of normal water supply through demand management programs or development of alternative supplies. To overcome this problem and ensure greater access to its own water supply, SFPUC and its wholesale customers adopted an Interim Water Shortage Allocation Plan (IWSAP) in 2000 (updated in 2009) and included it in the Agreement.

The IWSAP has two components. The Tier 1 component of the IWSAP establishes distribution rates between San Francisco and the wholesale customer agencies collectively based on the degree of water shortage. Tier 1 rates apply to system-wide shortages up to 20%. Table 3-1 sets out these Tier 1 reduction rates:

Table 3-1 Interim Water Shortage Allocation Plan Tier 1 Reduction Rates

Level of System-Wide Reduction in Water Use Required	Share of Available Water	
	SFPUC Share	Suburban Purchasers Share
5% or less	35.5%	64.5%
6% through 10%	36.0%	64.0%
11% through 15%	37.0%	63.0%
16% through 20%	37.5%	62.5%

The Tier 2 component of the IWSAP allocates the collective wholesale customer share among each of the 27 wholesale customers. The Tier 2 does not have a specific allocation reduction for each of the wholesale customers, but instead lays out how parties shall proceed in the event of a system-wide shortage greater than 20%. There are several actions SFPUC and the wholesale customers take to implement Tier 2. The first action is to meet and discuss whether a change to the Tier 1 water allocation needs to be enacted in order to mitigate undue hardships that might be experienced by the wholesale or retail customers. Second, Tier 1 water allocations, or modifications thereto, are to be adopted by mutual consent of SFPUC and the Wholesale Customers. If a Tier 1 allocation can not be mutually agreed upon within 30 days, SFPUC can determine the Tier 2 reduction based on Section 3.11(C) of the Agreement, unless a Tier 2 allocation methodology agreed to by the Wholesale Customers be used to apportion the water to be made available to them collectively, in lieu of the provisions of Section 3.11(C) of the Agreement.

The IWSAP allows for voluntary transfers of shortage allocations between SFPUC and any wholesale customer and between wholesale customer agencies themselves. Also, water “banked” by a wholesale customer, through greater reductions in usage than required, may also be transferred.

3.1.2 Emergency Interties

The City of East Palo Alto maintains two interties, one with the Palo Alto Park Mutual Water Company and one with the O’Connor Tract Mutual Water Company. These interties are equipped with a pressure-reducing valve (PRV) and serve only the two companies. The emergency interties cannot provide service to the City of East Palo Alto.

3.1.3 Gloria Bay Well

In 1981, the East Palo Alto County Water District installed the Gloria Bay Well at the corner of Gloria Way and Bay Road in order to supplement the Hetch Hetchy supply. Shortly after the groundwater well’s activation, residents complained of a strange odor emanating from the water and claimed it made the water undrinkable. The water was found to be safe to drink, passing the California Department of Public Health state drinking water standards at the time, though not meeting the Department’s aesthetic standards for odor. Officials were uncertain whether the odor was caused by the well water’s contact with chlorinated San Francisco water (the SFPUC now uses chloramines instead of chlorine to treat its drinking water) or the specific mineral content of the well water itself. The well ceased production in 1989 and was officially taken out of domestic service in July 1999.

A pump test conducted in 2003 shows the groundwater well has the capacity to produce 350 gallons per minute (gpm). Well inspections completed at the same time determined that the screen perforations were located in the intervals from 259 to 282 feet and from 319.5 to 325.5 feet below ground surface. The casing is 12-inch, spiral-seam steel.

The groundwater well is currently utilized on a limited, part-time basis for non-domestic purposes. The water from the groundwater well serves the City of East Palo’s street cleaning, construction dust-control, and sewer-line flushing programs. The well’s discharge line is not connected to the distribution system.

If the City of East Palo Alto is able to reintroduce groundwater into its water supply in the future, the groundwater will need to be treated.

3.2 Water Demands

3.2.1 Historical Water Use

The City of East Palo Alto currently supplies water service to 4,163 metered customers and to the City of Menlo Park. All potable water is delivered from the SFPUC water system. Table 3-2 summarizes the historical water use by service classification during the period of 1999-00 to 2007-08.

Table 3-2 Historical Water Use (ccf)

Water year	Residential/ Multi-Family	Commercial/ Industrial	Other	Unaccounted	Menlo Park	Total
99-00	678,341	127,287	106,527	84,735	--	996,890
00-01	711,794	134,663	115,426	83,642	--	1,045,525
01-02	612,600	109,719	192,010	80,000	--	994,329
02-03	740,136	120,331	53,121	76,915	--	990,503
03-04	735,601	161,415	36,184	139,923	--	1,073,123
04-05	681,901	40,953	28,662	0*	64,787	816,303
05-06	672,672	153,878	22,601	134,413	55,822	1,039,386
06-07	772,926	205,943	24,180	-26,175	60,653	1,037,527
07-08	774,219	143,118	23,323	55,927	59,237	1,055,824
08-09	655,590	198,590	21,007	62,858	52,199	990,244

included in other data provided from BAWSCA

The total annual water production during the analysis periods ranged from 816,303 to 1,073,123 ccf. The total production increased about 5% from 1999 to 2008.

The total water delivery to the water customers in the service area, as measured by water meters, is typically less than the total water production (or delivered from SFPUC). Unaccounted water usage is always present in a water system and can result from many factors, such as unidentified leaks in a pipe network, periodic fire-hydrant flushing, firefighting, unauthorized use, inaccurate and nonfunctioning meters, etc. Table 3-2 shows the water loss (unaccounted) during the last ten years. In modeling, unaccounted usage must be added to the system demands so that total water supplied will equal total demand. The overall water loss for the past ten years is estimated to be about 7.0% with current losses at 5.3% for the system.

Additionally, the City of East Palo Alto provides water for street sweeping and construction from the Gloria Bay Well. Table 3-3 summarizes the water provided from 2003-04 to 2008-09.

Table 3-3 Historical Gloria Bay Water Use (ccf)

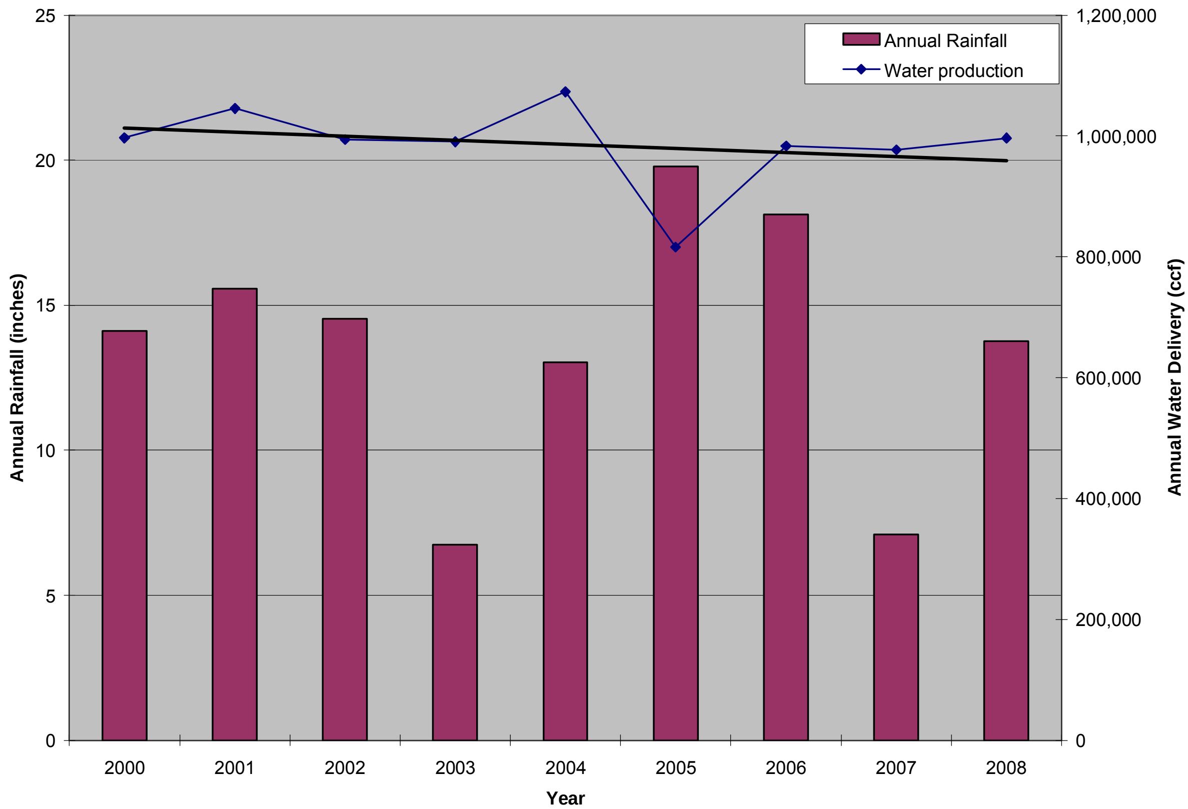
Water year	Gloria Bay Well
03-04	4,837
04-05	2,566
05-06	881
06-07	1,322
07-08	7,761
08-09	584

3.2.2 Climate

The San Francisco Bay Area has a Mediterranean climate, characterized by dry, warm summers and mild winters. The area receives most of its rainfall between November and June, and its warmest temperatures occur in September and October. The average annual rainfall for the City of East Palo Alto is about 14 inches. Daily summer temperatures vary from 68 to 85°F, while winter temperatures rarely descend below freezing.

Figure 3-2 shows historical annual water production by the City of East Palo Alto and annual rainfall over the last nine years (2000-08). As seen in the trend line, data show that the historical water demand in the last nine years had some fluctuation from the expected water demand. This fluctuation may be influenced by climatic conditions; as shown in Figure 3-2, there is a general inverse correlation between rainfall and water demand. Predictably, when the weather is dry and hot, water demand increases. During wet, cool years, water demand decreases, reflecting lower water outdoor usage. For example, 2003 and 2004 were dry years, and water demand was higher than expected; on the other hand, 2005 and 2006 were wet years, and water demand was lower than expected.

Figure 3-2 Historic Annual Water Deliveries and Rainfall



Notes: Rainfall year 2000 correlates to water delivery year 1999/2000
Year 2005 to 2008 water production does not include deliveries to Menlo Park
(Rainfall source: Western Regional Climate Center, Palo Alto station)

3.2.3 Population Forecasts

Population in the City of East Palo Alto water service area is anticipated to increase from approximately 29,690 people in 2008 to an estimated 36,000 people by 2030, according to Bay Area Water Supply and Conservation Agency.

Figure 3-4 shows historical population data in the City of East Palo Alto water service area provided by BAWSCA. The population in the water service area in 2008 was 29,690.

Population in the water service area during the ten-year period from 1999 to 2008 grew by 10%.

Table 3-4 Estimated and Projected Change in Population

Fiscal year	East Palo Alto Service Area
99-00	27,300
00-01	28,000
01-02	28,500
02-03	31,200
03-04	31,500
04-05	31,500
05-06	25,696
06-07	29,690
07-08	29,690
08-09	30,000
10-11	30,000
20-21	33,000
30-31	36,000

Source: Bay Area Water Supply and Conservation Agency

In addition to the historical population data for the service area provided by BAWSCA, the following 1990 and 2000 population data and housing unit data were obtained from the United States Census Bureau for the entire city:

1990 Census population: 23,451; occupied housing units: 6,953; occupancy rate per unit: 3.4

2000 Census population: 29,506; occupied housing units: 6,976; occupancy rate per unit: 4.2

Based on the Census population data in 1990 and 2000, the population growth during the ten-year period from 1990 to 2000 was approximately 606 people per year.

3.2.4 Per Capita Water Use

BAWSCA computes the per capita rate for all the SFPUC member agencies. Over the last ten years, the City of East Palo Alto has had the lowest or was among the lowest three for residential per capita use among the BAWSCA member agencies. For the 2007-08 water year, the most recent year for which data are available, the residential per capita water use for the City of East Palo Alto was estimated to be 53 gallons per person per day, and the estimated gross per capita water demand was 69 gallons per day. The following table (3-5) lists the City of East Palo Alto's residential and gross per capita use and its rank among the BAWSCA member agencies.

Table 3-5 Per Capita Water Use (gpd)

Water Year	Residential	Rank*	Gross	Rank*
99-00	51	Lowest	75	2nd Lowest
00-01	52	2nd Lowest	77	2nd Lowest
01-02	44	Lowest	71	Lowest
02-03	49	Lowest	65	Lowest
03-04	48	Lowest	70	Lowest
04-05	54	Lowest	60	Lowest
05-06	54	2nd Lowest	74	2nd Lowest
06-07	53	3rd Lowest	67	2nd Lowest
07-08	53	3rd Lowest	69	Lowest

**** rank among BAWSCA member agencies***

3.2.5 Future Water Demand

The majority of the City of East Palo Alto is built out. Demand projections were based solely on the Ravenswood Business District (RBD). The RBD includes development for commercial, industrial, and residential uses. Based on the estimated 1,200 residential units and the occupancy rate of 4.2 persons per occupied housing unit, it is assumed that the majority of the new population growth will be within the RBD development. Potential for population growth outside the RBD development is small. Therefore, the impact to the water system and the model are insignificant compared to the future demands of larger developments expected as part of the redevelopment effort within RBD.

The RBD is expected to use 1,698 ccf per day. This equates to a 63% increase over the current, 08/09, and average usage. The RBD is expected to be built out in 2025. Table 3-6 shows the projected water demands that need to be supplied by the City of East Palo Alto.

Table 3-6 Projected Water Demand (ccf)

Fiscal Year	2008/09 (Current)	2010	2015	2020	2025	2030
Average Day Demand	990,224	990,224	1,188,293	1,386,312	1,610,012	1,610,012

4.0 WATER QUALITY

The City of East Palo Alto entered into a Water Supply Agreement that specifies SFPUC shall deliver to the City of East Palo Alto treated water that complies with primary maximum contaminant levels and treatment technique standards. Water shall be introduced at the regulatory entry points designated in the San Francisco Regional Water System Domestic Water Supply Permit (currently Permit No. 02-04-04P3810001) issued by the California Department of Public Health (CDPH).

The Hetch Hetchy Reservoir water meets all federal and state criteria for watershed protection, disinfection treatment, bacteriological quality, and operations. As a result, it qualifies for a United States Environmental Protection Agency (USEPA) filtration exemption. In other words, water from Hetch Hetchy does not require filtration treatment to ensure its safety. This exemption is contingent upon the Hetch Hetchy water continuing to meet the state criteria, which the City of East Palo Alto is confident will happen.

The following are water quality standards the City of East Palo Alto and the SFPUC are required to meet. Additionally, if the City of East Palo Alto were to find additional sources of water, the City would have to meet the standards itself, without relying on the SFPUC.

4.1 Water System Vulnerability

4.1.1 Drinking Water Source Assessment and Protection (DWSAP) Program

CDPH is the lead agency for developing and implementing the DWSAP. The DWSAP has two primary elements, Drinking Water Source Assessment and Source Protection. The City of East Palo Alto is not required to complete a source water assessment as all of the supply comes from SFPUC.

4.1.2 Bioterrorism ACT

On June 12, 2002 the United States Congress passed Public Law 107-188, the “Public Health Security and Bioterrorism Preparedness and Response Act of 2002” (Bioterrorism Act). The Bioterrorism Act requires public water systems serving populations greater than 3,300 to perform a Vulnerability Assessment and, within the following six months, to submit a completed or updated Emergency Response Plan.

Vulnerability Assessment

The Vulnerability Assessment is required to detail the water system’s vulnerability to terrorist attacks or other intentional acts intended to disrupt the reliable and safe supply of drinking water. The Vulnerability Assessment includes a review of:

- Pipes and constructed conveyances
- Physical barriers
- Collection, pre-treatment, treatment, storage, and distribution facilities
- Electronic, computer, and other automated systems
- Use, storage, and handling of various chemicals

- Operation and maintenance of the water system

American Water Services Company has completed a Vulnerability Assessment. Although there are no Federal or State requirements beyond completion and submittal of the report, the Vulnerability Assessment should be maintained as a confidential, working document. Further, American Water Services Company and/or the City should implement on an appropriate timescale all Vulnerability Assessment recommendations that are technically and financially feasible. The American Water Services Company and the City of East Palo should keep the document up-to-date as water system security upgrades are implemented. Water utility managers should review the Vulnerability Assessment periodically to ensure the water system operates at an acceptable level of security risk.

Emergency Response Plan

The Emergency Response Plan is required to identify responses to activities, or the results of activities, associated with undesirable events identified in the Vulnerability Assessment. The Emergency Response Plan includes plans, procedures, and identification of staff and equipment to respond to or significantly mitigate the consequences of such events. Federal guidelines state that the Emergency Response Plan must contain action plans for at least the following four events:

- Water system contamination
- Structural damage / physical attack
- Cyber attack on supervisory control and data acquisition or operational computer system
- Hazardous chemical release from water system facilities

American Water Services Company has already completed an Emergency Response Plan. The Plan should be submitted to the regulatory agency for certification. A copy should be provided to the City of East Palo Alto. American Water Services Company should continue to revise and update their Emergency Response Plan to reflect any operational or system changes. In addition, all water system employees should be trained in accordance with the Emergency Response Plan. At a minimum, all employees should annually review the Emergency Response Plan.

4.1.3 National Pollutant Discharge Elimination System (NPDES) Permits

The USEPA maintains several databases at Envirofacts Data Warehouse (http://www.epa.gov/enviro/). One of the databases, the Permit Compliance System (PCS), provides information on companies that have been issued permits to discharge wastewater. The database contains information on when a permit was issued and expires, how much the company is permitted to discharge, and the actual monitoring data showing what has been discharged.

A search in the PCS database indicates that in the City of East Palo Alto in San Mateo County, California, there are currently no companies that hold an NPDES permit for wastewater discharge.

4.2 Drinking Water Quality Monitoring and Reporting

4.2.1 State Drinking Water Quality and Monitoring Regulations

The State of California requires all public water systems (PWS) to monitor their potable water sources for chemical, biological, and radiological contaminants. Testing for these categories of constituents, including SOCs, VOCs, IOCs, and radionuclides, is required at each source. Distribution systems must also be monitored for bacteriological constituents (total and fecal coliforms), disinfection residuals (chlorine), disinfection byproducts (total trihalomethanes and haloacetic acids), lead, and copper.

Primary Maximum Contaminant Levels

Primary Maximum Contaminant Levels (MCLs) have been established for constituents with known health effects provided that USEPA has evaluated the technical and economical impacts of setting an MCL. The USEPA provides a list of regulated constituents and current MCLs (http://www.epa.gov/ogwdw/contaminants/index.html) adopted by the State of California. All public water systems are required to monitor these constituents at their raw water sources at frequencies set forth by the State.

The City of East Palo Alto relies on SFPUC to test the Hetch Hetchy system for these contaminants. Additionally, the City of East Palo Alto tests for bacteriological constituents within its own distribution system. The water quality analysis results for samples collected in 2009 and the routine distribution system sampling results indicate the City of East Palo Alto complies with all the primary MCLs.

Secondary MCLs

Secondary MCLs have been established for certain constituents without known health effects, but for which there are aesthetic concerns such as color, taste, or odor. The USEPA provides a list of the constituents with the current secondary MCLs (http://www.epa.gov/ogwdw/contaminants/index.html) adopted by the State of California. Currently, constituents with secondary MCLs must be tested for at least once every three years at all groundwater sources.

Iron and manganese are common metallic elements found in the earth's crust which are chemically similar and cause similar problems. When exposed to air, iron and manganese sediments oxidize and change from colorless, dissolved forms to colored, solid forms. Excessive amounts of these sediments are responsible for staining and may even plug water pipes. Iron and manganese can also affect the flavor and color of food and water. Finally, nonpathogenic bacteria, which feed on iron and manganese in water, form slime in toilet tanks and can clog water systems.

The City of East Palo Alto relies on SFPUC to monitor these contaminants in the Hetch Hetchy system.

The water quality from the Gloria Bay Well contained consistently high levels of iron and manganese. If the City of East Palo Alto is to reinstate this well into the domestic system, the water will need to be treated for iron and manganese because of their effects on taste and odor.

4.2.2 Federal UCMR 2

USEPA published the second cycle of the Unregulated Contaminant Monitoring Regulation (UCMR 2) on January 4, 2007. UCMR 2 includes “Assessment Monitoring” for ten unregulated contaminants and “Screening Survey” for 15 unregulated contaminants. All PWSs serving more than 10,000 people and selected systems serving less than 10,000 people are required to conduct Assessment Monitoring. In addition, PWSs serving more than 100,000 people and selected systems serving less than 100,000 people are required to conduct the Screening Survey. SFPUC completed four quarters of monitoring of 25 contaminants as required under the USEPA second Unregulated Contaminant Monitoring regulation. None of the 25 contaminants were found in the water.

It has been confirmed by the UCMR 2 Coordinator at USEPA that the City of East Palo Alto is not required to conduct any further UCMR 2 monitoring.

4.2.3 Disinfectant and Disinfection Byproduct Rule (D/DBPR)

Stage 1 D/DBPR

During disinfection of drinking water, the disinfectants themselves can react with naturally occurring materials in the water to form unintended byproducts which may pose health risks. Amendments to the SDWA in 1996 require the USEPA to develop rules to reduce disinfection byproducts (DBPs) in drinking water.

USEPA promulgated the Stage 1 D/DBPR on December 16, 1998. The Stage 1 D/DBPR applies to all public water systems with a chemical disinfectant added to the drinking water supply. Stage 1 D/DBPR reduces exposure to three disinfectants and many disinfection byproducts. The rule establishes maximum residual disinfectant level goals (MRDLGs) and maximum residual disinfectant levels (MRDLs) for three chemical disinfectants: chlorine, chloramines, and chlorine dioxide. It also establishes MCLs for the following DBPs: four total trihalomethanes (TTHM), five haloacetic acids (HAA5), chlorite, and bromate. Chlorite is monitored only in systems using chlorine dioxide as a disinfectant, whereas bromate is required to be monitored only in systems using ozone. TTHM and HAA5 monitoring is required for any water system using chlorine as a disinfectant.

Under the Stage 1 D/DBPR, the MCL for TTHM is 0.080 milligrams per liter (mg/L) and the MCL for HAA5 is 0.060 mg/L. Compliance is measured by the running annual average of the quarterly results taken from all of the sampling locations.

Test results from SFPUC and from locations within the City of East Palo Alto’s service area show that the there are no high-level DBPs in the water distribution system.

Stage 2 D/DBPR

USEPA published the final Stage 2 D/DBPR on January 4, 2006 and the final rule became effective on March 6, 2006. The Stage 2 D/DBPR applies to all public water systems with a chemical disinfectant added to the drinking water supply. The Stage 2 D/DBPR strengthens public health protection for customers of systems that deliver disinfected water by requiring such systems to meet maximum contaminant levels as an average at each compliance monitoring location (instead of as a system-wide average as in previous rules) for two groups of DBPs, TTHM and HAA5. The rule targets systems with the greatest risk and builds incrementally on existing rules. This regulation will reduce DBP exposure and related health risks, and it should provide more equitable public health protection.

The major difference between Stage 1 and Stage 2 D/DBP Rules is the compliance calculation of TTHM and HAA5. Stage 1 D/DBPR compliance is based on a system-wide running annual average (RAA), while Stage 2 D/DBPR is based on running annual average at each location, called the locational running annual average (LRAA). Under the Stage 2 D/DBPR, the MCLs for TTHM and HAA5 remain the same as the Stage 1 D/DBPR.

4.2.4 Radionuclide Rule

USEPA promulgated the final drinking water standard for radionuclides on December 7, 2000. The final rule includes the MCLs and monitoring requirements for gross alpha, radium-226, radium-228, uranium, and beta/photon emitters. The final rule became effective on December 8, 2003. The State was required to adopt or issue a radionuclide rule no less stringent than the final Federal rule.

Under the radionuclide rule, radium-226 and radium-228 must be analyzed and reported separately, in addition to gross alpha and uranium analysis. An initial round of four consecutive quarterly samples was required to be completed by December 31, 2007. The MCL for gross alpha remains 15 picocuries per liter (pCi/l) and the MCL for radium-226 and radium-228 remains as 5 pCi/l, as the sum of the two constituents. The MCL for uranium is 20 pCi/l. Subsequent gross alpha, radium-226, radium-228, and uranium monitoring frequencies are based on the initial round of analysis results. If the results are below the detection limit for the purpose of reporting (DLR), the monitoring requirement is one sample every nine years. If the results are below one half the MCL but above the DLR, the monitoring requirement is one sample every six years. If the results are above one half the MCL but below the MCL, the monitoring requirement is one sample every three years. If the results are over the MCL, the sources have to be monitored quarterly until the running annual average is below the MCL, or the owner must provide treatment at the State's discretion.

Based on the water quality analysis results for radionuclides from SFPUC, the water supplied to the City of East Palo Alto does not have high levels of any such radionuclides.

4.2.5 Arsenic Rule

On January 22, 2000, USEPA published the final Arsenic Rule revising the current MCL from 0.050 mg/L to 0.010 mg/L (or ten parts per billion). The revised MCL became effective January 2006. The SFPUC has reported a non-detected result for arsenic concentration. Samples for inorganic analysis were collected at the Gloria Bay Well in 2003. The analysis results indicate the well had an arsenic level of 1.4 parts per billion, which is below the new arsenic MCL.

4.2.6 Groundwater Rule

On October 12, 2006, USEPA promulgated the final Groundwater Rule (GWR) to reduce the risk of fecal contamination in public water systems. The GWR applies to all public water systems that use groundwater as the source of drinking water supply. Currently, the City of East Palo Alto does not use groundwater for potable purposes.

The GWR addresses microbiological contamination risks in drinking water through a risk targeting approach. The four major components of the GWR are described below:

I. Periodic Sanitary Survey

Under the GWR, states are required to conduct a sanitary survey for each public water system that uses groundwater. The survey requires evaluation of eight critical elements and identification of significant deficiencies therein: 1) source; 2) treatment; 3) distribution system; 4) finished water storage; 5) pumps, pump facilities, and controls; 6) monitoring, reporting, and data verification; 7) system management and operation; and 8) operator compliance with state requirements. States must complete the initial survey for most of the water systems by December 31, 2012 and update the survey every three years thereafter. For water systems that meet certain performance criteria, however, states may complete the initial survey by December 31, 2014 and update the survey every five years thereafter. The performance criteria are met if the system in question: 1) provides 4-log treatment of viruses before or at the first customer for all its groundwater sources; 2) has outstanding performance record as defined by the states; and 3) has no history of total coliform MCL or monitoring violations under the Total Coliform Rule (TCR).

The USEPA has developed guidelines to help states and water systems to carry out sanitary surveys and identify significant deficiencies that could affect the quality of drinking water.

Source Water Monitoring

For water systems that do not achieve at least 4-log of viruses inactivation or removal, triggered monitoring is required if any sample collected during the routine sampling under the TCR has a positive total coliform result. Subsequently, the water system is required to take one sample at each groundwater source and test it for a fecal indicator (E. Coli, enterococci or coliphage) within 24 hours of receiving the positive total coliform result. If any fecal indicator is detected, the system is required to take five more repeat samples and test for a fecal indicator within 24 hours. If one or more of the five repeat samples test positive for any fecal indicator, corrective action is required. The compliance date for triggered monitoring and associated corrective action was December 1, 2009.

As a complement to triggered monitoring, the GWR allows states to require water systems that do not provide at least 4-log virus inactivation or removal to conduct source water assessment monitoring at any time to help identify high-risk systems. USEPA recommends that the following risk factors be considered by states in targeting high-risk systems: 1) high population density combined with on-site wastewater treatment systems; 2) aquifers with restricted geographic extent, 3) aquifers with thin karst, fractured bedrock and gravel; 4) shallow unconfined aquifer; 5) aquifers with thin or absent soil cover; and 5) groundwater wells previously identified as having fecal contamination.

II. Corrective Actions

Corrective Actions are required for any water systems with a significant deficiency identified during the sanitary survey or fecal matter is detected and confirmed at a source. The water system must implement one or more of the following corrective actions: 1) correct all significant deficiencies, 2) eliminate the source of contamination, 3) provide an alternative source of water, and/or 4) provide treatment which reliably achieves 4-log virus inactivation or removal. The water system must complete the corrective action(s) within 120 days of a significant deficiency identified or a fecal indicator detected positive.

The most common and economic method to provide a 4-log virus inactivation is chlorination. To achieve inactivation, a certain CT (chlorine residual concentration in mg/L × contact time in minutes) value is required, which is based on water temperature and pH. For example, at 15°C and a pH-level between 6 and 9, a CT of 4 mg-min/L is required to achieve 4-log virus inactivation. Therefore, if a water system has 1 mg/L of chlorine residual at the first customer and the contact time between the point of application and the first customer is 4 minutes, the CT value is 4 mg-min/L (1 mg/L × 4 min).

VI. Compliance Monitoring

If a water system already treats groundwater to achieve at least 4-log virus inactivation or removal, GWR requires regular compliance monitoring to ensure that the treatment technology installed is reliable. For systems that use chlorine as a disinfectant and serve more than 3,300 people, continuous residual-chlorine monitoring is required. The water system must maintain the state-determined residual-chlorine level at all times. If the residual chlorine falls below the required level, the system must restore the residual chlorine to an appropriate level within four hours. If the continuous residual-chlorine monitor fails, the water system is required to take a grab sample every four hours, and the operator has 14 days to resume continuous monitoring. These regulations took effect on December 1, 2009.

Current Status of City of East Palo Alto

The City of East Palo Alto uses groundwater only for non-potable use. If the City were to use the Gloria Bay Well or acquire additional wells for potable use, the City would need to follow the Groundwater Rule.

4.2.7 Lead and Copper Rule

On January 12, 2000, USEPA revised the Lead and Copper Rule, previously adopted on December 11, 1995. The revised rules clarify the lead and copper requirements, but do not substantially modify them.

PWSs must monitor lead and copper levels at a number of residential taps based on the population served. The required number of lead and copper samples may be reduced depending on past results. Compliance is based on the 90th percentile concentration for all samples collected. The Action Level (AL) for lead is 0.015 mg/L and for copper is 1.3 mg/L.

Based on the 2008 Consumer Confidence Reports, the 90th percentile concentrations of lead and copper in samples collected in the water system are below ALs.

4.3 Public Notification of Drinking Water Quality

4.3.1 Consumer Confidence Reports

In 1996, Congress amended the Safe Drinking Water Act (SDWA), adding a requirement that water systems report water quality to their customers. The finalized rule, called the Consumer Confidence Report (CCR) Rule, was published in the Federal Register on August 19, 1998 and requires every community water system to prepare an annual CCR on the quality of water delivered by the systems and deliver the CCR to its customers by July 1 of each year.

Every CCR must contain the following: 1) water system information, including the name and phone number of a contact person, information on public participation opportunities, a Spanish-language section on important content, and information for other non-English speaking populations; 2) water source identification and the results of the source water vulnerability assessment; 3) summary of data on detected regulated and unregulated contaminants, including possible source(s) of each contaminant, and whether the water system received any violations; and 4) educational information on nitrate, arsenic, lead, radon, and Cryptosporidium, if applicable.

5.0 FUTURE WATER SUPPLY

5.1 Water Supply

The City of East Palo Alto water system draws its entire supply from the Hetch Hetchy Aqueduct, which is owned and operated by the San Francisco Public Utilities Commission. The City of East Palo Alto's individual Supply Assurance from SFPUC is 1.96 MGD (or approximately 2,128 acre-feet per year). A water supply well is located at the corner of Gloria Way and Bay Road and is capable of supplying approximately 350 gallons per minute. Shortly after the construction of the well, it was taken offline due to taste and odor issues and is now used exclusively for non-potable purposes.

The City of East Palo Alto has a supply assurance from SFPUC of 1.96 MGD. In 2007-08, the City used 2.04 MGD. Currently, SFPUC can meet the demands of the City, but SFPUC may not be able to meet the City's future demand. The City's demand is expected to increase by 63% over the next 20 years.,The City of East Palo Alto needs look to other sources to meet future demands and provide service during times of drought and emergencies.

5.2 Groundwater

The City of East Palo Alto is located over the Santa Clara Valley Groundwater Basin, San Mateo Subbasin. This groundwater basin is not adjudicated or otherwise regulated, and has not been identified or projected to be in overdraft by the California Department of Water Resources.

The City of East Palo Alto currently does not use local groundwater for drinking water purposes. The City of East Palo Alto has less than a four-hour supply of water in storage, yet there is access to groundwater resources within the city. The City of East Palo Alto is able to and has in the past drawn groundwater out of this basin, mostly through its Gloria Bay Well. This groundwater, however, has high levels of total dissolved solids, chloride, iron, and manganese. The City ceased using the well water for drinking purposes in 1989 and completely removed the facility from domestic service in 1999. Other groundwater is currently used for non-domestic purposes. Table 5-1 summarizes the results of some of the historical water quality testing, as well as water quality testing conducted during the preparation of the *HDR Gloria Way Well Investigation Summary Report, 2004.*

The groundwater resource could provide a secondary source of supply vital to the reliability of the water supply system. During drought conditions, the City of East Palo Alto may not be able to meet their demands. Groundwater production facilities could be used to meet the demands during SFPUC water reductions.

Additionally, groundwater production will be a vital source to the City to meet its future demands. The City's demand is expected to increase by 63% over the next 20 years, primarily for the Ravenswood Business District development. The City will need to develop a 1,000 gpm of groundwater production to meet the future development. The development of this additional source will most likely need iron and manganese treatment to meet water quality standards.

Table 5-1 Gloria Bay Well Water Quality Testing Results

PARAMETER	REPORTING UNIT	TYPICAL LAB DLR	LAB TEST RESULTS Dec 2003	STATE MCL	E Palo Alto or SFPUC ANNUAL AVERAGE 2001-2002	Historic Results 1986	Historic Results 1989	NOTES/COMMENTS
General Mineral / Physical:								
Bicarbonate Alkalinity	mg/L	5.0	200	(a)	66 (13-120)			Slightly elevated for GW
Calcium	mg/L	0.50	57	(a)	18 (4-31)	40	43	1963 WHO limit was 75 mg/L
Carbonate Alkalinity	mg/L	5.0	8.2	(a)				
Chloride	mg/L	100	280	500 (i)	5 (ND - 7)	450	264	Above reccom'd limit of 250
Color	color units	5.0	10	15 (e)	10	20	8	Possibly assocated with Mn
Corrosivity				Non-Corr.				Not tested
Fluoride	mg/L	0.10	0.33	2 (f)	0.2 (0.1-0.2)	0.1	0.9	Sub-optimal for dental
Hydroxide Alkalinity	mg/L	5.0	ND	(a)				
Lab pH	pH Units	2.0	7.95	6.5 to 8.5	9 (8.6 - 9.4)	8.1	7.9	Below SFPUC source.
Lab Turbidity	NTU	0.10	0.50	5 (e)	0.33 (0.20-0.66)	0.92	0.6	
Magnesium	mg/L	0.10	26	(a)				Mid point of typical range
MBAS	mg/L	0.050	ND	0.5 (e)				
Nitrate as NO3	mg/L	5.0	ND	45 (f)		<1	0.2	
Nitrite as NO2	mg/L	5.0	ND	(a)				
Nitrate + Nitrite (as N)	mg/L	2.0 (m)	ND	10 (f)				Not tested
Nitrite as N	mg/L		ND	1 (f)				Not tested
Odor	TON	1.000	ND	3 (e)				Lowest obtainable odor value
Phosphate (PO4)	mg/L			(a)				Not tested
Potassium	mg/L	2.0	ND	(a)				
Sodium	mg/L	0.50	230	(a)	18 (3-22)	220	240.4	20 ppm 1985 EPA guide value
Specfic Conductance (EC at 25C)	umho/cm	1.0	1500	1600 (h)	214 (13-340)	1500	1040	Above recom'd limit of 900
Sulfate (as SO4)	mg/L	5.0	30	500 (i)	17 (0.7-25)	30	36	Well below SMCL
TDS	mg/L	10	840	1000 (g)	114 (ND-190)	1040	800	Above recom'd limit of 500
Total Alkalinity (as CaCO3)	mg/L	5.0	210	(a)	66 (16-120)	210	250	Evidence of sulfate Ca/Mg
Total Hardness (as CaCO3)	mg/L	1.0	250	(a)	66 (11-120)	190	192	Considered "hard" water
Regulated Inorganics (Primary MCL is shown unless otherwise noted):								
Aluminum	ug/L	5.0	5.4	200 (b)				
Antimony	ug/L	1.0	ND	6				
Arsenic	ug/L	1.0	1.4	10 (c)	ND (j) (ND-180)	<10	<2	Relatively low
Asbestos	MFL		< 0.020	7				Results < analytical sensitivity.
Barium	ug/L	2.0	350	1000		<500	280	Elevated; saline environment?
Beryllium	ug/L	1.0	ND	4				
Boron	mg/L	0.10	0.26	1 (d)	ND (j)			>0.75 is problem for crops
Cadmium	ug/L	1.0	ND	5		<5	<10	
Total Chromium	ug/L	5.0	ND	50		<5	<20	
Cyanide	mg/L	0.0050	ND	0.15				
Copper	mg/L	0.010	ND	1 (e), 1.3 (d	0.059	<0.1	<0.01	
Iron	mg/L	0.10	0.14	0.3 (e)	ND (ND-140)	1.0	<0.1	1/2 the current MCL
Lead	ug/L	5.0	ND	15 (d)	ND	<5	<50	
Manganese	mg/L	0.010	0.19	0.05 (e)	NR (k)			4 times the current MCL
Mercury	ug/L	0.20	ND	2		<50	<1	
Nickel	ug/L	1.0	1.4	100				
Selenium	ug/L	1.0	3.1	50		<10	<50	
Silver	ug/L	1.0	ND	100 (e)		<0.02	<0.005	
Thallium	ug/L	1.0	ND	2				
Zinc	mg/L	0.050	ND	5.0 (e)		0.06	<0.01	
Radiological:								
Combined Radium 226 & 228	pCi/L		0.13 (l)	5				
Gross Alpha	pCi/L			15			0.56	
Tritium	pCi/L			20000				
Strontium-90	pCi/L			8				
Gross Beta	pCi/L			50				
Uranium	pCi/L			20				
Radon	pCi/L							
Bacteriological:								
Total Coliform	P/A	1.0	ND	> 1	0.17			
E-Coli	P/A	1.0	ND	A				
Regulated Organic Chemicals:								
VOC's	*Varies*	*Varies*	ND	*Varies*				Results for all T-22 VOC's
SOC's	*Varies*	*Varies*	ND	*Varies*				Results for all T-22 VOC's
MTBE	mg/L			0.005 (e)				
Thiobencarb	mg/L			0.001 (e)				

NOTES:
(a) Not specifically restricted/regulated.
(b) Secondary MCL value is shown. The primary MCL is 1,000 ug/L.
(c) The Federal MCL is currently 10 ug/L. State MCL is not yet established.
(d) Current State Action Level.
(e) Secondary MCL.
(f) Primary MCL
(g) Secondary MCL Upper Limit. Max recom'd is 500 mg/L. Short-Term max MCL is 1,500 mg/L.
(h) Secondary MCL Upper Limit. Max recom'd is 900 mg/L. Short-Term max MCL is 2,200 mg/L.
(i) Secondary MCL Upper Limit. Max recom'd is 250 mg/L. Short-Term max MCL is 600 mg/L.
(j) ND = not detected
(k) NR = not reported
(l) Feb. 2004 data.
(m) Calculated from Lab Data

(Source: HDR 2004, Gloria Way Well Investigation Summary Report)

The groundwater in the City of East Palo Alto will need to be treated to precipitate, coagulate, and filter out the iron, manganese, and arsenic. The most common techniques are coagulation and filtration, sequestration, ion exchange, and oxidation and filtration. There are a number of chemical oxidants and filtration media available that can be used in various combinations. The treatment for manganese would also result a measurable reduction in TDS.

In coagulation and filtration, a treated filtration media, such as manganese greensand or a newer synthetic alternative, is used to convert soluble iron and manganese in water into insoluble complexes, which are then precipitated out of the solution and removed by pressure filtration.

Sequestration involves the addition of sequestering agents such as polyphosphates followed by chlorination (or in some cases sodium silicate followed by chlorination), which keeps dissolved iron and manganese from oxidizing and precipitating out of the solution. This option, however, is only effective for water with less than 1.0 mg/L iron and less than 0.3 mg/L manganese.

Ion exchange involves the use of a conventional ion exchange resin to selectively remove iron, calcium, and magnesium. This solution, however, is limited to applications with relatively small quantities of iron and manganese. If either metal is allowed to oxidize to form insoluble complexes during the process, the resulting solids can clog and foul the ion exchange resin, reducing its efficacy.

Oxidation and filtration via manganese greensand has become the most widely used method for the removal of dissolved iron and manganese in recent years because of its relative ease of operation, low maintenance, low energy requirements, and reliability compared to other options.

Designed to both promote the oxidation and flocculation of dissolved iron and manganese—converting soluble ferrous iron ($Fe2+$) to insoluble ferric iron ($Fe3+$), and dissolved $Mn2+$ to the less soluble $Mn4+$ form—and remove the resulting flocs by filtration, manganese greensand systems rely on particles of the naturally occurring silicate mineral glauconite coated with manganese oxide (MnO) in various valence states.

As the run progresses, the greensand bed is periodically backwashed to remove the collected solids. After the oxidizing power of the bed becomes depleted, it can be restored using either an intermittent or continuous regeneration process using potassium permanganate ($KMnO4$).

The SFPUC has recently converted from chlorine disinfection to disinfection using chloramine. Disinfection at the Gloria Bay site may soon be required and the City may need to install a chloramine disinfection system.

The City of East Palo Alto could construct a 1,000 gpm groundwater well and a 1,000 gpm iron and manganese treatment facility. The treated water could then be blended with Hetch Hetchy surface water in a new storage reservoir.

5.3 Recycled Water Programs

Currently, the use of recycled water within the City of East Palo Alto is very limited. All wastewater from the City is conveyed outside city limits and treated by the wastewater treatment facilities serving the Cities of Palo Alto and Redwood City. These two facilities receive all of the wastewater produced by East Palo Alto. The facilities provide full treatment capacity to prepare recycled water, which is then used in Redwood City and in northern Santa Clara County. No infrastructure is in place to transfer recycled wastewater back into City of East Palo Alto.

The City of East Palo Alto has the capability to install satellite wastewater treatment plants to draw wastewater off the City's sewer lines before discharge outside the municipal boundaries. The City could reuse treated wastewater for irrigation of public parks and facility landscaping. The City of East Palo Alto should continue to study the use of recycled water in areas such as public works projects, dust control, and soils compaction remediation, considering the feasibility of recycled water and dual plumbing in the Ravenswood Business District.

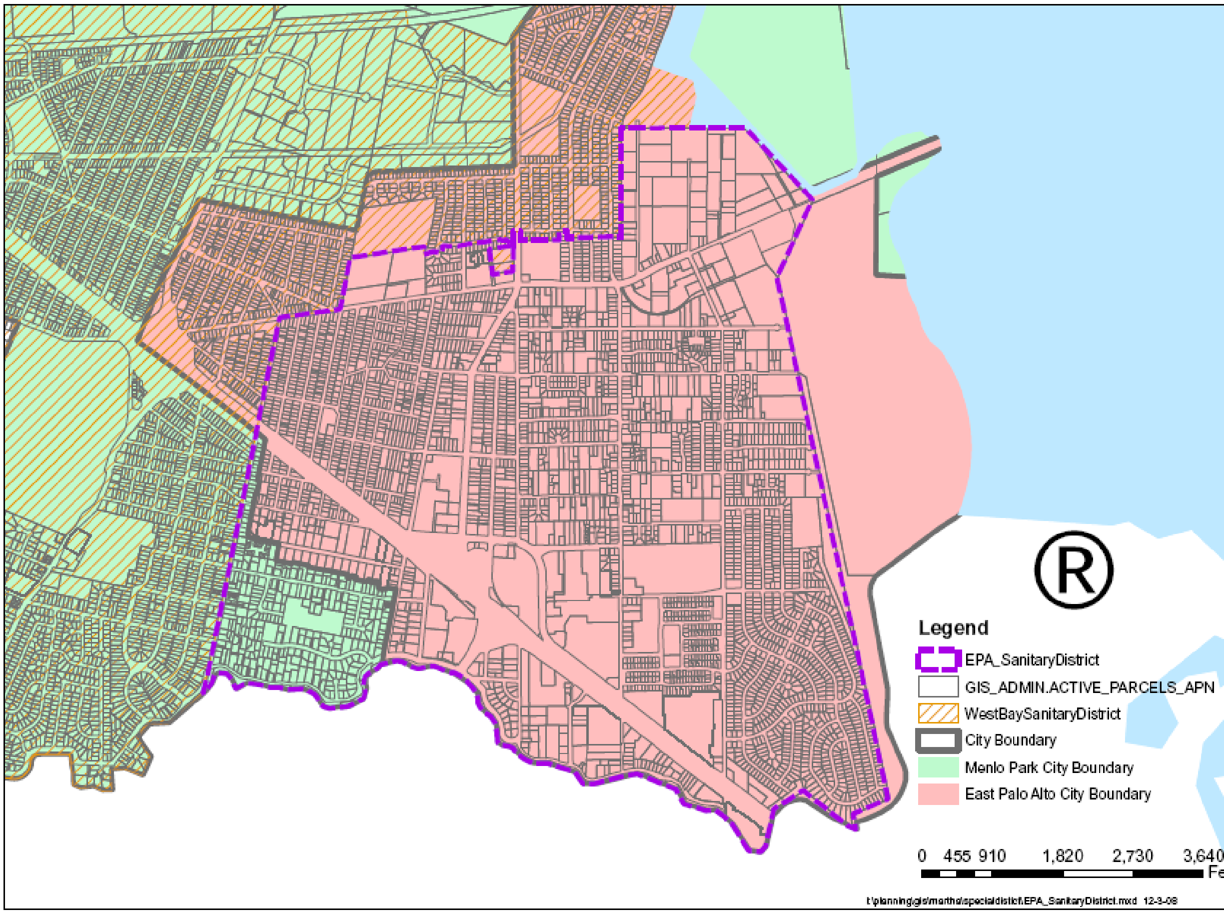
5.3.1 Treated Wastewater

The East Palo Alto Sanitary District (District) serves portions of the Cities of East Palo Alto and Menlo Park, an area of approximately two square miles. Its collection system is comprised of 30 to 35 miles of gravity sewer mains, ranging from 6-inch to 24-inch diameter pipe. The District has no pump stations. Its service area includes over 6,500 residential and more than 200 commercial, industrial, and institutional connections. Wastewater collected in the District's system is transported to the City of Palo Alto's Regional Water Quality Control Plant (RWQCP). The District has 3.06 MGD (Annual Average) or 7.64% of treatment capacity allotment at the Regional Plant. The RWQCP has a dry-weather capacity of 40 MGD and a wet-weather capacity of 80 MGD. Currently, the District collects 657 million gallons of wastewater per year, or 1.8 MGD, from the City of East Palo Alto service area.

In addition to a small portion of northern East Palo Alto, West Bay Sanitary District (WBSD) serves areas in the cities of Menlo Park, Atherton, Redwood City, and Woodside, and in the unincorporated areas of San Mateo and Santa Clara Counties. All wastewater collected within the district is transported through roughly 207 miles of mainline trunk sewers to the Menlo Park Pumping Station and from there to the South Bayside System Authority Regional Treatment (SBSA) Plant. The district owns and operates this treatment plant in conjunction with the cities of Redwood City, Belmont, and San Carlos through a joint powers authority, the South Bayside System Authority. WBSD has treatment rights of 6.6 MGD of average dry-weather flow and 14.4 MGD of peak wet-weather flow at the SBSA Plant. WBSD service area serves approximately 18,380 residential customers and 625 commercial customers through 6-inch to 54-inch sewer mains. WBSD's average daily flow during dry weather is approximately 4.5 MGD or 68% of their capacity rights; it is not known how much of that flow comes out of East Palo Alto.

Both the Palo Alto Regional Water Quality Control Plant and the South Bayside System Authority Regional Treatment Plant put their entire wastewater streams through primary, secondary, and advanced (tertiary) stages of treatment to meet recycled water standards for unrestricted beneficial reuse per California Code of Regulations, Title 22. Both plants deliver highly treated wastewater for reuse in certain sections of their service area. Neither, however, delivers recycled wastewater back to the City of East Palo Alto water service area. Refer to Appendix 3 for complete service territory for the sanitation districts.

Figure 5-1 Sanitation District Boundaries



(Source: LAFCO 2008: Municipal Service Review Determination East Palo Alto Sanitary District, Draft)

The South Bayside System Authority Recycled Water Project

The South Bayside System Authority's expansion of their recycled water system is almost complete. The system extends south into the Greater Bayfront area and Central Redwood City. Figure 5-2 shows the three recycled water service areas.

The recycled water system will also include offsite recycled water storage reservoirs and pump stations. It is anticipated that the Greater Bayfront and Central Redwood City areas will each require a storage facility and pump station for the efficient operation of the system. Although the specific location and design of these facilities has not yet been determined, the preliminary hydraulic modeling for the system indicates approximate locations for these facilities within each service area. The reservoir/pump station in the Greater Bayfront area is shown near the City's Police Department facility on Maple Street, and the reservoir/pump station in the Central Redwood City area is shown within Red Morton Community Park.

East Palo Alto Sanitary District Recycled Water Project

The East Palo Alto Sanitary District Recycled Water Project (Project) is currently in Phase 3 of the City of Palo Alto Water Reuse Program. Phase 1 and Phase 2 are portions of the project that could directly serve the City of East Palo Alto. Phase 1 serves the Palo Alto Golf Course, Emily Renzel March, Greer Park, and the Regional Water Quality Control Plant (RWQCP). Phase 2 contains a pipeline along Embarcadero just east of Highway 101 and along East Bayshore Road.

The Project would initially serve approximately 800 acre-feet of recycled water per year, mostly in the Stanford Research Park area. The Project will provide recycled water primarily for landscape irrigation; other uses, however such as commercial and light industrial, will also be considered.

As irrigation and other non-potable uses are the first to be cut back during drought, each of these projects could provide customers with a reliable, locally controlled supply to protect landscape value. It will also reduce the level of potable water rationing during drought, since non-potable water demand can continue to be fulfilled with recycled water.

In order to access recycled water, the City of East Palo Alto would have to connect to the South Bayside System Authority or the East Palo Alto Sanitary District recycled water lines. For the South Bayside System Authority, at least four miles of pipe would need to be laid to transport to the city limits of East Palo Alto. The pipe would run from the corner of Maple Street and the Bayshore Freeway to the area located around East Bayshore Road and Laurel Lane. Additional infrastructure would be needed to get the recycled water to the place of use within the city limits.

More feasible would be a connection to the closer of the two recycled water systems, East Palo Alto Sanitary District. This would require the construction of approximately 4,000 feet of pipe from the corner of Embarcadero Road and East Bayshore Road to the area located around East Bayshore Road and Pulgas Avenue.

The City of Palo Alto is open to negotiating a connection to existing recycled-water pipelines. The southwest portion of the East Palo Alto, which includes the City of East Palo Alto Permit Center, Martin Luther King Park, Ravenswood Gateway 101 Park, Edison Brentwood Academy, and the potential Ravenswood Business Development, has the most potential to use the recycled water.

Figure 5-2 EPASD and SBSA Recycled Water Lines

Note: Not all recycled lines are depicted on the map.

5.3.2 Satellite Wastewater Treatment Plants

Satellite wastewater treatment plants or point-of-use facilities collect wastewater from an interceptor or trunk line, treat the water so that it meets appropriate reuse standards, and then release it to nearby customers. Because the plants have such a small physical footprint, certain Conventional Biological Process (CBP) and Membrane Biological Reactors (MBR) generally can be located even in dense urban locations without difficulty. The highly automated systems require relatively little operator oversight and tend to perform reliably.

Conventional Biological Process (CBP)

A decentralized CBP, commonly referred to as a "package plant", utilizes the biological extended aeration principle of operation, which is a variation of the activated sludge treatment process. This system functions by creating an environment with sufficient oxygen levels and agitation to allow for bio-oxidation of the wastes to suitable levels for discharge.

Waste material in domestic wastewater is generally organic (biodegradable) which means that microorganisms can use this matter as their food source. A biological wastewater treatment system makes use of bacteria and other microorganisms to remove up to 90% of the organic matter in the wastewater.

Biological wastewater treatment systems and processes were actually developed by observing nature. As waste entered the stream, the dissolved oxygen content in the water decreased and bacteria populations increased. As the waste moved downstream, the bacteria would eventually consume all of the organic material. Bacterial populations would then decrease, the dissolved oxygen in the stream would be replenished, and the whole process would be repeated at the next wastewater discharge point.

The influent wastewater enters the wastewater treatment package plant by passing through a bar screen for gross solids removal. This step provides for the mechanical reduction of solids prior to aeration. Once the wastewater has entered the aeration chamber, the untreated flow is mixed with an active biomass in a rolling action that takes place the length and width of the chamber in a slow forward progression. This rolling mixing action is the result of air originating from air diffusers located along one side of the bottom of the tank. This insures that adequate mixing is maintained in the tank. The chambers are filleted on each side along the bottom to assure and enhance the rolling motion of the water and to eliminate any “dead zones” in the tank. The oxygen transfer achieved with the diffused air passing through the wastewater coupled with the rolling action provides a sufficient oxygen supply allowing microorganisms to oxidize treatable wastes in to carbon dioxide, water, and stable sludge.

After aeration, the wastewater flows to the clarifier that typically has a hopper bottom configuration. The wastewater clarifiers are sized to provide the required retention time based on an average twenty-four hour design flow. During the settling period, solids settle on the bottom of the clarifier. Airlift pumps with adjustable pumping capabilities are used to return these solids, as activated sludge, to the aeration chamber to maintain the maximum efficiency of the biological process. When necessary, excess sludge is wasted to an aerated sludge digestion tank for additional treatment and reduction. A skimmer airlift pump is used to return floatable solids and scum to the aeration chamber for further processing.

The treated water flows from the clarifier to a disinfection chamber for treatment via chlorination or ultra-violet (UV) disinfection prior to discharge to complete the treatment process. Tertiary filters may also be used where a higher quality of effluent is required.

Membrane Biological Reactors (MBR)

The MBR process combines an aerobic biological process with an immersed membrane system. Cost-effective and reliable, this separation technology is suited for a wide range of municipal and industrial wastewater applications. MBR systems can also provide advanced nitrogen and phosphorus removal to meet the most stringent effluent requirements.

There are many equipment variations, configurations, and options that can be used with MBR systems, all of which are designed to provide the necessary treatment for each wastewater or water reuse project. The equipment selected depends on effluent requirements, power consumption, operation and maintenance requirements, need for future expansion, and initial capital costs.

Within the MBR process, the biological process and membrane operating systems are located in separate tanks to optimize performance of the overall process and to simplify operation and maintenance. This unique combination eliminates the need for clarifiers, return sludge pumping, polishing effluent filters, and maintenance normally associated with a conventional clarification process.

By eliminating clarifiers, the biological process can be designed and operated for high-rate wastewater treatment rather than sludge settleability. The biological system can also be operated at much higher mixed liquor suspended solids (MLSS) concentrations (8,000 to 16,000 mg/L). This results in a more efficient biological process that increases solids-retention time, reduces sludge yield, and improves reactor efficiency for nitrification and denitrification.

High MLSS levels also mean that the plants can operate with shorter hydraulic retention times, allowing smaller reactor basins than with conventional treatment. Space requirements of the plant can be up to 50% of those with a conventional biological process.

Operation of the MBR treatment process is easily automated and can be controlled with a microprocessor such as that in a membrane monitoring system, which continuously monitors and records operational parameters. A highly automated design helps operators meet stringent environmental requirements.

A satellite wastewater treatment plant in the City of East Palo Alto has the potential to create up to 50,000 GPD of usable water, offsetting that amount of water currently being imported and purchased from Hetch Hetchy by the San Francisco Public Utilities Commission. Each system can reduce the City of East Palo Alto's dependence on the imported water supply by as much as 2.5%. The footprint for a satellite wastewater treatment plant in the City of East Palo Alto would be approximately 20,000 square feet. This would include all required infrastructure and pumping equipment required to distribute the water to consumers.

While the capital investment would be significant, approximately three million dollars, the operating cost would be approximately $1.00 per thousand gallons, significantly less than the cost of water delivered form the SFPUC.

5.4 Stormwater Capture

Stormwater capture and reuse has the potential to become a valuable method of supplementing an area's water supply. As restrictions on water use and the cost of potable water continue to rise, it makes sense to explore other options for cheaper, available water. Stormwater can be used as a new source of water for municipalities through the use of a supplemental water source to be pumped and treated through traditional potable water distribution systems or through "purple pipe" recycled water systems, where a secondary water line is installed to distribute water for non-potable uses. This analysis reviews both the availability of stormwater for potential reuse and the feasibility of capturing and storing this stormwater for distribution.

Hydrologically, East Palo Alto is located along the western edge of the San Francisco Bay. The city is bounded on the south by San Francisquito Creek, the northeast by the San Francisco Bay, and the west by Menlo Park.

San Francisquito Creek collects flow from approximately 42 square miles of upstream watershed and drains it to the Bay. However, in the vicinity of East Palo Alto the creek acts as a berm. As a result, it is assumed that the drainage collected north of the stream contains no additional flow from Palo Alto (which is located south of the creek) or from any of the upstream watershed that flows into the creek. Because the city boundary between Menlo Park and East Palo Alto is roughly perpendicular to the gradient, and because the storm drainage systems are unknown, the additional assumption is made that no notable flow enters East Palo Alto from the west. In other words, this analysis assumes that the entire city is a stand alone drainage basin with no upstream tributary impacts.

The City of East Palo Alto sits on a broad plane that slopes towards the Bay, from southwest to northeast. In addition to the creek, the city is divided in its southern portion by the US 101 freeway and in its northern portion by a rail line. The location of these facilities do provide the opportunity to block and divert surface flow; however, the existence of drainage facilities cast doubt on the likelihood to successfully capture and reroute significant flow without notable capital expenditure.

The northern edge of the city fronts the San Francisco Bay. The segment between the urban front and the Bay proper is considered part of the Baylands, an area that lies between the maximum and minimum tidal elevations, including land that is actually touched by tides and land that would be tidal in the absence of any levees, seawalls, or other manufactured structures. The marsh consists entirely of brackish water, in many places saltier than the Pacific Ocean. While this is a natural drainage outlet for stormwater, the water that collects in this area is not suitable for reuse. These areas are also unsuitable places to collect water despite the near-optimal location from a drainage standpoint. Additionally, because deep pits located near the Bay would likely collect groundwater of unsuitable quality, any capture facilities would require a location farther inland if the water is to be reused.

Assuming that inland areas are able to provide feasible locations for stormwater capture, a number of additional challenges exist in capturing, treating, and distributing stormwater in a usable way to the community. Groundwater within the city is largely unusable for potable purposes, so either enhanced treatment would need to be used if the two were to mix, or barriers would have to be installed to prevent groundwater intrusion into storage units within the city. In addition, water use fluctuates considerably from season to season. The rainy season runs from October to April. The dry season, which spans April through October, brings with it the potential for high water use; significant facilities would have to be constructed to store water through this period, as opposed to a more constant inflow/outflow scenario.

Infrastructure costs are also significant, whether anticipated uses are potable or non-potable. The costs of a non-potable system include storage and pumping facilities as well as a separately lined system for delivery. While this would operate under pressure, constructing this system would be prohibitively challenging on a large scale due to the existence of other facilities in the street. A separate system is quite feasible for new developments, but the city is currently built out with the exception of the Ravenswood Business District. As a result, feasible separate systems involve capture facilities for local parks or site-by-site facilities for new infill projects (i.e. cisterns or green roof systems).

Inclusion into the potable water system would involve treatment systems. As capture systems are necessarily located at downstream ends of watersheds, providing heads to maintain similar system pressure will involve significant expense. Treatment systems for the city are located offline (as the city water is provided treated from purveyors). Thus, capture systems would involve the construction of water treatment plants and booster pumps. This is a significant investment that is not anticipated to be feasible.

5.5 Conservation Programs

Many water managers today consider water conservation as effectively a new water supply. The City of East Palo Alto is committed to implementing water conservation programs at the local and regional level. Doing so will make it possible for the City to satisfy water demand, especially during times of water scarcity.

As shown in Section 4.4, the City of East Palo Alto has one of the lowest per-capita usages among agencies that purchase water from SFPUC. The 2007-08 gross per-capita consumption rate of water by East Palo Alto water customers is 69 gpd, one of the lowest in the state. Within the BAWSCA service area in 2007-08, the average residential per-capita consumption rate was 90 gpd and the average gross per-capita consumption was 152 gpd. Of the BAWSCA members, Westborough had the lowest residential per-capita consumption at 48.7 gpd while Purissima Hills had the highest at 334 gpd. In 2008, the City of East Palo Alto had the lowest gross per capita consumption and the third lowest residential consumption per capita of all BAWSCA member agencies.

Nonetheless, East Palo Alto has implemented water conservation programs to encourage further resource conservation.

The City of East Palo Alto has developed conservation measures through their municipal code. The regulations intend to promote reasonable water conservation while maintaining a comfortable standard of living and a healthy economy (Chapters 17.04 and 13.24.330-450—see Appendix 2). The municipal code also carries out certain provisions of the California Water Code as embodied in Article XIV, Section 3 of the State Constitution, which declares that maximum beneficial use of water resources is necessary to prevent the waste or unreasonable use—or method of use—of water. Additionally, the municipal code implements the provisions of the conservation element from the San Mateo County water resource management plan.

Beyond the general water conservation measures found in the City of East Palo Alto's municipal code, the City should consider implementing additional conservation measures.

The SFPUC analyzed the benefit-cost ratios, 30-year average water savings, costs of savings, net utility benefits, and first five year utility costs for each of 32 conservation measures for the City of East Palo Alto. The final results of the SFPUC analysis determined that there were 17 conservation measures East Palo Alto should consider implementing. The conservation measures were split into two groups: 1) conservation measures perceived as a reasonable representation of potentially achievable water savings by 2031, and 2) conservation measures based on the full extent of what appeared cost-effective and implementable.

The conservation measures currently in place range from mandatory metering with commodity rates, including meters on detector checks on private fire services, to strict guidelines on landscape use. The following is a list of conservation measures that were evaluated by SFPUC:

Measures already incorporated in the municipal code:

- **Residential plumbing retrofit** - Provide homeowners, specifically those with pre-1992 homes, with retrofit kits that contain easy-to-install, low-flow showerheads, faucet aerators, and toilet tank retrofit devices.

- **Landscape requirements for new landscaping systems (Turf Limitations/Regulations)** - Enforce existing requirements on use of native or low-water-use plants for landscaping purposes. Proof of compliance would be necessary to obtain a water connection on all new multifamily residential and commercial projects. Non-compliers would face a surcharge on their water bill until they complied.

Group 1:

- **Residential ULF toilet rebate** - Provide a rebate to homeowners to replace an existing high-volume toilet with a new water-efficient toilet.
- **Xeriscape education and training -** Sponsor training for staff of stores where plants and irrigation equipment is sold; educate sales people about the benefits of native (low water use) plants, efficiently irrigated.
- **Require sub-metering on multifamily units** - Require all new multifamily units to provide sub-meters on individual units. To help reduce financial impacts on tenants, regulations would be adopted that specify acceptable methods of metering and billing.
- **Rebate efficient clothes washers** - Provide a rebate to new apartment complexes over a certain size with a common laundry room equipped with efficient washing machines.
- **Require 0.5 gal/flush urinals in new buildings -** Require new buildings be fitted with 0.5 gal/flush or better urinals.
- **City Department water reduction goals -** Provide water reduction goals for metered City and County accounts and offer audits and employee education.

Group 2:

- **Residential water surveys** - Offer indoor and outdoor water surveys to existing single-family and multifamily residential retail customers with high water use; provide customized report to homeowner.
- **Large landscape conservation audits** - Provide free landscape water audits to all public and private irrigators of landscapes larger than one acre with separate irrigation accounts upon request.
- **Commercial water audits** - Provide a free water audit that evaluates ways for the business to save water and money to high water use commercial accounts.
- **Rebates for 6/3 dual flush -** Provide a rebate or voucher for the retrofit of a 6/3 dual flush, 4-liter or equivalent very-low-water-use toilet. Rebate amounts would reflect the incremental purchase cost and would be in the range of $50 to $100 per toilet replaced.
- **Homeowner irrigation classes** - At stores where irrigation equipment is sold or other suitable venues, sponsor classes on selection and installation of efficient equipment (drip irrigation, smart controllers, low volume sprinklers, etc.) and proper planting.
- **Commercial clothes washer rebate** - Offer incentives to apartment and coin-operated laundry managers to retrofit or use efficient clothes washers. The rebate would either go to the manager or the washing machine leasing company.
- **Incentives for retrofitting sub-metering** - Rescind any regulations that prohibit sub-metering of multifamily buildings and encourage sub-metering through water audits, direct mail promotions, and/or incentives to building owners.

- **Require dedicated irrigation meters for new accounts** - Require new accounts with a substantial amount of irrigated landscape have dedicated landscape meters and are charged on a separate rate schedule that recognizes the high peak demand placed on the system by irrigators.

Although these water conservation measures have been evaluated for the City of East Palo Alto, the already low per-capita water use means that there is little potential for water savings in existing homes. Since the City of East Palo Alto is primarily built out, it should focus on conservation measures that apply to redevelopment areas.

5.6 Water Supply Exchanges

Regionally, within the Bay Area Water Supply and Conservation Agency (BAWSCA) and the San Francisco Public Utilities Commission (SFPUC), the increasing expense and environmental impact of building new traditional water supplies (e.g. dams and reservoirs) has motivated innovative use of existing facilities (e.g. conjunctive use of surface and groundwater as well as pump and storage schemes) and increased demand management efforts.

Recent interest in water transfers and exchanges to the City of East Palo Alto and the San Francisco Bay area are being evaluated to achieve economical and relatively equitable allocation of water between users, particularly during water shortages.

The water transfer and exchange concept requires extending water markets to include transfers among water-use contractors and other agencies who may exchange with the City of East Palo Alto (e.g. City of Palo Alto, City of Menlo Park, California Water Company, and the Palo Alto Mutual Water Company) or the San Francisco Public Utility Commission (e.g. State Water Contractors, Federal Water Contractors, East Bay Municipal Utility District, and Stockton East Municipal Utility District). This entails the involvement of parties with diverse views and would require the use of conveyance and storage systems controlled by other agencies in order to deliver water to the combined areas of demand.

Wholesale Customers are regulated by the Water Supply Agreement as to how and when water may be transferred between Wholesale Customers and with parties not included in the agreement. A Wholesale Customer that has an Individual Supply Guarantee may transfer a portion of it to one or more other Wholesale Customers. Transfers of a portion of an Individual Supply Guarantee must be permanent. The minimum quantity that may be transferred is 100,000 gpd. Transfers of portions of Individual Supply Guarantees are subject to approval by the SFPUC.

Each Wholesale Customer (except for Alameda County Water District and the cities of Milpitas, Mountain View and Sunnyvale) agrees that it will not contract for, purchase or receive, with or without compensation, directly or indirectly, from any person, corporation, governmental agency or other entity, any water for delivery or use within its service area without the prior written consent of SFPUC other than recycled water, water necessary on an emergency and temporary basis, and water in excess of a Wholesale Customer's Individual Supply Guarantee.

The controversies and complexities of effecting water transfers and exchanges under these conditions have previously deterred water managers from pursuing this management option. However, in light of the changing economic and policy environment of water management, the recent experience in other regions of California shows water transfers and exchanges to be valuable components of urban water management that offer planners and managers new choices for enhancing the performance and reliability of their systems.

5.7 O'Connor Tract Mutual Water Company

The O'Connor Tract Mutual Water Company is located on the central-west portion of the City of East Palo Alto. Only a portion of the service territory is located within city limits. The remaining portion is located in Menlo Park. The O'Connor Tract consists of approximately 340 connections, of which many are for multifamily residences. About 35 of these connections are metered.

The distribution system consists of two wells with production capacity of 600 and 800 gpm. The wells are approximately 200 to 250 feet deep and have high manganese content but generally good water quality. Recent correspondence provided by the California Department of Health Services includes a Notice of Violation regarding levels of iron and manganese and provides the Company with specific instructions for weekly testing and monitoring.

The system has one 100,000-gallon storage tank and one pressure tank, which together maintain the pressure within the system. The system is fed by a booster station containing one 10-hp pump and two 20-hp pumps. The booster station pumps into a system which consists of distribution mains between two and eight inches. The system is equipped with one emergency generator sized to run both wells and the booster station during an emergency.

A 6-inch intertie with the City of East Palo exists with a pressure-reducing valve.

5.8 Palo Alto Park Mutual Water Company

The Palo Alto Park Water Company is located on the central-west portion of the City of East Palo Alto. The Palo Alto Mutual Water Company consists of approximately 677 unmetered residential connections, 20 unmetered commercial connections, and two metered residential connections.

The distribution system consists of five wells. The wells range from 70 to 500 feet deep and have generally good water quality other than high iron and manganese levels. The system has one 350,000-gallon storage tank and one 11,500-gallon storage tank. The wells pump into the tank, where the water is blended to lower the iron and manganese before distribution. The system is fed by a 1,200-gpm booster station, which maintains a system pressure of 68 psi. The booster station pumps into a system that consists of 6-inch to 8-inch distribution mains. The system is equipped with one emergency generator able to run the wells and booster station during an emergency.

The construction of one new well, new wellheads on the existing four wells, a new booster station, a new 350,000-gallon storage tank, and installation of fire hydrants every 300 feet were completed in 1994.

A 6-inch intertie with the City of East Palo exists with a pressure reducing valve.

5.9 School District

The Ravenswood School District previously purchased property that contained a groundwater well located at the corner of Clark Avenue and O'Connor Street. The groundwater well has been covered over and is not being used. It is uncertain whether the groundwater well was properly destroyed. The well should be investigated further to determine if it was properly destroyed. If the well was not properly destroyed, this could cause concern for groundwater contamination if the City is to develop additional groundwater sources.

6.0 DISTRIBUTION SYSTEM MODIFICATION AND STORAGE REQUIREMENTS

6.1 Existing Distribution System

The water system draws all of its current water supply through three turnouts off the San Francisco Public Utilities Commission's (SFPUC) Bay Division Pipelines (BDPLs) 1 and 2.

Treated water is supplied from the Hetch Hetchy Aqueduct at pressures ranging from 105 to 140 psi. The turnouts are located on the aqueduct near Willow Road, O'Brien Drive, and University Avenue. Pressure-regulating valves at each turnout reduce the pressure in the distribution system. The pressure-regulating valves are set at the following pressures: 70 psi at Willow Road, 75 psi at O'Brien Drive, and 75 psi at University Avenue.

The existing distribution system is a network of 1½-inch to 12-inch diameter pipes. There are three turnouts with the SFPUC for supply as well as two emergency interties that serve only the two mutual water companies. The system has nearly 300 fire hydrants. The main lines are part of the WaterCAD® model used for the analysis in Section 7. There are also other pipelines, mostly in smaller residential streets that are not part of the model.

There is currently no storage within the City of East Palo Alto's water system. The City relies solely on water from the SFPUC system for the storage necessary for equalization, fire flows, and emergency use.

6.2 Existing Model

To accurately analyze the water distribution system in the City of East Palo Alto, a hydraulic network simulation model was created to represent the system. The results of this hydraulic model were used to assist in long-range master planning, fire-flow studies, short-term project design, and system rehabilitation.

The water distribution system was first put into a hydraulic network simulation model and analyzed in 1992 as part of a previous master plan done for the system prior to being taken over by the City of East Palo Alto. The system was modeled using the WaterCAD® software program and was used as the basis for the hydraulic network simulation model used in this current study, which was also analyzed using the WaterCAD® modeling software program.

<u>Existing</u> WaterCAD® <u>System Model</u>

From the previous hydraulic network simulation model completed using WaterCAD®, there were three base scenarios – average day, max day, and peak day – all of which contained an alternative scenario to model a proposed hotel (which is currently in operation). The max day also contained an alternative scenario with improved projects. The alternative scenarios for the new hotel included an additional water line down Clarke Avenue. Closed in the model were lines P-69 and P-145, which connect to the University Avenue Reservoir and an old well along US 101 and Cooley Avenue, respectively. As these two facilities are not part of the current operations system, these lines remained closed in the model and had no effect on the analysis results.

Most water system models do not contain every pipe in the system and instead focus on the main lines. This is to simplify the model for ease of analysis. The previous model was designed in this manner, including lines in major streets but generally omitting those running along smaller residential streets. This layout was generally maintained during the model update except as necessary to account for a specific update or demand. The accuracy of the model results when used to predict current and future system conditions inherently depends on the level of detail applied to the creation of the model. Further refinement to the model at any future time will allow the City of East Palo Alto to be able to make more informed decisions about the system and to more effectively conduct cost/benefit analyses for capital improvements.

The consideration for necessary capital improvement projects include minor lines not included in the model, as many of them are below the minimum eight-inch-diameter standard size, and are therefore likely to have even greater pressure and fire-flow concerns than the modeled portions of the system.

6.3 Design Criteria

Water utilities, including the City of East Palo Alto, must be able to supply water at highly variable rates. Yearly, monthly, daily, and hourly fluctuations in water use occur, with higher use during dry years and in hot months. Intraday water use typically follows a diurnal pattern, being lowest at night and peaking in the early morning and late afternoon. Water demands that are most important to the hydraulic design and operation of a water distribution system include average day demand, peak day demand, and peak hour demand. Minimum day demand usage is becoming increasingly significant relative to water quality issues in the distribution system.

The term “water demand” is often used interchangeably with “water production” and “water consumption.” Rather than treat them as equivalent, this report defines water demand as the amount of water supplied by SFPUC including unaccounted water. This amount represents the total amount of water that was delivered historically and that which will be needed to serve the future water needs of the City of East Palo Alto.

Average day demand (ADD) is calculated from total annual water use, and it is used primarily as a basis for estimating maximum day and maximum hour demands. The average day demand rate is also used to estimate future revenues and operating costs.

Peak day demand (PDD) is the maximum quantity of water used on any one day of the year. The peak day demand rate is used to size water supply hydraulics, treatment facilities, and pumping stations. The water supply facilities must be adequate to supply water at the maximum day rate.

Peak hour demand (PHD) is the peak rate at which water is required during any one hour of the year. Since minimum distribution system pressures are usually experienced during peak hour, the sizes and locations of distribution facilities are generally determined on the basis of this condition. Peak hour demand is partially met through the use of strategically located system storage. The use of system storage minimizes the required capacity of transmission mains and permits a more uniform and economical operation of the water supply, treatment, and pumping facilities.

<u>Demands</u>

Base Average Day Demands

ADD's were already set up in the previous system model. In addition, the City of East Palo Alto provided monthly billing usage reports for the previous three years (see Appendix 4.1). Comparing these two sets of demands, the previous system model shows an ADD of 1,472 gpm and City billing reports show an ADD of 1,465 gpm. That these numbers are relatively close suggests that the demands being modeled are reasonably accurate. Important to note, the previous model was created in 1992, while the current billing usage reports come from the years 2005-06, 2006-07, and 2007-08. Since 1992, additional services have been added to the water system at different locations within the city. East Palo Alto has also provided bi-monthly water usage reports for the known large users since 1992 which total an ADD of 53.86 gpm (see Appendix 4.2). These additional demands were subtracted from the original ADD used in 1992 in the previous system model, and the demands at each junction in the system model were then re-proportioned to more accurately model the locations of demand. The new additional demands that were added after the existing model was created were then inserted at the appropriate junctions in the system model. The total demand use has remained the same even with the new services, largely because an environmental business, Romic Environmental Technologies Corporation, which was the city's largest water consumer, closed in 2007. During the early 2000s, Romic was using an average of 31,000 gpd with a peak of 41,000 gpd in 2001. This occurred during the time between the previous model and the current model.

Appendix 9.1.1 shows a color-coded representation of the current ADD demands on the system.

Also important to note, the previous model does not show any demand in Menlo Park. Although there are emergency connections, this was neither included in the model nor operating during the calibration events. As this is an unknown variable, it is not part of the modeling but should be taken into consideration for emergency situations.

Peak Day Demands and Peak Hour Demands

The PDD is calculated as the ADD × 1.5 and the PHD is calculated as the ADD × 3.0.

In addition, Appendix 9.2.1 shows a color-coded representation of the current PDD demands on the system, and Appendix 9.3.1 shows a color-coded representation of the current PHD demands on the system.

Fire-Flow Demand

Fire-Flow Demands (FFD) were set at each junction in the system to simulate the effects on the system in the event of a fire. Typically, a demand of 1,000 gpm is placed at a junction to imitate the demand associated with a fire flow for a single family dwelling. A demand of 1,500 gpm is used for a fire flow at a junction associated with a multifamily dwelling. Other high-density dwellings such as hotels are given a corresponding fire flow based on the size and density of the dwelling.

In the existing system model, the FFDs were set at each junction as described above. There is a hotel within the East Palo Alto city limits, the Four Seasons Hotel, which was given a FFD of 2,500 gpm. Since the existing FFDs were set appropriately, they remained the same and additional FFDs were added at the junctions with the new services as described in the Base Average Day Demands section. Since each of the new service connections is for multifamily housing (apartments) or commercial properties, a fire-flow demand of 1,500 gpm was added for each at the corresponding junctions.

Calibration

Calibration of the system involved revising the roughness coefficient of the pipes in the model to allow the calculated, modeled flows to match flow observations recorded in the field, which account for buildup and degradation of the pipes over time. The first step in calibrating the system was to perform a field fire-flow test. Once fire-flow test results were obtained from the field, the results were used in a computer software calibration program to perform a calibration analysis on the system model.

Before the field fire-flow test was performed, the locations for the fire hydrant testing to calibrate the model were identified. Selection of the locations was closely coordinated between the design team and East Palo Alto staff based on critical points in the system intended to provide the most reliable data. For the tests to be effective, approximately 10% of the total number of nodes in the system, or 14 fire hydrants, were tested. Also, to get an accurate representation of the system, the hydrants tested were spread out across the entire system. Appendix 5.1 shows the locations of the fire hydrants selected. Following the formulation of the test hydrant locations, the testing date was scheduled and public notification was provided.

Following the public notification, the hydrants selected for the calibration data were tested between 10:00 p.m. on May 20, 2009 and 2:00 a.m. on May 21, 2009. The testing was conducted by field staff, the engineering project manager, the Director of Public Works, and Water Superintendent. All tests were completed successfully and were adequate to provide the necessary data to calibrate the computer model. The pressure gauges at the points of connection turnouts from SFPUC were measured and any variations in the system during the times of the tests were noted. Results from the field fire-flow tests are shown in Appendix 5.2.

The next step in the calibration process was to apply the fire-flow test data obtained in the field to a computer software calibration program to adjust, or “calibrate”, the existing system model. The computer software program used to do the calibration was H2ONet v8.5®. The program works by dividing the water distribution system into several different groups and assigning a new roughness coefficient (a Hazen-Williams “C” value) to each group based on empirical observations. Revising the roughness coefficient of the pipes allows the calculated model flows to match flow observations recorded in the field due to buildup and degradation of the pipes over time. The more refined the groups are, the more accurate the calibration is.

For this calibration, pipes in the model were first broken down into 14 different zones, each associated with a fire-flow test performed in the field. Pipe groups were then divided even further into pipe size and material, so each group within a zone contained a certain pipe size for each pipe material in that zone.

Once the pipes were properly grouped, field data was inserted into the calibration feature. The recorded fire flow at each fire hydrant was inserted into the program at the corresponding node, and the residual pressure was recorded. Results from running the program was a list of new C-values for each pipe were given (see Appendix 5.3).

Because the previous system model was done using WaterCAD®, it was determined that it would be most efficient to continue evaluating the system model with this computer software program. However, the calibration feature in WaterCAD® was not available, so, as mentioned above, the model had to be converted to H2ONet® to run the calibration. Once the system was calibrated, the new pipe C-values were imported to WaterCAD® and the new system model was assumed to be calibrated. Using the fire flow test feature in WaterCAD® to simulate the same test done in the field, the calibration results were verified based on the resulting available fire flows calculated by the software program.

Although most of the computer-simulated fire-flow results were within reasonable accuracy of what was found in the field, verifying the calibration results found that flows at a few nodes in the program yielded much higher than what was recorded in the field. Upon further review of these results, it was found that each of the nodes with higher than expected available fire flows were located directly near one of the three turn-outs in the system.

Each of the turn-outs has a pressure-reducing valve, which limits the pressure and, consequently, the flow into the system as it pulls water from the aqueduct. Pressure testing was done in the field at the same time as the fire flow tests confirming pressures and flows at each of the turn-outs.

The system model in WaterCAD® was set up correctly with pressure-reducing valves at each turn-out based on information observed in the field; however, pressures just downstream of each turn-out during the fire-flow computer analysis showed a much higher pressure than allowed by the settings on the valve. This appears to cause higher than expected flows in the nodes near the turn-outs.

6.3.1 Water Requirements

<u>Stormwater Capture</u>

The quantity of flow available for stormwater reuse is based upon commonly accepted hydrologic methods. Typical rainfall depths for design storms were obtained from the NOAA Atlas 2 web server and include data for the two-year storm and the 100-year storm. The rainfall depths were then put into the catchment runoff yield equation as follows:

$$Y_f = \frac{(P_{24} - I_a)^2}{(P_{24} - I_a + S) \times P_{24}}$$

The inputs to the equation are based on the 24-hour precipitation for a given storm event and the curve number used for the analysis. The curve number was calculated based on the assumption that the community overlies a combination of type B and type D soils and a mixture of commercial and residential parcels. Based on proportional areas, a composite value was determined and used for this calculation. The yield fraction was then applied to the total rainfall that occurs over a design storm to give total runoff volumes.

The yield function outlined above is generally reasonably accurate for small storms. Determining the yield on an annual basis is considerably more complicated. First, California rainfall patterns generate an average value; however, this average is compiled between years considerably drier or wetter than average. In a dry year, half of the average rainfall is not uncommon, and likewise in a wet year, twice of the average rainfall can occur. Furthermore, often the bulk of the year's precipitation can fall during two to three large storm periods during the months of January and February. For these reasons, determining the capture potential for a one-year or two-year storm is not an unreasonable assumption for estimating capture potential as capturing an entire year's "average" precipitation is a noteworthy challenge that is beyond the scope of this document.

Rainfall depths were obtained from the NOAA Atlas 2. This gives expected runoff values for various storms, and for this discussion, the two-year, 24-hour storm was analyzed. The two-year storm gives a depth of 2.19 inches. A natural divide that bisects the city into northern and southern portions divides the falling rain. The southern portion contains approximately 1,000 acres, and the northern portion contains approximately 1,200 acres. With calculations applied, the runoff potential for a single two-year storm is a combined 150 acre-feet (or approximately 50 million gallons). One could estimate that an annual yield may be five to ten times this amount (based on an annual runoff total of up to 20 inches), which would give a total storage volume of up to 1500 acre feet, or 500 million gallons. Short of a new reservoir that would encompass at least 200 acres of land, the feasibility of storing anywhere near this water does not exist. This strengthens the arguments made in earlier sections that water capture feasibility exists only on a small-scale, case-by-case basis.

Appendix 7 shows some potential small-scale locations of possible reuse. The stormwater can be collected at each of these facilities, namely parks, and reused for irrigation purposes. Depending on the specific water needs at each site and the availability of site area dedicated to recycling, surplus water could be brought to these sites and pumped out for use elsewhere. By utilizing this system, the City would conserve water equal to this reuse volume and therefore need less original source water.

6.3.2 Storage Requirements

The water system currently does not have a storage reservoir, forcing dependence on the SFPUC connections. This is particularly dangerous for a fire situation: a failure of systems beyond East Palo Alto's control could limit the capacity of the system to meet the fire demand. Also any extended failure on the SFPUC facilities would leave the city without water.

6.3.3 Computation of Total Storage Requirements

The sizing guidelines for a reservoir varies, but a common size requirement is the PDD plus fire flow. In this system's case, the maximum fire flow requirement is 4,000 gpm. This is then projected for a four-hour fire for a total of 960,000 gallons. The PDD for the system is 2,208 gpm or 3,179,460 gpd. Therefore the required total size of the reservoir is 4.2 MG. This sizing is based on current needs and does not include future demand increases related to Ravenswood Business District.

As part of the Ravenswood Business District Construction Cost Estimates for Infrastructure report done for the City of East Palo Alto and dated October 31, 2008, a 1.8 MG storage tank will be required for future demands associated with the RBD redevelopment.

FF =	4,000	gpm
PDD =	2,207.96	gpm

FF for 4 hours =	4,000 gal	60 min	4 hr	= 960,000 gallons
	min	1 hr		

PDD =	2,207.96 gal	60 min	24 hr	= 3,179,460 gallons
	min	1 hr	1 day	

Storage = MDD (per day) + FF (4 hour) = 960,000 gal + 3,179,460 gal = **4,139,520 gallons**

6.3.4 Pressure Requirements

The water distribution system must sustain a minimum working pressure of 40 psi during peak-hour demands and 20 psi during times of maximum-day demands with concurrent fire flow. Meeting minimum pressure in the system is only one requirement the system must meet. The water distribution system is also responsible for providing sufficient water flow in times of emergency. As described in Section 6.3, the system must be able to deliver 1,000 gpm of available fire flow to a single-family residence and 1,500 gpm of available fire flow to a multifamily residence. Commercial and industrial sites usually require an available fire flow of around 2,500 gpm, depending on the size and number of occupants in the structure.

Evaluation of the Current System

ADD

Evaluation of the current system shows that during the ADD situation, the current system model maintains a minimum pressure of 40 psi. Results of the system model in Appendix 8.1.2 show a pressure of 61.9 psi at node J-669, which is the lowest pressure within the system.

Analyzing the results of the fire-flow analysis, out of the 122 nodes tested for available fire flow, only 65 met the minimum fire-flow requirement. In other words, only about half of the system would be able to deliver the needed fire flow during the ADD situation. Although this is of concern, the majority of the nodes that did not meet the required flow were within 100 gpm of what was needed. Results of the Fire Flow Analysis are shown in Appendix 8.1.1.

Appendices 9.1.2 and 9.1.3 show a color-coded representation of the results described in this section.

PDD

For the PDD situation, demand in the system increases as expected, which in turn decreases the pressure throughout the system. However, as shown in Appendix 8.2.2, the pressure at J-669 is 60 psi, still well above the required minimum pressure of 40 psi.

Analyzing the results of the fire-flow analysis, only 40 out of the 122 nodes tested for available fire flow met the minimum requirement. This means that over two-thirds of the system would not be able to deliver the needed fire flow during the current PDD situation. This is problematic, considering that nodes not meeting the flow requirements were, on average, delivering about half of the required fire flow. It's also important to note that fires often occur during times of peak water consumption. Results of the fire-flow analysis are shown in Appendix 8.2.1.

Appendices 9.2.2 and 9.2.3 show a color-coded representation of the results described in this section.

PHD

For the PHD situation, as demand in the system is at its highest for regular use. In this situation, pressure at J-669 is 50.4 psi – still over the minimum of 40 psi. Calculation results are shown in Appendix 8.3.2. This demonstrates that the current system has the ability to deliver the necessary pressure throughout the system even during peak hour usage.

Typically fire flows are not analyzed for the PHD situation; however, calculations were still performed and are shown in Appendix 8.3.1.

Appendices 9.3.2 and 9.3.3 show a color-coded representation of the results described in this section.

6.3.5 Minimum Pipe Sizes

Minimum pipe size for the water distribution network should be six inches. Normally, it is recommended to have 8-inch lines as the minimum standard size. However, this system has nearly 90,000 linear feet of 6-inch lines, making those increases cost-prohibitive given the proposed budget. As part of upgrading the system to account for future demands, pipes will need to be replaced with larger diameter pipes to maintain adequate pressure under projected future demands. Furthermore, upgrading all pipe sizes will increase available fire flow to the system. As pipes require repair or replacement a minimum diameter pipe of 8-inch should be installed.

6.4 Future System

<u>Future Demands</u>

Ravenswood Business District (RBD)

As part of the Water Master Plan for the City of East Palo Alto, future demands must also be evaluated in order to sufficiently account for growth in the city. As most of the city is already developed, redevelopment will be the primary source of growth, typically converting low-demand, single-family areas into dense areas of business and multifamily residential use. One such example is currently under redevelopment is the Ravenswood Business District.

The Ravenswood Business District (RBD) is a redevelopment district of approximately 146 acres in the northeastern corner of East Palo Alto. Currently the land is used primarily for low-density industrial operations with some commercial and governmental uses and also includes some vacant land and wetland areas. According to the Ravenswood Business District Construction Cost Estimates for Infrastructure report done for the City of East Palo Alto and dated October 31, 2008, the proposed development outlook for underground utilities for the year 2025 assumes 5,000,000 square feet of commercial space, 15,000 square feet of retail, and 1,188 residential units. The report also goes into detail about the assumed water demands and peaking factors that are consistent with those used throughout this Master Plan.

A breakdown of the proposed demands for the RBD can be found in the Appendices of the aforementioned report. These demands were previously modeled in WaterCAD®, and results are given in Appendix 10. The Junction Report tables in this Appendix were used to insert demands at each junction in the WaterCAD® model for the new Master Plan, and an alternative demand was created to model these future demands for the RBD redevelopment.

Appendix 13.1.1 shows a color-coded representation of the current-plus-RBD demands on the system under ADD conditions. Appendix 13.2.1 shows a color-coded representation of the current-plus-RBD demands on the system during PDD. Appendix 13.3.1 shows a color-coded representation of the current-plus-RBD demands on the system at PHD.

EPA Mutual Water Company & O'Connor Tract Mutual Water Company

Two mutual companies exist within the limits of the City of East Palo Alto. Currently the City of East Palo Alto has no storage or redundancy in the system. It appears reasonable to incorporate the two mutual water systems into the City's system for emergency purposes. Doing so would provide a major benefit by supplying an additional water source during emergency situations. The following is an analysis of the system during an emergency situation. Currently the connection with the mutual water companies only serves water from the City of East Palo Alto to the mutual water companies. These emergency connections would be bi-directional to provide emergency service to each utility.

Based on historical usage in the current City of East Palo Alto system, single-family residential services use approximately 0.3 gpm while multifamily services use about 1.0 gpm. The EPA Mutual Water Company's service comprises approximately 568 single-family residences. Using the demand of 0.3 gpm per single-family service, this yields a total demand of approximately 155 gpm for the EAP Mutual Water Company in full. The O'Connor Tract Mutual Water Company comprises approximately 91 single-family residential services and 29 multifamily residential services. This yields a total demand of approximately 53 gpm for the O'Connor Tract Mutual Water Company. See Appendix 11 for relevant data concerning the determination of these flows.

As mentioned, the benefit of installing emergency interties with the two mutual water companies would be the additional water source during emergency conditions. The O'Connor Tract Mutual Water Company consists of two wells, together capable of producing 1,400 gpm. The system also has a 100,000-gallon storage tank fed by a booster station, which is powered by one 10-hp two 20-hp pumps. The EPA Mutual Water Company has two storage tanks with a combined volume of 361,500 gallons and fed by a 1,200-gpm booster station. Each company has a six-inch intertie with the City of East Palo Alto, and each intertie is fitted with a pressure-reducing valve.

Both mutual water companies were added into the system model, reflecting demands and supply sources as outlined above. The system model was then run and calculations analyzed to determine the system's function when connected to the mutual water companies.

Appendix 15.1.1 shows a color-coded representation of the current system with RBD and both Mutual Water Companies' ADD demands on the system. Appendix 15.2.1 shows a color-coded representation of the current system with RBD and both Water Mutual Companies' PDD demands on the system. Appendix 15.3.1 shows a color-coded representation of the current system with RBD and both Mutual Water Companies' PHD demands on the system.

<u>Evaluation of Existing System with future Ravenswood Business District (RBD)</u>

ADD

Evaluation of the existing system with additional flows from RBD shows that during the ADD situation, the system model maintains a pressure of at least 40 psi. As shown in Appendix 12.1.2, node J-669 in the system model has a pressure of 60.6 psi, which is the lowest pressure within the system.

Analyzing the results of the fire-flow analysis, out of the 122 nodes tested for available fire flow, only 50 met the minimum fire flow requirement. This is just over 40% of the system, indicating that over half of the system would not be able to deliver the needed fire flow during the ADD situation. The nodes not meeting the required flow were on average delivering about half of the required fire flow needed. Results of the fire flow-analysis are shown in Appendix 12.1.1.

Appendices 13.1.2 and 13.1.3 show a color-coded representation of the results described in this section.

PDD

For the PDD situation with additional flows from RBD, the pressure at J-669 is 57.3 psi, as shown in Appendix 12.2.2. This is still well above the required minimum pressure of 40 psi.

Under PDD conditions, none of the 122 nodes tested for available fire flow met the minimum requirement. This indicates that as future build-out occurs in the city and demands increase, the current system will be unable to deliver fire flows as needed during times of peak demand. Results of the fire flow analysis are shown in Appendix 12.2.1.

Appendices 13.2.2 and 13.2.3 show a color-coded representation of the results described in this section.

PHD

For the model including RBD under PHD circumstances, pressure at J-669 is 41.2 psi, which still maintains the minimum requirement of 40 psi. These conditions describe the worst-case scenario, because demand in the system is at its highest. Calculations are shown in Appendix 12.3.2.

Typically, fire flows are not analyzed for the PHD situation; however, calculations were still performed and are shown in Appendix 12.3.1.

Appendices 13.3.2 and 13.3.3 show a color-coded representation of the results described in this section.

<u>Evaluation of Existing System with Future Ravenswood Business District (RBD) and EPA & O'Connor Tract Mutual Water Companies</u>

This section evaluates the effects of utilizing both mutual water systems during an emergency situation. While a certain demand is associated with each mutual water company, each also includes a water source as described above. As the results show, the inclusion of interties in emergency situations greatly improves the system's ability to provide adequate fire flow to much of the city that otherwise could not meet the required demands.

ADD

Evaluation of the existing system with additional flows from RBD and both mutual water companies shows that during the ADD situation, the system model maintains a minimum pressure of at least 40 psi. As visible in Appendix 14.1.2, node J-669 in the system model has a pressure of 68.8 psi, which is the lowest pressure throughout the system.

Out of the 122 nodes tested for available fire flow, 114 nodes met the required fire-flow demand. This is a drastic improvement over even the current system, with 93% of the system meeting fire-flow requirements. These results include additional demands from both RBD and both Mutual Water Companies, which demonstrates that during emergency situations, the City would meet almost all fire flow demands for the ADD situation. Results of the Fire Flow Analysis are shown in Appendix 14.1.1

Appendices 15.1.2 and 15.1.3 show a color-coded representation of the results described in this section.

PDD

For the PDD situation with additional flows from RBD and both mutual water companies, the pressure at J-669 is 65.1 psi, as shown in Appendix 14.2.2. This is well above the required minimum pressure of 40 psi.

Analyzing the results of the fire-flow analysis, out of the 122 nodes tested for available fire flow, 111 nodes met the required fire flow demand. Once again, this is much better than even the ADD situation with the current system; with the additional water sources from the mutuals, over 90% of the system meets fire flow requirements. Results of the fire-flow analysis are shown in Appendix 14.2.1.

Appendices 15.2.2 and 15.2.3 show a color-coded representation of the results described in this section.

PHD

Finally, for the PHD situation that includes both RBD and the mutual water companies, the lowest pressure in the system is 54.5 psi at J-388 which is above the minimum requirement of 40 psi. In the PHD situation for the additional RBD demands only, some areas do not meet pressure requirements. With the additional water sources from the mutual water companies, the pressure remains comfortably above the minimum required and exemplifies the benefits of the additional water sources. Calculations are shown in Appendix 14.3.2.

Typically fire flows are not analyzed for the PHD situation; however, calculations were still performed and are shown in Appendix 14.3.1.

Appendices 15.3.2 and 15.3.3 show a color-coded representation of the results described in this section.

7.0 CAPITAL IMPROVEMENT PROGRAM

Based on the analysis and research in the preceding sections of this report, the following projects are suggested as parts of a Capital Improvement Program (CIP). The list below is prioritized based on need, but they may need to be reordered per funding availability. The costs related to these projects are mostly estimated through Means Costworks 2009 software or, if an item was not available, based on research of similar projects. An additional 20% was added for design fees and 20% for contingency. These numbers are all based on 2009 costs and should therefore be adjusted for future years. Understanding that the City will bid each of these projects, the final numbers could vary greatly depending on factors such as final design parameters, unknown outside costs, new regulations or standards, bidding climate, or fluctuations in material or labor costs.

7.1 Pipeline Replacement Projects

This analysis is based on the current system discussed in Section 6.3 PDD fire-flow analysis. There are additional lines that would not meet standards with the addition of the Ravenswood demands. However, those necessary improvements should be funded from developer fees or redevelopment funds rather than a CIP program. As recommended in the Ravenswood Business District Construction Cost Estimates for Infrastructure report done for the City of East Palo Alto and dated October 31, 2008, water mains serving this area will need to be upsized to be a minimum of twelve-inches.

The following criteria were used to evaluate the pipeline improvements:

1. Improve areas in current system with below standard pressures or fire flows
2. Replace all other lines less than six-inches in diameter with eight-inch pipes
3. Upgrade remaining six-inch lines with eight-inch pipes

The proposed replacements have been split into three groups based on the disparity between necessary fire flow and current fire-flow availability. Lines with greater than 700 gpm difference are in Group I and need upgrades most urgently. Lines in Group II differ by between 500 and 700 gpm. Group III has a less than 500-gpm difference. Groups IV and V are then based on items 2 and 3 above.

Table 7-1 Pipeline Replacement Projects

Group I Streets

Newbridge (Mello - Bay)	1,000	ft of	12"	to	16"
Poplar Ave, Ralmar Ave (from Menalta to Donohoe)	1,550	ft of	6"	to	8"
Donohoe (Ramlar - West Bayshore)	1,850	ft of	6"	to	8"
O'Connor (Clarke - Larkspur)	751	ft of	6"	to	8"
	1,320	ft of	8"	to	12"
University (Woodland - O'Connor)	858	ft of	6"	to	8"
Bell St. (Euclid - Cooley)	780	ft of	8"	to	12"
Demeter St (from Bay to Purdue)	1,550	ft of	6"	to	12"
	990	ft of	10"	to	12"
Runnymeade (Euclid - Cooley)	1,050	ft of	8"	to	12"

Group II Streets

Euclid (Runnymeade - West Bayshore)	2,100	ft of	6"	to	8"
	245	ft of	8"	to	12"
Euclid & Woodland (West Bayshore - University)	2,310	ft of	8"	to	12"
Woodland (University - Clarke)	1,210	ft of	4"	to	8"
	1,440	ft of	10"	to	12"
Clarke Ave. (Woodland - West Bayshore)	730	ft of	10"	to	12"
Clarke Ave. (West Bayshore - Bay)	2,110	ft of	12"	to	16"
	3,060	ft of	8"	to	12"
Newell Rd. (Woodland - West Bayshore)	980	ft of	8"	to	12"
Donohoe (Euclid - Clarke)	2,730	ft of	8"	to	12"
O'Connor (O'Connor - Euclid) *Menlo Park	1,890	ft of	10"	to	12"
O'Connor (Euclid - University)	770	ft of	8"	to	12"
Scofield St. (University - Cooley)	900	ft of	8"	to	12"
University (Donohoe - Bay)	3,460	ft of	8"	to	12"
Cooley Ave. (Woodland - Bay)	5,980	ft of	8"	to	12"
Bell St. (Cooley - Clarke)	1,290	ft of	8"	to	12"
Green St. (Cooley - Clarke)	1,290	ft of	8"	to	12"
Pulgas Ave. (West Bayshore - East Bayshore)	250	ft of	6"	to	12"
Pulgas Ave. (East Bayshore – N. end of street)	8,019	ft of	8"	to	12"
Tara St. (Bay - North end of street)	1,485	ft of	6"	to	12"
Garden St. (Pulgas - Terra-Villa)	1,350	ft of	4"	to	8"
Myrtle St. (Clarke - Pulgas)	1,310	ft of	8"	to	12"
Sage St. (Pulgas - Larkspur)	750	ft of	6"	to	8"
Larkspur (Sage - Gardenia)	1,800	ft of	6"	to	8"
Wisteria Dr. (Sage - Daphne)	4,345	ft of	6"	to	8"
Daphne Way (Wisteria) Loop	2,035	ft of	6"	to	8"
Azalia (Sage - Camellia)	2,950	ft of	6"	to	8"
Camellia Dr. (Pulgas - Larkspur)	3,426	ft of	6"	to	8"
Gardenia (Verbania - Larkspur)	1,940	ft of	6"	to	8"
Jasmine Way (Camellia - Daphne)	1,200	ft of	6"	to	8"
Abelia Way (Camellia - Verbena)	990	ft of	6"	to	8"
Abelia to Daphne (Easement)	250	ft of	6"	to	8"
Verbena Dr. (Abelia - Camellia)	770	ft of	6"	to	8"
East Bayshore (Clark-Pulgas)	1,670	ft of	6"	to	8"
East Bayshore (Clark-Cooley)	2,487	ft of	12"	to	16"

Group III Streets

Bay Road (Westminister - Newbridge)	1,210	ft of	6"	to	8"
	620	ft of	6"	to	8"
Bay Road (Dumbarton - End of street east)	2,470	ft of	8"	to	12"
	1,300	ft of	10"	to	12"
	2,629	ft of	12"	to	16"
Holland & Bradley (Bay - Menalto)	1,290	ft of	6"	to	8"
East Bayshore (Holland - Menalto)	1,320	ft of	4"	to	8"
East Bayshore (End of line west - Menalto)	700	ft of	6"	to	8"
Glen Way (Bay - Euclid)	1,250	ft of	10"	to	12"
University (Bay - Hetch Hetchy Aqueduct)	3,780	ft of	8"	to	12"
	75	ft of	12"	to	16"
Gloria Way (Bay - Kavanaugh)	1,500	ft of	8"	to	12"
Illinois (Notre Dame - Bay)	1,550	ft of	12"	to	16"
East of Notre Dame Ave. (Demeter - Pulgas)	620	ft of	10"	to	12"
Weeks (Cooley - Pulgas)	2,620	ft of	8"	to	12"

In addition to these lines above, there are an additional 9,407 LF of less than six-inch diameter lines that should be upgraded to eight-inch pipe. Most of these smaller lines are not part of the model, but models indicate they are substandard for fire flow. This is listed at Group IV below.

Finally, Group V identifies the remaining six-inch lines that should be upgraded to eight-inch lines. This is typical for water systems, but because of the large number of six-inch lines, it is the least priority.

Projected costs for each upgrade include removal of the existing line, replacement with the upgraded size (including typical fittings and valves), excavation and backfill, installation of fire hydrants, establishment of service connections, and paving for a 4' wide trench The estimated cost for each size upgrade is:

Table 7-2 Pipeline Replacement Project Costs Group I

CIP Project	Unit Cost	Quantity	Unit	Cost
6" to 8"	$100	5,009	LF	$500,900
6" to 12"	$134	1,970	LF	$263,980
8" to 12"	$134	3,150	LF	$422,100
10" to 12"	$134	730	LF	$97,820
12" to 16"	$181	1,000	LF	$181,000
Total		**11,859**	**LF**	**$1,465,800**

Table 7-3 Pipeline Replacement Project Costs Group II

CIP Project	Unit Cost	Quantity	Unit	Cost
4” to 8”	$100	2,560	LF	$256,000
6” to 8”	$100	24,226	LF	$2,422,600
6” to 12”	$134	1,735	LF	$232,490
8” to 12”	$134	32,344	LF	$4,334,096
10” to 12”	$134	4,060	LF	$544,040
12” to 16”	$181	4,597	LF	$832,057
Total		**69,522**	**LF**	**$8,621,283**

Table 7-4 Pipeline Replacement Project Costs Group III

CIP Project	Unit Cost	Quantity	Unit	Cost
4” to 8”	$100	1,320	LF	$132,000
6” to 8”	$100	3,820	LF	$382,000
8” to 12”	$134	10,370	LF	$1,389,580
10” to 12”	$134	3,170	LF	$424,780
12” to 16”	$181	4,254	LF	$769,974
Total		**22,934**	**LF**	**$3,098,334**

Table 7-5 Pipeline Replacement Project Costs Group IV

CIP Project	Unit Cost	Quantity	Unit	Cost
<6” to 8”	$100	9,407	LF	$940,700
Total		**9,407**	**LF**	**$940,700**

Table 7-6 Pipeline Replacement Project Costs Group V

CIP Project	Unit Cost	Quantity	Unit	Cost
6” to 8”	$100	87,651	LF	$8,765,100
Total		**87,651**	**LF**	**$8,765,100**

The total estimated construction cost for these projects is $22,891,217.

7.2 Water Replacement Program

Water meters, as they become old, tend to become inaccurate. This project will replace water meters, water meter boxes, and lids as well as 100 large meters. The replacement of meters and meter reading equipment will enhance and upgrade the ability to monitor usage and reduce the time associated with meter reading. The schedule of water meter replacement is outlined in the City's Water System Master Plan and will be completed in phases. This project specifically furthers General Plan Land Use Policy 4.1, to "work closely with local public facilities and services providers to meet community needs". This project would further this policy by improving the City's infrastructure to support the needs of the current and future residents of the City.

The total estimated budget for these projects is $4,000,000. An allowance of $175,000 should also be budgeted for inspection of the meters.

7.3 Maintenance Programs

Common maintenance programs establish a five-year cycle such that every hydrant and valve is maintained at least once during that time period. During the valve maintenance, each valve can is cleaned of any debris and then fully closed and re-opened. This regular cycling of the valves assures that they can be opened and closed if needed for operations or an emergency. During fire-hydrant maintenance, each hydrant is opened both to check the valve and to flush the system. Any repairs necessary, including painting, should be noted so that they can be completed at another time. This check also assures that the fire hydrant will function during a fire event.

Although the cycles are typically five years, there are currently many valves and hydrants in the systems that have not been maintained in this timeframe. It is recommended that the cycle be modified to a two-year period to perform maintenance and repairs on each valve and hydrant. Following that, maintenance can resume on the typical five-year schedule.

There are 908 valves in the system. It should take on average approximately 30 minutes per valve, including travel time, for a two-person crew to clean and cycle the valve. This is a total labor effort, over the two-year period, of 908 labor hours. At $50 per hour per person, the cost amounts to $45,400. During this maintenance, it would be expected that valves will be broken either before or during maintenance. Assuming that 5% of the valves require $8,000 in repair costs per valve (including pavement replacement and the shutdown) adds an additional expense of $368,000.

There are 295 fire hydrants in the system. For each hydrant, it should take approximately 60 minutes to operate the valve, flush the system, and clean the area for a two-person crew. This is a total labor effort, over the two year period, of 590 labor hours. At $50 per hour per person, this costs $29,500. During this maintenance, hydrants may break either before or during the maintenance. A reasonable allowance to repair 10% of the hydrants at $6,000 each (including pavement replacement and the shutdown) adds an additional expense of $180,000.

7.4 Emergency Connections

The system currently does not have any emergency supply connections with other agencies. Developing an emergency connection with another water department would provide additional water sources during an emergency situation. Such a connection would require piping and possibly additional facilities to account for system pressure differences. The scope of this system remains unknown until the needed facilities can be determined. To the south of the City of East Palo Alto is the City of Palo Alto which offers the best prospect for an emergency connection. The City of Menlo Park would also be a possibility. $250,000 per connection is an appropriate budget for the connection system and necessary piping.

Section 7.6 of this report discusses the possible emergency connections with the EPA & O'Connor Tract Mutual Water Companies.

7.5 Storage Projects

As discussed in Sections 6.2.2 and 6.2.3, the system does not have storage, and the estimated volume needed is 4.2 MG.

The most likely location for such storage would be an underground reservoir and pump station. Due to the topography of the city, the storage couldbe located in one location or in multiple locations. The best option would for the tank(s) to be located under one of the city parks or schools or at another location that does not have structures above it. The facilities would include all necessary piping, the reservoir(s), and the pump station(s) to return the water to the proper system pressure.

The sizing of this tank does not include future needs from the Ravenswood developments, which should pay for either an additional tank or the cost to increase the size of this proposed tank. As part of the Ravenswood Business District Construction Cost Estimates for Infrastructure report done for the City of East Palo Alto and dated October 31, 2008, a 1.8 MG storage tank will be required for future demands associated with the RBD redevelopment.

Until final design can be completed, a detailed cost analysis is not possible. However, based upon similar sized projects, a budget of $5,000,000 should be reasonably accurate. This budget does not include any land acquisition costs, property issues, or geotechnical issues and only includes the costs for the construction of the facility.

7.6 Treatment Facility for Gloria Bay Well

The Gloria Bay Well was constructed in 1981 and is capable of producing 350 gpm of local groundwater, thereby reducing the demand for purchased water. However, although this water accords with California Department of Public Health safety regulations, its iron and manganese levels violate aesthetic and odor standards. Shortly after the construction of the well, the well was taken offline due to taste and odor issues, and is now used exclusively for non-potable purposes. Installation of iron-manganese treatment would provide the opportunity to bring this well back into the system.

In April 2004, a study titled "Gloria Bay Well Investigation Summary Report" was prepared. This report included four alternatives for treatment at Gloria Bay. Further design is necessary to determine which of the options would be best for the water system. Alternative A is Wellhead Treatment and Direct Distribution, Alternative B is Wellhead Treatment and Offsite Blending, Alternative C is Blending of Untreated Well Water at T-Main, and Alternative D is Blending of Untreated Well Water at Tank. These alternatives need to be analyzed further in a design phase, but preliminary budget estimates suggest a cost of $600,000.

7.7 Facilities for Emergency Connections with the Mutual Water Companies

As discussed in Section 6.4, the addition of the Ravenswood Business Development and the emergency connections with the two mutual water companies would change the dynamics of the system slightly. Currently the connection with the mutual water companies only serves water from the City of East Palo Alto to the mutual water companies. These emergency connections would be bi-directional to provide emergency service to each utility. After establishing the connections, some upgrades would be required if there arises a need for long-term use of the mutual water source. This is based on the current system model so that if the other CIP elements on this list were completed, certain other projects would not be necessary; the pipelines below would be a duplicate of some of the pipelines listed in the general pipeline-replacement projects. If, however, they are all necessary, then the following lengths accounts for all such replacements.

East Bayshore (To Menalto Ave)	1035	ft	of	6"	to	8"
Donohoe St (Ralmar - Euclid)	1620	ft	of	6"	to	8"
O'Connor St (Euclid - university)	770	ft	of	8"	to	12"
West Bayshore (From Pulgas Ave to end of lline)	362	ft	of	8"	to	12"
Pulgas Ave (Myrtle - O'Connor)	880	ft	of	8"	to	12"
Garden St (Terra-Villa - Pulgas)	350	ft	of	4"	to	8"
Tara St (Bay Rd to end of line)	1485	ft	of	6"	to	8"

Based upon the unit costs, explained earlier, the total estimated budget for these projects is $718,608. An allowance of $100,000 should also be budgeted for water quality testing and maintenance prior to installing the emergency connections to the mutual systems. If any long-term use of the mutual water companies becomes needed, it would be fair to expect that some improvements would be necessary on the current mutual water company systems. To reflect this, an additional $150,000 should be budgeted for such examination and improvements.

7.8 Stormwater Capture and Reuse Projects

There are multiple sites within the City of East Palo Alto at which a stormwater capture and/or recycling project could be utilized. The two ideal locations are the Martin Luther King Park and the Jack Farell Park sites. At each of these locations, a collection, treatment, storage, and irrigation reuse system could be installed to replace the potable water used currently for irrigation. Although the system construction is an initial capital cost, long-term savings result from a reduction of potable water usage.

Depending on the size of the storage constructed, there will be times when potable water use is still necessary. The highest demands for irrigation water also are the times of the year in which the least rainfall is available. As such, during the summer months much of the irrigation will still need to be supplied by potable sources, while during winter months there will be excess water captured. However, an average use for a park site is in the range of 5000 gallons per acre per day. The Martin Luther King Park is 5.44 acres, meaning 27,200 gallons of water would be used per day to irrigate the park. To have storage for three days, an 81,600-gallon storage system would be required.

As recommended, the total system would include a 90,000 gallon storage chamber, a tertiary treatment system, and an irrigation pump connected to the system.

There would also need to be some additional drainage collection systems in place to collect the water in the centralized location.

Allowance for storm-drain collection system	$100,000
90,000-gallon storage chamber	$200,000
Tertiary Treatment System	$100,000
Pumping System and Piping	$ 50,000
Total Budget	$450,000

7.9 Satellite Wastewater Treatment and Reuse

Satellite Wastewater Treatment and Reuse involves capturing of municipal wastewater from a trunkline before it leaves the City, treating it to California Title 22 standards, and reusing it for non-potable purposes. Water produced from a Satellite Wastewater Treatment and Reuse may be combined with captured stormwater and non-potable groundwater wells, reducing the use of potable water supplies.

A 250,000 gpd biological wastewater treatment process is the most proven technology for organic matter removal and nutrient reduction. Based upon the growth type of microorganisms, biological wastewater treatment can be divided into two major groups, suspended growth process (e.g., activated sludge) and attached growth process (e.g., trickling filter).

Though the capital cost for a package satellite wastewater treatment plant is significant ($6M - $7M), the operational cost is relatively low ($0.60 / thousand gallons). System operation is very simple and the equipment is very reliable. In California's very restricted water use condition grant programs for water reclamation and reuse have become increasingly available.

7.10 New Groundwater Well

Based on future needs and available groundwater, a 1,000 gpm well is proposed. It is expected that an iron-manganese treatment system will be necessary for this well given the water quality in the Gloria Bay Well. The location of the well will influence the cost, particularly with regard to site availability and hydrogeological conditions. This budget does not include any land-acquisition or water-rights costs should either be necessary.

Well construction	$600,000
Iron Manganese Treatment	$400,000
Associated Pumping and Piping	$100,000
Total Budget	$1,100,000

7.11 Ravenswood School District Well Investigation

The City of East Palo Alto should investigate the existence of the Ravenswood School District groundwater well and any other wells the district owns. The existence of one well has been confirmed but whether the well was properly destroyed is a concern. The City should investigate whether the well was destroyed properly as this could cause concern for contamination if the City was to develop additional groundwater wells. A preliminary budget estimate suggests a cost of $15,000.

7.12 CIP Budget Summary

Table 7-7 CIP Budget Summary

Project	Base Estimate	20% Design	20% Contingency	Total
Pipeline Replacement Projects	$22,891,217	$4,578,243	$4,578,243	$32,047,703
Water Meter Replacement Program	$4,175,000	$835,000	$835,000	$5,845,000
Maintenance Projects	$622,900	$124,580	$124,580	$872,060
Emergency Connections[1]	$500,000	$100,000	$100,000	$700,000
Storage Project	$5,000,000	$1,000,000	$1,000,000	$7,000,000
Treatment Facility for Gloria Bay Well	$600,000	$120,000	$120,000	$840,000
Facilities to Connect Mutual Water Companies[2]	$968,608	$193,722	$193,722	$1,356,052
Stormwater Reuse and Capture	$450,000	$90,000	$90,000	$630,000
Satellite Wastewater Treatment and Reuse	$6,000,000	$1,200,000	$1,200,000	$8,400,000
New Groundwater Well	$1,100,000	$220,000	$220,000	$1,540,000
Ravenswood School District Groundwater Well	$15,000	$0	$0	$15,000
Total Budget	**$42,322,725**	**$8,461,545**	**$8,461,545**	**$59,245,815**

[1] Estimated one connection to each city.

[2] Includes $100,000 for water sampling and $150,000 for mutual water company system improvements

8.0 FUNDING SOURCES

This section identifies the funding/financing opportunities to implement the Capital Improvement Projects listed is Section 7.

8.1 Current Funding for City of East Palo Alto

Several appropriations from the United States Congress have been set aside for the City of East Palo Alto over the past six years. The City has secured five appropriations in the amount of 3,034,500 with a match of $2,482,272, but many of these have yet to be awarded. Currently, the City is using a appropriations from 2004 to develop this Master Plan. The City still has four appropriations in the amount of 2,928,400 with a match of $2,395,463. The total remaining project cost is $5,517,272. The following table lists the year of, the amount, statutory language, and status of each appropriation.

Table 8-1 Current Appropriations

Date of Appropriation	Amount of Appropriation/Match	Total Project Cost	Statutory Language on Scope	Award Status
2004	$106,100/$86,809	$192,909	Water, wastewater, and storm water	10/1/2006, expires 10/31/2010
2005	$192,400/$157,418	$349,818	Storm water	Not awarded, in jeopardy of loss
2008	$788,000/$644,727	$1,432,727	water infrastructure	Not awarded, no application or work plan submitted
2009	$1,100,000/$900,000	$2,000,000	water treatment upgrades	Not awarded, no application or work plan submitted
2010	$848,000/$693,818	$1,541,818	Water supply & storm water improvements	Not awarded, no application or work plan submitted
Total	**$3,034,500/$2,482,272**	**$5,517,272**	**Water infrastructure improvements**	**Application to be submitted**

The City of East Palo Alto (City) needs to determine how these funds will be used, request Congress revise the appropriation language so all funds can be applied for in a single, consolidated grant application (if appropriate), and submit the project work plan and grant application to US EPA. The U.S. Congress has made funding appropriations each year from 2005 to 2010 to the City for water, wastewater, and stormwater infrastructure purposes. If the City decides to pursue one application and work plan, then the language in each congressional appropriation purpose must be the same. Requesting that Congress revise the existing appropriation language to a broad purpose such as "water infrastructure improvements" would provide flexibility and consistency to support the highest priorities identified in this Master Plan. The USEPA is obligated to process the award within 30 days from the date the revised appropriation language has been changed by congress.

Another option is for the City to submit separate work plans and grants applications for each of the separate appropriations.

8.2 Pay-as-You-Go Funding

8.2.1 Utility Rate Charges

Water utility rate charges typically have two components. The first is often called the customer service charge and covers expenses that are uniform and do not vary across customers or customer classes. These expenses typically include such items as the cost of meter reading and billing. The second rate component is the commodity charge, which is based on how much water a customer consumes. This charge covers items that vary with water consumption, such as power and chemical treatment costs. Commodity charge rates can be structured as uniform, inclining, or declining blocks. Inclining blocks, where rates increase with higher water use, generally promote conservation better than other rate structures.

8.2.2 System Development Fees

System development fees (SDF) are fees designed to recover a proportionate share of the costs associated with expanding future system capacity and ensuring ongoing reliability. SDFs are a one-time charge applied at the time of development approval. Because such fees are collected only when and if development occurs, they cannot be relied upon to fund facilities in any particular year. However, if development is successful, SDFs serve to recapture a piece of the involved cost.

All SDFs are subject to Impact Fee Nexus Requirements, established by AB 1600. Adopted in 1987, the law requires that all public agencies satisfy the following requirements when establishing, increasing, or imposing a fee as a condition of approval for a development project:

1. Identify the purpose of the fee
2. Identify the use to which the fee will be put
3. Determine a reasonable relationship between:
    a. The fee's use and the type of development project on which the fee is imposed
    b. The need for the public facility and the type of development project on which the fee is imposed
    c. The amount of the fee and the cost of the public facility or portion of the public facility attributable to the development on which the fee is imposed

8.3 Financing

A number of financing options at both the state and federal levels are available to fund water system projects. Within California, the Department of Water Resources (DWR) California Department of Public Health (CDPH), and State Water Resources Control Board (SWRCB) oversee the vast majority of disbursements for public water systems. Funding from federal acts and agencies tends to be funneled through these state agencies. As grant programs vary widely in their application dates and restrictions on types of projects, consulting the appropriate departmental website is advised. Applications and contact information are also available online, and some agencies—the CDPH, for example—offer "universal pre-applications" that enable water systems administrators to apply in advance to all grant and loan programs for which their projects qualify.

8.4 Legislation

8.4.1 Proposition 13

In March of 2000, California voters passed a water bond in Proposition 13. The Department of Health Services (now CDPH) was designated to receive $70 million from the sale of general obligation bonds approved in the ballot measure. Of these funds, $68 million were to be used as the state match to access approximately $340 million in federal capitalization grant funds for public water infrastructure improvements during the subsequent four years. The remaining $2 million were allocated to provide technical assistance to water providers, with specific focus on disadvantaged communities. These monies are nearly exhausted, but the repayment of loans allows it to continue funding projects in small amounts.

8.4.2 Proposition 50

Entitled the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002, Proposition 50 was approved by the California electorate on November 5, 2002 and amended by AB 1747 in August of 2003. Most funds have already been allocated by state agencies, but DWR has funds remaining for applicants who were approved during the last two-year funding cycle. Although DWR is not currently accepting applications, the agency tentatively plans to release new funding guidelines in early 2010. Applicants can download RFP requirements from the DWR website and submit their grant proposal(s) for programs.

8.4.3 Proposition 84

This proposition, titled the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006, authorizes approximately $5.4 billion in general obligation bonds to fund safe drinking water, water quality and supply, flood control, waterway and natural resource protection, water pollution and contamination control, state and local park improvements, public access to natural resources, and water conservation efforts. Of the whole, approximately $1.5 billion are allocated for safe drinking water, water quality, and other water projects. While most money has already been allocated, some funds are still available and are disbursed through a variety of state agencies and programs.

8.4.4 American Reinvestment and Recovery Act of 2009

In February 2009, President Obama signed into law The American Recovery and Reinvestment Act of 2009 (ARRA). ARRA dispenses funds to state agencies, which then make funding available to local and regional projects. All eligible projects must facilitate compliance with national or state water regulations, replace aging infrastructure, consolidate existing water systems, or enhance water conservation and security.

Normal construction loans comprise the majority of the project financing made available, and cover planning, design, acquisition, and construction costs. Per federal stipulations, funding is earmarked for projects focused on economic stimulus, creation of jobs, and/or infrastructure development. Designed to be expended in full within a five-year period, ARRA is specifically targeted at “shovel-ready” projects. Additionally, priority is given to green projects or project components as evaluated by the funding agency.

8.5 Grants

8.5.1 Water Recycling Funding Program

The State Water Resources Control Board (SWRCB)'s Water Recycling Funding Program (WRFP) provides funding for the planning, design, and construction of water recycling projects. Funding, both through grants and loans, is available to assist public agencies with their feasibility studies, planning, and construction.

The Water Recycling Facilities Planning Grant Program (FPGP) component of WRFP provides grants to public agencies for facilities-planning studies. FPGP aims to assist agencies in the preparation of facilities planning studies for water recycling that uses treated municipal wastewater and/or treated groundwater from sources contaminated due to human activities. Grants are provided for facilities planning studies to determine the feasibility of using recycled water to offset the use of potable water from state and/or local supplies. The program funds up to 50% of a project's costs, and the maximum grant amount is $75,000.

The WRFP also includes a Construction Funding Program, which awards grants at the amount of 25% of the eligible construction cost of a proposed project or $5 million, whichever is less. Eligible costs may include allowances for design, legal tasks, construction management, and engineering during construction.

8.5.2 Integrated Regional Water Management Program

The Integrated Regional Water Management (IRWM) program is intended to promote integrated regional water management to ensure sustainable water use, reliable water supplies, better water quality, environmental stewardship, efficient urban development, and protection of agriculture. DWR's IRWM grant program encourages development of integrated regional strategies for management of water resources by providing funding through competitive grants. The program is funded through Propositions 50 and 84.

8.5.3 Local Groundwater Assistance

Local public agencies with authority to manage groundwater resources are eligible to apply for up to $250,000 of Local Groundwater Assistance (LGA) from DWR. The funds can be used to help fund groundwater data collection, modeling, monitoring and management studies; monitoring programs and installation of equipment; basin management; development of information systems; and other groundwater related work. Funded through Proposition 84, the LGA program is in its public comment stage until January 12, 2010. Final guidelines and the proposal solicitation package are scheduled to be available in early 2010.

8.5.4 United States Bureau of Reclamation

The United States Bureau of Reclamation (USBR) provides a smaller pool of grant money than does DWR, CDPH, or other state agencies, but funding is nevertheless worth pursuing. USBR creates a calendar annually for grant submittals and posts the RFP and response template on their website. Programs receiving grant awards are innovative in design or meet the needs of a niche market.

8.6 Loans

8.6.1 General Obligation Bonds

The City can issue general obligation bonds for capital improvements and replacement, which must be approved by voters before going into effect. General obligation bonds are debt instruments backed by the full faith and credit of the City. They are secured by an unconditional pledge of the City to levy assessments, charges or ad valorem taxes necessary to retire the bonds.

8.6.2 Revenue Bonds

Unlike general obligation bonds, revenue bonds are not backed by the City as a whole, but constitute a lien against the revenues of the City's water operating fund. Revenue bonds involve a comparatively greater risk to the investor than do general obligation bonds, as repayment of debt depends on the City levying and collecting adequate water rates. Due to this increased risk, revenue bonds generally command a higher interest rate than do general obligation bonds. This type of debt also has specific financial requirements concerning the amount of money that is left in reserve each year for annual debt payment.

8.6.3 Clean Water State Revolving Fund

The Clean Water State Revolving Fund (CWSRF) program is available to fund a wide variety of water quality projects including all types of nonpoint source, watershed protection and restoration, and estuary management projects, as well as more traditional municipal wastewater treatment projects. The fund provides financing for the construction of publicly-owned facilities, such as wastewater treatment, local sewers, sewer interceptors, water reclamation facilities, and stormwater treatment. Expanded use projects include implementation of nonpoint source projects or programs as well as development and implementation of estuary comprehensive conservation and management plan.

CWSRF monies are loaned to communities, and repayments are recycled back into the program to fund additional water quality protection projects. Because the program draws federal funds, its goals reflect both federal and state legislative intent. They assign certain projects higher funding priority than other eligible projects. Higher priority projects include those addressing public health risk problems, those needed to comply with federal regulations, those providing most assistance to disadvantaged or distressed communities on a per-household basis, and those with efficiency improvements or environmental benefits.

CWSRF is overseen by SWRCB, which accepts applications on a continuous basis through its website.

8.6.4 Safe Drinking Water State Revolving Fund

Similar to CWSRF, the Safe Drinking Water State Revolving Fund (SDWSRF) offers low-interest financing for projects designed to enhance the quality of local drinking water. Because the primary focus of SDWSRF is potable water, it is overseen by CDPH.

As with CWSRF, SDWSRF determines funding priority based on certain criteria. CDPH assigns higher priority to projects addressing public health risk problems, those needed to comply with federal regulations, those providing most assistance to disadvantaged or distressed communities on a per-household basis, and those with efficiency improvements or environmental benefits. Additionally, because ARRA provided $160 million to SDWSRF, additional priority is given to projects deemed shovel-ready or those expected to produce jobs within the next five years per ARRA guidelines. Also per ARRA direction, the maximum amount of loan financing to be awarded to a single project is $20 million per project and $30 million per entity; of this, the program forgives 50% or more depending on the level of disadvantage in the community served by the loan. The maximum repayment terms of the loan is 20 years or the useful life of the project, unless otherwise allowed or restricted.

In accordance with federal requirements, all potential recipients for SDWSRF funding must have had their projects included on a statewide Project Priority List. Pre-applications for SDWSRF are addressed through a universal pre-application process, which is used for several CDPH drinking water system funding programs. The most recent pre-application period funding closed in September 2009. Information regarding the next pre-application date is pending.

Technical Appendix
Master Planning Regulation

Appendix 1:
SFPUC Water Supply Agreement

Appendix 2:
Conservation Ordinances, Chapters 17.04 and 13.24.330-450

Appendix 3:
East Palo Alto Sanitary District and West Bay Sanitary District Service Territory

Appendix 4:
Demands

Appendix 5:
Calibration

Appendix 6:
Current System Model Pipe Diameters

Appendix 7:
Stormwater Capture Exhibit

Appendix 8:
WaterCAD Calculations for Current System

Appendix 9:
WaterCAD Exhibits for Current System

Appendix 10:
Future RBD Demands

Appendix 11:
Future Demands for EPA & O'Connor Tract Mutual Water Companies

Appendix 12:
WaterCAD Calculations for Current System with RBD Demands

Appendix 13:
WaterCAD Exhibits for Current System with RBD Demands

Appendix 14:
WaterCAD Calculations for Current System with RBD and EPA & O’Connor Mutual Water Companies Demands

Appendix 15:
WaterCAD Exhibits for Current System with RBD and EPA & O’Connor Mutual Water Companies Demands

Appendix 16:
Comments