City of Palo Alto
Recycled Water Facility Plan

Prepared by:

RMC
Water and Environment

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Table of Contents

List of Tables

List of Figures

Appendices

Appendix A - Recycled Water Users Database
Appendix B - Recommended Project Back Up Information
Appendix C - Alternatives Assessment Back Up Information
Appendix D - Preliminary Alignment Site Visit, May 17, 2007
Appendix E - City of Palo Alto Recycled Water Market Survey (RMC 2006)
Appendix F - Recommended Project Cash Flow Analysis
Appendix G - Stakeholder Meeting Summary or Material
Appendix H - Recycled Water Use Ordinance

Acknowledgements

The City of Palo Alto Recycled Water Facility Plan represents a collaborative effort between the City of Palo Alto, RMC Water and Environment, and local stakeholders (Regional Water Quality Control Plant, SCVWD, and City of Palo Alto Utilities customers). It was funded by the City of Palo Alto and a grant from the State Water Resources Control Board. We would like to acknowledge and thank the following key personnel whose contributions and assistance were instrumental in the preparation of this Report.

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List of Abbreviations

AFY	acre-feet per year
BMPs	Best Management Practices
ccf	hundred cubic foot
CCI	Construction Cost Index
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CIP	Capital Improvement Program
CPAU	City of Palo Alto Utilities
DPH	Department of Public Health
EIR	Environmental Impact Report
ENR	Engineering News Record
GIS	Geographical Information System
gpd	gallons per day
gpm	gallons per minute
HDD	Horizontal Directional Drilling
IS/MND	Initial Study/ Mitigated Negative Declaration
LTGS	Long Term Goals Study
mg/L	milligrams per liter
MGD	million gallons per day
MND	mitigated negative declaration
MOU	Memorandum of Understanding
MPN	most probable number
NPDES	National Pollution Discharge Elimination System
psi	pounds per square inch
RWQCB	Regional Water Quality Control Board
RWQCP	Palo Alto Regional Water Quality Control Plant
SCVWD	Santa Clara Valley Water District
SFPUC	San Francisco Public Utilities Commission
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
UWMP	Urban Water Management Plan

Executive Summary

ES-1 Overview

The City of Palo Alto Utilities (CPAU) is investigating the expansion of the Palo Alto Regional Water Quality Control Plant's (RWQCP) regional recycled water system to serve areas in the City of Palo Alto (City). This Study documents the work conducted in support of this effort, known as the Palo Alto Recycled Water Project (Project).

ES-1.1 Background

Phase 1 of the RWQCP's regional recycled water system has been in operation since 1980. It serves the Palo Alto Golf Course, Greer Park, the Emily Renzel Marsh, and the RWQCP. As of December 2008, Phase 2 of the regional recycled water system, the Mountain View Recycled Water project, is under construction and is scheduled to be online by Spring 2009. The Palo Alto Recycled Water Project is the next increment of the RWQCP's ongoing expansion of its regional recycled water system.

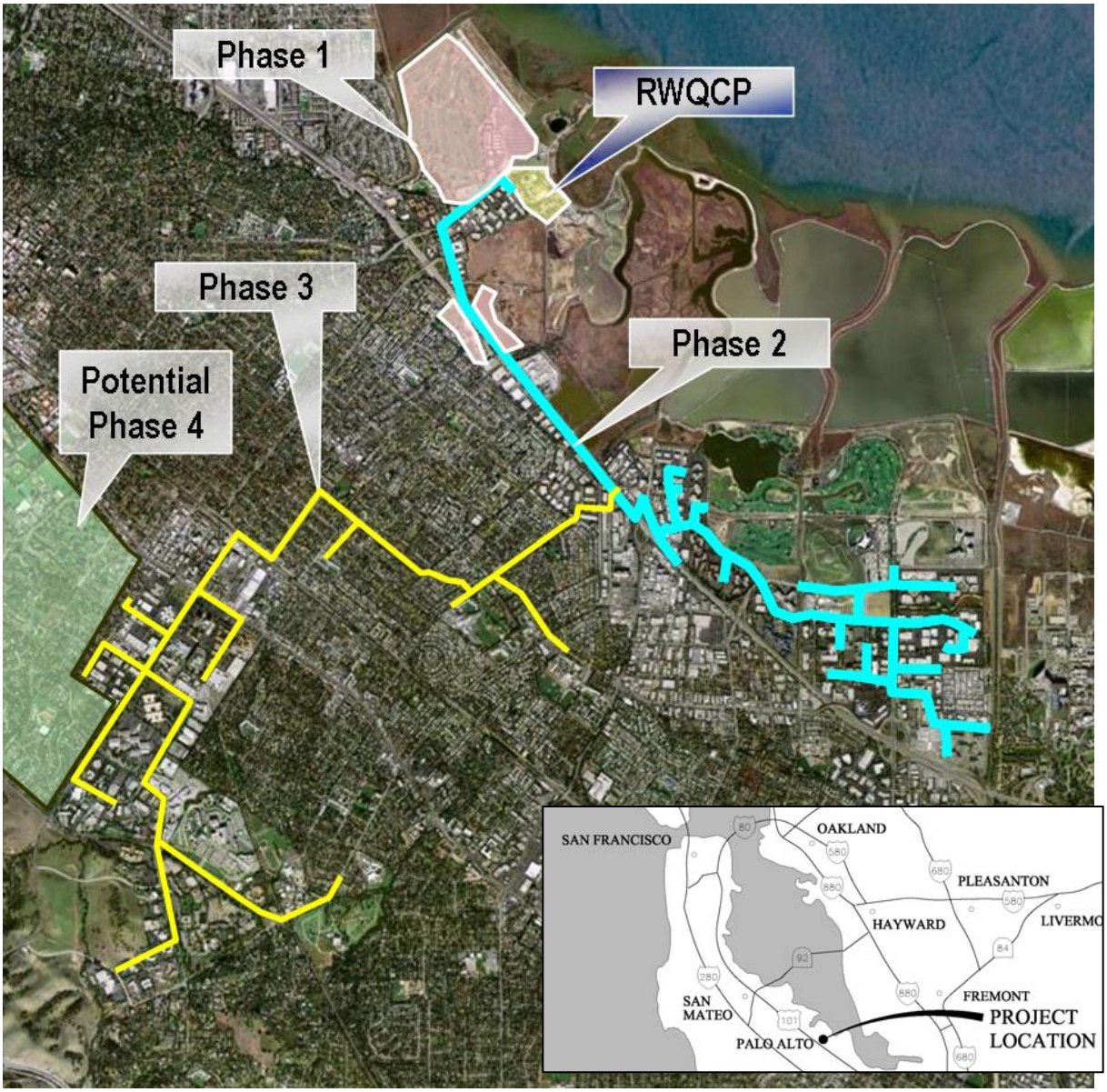
Palo Alto completed a Water Reclamation Master Plan (Master Plan) for the Palo Alto RWQCP in 1992 (Brown and Caldwell 1992) and the accompanying Final Program Environmental Impact Report (EIR) in 1995 (CH2MHill 1995). The Master Plan and program-level EIR evaluated the development of a regional water reuse system that could ultimately provide service to the entire RWQCP service area. The Master Plan includes a phased approach to the expansion of treatment, distribution, storage, and use of recycled water.

In 2006, the City of Palo Alto completed a Recycled Water Market Survey Report (Market Survey) (RMC 2006) as a preliminary effort to determine potential locations of recycled water use within the City. The objectives of the Market Survey were to review and update the list of potential recycled water users identified in the 1992 Master Plan and to update the proposed cost estimate for the delivery of recycled water to the City of Palo Alto and future expansions. The Market Survey included site investigations, market analysis, conceptual project design, and preparation of a preliminary financing and revenue plan.

The City applied for and secured grant funding for the project planning from the State Water Resources Control Board (SWRCB) through the Regional Water Recycling Facilities Planning Grant Program. The grant provides a 50% cost share with the City for up to $75,000 to fund this Study. Upon completion of this Study, the City may decide to move forward with implementation of the Recommended Project (detailed in Chapter 5).

The project considered herein would constitute Phase 3 of the regional recycled water program. **Figure ES-1** provides an overview of the proposed alignment and pipe laterals within the context of the RWQCP's recycled water system expansion.

Figure ES-1: RWQCP Regional Recycled Water System Expansion Phases



Footnotes:

1. Phase 1 in operation since 1980.
2. Phase 2 currently under construction.
3. Phase 3 pipeline alignment shown is the Recommended Project detailed in Chapter 5.
4. Phase 4 has been identified at a conceptual level and has not been examined at the facility-planning level. As shown here, Phase 4 includes the Stanford University and Medical Center Area.

ES-1.2 Project Goals

The primary objective of extending recycled water pipelines into Palo Alto would be to allow the City to maximize recycled water as a supplemental water source. A Palo Alto Recycled Water Project would achieve the following:

1. Improve water supply reliability by conserving drinking water, currently used for irrigation and other non-potable uses, for potable purposes,
2. Provide a dependable, locally controlled water source,

3. Secure a water source that will be available even in droughts to serve irrigation and other non-potable uses,
4. Reduce reliance on imported water, and
5. Conserve the San Francisco Bay by reducing the wastewater constituent mass loadings to the Bay and enhancing preservation of salt water marshland habitats.

ES-1.3 Study Objectives and Approach

The objectives of this Study are threefold:

1. Define recycled water project alternatives (i.e. reuse sites and demands, distribution alignment, sizing, construction alternatives, etc.) and identify a Recommended Project.
2. Develop a realistic funding strategy for the Recommended Project
3. Develop an implementation strategy for the Recommended Project.

Technical activities performed by RMC as part of this Study include site investigation, market analysis, alternative development and evaluation, stakeholder outreach, preparation of an environmental document, funding investigation, and preparation of a preliminary financing and revenue plan. The details and results of these services are presented and discussed in Chapters 2 through 5 of this report.

The approach of the Study was to build upon the technical information developed in the 2006 Market Survey, which conducted a recycled water market assessment, identified the project focus area, and developed project alternatives. This Study refined the technical information from the Market Survey, developed a Recommended Project, and developed an implementation plan.

In parallel, the City has been meeting with Project stakeholders to build support for the Project, and identify and address potential concerns in the Project definition.

ES-2 Recommended Project Description

The Recommended Project would involve the construction of approximately 5 miles of 12 to 18-inch pipe, a retrofit of the RWQCP recycled water pump station, construction of a booster pump station, construction of approximately 5 miles of lateral pipelines to over 90 use sites, and user connections and on-site retrofits. The Project would initially serve approximately 900 AFY of recycled water, mostly to the Stanford Research Park Area. The predominant use of recycled water would be landscape irrigation. Irrigation would occur primarily during the night (between 10:00 p.m. and 6:00 a.m.) to maximize water use efficiency and minimize public contact. Some industrial use, such as commercial and light industrial cooling towers, would also be included.

Figure ES-2 shows the location of the Recommended Project target recycled water users. **Table ES-1** provides the user name and estimated demand information. **Figure ES-3** illustrates the Recommended Project facilities, including preliminary pipeline sizing, and booster pump station location. **Table ES-2** describes the Recommended Project facilities.

Figure ES-2: Recommended Project Target Recycled Water Users

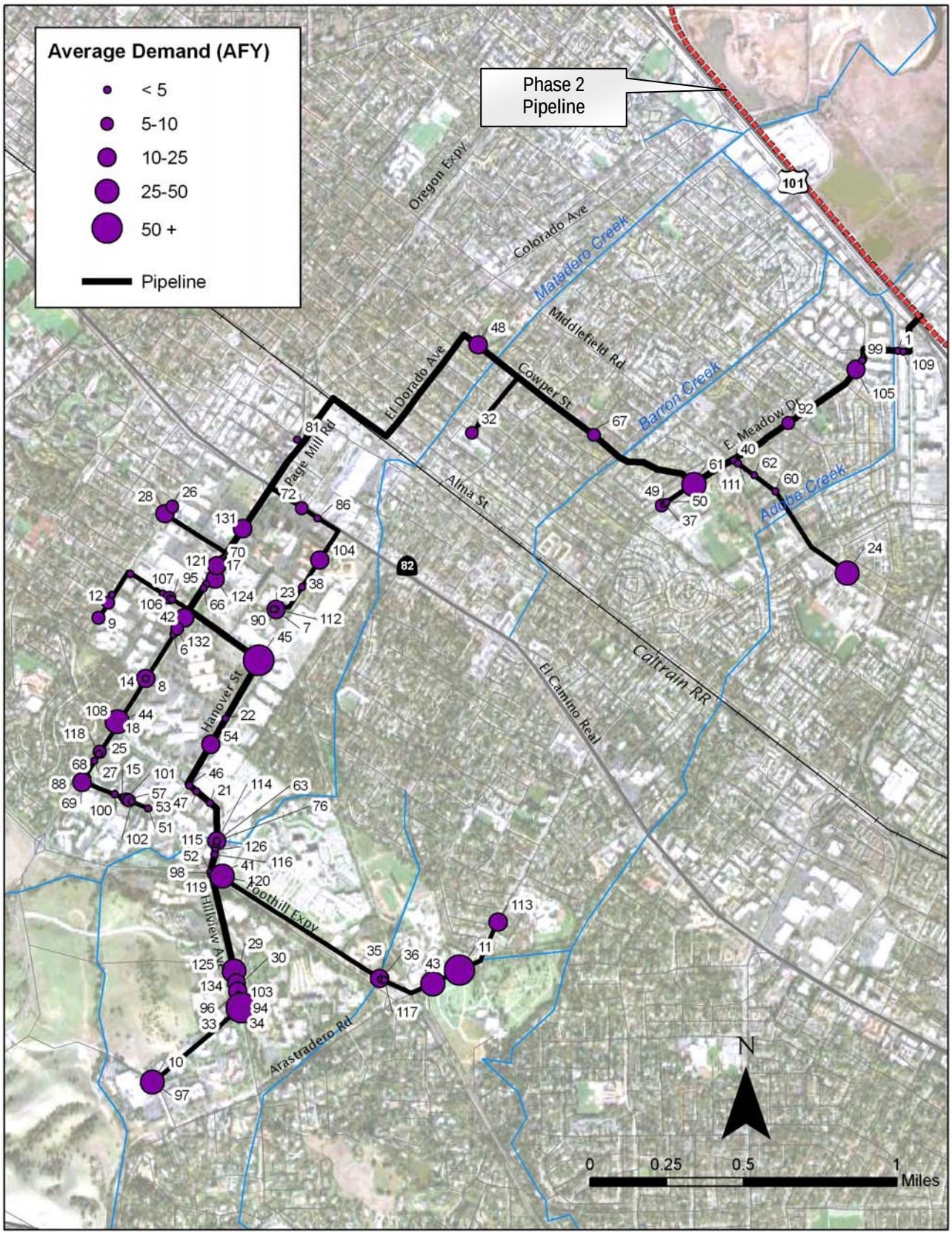


Table ES-1: Recommended Project Target Recycled Water Users

ID	Potential Customer	AFY[1]	ID	Potential Customer	AFY[1]
1	1101 E Meadow Housing	0.6	62	Mitchell Park Library	0.7
2	1451-1601 California Housing	0.0	63	Mozart Development	2.8
6	495 Java Drive Assoc	5.0	66	NYSE	1.9
7	850 Assoc C/O WSJ Prop	1.2	67	Our Lady of the Rosary School	6.2
8	940 E Meadow Housing	0.3	68	Page Mill Center	6.6
9	Agilent Technologies	8.6	69	Page Mill Rd Prop, Inc	11.3
10	Agilent Technologies	40.5	70	Paine Webber, Inc	2.1
11	Alta Mesa Memorial Park	92.9	72	Palo Alto Square	9.1
12	Alza	6.6	76	Pennie & Edmonds LLP	0.2
14	Beckman Instruments	12.2	81	Pkwy Cal/Birch	1.6
15	C & J Management	3.3	86	Pkwy El Camino	0.4
17	Carramerica Reality Corp	6.4	88	Pkwy Ore/Pg Mill	4.3
18	Carten - Trust	0.7	90	Prognostics	1.5
20	Clark Park	20.0	92	Ramos Park	7.6
21	CNF Transportation Inc	1.6	94	Roche Bioscience	76.7
22	Cooley Godward LLP	0.8	95	RWI Group	0.3
23	CPI	18.5	96	SAP Labs, Inc	11.2
24	Cubberley Community Center	29.4	97	SAP Labs, Inc	7.4
25	CV Therapeutics, Inc.	5.1	98	Simpson Thacher & Bartlet	2.3
26	DNAX Research Institute	8.3	99	Space Systems Loral	0.0
27	Dow Jones & Co	0.1	100	Stanford & Hines Interest	3.6
28	Dow Jones & Co	12.7	101	Stanford & Hines Interest	2.4
29	DPIX	21.0	102	Stanford & Hines Interest	1.8
30	ECI Deer Creek LLC	2.3	103	Stanford & Hines Interest	3.1
32	El Carmelo Elementary School	6.2	104	Stanford & Hines Interest	13.6
33	EPRI	4.0	105	Stanford & Hines Interest	12.8
34	EPRI	12.7	106	Stanford Hospital and Clinics	9.6
35	Equity Office Properties	13.3	107	Stanford Hospital and Clinics	2.8
36	Equity Office Properties	0.2	108	Stanford Univ	0.4
37	Fairmeadow Elementary School	1.6	109	Substation	0.1
38	Finnegan, Henderson LLP	1.5	111	Substation	0.0
40	Fire Station	0.3	112	Substation	0.0
41	Foothills Club	2.6	113	Terman Park	19.9
42	Genencor International, Inc	19.2	114	Tibco Software Inc	10.4
43	Gunn Senior High School	26.1	115	Tibco Software Inc	0.7
44	Hewlett Packard	29.2	116	Tibco Software Inc	0.4
45	Hewlett Packard	58.8	117	Tibco Software Inc	2.0
46	Hewlett Packard	1.9	118	Trinet Essential	4.6
47	Hewlett Packard	1.6	119	University Club of PA	3.0
48	Hoover Park	12.6	120	VA Palo Alto Health Care	37.7
49	Jane L Stanford Middle School	7.3	122	Varian Medical Systems	2.6
50	Jane L Stanford Middle School	4.1	124	Varian, Inc.	13.8
51	Legato Systems	2.0	125	VM Ware (prev. Stanford & Hines)	29.2
52	Liveops.com Inc	2.3	126	VMWare Inc	1.0
53	Lockheed Missiles & Space	6.3	131	Wilson/S/G/R	10.9
54	Lockheed Missiles & Space	15.3	132	Wilson/S/G/R	6.1
57	Matadero Creek	5.6	133	Wilson/S/G/R	0.6
60	Mitchell Park	1.9	134	Xerox Corp	7.2
61	Mitchell Park	25.7		**Total**	**916**

Note: Estimates are for average annual demand and include the Factor of Usage modifier described in Chapter 3.

Figure ES-3: Recommended Project Facilities

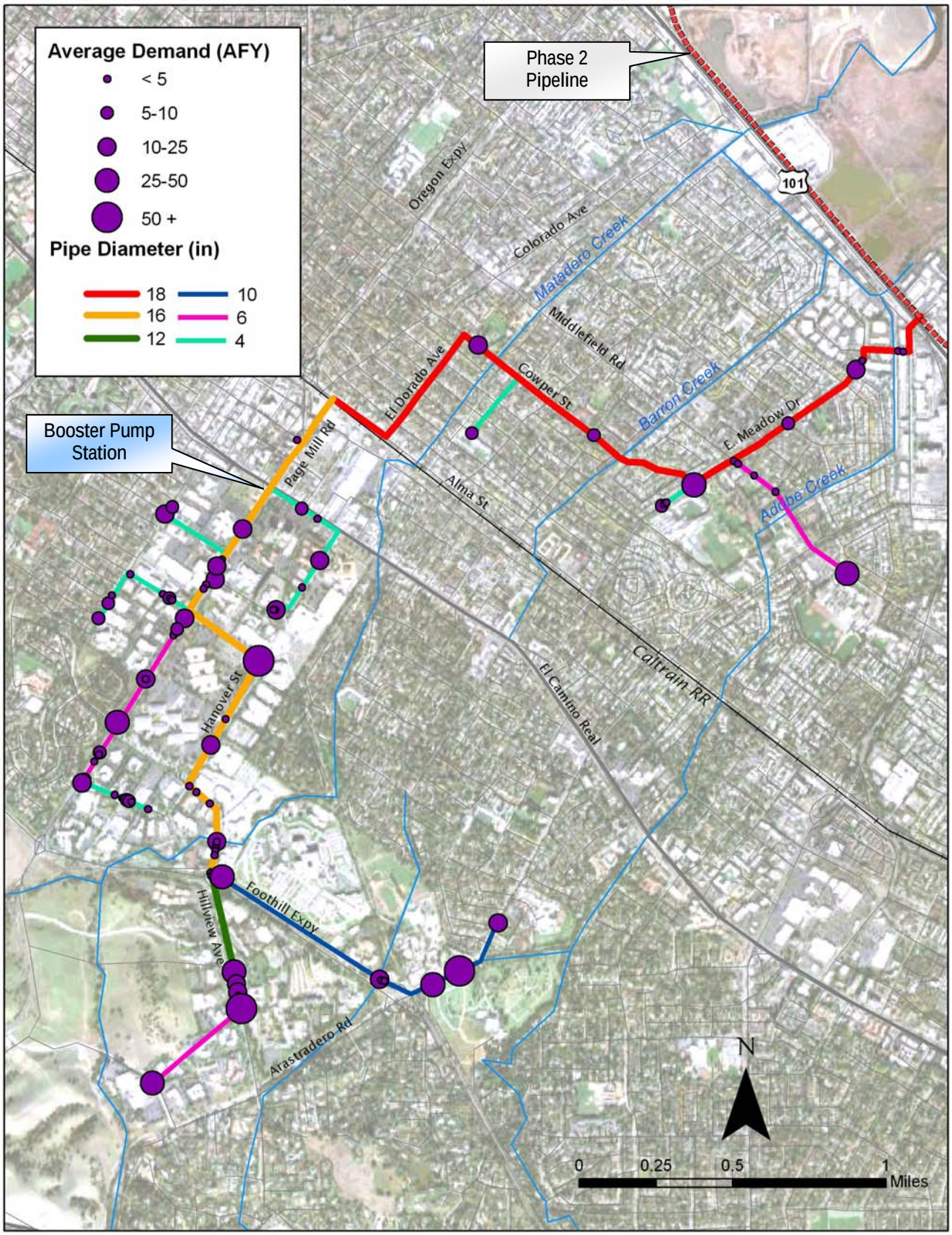


Table ES-2: Recommended Project Facilities

Description	Units	Quantity
Customers		
Number of Project Customers	--	97
Annual Average Demand (basis of design)	AFY	916
Percent Irrigation Demand vs. Non-Irrigation Demand	%	85 / 15
Peak Month Demand (all users)	MGD	2.0
Peak Hour Demand (irrigation users only)	MGD	4.8
	GPM	3310
Distribution System		
Total Pipeline Length	LF	51,500
18" Pipe	LF	13,300
16" Pipe	LF	10,300
12” Pipe	LF	2,100
10” Pipe	LF	6,500
6” Pipe	LF	8,300
4” Pipe	LF	11,400
US-101 Crossing (Microtunneling)	LF	200
Creek Bridge Crossings (Adobe, Barron, Matadero)	LF	150
Alma/Caltrain Crossing (Bore and Jack)	LF	200
El Camino Real Crossing (HDD)	LF	400
Foothill Expressway Crossing (HDD)	LF	400
RWQCP Pump Station Retrofit		
Peak Hour Flowrate (additional)	GPM	3310
Peak Flow TDH Required	FT	250
New Booster Pump Station		
Peak Hour Flowrate	GPM	2860
Peak Flow TDH Required	FT	250

Proposed Alignment. The proposed alignment would begin with a connection point to the Mountain View Project at the intersection of East Bayshore Road and Corporation Way. The pipeline would cross under US-101 by microtunneling. The pipeline would run along Fabian Way, East Meadow Drive, Cowper Street, El Dorado Avenue and along Alma Street. The pipeline would cross under the Caltrain railroad and run along Page Mill Road to El Camino Real, where the pipeline would likely use trenchless technologies to cross El Camino Real. The pipeline would continue along Page Mill Road to Hanover Street, and along Hanover Street and Hillview Avenue to Arastradero Road. The pipeline would run along side streets on lateral alignments from the proposed alignment or alignment options to serve individual users.

Hydraulic Considerations. Additional pumping capacity would be required at the RWQCP and would likely consist of a retrofit to the existing pump station. With the UV Disinfection Facility Project moving forward and scheduled for completion by October 2010, it is assumed that the proposed Project would not require any additional storage. A booster pump station would be constructed as part of the proposed Project to maintain a minimum delivery pressure of 65 psi for the end users. Due to the change in elevation between the RWQCP and the end users on Hillview Avenue (approximately 190 feet) and other sources of head loss in the pipeline, the RWQCP recycled water pump station would need to be expanded to provide adequate pressure to convey water to the end users.

Site Connections and Retrofits. The Recommended Project includes work for furnishing and installing customer connections between the recycled water and the customer's existing irrigation system, recycled water meters, valves, valve boxes and installing a "swivel-ell". The swivel-ell allows the customer to switch from the potable or recycled water distribution system while maintaining an air gap, per DPH regulations. Site retrofits for customers included in the Recommended Project include providing necessary signage, painting vaults and above ground piping purple, and providing necessary tags and purple sprinkler heads.

Water Quality. Salinity has been a concern for potential Palo Alto recycled water users as well as Phase 1 and 2 customers particularly as it relates to irrigation of redwood trees. Salinity management is being considered at the regional level by the RWQCP, so project-specific salinity management facilities were not included in the Recommended Project. The RWQCP is developing and implementing regional salinity management strategies to address these customer concerns, including a targeted inflow and infiltration (I/I) program that is expected to reduce the TDS of the reclaimed water from 900 milligrams per liter (mg/L) to approximately 700 mg/L, a tree and soil condition monitoring program to track the effect of recycled water on trees, and development of Best Management Practices (BMPs) for irrigation with recycled water.

Future Phases. The Recommended Project is Phase 3 of the RWQCP's regional recycled water system. Future extensions could serve Stanford University and Los Altos Hills, as well as provide a loop by making a second connection to the Phase 2 Mountain View Project. The vision of the regional recycled water system is identified in the 1992 RWQCP Water Reclamation Master Plan and the accompanying 1995 Final Program EIR (CH2MHill, 1995). The Master Plan and program-level EIR evaluated the development of a regional water reuse system that could ultimately provide service to the entire RWQCP service area.

ES-2.1 Estimated Costs

Table ES-3 summarizes the planning-level cost estimate for the Recommended Project.

Table ES-3: Recommended Project Planning-Level Cost Estimate

Description	Cost [1, 2]
Backbone Pipeline	$12,900,000
Lateral Pipeline	$5,000,000
User Retrofits and Connections	$1,400,000
Booster Pump Station	$900,000
RWQCP Pump Station Improvements	$800,000
Subtotal	**$21,000,000**
Construction Unknown @ Planning-Level (30%)	$6,300,000
Total Construction Cost	**$27,300,000**
Engineering and Construction Management (15%)	$4,100,000
Right of Way Costs (5%)	$1,100,000
Connection fee	$1,000,000
Total Capital Cost	**$33,500,000**
Annualized Capital Costs [3]	$2,300,000
Annual O&M Costs	$200,000
Total Annualized Cost	**$2,500,000**
Estimated Recycled Water Yield [4]	900 AFY
Unit Cost, Annualized ($/AFY)	**$2,700**

Notes:

1. Costs based on Mountain View/Moffett Field Recycled Water Pipeline bid information (average bid estimate, April 2007, ENR: 9103); previous RMC projects; San Jose Lower Silver Creek Reach 3 construction (January 2005; ENR: 8230); San Jose Highway 87 Detour II Sanitary Sewer Reconstruction Phase II (Feb 2005; ENR 8229); and City of Palo Alto Recycled Water Market Survey Report (RMC, June 2006).
2. All costs expressed in March 2008 dollars (ENR: 9150)
3. Annualized costs developed based on an interest rate of 5.5% and a period of 30 years.
4. Rounded to nearest 50 AFY.

ES-2.2 Benefits

Table ES-4 summarizes the key benefits of the Recommended Project to the City and its customers.

Table ES-5 identifies benefits to other potential stakeholders, including Purissima Hills Water District, Stanford University, the SFPUC, and BAWSCA.

Table ES-4: Recommended Project Key Benefits to the City and its Customers

Benefit Category	Description
Water Supply Reliability	• Provides approximately 900 AFY of new, locally controlled, and drought-proof water supply for non-potable uses. • Offsets need to purchase approximately 900 AFY of potable water thereby reducing current and future reliance on imported water from both SFPUC and SCVWD to meet level of service goals. • Reduces the level of water rationing in droughts, thereby protecting landscape value.
Protection of South Bay	• Reduces the wastewater constituent mass loading and volume of treated wastewater discharged to the San Francisco Bay and enhances preservation of salt water marshland habitats.
Sustainability	• Advances the City's green initiative by conserving high-quality, potable water for its highest use, and beneficially reusing the wastewater generated by the City.
Adherence to local, regional and state recycled water goals and policies	• Allows potential future connections to Stanford University and Los Altos Hills as well as future loop connecting to Phase 2, consistent with the regional recycled water system identified in the 1992 Water Reclamation Master Plan. • Contributes to meeting SCVWD's Policy No. E-2, 2.1.7 (specifically that water recycling accounts for 5 and 10 percent of total water use in Santa Clara County in 2010 and 2020, respectively). • Upholds state guidelines and policies relative to recycled water, including the California Water Code, Section 13510, and Section 461.

Table ES-5: Recommended Project Potential Benefits to Other Stakeholders

Stakeholder	Key Benefits
RWQCP	• Achieves long-term goals of the RWQCP's stakeholders, including taking a leadership role in promoting beneficial reuse and maximizing recycled water as a supplemental water source. • Provides a framework for regional recycled water system connectivity. • Reduces the wastewater constituent mass loading and volume of treated wastewater discharged to the San Francisco Bay.
SFPUC/BAWSCA	• Reduces dependence on imported potable water (Hetch Hetchy Project) for non-potable uses. • Contributes to achieving objectives of Phased WSIP Variant presented in the PEIR on SFPUC WSIP (ESA+Orion 2008)
SCVWD	• Reduces dependence on imported potable water (Central Valley Project) for non-potable uses by progressing toward meeting countywide recycled water goals established in Policy No. E-2, 2.1.7. • Prepares for regionalization of recycled water service, which will allow for more operational flexibility.
Purissima Hills Water District	• Provides an additional water supply management option to Purissima Hills Water District (PHWD).
Stanford University	• Provides an additional water supply management option to Stanford University.
SWRCB	• Augments overall State water supply with 900 AFY of drought-proof, non-potable water. • Benefits the Bay-Delta water system by aiding SCVWD to meet their countywide recycled water use policy. • Potentially displacing the need for Palo Alto to obtain future SCVWD potable water supplies. • Potentially displacing the need for other water users to obtain SCVWD potable water supplies.

ES-2.3 Comparison to Freshwater Alternative

Table ES-6 presents a simple cost and benefits comparison of the Recommended Project and a reference freshwater alternative. It should be noted that the freshwater alternative considered might not be viable in the long-term due to increasing limitations to SFPUC supply reliability as noted in the table.

Table ES-6: Recommended Project vs. Freshwater Alternative Comparison

Criteria	Palo Alto Recycled Water Project	Status Quo – Supply from SFPUC
Summary		
Description	Construct recycled water distribution system and pumping facilities to provide recycled water for primarily irrigation use.	Status Quo. No additional facilities required.
Water Supply	Treated wastewater from the RWQCP, meeting Title 22 recycled water standards for unrestricted use.	Surface waters from Tuolumne and Alameda watersheds
Benefits		
Water Offset Quantity	900 AFY, drought-proof supply for non-potable uses	
Other Benefits	Aligned with the objectives of the Phased WSIP looking at developing 10 MGD of local conservation, recycled water, and groundwater projects within SFPUC service area	
	Improves water supply reliability during drought and emergency conditions	
	Advances the City's green initiative	
	Reduces mass loading to South Bay	
	Adheres to local, regional and state recycled water policies	
	Allows flexibility to optimize water source use amongst different agencies	
Costs		
Capital Cost	$33.5 million (March 2008 dollars)	N/A
Unit Cost ($/AF)	Retail cost of $2,700/AF - without outside funding Retail cost of $1,700/AF - planning funding scenario	Wholesale cost up to $1,600/AF by 2015
Other Potential Future Costs/Risks	Cost of salinity management actions, if required	Risk of additional supplies reductions in average years and drought years
	Cost of groundwater monitoring activities, if required	Risk of additional future cost increases

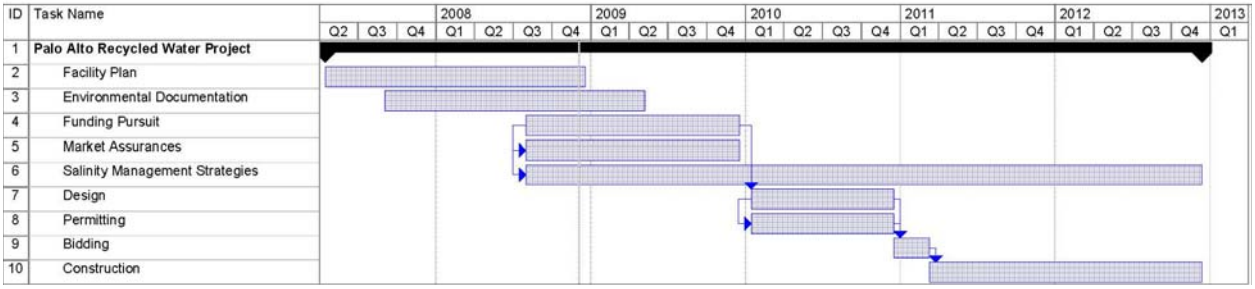
As described above, the Recommended Project provides key water supply and environmental benefits to the City and its customers.

Given the uncertainty associated with the cost of SFPUC water, uncertainty associated with supply availability during average years as a result of the Phased WSIP, and limited supply availability in drought years, the Recommended Project appears attractive. However, outside funding is currently needed to offset part of the City's costs and move the Recommended Project forward.

ES-2.4 Implementation Schedule

Figure ES-4 presents the major tasks and associated project implementation schedule; and shows that the Project could be on-line in early 2013.

Figure ES-4: Recommended Project Implementation Schedule



Note: Stakeholder involvement and public outreach is not represented as a separate task but will need to happen throughout the project implementation, above and beyond the Facility Plan and environmental documentation period

- **Facility Plan and Environmental Documentation** – The Facility Plan (this report) is complete. The required environmental documentation is scheduled for completion by mid-2009. These steps represent the preliminary planning stage for the Project, enabling pre-design and design to begin in the near future assuming funding pursuits are successful.
- **Funding Pursuit and Financial Planning –** As discussed in the financing plan section, securing funding is vital to the feasibility of the Project. The City will continue to pursue funding opportunities identified in this Study. The Project may not advance to further stages until adequate funding is secured. As part of the funding pursuit, a detailed financial plan (including annual projections) will be developed.

  Additionally, as part of financial planning activities, the City must address coordination and management issues between the CPAU (responsible for this Project) and the Department of Public Works (responsible for the operation of the RWQCP). Many of these aspects have been addressed previously by the City of Mountain View and RWQCP for the Phase 2 Project. Institutional, financial, and operational agreements will formalize the roles and responsibilities of the project.
- **Market Assurances** – The City has developed a recycled water use ordinance for the Stanford Research Park and users located in the vicinity of the proposed backbone system. A copy of the ordinance is provided in Appendix F.
- **Implementation of Regional Salt Management Strategies and Stakeholder Outreach** – The RWQCP in coordination with its partners, including the City of Palo Alto, will be implementing the regional salt management strategies over the course of the project and will continue these activities through the operation of the regional system. These strategies are described in Chapter 3.
- **Permitting and Agency Coordination –** The City will need to address permitting issues and stakeholder agency coordination during design. The major jurisdictional and stakeholder agencies and required permits and approvals required for implementing the Project have been identified in Chapter 5.
- **Design and Construction** – Assuming that adequate funding can be pursued and secured in 2008/09, the Project could move into design in early 2010 and into construction in early 2011. The Project could be online in early 2013.

Chapter 1 Introduction

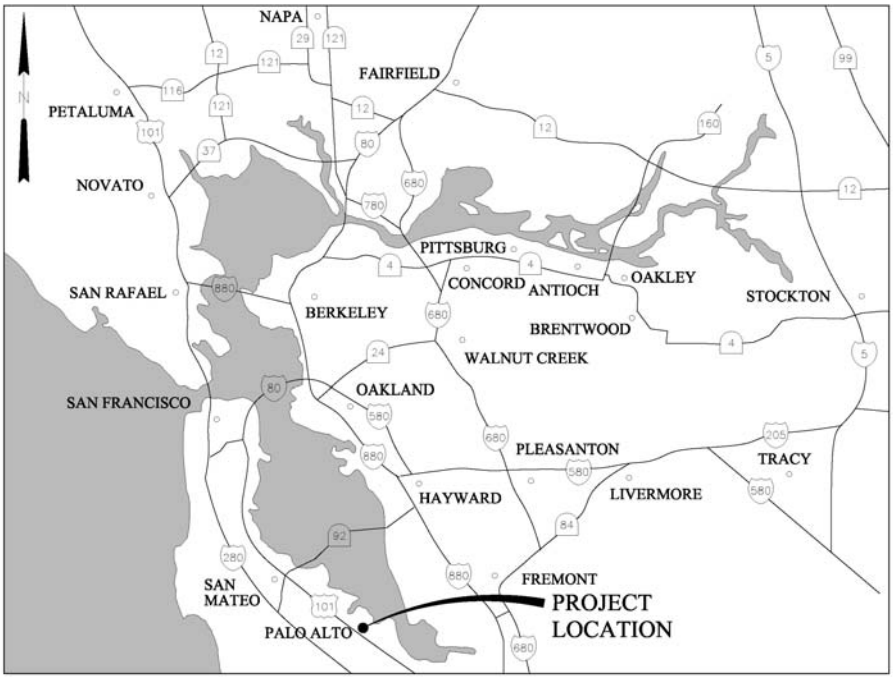
The City of Palo Alto Utilities (CPAU) is investigating the expansion of the Palo Alto Regional Water Quality Control Plant's (RWQCP) regional recycled water system to serve areas in the City of Palo Alto (City). This Study documents the work conducted in support of this effort, known as the Palo Alto Recycled Water Project (Project). This Study was completed in accordance with the requirements of the State Water Resources Control Board (SWRCB) Planning Grant[1].

This chapter provides background information on the City of Palo Alto and the Palo Alto RWQCP's regional recycled water system, defines Project goals and Study objectives, and outlines the remaining chapters of the Study.

1.1 Background

The City of Palo Alto is located 35 miles south of San Francisco and 14 miles north of San Jose. **Figure 1-1** shows the location of the City. Palo Alto is a community of approximately 61,200 residents. Part of the San Francisco Metropolitan Bay Area and the Silicon Valley, Palo Alto is located within Santa Clara County and borders San Mateo County. The City's boundaries extend from San Francisco Bay on the east to the Skyline Ridge of the coastal mountains on the west, with Menlo Park to the north and Mountain View to the south. The City encompasses an area of approximately 26 square miles, of which one-third is open space.

Figure 1-1: City of Palo Alto Location



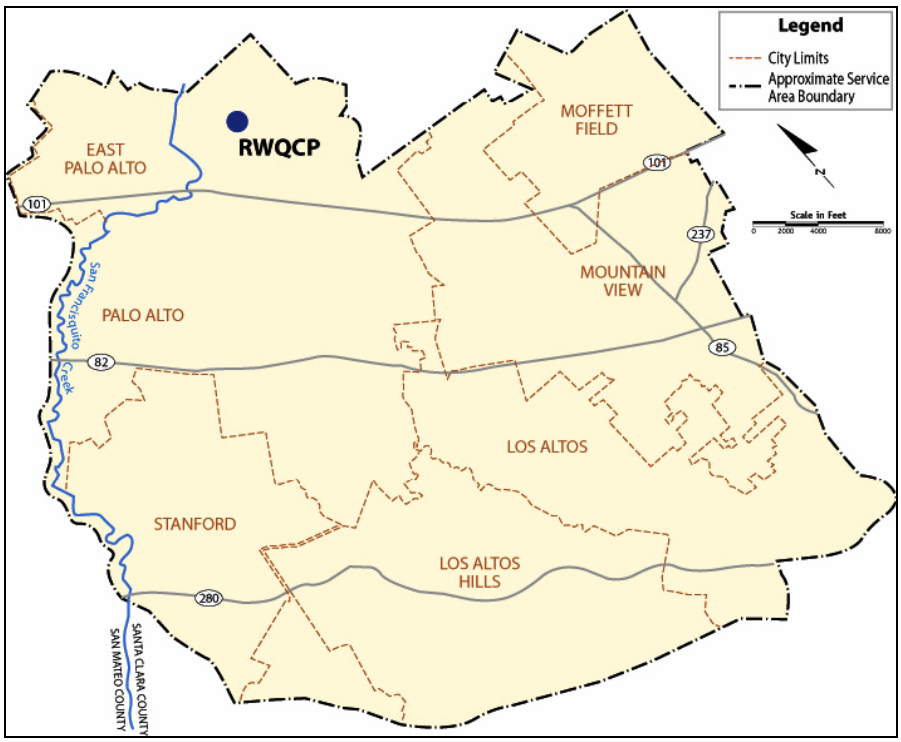
The CPAU operates city-owned utility services that include electric, fiber optic, natural gas, water and wastewater services. CPAU has been providing services to the citizens and businesses of Palo Alto since 1896. The CPAU is conducting this Study.

[1] SWRCB Water Recycling Facilities Planning Grant Program: http://www.waterboards.ca.gov/water_issues/programs/grants_loans/water_recycling/facilitiesplan.shtml.

The City's Public Works Department is responsible for the administration and operation of the RWQCP. The RWQCP is located on the San Francisco Bay in the northeastern portion of the City. It provides treatment and disposal of wastewater to the Cities of Palo Alto, Mountain View and Los Altos, the Town of Los Alto Hills, the East Palo Alto Sanitation District, and Stanford University, known collectively as the RWQCP Partners. **Figure 1-2** shows the RWQCP service area. The RWQCP has a design average dry-weather flow capacity of 39 million gallons per day (MGD) and a current flow of approximately 23 MGD.

The RWQCP treats wastewater to the disinfected secondary-23 recycled water level[2] and discharges most of its effluent to the San Francisco Bay. For effluent that is not discharged to the Bay, the RWQCP has a 4 MGD recycled water facility that filters and disinfects the effluent to meet the requirements for disinfected tertiary recycled water "unrestricted use" as defined in California Code of Regulations, Title 22, Sections 60301 through 60355[3].

Figure 1-2: RWQCP Service Area



Palo Alto's Water Reuse Program began in the early 1980's with the delivery of recycled water to Shoreline Golf Links. The system was expanded to include the Palo Alto Municipal Golf Course, Greer Park, and the Renzel Marsh. Palo Alto completed a Water Reclamation Master Plan (Master Plan) for the Palo Alto RWQCP in 1992 (Brown and Caldwell 1992) and the accompanying Final Program Environmental Impact Report (EIR) in 1995 (CH2MHill 1995). The Master Plan and program-level EIR evaluated the development of a regional water reuse system that could ultimately provide service to the

[2] "Disinfected secondary-23 recycled water" means recycled water that has been oxidized and disinfected so that the median concentration of total coliform bacteria in the disinfected effluent does not exceed a most probable number (MPN) of 23 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed, and the number of total coliform bacteria does not exceed an MPN of 240 per 100 milliliters in more than one sample in any 30 day period.

[3] California Code of Regulations as they relate to recycled water use (the "Purple Book") can be found at: http://ww2.cdph.ca.gov/certlic/drinkingwater/Documents/Recharge/Purplebookupdate6-01.PDF.

entire RWQCP service area. The Master Plan includes a phased approach to the expansion of treatment, distribution, storage, and use of recycled water. The Palo Alto RWQCP developed the Master Plan in conjunction with its member agencies to address two main goals:

1) Reduce demand on drinking water supplies by providing recycled water suitable for non-potable uses and,

2) Reduce metal discharge and improve overall water quality to the San Francisco Bay in part by reducing wastewater discharge to the Bay.

The Program EIR evaluated the development of a regional water reuse system that could ultimately provide service to the entire RWQCP service area including Palo Alto, Mountain View, Los Altos, East Palo Alto, Los Altos Hills, part of Menlo Park, as well as Stanford University. The Program EIR addressed the environmental effects of the overall Water Reuse Program.

In December 2001, the RWQCP published a Long-Term Goals Study (LTGS) Report that concluded a one-year, stakeholder driven effort to develop long-term goals for the RWQCP. Water recycling was identified as a key priority for the RWQCP. In addition, developing recycled water activities was considered as a key means to achieve a number of the other long-term goals such as improving water supply reliability, providing a dependable, locally controlled water source, and reducing reliance on imported water.

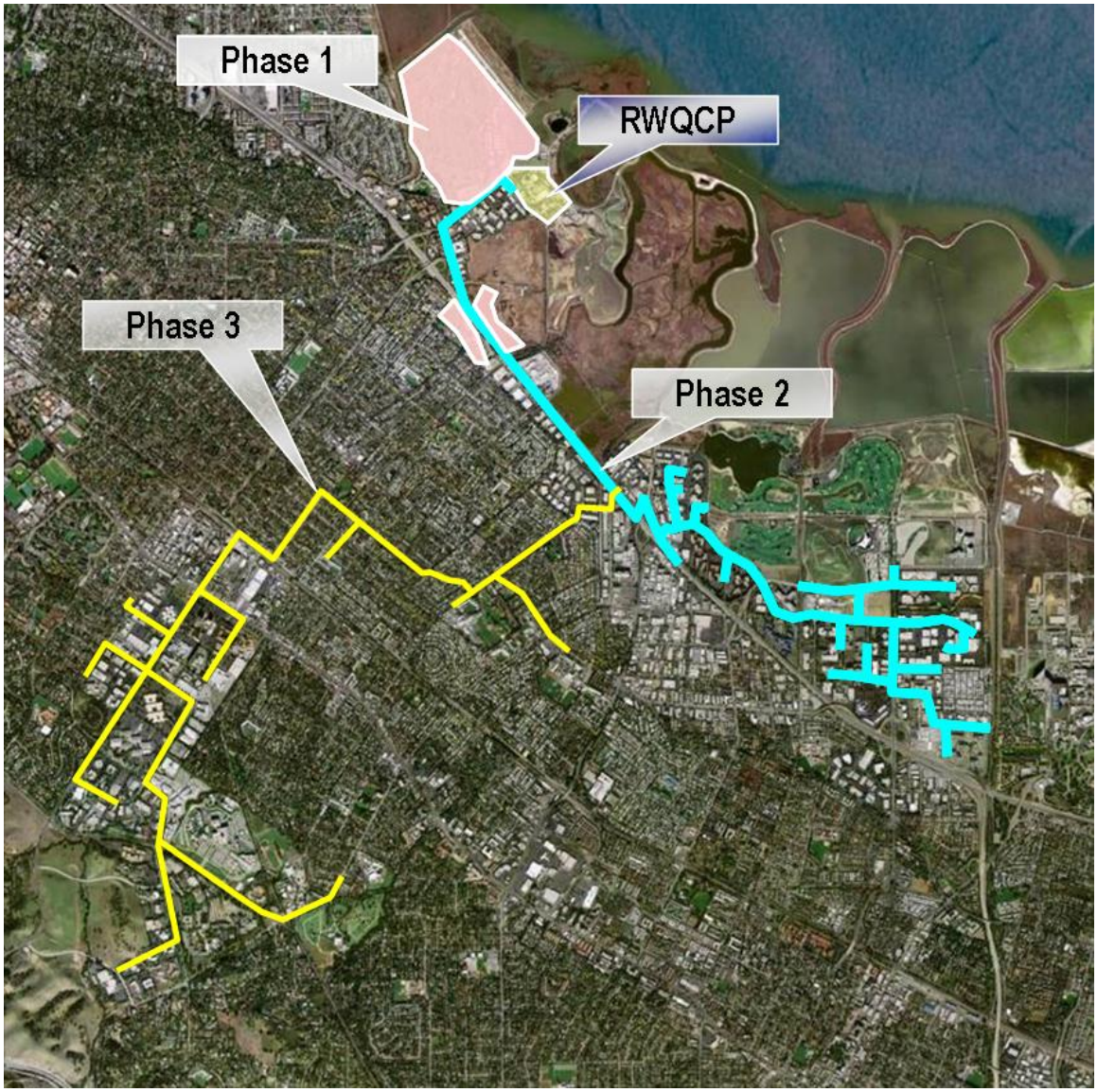
Funding opportunities from the SWRCB triggered the decision in May 2003 to move forward with Phase 2 of the of the Palo Alto RWQCP's ongoing expansion of its regional recycled water system, the Mountain View/Moffett Field Area Reclaimed Water Pipeline Project (Phase 2 Project). The Phase 2 Project is one of the projects identified in the 1992 Master Plan. In 2004, the RWQCP completed a facilities plan (RMC 2004) for the Phase 2 Project and design was completed in early 2007. Construction for the Mountain View Project began in the summer of 2007. The Phase 2 Project will replace an existing deteriorating pipeline to Shoreline Golf Course in Mountain View and extend the pipeline to serve the Mountain View-Moffett Field area. The pipeline replacement will restore the golf course connection and will provide recycled water services to the Shoreline community. The Mountain View/Moffett Field Area Reclaimed Water pipeline is sized to serve future users in the City of Palo Alto via several connections at Embarcadero Road and Bayshore Avenue, at Greer Park, and near San Antonio Road.

In 2006, the City of Palo Alto completed a Recycled Water Market Survey Report (Market Survey) (RMC 2006) as a preliminary effort to determine potential locations of recycled water use within the City. The objectives of the study were to review and update the list of potential recycled water users identified in the 1992 Master Plan and to update the proposed cost estimate for the delivery of recycled water to the City of Palo Alto and future expansions. The Market Survey included site investigations, market analysis, conceptual project design, and preparation of a preliminary financing and revenue plan. The Market Survey estimated a total city-wide 2006 projected recycled water demand of 1,870 AFY, excluding Stanford University, and recommended an alignment that would convey water from the RWQCP through the City of Palo Alto, with a target customer base at the Stanford Research Park. The proposed project would supply recycled water to the Stanford Research Park area.

The City applied for and secured grant funding for the project planning from the SWRCB through the Regional Water Recycling Facilities Planning Grant Program. The grant provides a 50% cost share with the City for up to $75,000 to fund this Study. Upon completion of this Study, the City may decide to move forward with implementation of the Recommended Project (detailed in Chapter 5).

The project considered herein would constitute Phase 3 of the regional recycled water program. **Figure 1-3** provides an overview of the proposed alignment and pipe laterals within the context of the RWQCP's ongoing recycled water expansion.

Figure 1-3: RWQCP Regional Recycled Water System Expansion Phases



Footnotes:

1. Phase 1 in operation since 1980.
2. Phase 2 currently under construction.
3. Phase 3 pipeline alignment shown is the Recommended Project detailed in Chapter 5.

1.2 Project Goals

The primary objective of extending recycled water pipelines into Palo Alto would be to allow the City to maximize recycled water as a supplemental water source. A Palo Alto Recycled Water Project would achieve the following:

1. Improve water supply reliability by conserving drinking water, currently used for irrigation and other non-potable uses, for potable purposes,
2. Provide a dependable, locally controlled water source,

3. Secure a water source that will be available even in droughts to serve irrigation and other non-potable uses,
4. Reduce reliance on imported water, and
5. Conserve the San Francisco Bay by reducing the wastewater constituent mass loadings to the Bay and enhancing preservation of salt water marshland habitats.

In addition, the Project would provide the following benefits to the community:

- Sustain landscape value during droughts when potable water use is restricted,
- Beneficially reuse the wastewater generated by the City,
- Uphold state guidelines and policies relative to recycled water, including the California Water Code, Section 13510, and Section 461.

1.3 Study Objectives and Approach

The objectives of this Study are threefold:

1. Define recycled water project alternatives (i.e. reuse sites and demands, distribution alignment, sizing, construction alternatives, etc.) and identify a Recommended Project.
2. Develop a realistic funding strategy for the Recommended Project
3. Develop an implementation strategy for the Recommended Project.

Technical activities performed by RMC as part of this Study include site investigation, market analysis, alternative development and evaluation, stakeholder outreach, preparation of an environmental document, funding investigation, and preparation of a preliminary financing and revenue plan. The details and results of these services are presented and discussed in Chapters 2 through 5 of this report.

The approach of the Study was to build upon the technical information developed in the 2006 Market Survey, which conducted a recycled water market assessment, identified the project focus area, and developed project alternatives. This Study refined the technical information from the Market Survey, developed a Recommended Project, and developed an implementation plan.

1.4 Stakeholder Involvement

The City, through the RWQCP, has actively included stakeholders in recycled water related projects. This involvement included EIR preparation for the Recycled Water Master Plan in 1992, stakeholder workshops for the LTGS preparation between 2000 and 2002, stakeholder workshops for the Mountain View Recycled Water Project facility planning in 2004, public meetings as part of Initial Study/ Mitigated Negative Declaration (IS/MND) preparation for the Mountain View Project, and surveys of potential customers for the Palo Alto Recycled Water Market Assessment in 2006.

In addition, the City has been meeting with stakeholders to build support for this Project, and identify and address potential concerns in the Project definition. Stakeholder involvement for this Project has included:

- **Facility managers meeting on June 13, 2007.** Facility managers are staff who manage a property's utilities, such as energy use (electric and gas), water use, and wastewater. The facility managers meeting included employees of large businesses such as Roche, Hewlett Packard and Varian, as well as public facilities such as parks (primarily for water use and irrigation). The managers are typically responsible for maintaining and operating irrigation systems and cooling towers on their properties. The facility managers were given an overview of the Project and were given the opportunity to ask questions and make comments regarding the Project. The feedback provided was directly considered in the project definition and implementation plan development.

- **Public scoping meeting for the proposed Project on September 18, 2007.** All interested members from the public were welcome to attend. The City specifically invited the LTGS stakeholders, who represent a wide range of environmental and socioeconomic interests of the communities, and the facility managers to attend and participate in the meeting. Announcements for the meeting were published in the Palo Alto Daily News and Palo Alto Weekly. A comment form was made available at the public scoping meeting for the public to send comments to the City and to be added to the mailing list for the Project. Comments received at the scoping meeting were directly considered in the project definition and implementation plan development.

Material presented at these meetings or meeting summary is included in Appendix G.

At least one additional public meeting is anticipated as part of the environmental review document completion.

Finally, the RWQCP is maintaining a Water Reuse Program webpage on the City of Palo Alto website (http://www.city.palo-alto.ca.us/environment/water_quality.asp).

1.5 Report Content

This Study is divided into five chapters and includes several appendices:

- Chapter 1 – Introduction (this section).
- Chapter 2 – Study Area Characteristics. This section identifies the current conditions in the RWQCP region including climate, topography, hydrologic features, water usage, water quality and land use. It also further discusses water supply and wastewater management issues, and the RWQCP Water Reuse Program.
- Chapter 3 – Market Assessment. This section identifies potential users of recycled water and the methodology used to evaluate the potential market. The project focus area is also defined.
- Chapter 4 – Alternatives Assessment. This section gives a detailed description of the Project components, planning and design assumptions, project alternatives, evaluation process, and identifies the Recommended Project
- Chapter 5 – Recommended Project. This section describes the Recommended Project at the facility-plan level, including operations strategy, design criteria, cost estimates, and implementation plan.

- Appendix A – Recycled Water Users Database
- Appendix B – Recommended Project Back-Up Information
- Appendix C – Alternative Analysis Back-Up Information
- Appendix D – Preliminary Alignment Site Visit, May 17, 2007
- Appendix E – City of Palo Alto Recycled Water Market Survey (RMC 2006)
- Appendix F – Recommended Project Cash Flow Analysis
- Appendix G – Stakeholder Meeting Summary or Material
- Appendix H – Recycled Water Use Ordinance

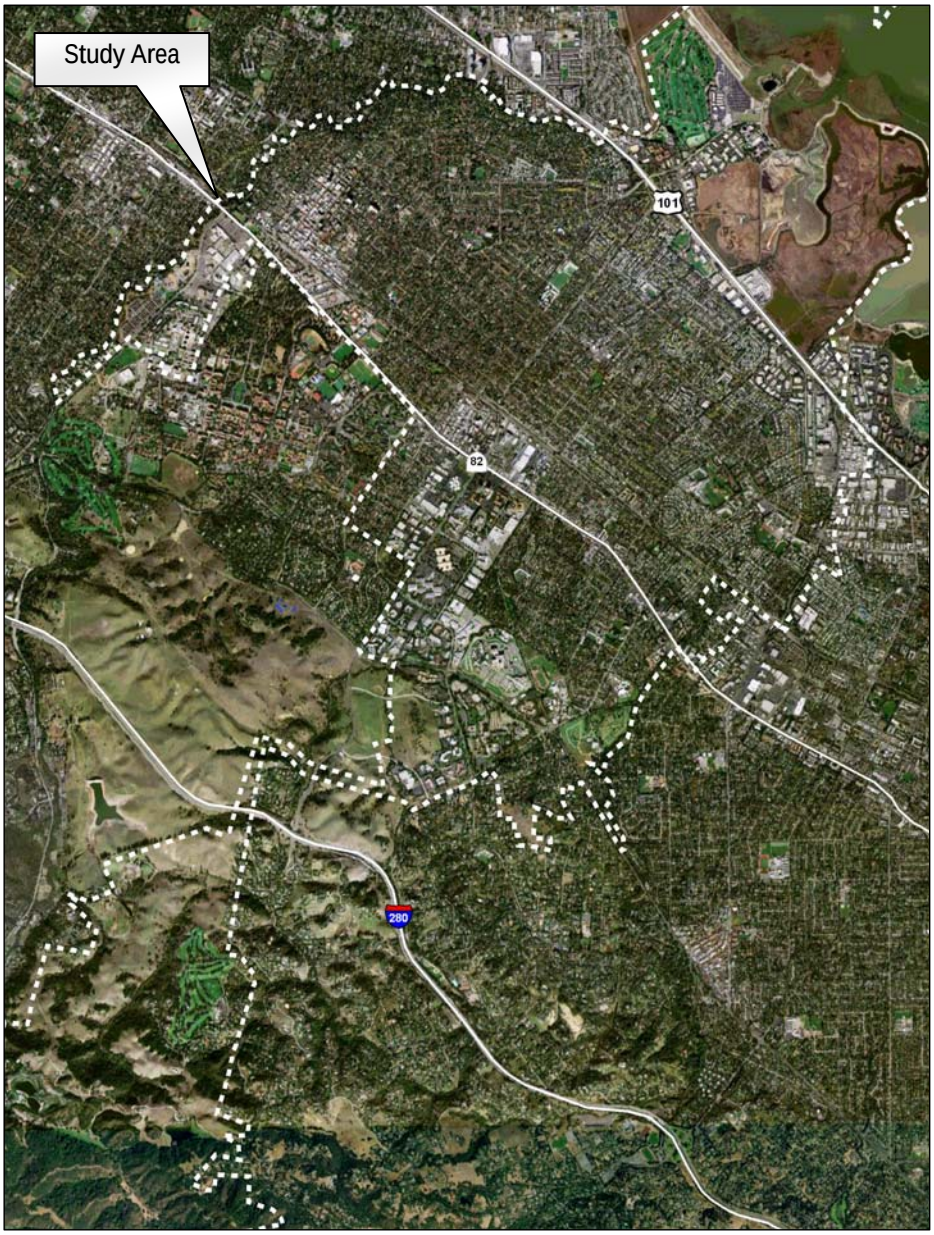
Chapter 2 Study Area Characteristics

This chapter presents the service area setting and further discusses the water supply and wastewater discharge management issues that prompted the interest in a Palo Alto Recycled Water Project. It also describes the existing RWQCP treatment facilities and Water Reuse Program.

2.1 Service Area Setting

The Project study area is illustrated in **Figure 2-1**. It encompasses the majority of the City of Palo Alto.

Figure 2-1: Project Study Area



Footnotes:

1. Note that the Study Area extends into a small area to the southwest of the area shown on the map.

The climate in Palo Alto is considered moderate. Typical of the San Francisco Bay Area, Palo Alto has cool, wet winters and warm, dry summers. In January, average temperatures range from 38.5°F to 57.4°F. In July, average temperatures range from 54.9°F to 78.4°F. The record high temperature is 107°F and the record low temperature is 20°F.

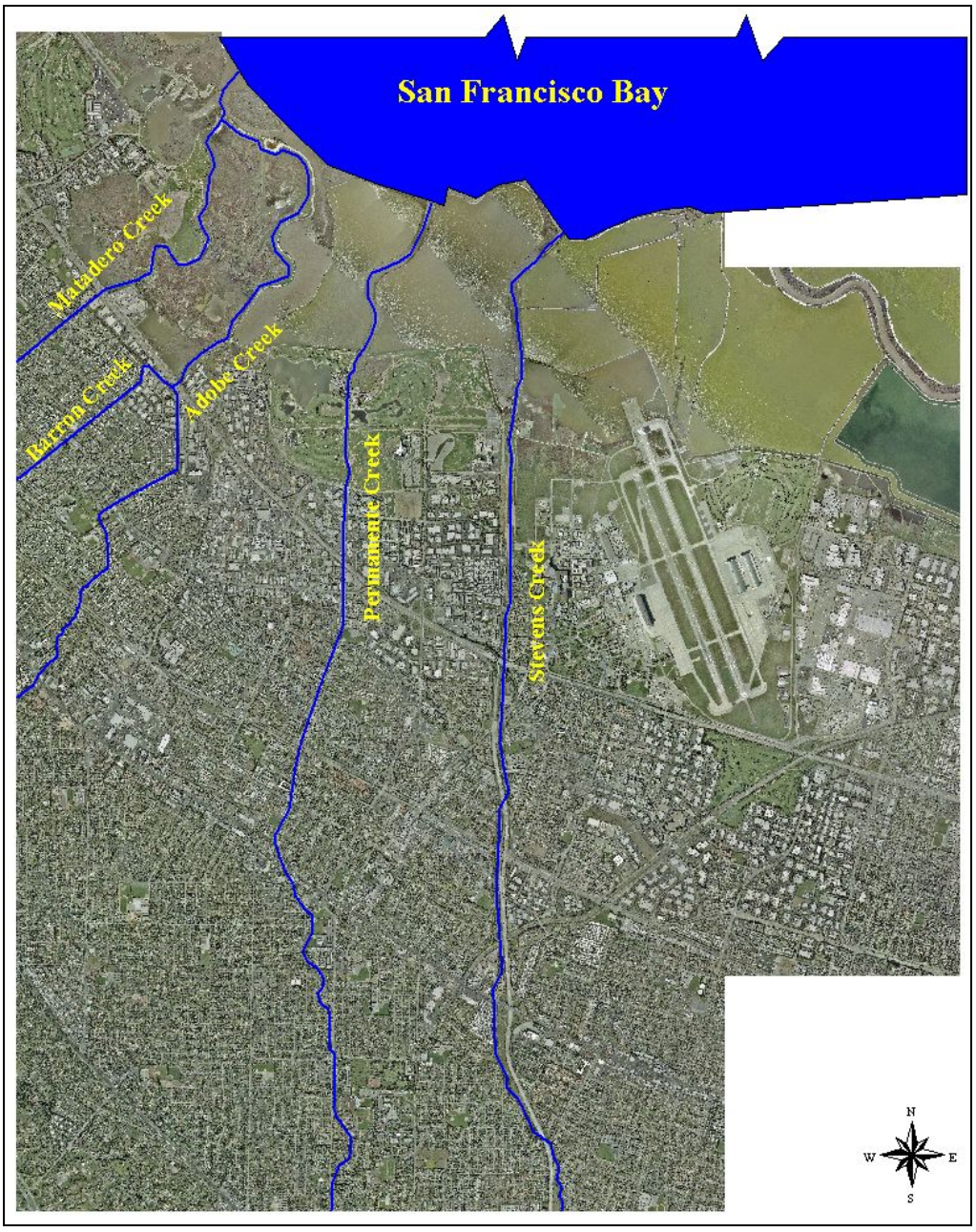
Due to the Santa Cruz Mountains to the west, there is a "rain shadow" in Palo Alto, resulting in an average annual rainfall of only 15.32 inches. Measurable rainfall occurs on an average of 57 days annually. The wettest year on record had 32.51 inches and the driest year had 7.34 inches. The most rainfall in one month was 12.43 inches. Measurable snowfall is rare in Palo Alto.

In the northern portion of the study area, along the baylands near the Bay, the topography is quite flat. However, in the southern portion of the study area, closer to the foothills of the Santa Cruz Mountains, the topography is much more sloped. The groundwater basin in the area is composed of sand and gravel deposits that are part of alluvial fans of sand, silt, gravel, and clay covering the bedrock layer. Most of the potable water supply in the service area comes from sources other than wells supplied by the groundwater basin.

The study area is comprised of residential areas, commercial areas, office parks, industrial parks, golf courses, recreational parks, an airport, research centers, schools, and open space reserves. The current population of the City of Palo Alto is approximately 61,200. The population is expected to increase by a total of 10% over the next 20 years.

The study area and adjacent RWQCP service area waters include the southern portion of San Francisco Bay and several creeks/streams (i.e. Matadero, Adobe, Permanente, and Stevens Creek). The southern portion of San Francisco Bay is shallower than the rest of the Bay and thus receives less dilution and mixing from tidal action than the other areas of the Bay. Therefore, the presence and effects of even minute quantities of pollutants in the RWQCP effluent in the South Bay continues to be a major cause of concern as many locals still rely on the South Bay for fishing and livelihood, and many endangered species rely on the health of this sensitive estuarine habitat. **Figure 2-2** shows the main water features of the Study area and adjacent RWQCP service area.

Figure 2-2: Project Service Area Water Features



2.2 Water Supply Management Issues

Even though water demand is forecasted to remain relatively constant over the next 20 years, the City's exclusive dependence on the SFPUC for potable water supply raises several water supply management issues that recycled water could help address.

2.2.1 Water Demand

Even though Palo Alto's population (and number of connections to the City of Palo potable water system) is expected to increase over the next 20 years, the City's future water demands are forecasted to remain

relatively constant over the same period of time, as shown in **Table 2-1,** based on the City of Palo Alto's 2005 Urban Water Management Plan (UWMP) (Palo Alto, 2005).

Table 2-1: Projected Water Demand

	2005	2010	2015	2020	2025	2030
Number of meters/connections	19,365	19,858	20,351	20,810	21,088	21,366
Demand before DSM Program (AFY)	13,862	13,938	14,009	14,083	14,102	14,144
Demand after DSM Program (AFY)	13,714	13,528	13,437	13,461	13,447	13,477

Source: City of Palo Alto 2005 UWMP
DSM Demand-Side Management

In developing the demand projections for the 2005 UWMP, the City of Palo Alto relied on ABAG population projections that are being updated and showing a larger population increase than previously projected. It is not unreasonable to expect that the City of Palo Alto 2010 UWMP will assume a greater increase in population numbers and number of meters/connections, which could lead to an increase in water demand.

2.2.2 Water Supply

As described in Palo Alto's 2005 UWMP the City relies 100% on San Francisco Public Utilities Commission (SFPUC) potable water supplies as its primary source of water supply. Approximately 85% of the SFPUC water comes from Sierra Nevada snowmelt that is stored in the Hetch Hetchy Reservoir on the Tuolumne River in Yosemite National Park. Hetch Hetchy water is of excellent quality and need not be filtered prior to distribution. The remainder of the SFPUC water comes from a combination of runoff in the Alameda watershed that is stored in reservoirs, and the Sunol Filter Galleries, which utilize groundwater near the town of Sunol. These potable sources are also of excellent quality, but have slightly higher levels of sodium and dissolved solids. The SFPUC serves about one-third of its water supplies directly to retail customers in San Francisco and about two-thirds of its water supplies to 27 wholesale customers (including Palo Alto), represented by the Bay Area Water Supply and Conservation Agency (BAWSCA).

The City has an existing well water system that is currently not in use. The City's existing well system consists of five wells that were constructed in the mid-1950s and were operated continuously until 1962. The wells were used in 1988 and 1991 for short periods to provide supplemental supplies in times of drought. At present, the wells would require major repair and upgrades if they are to be counted on either for emergency use or for supplemental drought supply. The City is currently investigating alternatives for new local emergency groundwater wells.

Water Supply Availability – Average Year

On October 30, 2008, SFPUC approved the Phased Water System Improvement Program (Phased WSIP) Goals and Objectives and adopted the associated California Environmental Quality Act (CEQA) Findings for the project. As part of the Phased WSIP, the SFPUC agreed to limit average annual water sales supplied from its watersheds to 265 MGD during the period up to 2018, whereas the demand on the SFPUC regional water system by 2018 is projected to be 285 MGD. The approved program has provisions to impose financial penalties if the 265-MGD limit is exceeded. To ensure the cap is not exceeded, the SFPUC and BAWSCA are currently investigating aggressive conservation and recycling options.

The Project considered herein could contribute 0.9 MGD towards meeting the goals outlined in the WSIP and could conceivably mitigate any financial exposure to future penalties associated with exceeding the 265 MGD limit (see Chapter 5).

Water Supply Reliability – Drought Conditions

The City has conducted several studies to identify and address water supply management issues. In 1999 the City began work on a Water Integrated Resources Plan (WIRP), a multi-phase study to evaluate water resource options. In mid-2003, WIRP conclusions were prepared for the City. The primary conclusion was that supplies from the SFPUC are adequate in normal years, but additional supplies are needed in drought years to avoid shortages. The City's UWMP states that in a single dry year, the City's SFPUC water allocation may be reduced to 90% of normal. In a three year drought, water availability could be reduced to 80% of normal.

Recycled water would provide a drought-proof water supply for non-potable demands when the City's potable water allocation is reduced. The City is also investigating local emergency groundwater well projects to address this issue as described above.

Water Supply Cost

The SFPUC currently wholesales the water at an average cost of $1.30 per hundred cubic foot (ccf) or approximately $566 per AF. The CPAU's potable water rates for non-residential use are $4.34 per ccf. The cost of wholesale potable water is projected to soar over the coming years. The City is projecting that SFPUC will rise to $1,600 per AF or more by 2015 due to large costs associated with needed Hetch Hetchy capital improvement programs.

Water Supply Reliability – Service Disruption

The City's exclusive dependence on the SFPUC for potable water supply makes Palo Alto's water supply extremely vulnerable to potential disruption and outage in the event of any damage to the transmission system (e.g. an earthquake). To address this issue, the SFPUC is currently implementing the WSIP to increase the reliability of the regional water system and the City is investigating local emergency groundwater well projects. Recycled water would provide an additional local, reliable water supply for non-potable demands in the event of service disruption.

2.2.3 Summary

Recycled water would be a new, locally-controlled, drought-proof source of water for the City, which could help address potential SFPUC water supplies concerns, including:

- SFPUC water allocation under average conditions and under drought conditions
- Rising price of SFPUC wholesale water
- Potential for service disruption

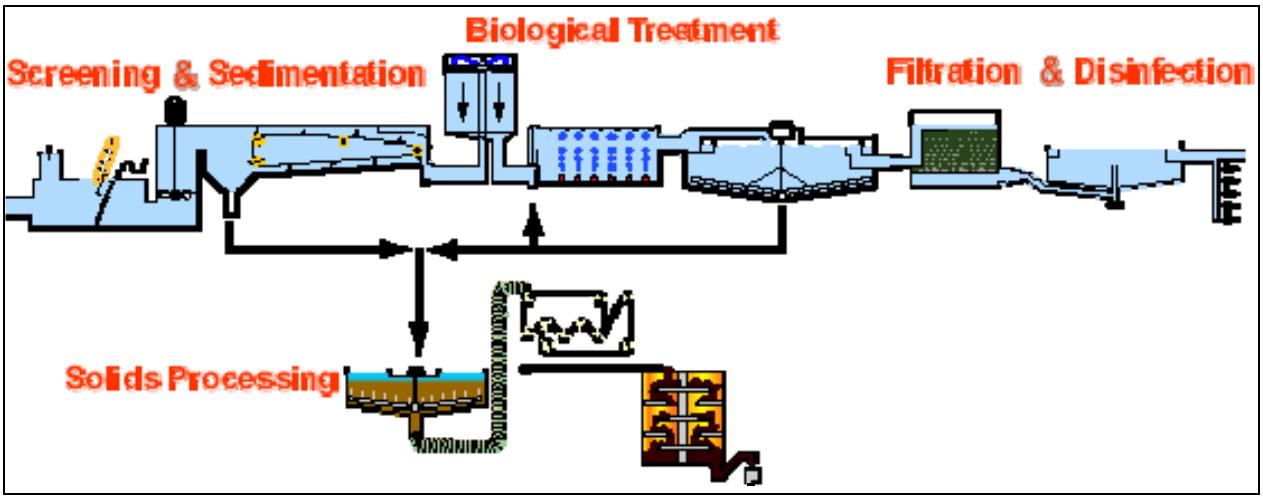
2.3 Wastewater Discharge Management Issues

The RWQCP provides treatment and disposal of wastewater for the City of Palo Alto and RWQCP Partners. The RWQCP service area is shown in Chapter 1 in Figure 1-2. The average dry weather flow capacity of the RWQCP is 38 MGD. Currently, the average flow is around 23 MGD. **Figure 2-3** shows a schematic of the existing wastewater treatment process at the RWQCP.

The treatment process at the RWQCP includes primary treatment (bar screening and primary sedimentation), secondary treatment (fixed film reactors, activated sludge process, clarification, and filtration), and tertiary treatment (filtration through a sand and coal filter, sodium hypochlorite disinfection, and sodium bisulfite for dechloronation). The RWQCP effluent is discharged to the San

Francisco Bay via a man-made channel. The quality of the effluent has improved over time as a result of improved source control and treatment efforts.

Figure 2-3: RWQCP Wastewater Treatment Process Schematic



Source: RWQCP website

Additionally, the RWQCP has the ability to treat up to 4 MGD of water for reclamation purposes via coagulation and filtration through a multi-layered filter and disinfection processes. The additionally treated effluent meets California Department of Health Services Title 22 requirements for "unrestricted" reuse.

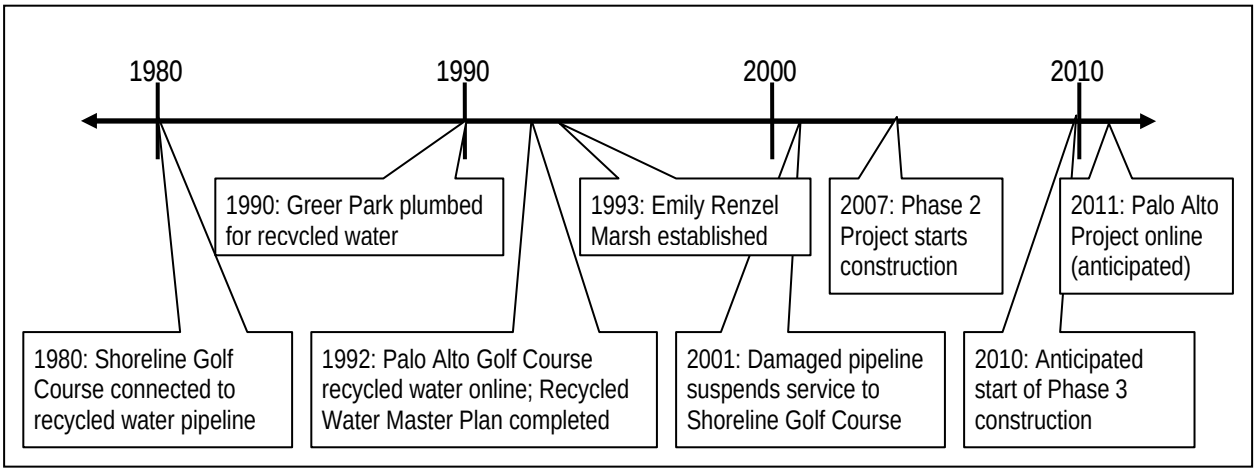
The RWQCP has recently completed the design of ultra-violet (UV) disinfection facilities to replace its existing disinfection facilities. The UV facilities would increase the recycled water production capacity to 6.45 MGD with the ability to further increase capacity to 8.6 MGD in the future. The new UV facilities are scheduled to be on-line by October 2010.

The RWQCP is regulated by an NPDES permit issued by the RWQCB. Currently the RWQCP meets all NPDES permit requirements. However, the RWQCB has begun to set lower limits for the discharge of pollutants for NPDES permit renewal. Future requirements may include increased water quality restrictions for effluent into the Bay. Water reclamation has been one of the strategies implemented by the RWQCP to achieve the NPDES permit limits.

2.4 RWQCP Water Reuse Program

The RWQCP Water Reuse Program was started in the early 1980's and has been providing recycled water for landscape and golf course irrigation in the cities of Palo Alto and Mountain View. The main goals of the RWQCP Water Reuse Program are to reduce demand on drinking water supplies, to reduce pollutant discharge to the Bay and to improve the overall quality of the Bay. **Figure 2-4** details the history of the RWQCP Water Reuse Program, which is described in Section 1.1.

Figure 2-4: RWQCP Water Reuse Program Timeline



Recycled Water Production

As of June 2008, the RWQCP produced and distributed approximately 1 MGD of recycled water to several irrigation customers during the summer months. As part of the Phase 2 Project, the RWQCP will extend its recycled water delivery capacity. **Table 2-2** shows current and future recycled water production at the RWQCP. This topic is examined in greater detail in Chapters 3 and 4 where information regarding the recommended facilities and target users are included in the analysis.

Table 2-2: RWQCP Recycled Water Production

Description	Recycled Water Production (MGD)
Current Recycled Water Production Capacity [1]	4.0
UV disinfection system in place, operating at full capacity [2]	6.5
UV disinfection system in place, with potential UV expansion [2]	8.6

Notes:

1. Data from Regional Water Recycling Facilities Planning Study (RMC 2004).
2. Data from the Palo Alto RWQCP Disinfection Facility Plan (RMC 2007). Construction is scheduled to start in 2009, and the project would be online by October 2010.

Chapter 3 Market Assessment

This chapter describes the regulatory framework affecting recycled water, documents the market analysis procedures, identifies the Project Focus Area, and defines demands in the Project Focus Area.

3.1 Treatment Requirements for Discharge and Reuse

In general, recycled water operations in California are governed by California Department of Health Services (DPH) regulations and guidelines. Title 22, Division 4, Chapter 3 of the California Code of Regulations serves as the source for regulations relating to recycled water. Current regulations, including Title 22 are compiled in the publication California Health Laws Related to Recycled Water "The Purple Book" updated in June 2001.

The recycled water produced at the RWQCP meets the requirements for disinfected tertiary recycled water, including the following criteria:

- The filtered wastewater has been disinfected by either: (a) A chlorine disinfection process following filtration that provides a CT value—the product of total chlorine residual (C) and modal contact time (T) measured at the same point—of not less than 450 milligram-minutes per liter at all times with a modal contact time of at least 90 minutes, based on peak dry weather design flow; or (b) A disinfection process that, when combined with the filtration process, has been demonstrated to inactivate and/or remove 99.999% of the plaque-forming units of F-specific bacteriophage MS2, or polio virus in the wastewater. A virus that is at least as resistant to disinfection as polio virus may be used for purposes of demonstration.
- The median concentration of total coliform bacteria measured in the disinfected effluent does not exceed a most probable number (MPN) of 2.2 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed and the number of total coliform bacteria does not exceed an MPN of 23 per 100 milliliters in more than one sample in any one 30-day period. No sample shall exceed an MPN of 240 total coliform bacteria per 100 milliliters.

The use of disinfected tertiary recycled water that is produced at the RWQCP is permitted for all irrigation and industrial uses that were identified through this market analysis.

3.2 Market Assessment Procedures

The Palo Alto Recycled Water Market Survey performed a market assessment in 2006 to identify where recycled water could be used and how much could be used. As part of the development of this Study, demands for users in the project focus area were revisited to update demand estimates and further evaluate how recycled water could be used. This section presents an overview of the Market Survey methodology and the refinement methodology, as well as the assessment criteria. The results of the market refinement are presented in section 3.3.

3.2.1 Market Survey Methodology

The following resources were considered to gather data on water usage for potential recycled water users:

- Water Reclamation Master Plan for the Palo Alto Regional Water Quality Control Plant (Brown and Caldwell, 1992) – The 1992 Master Plan provides a cursory overview of potential recycled water demands within the City of Palo Alto.
- Regional Recycled Water Facilities Planning Study (RMC, 2004) – The Facilities Planning Study defines the Mountain View Project details with a general examination of recycled water use in the City of Palo Alto. Most of the data for the City of Palo Alto was derived from the 1992 Brown and Caldwell Master Plan.

- Input from staff from the City of Palo Alto (Virginia Waik, Jane Ratchye, Roland Rivera) obtained during meetings, through phone conversations, and through e-mails. Water meter data was provided by the City of Palo Alto in the following forms:
  - Annual and monthly usage data (2003-2005) for city-owned property
  - Monthly usage data (2000-2005) for other locations including the Stanford Research Park and other sites identified in the 1992 Master Plan
  - Monthly usage data for Alta Mesa Hills Memorial Park and Palo Alto Golf and Country Club.
- Acreage analysis – For potential use areas not covered by any of the above documents, an acreage and water usage analysis was performed. Acreage was estimated based on input from City of Palo Alto staff. The average irrigation requirement was estimated to be two acre-feet per year, based on irrigation at City of Palo Alto parks locations. Average annual demands estimated using this method are considered less accurate and more conservative than those calculated based on actual water meter data provided by the City of Palo Alto.
- Surveys of users with high recycled water usage potential – A survey developed by RMC and distributed by the City of Palo Alto was used to obtain personalized information for potential users of over 10 acre-feet per year (AFY) as described in the Market Survey in Appendix E. The survey was administered in order to collect information on average and peak water usage, retrofit needs, irrigation schedules, and any concerns the users might have regarding implementation of a recycled water program. Additionally, some of the larger users were also interviewed (either in person or over the phone) with the intent of reviewing the survey, addressing concerns, and answering any questions.

To obtain the most accurate results, estimated annual recycled water usage for each potential use area was determined using one of the following techniques, presented in preferential order: (1) dedicated irrigation meter data, (2) percentage of actual water usage data averaged over the last two years (fiscal years 2003-2004 and 2004-2005), (3) percentage of actual water usage for the past year (fiscal year 2004-2005), (4) acreage analysis and (5) data from the 1992 Master Plan. For future users, annual water usage is estimated based on potential irrigated acreage and an assumed water demand of two feet per acre per year. This water demand was estimated based on a two year average water usage correlated to acreage for City of Palo Alto parks.

3.2.2 Facility Plan Refinement Methodology

The following resources were used by this Study to refine the project focus area demands identified in the Market Survey.

1. Water Use Records. The City of Palo Alto provided water use records for fiscal years 2005/2006 and 2006/2007 for approximately 14 of the largest potential users. These additional years of data were added to the existing data set to create a larger data set of water use information.
2. Customer Contact. Direct contact with the largest potential recycled water users to obtain additional information regarding water usage. This approach defined cooling tower water use for large users and confirmed irrigation use data.
3. Acreage Analysis. Estimates of irrigated acreages combined with evapo-transpiration and precipitation data to estimate water usage. This analysis confirmed estimates for large irrigation users and provided demand estimates for users who were not originally identified in the Market Survey (e.g., Alta Mesa Memorial Park).
4. Factor of Usage. Demand estimates were multiplied by a factor of usage (numeric value from 0 to 1.0) to determine a more “realistic” average annual demand for each potential recycled water customer where supplementary use information was available. For the largest users in the Study,

the factor of usage attempts to quantify the likelihood of the potential customer converting to 100% recycled water supply based on factors such as location, customer concerns, public perception, water quality needs (i.e. blending), and/or availability of other water supplies. For example, Alta Mesa Memorial Park uses groundwater for irrigation. This "other" source of water supply for non-potable use reduces the likelihood of conversion to recycled water. A factor of usage less than 1.0 takes this into account. A factor of usage of 1.0 was applied to all users will demands less than 20 AFY unless supplementary information was available.

The compiled water use data and assumptions regarding demand estimates can be found in Appendix A.

3.2.3 Assessment Criteria

A number of criteria were used to assess each of the potential recycled water uses and determine if potential recycled water customers should be included in future recycled water projects. These criteria were developed to ensure that sufficient information would be collected through the market assessment to develop sound project alternatives.

A. Average Annual Demand

Average annual demand is the existing or potential average annual recycled water demand for each potential recycled water customer. Customers in Palo Alto may have a domestic water use meter, a dedicated irrigation water meter (for example, at parks), or both. Data from these different types of water meters served as the basis for this assessment. Customer survey information was used to supplement the water meter data and add detail to the estimate, such as including demand for non-irrigation uses. For the market assessment refinement, potential recycled water usage was estimated to be:

- Equal to the total irrigation meter flow when the customer had a designated irrigation meter.
- Approximately 50% of total potable water usage when there was only one combined meter. This estimate was based on information obtained from Roche Bioscience and confirmed by information provided by other large users. Roche Bioscience, which only has a domestic water meter, provided detailed records in the 2006 survey that included the following information: 47% of their total water use was for irrigation, 8% was for industrial/commercial use, and 19% was for cooling tower use.
- For customers with potential process or cooling tower water demand, an additional recycled water demand was added to the irrigation demand based on customer surveys. For customers with both domestic and irrigation meters, 20% of the domestic water meter was added. For customers with just domestic meters, 8% of the domestic water meter was added. These estimates were based on information obtained from survey interviews from multiple large users.
- If the customer is a park or median the potential recycled water flow equals the total meter flow if there is only one meter, regardless of meter type. If there is both irrigation and domestic meters, the demand equals the irrigation meter flow.
- If the customer is a school the potential recycled water flow equals 75% of the total meter flow, regardless of meter type. Based on input from City staff during the 2006 Market Survey, water used specifically for irrigation at schools varied greatly from school to school (from 50% to 90%). The estimate of 75% of the total meter flow was established through coordination with Palo Alto staff during the 2006 Market Survey. This estimate was confirmed by an irrigated acreage analysis conducted on the Gunn Senior High School.
- Demand from fire protection systems were not included as recycled water demand.

B. Peak Demands

Peak monthly demand – A monthly peaking factor was applied to the average monthly flow to obtain the average daily flow for a peak month. Using data from City of Palo Alto monthly irrigation water records for City parks, a monthly peaking factor was estimated at 2.3. This peaking factor is consistent with the peaking factor used in the 1992 Master Plan and the 2004 Mountain View/Moffett Field Area Facilities Planning Study.

Peak hourly demand – An hourly peaking factor is applied to the maximum month, average day peak to obtain the maximum month, average day, peak hour flow. A peaking factor of 3.0 was used, consistent with the peaking factor used in the 1992 Master Plan and the 2004 Mountain View/Moffett Field Area Facilities Planning Study.

C. Water Quality Needs

The water quality needs that were assessed are those that are operational rather than regulatory in nature. Examples of operational water quality issues for urban water recycling customers include salinity, turbidity, and chlorine residual. Water quality needs were used to determine if any potential customers should be eliminated from the consideration for potential future recycled water projects. Particular water quality needs were identified through the customer survey that was completed by customers.

Most surveyed customers indicated a concern for the salinity content of the recycled water, which is higher than the salinity content of the current potable supply. The salinity content was of concern for landscape irrigation and for industrial processes such as cooling towers. Most potential customers interviewed as part of the market assessment were still willing to use recycled water for irrigation if recycled water was available at a lower cost than potable water. Salinity management options are addressed in Chapter 4.

D. Retrofit Needs

All existing irrigation systems will be retrofitted to include an additional meter for recycled water and provided with an air gap for the potable system. Other onsite retrofits include purple sprinkler heads installation, recycled water valve boxes covers, prevention of cross-connection, and any irrigation pattern changes needed to isolate the recycled water system from water fountains, picnic area, etc.

E. Implementation Considerations and Customer Concerns

Key implementation considerations and customers concerns were collected as part of the recycled water survey as described in Section 3.2.1, Market Survey Methodology. The main concern was water quality. Those interviewed expressed concern that existing landscaped areas might be adversely impacted by the higher salinity associated with recycled water. Other typical concerns included site retrofits, service timing, cost, and reliability. These concerns were documented in the Market Survey. It was determined that these concerns should not eliminated any users from consideration in this Study.

F. Delivery Pressure and Reliability Needs

Determining the needed level of reliability in recycled water supply will be necessary when developing design criteria for the storage, conveyance, and distribution components of the project alternatives. It is assumed that potable water will continue to be available to each customer to supply necessary water demands in the event that the recycled water system is down for a prolonged period of time. In case of an interruption to recycled water production, the RWQCP would re-establish supply of the recycled water as soon as reasonably possible. Experience with other recycled water systems has shown that production down times are typically less than 72 hours. Since customer connections to the potable water supply would be maintained, users could switch to potable water in the event of a recycled water outage. Additionally, the availability of recycled water for irrigation

improves irrigation reliability during drought situations since irrigation customers may have a reduced potable supply under these conditions.

3.3 Market Survey Results

This section summarizes the results of the Market Survey, including a geographical analysis of the results and identification of the project focus area.

3.3.1 Market Survey Results Summary

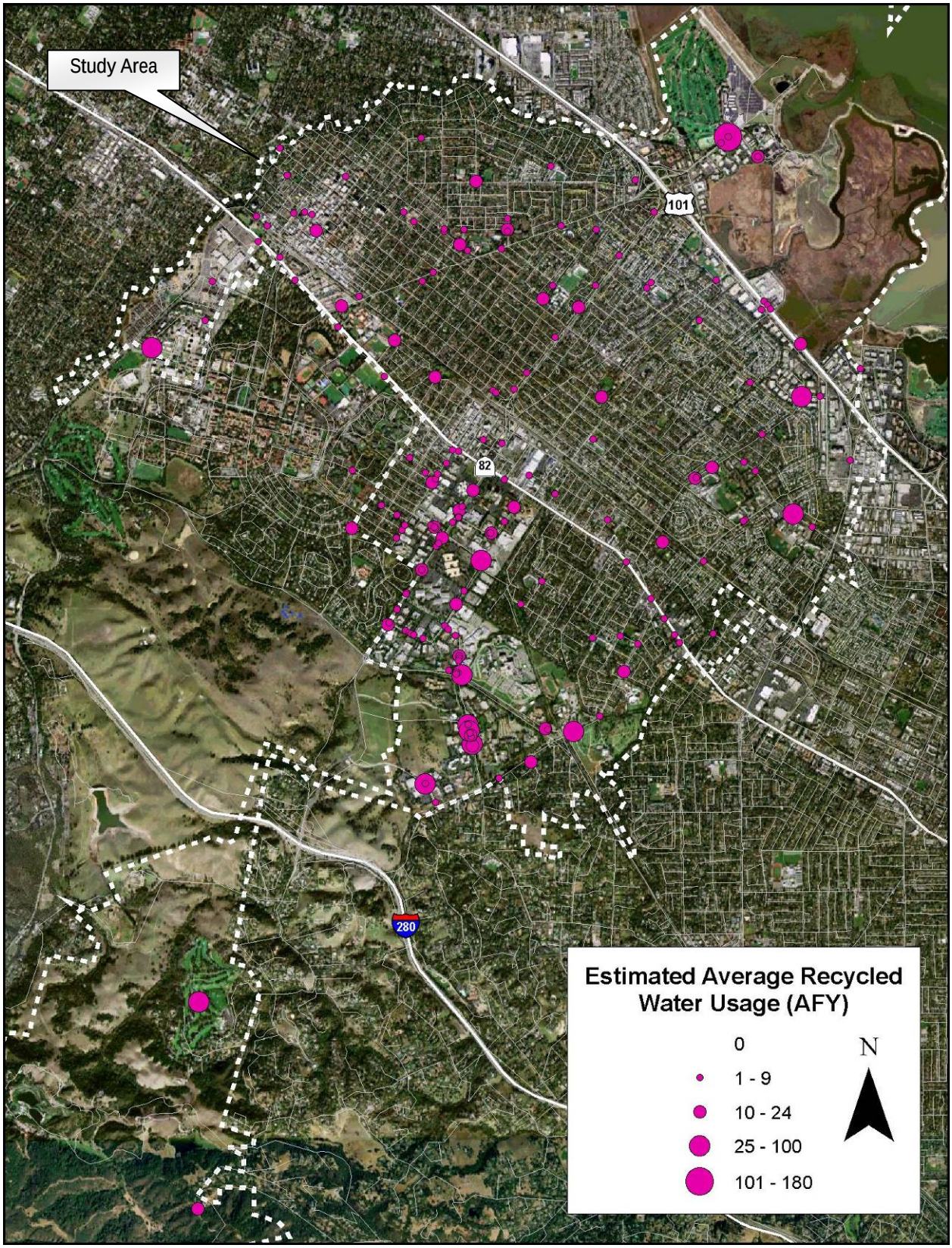
The predominant potential use of recycled water within the City of Palo Alto is landscape irrigation. Other potential uses of recycled water within the City include some industrial applications (i.e. cooling towers). Dual plumbing retrofits in existing buildings are typically prohibitively expensive, thus those applications are not included in this Study.[4]

The Market Survey estimated average recycled water demand for the entire City of Palo Alto service area was approximately 1,693 AFY with a peak month average day demand of approximately 3.48 MGD. This calculated demand does not include the existing recycled water customers within the City of Palo Alto, such as the golf course. The 1992 study estimated 2,844 AFY of total recycled water demand within the City of Palo Alto; however this number included existing recycled water users such as the Palo Alto Municipal Golf Course and Greer Park. If current recycled water demands are subtracted from the 1992 total potential of 2,844 AFY, the calculated 1992 demand is approximately 2,674 AFY, which is about 58% over the calculated 2006 demands. This discrepancy presumably is due to the assumptions used in the 1992 Master Plan where most of the demand was based on the irrigation acreage rather than meter data.

Figure 3-1 shows the locations of potential recycled water users in the City of Palo Alto. Water usage is grouped by address; multiple meters with the same location are summed as a single point.

[4] This observation is based on local and statewide jurisdictions. An additional hindrance to dual plumbing includes the required annual inspections.

Figure 3-1: Potential Recycled Water Users



Initially, all identified potential customers within the service area were examined and evaluated based on the assessment criteria described in Section 3.2.3, Assessment Criteria. Because the majority of the customers were landscape irrigators, the assessment criteria did not help in distinguishing certain customer(s) for a recommended recycled water project.

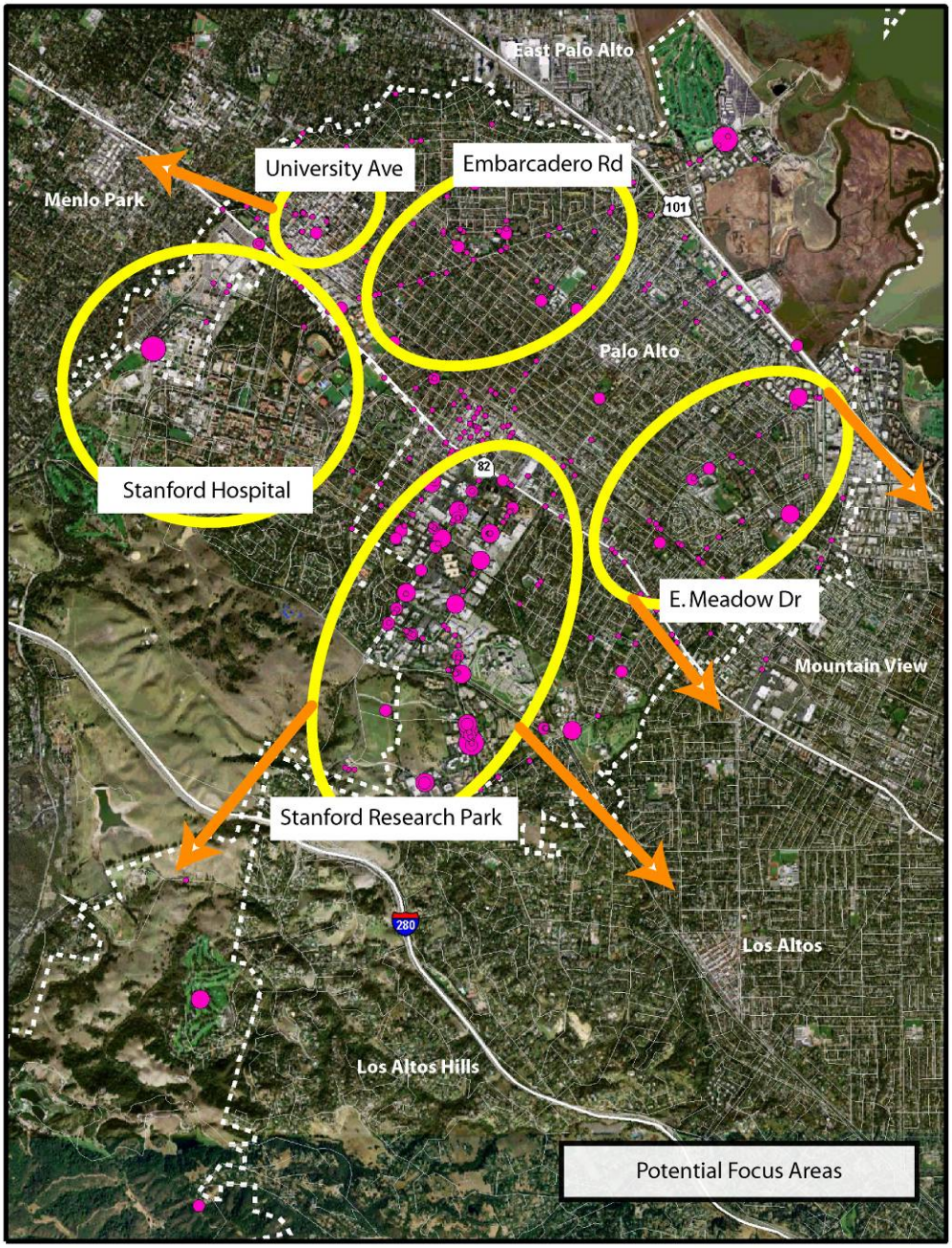
Additionally, information was collected from the customers with high potential water usage (i.e. high water demand) using a written survey administered by the City of Palo Alto to establish water use patterns, peak water use, retrofit needs and general perceptions concerning recycled water. Survey results further backed the preliminary analysis in showing that most of the assessment criteria did not help in distinguishing certain customer(s) for a recycled water project. Water quality needs, retrofit needs, implementation concerns, and customer concerns were similar throughout.

The main factor that distinguished the potential customers from one another is the potential recycled water demand and the location of that demand relative to other large potential users of recycled water. The Market Survey identified areas of concentrated recycled water demand and identified a Project Focus Area. This Study reassessed the recycled water demand of the Project Focus Area. These steps are described in the following two sections.

3.3.2 Geographic Analysis

Average annual demand of recycled water was used to locate customer concentrations within the City. The market assessment described above shows that there are five main geographic customer concentrations/potential focus areas, shown in **Figure 3-2**.

Figure 3-2: Recycled Water User Concentrations/Potential Focus Areas



There are five main areas of concentration of users:

- Area 1 (Stanford Research Park Area) – The largest concentration of users is located near Page Mill Road south of El Camino Real in and around the Stanford Research Park. The Stanford Research Park is a 700 acre business park with potential landscape irrigation and industrial applications. The Market Survey originally identified this area as having approximately 720 AFY of average annual demand mainly for landscape irrigation.

- Area 2 (East Meadow Drive Area) – Another concentration of users include the East Meadow Drive Area, which the Market Survey originally identified as having approximately 121 AFY of average demand for customers including the Cubberley Community Center and Mitchell Park.
- Area 3 (Embarcadero Road Area) – This concentration of users includes approximately 115 AFY of average demand mainly for median irrigation along Embarcadero Road, Rinconada Park and the Lucie Stern Community Center Area.
- Area 4 (Stanford Hospital Area) – This concentration of users occurs at Stanford University/Stanford Hospital, with approximately 107 AFY of average demand. These demands include recycled water for irrigation and cooling towers.
- Area 5 (University Avenue Area) – Another concentration of users occurs along University Avenue in Palo Alto. Demands in this area include approximately 35 AFY of average demand for irrigation demands at City of Palo Alto parks and City Hall.

The arrows shown on Figure 3-2 indicate options for potential for expansion to other areas. Potential expansion options were assessed in the Market Survey.

Note that Stanford University was a large potential recycled water user that was not included in the Market Survey. During the development of the Market Survey, City staff and RMC met with a representative from Stanford University. Stanford indicated that it had other non-potable sources of water to offset potable use (i.e. Lake Lagunita and cooling tower blowdown). It was determined that Stanford University was less viable as a priority focus area at that time.

3.4 Project Focus Area Demand

The Stanford Research Park and other nearby customers make up the greatest concentration of large users for a feasible recycled water project and was identified in the Market Survey as being the Project Focus Area for a future recycled water project. The Project Focus Area is located in southern Palo Alto along Page Mill Road, south of El Camino Real as shown in Figure 3-2. All customers included in the Project Focus Area are listed in Appendix A. This Study performed a market assessment refinement on the Project Focus Area. The results are described below.

3.4.1 Market Assessment Refinement Results

Table 3-1 summarizes the results of the market assessment refinement. **Table 3-2** presents the breakdown of potential recycled water use. As shown on both tables, a total demand of 969 AFY was identified in the Project Focus Area. Appendix A contains a full listing of the potential users and their associated demands.

Table 3-1: Market Assessment Refinement Results

	Annual Average Demand Estimate (AFY) [1]	Annual Average Demand Estimate (MGD) [1]	Peak Month Demand Estimate (MGD) [1]
Updated Project Focus Area Demand Estimate	969	0.87	1.99

Footnotes:

1. Demands presented here represent the potential demand in the Project Focus Area and may not match the Recommended Project demand described in Chapter 5. Estimates shown accounts for the Factor of Usage described in Section 3.2.2.

Table 3-2: Market Assessment Refinement Analysis

Customer Grouping	No. of Users	Total Potential Demand (AFY) [1]	Irrigation (AFY) [1]	Industrial/ Commercial (AFY) [1]	*% of Demand*
All Potential Project Users	**134**	**969**	**826**	**143**	***100%***
Users > 2 afy	68	**921**	778	143	*95%*
Users > 10 afy	30	**731**	611	120	*75%*
Users > 20 afy	11	**467**	382	85	*48%*
% of Demand	--	***100%***	*85%*	*15%*	--

Footnotes:

1. Demands presented here represent the potential demand in the Project Focus Area and may not match the Recommended Project demand described in Chapter 5. Estimates shown include the Factor of Usage described in Section 3.2.2.

There are three important points that Table 3-2 conveys:

- Approximately 85% of the updated demand estimate is attributed to irrigation use
- The eleven largest users comprise nearly 50% of the overall demand assessment
- Roughly half of the users comprise 95% of the total possible project demand

3.4.2 Major Customers

An overview of the major customers within the Project Focus Area is shown in **Table 3-3**. A complete list of potential users can be found in Appendix A.

Table 3-3: Potential Recycled Water Users Demand Estimate

Potential User	Location	Average Annual Demand (AFY) [1]	Irrigation (AFY)	Factor of Usage	Industrial/ Com-mercial (AFY)	Factor of Usage	Annual Demand Estimate (MGD) [1]	Peak Month Demand Est. (MGD) [1]	Peak Hour Demand Est. (MGD) [1]	Data Sources[2]
Project Study Area	All of Palo Alto	1,693	1263	n/a	430	n/a				A
Project Focus Area	Stanford Research Park and surrounding area	969					0.87	1.99	5.1 [3]	B
Alta Mesa Memorial Park	695 Arastradero Rd	92.9	185.9	0.5	0.0	--	0.083	0.191	0.572	B
Roche Bioscience	3431 Hillview Ave	76.7	51.6	1.0	29.3	0.9*	0.068	0.157	0.472	B
Hewlett Packard	3000 Hanover St	58.8	39.1	1.0	39.4	0.5	0.052	0.121	0.362	B
Agilent Technologies	3500 Deer Creek Rd	40.5	34.8	1.0	5.7	1.0	0.036	0.083	0.249	B
VA Palo Alto Health Care	3801 Miranda Ave	37.7	32.4	1.0	5.3	1.0	0.034	0.077	0.232	B
Cubberley Community Center	4000 Middlefield Rd	29.4	29.4	1.0	0.0	--	0.026	0.060	0.181	B
Hewlett Packard	1501 Page Mill Rd	29.2	15.3	1.0	27.9	0.5	0.026	0.060	0.180	B
VM Ware (formerly Stanford & Hines)	3401 Hillview Ave	29.2	27.0	1.0	4.4	0.5	0.026	0.060	0.180	B
Gunn Senior High School	780 Arastradero Rd	26.1	26.1	1.0	0.0	--	0.023	0.054	0.161	B
Mitchell Park	600 E. Meadow Dr	25.7	25.7	1.0	0.0	--	0.023	0.053	0.158	B
DPIX	3406 Hillview Ave	21.0	8.2	1.0	12.8	1.0	0.019	0.043	0.129	B
Clark Park	Old Trace Road	20.0	20.0	1.0	0.0	--	0.018	0.041	0.123	B
Terman Park	655 Arastradero Rd	19.9	19.9	1.0	0.0	--	0.018	0.041	0.122	B
Remaining Users	121 users	462	404	--	60	--	0.41	0.95	2.84	B

Footnotes:

1. Demands presented here represent the potential demand in the Project Focus Area and may not match the Recommended Project demand described in Chapter 5. Estimates shown accounts for the Factor of Usage described in Section 3.2.2.
2. Data Sources:
   A. 2006 Market Survey
   B. Facility Plan Market Refinement
3. Peak Hour Demand corresponds only to irrigation users. The timing of these irrigation demands are primarily evening and nighttime hours and are not typically in use when industrial or commercial demands are in use.

3.4.3 RWQCP Supply and Project Focus Area Demand

Table 3-4 presents the available recycled water supply for the Palo Alto Project, based on the assumption that the RWQCP's future recycled water production capacity is increased to 8.6 MGD (described in Section 2.4). Accounting for Phase 1 and Phase 2 demands, the RWQCP will have adequate capacity to meet all Palo Alto annual average and peak month demands identified for the Project Focus Area in Table 3-1. The RWQCP does not have adequate capacity to meet Palo Alto peak hour demands directly. To meet peak hour demands, the use of storage must be considered.

Table 3-4: Available Recycled Water Supply

Description	Annual Average Flowrate (MGD)	Peak Month Flowrate (MGD)	Peak Hour Flowrate (MGD)
Future Recycled Water Production Capacity [1]	8.6 MGD continuous production capacity		
Phase 1 and 2 Recycled Water Demand [2, 3]	1.6	3.6	11.1
Recycled Water Available for Palo Alto Project	7.0	4.0	--

Notes:

1. Assumes UV disinfection facility in place. Data from the Palo Alto RWQCP Disinfection Facility Plan (RMC 2007). Construction is scheduled to start in 2009, and the project would be online in October 2010.
2. Data from James Allen, Project Manager, Palo Alto Regional Water Quality Control Plant, and Regional Water Recycling Facilities Planning Study (RMC 2004). Includes current recycled water users served by the RWQCP (Palo Alto Golf Course and Greer Park) and future Phase 2 users (currently under construction).
3. Peak hour flowrate for current recycled water users was escalated from the peak month flowrate using the peaking factors established in the Market Survey.

Table 3-5 shows storage available at the RWQCP that may be used to deliver peak hour flows to Palo Alto in the future. With a total potential storage capacity of 2.4 MG, the RWQCP would be able to serve a peak hour demand of approximately 4.8 MGD to Palo Alto (see Appendix C for storage details). RWQCP supply issues are considered in the development of Recommended Project Facilities in Chapter 4.

Table 3-5: Available Recycled Water Storage

Description	Capacity	Comments
Existing RWQCP Storage Capacity	0.6 MG	--
Additional RWQCP Storage Capacity	1.8 MG	Contact tank currently used for disinfection; will be available for use after UV conversion
TOTAL	2.4 MG	

3.4.4 Salinity Management Strategies

Salinity has been a concern for potential Palo Alto recycled water users as well as Phase 1 and 2 customers, particularly as it relates to redwood trees.

Past studies conducted on this subject have not shown any conclusive, adverse effects of recycled water use on redwood trees, or they are ongoing. There have been increasing reports of decline in redwoods throughout California in landscapes irrigated with both potable and recycled water (Downer 2004 as cited in HortScience, Inc 2005). However, redwoods with decline symptoms also have been noted in landscapes irrigated with potable water (HortScience, Inc 2005).

HortScience conducted an independent study for the City of Palo Alto RWQCP to evaluate the effects of the RWQCP's recycled water on redwood trees in the Mountain View/Moffett area. The study evaluated

redwood trees at five sites based on the following based on various factors including water quality, salt-sensitivity of plants in the landscape, soil characteristics, and irrigation method and frequency. The study found that there are other agents that can cause decline in redwood trees. Existing and potential problems with redwood trees independent of irrigation water quality (HortScience Inc. 2005) include the following:

- **Climatic factors:** Redwood trees are native to cool, foggy coastal areas in forest situations where the conditions differ drastically from those planted in the Bay Area landscape. Rather than moisture in the air and soil, redwood trees planted in Bay Area landscapes experience prolonged periods of warm, dry weather, low rainfall and infrequent fog. These conditions promote physiological stress.
- **Fungal pathogens:** For example, Cylindrocarpon found in redwoods in the South Bay is known to cause root rot, although none have been reported as redwood pathogens.
- **Other diseases:** Other diseases that have caused decline in redwood trees include *Botryosphaeria* canker, *Phytophthora* root rot, and *Armillaria* root rot. In addition, the insect pest, Aspidotus nerri, may or may not contribute to redwood tree decline.

No standards have yet been established for boron, sodium, and chloride in redwood tissues or salts in irrigation water. Lacking quantitative thresholds to evaluate the effects of recycled water use from this project on redwood trees and inconclusive results surrounding this issue, the decline of redwood trees cannot be directly linked to irrigation with recycled water. As such, potential impacts of the project on redwood trees would be considered less than significant. HortScience identifies five management methods that, when implemented, would maintain salt concentrations below damaging levels, as follows:

- Leach salts below the root zone: apply a large volume of water that carries salts accumulated in the root zone farther down into the soil profile. This method requires well draining soils;
- Apply Gypsum: displaces sodium on clay particles so the sodium can be leached below the root zone. Gypsum is a chemical amendment;
- Increase Irrigation: increase irrigation frequency to maintain moisture in the soil, to avoids salts from concentrating;
- Modify irrigation system: avoid wetting foliage during application as plants are more sensitive to sodium and chloride when water is applied to the foliage compared to the soil; and
- Reduce salt concentration in recycled water.

The RWQCP and its partners are actively addressing the issue of salinity in its recycled water as part of the City of Palo Alto RWQCP Water Reuse Program. Strategies identified under the program consist of immediate strategies that that further reduce salinity in the recycled water and address potential effects on redwood trees. These strategies include the following.

- **Inflow and Infiltration (I/I) program**. Much of the salinity in the recycled water the RWQCP produces is due to salty groundwater infiltrating into the sewer collection system. Palo Alto and Mountain View are looking into rehabilitating the worst of these sewer pipes, which will reduce salt water infiltration into the sewers. It is estimated that I/I program would reduce the TDS of the reclaimed water from 900 mg/l to approximately 700 mg/l.
- **Tree and Soil Condition Monitoring Program**. As part of the recycled water program, a tree and soil condition monitoring program should be conducted to track the effect of recycled water on trees. In addition, soil conditions play a large part in the management of salts. The soil condition study could be used to develop guidelines or best management practices (BMPs) for irrigation users.
- **Best Management Practices.** The BMPs will focus on recommended management methods to address potential issues related to recycled water use to irrigate redwood trees. The BMPs will use the Hortscience study as a framework.

In the event that the above strategies are unsuccessful in reducing salinity concentrations and recycled water is shown to result in direct declines in redwood trees through the Tree and Soil Condition Monitoring Program, then the following strategies would need to be pursued:

- **Gypsum addition to Recycled Water at the RWQCP.** Gypsum addition to recycled water makes salt less likely to build up in the root zone. Golf courses like the San Francisco Olympic Club Golf Course have taken this approach and had success.
- **Regional Blending System.** A recycled water-potable water blending station would significantly reduce the TDS of the recycled water. With a 50-50 blending ratio (recycled-potable), the blended water would have a potential TDS of approximately 350, assuming the I/I program was effectively implemented. Blending at the RWQCP would improve the water quality for both the Mountain View/Moffett Field and Palo Alto projects. A blending station could also be installed as a combined facility with the in-line booster pump station. Per Title 22 regulations, the combined facility would require an air gap separation between the recycled water and potable water systems. Note that blending is not included in the Recommended Project and the RWQCP would need to be consulted regarding this option.
- **Advanced Treatment Facilities at the RWQCP.** Advanced treatment such as the use of reverse osmosis would significantly reduce the salinity of the recycled water. The capital cost and annual operation cost to construct and maintain such a facility would be very expensive and should only be considered if other alternatives fail.

3.4.5 Groundwater Considerations

- **Groundwater Usage.** A few potential users currently use groundwater in addition to potable water from the City. The main user of groundwater for irrigation is Alta Mesa Memorial Park. To account for the reduced likelihood of Alta Mesa converting to recycled water, a factor of usage of 0.5 was applied to the user's demand (for more info on factor of usage, refer to Section 3.2.2). Other groundwater users such as Hewlett Packard and Hines pump groundwater and treat it for clean up actions. It was assumed that these cleanup actions are not permanent installations and will reduce or halt groundwater pumping in the future.
- **Groundwater Protection.** Groundwater occurs under both confined (under an aquitard that restricts percolation of water directly from the surface) and unconfined conditions (no aquitard over the groundwater) within the Project area. Recharge of the aquifers occurs mainly along the mountain front to the west of the project area where rainfall, streamflow, and deep percolation of applied water infiltrate the land surface. Data suggests that near Stanford there is a shallow aquifer about 150 feet below ground surface (bgs) and a deeper aquifer system below this depth. There are up to three fine-grained clay layers that impede vertical movement of groundwater at about 150, 200, and 300 feet bgs. The aquitards tend to thicken and become more laterally continuous toward the Bay. All of the production wells in the area draw most of their water from the deeper aquifer system, which is the zone below 300 ft bgs.

  Protection of the groundwater basin and its beneficial uses is important not only to the City, but also to SCVWD and the RWQCB. Of particular interest are inorganic salt ions, considered collectively as total dissolved solids (TDS), and "emerging contaminants". Although impacts on groundwater beneficial uses associated with the recommended recycled water uses are anticipated to be insignificant, they should be considered during project implementation, particularly in light of the Recycling Water Policy currently being developed by the SWRCB[5].

[5] Recycled Water Policy information: http://swrcb2.swrcb.ca.gov/water_issues/programs/water_recycling_policy/

Chapter 4 Alternatives Assessment

This Chapter documents the alternatives assessment that was conducted to identify the Recommended Project. The alternatives assessment focused on three key project aspects: 1) backbone pipe alignment, 2) extent of the lateral system, and 3) system hydraulics and operation.

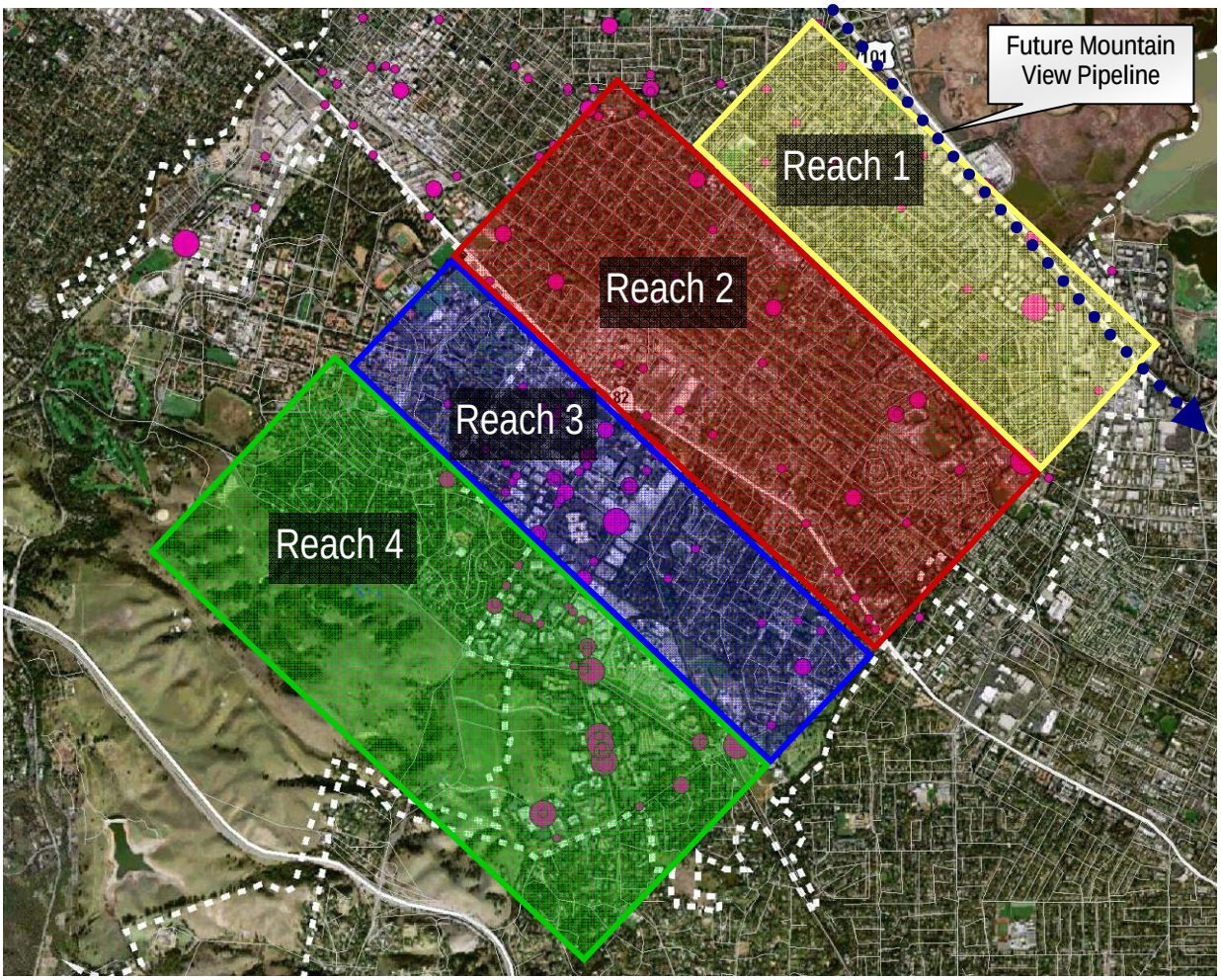
4.1 Backbone Pipe Alignment

Backbone pipe alignment alternatives were developed to serve the Project Focus Area users. The purpose of the alternative analysis was to identify a backbone alignment that is cost-effective, serves the largest potential recycled water demand, and that has minimal utility, traffic, and constructability issues.

4.1.1 Basis of Alternatives Development

The locations of the potential recycled water users within the Project focus area are shown on Figure 3-2. The greatest concentration of recycled water demand is located in the Stanford Research Park. The goal of the alternative analysis was to develop backbone pipeline alignments to serve this largest concentration of users. After the backbone alignment was identified, laterals to users located off the backbone were assessed. For the purpose of this alternatives evaluation, the recycled water pipeline was divided into four separate reaches, as delineated on **Figure 4-1**, each with unique alignment considerations. Pipeline alignments were analyzed for each reach to identify the most appropriate alignment for the area.

Figure 4-1: Alternatives Assessment Reaches



Construction Methods

A variety of construction methods were considered as potential means to install the pipeline for this Project. The selected construction methods typically correlated to cost and environmental impacts associated with the Project. Construction methods were therefore an important factor in defining and assessing potential pipeline alignments.

Open Trench with Shoring. This method is assumed to be acceptable for the majority of the pipeline installed within existing roadways. The shoring provides trench stability and is necessary in the potentially unstable soils of this region. Where this method is used within roadways, the existing pavement will need to be cut, removed and replaced during the course of the construction. Due to its high impact on traffic flow, this is a less desirable option for some busy intersection crossings. Open cut construction is typically inappropriate for stream crossings or near environmentally sensitive areas.

Open cut construction may be conducted at night to minimize traffic impacts. During the day, the work area will be covered with steel plates to allow traffic flow to continue uninterrupted. The work is assumed to cost more and to proceed at a slower rate due to the necessity of removing the plates prior to starting work each night and replacing the plates and the asphalt patches before finishing each night.

Microtunneling. This is a trenchless installation method that will be used for all the creek crossings as soil stability and groundwater levels may preclude other methods.

Boring and Jacking. This is a trenchless pipeline installation method that was assumed to be used for major roadway intersection crossings.

Horizontal Directional Drilling (HDD). This is another trenchless pipeline installation method that was assumed to be used for crossing major roadway intersection crossings. HDD is particularly suited for areas where there may not be space for the large jacking and receiving pits used by boring and jacking trenchless methods.

Hanging on Existing Structures. This is a potential method for the installation of pipelines over creeks where existing bridges can provide structural support for the pipeline. There may be limitations on the size of pipe that can be hung on bridges, dependent on size and space restriction on the bridges.

Installation of the pipeline would require, but is not limited to, the following equipment: excavator, backhoe, front-end loaders, pavement saw, dump trucks, diesel generator, water tank, water truck, flat-bed truck, compactors, double transfer trucks for soil hauling, concrete trucks, and paving equipment (as needed). Equipment and vehicle staging would be accommodated either at each construction site (pipeline and pump station sites), or at a centralized staging area.

Environmental Impacts

Environmental impacts of the Project and the various alignments are assessed in a Mitigated Negative Declaration (MND) prepared for this project. The findings were considered in the development and selection of the Recommended Project alignment.

4.1.2 Assessment Criteria

Assessment criteria were used to evaluate alternatives on a reach-by-reach basis. A set of economic and non-economic criteria addressing specific issues within the project area was developed to evaluate the project alternatives. **Table 4-1** lists these criteria.

Capital cost for the project alternatives were developed and benchmarked to the *Engineering News Record* (ENR) construction cost index (CCI) for June 2007 (CCI value: 9064). Unit costs used for the alternative analysis were later updated for the recommended facilities cost estimate.

Table 4-1: Alternatives Assessment Criteria

Criteria	Description
Recycled Water Demand[1]	Total recycled water served along reach[1]
Pipeline Length[2]	Total pipeline length along reach[2]
Demand per Feet[2]	Total average demand per feet along reach[2]
Raw Construction Cost[2]	Raw cost of pipeline installation
Traffic Concerns	Considers issues of traffic impacts due to construction
Utility Concerns	Considers issues of utility congestion along alignment
Constructability	Considers general issues of construction

Notes:

1. Demands are from Palo Alto Recycled Water Market Survey Final Report (RMC, 2006).
2. Total Pipeline Length along Reach, Total Average Demand per Feet along Reach and Raw Construction Cost refer respectively to length of backbone pipeline, demand by feet of backbone pipeline, and cost associated with backbone pipeline only, and do not include laterals. Pipeline costs were estimated using the pipeline sizing detailed in the Market Survey, modified with preliminary refinement results.

Based on these criteria, a preferred conceptual alignment was recommended for each reach. A proposed alignment and viable alternatives were then identified for the length of the pipeline.

4.1.3 Alternatives Description

The sections below present the alternatives considered on a reach-by-reach basis. For a given reach, each alternative is described and illustrated on a map. Four backbone pipeline alignment alternatives were identified for Reach 1, four for Reach 2, two for Reach 3, and one for Reach 4.

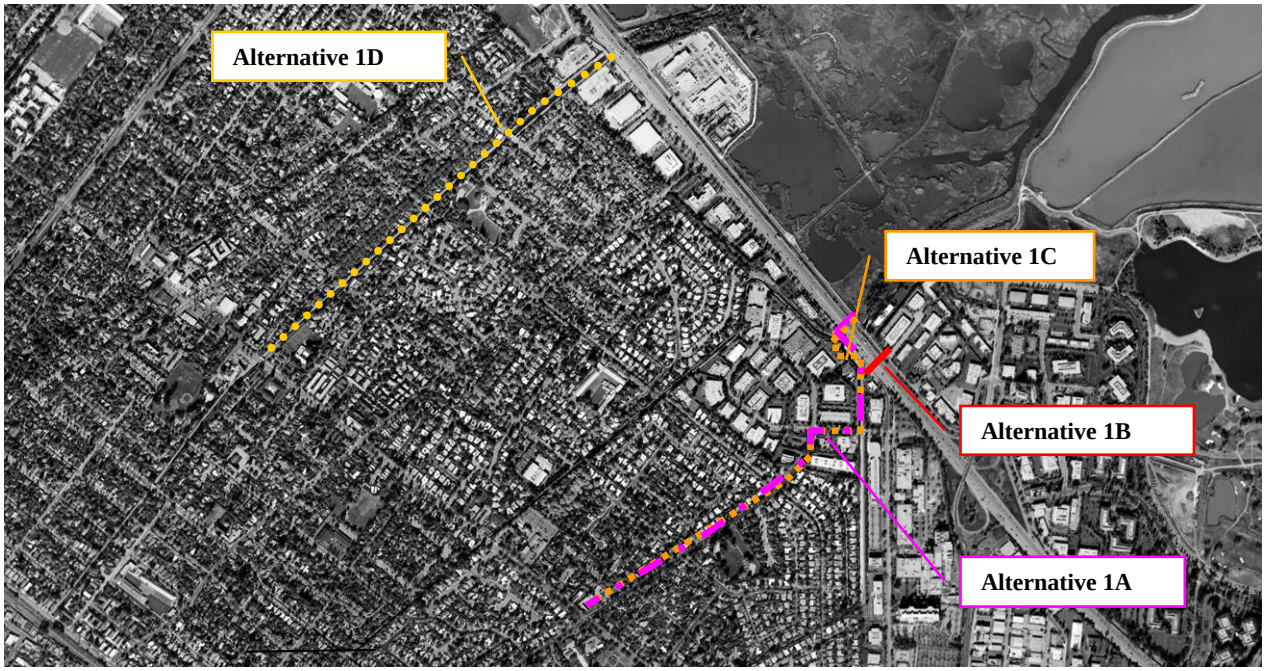
Reach 1 Description

Reach 1 alternatives are described in **Table 4-2** and illustrated in **Figure 4-2**.

Table 4-2: Reach 1 Alternatives

Reach 1: From connection point at Mountain View Recycled Water Pipeline at US-101 and Adobe Creek to Middlefield Road	
Alternative 1A	From connection point at intersection of US-101 and Adobe Creek along Adobe Creek; across Adobe Creek on existing bridge; along W. Bayshore Rd, Fabian Way; across Adobe Creek; along E. Meadow Drive to Middlefield Rd.
Alternative 1B	From new connection point at intersection of E. Bayshore Rd and US-101 by micro-tunneling across US-101; along Fabian Way; across Adobe Creek; along E. Meadow Drive to Middlefield Rd.
Alternative 1C	From connection point at intersection of US-101 and Adobe Creek across Adobe Creek on pipeline bridge to be constructed; along W. Bayshore Rd; along Fabian Way; across Adobe Creek; along E. Meadow Drive to Middlefield Rd.
Alternative 1D	From new connection point at intersection of US-101 and Matadero Creek; along Matadero Creek to Middlefield Rd.

Figure 4-2: Reach 1 Alternatives



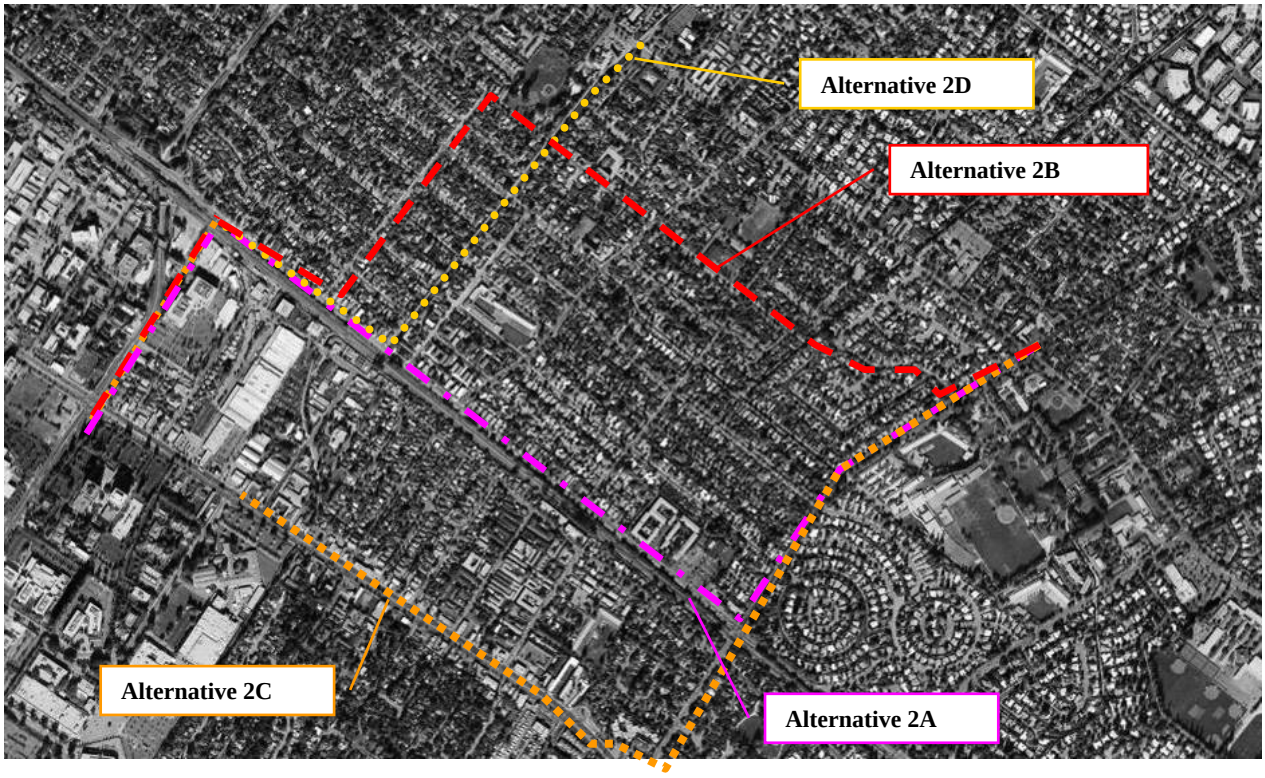
Reach 2 Description

Reach 2 alternatives are described in **Table 4-3** and illustrated in **Figure 4-3**.

Table 4-3: Reach 2 Alternatives

Reach 2: From Middlefield Road to El Camino Real	
Alternative 2A	Along E. Meadow Drive, Alma St to Page Mill Rd; along Page Mill Rd to El Camino Real.
Alternative 2B	Along E. Meadow Drive, Cowper St and El Dorado Ave to Alma St; along Alma St to Page Mill Rd; along Page Mill Rd to El Camino Real.
Alternative 2C	Along E. Meadow Drive, W. Meadow Drive, El Camino Way, El Camino Real to Hansen Way.
Alternative 2D	Along Matadero Creek to Alma St; along Alma St to Page Mill Rd; along Page Mill Rd to El Camino Real (only compatible with Alternative 1D)

Figure 4-3: Reach 2 Alternatives



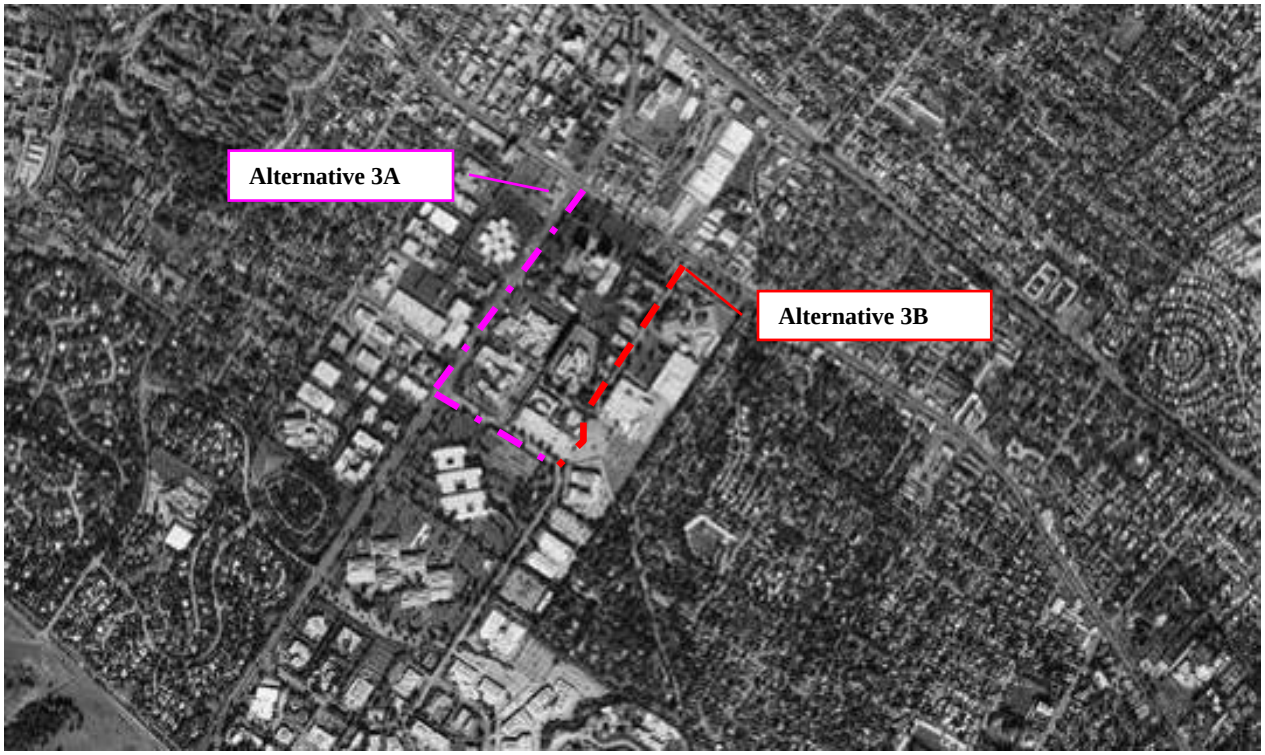
Reach 3 Description

Reach 3 alternatives are described in **Table 4-4** and illustrated in **Figure 4-4**.

Table 4-4: Reach 3 Alternatives

Reach 3: From El Camino Real to Hanover Street	
Alternative 3A	From and across El Camino Real, along Page Mill Rd to Hanover St.
Alternative 3B	From El Camino Real, along Hansen Way to Hanover St, through private property. (Only Works with Alternative 2C)

Figure 4-4: Reach 3 Alternatives



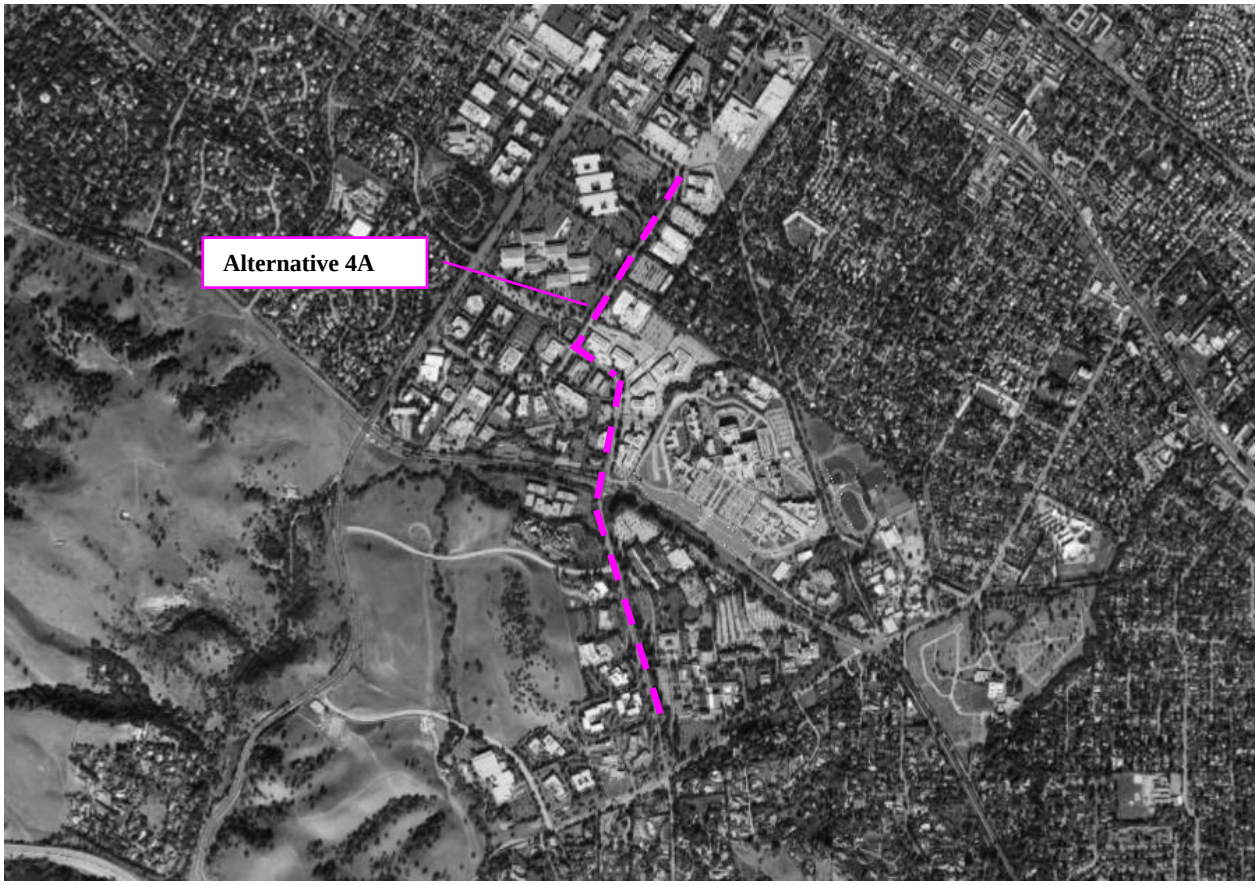
Reach 4 Description

Reach 4 has only one alternative which is described in **Table 4-5** and illustrated in **Figure 4-5**.

Table 4-5: Reach 4 Alternatives

Reach 4: From Hanover St. to Arastradero Ave.	
Alternative 4A	Along Hanover St. and Hillview Ave., across Foothill Expressway, to Arastradero Ave

Figure 4-5: Reach 4 Alternatives



4.1.4 Alternatives Evaluation

The summary of the alignment alternatives evaluation is provided in **Table 4-6**. The comparison criteria include raw construction cost, demand serviced, and general implementation issues such as traffic, utility, and constructability. Based on these criteria, the recommended conceptual alignment and viable alternatives were identified for the length of the pipeline.

Table 4-6: Alternatives Assessment Results

Comparison Criteria	Alternative 1A	Alternative 1B	Alternative 1C	Alternative 1D	Alternative 2A	Alternative 2B	Alternative 2C	Alternative 2D	Alternative 3A	Alternative 3B	Alternative 4A
Recycled Water Demand[1]	9 AFY	9 AFY	9 AFY	15 AFY	112 AFY[3]	113 AFY[3]	113AFY[3]	13 AFY	283 AFY	283 AFY	407 AFY
Pipeline Length[2]	5,120 feet	4,510 feet	5,060 feet	4,950 feet	14,800 feet	14,750 feet	9,650 feet	7,300 feet	4,200 feet	3,000 feet	7,150 feet
Demand per Feet[2]	0.0018 AFY/LF	0.0020 AFY/LF	0.0018 AFY/LF	0.0030 AFY/LF	0.0076 AFY/LF	0.0076AFY/LF	0.0112 AFY/LF	0.0018 AFY/LF	0.067 AFY/LF	0.094 AFY/LF	0.057 AFY/LF
Raw Construction Cost[2]	$2.6 million	$2.7 million	$2.8 million	$2.2 million	$5.8 million	$5.8 million	$7.0 million	$3.4 million	$3.7 million	$2.1 million	$3.0 million
Traffic Concerns	No specific issue	No specific issue	No specific issue	Potential issues at road crossings	Heavy traffic along Alma St	No specific issue identified	Heavy traffic along El Camino Real	Potential issues at road crossings	Heavy traffic along Page Mill Rd Major traffic at Page Mill Rd and El Camino Real intersection	Minor traffic on Hansen Way Laterals to major users would require construction on Page Mill	Major traffic at Hillview Ave and Foothill Expressway intersection
Utility Concerns	Pipeline would be installed on west side of US -101 bridge underpass. SCVWD strongly opposed to any activity that would reduce the hydraulic capacity of Adobe Creek.	No specific issue	Pipeline would be installed on west side of US -101 bridge underpass. SCVWD strongly opposed to any activity that would reduce the hydraulic capacity of Adobe Creek.	High voltage electrical utility (60kV) located in SCVWD right of way. SCVWD policy is not to allow additional easements.	No specific issue identified	No specific issue identified	Potential utility congestion along El Camino Real	High voltage electrical utility (60kV) located in SCVWD right of way. SCVWD policy is not to allow additional easements.	No specific concern along Page Mill Rd	No specific concern along Hansen Way	10-ft SFPUC public utility easement at Hillview Ave and Foothill Expressway intersection
Constructability	Easement from Caltrans required across US-101 Easement from SCVWD required for crossing of Adobe Creek at 2 locations for pipe hanging on west and south side of bridge.	Easement from Caltrans required across US-101 Micro-tunneling construction assumed to meet Caltrans' requirement Easement from SCVWD required for Adobe Creek crossing on E. Meadow Dr. for pipe hanging on south side of bridge	Easement from Caltrans required across US-101 Pipe bridge with abutments to be constructed on each side of Adobe Creek Easement from SCVWD required for Adobe Creek crossing on E. Meadow Dr. for pipe hanging on south side of bridge Visual impacts due to pipe bridge across Adobe Creek	Construction along Matadero considered extremely difficult Easement from SCVWD required for installation along Matadero Creek Easement from Caltrans required Potential serviceability issue Potential access restriction due to private property nearby	Trenchless construction assumed across Caltrain railroad Reduced productivity due to high traffic congestion	Trenchless construction across Caltrain railroad	Trenchless construction across Caltrain railroad No viable detours O&M costs associated with right of entry with Caltrans Reduced productivity due to high traffic congestion	Trenchless construction across Caltrain railroad Coordinate with City of Palo Alto and SCVWD regarding easement along Matadero Creek Trenchless construction across Caltrain railroad Potential serviceability issue Potential access restriction due to private property nearby	All construction occurring in public roadways Assumed trenchless construction at El Camino Real crossing Suitable location for booster station along Page Mill Rd	Need to acquire private easements for area located between Hansen Way and Hanover St Potential space limitations for booster station along Hansen Way Potential access restriction associated with private property	All construction occurring in public roadways Assumed trenchless construction at Foothill Expressway crossing
Recommendation	Backup to Alternative 1B	Preferred Alternative	Alternative to be discarded	Evaluate Alternative 1D option as backup to Alternative 1A	Alternative to be discarded	Preferred Alternative	Alternative to be discarded	Evaluate Alternative 2D option as backup to Alternative 2B	Preferred Alternative	Backup to Alternative 3B.	Preferred Alternative

Notes:

1. Demands are from Palo Alto Recycled Water Market Survey Final Report (RMC, 2006).
2. Total Pipeline Length along Reach, Total Average Demand per Feet along Reach and Raw Construction Cost refer respectively to length of backbone pipeline, demand by feet of backbone pipeline, and cost associated with backbone pipeline only, and do not include laterals. Pipeline costs were estimated using the pipeline sizing detailed in the Market Survey, modified with preliminary refinement results.

4.1.5 Baseline Backbone System Alignment

Based on the criteria of recycled water demand served, utility, traffic, and constructability issues, and cost-effectiveness the proposed pipeline alignment was selected based on Alternatives 1B, 2B, 3A, and 4A. **Table 4-7** describes the alignment and **Table 4-8** provides additional alignment details. Potential users within 100-ft of the backbone alignment were considered to be "on" the backbone. Users outside of this 100-ft buffer were considered in the lateral analysis.

Table 4-7: Recommended Backbone Pipeline Alignment

Recommended Backbone Pipeline Alignment	
Alternative 1B	From new connection point at intersection of E. Bayshore Rd and US-101 by micro-tunneling across US-101; along Fabian Way; across Adobe Creek; along E. Meadow Drive to Middlefield Rd.
Alternative 2B	Along E. Meadow Drive, Cowper St and El Dorado Ave to Alma St; along Alma St to Page Mill Rd; along Page Mill Rd to El Camino Real.
Alternative 3A	From and across El Camino Real, along Page Mill Rd to Hanover St.
Alternative 4A	Along Hanover St and Hillview Ave. to Arastradero Ave

Table 4-8: Recommended Backbone Alignment Description

Description	Units	Quantity
Backbone Alignment Length	LF miles	26,020 4.9
Demand Analysis		
Total Demand Identified in Market Assessment Refinement	AFY	969
Demand on Backbone Alignment	AFY	352
Demand not on Backbone (for Lateral Analysis)	AFY	617
User Analysis		
Users Identified in Market Assessment Refinement	--	134
Backbone Users	--	39
Users not on Backbone (for Lateral Analysis)	--	95

4.1.6 Alternatives to Backbone Pipeline Alignment

For the purpose of environmental review, alternative alignments were also considered should problems arise with the baseline alignment. The alignment options are based on the alternative analysis process defined earlier in this document and include the following:

- **Alignment Option 1, based on Alternative 1A.** From connection point at intersection of US-101 and Adobe Creek, the pipeline would be located along Adobe Creek, under the US-101 overpass. The pipeline would then run along West Bayshore Rd and connect to the proposed alignment at Fabian Way.
- **Alignment Option 2, based on Alternative 1D and 2D.** Through coordination meetings with the Santa Clara Valley Water District after the alternative analysis process, Alternatives 1D and 2D were modified due to construction issues along Matadero Creek. Alignment Option 2 begins at

Colorado Avenue and US-101 and would follow Colorado Avenue to connect to the proposed alignment at Alma Street.

- **Alignment Option 3, based on Alternative 3B.** Alignment Option 3 would connect to the proposed alignment at the intersection of Page Mill Road and El Camino Real, run parallel to El Camino Real to Hansen Way through the Palo Alto Square parking lot, run along Hansen Way and use an existing PUE as a ROW through the parking lot connecting Hansen Way and Hanover Street. Alignment Option 2 would connect to the proposed alignment at Hanover Street. This Option allows for a booster pump station to potentially be sited at the electricity substation on the corner of Hansen Way. The electricity substation at the Hansen Way site is located on land leased from Stanford, and Stanford's permission would be required before locating a booster pump station there.

4.2 Lateral System Assessment

The refined backbone pipeline alignment targets the largest users identified in the updated demand assessment. As part of the facility planning process, a lateral assessment was conducted to determine the cost effectiveness of serving users not directly on the backbone pipeline alignment. This section presents the lateral assessment methodology and results of the lateral assessment.

4.2.1 Assessment Methodology

The methodology for the lateral assessment is detailed in the list below.

- **Define Users on Backbone Alignment.** Potential users within 100-ft of the backbone alignment were considered to be "on" the backbone. Users outside of this 100-ft buffer were considered in the lateral analysis.
- **Generate Backbone Unit Cost.** The total demand of the backbone users was used to determine a unit cost in dollars per acre-foot ($/AF) of the backbone alignment[6]. The backbone unit cost included only raw pipeline costs such as shoring and bracing, pipe costs, trenchless construction, and creek and bridge crossings.
- **Identify Groups of Lateral Users.** Users not on the backbone alignment were analyzed to determine if they could be served together as groups. This process evaluated how many users could be served by the same lateral pipe rather than each user having a individual laterals coming off the backbone to serve recycled water, thereby increasing the cost effectiveness of serving users in the same area.
- **Evaluate Unit Cost of Lateral Users and User Groups.** The cost to serve each individual user or group of users was evaluated against the cost of the backbone pipeline. Using the same unit costs for raw pipeline costs as used for the backbone alignment, each user or group of users was evaluated to determine the cost to serve recycled water. The amount of recycled water served to each user or group of users was incorporated into the analysis to determine a unit cost in dollars per acre-foot ($/AF) to serve each lateral user.
- **Compare Lateral User and Backbone User Unit Costs.** If the unit cost to serve lateral users or user groups was less than the unit cost to serve users on the backbone pipeline alignment, then the lateral users or user groups were included in the project.

In summary, the lateral analysis used the following logic expression to determine which users or group of users would be included in the project.

$$\text{IF } \$/AF_{Lateral} <= \$/AF_{Backbone} \quad \text{THEN lateral user or lateral user group is included}$$

[6] Unit costs in dollars per acre-foot used raw pipeline costs and are not comparable to annualized unit costs presented elsewhere in this analysis.

4.2.2 Lateral Assessment Results

The results of the lateral assessment are detailed in **Table 4-9**.

Table 4-9: Lateral Assessment Results

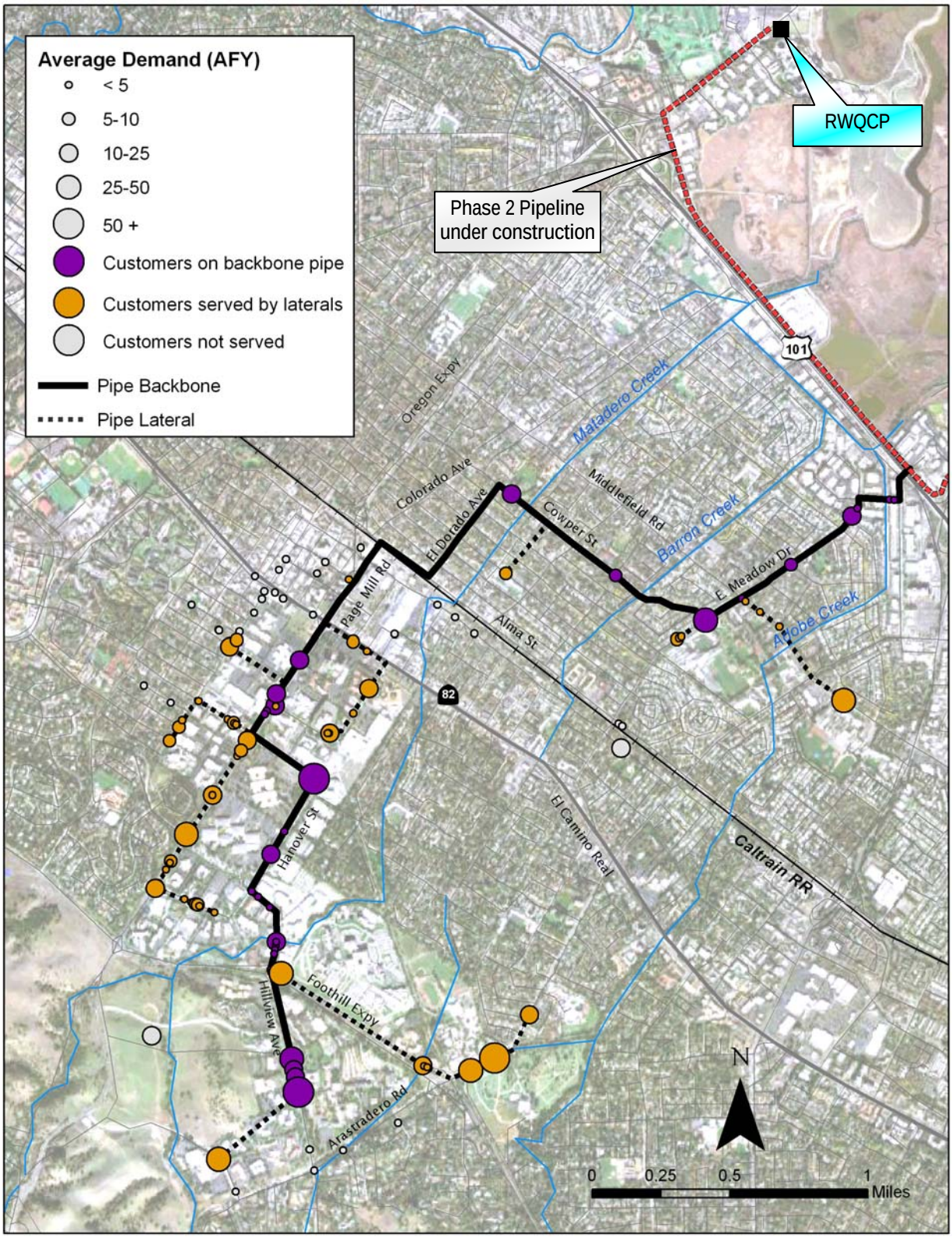
Description	Units	Quantity
Total Lateral Pipe Length	LF	26940
Demand Analysis		
Total Demand Identified in Market Assessment Refinement	AFY	969
Recommended Facilities Project Demand Based on Lateral Assessment	AFY	916
Demand on Backbone Alignment	AFY	352
Demand on Laterals	AFY	564
Demand Unserved (Not cost-effective)	AFY	53
User Analysis		
Users Identified in Market Assessment Refinement	--	134
Recommended Project Users	--	97
Backbone Users	--	39
Total Lateral Users	--	58
Unserved Users	--	37

4.2.3 Recommended Alignment

Figure 4-6 shows a map of the Recommended Project users, detailing backbone users, lateral users and user groups, as well as potential users that would not be served[7].

[7] These users were not cost-effective to serve as part of the Recommended Project; however, these users should be included in future expansion analyses of the Palo Alto pipeline.

Figure 4-6: Target Recycled Water Users



Notes:

1. Refer to Appendix A for customer list and associated demands.

4.3 System Hydraulics and Operation

A hydraulic model was used to evaluate pipeline sizing alternatives and analyze system pumping and storage alternatives. Planning-level design criteria were developed for pumping and storage facilities. The following information is reviewed in this section:

- Description of hydraulic model and hydraulic criteria
- Analysis of hydraulics from the RWQCP to the Palo Alto connection point
- Analysis of operational storage alternatives
- Evaluation of booster pumping facilities
- Evaluation of pipeline sizing

4.3.1 Model Description

Hydraulics for the Recommended Project were modeled using H2OMap[8], a software package developed by MWHSoft, Inc. H2OMap includes integrated Geographic Information System (GIS) capabilities to allow the incorporation of geospatial planning data into a hydraulic model. A GIS shapefile of potential recycled water customers was imported into an existing model that was used to model demands associated with the Phase 2 Project. The H2OMap model was used to help define the backbone pipeline sizing and alignment for this proposed project, taking into consideration the existing recycled water distribution system and demands. Junctions/nodes were inserted into the model at appropriate locations along the pipeline alignment to represent anticipated demands. Demands determined in the refined market assessment were used in the model. A table of all the customers with their average and peak demands can be found in Appendix A.

The model analyzed the backbone pipeline alignment from the connection point with the Phase 2 pipeline at the East Bayshore Road/Adobe Creek intersection to the end users on the backbone alignment on Hillview Avenue. Boundary conditions at the connection point were established by the model developed for the Phase 2 Project. The Phase 2 model, developed in 2005 and updated with the results of 2006 Market Survey, included flows designated for the Palo Alto recycled water project.

4.3.2 Hydraulic Criteria

Table 4-10 and **Table 4-11** show hydraulic design criteria and relevant pumping, storage, and pipeline capacities that were used to size the recycled water facilities.

[8] Model information found at: http://www.mwhsoft.com/page/p_product/water/water_overview.htm.

Table 4-10: Planning-Level Hydraulic Design Criteria

Item	Value
Pressure at Mountain View/Moffett Field connection point during peak flow [1]	93 psi
Minimum Pressure at Customer Connections	65 psi
Maximum Pressure	180 psi
Minimum Pipe Size for Backbone Alignment	6 inches
Maximum Head Loss	5 feet per 1000 feet
Velocity	2-8 feet per second
Annual Average Demand	916 AFY
Peak Month Demand (all users)	2.0 MGD
Peak Hour Demand (irrigation users only)	4.8 MGD 3310 gpm

Footnotes:
1. Connection pressure obtained from the Phase 2 Project hydraulic model.

Table 4-11: RWQCP Facilities Hydraulic Capacities

Description	Capacity	Comments
RWQCP High Pressure Pumping Capacity	6.24 MGD (4,330 gpm)	Priority use is for Phase 2 users. Could serve Palo Alto when capacity is available
RWQCP Low Pressure Pumping Capacity	1,600 gpm	Dedicated to supply the Palo Alto Golf Course
Total Potential RWQCP Storage Capacity	2.4 MG	Includes existing 0.6 MG storage tank and 1.8 MG contact tank currently used for disinfection; will be available for use after UV conversion.
Phase 2 Pipeline Capacity	21 MGD	Has capacity to serve Phase 2 users and Palo Alto users

Footnotes:
1. Data from James Allen, Project Manager, Palo Alto Regional Water Quality Control Plant, and Regional Water Recycling Facilities Planning Study (RMC 2004)..

4.3.3 RWQCP Pumping Needs

The Phase 2 Project planning study and hydraulic model assumed that adequate pumping capacity would be available at the RWQCP to maintain minimum delivery pressure for its end users. The RWQCP has since designed a pump station at the facility to deliver 6.24 MGD of recycled water flows to Phase 2 users. These pumps were not designed to provide capacity for the Palo Alto recycled water project during peak flow conditions. Pump station construction started in June 2008 and will be completed in early 2009.

If the Palo Alto Project is constructed, additional pumping capacity will be necessary at the RWQCP to achieve the minimum pressure criteria at Phase 2 connection point during peak flows. A hydraulic analysis of the 2-mile long pipeline from the RWQCP to the connection point determined that the additional pumping capacity would need to impart approximately 230 ft of total dynamic head (TDH) to match the hydraulic grade line established by the Phase 2 pumps during peak hour flow conditions and to achieve the minimum delivery pressure of 93 psi at the connection point. To achieve this additional pumping capacity, additional pumps could be added to the Phase 2 pump station. **Table 4-12** shows the preliminary design criteria established for the needed pump station addition.

Table 4-12: RWQCP Pump Station Expansion Planning-Level Design Criteria

Description	Criteria
Peak Hour Flowrate	4.8 MGD (3310 gpm)
Peak Flow TDH Required	230 ft
Total Installed horsepower (approximate)	350 hp

4.3.4 RWQCP Storage Needs

As described in Section 3.4.3, with a total potential storage capacity of 2.4 MG, the RWQCP would be able to serve a peak hour demand of approximately 4.8 MGD to Palo Alto, equal to the peak hour demand of the users identified in the Recommended Project. This Study assumed that the RWQCP would supply flows to the Phase 2 and Palo Alto Projects during peak hour conditions. However, an alternative to adding pumping capacity to the RWQCP pump station is the addition of operational storage to the Palo Alto backbone alignment. Operational storage would be used to meet peak hour demands and help optimize system operation. During off-peak hours, the Phase 2 pump station would fill an in-system storage tank on the backbone alignment to match peak month demand capacity of the Palo Alto Project. Recycled water would then be pumped from the storage facility to Palo Alto customers during peak hour demand conditions.

In-system storage would require a minimum of a 1.6 MG storage tank, equal to the peak month demand of irrigation users. A 1.6 MG storage tank would require a minimum footprint of approximately 21,000 square feet, or 0.5 acres, assuming a circular tank with a height of 25 feet, a 20-foot perimeter around the tank, and a rectangular footprint. Additionally, a pump station would be required at the storage tank to deliver recycled water to customers at pressure. For the system to operate efficiently, the storage tank and pump station would need to be located on the alignment prior to large demand customers on Hillview Ave, which are located at high elevations. A review of the alignment and discussions with City staff returned no potential locations for siting a storage facility of this magnitude.

The analysis presented here indicates that in-system operational storage is not a viable alternative for the Palo Alto Project due to size considerations. Additional pumping capacity will be required at the RWQCP.

4.3.5 In-Line Booster Pump Station

The hydraulic model determined the need for a booster pump station in the backbone alignment. The need for a booster station is due to the large change in elevation from the connection point with the Phase 2 pipeline (approximately 10-ft above sea level, delivering recycled water at 93 psi during peak conditions) to the end users on Hillview Avenue (approximately 190-ft above sea level, requiring a minimum of 65 psi delivery pressure).

Pump Station Hydraulic Criteria and Layout

Using the hydraulic model, it was determined that the pump station would need to impart approximately 250 ft of total dynamic head (TDH) to achieve the minimum delivery pressure for all users during peak flow conditions, depending on the location of the pump station. **Table 4-13** shows the preliminary design criteria established for the needed booster pump station. **Figure 4-7** shows a potential pump station layout for these criteria. **Figure 4-8** shows a similar layout that includes space for future improvements, such as adding a blending station if the City chooses to address potential water quality concerns at a future date. The blending facility addition would consist of adding a clear well for temporary potable water and recycled water storage. The existing pump station can be modified to pump the blended water out of the clear well. An air gap would be required to separate the potable water influent from the clear well.

Table 4-13: In-Line Booster Pump Station Planning-Level Design Criteria

Description	Criteria
Peak Hour Flowrate [1]	4.1 MGD (2,860 gpm)
Peak Flow Total Dynamic Head (TDH) Required	250 ft
Total Installed horsepower (approximate)	400 hp including standby
Pump Station Footprint	Approximately 50-ft x 30-ft
Backup Power Generation	May be required for reliability for industrial/commercial demands
Control System	Supervisory Control And Data Acquisition (SCADA) system to be connected to City's existing system
Surge Protection	May include horizontal tank and air compressor
Potable Water Blending Station	May be added at a later date to address water quality concerns (see Figure 4-8)

Footnotes:

1. Demands presented for the booster pump station include only irrigation users located on the proposed alignment downstream of the pump station.

Figure 4-7: Sample Booster Pump Station Layout

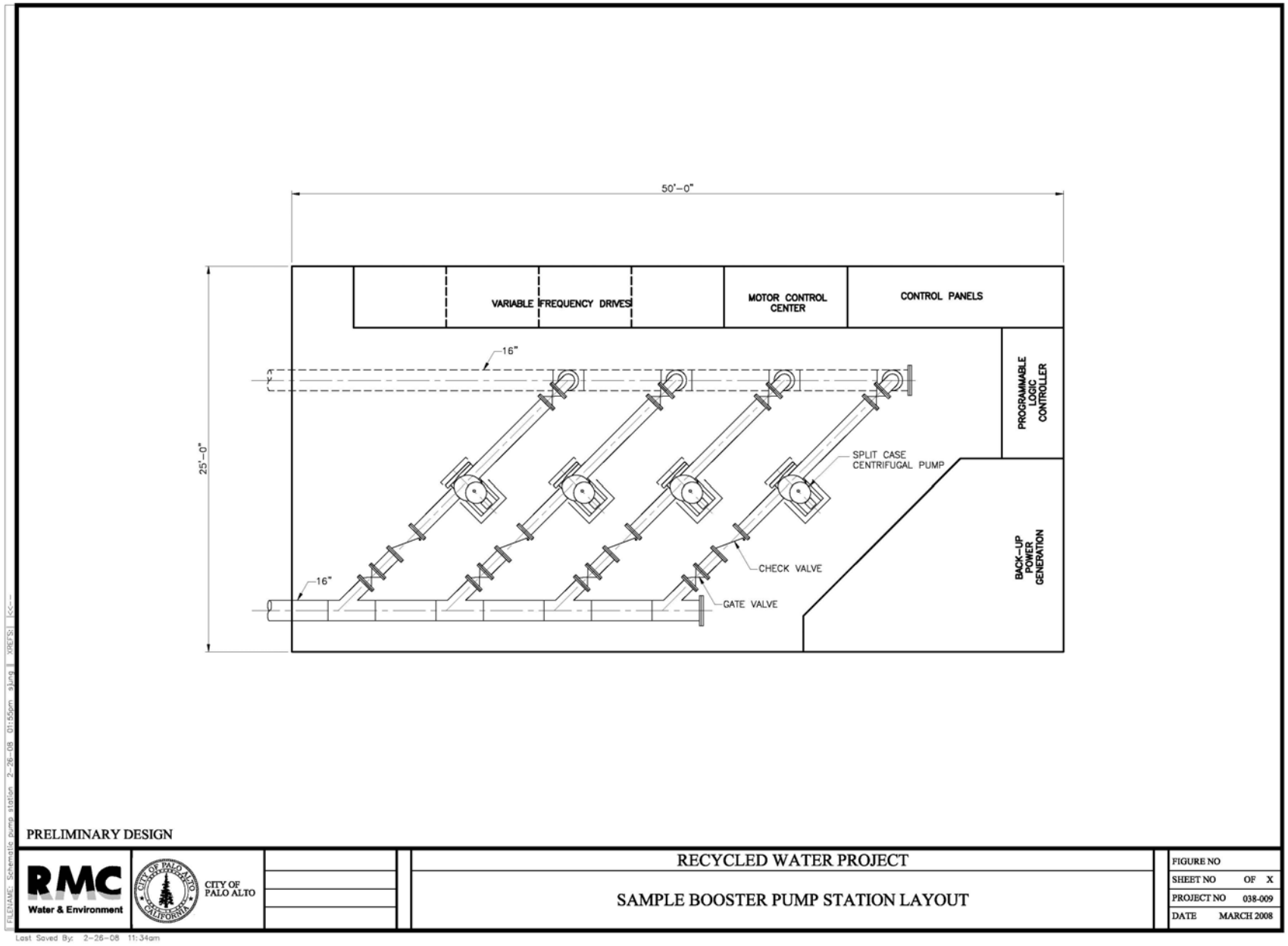
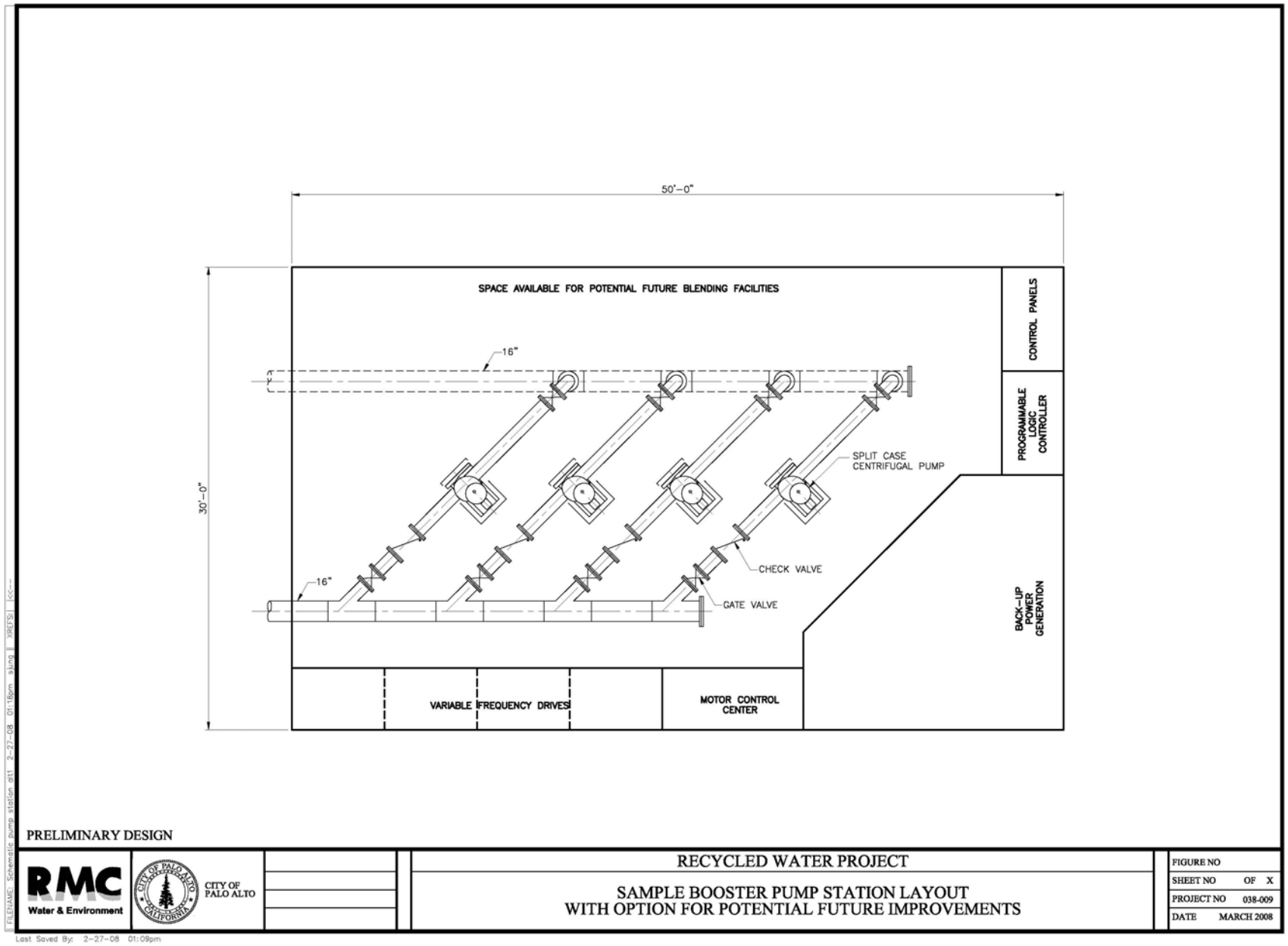


Figure 4-8: Sample Pump Station Layout with Potential for Future Improvements



Location Alternatives

Four potential pump station locations are being evaluated in the IS/MND: Mayfield Park Soccer Fields (underground pump station), Page Mill Road and Park Boulevard, Palo Alto Fire Station, and the Palo Alto Electricity Substation. During the course of this Study, it was determined that a pump station at Page Mill Road and Park Boulevard would not be compatible with the City's plans for the site and that this location is not considered a feasible alternative. The four pump station sites are discussed below and shown on **Figure 4-9** and **Figure 4-10**.

Mayfield Park Soccer Fields (Recommended Alternative)

The Mayfield Park Soccer Fields pump station proposed site is located on the southwest corner of the Page Mill Road and El Camino Real intersection. The site is on the proposed alignment and located in a strategic area for delivering recycled water to the majority of demands along the pipeline. The park is Stanford property that is leased to the City of Palo Alto and has recently been refurbished with new fields. Construction of the booster pump station at Mayfield Park Soccer Fields would be coordinated with Stanford and with the EIR completed for the Mayfield soccer fields. The booster pump station, if constructed at the proposed Mayfield Park Soccer Fields site, would be an underground pump station located under the parking lot due to the sensitive aesthetic nature of the site.

Through discussions with City staff, the Mayfield Park Soccer Fields were identified as the recommended alternative due to its location and the ability to site the pump station below the parking lot.

Palo Alto Fire Station

The Palo Alto Fire Station potential site is located at 2675 Hanover Street, a half a block west of Page Mill Road. The site is on City-owned land and the pump station would be located in the area behind the Fire Station. The site is on a lateral pipeline alignment and is located on the alignment off of Page Mill Road, where water would have to be pumped up to users.

Palo Alto Electricity Substation

The Electricity Substation site is located on Hansen Way near Hillview Avenue. The land is owned by Stanford University and leased by the City of Palo Alto, so Stanford's permission would be required before locating a booster pump station at the site. The City currently has a public utility easement (PUE) for electrical utilities through the parking lot between Hansen Way and Hillview Avenue. The easement would be expanded for the recycled water pipeline. The proposed location for this pump station is on alignment option 3, where water would have to be pumped up to users.

Page Mill Rd and Park Boulevard

This site, located at the intersection of Page Mill Road and Park Boulevard was initially identified because the site is located on the proposed alignment. The site is the future site of a Public Safety Building. During the course of this Study, it was determined that a pump station is not structural compatible with the new Public Safety Building. It is not considered a feasible alternative.

Figure 4-9: Potential Booster Pump Station Locations

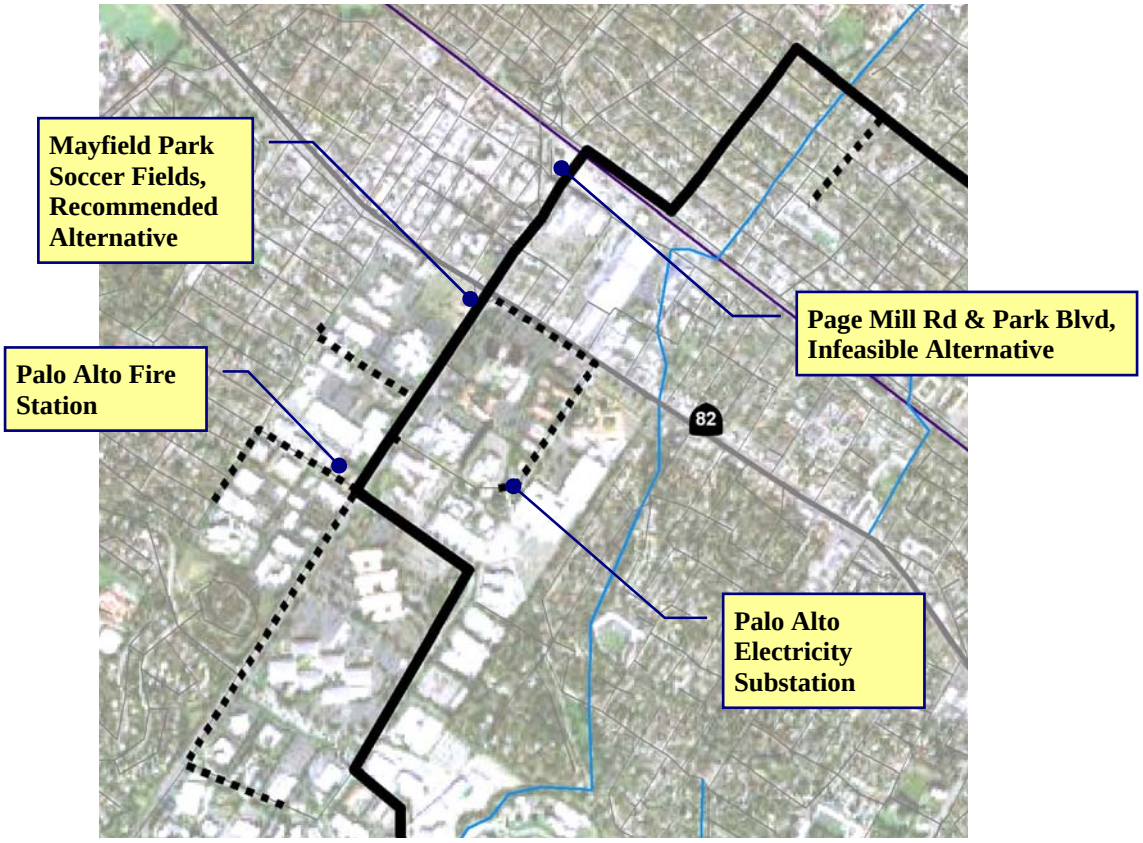
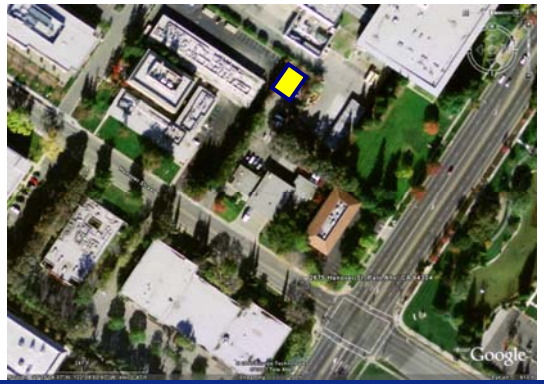


Figure 4-10: Potential Booster Pump Station Sites

Mayfield Park Soccer Fields Southwest corner of the Page Mill Road and El Camino Real intersection	Palo Alto Electricity Substation On Hansen Way near Hillview Avenue
	
Palo Alto Fire Station **2675 Hanover Street, a half a block west of Page Mill Road**	**Page Mill Rd and Park Blvd**
	Though initially considered as part of this Study, this site is no longer considered a feasible alternative due to compatibility issues with the planned Public Safety Building

4.3.6 Pipeline Sizing Results

Table 4-14 summarizes the results of the hydraulic analysis and shows the recommended pipeline sizes for the Recommended Project. Backbone alignment pipe sizes were determined with the hydraulic model. Laterals pipeline segments were analyzed individually using the Hazen-Williams equation to obtain planning-level pipe sizes. The results presented here are based on the project defined in Chapters 2, 3, and 4 and assume the use of a booster pump station on the backbone alignment. Final pipeline sizing would be conducted during the design stages.

Table 4-14: Recommended Project Pipeline Sizing

Pipeline Size [1]	Units	Length
18" Pipe	LF	13,300
16" Pipe	LF	10,300
12” Pipe	LF	2,100
10" Pipe	LF	6,500
6” Pipe	LF	8,300
4” Pipe	LF	11,400

Note:

1. For planning-level purposes it was assumed that all pipe 18-inches in diameter and larger would be ductile iron pipe and all pipe 16-inches in diameter or smaller would be PVC pipe. This assumption is based on the bid results of the Mountain View/Moffett Field project.

Chapter 5 Recommended Project

This Chapter describes the Recommended Palo Alto Recycled Water Project identified in Chapter 4, including target users, facilities, cost estimates, construction financing plan, and implementation strategy.

5.1 Target Users and Facilities Description

The Recommended Project would involve the construction of approximately 5 miles of 12 to 18-inch pipe, RWQCP recycled water pump station expansion, construction of a booster pump station, construction of approximately 5 miles of lateral pipelines to over 90 use sites, and user connections and on-site retrofits. The Project would initially serve approximately 900 AFY of recycled water, mostly to the Stanford Research Park Area. The predominant use of recycled water would be landscape irrigation. Irrigation would occur primarily during the night (between 10:00 p.m. and 6:00 a.m.) to maximize water use efficiency and minimize public contact. Some industrial use, such as commercial and light industrial cooling towers, would also be included.

Figure 5-1 shows the Recommended Project target recycled water users. **Table 5-1** provides the target user name and demand information. **Figure 5-2** illustrates the Recommended Project facilities, including preliminary pipeline sizing and booster pump station location. **Table 5-2** describes the Recommended Project facilities. **Table 5-3** lists the construction methods envisioned along the pipeline alignment.

Proposed Alignment. The proposed alignment would begin with a connection point to the Mountain View Project at the intersection of East Bayshore Road and Corporation Way. The pipeline would cross under US-101 by microtunneling. The pipeline would run along Fabian Way, East Meadow Drive, Cowper Street, El Dorado Avenue and along Alma Street. The pipeline would cross under the Caltrain railroad and run along Page Mill Road to El Camino Real, where the pipeline would likely use trenchless technologies to cross El Camino Real. The pipeline would continue along Page Mill Road to Hanover Street, and along Hanover Street and Hillview Avenue to Arastradero Road. The pipeline would run along side streets on lateral alignments from the proposed alignment or alignment options to serve individual users.

Hydraulic Considerations. Additional pumping capacity would be required at the RWQCP and would likely consist of a retrofit to the existing pump station. With the UV Disinfection Facility Project moving forward and scheduled to be completed by October 2010, it is assumed that the proposed Project would not require any additional storage. A booster pump station would be constructed as part of the proposed Project to maintain a minimum delivery pressure of 65 psi for the end users. Due to the change in elevation between the RWQCP and the end users on Hillview Avenue (approximately 190 feet) and other sources of head loss in the pipeline, the RWQCP recycled water pump station would need to be expanded to provide adequate pressure to convey water to the end users.

Site Connections and Retrofits. The Recommended Project includes work for furnishing and installing connections between the recycled water distribution system and the user's existing irrigation system, recycled water meters, valves, valve boxes and installing a "swivel-ell". The swivel-ell would allow the user to switch from the potable or recycled water distribution system while maintaining an air gap, per DPH regulations. Site retrofits assumed in the Recommended Project include providing necessary signage, painting vaults and above ground piping purple, and providing necessary tags and purple sprinkler heads.

Future Phases. The Recommended Project would constitute Phase 3 of the RWQCP's regional recycled water system. Future extensions could serve Stanford University and Los Altos Hills, as well as provide a loop by making a second connection to the Phase 2 Mountain View Project. The vision of the regional recycled water system is identified in the 1992 RWQCP Water Reclamation Master Plan and the accompanying 1995 Final Program EIR (CH2MHill, 1995).

Figure 5-1: Recommended Project Target Recycled Water Users

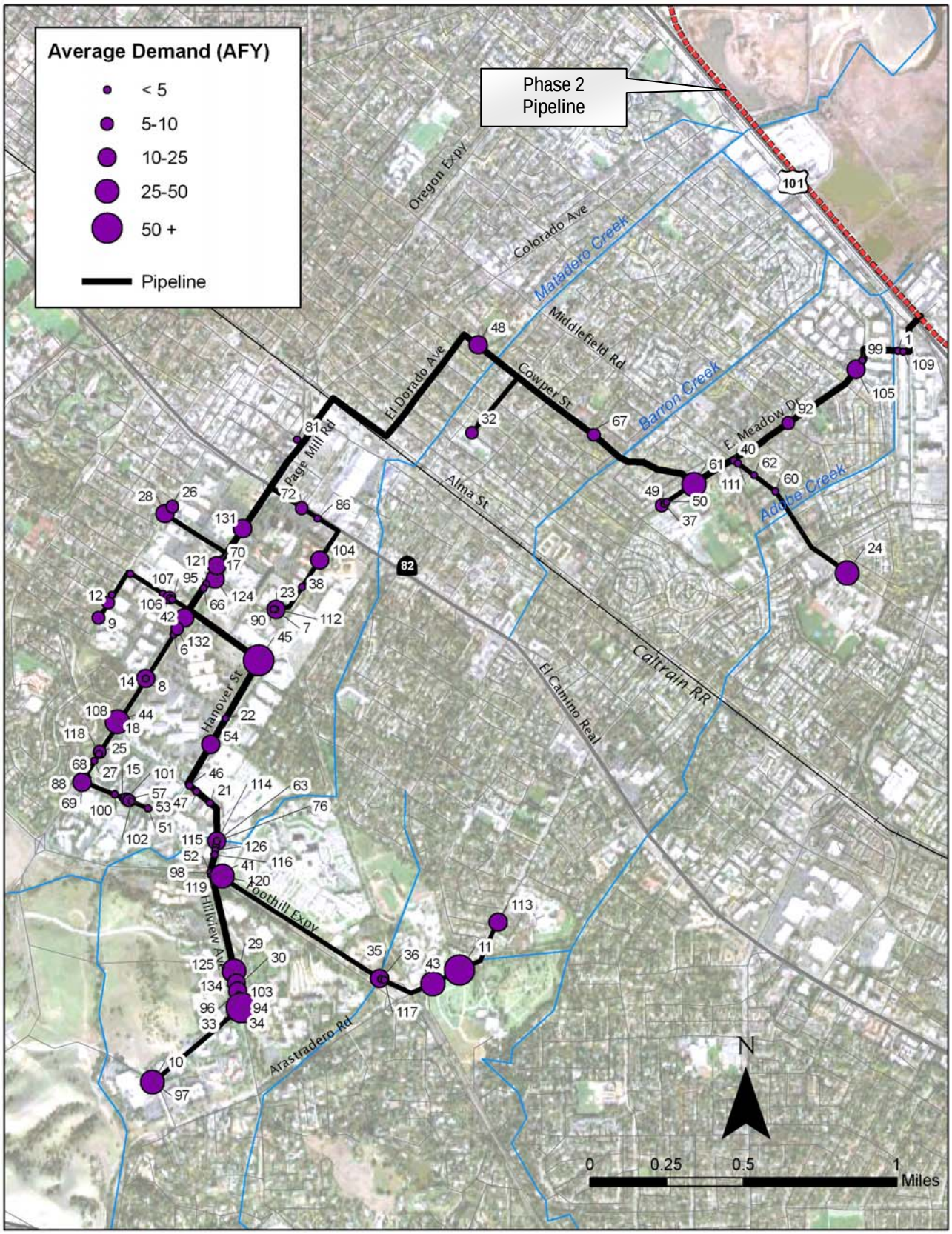


Table 5-1: Recommended Project Target Recycled Water Users

ID	Potential Customer	AFY[1]	ID	Potential Customer	AFY[1]
1	1101 E Meadow Housing	0.6	62	Mitchell Park Library	0.7
2	1451-1601 California Housing	0.0	63	Mozart Development	2.8
6	495 Java Drive Assoc	5.0	66	NYSE	1.9
7	850 Assoc C/O WSJ Prop	1.2	67	Our Lady of the Rosary School	6.2
8	940 E Meadow Housing	0.3	68	Page Mill Center	6.6
9	Agilent Technologies	8.6	69	Page Mill Rd Prop, Inc	11.3
10	Agilent Technologies	40.5	70	Paine Webber, Inc	2.1
11	Alta Mesa Memorial Park	92.9	72	Palo Alto Square	9.1
12	Alza	6.6	76	Pennie & Edmonds LLP	0.2
14	Beckman Instruments	12.2	81	Pkwy Cal/Birch	1.6
15	C & J Management	3.3	86	Pkwy El Camino	0.4
17	Carramerica Reality Corp	6.4	88	Pkwy Ore/Pg Mill	4.3
18	Carten - Trust	0.7	90	Prognostics	1.5
20	Clark Park	20.0	92	Ramos Park	7.6
21	CNF Transportation Inc	1.6	94	Roche Bioscience	76.7
22	Cooley Godward LLP	0.8	95	RWI Group	0.3
23	CPI	18.5	96	SAP Labs, Inc	11.2
24	Cubberley Community Center	29.4	97	SAP Labs, Inc	7.4
25	CV Therapeutics, Inc.	5.1	98	Simpson Thacher & Bartlet	2.3
26	DNAX Research Institute	8.3	99	Space Systems Loral	0.0
27	Dow Jones & Co	0.1	100	Stanford & Hines Interest	3.6
28	Dow Jones & Co	12.7	101	Stanford & Hines Interest	2.4
29	DPIX	21.0	102	Stanford & Hines Interest	1.8
30	ECI Deer Creek LLC	2.3	103	Stanford & Hines Interest	3.1
32	El Carmelo Elementary School	6.2	104	Stanford & Hines Interest	13.6
33	EPRI	4.0	105	Stanford & Hines Interest	12.8
34	EPRI	12.7	106	Stanford Hospital and Clinics	9.6
35	Equity Office Properties	13.3	107	Stanford Hospital and Clinics	2.8
36	Equity Office Properties	0.2	108	Stanford Univ	0.4
37	Fairmeadow Elementary School	1.6	109	Substation	0.1
38	Finnegan, Henderson LLP	1.5	111	Substation	0.0
40	Fire Station	0.3	112	Substation	0.0
41	Foothills Club	2.6	113	Terman Park	19.9
42	Genencor International, Inc	19.2	114	Tibco Software Inc	10.4
43	Gunn Senior High School	26.1	115	Tibco Software Inc	0.7
44	Hewlett Packard	29.2	116	Tibco Software Inc	0.4
45	Hewlett Packard	58.8	117	Tibco Software Inc	2.0
46	Hewlett Packard	1.9	118	Trinet Essential	4.6
47	Hewlett Packard	1.6	119	University Club of PA	3.0
48	Hoover Park	12.6	120	VA Palo Alto Health Care	37.7
49	Jane L Stanford Middle School	7.3	122	Varian Medical Systems	2.6
50	Jane L Stanford Middle School	4.1	124	Varian, Inc.	13.8
51	Legato Systems	2.0	125	VM Ware (prev. Stanford & Hines)	29.2
52	Liveops.com Inc	2.3	126	VMWare Inc	1.0
53	Lockheed Missiles & Space	6.3	131	Wilson/S/G/R	10.9
54	Lockheed Missiles & Space	15.3	132	Wilson/S/G/R	6.1
57	Matadero Creek	5.6	133	Wilson/S/G/R	0.6
60	Mitchell Park	1.9	134	Xerox Corp	7.2
61	Mitchell Park	25.7		**Total**	**916**

Note: Estimates are for average annual demand and include the Factor of Usage modifier described in Chapter 3.

Figure 5-2: Recommended Project Facilities

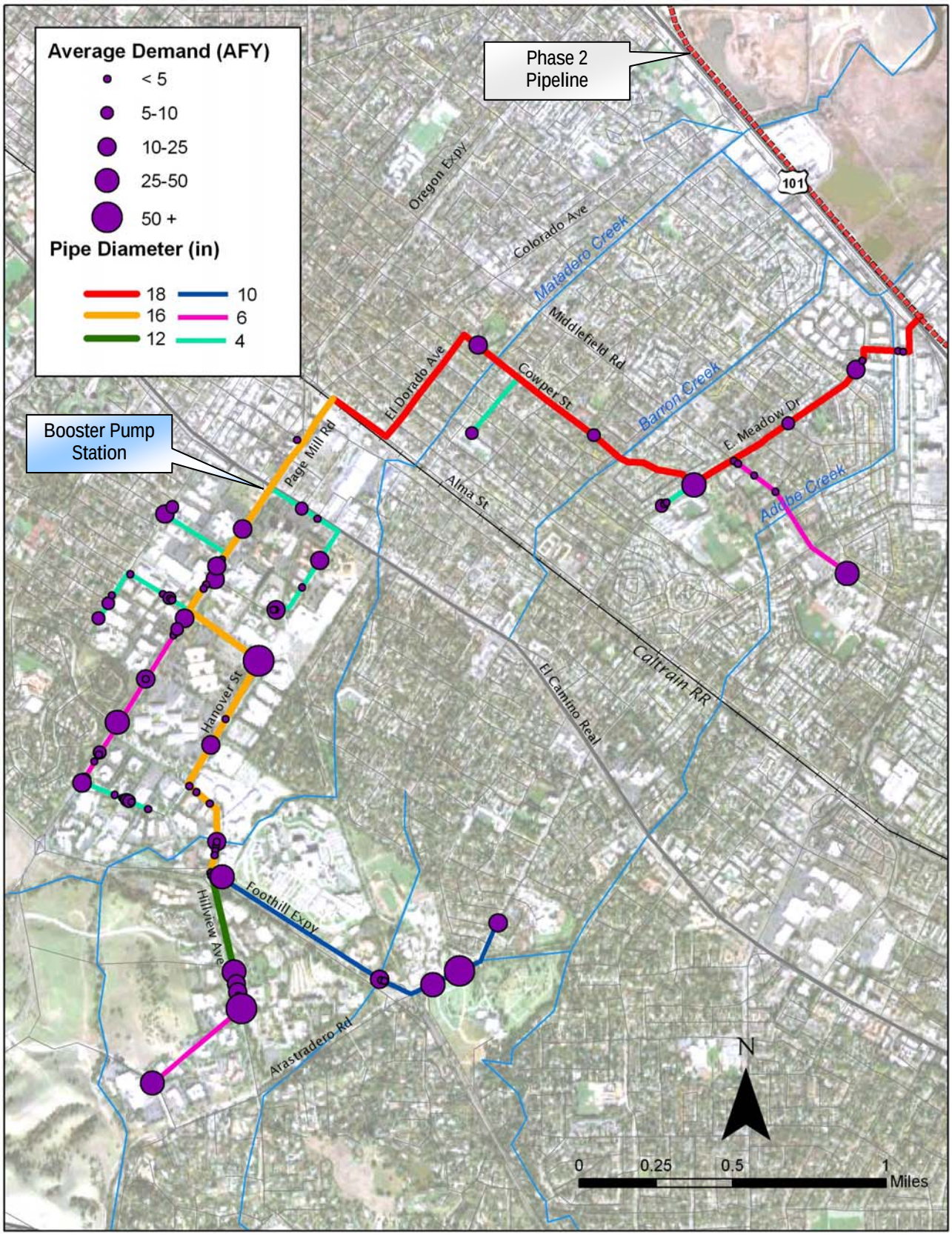


Table 5-2: Recommended Project Facilities

Description	Units	Quantity
Customers		
Number of Project Customers	--	97
Annual Average Demand	AFY	916
Percent Irrigation Demand vs. Non-Irrigation Demand	%	85 / 15
Peak Month Demand (all users)	MGD	2.0
Peak Hour Demand (irrigation users only)	MGD	4.8
	GPM	3310
Distribution System		
Total Pipeline Length	LF	51,500
18" Pipe	LF	13,300
16" Pipe	LF	10,300
12" Pipe	LF	2,100
10" Pipe	LF	6,500
6" Pipe	LF	8,300
4" Pipe	LF	11,400
US-101 Crossing (Microtunneling)	LF	200
Creek Bridge Crossings (Adobe, Barron, Matadero)	LF	150
Alma/Caltrain Crossing (Bore and Jack)	LF	200
El Camino Real Crossing (HDD)	LF	400
Foothill Expressway Crossing (HDD)	LF	400
RWQCP Pump Station Retrofit		
Peak Hour Flowrate (additional)	GPM	3310
Peak Flow TDH Required	FT	250
New Booster Pump Station		
Peak Hour Flowrate	GPM	2860
Peak Flow TDH Required	FT	250

Table 5-3: Recommended Project Construction Methods

Alignment Roadway	Starting Cross Street	Ending Cross Street	Construction Method
Corporation Way	US-101	Fabian Way	Trenchless under 101.
Fabian Way	West Bayshore Rd	East Meadow Dr	Open-Cut.
East Meadow Drive	Fabian Way	Cowper Street	Open-Cut. Pipe attachment to downstream side of Adobe Creek Bridge.
Cowper Street	East Meadow Dr	El Dorado Avenue	Open-Cut. Pipe attachment to downstream side of Barron Creek Bridge and Matadero Creek Bridge.
El Dorado Avenue	Cowper Street	Alma Street	Open-Cut.
Alma Street	El Dorado Avenue	Page Mill Road	Open-Cut.
Page Mill Road	Alma Street	Hanover Street	Open-Cut. Trenchless section under Caltrain railroad crossing and El Camino Real.

Alignment Roadway	Starting Cross Street	Ending Cross Street	Construction Method
Hanover Street	Page Mill Road	Hillview Avenue	Open-Cut.
Hillview Avenue	Hanover Street	Arastradero Road	Open-Cut. Trenchless section across SFPUC Easement and Foothill Expressway.

The Palo Alto Recycled Water Project Mitigated Negative Declaration considered alternatives to the Recommended Project. These alternatives would be considered if facilities of Recommended Project were deemed infeasible during design or construction. Three alignment alternatives are summarized in Section 4.1.6 and three pump station location alternatives are described in Section 4.3.5.

5.2 Cost Estimate

Table 5-4 summarizes the planning-level cost estimate for the Recommended Project. Refer to Appendix B for details.

Table 5-4: Recommended Project Planning-Level Cost Estimate

Description	Cost [1, 2]
Backbone Pipeline	$12,900,000
Lateral Pipeline	$5,000,000
User Retrofits and Connections	$1,400,000
Booster Pump Station	$900,000
RWQCP Pump Station Improvements	$800,000
Subtotal	**$21,000,000**
Construction Unknown @ Planning-Level (30%)	$6,300,000
Total Construction Cost	**$27,300,000**
Engineering and Construction Management (15%)	$4,100,000
Right of Way Costs (5%)	$1,100,000
Connection fee	$1,000,000
Total Capital Cost	**$33,500,000**
Annualized Capital Costs [3]	$2,300,000
Annual O&M Costs	$200,000
Total Annualized Cost	**$2,500,000**
Estimated Recycled Water Yield [4]	900 AFY
Unit Cost, Annualized ($/AFY)	**$2,700**

Notes:

1. Costs based on Mountain View/Moffett Field Recycled Water Pipeline bid information (average bid estimate, April 2007, ENR: 9103); previous RMC projects; San Jose Lower Silver Creek Reach 3 construction (January 2005; ENR: 8230); San Jose Highway 87 Detour II Sanitary Sewer Reconstruction Phase II (Feb 2005; ENR 8229); and City of Palo Alto Recycled Water Market Survey Report (RMC, June 2006).
2. All costs are expressed in March 2008 dollars (ENR: 9150)
3. Annualized costs developed based on an interest rate of 5.5% and a period of 30 years.
4. Rounded to nearest 50 AFY.

5.3 Benefits

Table 5-5 summarizes the key benefits of the Recommended Project to the City and its customers. **Table 5-6** identifies benefits to stakeholders, other than the City and its customers. Potential benefits to Purissima Hills Water District, Stanford University, the SFPUC, and BAWSCA are further discussed below.

Table 5-5: Recommended Project Key Benefits to the City and its Customers

Benefit Category	Description
Water Supply Reliability	• Provides approximately 900 AFY of new, locally controlled, and drought-proof water supply for non-potable uses. • Offsets need to purchase approximately 900 AFY of potable water thereby reducing current and future reliance on imported water from both SFPUC and SCVWD to meet level of service goals. • Reduces the level of water rationing in droughts, thereby protecting landscape value.
Protection of South Bay	• Reduces the wastewater constituent mass loading and volume of treated wastewater discharged to the San Francisco Bay and enhances preservation of salt water marshland habitats.
Sustainability	• Advances the City's green initiative by conserving high-quality, potable water for its highest use, and beneficially reusing the wastewater generated by the City.
Adherence to local, regional and state recycled water goals and policies	• Allows potential future connections to Stanford University and Los Altos Hills as well as future loop connecting to Phase 2, consistent with the regional recycled water system identified in the 1992 Water Reclamation Master Plan. • Contributes to meeting SCVWD's Policy No. E-2, 2.1.7 (specifically that water recycling accounts for 5 and 10 percent of total water use in Santa Clara County in 2010 and 2020, respectively). • Upholds state guidelines and policies relative to recycled water, including the California Water Code, Section 13510, and Section 461.

Table 5-6: Recommended Project Potential Benefits to Other Stakeholders

Stakeholder	Key Benefits
RWQCP	• Achieves long-term goals of the RWQCP's stakeholders, including taking a leadership role in promoting beneficial reuse and maximizing recycled water as a supplemental water source. • Provides a framework for regional recycled water system connectivity. • Reduces the wastewater constituent mass loading and volume of treated wastewater discharged to the San Francisco Bay.
SFPUC/BAWSCA	• Reduces dependence on imported potable water (Hetch Hetchy Project) for non-potable uses. • Contributes to achieving objectives of Modified WSIP Alternative presented in Draft PEIR (City and County of San Francisco Planning Department 2007)
SCVWD	• Reduces dependence on imported potable water (Central Valley Project) for non-potable uses by progressing toward meeting countywide recycled water goals established in Policy No. E-2, 2.1.7. • Prepares for regionalization of recycled water service, which will allow for more operational flexibility.
Purissima Hills Water District	• Provides an additional water supply management option to Purissima Hills Water District (PHWD).
Stanford University	• Provides an additional water supply management option to Stanford University.
SWRCB	• Augments overall State water supply with 900 AFY of drought-proof, non-potable water. • Benefits the Bay-Delta water system by aiding SCVWD to meet their countywide recycled water use policy. • Potentially displacing the need for Palo Alto to obtain future SCVWD potable water supplies. • Potentially displacing the need for other water users to obtain SCVWD potable water supplies.

Purissima Hills Water District

Purissima Hills Water District (PHWD) provides approximately 1800 afy to customers within its Los Altos Hills service area. PHWD currently uses its full allotment of SFPUC water and is interested in partnering opportunities to increase its water supply capacity.

PHWD has identified several large irrigation users within its service area as potential recycled water users, including Foothill College, Congregation Beth Am Campus, and the Purissima Little League Fields. The potential recycled water users are spread throughout Los Altos Hills. The largest of these users, Foothill College, uses approximately 70 afy (approx. 4% of PHWD average annual demand).

Given the location of the users and their potential recycled water demand, at this time it would not be cost effective to include the users in the initial Palo Alto recycled water distribution system. In the future, the addition of a storage tank and pump station near the PHWD service area could add capacity to the planned Palo Alto recycled water distribution system and supply recycled water to PHWD users.

As part of preliminary discussions with PHWD conducted during the course of this study, a potential water exchange scenario was identified that could supplement PHWD water supplies. PHWD identified the Alta Mesa Cemetery as a potential partner to obtain ground water supplies from. Recycled water from the City would offset the Cemetery's use of groundwater (annual use from 1996 to 2006 was estimated to be approximately 120 to 187 afy from SCVWD data), which could then be pumped to PHWD's use. Additional facilities not included in the Recommended Project would likely be required.

As the Palo Alto Recycled Water Project moves forward, PHWD is interested in developing the water exchange scenario with Alta Mesa Cemetery and the City. Discussions regarding PHWD compensating the City for project facilities would commence at that time.

Stanford University

Stanford University and Stanford University Hospital represent a significant recycled water demand in the RWQCP service area. The Stanford University Hospital was identified in the Market Survey as having a potential demand of 107 AFY. Stanford University was not included in the Market Survey, as they indicated at the time that they were not interested in receiving recycled water from the City. The 1992 Recycled Water Master Plan estimated Stanford University as having a potential non-potable water demand of 1,800 AFY (note that similar to other demands estimated in the Master Plan, this estimate may be high). Based on more recent discussions with Stanford Utilities Department staff, it is estimated that the current non-potable water demand is closer to 1,000 AFY.

Stanford University currently relies on four water supply sources: SFPUC water, surface water from San Fransquito Creek, groundwater, and recycled water produced on-site, which represents a fairly small portion of the overall supply. Only SFPUC supply is used for potable purposes. Surface water and groundwater is used to supply Stanford's non-potable water system. The non-potable water system is used for irrigation in large portions of the campus. Some of the new buildings are also dual-plumbed and connected to the non-potable water distribution system or supplied directly with recycled water produced on-site. These characteristics make Stanford University and Stanford University Hospital good candidates for recycled water use.

Based on discussions with representatives from Stanford University, Stanford's interest in the Palo Alto Recycled Water Project currently focuses on connecting potential on-campus users located in the vicinity of the proposed backbone pipeline. This scenario would target irrigation demand around Stanford University owned-residential buildings. This scenario would not supply recycled water to the primary Stanford University market identified in the 1992 Master Plan, however, it may provide an opportunity for other projects to be considered in the future.

Future projects may include expanding the Palo Alto Recycled Water Project to connect to Stanford's non-potable water system; potentially freeing up 1,000 afy of surface water and groundwater for higher beneficial uses. A partnership opportunity could be realized with Stanford's proposed Stanford University

Medical Center Project and Shopping Center Expansion. The City is currently conducting a Water Supply Assessment for the proposed expansion and, together with Stanford, is investigating options for offsetting predicted water supply deficiencies during extended drought years for this new development. Stanford could address these water supply shortages by using recycled water from the City for uses identified in the 1992 Master Plan and 2005 Market Survey, thereby freeing up potable water resources for Stanford to allocate towards the new development. This concept would most likely require additional facilities for both the recycled water system (including operational storage, pumping and pipeline) and surface water and groundwater systems (including water treatment).

It is conceivable that Stanford would be required to contribute funds to the City or RWQCB to reserve the rights to connect to the Palo Alto recycled water system in the future. The City currently has a similar arrangement with RWQCP for connection to the Phase 2 pipeline: it will be required to pay $1 million when the City connects to the pipeline.

The City is interested in working with Stanford to explore these opportunities further as the Palo Alto Recycled Water Project moves forward.

SFPUC and BAWSCA

The SFPUC is currently implementing its WSIP to increase the reliability of the regional water system that serves 2.4 million people in San Francisco and the San Francisco Bay Area. The WSIP will improve the regional system with respect to water quality, seismic response, water delivery, and water supply to meet water delivery needs in the service area through the year 2030.

As discussed in Section 2.2.2, SFPUC is planning on limiting average annual water deliveries supplied from its watersheds to 265 MGD, whereas the demand on the SFPUC regional water system by 2018 is projected to be 285 MGD per the Phased WSIP (ESA+Orion, 2008). To bridge the 20 MGD gap, the SFPUC proposes development of 10 MGD of local conservation, recycled water, and groundwater projects within San Francisco and an additional 10 MGD of local conservation, recycled water, and groundwater projects within the overall service area.

The SFPUC has initiated discussions with BAWSCA and the wholesale customers to determine the best approach to develop the additional 10 MGD of local supply/conservation needed.

The Palo Alto Recycled Water Project is aligned with the objectives of the Phased WSIP. It may be therefore possible for the City to obtain support from the SFPUC and BAWSCA for the Palo Alto Project.

Additionally, the SFPUC and BAWSCA will soon be renegotiating the master contract that dictates water rates and policies between the SFPUC and BAWSCA member agencies. Changes to the master contract may allow for the City to have greater control over their SFPUC water allocation. This may allow for the City to enter into agreement with Purissima Hills or Stanford to facilitate water exchanges, for example. Direct funding through WSIP or water exchange concepts will need to be further explored through BAWSCA, particularly at the time of contract negotiation.

5.4 Construction Financing Plan

This section identifies relevant outside funding sources, outlines potential revenue sources and pricing, establishes anticipated cash flow, and identifies variables that may impact the cost estimate and financing plan.

5.4.1 Outside Funding Sources

The Palo Alto Recycled Water project will be funded primarily by the City; however, outside funding will be needed to offset part of the costs as discussed above. **Table 5-7** summarizes outside funding sources that are considered to be the best available sources of funding for this project. **Figure 5-3** presents potential funding scenarios and their impact on project costs.

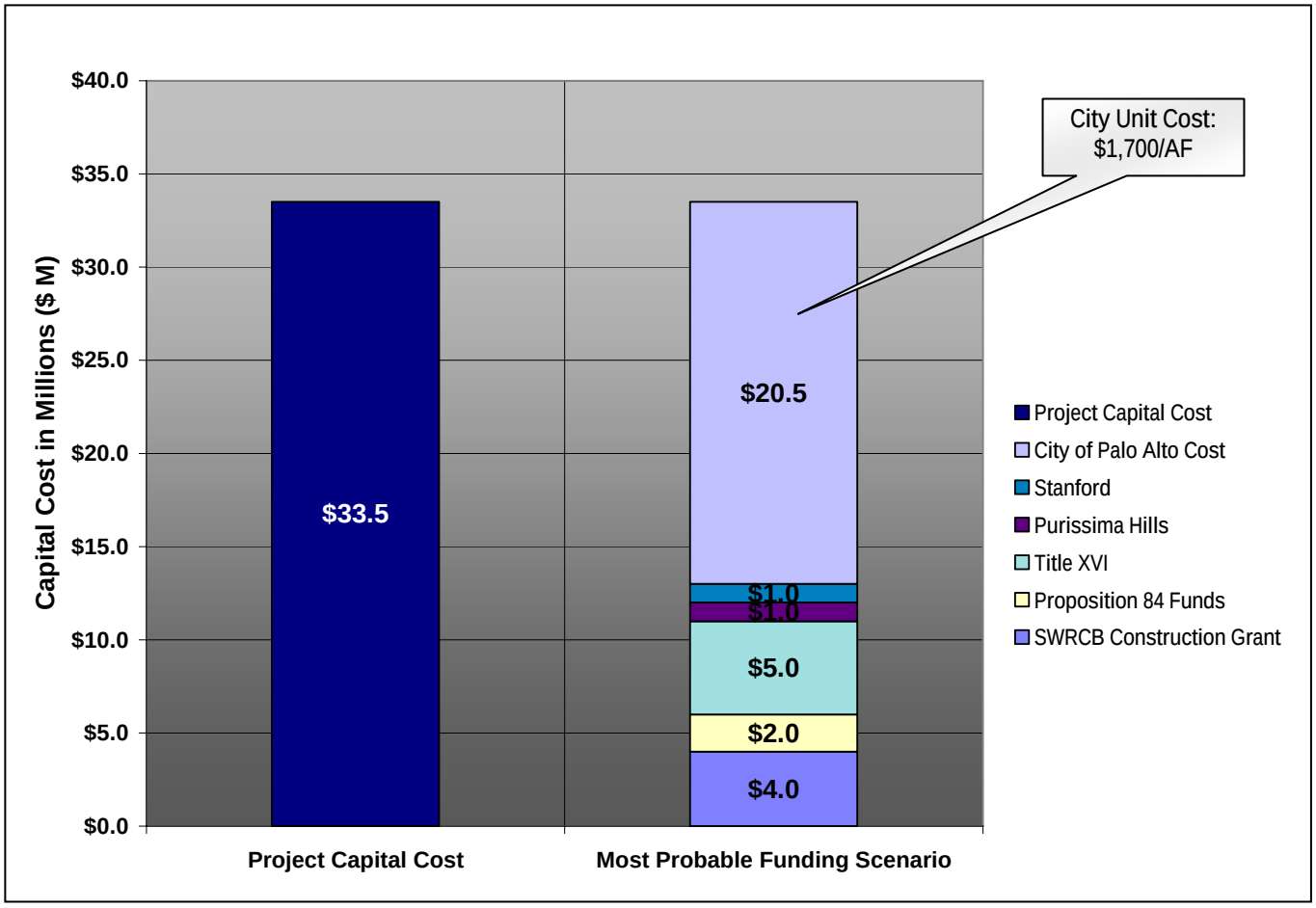
Table 5-7: Outside Funding Sources

Partner / Method	Description / Project Benefits to Partner	Potential Contribution to Recommended Project
Tier 1 Opportunities	Tier 1 includes opportunities with major potential impact on Project financing	
SWRCB Construction Grant	City obtained a SWRCB Facilities Planning Grant for the planning phase of this project and consequently has a high priority for obtaining a construction grant. Grant can cover 25% of eligible project costs, up to $4 million, provided funds are available. It is a competitive process. Readiness to proceed is currently the main criterion for selection. Funds are available from repayments to the Proposition 13 fund. For fiscal year 2008/09 the SWRCB anticipates having approximately $13M available for grant funding. On an annual basis, 60% and 40% of the available funds are allocated to Northern California and Southern California projects, respectively.	$4M
Proposition 84 through the IRWMP	The City is pursuing Proposition 84 funds for the Palo Alto Recycled Water Project. Proposition 84 funds will be allocated to water supply, water quality, and other projects meeting the RWQCB Region 2 goals through the IRWMP process. Proposition 84 funds will be awarded by DWR through a competitive process. The City will be actively involved in the next phase of the IRWMP. Guidelines for Proposition 84 funding are anticipated for July 2008. It is conceivable that the City may be successful in funding approximately 5% to 10% of estimated project costs through Proposition 84 grants, or $2 to $4 million.	$2M
Federal Grant	Palo Alto is seeking Federal grant funding for the Recycled Water Project. Federal funding may be available through the Title XVI program or other programs. Should Federal funding be pursued, NEPA coverage for the project would be required with USBR as the lead agency. City would need to enter into an agreement with USBR (which could take up to 8 months). Federal funding may cover up to 25% of construction costs; up to $20 million.	$5M
SWRCB State Revolving Fund (SRF) and Water Recycling Fund Loans	The City can apply for two different construction loan programs from the State which provide low interest loans to public agencies using a priority list process. The construction loan programs are 1) the SRF, and 2) the Water Recycling Fund. The Project is currently on the SRF Priority Project List. The City will apply to the Water Recycling Fund through the same process as the SWRCB construction grant. Currently the Water Recycling Fund is funded through Proposition 13 and bond money from a 1984 water recycling bond measure. The terms of both loans are very similar and loans can be obtained from both funds if necessary. If this funding is available and additional upfront capital funding is needed for the project, the City would apply for these 20-year loans.	--[3]
Tier 2 Opportunities	One or more Tier 1 opportunities will need to be realized in order for Tier 2 opportunities to provide real benefits to the project	
Purissima Hills Water District	See Section 5.3	$1 million in future offset or connection fees[4]
Stanford	See Section 5.3	$1 million in future offset or connection fees[4]
SFPUC/ BAWSCA	See Section 5.3	--[5]
SCVWD	See Table 5-6	--[5]

Footnotes:

1. Costs are rounded to the nearest $0.1 million.
2. SWRCB contribution is assumed to be 25% of eligible costs.
3. Savings on debt service rather than direct contribution to capital funding.
4. Based on similar arrangement between the City of Palo Alto and RWQCP for connection to the Phase 2 pipeline.
5. Unknown at this time. No basis for estimate.

Figure 5-3: Recommended Project Funding



Footnotes:

1. The calculated "City Unit Cost" assumes that Palo Alto shares Project capital costs with funding sources shown and takes on the full cost of annual operation and maintenance activities.

5.4.2 Revenue Sources and Pricing

Given the City's water supply management context described in Section 2 and project benefits described in Section 5.3, revenue sources for the project could be twofold:

- **Revenue from sales of recycled water**. It is anticipated that the City will establish the price of recycled water lower than the price of potable water to provide an incentive to potential recycled water customers to connect to the system. This practice is common in the recycled water industry, with recycled water prices ranging between 50% to 90% of potable water prices. The City anticipates pricing recycled water at approximately 80% of potable water cost.

The City of Mountain View is considering selling recycled water at a rate of 70% to 75% of potable water costs. Under Mountain View's current rate schedule, commercial customer rates for potable water range from $2.94 to $5.85 per ccf depending on total monthly use. For low use commercial customers the unit price of recycled water would be roughly $2.27 per ccf compared to a current price of potable water of $2.94 per ccf.

- Revenue from a recycled water surcharge to be imposed on all City potable water users.

5.4.3 Cash Flow Projections

Cash flow projections are included in Appendix F. Projections are based on anticipated outside funding sources and revenue sources. The City will complete a more detailed financing plan (including refined annual financial projections) after a decision to move forward with the Project is made.

5.4.4 Sensitivity Analysis

The financial to be completed by the City will be most influenced by the following factors (in addition to project cost):

- **Outside Funding.** At this preliminary stage in the Project, there is uncertainty regarding securing outside funding. The feasibility of implementing the Project is largely dependent on obtaining funding from one or more Tier 1 opportunities (identified in Table 5-7).
- **Water Quality and User Commitment.** Securing user commitments will play a vital role in advancing the project and making it cost-effective. Project costs are very sensitive to user commitments due to the significant length of the pipeline. Without the commitment of the largest recycled water users, many of which are located several miles away from the Phase 2 pipeline connection point, the unit cost of recycled water would increase substantially.

  The City is currently developing a recycled water use ordinance that will advance market assurances. In addition, the City has been reaching out to potential customers through meetings with facilities managers.

  Maximizing user commitment will also involve addressing their water quality needs. It is currently assumed that no blending will be required (see Section 4.6). A change in that assumption could significantly affect the financial aspects of the project.

5.5 Comparison to Freshwater Alternative

Table 5-8 presents a simple cost and benefits comparison of the Recommended Project and a reference freshwater alternative. The reference freshwater alternative was selected based on the City's water supply management context described in Section 2.

Table 5-8: Recommended Project vs. Freshwater Alternative Comparison

Criteria	Palo Alto Recycled Water Project	Status Quo – Supply from SFPUC
Summary		
Description	Construct recycled water distribution system and pumping facilities to provide recycled water for primarily irrigation use.	Status Quo. No additional facilities required.
Water Supply	Treated wastewater from the RWQCP, meeting Title 22 recycled water standards for unrestricted use.	Surface waters from Tuolumne and Alameda watersheds
Benefits		
Water Offset Quantity	900 AFY, new, locally produced, drought-proof supply for non-potable uses	
Other Benefits	Aligned with the objectives of the Phased WSIP looking at developing 10 MGD of local conservation, recycled water, and groundwater projects within SFPUC service area	
	Improves water supply reliability during drought and emergency conditions	
	Advances the City's green initiative	
	Reduces mass loading to South Bay	
	Adheres to local, regional and state recycled water policies	
	Allows flexibility to optimize water source use amongst different agencies	
Costs		
Capital Cost	$33.5 million (March 2008 dollars)	N/A
Unit Cost ($/AF)	Retail cost of $2,700/AF - without outside funding Retail cost of $1,700/AF - planning funding scenario	Wholesale costs up to $1,600/AF by 2015
Other Potential Future Costs/Risks	Cost of salinity management actions, if required	Risk of additional supplies reductions in average years and drought years
	Cost of groundwater monitoring activities, if required	Risk of additional future cost increases

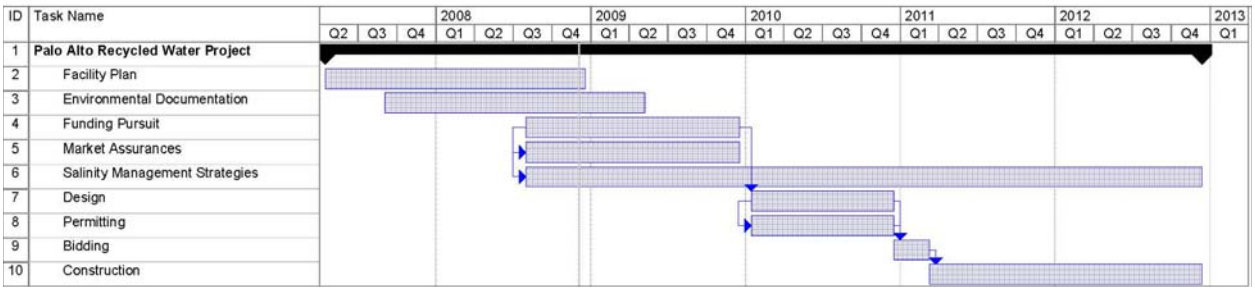
As described in Table 5-8, the Recommended Project provides key water supply and environmental benefits to the City and its customers.

Given the uncertainty associated with the cost of SFPUC water, uncertainty associated with supply availability during average years as a result of the Phased WSIP, and limited supply availability in drought years, the Recommended Project appears desirable. However, outside funding is currently needed to offset part of the City's costs and move the Recommended Project forward.

5.6 Implementation Plan

The implementation plan for the Palo Alto Recycled Water Project is summarized in the paragraphs below. **Figure 5-4** presents the project implementation schedule. Stakeholder involvement and public outreach is not represented as a separate task but will need to happen throughout the project implementation, above and beyond the Facility Plan and environmental documentation period.

Figure 5-4: Recommended Project Implementation Schedule



- **Facility Plan and Environmental Documentation** – The Facility Plan (this report) is complete. The required environmental documentation is scheduled for completion by mid-2009. These steps represent the preliminary planning stage for the Project, enabling pre-design and design to begin in the near future assuming funding pursuits are successful.

- **Funding Pursuit and Financial Planning –** As discussed in the financing plan section, securing funding is vital to the feasibility of the Project. The City will continue to pursue funding opportunities identified in this Study. The Project may not advance to further stages until adequate funding is secured. As part of the funding pursuit, a detailed financial plan (including annual projections) will be developed.

  Additionally, as part of financial planning activities, the City must address coordination and management issues between the Utilities Department (responsible for this Project) and the Department of Public Works (responsible for the operation of the RWQCP). Many of these aspects have been addressed previously by the City of Mountain View and RWQCP for the Phase 2 Project. Institutional, financial, and operational agreements will formalize the roles and responsibilities of the project.

- **Market Assurances** – The City has developed a recycled water use ordinance for the Stanford Research Park and users located in the vicinity of the proposed backbone system. A copy of the ordinance is provided in Appendix F.

- **Implementation of Regional Salt Management Strategies and Stakeholder Outreach** – The RWQCP in coordination with its partners, including the City of Palo Alto, will be implementing the regional salt management strategies over the course of the project and will continue these activities through the operation of the regional system. These strategies are described in Chapter 3.

- **Permitting and Agency Coordination –** The City will need to address permitting issues and stakeholder agency coordination during design. The major jurisdictional and stakeholder agencies and required permits and approvals required for implementing the Project have been identified in Chapter 5.

- **Design and Construction** – Assuming that adequate funding can be pursued and secured in 2008/09, the Project could move into design in early 2010 and into construction in early 2011. The Project could be online in early 2013.

Table 5-9: Jurisdictional and Stakeholder Agencies for Permitting or Review

Agency Name	Permits or Special Topics
City of Mountain View	Connection Fees
City of Palo Alto Public Works Department	Grading and Excavation Permit
City of Palo Alto	Encroachment and Street Work Permit
Santa Clara Valley Water District (SCVWD)	For construction across creeks/flood control channels
Santa Clara Department of Environmental Health	Hazardous Material Business Plan
San Francisco Bay Area Air Quality Management District	Permit to Construct
San Francisco Bay Conservation and Development Commission	Construction near the San Francisco Bay Shoreline
California Regional Water Quality Control Board	NPDES Permit for construction activities and construction Storm Water Pollution Prevention Plan (SWPPP)
California Department of Health Services	Title 22 – Recycled Water Regulations
California Department of Fish and Game	Stream Bed Alteration Agreement/Waiver, if necessary
CALOSHA	Underground Classification for Tunnels
Caltrans	Encroachment Permit
Pacific Gas and Electric, cable and telecom providers	Infrastructure review

References

Brown and Caldwell. “Water Reclamation Master Plan for the Regional Water Quality Control Plant.” April 1992.

Carollo Engineers. “City of Palo Alto Groundwater Supply Feasibility Study.” April 2003.

City of Palo Alto. “Urban Water Management Plan.” December 2005.

CH2M Hill, Inc. “Final Environmental Impact Report – Palo Alto Regional Water Quality Control Plant Wastewater Reclamation Program.” April 1995.

ESA+Orion. “PEIR on SFPUC Water System Improvement Program.” September 2008.

HortScience, Inc. “Evaluation of Use of Recycled Water on Redwoods in the Mountain View / Moffett Area..” January 2005.

RMC Water and Environment. “Mountain View/Moffett Field Area Water Reuse Project, Regional Recycled Water Facilities Planning Study.” State Water Resources Control Board Water Recycling Project No. 3212-010. Prepared for Palo Alto Regional Water Quality Control Plant. March 2004.

RMC Water and Environment. “City of Palo Alto Recycled Water Market Survey Report.” July 2006.

Appendix A - Recycled Water Users Database

ID No.	Potential Customer	Location	Irrigation (AFY)	Factor of Usage	Industrial/ Commercial (AFY)	Factor of Usage	Average Annual Demand (AFY)	Annual Demand Estimate (MGD)	Peak Month Demand Est. (MGD)	Peak Hour Demand Est. (MGD)	Peak Hour Demand Est. (GPM)
11	Alta Mesa Memorial Park	695 Arastradero Rd	185.9	0.5	0.0	-	92.9	0.083	0.191	0.572	397.2
94	Roche Bioscience	3431 Hillview Ave	51.6	1.0	29.3	0.9*	76.7	0.068	0.157	0.472	327.7
45	Hewlett Packard	3000 Hanover St	39.1	1.0	39.4	0.5	58.8	0.052	0.121	0.362	251.3
10	Agilent Technologies	3500 Deer Creek Rd	34.8	1.0	5.7	1.0	40.5	0.036	0.083	0.249	173.1
120	VA Palo Alto Health Care	3801 Miranda Ave	32.4	1.0	5.3	1.0	37.7	0.034	0.077	0.232	160.9
24	Cubberley Community Center	4000 Middlefield Rd	29.4	1.0	0.0	-	29.4	0.026	0.060	0.181	125.5
44	Hewlett Packard	1501 Page Mill Rd	15.3	1.0	27.9	0.5	29.2	0.026	0.060	0.180	124.9
125	VM Ware (formerly Stanford & Hines)	3401 Hillview Ave	27.0	1.0	4.4	0.5	29.2	0.026	0.060	0.180	124.8
43	Gunn Senior High School	780 Arastradero Rd	26.1	1.0	0.0	-	26.1	0.023	0.054	0.161	111.6
61	Mitchell Park	600 E. Meadow Dr	25.7	1.0	0.0	-	25.7	0.023	0.053	0.158	109.9
29	DPIX	3406 Hillview Ave	8.2	1.0	12.8	1.0	21.0	0.019	0.043	0.129	89.8
20	Clark Park	Old Trace Road	20.0	1.0	0.0	-	20.0	0.018	0.041	0.123	85.5
113	Terman Park	655 Arastradero Rd	19.9	1.0	0.0	-	19.9	0.018	0.041	0.122	85.0
42	Genencor International, Inc	925 Page Mill Rd	16.5	1.0	2.7	1.0	19.2	0.017	0.039	0.118	82.1
23	CPI	811 Hansen Way	15.7	1.0	2.7	1.0	18.5	0.016	0.038	0.114	78.9
54	Lockheed Missiles & Space	3251 Hanover St	11.0	1.0	4.2	1.0	15.3	0.014	0.031	0.094	65.2
124	Varian, Inc.	3120 Hansen Wy	0.0	0.0	15.0	1.0	13.8	0.012	0.028	0.085	58.9
104	Stanford & Hines Interest	600 Hansen Way	13.3	1.0	0.3	1.0	13.6	0.012	0.028	0.084	58.3
35	Equity Office Properties	4001 Miranda Ave	12.9	1.0	0.4	1.0	13.3	0.012	0.027	0.082	56.9
105	Stanford & Hines Interest	925 Page Mill Rd	12.8	1.0	0.0	-	12.8	0.011	0.026	0.079	54.9
28	Dow Jones & Co	901 California Ave	10.8	1.0	1.9	1.0	12.7	0.011	0.026	0.078	54.2
34	EPRI	3420 Hillview Ave	10.8	1.0	1.9	1.0	12.7	0.011	0.026	0.078	54.2
48	Hoover Park	2901 Cowper St	12.6	1.0	0.0	-	12.6	0.011	0.026	0.077	53.7
14	Beckman Instruments	1050 Page Mill Rd	10.4	1.0	1.8	1.0	12.2	0.011	0.025	0.075	52.1
71	Palo Alto Research Center	3333 Coyote Hill Rd	10.1	1.0	1.8	1.0	11.8	0.011	0.024	0.073	50.6
93	Robles Park	4116 Park Blvd	11.5	1.0	0.0	-	11.5	0.010	0.024	0.071	49.2
69	Page Mill Rd Prop, Inc	1801 Page Mill Rd	9.6	1.0	1.7	1.0	11.3	0.010	0.023	0.070	48.3
96	SAP Labs, Inc	3410 Hillview Ave	11.2	1.0	0.0	-	11.2	0.010	0.023	0.069	47.9
131	Wilson/S/G/R	650 Page Mill Rd	9.3	1.0	1.6	1.0	10.9	0.010	0.022	0.067	46.6
114	Tibco Software Inc	3301 Hillview Ave	9.9	1.0	0.5	1.0	10.4	0.009	0.021	0.064	44.6
106	Stanford Hospital and Clinics	2670 Hanover St	8.2	1.0	1.4	1.0	9.6	0.009	0.020	0.059	41.1
72	Palo Alto Square	3000 El Camino Real	7.7	1.0	1.4	1.0	9.1	0.008	0.019	0.056	38.8
9	Agilent Technologies	1601 California Ave	7.3	1.0	1.3	1.0	8.6	0.008	0.018	0.053	36.7
26	DNAX Research Institute	901 S. California Ave.	7.1	1.0	1.2	1.0	8.3	0.007	0.017	0.051	35.6
92	Ramos Park	800 E. Meadow Dr	7.6	1.0	0.0	-	7.6	0.007	0.016	0.047	32.4
97	SAP Labs, Inc	3473 Deer Creek Rd	7.4	1.0	0.0	-	7.4	0.007	0.015	0.046	31.6
49	Jane L Stanford Middle School	480 E. Meadow Dr	7.3	1.0	0.0	-	7.3	0.007	0.015	0.045	31.4
134	Xerox Corp	3400 Hillview Ave	6.2	1.0	1.1	1.0	7.2	0.006	0.015	0.045	31.0
12	Alza	1501 California Ave	2.7	1.0	3.9	1.0	6.6	0.006	0.014	0.041	28.4
68	Page Mill Center	1530 Page Mill Rd	5.6	1.0	1.0	1.0	6.6	0.006	0.014	0.041	28.3
17	Carramerica Reality Corp	3075 Hansen Wy	6.2	1.0	0.2	1.0	6.4	0.006	0.013	0.040	27.5
53	Lockheed Missiles & Space	3176 Porter Dr	5.4	1.0	0.9	1.0	6.3	0.006	0.013	0.039	27.0
32	El Carmelo Elementary School	3024 Bryant St	6.2	1.0	0.0	-	6.2	0.006	0.013	0.038	26.6
67	Our Lady of the Rosary School/Church	3290 Middlefield Rd	6.2	1	0.0	-	6.2	0.006	0.013	0.038	26.5
132	Wilson/S/G/R	950 Page Mill Rd	5.2	1.0	0.9	1.0	6.1	0.005	0.012	0.037	25.9
57	Matadero Creek	3172 Porter Dr	4.8	1.0	0.8	1.0	5.6	0.005	0.011	0.034	23.9
25	CV Therapeutics, Inc.	1651 Page Mill Rd	4.4	1.0	0.8	1.0	5.1	0.005	0.011	0.032	21.9

ID No.	Potential Customer	Location	Irrigation (AFY)	Factor of Usage	Industrial/ Commercial (AFY)	Factor of Usage	Average Annual Demand (AFY)	Annual Demand Estimate (MGD)	Peak Month Demand Est. (MGD)	Peak Hour Demand Est. (MGD)	Peak Hour Demand Est. (GPM)
6	495 Java Drive Assoc	1001 Page Mill Rd	0.7	1.0	4.3	1.0	5.0	0.004	0.010	0.031	21.4
56	Marcus & Millichap, Inc.	777 California Ave	5.0	1.0	0.0	-	5.0	0.004	0.010	0.031	21.4
118	Trinet Essential	1661 Page Mill Rd	4.6	1.0	0.0	-	4.6	0.004	0.009	0.028	19.7
88	Pkwy Ore/Pg Mill	1600 Page Mill Rd	4.3	1.0	0.0	-	4.3	0.004	0.009	0.027	18.6
5	340 Portage Housing	340 Portage	4.2	1.0	0.0	-	4.2	0.004	0.009	0.026	17.9
50	Jane L Stanford Middle School	500 E. Meadow Dr	4.1	1.0	0.0	-	4.1	0.004	0.008	0.025	17.6
33	EPRI	3412 Hillview Ave	3.4	1.0	0.6	1.0	4.0	0.004	0.008	0.025	17.3
100	Stanford & Hines Interest	3150 Porter Dr	3.6	1.0	0.0	-	3.6	0.003	0.007	0.022	15.6
15	C & J Management	3165 Porter Dr	3.3	1.0	0.0	-	3.3	0.003	0.007	0.021	14.3
103	Stanford & Hines Interest	3421 Hillvew Ave	3.1	1.0	0.0	-	3.1	0.003	0.006	0.019	13.2
119	University Club of PA	3277 Miranda Ave	2.6	1.0	0.5	1.0	3.0	0.003	0.006	0.019	13.0
16	Cameron Park	2101 Wellesley St	2.9	1.0	0.0	-	2.9	0.003	0.006	0.018	12.2
63	Mozart Development	3300 Hillview Ave	2.8	1.0	0.0	-	2.8	0.003	0.006	0.018	12.2
107	Stanford Hospital and Clinics	2690 Hanover St	2.4	1.0	0.4	1.0	2.8	0.002	0.006	0.017	11.9
122	Varian Medical Systems	3100 Hansen Wy	2.2	1.0	0.4	1.0	2.6	0.002	0.005	0.016	11.2
41	Foothills Club	3351 Miranda Ave	2.2	1.0	0.4	1.0	2.6	0.002	0.005	0.016	11.1
101	Stanford & Hines Interest	3170 Porter Dr	2.1	1.0	0.4	1.0	2.4	0.002	0.005	0.015	10.4
98	Simpson Thacher & Bartlet	3330 Hillview Ave	2.0	1.0	0.3	1.0	2.3	0.002	0.005	0.014	10.0
30	ECI Deer Creek LLC	3408 Hillview Ave	2.0	1.0	0.3	1.0	2.3	0.002	0.005	0.014	10.0
52	Liveops.com Inc	3340 Hillview Ave	1.9	1.0	0.3	1.0	2.3	0.002	0.005	0.014	9.7
70	Paine Webber, Inc	775 Page Mill Rd	2.1	1.0	0.0	1.0	2.1	0.002	0.004	0.013	9.1
51	Legato Systems	3210 Porter Dr	1.7	1.0	0.3	1.0	2.0	0.002	0.004	0.012	8.5
129	Werry Park	2100 Dartmouth St	2.0	1.0	0.0	-	2.0	0.002	0.004	0.012	8.5
117	Tibco Software Inc	4015 Miranda Ave	1.9	1.0	0.1	1.0	2.0	0.002	0.004	0.012	8.4
66	NYSE	845 Page Mill Rd	1.9	1.0	0.0	-	1.9	0.002	0.004	0.012	8.1
60	Mitchell Park	3800 Middlefield Rd	1.9	1.0	0.0	-	1.9	0.002	0.004	0.012	8.1
46	Hewlett Packard	3200 Hillview Ave	1.9	1.0	0.0	-	1.9	0.002	0.004	0.012	8.0
102	Stanford & Hines Interest	3180 Porter Dr	1.8	1.0	0.0	-	1.8	0.002	0.004	0.011	7.9
31	ECI Deer Creek LLC	3495 Deer Creek Rd	1.8	1.0	0.0	-	1.8	0.002	0.004	0.011	7.8
127	Weisshaar Park	2298 Dartmouth St	1.7	1.0	0.0	-	1.7	0.002	0.003	0.010	7.2
37	Fairmeadow Elementary School	490 E. Meadow Dr	1.6	1.0	0.0	-	1.6	0.001	0.003	0.010	7.1
81	Pkwy Cal/Birch	2771 Birch St	1.6	1.0	0.0	-	1.6	0.001	0.003	0.010	7.0
47	Hewlett Packard	3215 Hillview Ave	1.6	1.0	0.0	-	1.6	0.001	0.003	0.010	6.8
21	CNF Transportation Inc	3240 Hillview Ave	1.6	1.0	0.0	-	1.6	0.001	0.003	0.010	6.7
90	Prognostics	900 Hansen Wy	1.5	1.0	0.0	-	1.5	0.001	0.003	0.009	6.6
130	Wilson/S/G/R	601 California Ave	1.5	1.0	0.0	-	1.5	0.001	0.003	0.009	6.4
38	Finnegan, Henderson LLP	700 Hansen Way	1.5	1.0	0.0	-	1.5	0.001	0.003	0.009	6.2
64	Nanosys, Inc	2625 Hanover St	1.4	1.0	0.0	-	1.4	0.001	0.003	0.009	6.1
75	Parkway	370 Grant Ave	1.4	1.0	0.0	-	1.4	0.001	0.003	0.009	5.9
7	850 Assoc C/O WSJ Prop	850 Hansen Wy	1.2	1.0	0.0	-	1.2	0.001	0.003	0.008	5.3
59	Mayfield Park	2302 Wellesley St	1.0	1.0	0.0	-	1.0	0.001	0.002	0.006	4.5
126	VMWare Inc	3305 Hillview Ave	1.0	1.0	0.0	-	1.0	0.001	0.002	0.006	4.2
73	Parks Dept	900 Arastradero Rd	0.8	1.0	0.0	-	0.8	0.001	0.002	0.005	3.5
22	Cooley Godward LLP	3175 Hanover St	0.8	1.0	0.0	-	0.8	0.001	0.002	0.005	3.2
18	Carten - Trust	1290 Page Mill Rd	0.7	1.0	0.0	-	0.7	0.001	0.002	0.005	3.2
115	Tibco Software Inc	3303 Hillview Ave	0.7	1.0	0.0	-	0.7	0.001	0.002	0.005	3.2
62	Mitchell Park Library	3700 Middlefield Rd	0.7	1.0	0.0	-	0.7	0.001	0.001	0.004	2.9

ID No.	Potential Customer	Location	Irrigation (AFY)	Factor of Usage	Industrial/ Commercial (AFY)	Factor of Usage	Average Annual Demand (AFY)	Annual Demand Estimate (MGD)	Peak Month Demand Est. (MGD)	Peak Hour Demand Est. (MGD)	Peak Hour Demand Est. (GPM)
39	Fire Station	2675 Hanover St	0.7	1.0	0.0	-	0.7	0.001	0.001	0.004	2.8
1	1101 E Meadow Housing	1101 E. Meadow Dr	0.6	1.0	0.0	-	0.6	0.001	0.001	0.004	2.7
3	2450-2500 El Camino Housing	2450 El Camino Real	0.6	1.0	0.0	-	0.6	0.001	0.001	0.004	2.6
133	Wilson/S/G/R	975 Page Mill Rd	0.6	1.0	0.0	-	0.6	0.000	0.001	0.003	2.4
84	Pkwy Cal/Birch	480 California Ave	0.5	1.0	0.0	-	0.5	0.000	0.001	0.003	2.3
58	Mayfield Park	2300 Wellesley St	0.5	1.0	0.0	-	0.5	0.000	0.001	0.003	2.3
55	Marcus & Millichap, Inc.	2626 Hanover St	0.5	1.0	0.0	-	0.5	0.000	0.001	0.003	2.2
123	Varian Medical Systems	3450 Hillview Ave	0.5	1.0	0.0	-	0.5	0.000	0.001	0.003	2.1
79	Pkwy Aras	1055 Arastradero Rd	0.5	1.0	0.0	-	0.5	0.000	0.001	0.003	2.0
87	Pkwy Ore/Pg Mill	130 Sheridan Ave	0.4	1.0	0.0	-	0.4	0.000	0.001	0.003	1.9
116	Tibco Software Inc	3307 Hillview Ave	0.4	1.0	0.0	-	0.4	0.000	0.001	0.003	1.9
108	Stanford Univ	1454 Page Mill Rd	0.4	1.0	0.0	-	0.4	0.000	0.001	0.003	1.8
86	Pkwy El Camino	3101 El Camino Real	0.4	1.0	0.0	-	0.4	0.000	0.001	0.002	1.6
128	Wells Fargo Bank, N.A.	505 California Ave	0.3	1.0	0.0	-	0.3	0.000	0.001	0.002	1.4
40	Fire Station	3600 Middlefield Rd	0.3	1.0	0.0	-	0.3	0.000	0.001	0.002	1.3
95	RWI Group	835 Page Mill Rd	0.3	1.0	0.0	-	0.3	0.000	0.001	0.002	1.3
8	940 E Meadow Housing	940 E. Meadow Dr	0.3	1.0	0.0	-	0.3	0.000	0.001	0.002	1.3
4	2701 El Camino housing	2701 El Camino Real	0.3	1.0	0.0	-	0.3	0.000	0.001	0.002	1.3
80	Pkwy Cal/Birch	2600 Birch St	0.3	1.0	0.0	-	0.3	0.000	0.001	0.002	1.1
36	Equity Office Properties	4005 Miranda Ave	0.2	1.0	0.0	-	0.2	0.000	0.000	0.001	0.9
76	Pennie & Edmonds LLP	3300 Hillview Ave	0.2	1.0	0.0	-	0.2	0.000	0.000	0.001	0.9
19	City of Palo Alto	475 Cambridge Ave	0.2	1.0	0.0	-	0.2	0.000	0.000	0.001	0.9
91	R R Donnelley Financial	855 California Ave	0.2	1.0	0.0	-	0.2	0.000	0.000	0.001	0.8
65	Nanosys, Inc	2627 Hanover St	0.2	1.0	0.0	-	0.2	0.000	0.000	0.001	0.8
77	Pkwy Alma/Fairmdw	3615 Alma St	0.2	1.0	0.0	-	0.2	0.000	0.000	0.001	0.7
13	Avery Construction	2400 Hanover St	0.2	1.0	0.0	-	0.2	0.000	0.000	0.001	0.7
85	Pkwy El Camino	2501 El Camino Real	0.2	1.0	0.0	-	0.2	0.000	0.000	0.001	0.7
89	Pkwy Park Blvd	3490 Park Blvd	0.1	1.0	0.0	-	0.1	0.000	0.000	0.001	0.6
82	Pkwy Cal/Birch	394 California Ave	0.1	1.0	0.0	-	0.1	0.000	0.000	0.001	0.4
109	Substation	1151 E. Meadow Dr	0.1	1.0	0.0	-	0.1	0.000	0.000	0.001	0.4
27	Dow Jones & Co	1701 Page Mill Rd	0.1	1.0	0.0	-	0.1	0.000	0.000	0.000	0.3
83	Pkwy Cal/Birch	444 California Ave	0.1	1.0	0.0	-	0.1	0.000	0.000	0.000	0.3
110	Substation	3297 Park Blvd	0.1	1.0	0.0	-	0.1	0.000	0.000	0.000	0.2
74	Parkway	3360 Park Blvd	0.0	1.0	0.0	-	0.0	0.000	0.000	0.000	0.1
111	Substation	3620 Middlefield Rd	0.0	1.0	0.0	-	0.0	0.000	0.000	0.000	0.1
112	Substation	800 Hansen Way	0.0	1.0	0.0	-	0.0	0.000	0.000	0.000	0.1
78	Pkwy Alma/Fairmdw	3625 Alma St	0.0	1.0	0.0	-	0.0	0.000	0.000	0.000	0.1
121	Varian Medical Systems	3075 Hansen Wy	0.0	1.0	0.0	-	0.0	0.000	0.000	0.000	0.1
99	Space Systems Loral	3825 Fabian Way	0.0	0.0	0.0	-	0.0	0.000	0.000	0.000	0.0
2	1451-1601 California Housing	1451 California	0.0	0.0	0.0	-	0.0	0.000	0.000	0.000	0.0
						TOTAL	**969**	**0.86**	**1.99**		

ID No.	Potential Customer	Location	Meter Records (CCF)				RECYCLED WATER DEMANDS (CCF)									ANNUAL DEMAND		Notes
			Meter Type	W4	W7	Data Years	AF	Irrigation	UF	AF	Ind./ Comm.	UF	AF	Cooling Tower	UF	CCF	AFY	
11	Alta Mesa Memorial Park	695 Arastradero Rd					100%	80,956	0.5							40,478	92.9	72 ac. Cemetery. Assume 75% is irrigated. Esitmate with Use Factor confirmed by SCVWD groundwater pumping records
94	Roche Bioscience	3431 Hillview Ave	W4	44,925		06/07	50%	22,463	1.0	8%	3,682	0.5	20%	9,097	1.0	33,401	76.7	Data obtained from water use records 2004-2007 and discussions with Jerry Meek, Facility Manager at Roche. Note that 2006/07 data was used b/c Roche property was modified in 2006.
45	Hewlett Packard	3000 Hanover St	W7 & W4	7,436	17,020	04-07	100%	17,020	1.0	20%	1,487	0.5		15,695	0.5	25,611	58.8	Currently 5882 CCF/yr of pumped and treated groundwater is used for irrigation. Cooling tower use from customer survey. Other uses: scrubbers, and lab use.
10	Agilent Technologies	3500 Deer Creek Rd	W4	30,319		04-06	50%	15,160	1.0	8%	2,485	1.0				17,645	40.5	Agilent no longer occupies this facility. Demand is based on Agilent's past use
120	VA Palo Alto Health Care	3801 Miranda Ave	W4	28,186		04-07	50%	14,093	1.0	8%	2,310	1.0				16,403	37.7	E/T estimate for irrigation is higher (79afy). Customer is unable to provide data regarding irrigation or cooling tower use
24	Cubberley Community Center	4000 Middlefield Rd	W7 & W4	8,257	12,791	04-07	100%	12,791	1.0							12,791	29.4	E/T estimate slightly higher, but confirms W7 records
44	Hewlett Packard	1501 Page Mill Rd	W7 & W4	10,325	6,647	04-07	100%	6,647	1.0	20%	2,065	0.5		10,106	0.5	12,733	29.2	Cooling tower use from customer survey. Other uses: scrubbers, and lab use.
125	VM Ware (formerly Stanford & Hines Interest)	3401 Hillview Ave	W4	23,517		04/05	50%	11,759	1.0	8%	1,927	0.5				12,722	29.2	Data from 2004/05 as a placeholder. Currently pumps and treats groundwater for use.
43	Gunn Senior High School	780 Arastradero Rd	W4	15,162		04-07	75%	11,372	1.0							11,372	26.1	E/T estimate confirms irrigation demand
61	Mitchell Park	600 E. Meadow Dr	W7		11,198	06/07	100%	11,198	1.0							11,198	25.7	E/T estimate much higher (3 x higher) than wtr use records.
29	DPIX	3406 Hillview Ave	W7 & W4	40,227	3,589	04-07	100%	3,589	1.0				14%	5,561	1.0	9,150	21.0	Cooling tower data provided in Customer Survey. Also has air strippers and DI water (not good for RW).
20	Clark Park	Old Trace Road	W4	8,710		04/05	100%	8,710	1.0							8,710	20.0	
113	Genencor International, Inc	925 Page Mill Rd	W4	14,386		04-07	50%	7,193	1.0	8%	1,179	1.0				8,372	19.2	
42	CPI	811 Hansen Way	W4	14,602		04-07	50%	6,848	1.0	8%	1,197	1.0				8,045	18.5	
23	Terman Park	655 Arastradero Rd		1,668	7,968		100%	7,968	1.0							7,968	18.3	7.7 ac. Park. Assume 75% is irrigated
54	Lockheed Missiles & Space	3251 Hanover St	W7 & W4	9,166	4,811	04-07	100%	4,811	1.0	20%	1,833	1.0				6,645	15.3	
124	Varian, Inc.	3120 Hansen Wy	W4	6,750	0	04/05	0	0	0.0	8%	553	0.0		6,000	1.0	6,000	13.8	Varian has 0 irrigation demand, but could use 6000 ccf/yr for cooling towers based on survey.
104	Stanford & Hines Interest	600 Hansen Way	W7 & W4	631	5,814	04/05	100%	5,814	1.0	20%	126	1.0				5,940	13.6	
35	Equity Office Properties	4001 Miranda Ave	W7 & W4	806	5,640	04/05	100%	5,640	1.0	20%	161	1.0				5,801	13.3	
105	Stanford & Hines Interest	925 Page Mill Rd	W7	0	5,596	04/05	100%	5,596	1.0							5,596	12.8	
28	Dow Jones & Co	901 California Ave	W4	10,017	0	04/05	50%	4,698	1.0	8%	821	1.0				5,519	12.7	
34	EPRI	3420 Hillview Ave	W4	10,017	0	04/05	50%	4,698	1.0	8%	821	1.0				5,519	12.7	
48	Hoover Park	2901 Cowper St	W4	5,469	0	04/05	100%	5,469	1.0							5,469	12.6	User identified on Reach 2B. Demand from RWMS
14	Beckman Instruments	1050 Page Mill Rd	W4	9,646	0	04/05	50%	4,524	1.0	8%	791	1.0				5,315	12.2	
71	Palo Alto Research Center	3333 Coyote Hill Rd	W4	9,363	0	04/05	50%	4,391	1.0	8%	767	1.0				5,159	11.8	
93	Robles Park	4116 Park Blvd	W7 & W4	2	5,013	04/05	100%	5,013	1.0							5,013	11.5	
69	Page Mill Rd Prop, Inc	1801 Page Mill Rd	W4	8,928	0	04/05	50%	4,187	1.0	8%	732	1.0				4,919	11.3	
96	SAP Labs, Inc	3410 Hillview Ave	W7 & W4	1,960	4,878	04/05	100%	4,878	1.0							4,878	11.2	
131	Wilson/S/G/R	650 Page Mill Rd	W4	8,623	0	04/05	50%	4,044	1.0	8%	707	1.0				4,751	10.9	
114	Tibco Software Inc	3301 Hillview Ave	W7 & W4	1,176	4,311	04/05	100%	4,311	1.0	20%	235	1.0				4,547	10.4	
106	Stanford Hospital and Clinics	2670 Hanover St	W4	7,599	0	04/05	50%	3,564	1.0	8%	623	1.0				4,187	9.6	
72	Palo Alto Square	3000 El Camino Real	W4	7,186	0	04/05	50%	3,370	1.0	8%	589	1.0				3,959	9.1	
9	Agilent Technologies	1601 California Ave	W4	6,794	0	04/05	50%	3,186	1.0	8%	557	1.0				3,743	8.6	
26	DNAX Research Institute	901 S. California Ave.	W4	6,576	0	04/05	50%	3,084	1.0	8%	539	1.0				3,623	8.3	
92	Ramos Park	800 E. Meadow Dr	W4	3,303	0	04/05	100%	3,303	1.0							3,303	7.6	E/T method estimates much higher irrigation demand (13815 CCF)
97	SAP Labs, Inc	3473 Deer Creek Rd	W7 & W4	1,720	3,223	04/05	100%	3,223	1.0							3,223	7.4	
49	Jane L Stanford Middle School	480 E. Meadow Dr	W4	4,268	0	04/05	75%	3,201	1.0							3,201	7.3	
134	Xerox Corp	3400 Hillview Ave	W4	5,727	0	04/05	50%	2,686	1.0	8%	469	1.0				3,155	7.2	
12	Alza	1501 California Ave	W7 & W4	8,492	1,198	04/05	100%	1,198	1.0	20%	1,698	1.0				2,896	6.6	
68	Page Mill Center	1530 Page Mill Rd	W4	5,226	0	04/05	50%	2,451	1.0	8%	428	1.0				2,879	6.6	
17	Carramerica Reality Corp	3075 Hansen Wy	W7 & W4	392	2,722	04/05	100%	2,722	1.0	20%	78	1.0				2,800	6.4	
53	Lockheed Missiles & Space	3176 Porter Dr	W4	4,986	0	04/05	50%	2,339	1.0	8%	409	1.0				2,747	6.3	

ID No.	Potential Customer	Location	Meter Records (CCF)				RECYCLED WATER DEMANDS (CCF)									ANNUAL DEMAND		Notes
			Meter Type	W4	W7	Data Years	AF	Irrigation	UF	AF	Ind./ Comm.	UF	AF	Cooling Tower	UF	CCF	AFY	
32	El Carmelo Elementary School	3024 Bryant St	W4	3,615	0	04/05	75%	2,711	1.0							2,711	6.2	user identified on Reach 2B. Demand from RWMS
67	Our Lady of the Rosary School / Church	3290 Middlefield Rd						2,699	1.0							2,699	6.2	user identified on Reach 2B. Demand from E/T using IRR acreage
132	Wilson/S/G/R	950 Page Mill Rd	W4	4,791	0	04/05	50%	2,247	1.0	8%	393	1.0				2,639	6.1	
57	Matadero Creek	3172 Porter Dr	W4	4,420	0	04/05	50%	2,073	1.0	8%	362	1.0				2,435	5.6	
25	CV Therapeutics, Inc.	1651 Page Mill Rd	W4	4,050	0	04/05	50%	1,900	1.0	8%	332	1.0				2,231	5.1	
6	495 Java Drive Assoc	1001 Page Mill Rd	W7 & W4	9,450	292	04/05	100%	292	1.0	20%	1,890	1.0				2,182	5.0	
56	Marcus & Millichap, Inc.	777 California Ave	W7	0	2,178	04/05	100%	2,178	1.0							2,178	5.0	
118	Trinet Essential	1661 Page Mill Rd	W7	0	2,003	04/05	100%	2,003	1.0							2,003	4.6	
88	Pkwy Ore/Pg Mill	1600 Page Mill Rd	W7	0	1,891	04/05	100%	1,891	1.0							1,891	4.3	
5	340 Portage Housing	340 Portage	N/A	0	0	04/05		1,829	1.0							1,829	4.2	
50	Jane L Stanford Middle School	500 E. Meadow Dr	W4	2,395	0	04/05	75%	1,796	1.0							1,796	4.1	
33	EPRI	3412 Hillview Ave	W4	3,201	0	04/05	50%	1,501	1.0	8%	262	1.0				1,764	4.0	
100	Stanford & Hines Interest	3150 Porter Dr	W7 & W4	305	1,590	04/05	100%	1,590	1.0							1,590	3.6	
15	C & J Management	3165 Porter Dr	W7	784	1,459	04/05	100%	1,459	1.0							1,459	3.3	
103	Stanford & Hines Interest	3421 Hillvew Ave	W7 & W4	1,350	1,350	04/05	100%	1,350	1.0							1,350	3.1	
119	University Club of PA	3277 Miranda Ave	W4	2,408	0	04/05	50%	1,129	1.0	8%	197	1.0				1,327	3.0	
16	Cameron Park	2101 Wellesley St	W4	1,244	0	04/05	100%	1,244	1.0							1,244	2.9	
63	Mozart Development	3300 Hillview Ave	W7	0	1,241	04/05	100%	1,241	1.0							1,241	2.8	
107	Stanford Hospital and Clinics	2690 Hanover St	W4	2,199	0	04/05	50%	1,031	1.0	8%	180	1.0				1,212	2.8	
122	Varian Medical Systems	3100 Hansen Wy	W4	2,069	0	04/05	50%	970	1.0	8%	170	1.0				1,140	2.6	
41	Foothills Club	3351 Miranda Ave	W4	2,047	0	04/05	50%	960	1.0	8%	168	1.0				1,128	2.6	
101	Stanford & Hines Interest	3170 Porter Dr	W4	1,916	0	04/05	50%	899	1.0	8%	157	1.0				1,056	2.4	
98	Simpson Thacher & Bartlet	3330 Hillview Ave	W4	1,853	0	04/05	50%	869	1.0	8%	152	1.0				1,021	2.3	
30	ECI Deer Creek LLC	3408 Hillview Ave	W4	1,851	0	04/05	50%	868	1.0	8%	152	1.0				1,020	2.3	
52	Liveops.com Inc	3340 Hillview Ave	W4	1,786	0	04/05	50%	837	1.0	8%	146	1.0				984	2.3	
70	Paine Webber, Inc	775 Page Mill Rd	W7 & W4	89	915	04/05	100%	915	1.0	20%	18	1.0				932	2.1	
51	Legato Systems	3210 Porter Dr	W4	1,568	0	04/05	50%	735	1.0	8%	128	1.0				864	2.0	
129	Werry Park	2100 Dartmouth St	W4	863	0	04/05	100%	863	1.0							863	2.0	
117	Tibco Software Inc	4015 Miranda Ave	W7 & W4	168	827	04/05	100%	827	1.0	20%	34	1.0				861	2.0	
66	NYSE	845 Page Mill Rd						827	1.0							827	1.9	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
60	Mitchell Park	3800 Middlefield Rd						824	1.0							824	1.9	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
46	Hewlett Packard	3200 Hillview Ave						814	1.0							814	1.9	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
102	Stanford & Hines Interest	3180 Porter Dr						803	1.0							803	1.8	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
31	ECI Deer Creek LLC	3495 Deer Creek Rd						790	1.0							790	1.8	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
127	Weisshaar Park	2298 Dartmouth St						737	1.0							737	1.7	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
37	Fairmeadow Elementary School	490 E. Meadow Dr						719	1.0							719	1.6	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
81	Pkwy Cal/Birch	2771 Birch St						711	1.0							711	1.6	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
47	Hewlett Packard	3215 Hillview Ave						695	1.0							695	1.6	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
21	CNF Transportation Inc	3240 Hillview Ave						683	1.0							683	1.6	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
90	Prognostics	900 Hansen Wy						671	1.0							671	1.5	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
130	Wilson/S/G/R	601 California Ave						653	1.0							653	1.5	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
38	Finnegan, Henderson LLP	700 Hansen Way						635	1.0							635	1.5	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
64	Nanosys, Inc	2625 Hanover St						623	1.0							623	1.4	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
75	Parkway	370 Grant Ave						606	1.0							606	1.4	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
7	850 Assoc C/O WSJ Prop	850 Hansen Wy						539	1.0							539	1.2	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
59	Mayfield Park	2302 Wellesley St						456	1.0							456	1.0	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
126	VMWare Inc	3305 Hillview Ave						431	1.0							431	1.0	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
73	Parks Dept	900 Arastradero Rd						358	1.0							358	0.8	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
22	Cooley Godward LLP	3175 Hanover St						327	1.0							327	0.8	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
18	Carten - Trust	1290 Page Mill Rd						323	1.0							323	0.7	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
115	Tibco Software Inc	3303 Hillview Ave						323	1.0							323	0.7	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
62	Mitchell Park Library	3700 Middlefield Rd						291	1.0							291	0.7	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
39	Fire Station	2675 Hanover St						290	1.0							290	0.7	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
1	1101 E Meadow Housing	1101 E. Meadow Dr						279	1.0							279	0.6	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
3	2450-2500 El Camino Housing	2450 El Camino Real						261	1.0							261	0.6	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
133	Wilson/S/G/R	975 Page Mill Rd						240	1.0							240	0.6	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
84	Pkwy Cal/Birch	480 California Ave						235	1.0							235	0.5	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
58	Mayfield Park	2300 Wellesley St						231	1.0							231	0.5	Demand < 2.0 afy. Data from Market Survey (RMC 2005)

ID No.	Potential Customer	Location	Meter Records (CCF)				RECYCLED WATER DEMANDS (CCF)										ANNUAL DEMAND		Notes
			Meter Type	W4	W7	Data Years	AF	Irrigation	UF	AF	Ind./ Comm.	UF	AF	Cooling Tower	UF		CCF	AFY	
55	Marcus & Millichap, Inc.	2626 Hanover St						222	1.0								222	0.5	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
123	Varian Medical Systems	3450 Hillview Ave						213	1.0								213	0.5	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
79	Pkwy Aras	1055 Arastradero Rd						207	1.0								207	0.5	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
87	Pkwy Ore/Pg Mill	130 Sheridan Ave						196	1.0								196	0.4	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
116	Tibco Software Inc	3307 Hillview Ave						192	1.0								192	0.4	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
108	Stanford Univ	1454 Page Mill Rd						182	1.0								182	0.4	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
86	Pkwy El Camino	3101 El Camino Real						163	1.0								163	0.4	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
128	Wells Fargo Bank, N.A.	505 California Ave						144	1.0								144	0.3	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
40	Fire Station	3600 Middlefield Rd						136	1.0								136	0.3	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
95	RWI Group	835 Page Mill Rd						133	1.0								133	0.3	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
8	2701 El Camino housing	2701 El Camino Real						131	1.0								131	0.3	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
4	940 E Meadow Housing	940 E. Meadow Dr						131	1.0								131	0.3	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
80	Pkwy Cal/Birch	2600 Birch St						117	1.0								117	0.3	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
36	Equity Office Properties	4005 Miranda Ave						96	1.0								96	0.2	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
76	Pennie & Edmonds LLP	3300 Hillview Ave						92	1.0								92	0.2	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
19	City of Palo Alto	475 Cambridge Ave						87	1.0								87	0.2	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
91	R R Donnelley Financial	855 California Ave						86	1.0								86	0.2	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
65	Nanosys, Inc	2627 Hanover St						83	1.0								83	0.2	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
77	Avery Construction	2400 Hanover St						74	1.0								74	0.2	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
13	Pkwy Alma/Fairmdw	3615 Alma St						74	1.0								74	0.2	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
85	Pkwy El Camino	2501 El Camino Real						68	1.0								68	0.2	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
89	Pkwy Park Blvd	3490 Park Blvd						64	1.0								64	0.1	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
82	Pkwy Cal/Birch	394 California Ave						44	1.0								44	0.1	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
109	Substation	1151 E. Meadow Dr						36	1.0								36	0.1	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
27	Dow Jones & Co	1701 Page Mill Rd						32	1.0								32	0.1	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
83	Pkwy Cal/Birch	444 California Ave						29	1.0								29	0.1	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
110	Substation	3297 Park Blvd						22	1.0								22	0.1	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
74	Parkway	3360 Park Blvd						10	1.0								10	0.0	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
111	Substation	3620 Middlefield Rd						10	1.0								10	0.0	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
112	Substation	800 Hansen Way						9	1.0								9	0.0	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
78	Pkwy Alma/Fairmdw	3625 Alma St						6	1.0								6	0.0	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
121	Varian Medical Systems	3075 Hansen Wy						6	1.0								6	0.0	Demand < 2.0 afy. Data from Market Survey (RMC 2005)
99	1451-1601 California Housing	1451 California	N/A	0	0	04/05											0	0.0	
2	Space Systems Loral	3825 Fabian Way	No Data Available At This Time														0	0.0	Data unavailable at time of analysis
	Recommended Market							**399,544**			**34,011**			**46,460**			**421,501**	**968**	

Footnotes:

AF- Application factor. This indicates how the meter data was applied to determine each type of use. Calculation only performed for top users.

UF - Use factor. Captures uncertainty of serving demand.

Appendix B - Recommended Project Back Up Information

Palo Alto Recycled Water Facility Plan **DRAFT**

Preferred Alignment Project Cost Summary **6/23/2008**

Description	Units	Unit Cost	Quantity	Extended Cost	Notes
Capital Costs					
Shoring and Bracing[1]	LF	$15	51,500	$762,000	
18" Pipe[1]	LF	$406	13,300	$5,398,000	
16" Pipe[1]	LF	$258	10,300	$2,653,000	
12" Pipe[1]	LF	$239	2,100	$502,000	
10" pipe	LF	$221	6,500	$1,437,000	
6" pipe	LF	$179	8,300	$1,489,000	
4" pipe	LF	$150	11,000	$1,650,000	
US-101 crossing (microtunneling)[2]	LF	$2,000	200	$400,000	
Adobe Creek Bridge Crossing[1]	LF	$756	60	$45,000	
Barron Creek Crossing[1]	LF	$756	40	$30,000	
Alma/Caltrain Crossing (Bore and Jack)[2]	LF	$1,500	200	$300,000	
El Camino Real Crossing (HDD)[2]	LF	$500	400	$200,000	
Foothill Expresseway Crossing (HDD)[2]	LF	$500	400	$200,000	
Microtunneling Shafts (Jacking+ Receiving)[2]	EA	$200,000	1	$200,000	
Bore and Jack Shafts (Jacking+ Receiving)[2]	EA	$180,000	3	$540,000	
Matadero Creek Crossing[1]	LF	$756	50	$38,000	
Customers Retrofits[1]	EA	$3,448	97	$334,000	Includes signage, painting above ground fixtures, purple sprinkler heads
Customers Connections and Meters[1]	EA	$10,662	97	$1,034,000	Includes meters, valving, and air gap (swivel ell)
Appurtenances[1]		6%		$1,033,000	6% of pipeline costs listed above this line
Booster pump station	EA	$900,000	1	$900,000	
RWQCP pump station retrofit	EA	$830,000	1	$830,000	
Mobilization[1]		5%		$999,000	5% of total capital costs listed above this line
Subtotal				**$21,000,000**	
Construction Allowance (30%)		30%		$6,300,000	
Construction Total				**$27,300,000**	
Engineering and Construction Management		15%		$4,100,000	
Right of Way Costs		4%		$1,100,000	
Connection fee				$1,000,000	
Grand Total, Most Probable Cost				**$33,500,000**	
O&M Costs					
Annual Distribution O&M Costs		1%		$175,000	1% of Total Pipeline Costs
Pump Station Operation Cost	kwh	$0.12	435,664	$52,000	Assumes operation of booster pump station 8 hrs/day, 8 mos/year
Pump Station Maintenance Cost		15%		$8,000	of Pump Station Operating Cost
O&M Subtotal				**$235,000**	
Annualized Costs[8]					
Annualized Capital Costs				$2,300,000	
Annual O&M Costs				$200,000	
Total Annualized Cost				**$2,500,000**	
Estimated Recycled Water Yield		916	AFY		
Total Unit Cost, Annualized ($/AFY)				**$2,700**	

Notes:

1. From Mountain View/Moffett Field Recycled Water Pipeline bid information. Average bid estimate (April 2007; ENR: 9103)
2. From San Jose Highway 87 Detour II Sanitary Sewer Reconstruction Phase II (Feb 2005; ENR 8229) and previous RMC project experience.
3. From San Jose Lower Silver Creek Reach 3 construction (January 2005; ENR: 8230)
4. From City of Palo Alto Recycled Water Market Survey Report (RMC, June 2006)
5. From Mountain View/Moffett Field Recycled Water Pipeline bid information. Average bid estimate. Costs adjusted for gravel roads (April 2007; ENR: 9103)
6. Costs are adjusted to March 2008 dollars (ENR: 9150)
7. Assumed productivity along El Camino Real is half of that of other alignments, resulting in installation cost twice as high.
8. Annualized costs developed based on the following assumptions:

Interest Rate:	5.5%
Period (years):	30

Palo Alto Recycled Water Facility Plan **DRAFT**

Unit Costs **4/28/2008**

Description	Unit	Unit Cost	Source	Notes
Shoring and Bracing	LF	$15	A	
24-inch pipe	LF	$427	A	
18-inch pipe	LF	$406	A	
16-inch pipe	LF	$258	A	
12-inch pipe	LF	$239	A	
10-inch pipe	LF	$221	B	
8-inch pipe	LF	$191	A	
6-inch pipe	LF	$179	A	
Bridge Crossings	LF	$756	A	
Trenchless Crossings	LF	$797	A	
Customer Connection and Meters	EA	$10,662	A	
Customer Retrofits	EA	$3,448	A	
Appurtanances	LS	6%	A	% of total construction cost
Mobilization	LS	5%	A	% of total construction cost

All costs set to March 2008 ENR 9150.17

Source:

A - Mountain View/Moffett Field Recycled Water Pipeline bid information. Low bid estimate. April 2007.

B - RMC estimate

RMC
Water and Environment

Date: 25-Mar-08

Project: Palo Alto Recycled Water Facility Plan
Prepared by: KMS

Description: Pipeline Sizing and Booster Pump Station Criteria
Reviewed by: NBO

Palo Alto Recycled Water Pipeline Details

Pipeline Segments identified to confirm and optimize H20Map hydraulic model

Pipeline Segment	Length to demand concentration (ft)	Peak Hour Demand in Segment	Peak Hour Demand in Segment	Peak Hour Flow (mgd)	Peak Hour Flow (gpm)	Pipe Size	Notes
Segment 1	5000	0.57	394	4.64	3224	18	to Mitchell Park
Segment 2	8300	0.15	107	4.07	2829	18	to RR X-ing
Segment 3	1800	0.27	184	3.92	2723	16	to BPS at Mayfield
Segment 4	2600	1.09	758	3.66	2539	16	to Genencor
Segment 5	5,900	0.67	464	2.56	1780	16	to VA hospital
Segment 6	2100	0.69	478	1.90	1316	12	to Roche
Segment 7	1800	0.26	180	0.26	180	6	to Agilent/SAP
Segment 8	6500	0.95	658	0.95	658	10	to Terman Park
Total	**34000**	**4.64**	**3224**	**approximately**			

Notes:

Table above does not include all laterals

dist. To BPS (ft): 15100

RMC
Water and Environment

Date: 25-Mar-08
Project: Palo Alto Recycled Water Facility Plan
Prepared by: KMS
Description: Pipeline Sizing and Booster Pump Station Criteria
Reviewed by: NBO

Palo Alto Recycled Water Hydraulics

Palo Alto Peak Hour flow 3,224 gpm

Hydraulic Data:

Hazen Williams "C" =	120	Qcfs=	7.182
Pipe Diameter (in)=			
Flow (gpm)=	3,224		
(mgd)=	4.642		
(cfs)=	7.182		
Upstream WSEL (ft)=			
Downstream HGL (ft)=			
Minor Losses (% of Hf)=	5%		
Pumping Plant Eff.=	80%		
Number of Duty Pumps =			

Head Loss Calculations:

	Description	Diameter (inches)	Length (ft)	Flow (cfs)	Velocity (ft/sec)	h_f (ft)	K	h_k	h_m (ft)	Σh (ft)	Elevation (ft)	Pressure (ft)	HGL (ft)	Pressure (psi)
	Mtn View Pipeline	24.00		7.18	2.29	0.000	1.000	0.081	0.000	0.081	10.00	214.52	224.52	93.00
	Segment 1	18.00	5000	7.18	4.06	17.878		0.000	0.894	18.772				
	Segment 2	18.00	8300	6.30	3.57	23.314		0.000	1.166	24.479				
	Segment 3	16.00	1800	6.07	4.34	8.357		0.000	0.418	8.775	40.00	132.41	172.41	57.40
	Booster Pump Station									-250.000	50.00	372.41	422.41	161.45
	Segment 4	16.00	2600	5.66	4.05	10.605		0.000	0.530	11.135				
	Segment 5	16.00	5900	3.97	2.84	12.482		0.000	0.624	13.106				
High Point	Segment 6	12.00	2100	2.93	3.73	10.315		0.000	0.516	10.831	190.00	197.34	387.34	85.55
High Point	Segment 7	6.00	1800	0.40	2.05	6.544		0.000	0.327	6.872	195.00	185.47	380.47	80.41
	Segment 8	10.00	6500	1.47	2.69	21.526		0.000	1.076	22.602	100.00	275.57	375.57	119.47
		TOTAL:	34,000						**TOTAL:**	-133.349				

Palo Alto Booster Pump Station

Palo Alto Booster Pump Station Design Point		
Total Flow (gpm) =	3,224	
# of duty pumps	3	
Flow per pump (gpm)	1,075	
Head (ft)	250	
Eff (%)	80%	
Power (hp)	100	Approximately
NPSHr (ft)	TBD	
bhp =	254.64	
hp/pump =	93.37	
Engine hp =	100.00	
Total Installed hp =	**400**	Assumes 1 backup pump

RMC
Water and Environment

Date: 15-Nov-07
Project: Palo Alto Recycled Water Facility Plan
Prepared by: KMS
Description: RWQCP Pump Station Design Calculations
Reviewed by: MHM

Mountain View Scenario

Mtn View Peak Hour flow 4,334 gpm

Hydraulic Data:

Hazen Williams "C" =	120		Qcfs=	9.656	**Pipe Sizing**					
Pipe Diameter (in)=					**Initial Input**			**Diameter Based Results**		
Flow (gpm)=	4,334				Head Loss	5.00	ft/1000ft	Head Loss	5.000	ft/1000ft
(mgd)=	6.241				H-W "C"	120		H-W "C"	120	
(cfs)=	9.656				Flow	9.66	cfs	Flow	9.66	cfs
Upstream WSEL (ft)=						6,991	afy		6,991	afy
Downstream HGL (ft)=						4,333	gpm		4,333	gpm
Minor Losses (% of Hf)=	5%					6.2	mgd		6.2	mgd
Pumping Plant Eff.=	80%				Diameter	18.80	in	Diameter	18.80	in<<<<Call
Number of Duty Pumps =					Velocity	5.0	fps	Velocity	5.01	fps

Head Loss Calculations:

Description	Diameter (inches)	Length (ft)	Flow (cfs)	Velocity (ft/sec)	h_f (ft)	K	h_k	h_m (ft)	Σh (ft)	h_z Elevation (ft)	h_p Pressure (ft)	HGL (ft)	h_p Pressure (psi)
RWQCP	30.00		9.66	1.97	0.000	1.000	0.060	0.000	0.060	0.00	230.67	230.67	100.00
30" Pipe	30.00	2,800	9.66	1.97	1.438		0.000	0.072	1.510				
24" Pipe	24.00	9,035	9.66	3.07	13.759		0.000	0.688	14.447				
Palo Alto Turnout	24.00		9.66	3.07	0.000	1.000	0.147	0.000	0.147	0.00	214.50	214.50	92.99
	TOTAL:	11,835						**TOTAL:**	16.163				

Palo Alto & Mountain View Scenario

Mtn View Peak Hour flow 4,334 gpm
Palo Alto Peak Hour flow 3,310 gpm

Hydraulic Data:

Flow (gpm)=	7,644	Qcfs=	17.031
(mgd)=	11.007		
(cfs)=	17.031		

Head Loss Calculations:

Description	Diameter (inches)	Length (ft)	Flow (cfs)	Velocity (ft/sec)	h_f (ft)	K	h_k	h_m (ft)	Σh (ft)	Elevation (ft)	Pressure (ft)	HGL (ft)	Pressure (psi)
RWQCP	30.00		17.03	3.47	0.000	1.000	0.187	0.000	0.187	0.00	260.65	260.65	113.00
30" Pipe	30.00	2,800	17.03	3.47	4.109		0.000	0.205	4.314				
24" Pipe	24.00	9,035	17.03	5.42	39.308		0.000	1.965	41.273				
Palo Alto Turnout	24.00		17.03	5.42	0.000	1.000	0.456	0.000	0.456	0.00	214.42	214.42	92.96
	TOTAL:	11,835						**TOTAL:**	46.230				

RMC
Water and Environment

Date: 15-Nov-07

Project: Palo Alto Recycled Water Facility Plan
Description: RWQCP Pump Station Design Calculations

Prepared by: KMS
Reviewed by: MHM

RWQCP Pump Stations

Mountain View PS Design Point (from Aurora Submittal)	
Flow (gpm)	1328
Head (ft)	237
Eff (%)	80%
Power (hp)	99.3
NPSHr (ft)	18.3

Effect of Palo Alto Flow (additional head requirements reduce flow)			
Flow (gpm)	1175	Total Flow (gpm)	3525
Head (ft)	260	Capacity Deficit (gpm)	459
Eff (%)	?		
Power (hp)	99		
NPSHr (ft)	17		

Palo Alto PS Design Point

Total Flow (gpm) =	3,769	
# of duty pumps	2	
Flow (gpm)	2,114	
Head (ft)	260	
Eff (%)	80%	
Power (hp)	100-125	Approximately
NPSHr (ft)	18.3	
bhp =	309.63	
hp/pump =	170.30	
Engine hp =	175.00	
Total Installed hp =	**350**	Assumes no backup pumps (Mtn View PS does not include backup pumps)
		Could include a 30-45 hp lead/lag pump (Mtn View PS includes 31 hp pump)

RMC Water and Environment

Project: Palo Alto Recycled Water Facility Plan
Description: RWQCP Recycled Water Storage Analysis

Date: 5-Sep-07
Prepared by: KMS
Reviewed by: NBO

RWQCP Recycled Water Storage Analysis

Total Plant Effluent[2] =	24,311,769	gallons
RW Production Capacity[3] =	8,600,000	gallons
Total Mnt. View RW Demand[4] =	3,600,000	gallons
Total PA RW Demand[4] =	2,000,000	gallons
PA Irrigation Demand[4] =	1,660,000	gallons

Potential for 8.6 mgd in the future with additional banks online

Hour	Wastewater Unit Flow Factor[1]	Total Plant Effluent (gal)	Tertiary Effluent (Rec. Water) (gal)	Mountain View Demand (gal)	Palo Alto Demand (gal)	Storage Tank Fill Rate (gal)	RW Flow Leaving Plant (gpm)	Supply Deficiency (gal)	
6:00	1.00	1,012,990	358,333	0	21,250		21,250	0	
7:00	1.00	1,012,990	358,333	0	21,250		21,250	0	
8:00	1.00	1,012,990	358,333	0	21,250		21,250	0	
9:00	1.00	1,012,990	358,333	0	21,250		21,250	0	
10:00	1.00	1,012,990	358,333	0	21,250		21,250	0	
11:00	1.00	1,012,990	358,333	0	21,250		21,250	0	
12:00	1.00	1,012,990	358,333	0	21,250		21,250	0	
13:00	1.00	1,012,990	358,333	0	21,250		21,250	0	
14:00	1.00	1,012,990	358,333	0	21,250		21,250	0	
15:00	1.00	1,012,990	358,333	0	21,250		21,250	0	
16:00	1.00	1,012,990	358,333	0	21,250		21,250	0	
17:00	1.00	1,012,990	358,333	0	21,250		21,250	0	
18:00	1.00	1,012,990	358,333	0	21,250		21,250	0	
19:00	1.00	1,012,990	358,333	0	21,250		21,250	0	
20:00	1.00	1,012,990	358,333	0	21,250		21,250	0	
21:00	1.00	1,012,990	358,333	0	21,250		21,250	0	
22:00	1.00	1,012,990	358,333	450,000	207,500		657,500	-299,167	Irrigation Period
23:00	1.00	1,012,990	358,333	450,000	207,500		657,500	-299,167	
0:00	1.00	1,012,990	358,333	450,000	207,500		657,500	-299,167	
1:00	1.00	1,012,990	358,333	450,000	207,500		657,500	-299,167	
2:00	1.00	1,012,990	358,333	450,000	207,500		657,500	-299,167	
3:00	1.00	1,012,990	358,333	450,000	207,500		657,500	-299,167	
4:00	1.00	1,012,990	358,333	450,000	207,500		657,500	-299,167	
5:00	1.00	1,012,990	358,333	450,000	207,500		657,500	-299,167	
Totals	**24.00**	**24,311,769**	**8,600,000**	**3,600,000**	**2,000,000**	**0**	**5,600,000**	**2,393,333**	**gpd**

Total Storage Required:	**2,400,000**	**gallons**
Existing Storage:	**600,000**	**gallons**
Converted Cl Contact Basin	**1,800,000**	**gallons**
New Storage Required:	**0**	**gallons**

Notes:

1. Unit flow factors developed from recorded August 2005 RWQCP flows (assumed peak irrigation demand period).
2. Average August 2005 daily flow.
3. Future recycled water (RW) production capacity based on Palo Alto Recycled Water Facility Plan (RMC 2007).
4. Demand estimates obtained from Palo Alto Recycled Water Facility Plan (RMC 2007)

Customer Information			Type of Use[2]			Connection Information					Demand Estimates (MGD)		
ID	Name	Location	Landscape Irrigation	Industrial / Commercial	Total Demand (AFY)[1]	Status[3]	Projected Connection Date[4]	User Assurance Type[5]	Retrofit Required (Yes/No)	Current Fresh Water Supplier[6]	Average Annual	Peak Month	Peak Hour
1	1101 E Meadow Housing	1101 E. Meadow Dr	Yes	No	**0.6**	E	Jul-12	M	Yes	City	0.001	0.001	0.004
2	1451-1601 California Housing	1451 California	No	No	**0.0**	E	Jul-12	M	Yes	City	0.000	0.000	0.000
6	495 Java Drive Assoc	1001 Page Mill Rd	Yes	Yes	**5.0**	E	Jul-12	M	Yes	City	0.004	0.010	0.031
7	850 Assoc C/O WSJ Prop	850 Hansen Wy	Yes	No	**1.2**	E	Jul-12	M	Yes	City	0.001	0.003	0.008
8	940 E Meadow Housing	940 E. Meadow Dr	Yes	No	**0.3**	E	Jul-12	M	Yes	City	0.000	0.001	0.002
9	Agilent Technologies	3500 Deer Creek Rd	Yes	Yes	**40.5**	E	Jul-12	M	Yes	City	0.036	0.083	0.249
10	Agilent Technologies	1601 California Ave	Yes	Yes	**8.6**	E	Jul-12	M	Yes	City	0.008	0.018	0.053
11	Alta Mesa Memorial Park	695 Arastradero Rd	Yes	No	**92.9**	E	Jul-12	M	Yes	Groundwater	0.083	0.191	0.572
12	Alza	1501 California Ave	Yes	Yes	**6.6**	E	Jul-12	M	Yes	City	0.006	0.014	0.041
14	Beckman Instruments	1050 Page Mill Rd	Yes	Yes	**12.2**	E	Jul-12	M	Yes	City	0.011	0.025	0.075
15	C & J Management	3165 Porter Dr	Yes	No	**3.3**	E	Jul-12	M	Yes	City	0.003	0.007	0.021
17	Carramerica Reality Corp	3075 Hansen Wy	Yes	Yes	**6.4**	E	Jul-12	M	Yes	City	0.006	0.013	0.040
18	Carten - Trust	1290 Page Mill Rd	Yes	No	**0.7**	E	Jul-12	M	Yes	City	0.001	0.002	0.005
20	Clark Park	Old Trace Road	Yes	No	**20.0**	E	Jul-12	M	Yes	City	0.018	0.041	0.123
21	CNF Transportation Inc	3240 Hillview Ave	Yes	No	**1.6**	E	Jul-12	M	Yes	City	0.001	0.003	0.010
22	Cooley Godward LLP	3175 Hanover St	Yes	No	**0.8**	E	Jul-12	M	Yes	City	0.001	0.002	0.005
23	CPI	811 Hansen Way	Yes	Yes	**18.5**	E	Jul-12	M	Yes	City	0.016	0.038	0.114
24	Cubberley Community Center	4000 Middlefield Rd	Yes	No	**29.4**	E	Jul-12	M	Yes	City	0.026	0.060	0.181
25	CV Therapeutics, Inc.	1651 Page Mill Rd	Yes	Yes	**5.1**	E	Jul-12	M	Yes	City	0.005	0.011	0.032
26	DNAX Research Institute	901 S. California Ave.	Yes	Yes	**8.3**	E	Jul-12	M	Yes	City	0.007	0.017	0.051
27	Dow Jones & Co	901 California Ave	Yes	Yes	**12.7**	E	Jul-12	M	Yes	City	0.011	0.026	0.078
28	Dow Jones & Co	1701 Page Mill Rd	Yes	No	**0.1**	E	Jul-12	M	Yes	City	0.000	0.000	0.000
29	DPIX	3406 Hillview Ave	Yes	Yes	**21.0**	E	Jul-12	M	Yes	City	0.019	0.043	0.129
30	ECI Deer Creek LLC	3408 Hillview Ave	Yes	Yes	**2.3**	E	Jul-12	M	Yes	City	0.002	0.005	0.014
32	El Carmelo Elementary School	3024 Bryant St	Yes	No	**6.2**	E	Jul-12	M	Yes	City	0.006	0.013	0.038
33	EPRI	3412 Hillview Ave	Yes	Yes	**4.0**	E	Jul-12	M	Yes	City	0.004	0.008	0.025
34	EPRI	3420 Hillview Ave	Yes	Yes	**12.7**	E	Jul-12	M	Yes	City	0.011	0.026	0.078
35	Equity Office Properties	4001 Miranda Ave	Yes	Yes	**13.3**	E	Jul-12	M	Yes	City	0.012	0.027	0.082
36	Equity Office Properties	4005 Miranda Ave	Yes	No	**0.2**	E	Jul-12	M	Yes	City	0.000	0.000	0.001
37	Fairmeadow Elementary School	490 E. Meadow Dr	Yes	No	**1.6**	E	Jul-12	M	Yes	City	0.001	0.003	0.010
38	Finnegan, Henderson LLP	700 Hansen Way	Yes	No	**1.5**	E	Jul-12	M	Yes	City	0.001	0.003	0.009
40	Fire Station	3600 Middlefield Rd	Yes	No	**0.3**	E	Jul-12	M	Yes	City	0.000	0.001	0.002
41	Foothills Club	3351 Miranda Ave	Yes	Yes	**2.6**	E	Jul-12	M	Yes	City	0.002	0.005	0.016
42	Genencor International, Inc	925 Page Mill Rd	Yes	Yes	**19.2**	E	Jul-12	M	Yes	City	0.017	0.039	0.118
43	Gunn Senior High School	780 Arastradero Rd	Yes	No	**26.1**	E	Jul-12	M	Yes	City	0.023	0.054	0.161
44	Hewlett Packard	1501 Page Mill Rd	Yes	Yes	**29.2**	E	Jul-12	M	Yes	City & GW	0.026	0.060	0.180

Customer Information			Type of Use[2]			Connection Information					Demand Estimates (MGD)		
ID	Name	Location	Landscape Irrigation	Industrial / Commercial	Total Demand (AFY)[1]	Status[3]	Projected Connection Date[4]	User Assurance Type[5]	Retrofit Required (Yes/No)	Current Fresh Water Supplier[6]	Average Annual	Peak Month	Peak Hour
45	Hewlett Packard	3000 Hanover St	Yes	Yes	**58.8**	E	Jul-12	M	Yes	City & GW	0.052	0.121	0.362
46	Hewlett Packard	3200 Hillview Ave	Yes	No	**1.9**	E	Jul-12	M	Yes	City & GW	0.002	0.004	0.012
47	Hewlett Packard	3215 Hillview Ave	Yes	No	**1.6**	E	Jul-12	M	Yes	City & GW	0.001	0.003	0.010
48	Hoover Park	2901 Cowper St	Yes	No	**12.6**	E	Jul-12	M	Yes	City	0.011	0.026	0.077
49	Jane L Stanford Middle School	480 E. Meadow Dr	Yes	No	**7.3**	E	Jul-12	M	Yes	City	0.007	0.015	0.045
50	Jane L Stanford Middle School	500 E. Meadow Dr	Yes	No	**4.1**	E	Jul-12	M	Yes	City	0.004	0.008	0.025
51	Legato Systems	3210 Porter Dr	Yes	Yes	**2.0**	E	Jul-12	M	Yes	City	0.002	0.004	0.012
52	Liveops.com Inc	3340 Hillview Ave	Yes	Yes	**2.3**	E	Jul-12	M	Yes	City	0.002	0.005	0.014
53	Lockheed Missiles & Space	3176 Porter Dr	Yes	Yes	**6.3**	E	Jul-12	M	Yes	City	0.006	0.013	0.039
54	Lockheed Missiles & Space	3251 Hanover St	Yes	Yes	**15.3**	E	Jul-12	M	Yes	City	0.014	0.031	0.094
57	Matadero Creek	3172 Porter Dr	Yes	Yes	**5.6**	E	Jul-12	M	Yes	City	0.005	0.011	0.034
60	Mitchell Park	3800 Middlefield Rd	Yes	No	**1.9**	E	Jul-12	M	Yes	City	0.002	0.004	0.012
61	Mitchell Park	600 E. Meadow Dr	Yes	No	**25.7**	E	Jul-12	M	Yes	City	0.023	0.053	0.158
62	Mitchell Park Library	3700 Middlefield Rd	Yes	No	**0.7**	E	Jul-12	M	Yes	City	0.001	0.001	0.004
63	Mozart Development	3300 Hillview Ave	Yes	No	**2.8**	E	Jul-12	M	Yes	City	0.003	0.006	0.018
66	NYSE	845 Page Mill Rd	Yes	No	**1.9**	E	Jul-12	M	Yes	City	0.002	0.004	0.012
67	Our Lady of the Rosary School/Church	3290 Middlefield Rd	Yes	No	**6.2**	E	Jul-12	M	Yes	City	0.006	0.013	0.038
68	Page Mill Center	1530 Page Mill Rd	Yes	Yes	**6.6**	E	Jul-12	M	Yes	City	0.006	0.014	0.041
69	Page Mill Rd Prop, Inc	1801 Page Mill Rd	Yes	Yes	**11.3**	E	Jul-12	M	Yes	City	0.010	0.023	0.070
70	Paine Webber, Inc	775 Page Mill Rd	Yes	Yes	**2.1**	E	Jul-12	M	Yes	City	0.002	0.004	0.013
72	Palo Alto Square	3000 El Camino Real	Yes	Yes	**9.1**	E	Jul-12	M	Yes	City	0.008	0.019	0.056
76	Pennie & Edmonds LLP	3300 Hillview Ave	Yes	No	**0.2**	E	Jul-12	M	Yes	City	0.000	0.000	0.001
81	Pkwy Cal/Birch	2771 Birch St	Yes	No	**1.6**	E	Jul-12	M	Yes	City	0.001	0.003	0.010
86	Pkwy El Camino	3101 El Camino Real	Yes	No	**0.4**	E	Jul-12	M	Yes	City	0.000	0.001	0.002
88	Pkwy Ore/Pg Mill	1600 Page Mill Rd	Yes	No	**4.3**	E	Jul-12	M	Yes	City	0.004	0.009	0.027
90	Prognostics	900 Hansen Wy	Yes	No	**1.5**	E	Jul-12	M	Yes	City	0.001	0.003	0.009
92	Ramos Park	800 E. Meadow Dr	Yes	No	**7.6**	E	Jul-12	M	Yes	City	0.007	0.016	0.047
94	Roche Bioscience	3431 Hillview Ave	Yes	Yes	**76.7**	E	Jul-12	M	Yes	City	0.068	0.157	0.472
95	RWI Group	835 Page Mill Rd	Yes	No	**0.3**	E	Jul-12	M	Yes	City	0.000	0.001	0.002
96	SAP Labs, Inc	3410 Hillview Ave	Yes	No	**11.2**	E	Jul-12	M	Yes	City	0.010	0.023	0.069
97	SAP Labs, Inc	3473 Deer Creek Rd	Yes	No	**7.4**	E	Jul-12	M	Yes	City	0.007	0.015	0.046
98	Simpson Thacher & Bartlet	3330 Hillview Ave	Yes	Yes	**2.3**	E	Jul-12	M	Yes	City	0.002	0.005	0.014
99	Space Systems Loral	3825 Fabian Way	No	No	**0.0**	E	Jul-12	M	Yes	City	0.000	0.000	0.000
100	Stanford & Hines Interest	3150 Porter Dr	Yes	No	**3.6**	E	Jul-12	M	Yes	City	0.003	0.007	0.022
101	Stanford & Hines Interest	3170 Porter Dr	Yes	Yes	**2.4**	E	Jul-12	M	Yes	City	0.002	0.005	0.015
102	Stanford & Hines Interest	3180 Porter Dr	Yes	No	**1.8**	E	Jul-12	M	Yes	City	0.002	0.004	0.011

Customer Information			Type of Use[2]		Total Demand (AFY)[1]	Connection Information				Current Fresh Water Supplier[6]	Demand Estimates (MGD)		
ID	Name	Location	Landscape Irrigation	Industrial / Commercial		Status[3]	Projected Connection Date[4]	User Assurance Type[5]	Retrofit Required (Yes/No)		Average Annual	Peak Month	Peak Hour
103	Stanford & Hines Interest	3421 Hillvew Ave	Yes	No	**3.1**	E	Jul-12	M	Yes	City	0.003	0.006	0.019
104	Stanford & Hines Interest	600 Hansen Way	Yes	Yes	**13.6**	E	Jul-12	M	Yes	City	0.012	0.028	0.084
105	Stanford & Hines Interest	925 Page Mill Rd	Yes	No	**12.8**	E	Jul-12	M	Yes	City	0.011	0.026	0.079
106	Stanford Hospital and Clinics	2670 Hanover St	Yes	Yes	**9.6**	E	Jul-12	M	Yes	City	0.009	0.020	0.059
107	Stanford Hospital and Clinics	2690 Hanover St	Yes	Yes	**2.8**	E	Jul-12	M	Yes	City	0.002	0.006	0.017
108	Stanford Univ	1454 Page Mill Rd	Yes	No	**0.4**	E	Jul-12	M	Yes	City	0.000	0.001	0.003
109	Substation	1151 E. Meadow Dr	Yes	No	**0.1**	E	Jul-12	M	Yes	City	0.000	0.000	0.001
111	Substation	3620 Middlefield Rd	Yes	No	**0.0**	E	Jul-12	M	Yes	City	0.000	0.000	0.000
112	Substation	800 Hansen Way	Yes	No	**0.0**	E	Jul-12	M	Yes	City	0.000	0.000	0.000
113	Terman Park	655 Arastradero Rd	Yes	No	**19.9**	E	Jul-12	M	Yes	City	0.018	0.041	0.122
114	Tibco Software Inc	3301 Hillview Ave	Yes	Yes	**10.4**	E	Jul-12	M	Yes	City	0.009	0.021	0.064
115	Tibco Software Inc	3303 Hillview Ave	Yes	No	**0.7**	E	Jul-12	M	Yes	City	0.001	0.002	0.005
116	Tibco Software Inc	3307 Hillview Ave	Yes	No	**0.4**	E	Jul-12	M	Yes	City	0.000	0.001	0.003
117	Tibco Software Inc	4015 Miranda Ave	Yes	Yes	**2.0**	E	Jul-12	M	Yes	City	0.002	0.004	0.012
118	Trinet Essential	1661 Page Mill Rd	Yes	No	**4.6**	E	Jul-12	M	Yes	City	0.004	0.009	0.028
119	University Club of PA	3277 Miranda Ave	Yes	Yes	**3.0**	E	Jul-12	M	Yes	City	0.003	0.006	0.019
120	VA Palo Alto Health Care	3801 Miranda Ave	Yes	Yes	**37.7**	E	Jul-12	M	Yes	City	0.034	0.077	0.232
122	Varian Medical Systems	3100 Hansen Wy	Yes	Yes	**2.6**	E	Jul-12	M	Yes	City	0.002	0.005	0.016
124	Varian, Inc.	3120 Hansen Wy	No	Yes	**13.8**	E	Jul-12	M	Yes	City	0.012	0.028	0.085
125	VM Ware (formerly Stanford & Hines)	3401 Hillview Ave	Yes	Yes	**29.2**	E	Jul-12	M	Yes	Groundwater	0.026	0.060	0.180
126	VMWare Inc	3305 Hillview Ave	Yes	No	**1.0**	E	Jul-12	M	Yes	City	0.001	0.002	0.006
131	Wilson/S/G/R	650 Page Mill Rd	Yes	Yes	**10.9**	E	Jul-12	M	Yes	City	0.010	0.022	0.067
132	Wilson/S/G/R	950 Page Mill Rd	Yes	Yes	**6.1**	E	Jul-12	M	Yes	City	0.005	0.012	0.037
133	Wilson/S/G/R	975 Page Mill Rd	Yes	No	**0.6**	E	Jul-12	M	Yes	City	0.000	0.001	0.003
134	Xerox Corp	3400 Hillview Ave	Yes	Yes	**7.2**	E	Jul-12	M	Yes	City	0.006	0.015	0.045
					916						**0.865**	**1.989**	**5.966**

Notes:

1. Average Annual Deliveries
2. Ag Irrigation, Landscape Irrigation, Industrial Use, Ground Water Recharge, Etc.
3. E = Use Site exists and currently uses fresh water
   D = Use site under development and will be ready to take water upon completion of construction of water recycling project.
   F = Use site will not be developed to take water until after completion of construction of water recycling project.
4. Connections dates for user sites are estimates. Actual connections are pending CDPH approval to operate irrigation systems
5. M = Mandatory Use Ordinance; C = User Contract
6. Either the City of Palo Alto (City), groundwater, or a combination of both

Appendix C - Alternatives Assessment Back Up Information

Appendix
Palo Alto Recycled Water Recommended Facilities
Reach 1 Alternatives Cost Estimate[6]

REACH 1 - From US-101 Crossing to Middlefield Rd			**Alternative 1A** From connection point at intersection of US-101 and Adobe Creek along Adobe Creek, across Adobe Creek on existing bridge; along W. Bayshore Rd, Fabian Way, across Adobe Creek along E. Meadow Drive to Middlefield Rd.		**Alternative 1B** From new connection point at intersection of E. Bayshore Rd and US-101 by micro-tunneling across US-101; along Fabian Way; across Adobe Creek; along E. Meadow Drive to Middlefield Rd.		**Alternative 1C** From connection point at intersection of US-101 and Adobe Creek across Adobe Creek on pipeline bridge to be constructed; along W. Bayshore Rd; along Fabian Way; across Adobe Creek; along E. Meadow Drive to Middlefield Rd.		**Alternative 1D** From new connection point at intersection of US 101 and Matadero Creek to Middlefield Rd.	
Item	**Unit**	**Unit Cost**	**Quantity**	**Total Cost**	**Quantity**	**Total Cost**	**Quantity**	**Total Cost**	**Quantity**	**Total Cost**
Shoring and Bracing[1]	LF	$15	4700	$69,000	4250	$63,000	4700	$69,000	4,650	$68,000
24" Pipe[1]	LF	$425		$0		$0		$0		$0
24" Pipe[5]	LF	$380		$0		$0		$0		$0
18" Pipe[1]	LF	$404	4700	$1,898,000	4250	$1,716,000	4700	$1,898,000	300	$121,000
18" Pipe[5]	LF	$359		$0		$0		$0	4,350	$1,561,000
16" Pipe[1]	LF	$256		$0		$0		$0	0	$0
12" Pipe[1]	LF	$238		$0		$0		$0	0	$0
US-101 crossing (bridge crossing)[1]	LF	$752	300	$225,525		$0	300	$225,525	300	$225,525
US-101 crossing (Microtunneling)[2]	LF	$2,000		$0	200	$400,000		$0		$0
Adobe Creek Crossing[1]	LF	$752	120	$90,000	60	$45,000	60	$45,000		$0
Adobe Creek Pipe Bridge Crossing[3]	Each	$182,300		$0		$0	1	$182,000		$0
Alma/Caltrain Crossing (Bore and Jack)[2]	LF	$1,500		$0		$0		$0		$0
El Camino Real Crossing (HDD)[2]	LF	$500		$0		$0		$0		$0
Foothill Expresseway Crossing (HDD)[2]	LF	$500		$0		$0		$0		$0
Microtunneling Shafts (Jacking+ Receiving)[2]	Each	$110,000		$0	1	$110,000		$0		$0
Bore and Jack Shafts (Jacking+ Receiving)[2]	Each	$80,000		$0		$0		$0		$0
Matadero Creek Crossing[1]	LF	$752		$0		$0		$0		$0
Adjustment for Productivity[7]	LF	$425		$0		$0		$0		$0
Customers Retrofits[1]	Each	$3,430	4	$14,000	4	$14,000	4	$14,000	5	$17,000
Customers Connections and Meters[1]	Each	$10,606	4	$42,000	4	$42,000	4	$42,000	5	$53,000
Evaluation Subtotal				$2,300,000		$2,400,000		$2,500,000		$2,000,000
Appurtenances[1]	6%			$138,000		$144,000		$150,000	1	$120,000
Mobilization[1]	5%			$115,000		$120,000		$125,000	1	$100,000
Evaluation Total				**$2,600,000**		**$2,700,000**		**$2,800,000**		**$2,200,000**
AF of Recycled Water Served[4]				**9**		**9**		**9**		**15**

Notes:

1. From Mountain View/Moffett Field Recycled Water Pipeline bid information. Average bid estimate (April 2007; ENR: 9103)
2. Based on previous RMC projects (Personal Communication with Glenn Hermanson, July 2007)
3. From San Jose Lower Silver Creek Reach 3 construction (January 2005; ENR: 8230)
4. From City of Palo Alto Recycled Water Market Survey Report (RMC, June 2006)
5. From Mountain View/Moffett Field Recycled Water Pipeline bid information. Average bid estimate. Costs adjusted for gravel roads (April 2007; ENR: 9103)
6. Costs are adjusted to June 2007 dollars (ENR: 9064)
7. Assumed productivity along El Camino Real is half of that of other alignments, resulting in installation cost twice as high.

Appendix
Palo Alto Recycled Water Recommended Facilities
Reach 2 Alternatives Cost Estimate[6]

REACH 2 - From Middlefield Rd to El Camino Real			Alternative 2A: Along E. Meadow Drive, Alma St to Page Mill Rd; along Page Mill Rd to El Camino Real.		Alternative 2B: Along E. Meadow Drive, Cowper St and El Dorado Ave to Alma St; along Alma St to Page Mill Rd; along Page Mill Rd to El Camino Real.		Alternative 2C: Along E. Meadow Drive, W. Meadow Drive, El Camino Way, El Camino Real to Hansen Way.		Alternative 2D: Along Matadero Creek to Alma St; along Alma St to Page Mill Rd; along Page Mill Rd to El Camino Real (only compatible with Alternative 1D)	
Item	**Unit**	**Unit Cost**	**Quantity**	**Total Cost**	**Quantity**	**Total Cost**	**Quantity**	**Total Cost**	**Quantity**	**Total Cost**
Shoring and Bracing[1]	LF	$15	10800	$159,000	10750	$158,000	9250	$136,000	6900	$102,000
24" Pipe[1]	LF	$425		$0		$0		$0		$0
24" Pipe[5]	LF	$380		$0		$0		$0		$0
18" Pipe[1]	LF	$404	9100	$3,674,000	9050	$3,654,000	9250	$3,735,000	300	$121,000
18" Pipe[5]	LF	$359		$0		$0		$0	4,900	$1,758,000
16" Pipe[1]	LF	$256	1700	$436,000	1700	$436,000		$0	1700	$436,000
12" Pipe[1]	LF	$238		$0		$0		$0		$0
US-101 crossing (bridge crossing)[1]	LF	$752		$0		$0		$0		$0
US-101 crossing (Microtunneling)[2]	LF	$2,000		$0		$0		$0		$0
Adobe Creek Crossing[1]	LF	$752		$0		$0		$0		$0
Adobe Creek Pipe Bridge Crossing [3]	Each	$182,300		$0		$0		$0		$0
Alma/Caltrain Crossing (Bore and Jack)[2]	LF	$1,500	400	$600,000	400	$600,000	400	$600,000	400	$600,000
El Camino Real Crossing (HDD)[2]	LF	$500		$0		$0		$0		$0
Foothill Expresseway Crossing (HDD)[2]	LF	$500		$0		$0		$0		$0
Microtunneling Shafts (Jacking+ Receiving)[2]	Each	$110,000		$0		$0		$0		$0
Bore and Jack Shafts (Jacking+ Receiving)[2]	Each	$80,000	1	$80,000	1	$80,000	1	$80,000	1	$80,000
Matadero Creek Crossing[1]	LF	$752		$0	60	$45,100		$0		$0
Adjustment for Productivity[7]	LF	$425		$0		$0	3500	$1,487,500		$0
Customers Retrofits[1]	Each	$3,430	17	$58,000	13	$45,000	17	$58,000	3	$10,000
Customers Connections and Meters[1]	Each	$10,606	17	$180,000	13	$138,000	17	$180,000	3	$32,000
Evaluation Subtotal				$5,200,000		$5,200,000		$6,300,000		$3,100,000
Appurtenances[1]	6%			$312,000		$312,000		$378,000		$186,000
Mobilization[1]	5%			$260,000		$260,000		$315,000		$155,000
Evaluation Total				**$5,800,000**		**$5,800,000**		**$7,000,000**		**$3,400,000**
AF of Recycled Water Served[4]				**112**		**113**		**113**		**13**

Notes:

1. From Mountain View/Moffett Field Recycled Water Pipeline bid information. Average bid estimate (April 2007; ENR: 9103)
2. Based on previous RMC projects (Personal Communication with Glenn Hermanson, July 2007)
3. From San Jose Lower Silver Creek Reach 3 construction (January 2005; ENR: 8230)
4. From City of Palo Alto Recycled Water Market Survey Report (RMC, June 2006)
5. From Mountain View/Moffett Field Recycled Water Pipeline bid information. Average bid estimate. Costs adjusted for gravel roads (April 2007; ENR: 9103)
6. Costs are adjusted to June 2007 dollars (ENR: 9064)
7. Assumed productivity along El Camino Real is half of that of other alignments, resulting in installation cost twice as high.

Appendix
Palo Alto Recycled Water Recommended Facilities
Reach 3 Alternatives Cost Estimate[6]

REACH 3 - From El Camino Real to Hanover St			Alternative 3A From and across El Camino Real, along Page Mill Rd to Hanover St.		Alternative 3B From El Camino Real, along Hansen Way to Hanover St, through private property. (Only Works with Alternative 2C)	
Item	**Unit**	**Unit Cost**	**Quantity**	**Total Cost**	**Quantity**	**Total Cost**
Shoring and Bracing[1]	LF	$15	3300	$49,000	3000	$44,000
24" Pipe[1]	LF	$425		$0		$0
24" Pipe[5]	LF	$380		$0		$0
18" Pipe[1]	LF	$404		$0		$0
16" Pipe[1]	LF	$256	3300	$846,000	3000	$769,000
12" Pipe[1]	LF	$238		$0		$0
US-101 crossing (bridge crossing)[1]	LF	$752		$0		$0
US-101 crossing (Microtunneling)[2]	LF	$2,000		$0		$0
Adobe Creek Crossing[1]	LF	$752		$0		$0
Adobe Creek Pipe Bridge Crossing[3]	Each	$182,300		$0		$0
Alma/Caltrain Crossing (Bore and Jack)[2]	LF	$1,500		$0		$0
El Camino Real Crossing (HDD)[2]	LF	$500	900	$1,350,000		$0
Foothill Expresseway Crossing (HDD)[2]	LF	$500		$0		$0
Microtunneling Shafts (Jacking+ Receiving)[2]	Each	$110,000		$0		$0
Bore and Jack Shafts (Jacking+ Receiving)[2]	Each	$80,000	1	$80,000	1	$80,000
Matadero Creek Crossing[1]	LF	$752		$0		$0
Adjustment for Productivity[7]	LF	$425		$0		$0
Customers Retrofits[1]	Each	$3,430	70	$240,000	70	$240,000
Customers Connections and Meters[1]	Each	$10,606	70	$742,000	70	$742,000
Evaluation Subtotal				$3,300,000		$1,900,000
Appurtenances[1]	6%			$198,000		$114,000
Mobilization[1]	5%			$165,000		$95,000
Evaluation Total				**$3,700,000**		**$2,100,000**
AF of Recycled Water Served[4]				**283**		**283**

Notes:

1. From Mountain View/Moffett Field Recycled Water Pipeline bid information. Average bid estimate (April 2007; ENR: 9103)
2. Based on previous RMC projects (Personal Communication with Glenn Hermanson, July 2007)
3. From San Jose Lower Silver Creek Reach 3 construction (January 2005; ENR: 8230)
4. From City of Palo Alto Recycled Water Market Survey Report (RMC, June 2006)
5. From Mountain View/Moffett Field Recycled Water Pipeline bid information. Average bid estimate. Costs adjusted for gravel roads (April 2007; ENR: 9103)
6. Costs are adjusted to June 2007 dollars (ENR: 9064)
7. Assumed productivity along El Camino Real is half of that of other alignments, resulting in installation cost twice as high.

Palo Alto Recycled Water Facility Plan
Recycled Water Pipeline Alignment Refinement Appendix
Reach 4 Cost Estimate[6]

REACH 4 - From Hanover St to Arastradero Rd			**Alternative 4A** Along Hanover St and Hillview Ave. to Arastradero Ave.	
Item	**Unit**	**Unit Cost**	**Quantity**	**Total Cost**
Shoring and Bracing[1]	LF	$15	7150	$105,000
24" Pipe[1]	LF	$425		$0
24" Pipe[5]	LF	$380		$0
18" Pipe[1]	LF	$404		$0
16" Pipe[1]	LF	$256	7150	$1,832,000
12" Pipe[1]	LF	$238		$0
US-101 crossing (bridge crossing)[1]	LF	$752		$0
US-101 crossing (Microtunneling)[2]	LF	$2,000		$0
Adobe Creek Crossing[1]	LF	$752		$0
Adobe Creek Pipe Bridge Crossing[3]	Each	$182,300		$0
Alma/Caltrain Crossing (Bore and Jack)[2]	LF	$1,500		$0
El Camino Real Crossing (HDD)[2]	LF	$500		$0
Foothill Expresseway Crossing (HDD)[2]	LF	$500	900	$450,000
Microtunneling Shafts (Jacking+ Receiving)[2]	Each	$110,000		$0
Bore and Jack Shafts (Jacking+ Receiving)[2]	Each	$80,000	1	$80,000
Matadero Creek Crossing[1]	LF	$752		$0
Adjustment for Productivity[7]	LF	$425		$0
Customers Retrofits[1]	Each	$3,430	17	$58,000
Customers Connections and Meters[1]	Each	$10,606	17	$180,000
Evaluation Subtotal				$2,700,000
Appurtenances[1]	6%			$162,000
Mobilization[1]	5%			$135,000
Evaluation Total				**$3,000,000**
AF of Recycled Water Served[4]				**407**

Notes:

1. From Mountain View/Moffett Field Recycled Water Pipeline bid information. Average bid estimate. April 2007 (ENR: 9103)
2. Based on previous RMC projects (Personal Communication with Glenn Hermanson, July 2007)
3. From San Jose Lower Silver Creek Reach 3 construction (January 2005; ENR: 8230)
4. From City of Palo Alto - Recycled Water Market Survey Report June 2006
estimate. April 2007 (ENR: 9103)
6. Costs are adjusted to June 2007 dollars (ENR: 9064)
7. Assumed productivity along El Camino Real is half of that of other alignments, resulting in installation cost of 24" pipe twice as high.

Appendix D - Preliminary Alignment Site Visit, May 17, 2007

Memorandum

Palo Alto Recycled Water Facility Plan

Subject: **May 17, 2007 Site Visit**

Prepared For: Jane Ratchye

Prepared by: Kevin Smith, Erin Darling

Reviewed by: Helene Kubler, Mike Matson

Date: May 29, 2007

This memorandum documents the findings of the May 17, 2007 site visit (including meeting with City staff in preparation for the site visit). It will serve as the basis to refine the preferred conceptual pipeline alignment as currently identified in the Recycled Water Market Survey (RMC, 2006) and refine the project cost estimates. A particular objective of the meeting with the City was to identify any abandoned utility (e.g., water line, sewer line) that could be used to reduce the project costs.

This memorandum is organized as follows:

- Conceptual Pipeline Alignment
- Site Visit Summary

Conceptual Pipeline Alignment

The preferred conceptual pipeline alignment as identified in the Recycled Water Market Survey (RMC, 2006) is illustrated on **Figure 1**.

The conceptual pipeline alignment involves the following:

- Connection to the planned recycled water pipeline stub-out at East Bayshore Road near Alamo Creek.
- A 24-inch diameter pipeline would be extended from the existing pipeline underneath US-101 southwest along East Meadow Drive to Park Boulevard, crossing the Alma Street/Joint Powers Board right-of-ways.
- An 18-inch diameter pipeline would extend from the 24-inch pipeline northwest along Park Boulevard to Page Mill Road. This section would cross Matadero Creek and Barron Creek. At these crossings, trenchless construction techniques were assumed.
- A booster station would be located on the 18-inch pipeline in the vicinity of the intersection of Page Mill Road and El Camino Real.
- A 16-inch diameter pipeline would extend from the 18-inch pipeline at Park Boulevard southwest along Page Mill Road to Hanover Street.
- At Hanover Street, a 12-inch diameter pipeline lateral would continue along Page Mill Road to Foothill Expressway.
- A 16-inch diameter pipeline would extend from Page Mill Road along Hanover Street and Hillview Avenue to Arastradero Road, where a 12-inch diameter pipeline would continue to the end of the alignment at the Foothill Expressway.

Meeting and Site Visit Summary

Figure 2 illustrates areas of interest that were discussed at the meeting with City staff and/or toured on May 17th. Each area of interest is numbered for referencing purposes.

Table 1 provides the following information for each area of interest noted in Figure 2:

- A brief description of the area along the currently proposed alignment
- Potential issues that should be considered in refining the pipeline alignment and cost estimate
- Potential alignment sub-alternatives that might be considered as part of the Facility Plan. The alignment sub-alternatives were identified based on input from City staff and/or field observations. Specific discussions were held to identify existing utilities such as abandoned water line that could be used to reduce the project costs. The two most promising utilities that were identified are the Matadero Creek corridor and an abandoned water line owned by SFPUC. Both utilities will be further investigated (see areas of interest #1 and # 6). There are no other useable utilities known to the City Staff along the Alma and railroad corridor and/or other area of interest.
- Immediate next steps to refine the alignment
- Site photos

Figure 1: Preferred Conceptual Pipeline Alignment (RMC, 2006)

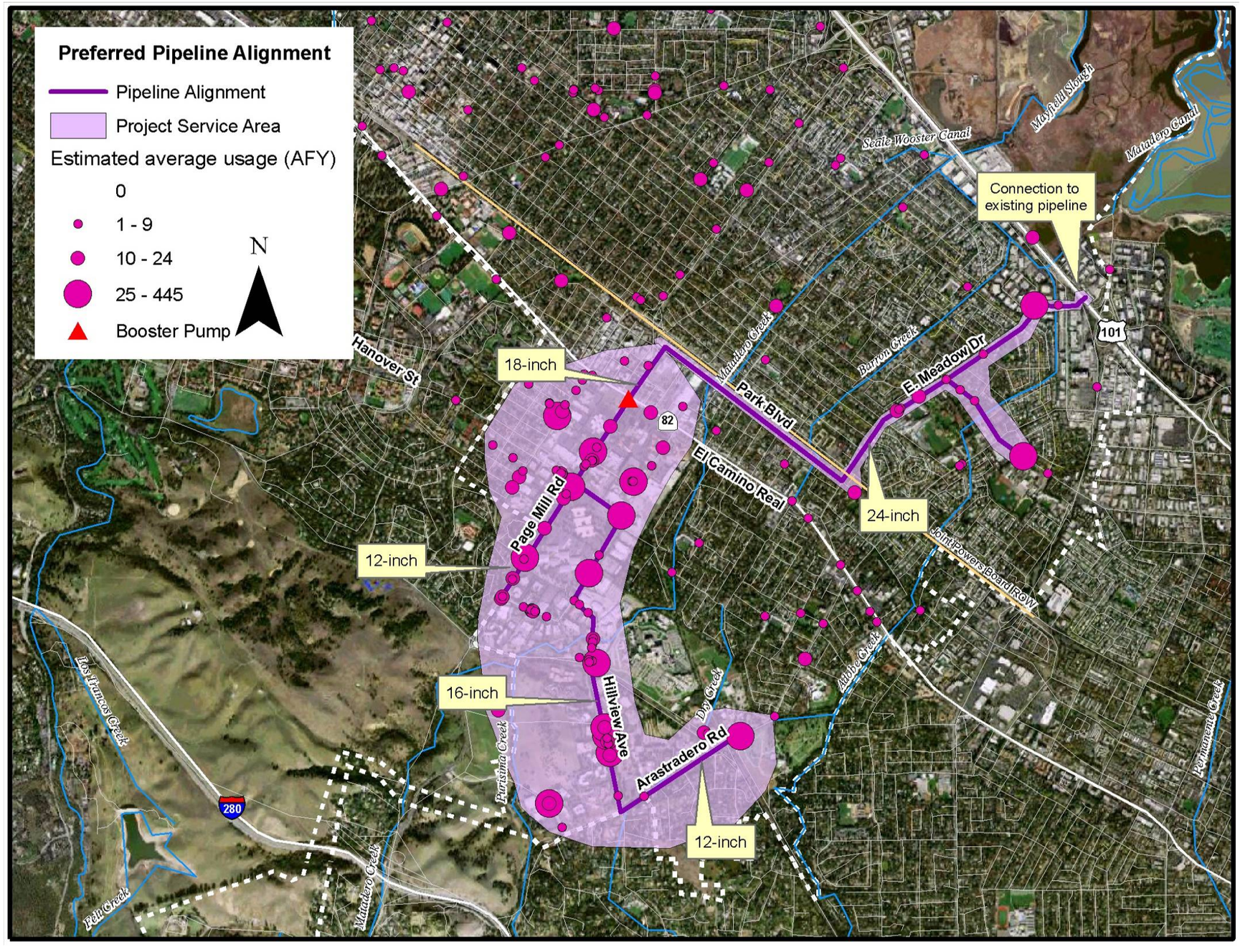


Figure 2: Alignment Site Visit Map

Table 1: Meeting with City Staff and Site Visit Summary

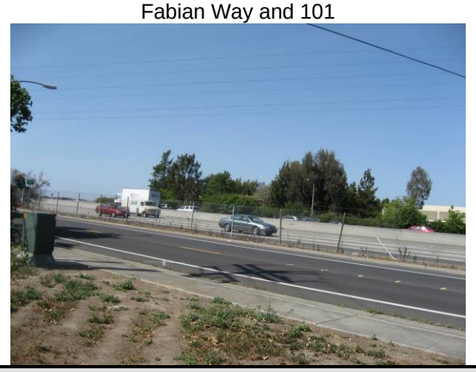
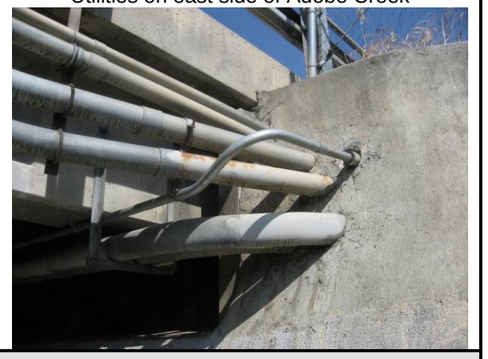
#1: Connection to Mountain View Recycled Water Project and Highway 101 Crossing	
General Description	The Mountain View/Moffett Field Area (MV) RW pipeline will be constructed along East Bayshore Rd. If feasible, the Palo Alto RW project could connect to the MV pipeline at East Bayshore Rd. and Adobe Creek. The RW pipeline would cross under East Bayshore Rd, Highway 101, and Fabian Way (each a separate overpass) possibly attached to the west side of Adobe Creek's channel wall. Currently no utilities use this west wall; several utilities are attached to the east wall. The west wall has an area above the creek channel and below the bridge to attach the pipeline that is approximately 28-inches in height. There is a pedestrian walkway on the east side of the creek underpass (approx. 5 feet wide).
Potential Issues	• The planned connection point with the MV pipeline is currently designed for a location approximately 1300-ft to the southeast on East Bayshore Rd. The planned connection is currently designed as a 12" stub out. Both issues must be addressed prior to MV pipeline construction. The MV pipeline project manager (Daisy Stark) has indicated the September/October timeframe as the deadline for changing the stub-out size and location (see e-mail attached at the end of this memorandum). • Construction access and right-of-way issues must be investigated to use the channel wall for the alignment (Caltrans, Palo Alto, SCVWD). • Potential biological impacts associated with Adobe Creek crossing should be considered. There are a few trees lining the roadway above the creek that need to be considered.
Sub-alternatives to Be Considered	• Crossing at Matadero Creek, near the intersection of West Bayshore Rd. and Colorado Ave. and running the pipeline along the Creek to Alma ` • Tunneling under Highway 101 near the planned connection point with the MV pipeline (1300-ft southeast of Adobe Creek on East Bayshore Rd). Utilizes parking area at intersection of Fabian Way and East Meadow Dr. for access pit.
Next Steps	• Refine hydraulic analysis to confirm pipe size (18-inch or 24-inch?) • Confirm feasibility of using the Adobe Creek channel for Highway 101 Crossing • Evaluate the feasibility of using the Matadero Creek corridor (coordinate with SCVWD as part of funding discussion) • Coordinate with MV pipeline construction. In particular, provide information to Daisy Stark per e-mail attached at the end of this memorandum.
Site Photos	Fabian Way and 101  Looking NW at Fabian Way/101 overpass  Looking at west side of Adobe Creek under 101  Utilities on east side of Adobe Creek 
#2: Adobe Creek Crossing on East Meadow Dr.	
General Description	After the Highway 101 crossing (see #1 above) the Palo Alto RW pipeline would run on the south side of Fabian Way before turning onto East Meadow Dr. On East Meadow Dr., the pipeline will be placed on the south side of the Adobe Creek bridge. As shown in the site photos, there is currently a utility on the north side of the bridge and the south side does not have any utilities attached to it.
Potential Issues	Right-of-way and bridge ownership must be determined to request permission to support the pipeline on the bridge. Structural evaluation may be needed. Potential biological impacts associated with Adobe Creek crossing should be considered.
Sub-alternatives to Be Considered	• At south end of Highway 101 Crossing (see #1 above) construct pipe bridge over Adobe Creek from the north side of the creek to the south side. Run pipeline adjacent to Adobe Creek in SCVWD access road to East Meadow Dr. This would avoid the E. Meadow Dr. bridge crossing.
Next Steps	• Determine ownership of Fabian Way right-of-way (City or Caltrans) • Investigate utilities in Fabian Drive • Coordinate with Public Works re: pavement moratorium policy and status of Fabian Way

Table 1: Meeting with City Staff and Site Visit Summary

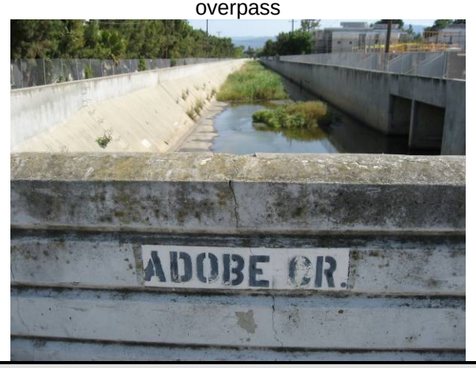
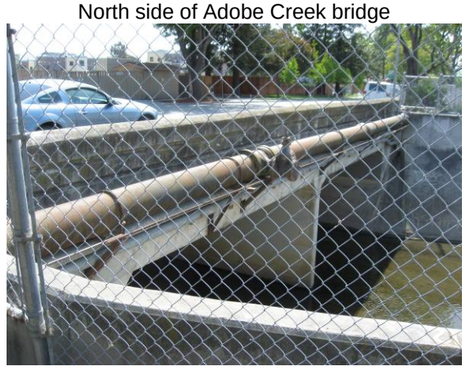
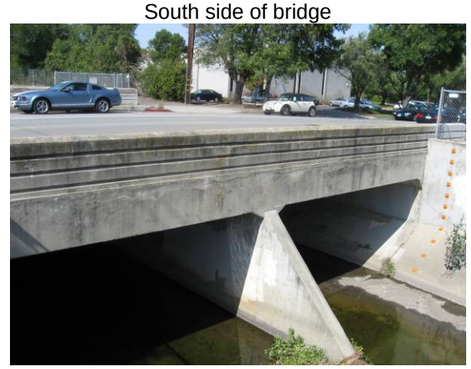
Site Photos	Looking south at Adobe Creek from E. Meadow overpass 	North side of Adobe Creek bridge 	Utility on north side of bridge 	South side of bridge 
#3: East Meadow Drive				
General Description	The pipeline would run along East Meadow Drive for approximately 7500 feet. East Meadow Drive is a wide, two-lane road with a bike lane in both directions and occasional parking availability on the shoulders next to the bike lane. The road looks like it has been paved within the last 5-10 years.			
Potential Issues	Potential traffic control issues. Potential issues with construction near a school (sensitive receptor for air and noise)			
Next Steps	• Investigate utilities on East Meadow to refine alignment, including most feasible side of street to use. • Coordinate with City Public Works re: pavement moratorium policy and status of E. Meadow Dr.			
Site Photos	Intersection traveling north on East Meadow Dr. 	East Meadow Dr. passes several parks and green spaces 	Traveling north on East Meadow Dr. 	School on East Meadow Dr. 
#4: Middlefield Rd.				
General Description	The RW pipeline would branch off at Middlefield Road to serve several customers, including Mitchell Park and the Cubberly Community Center. Middlefield Rd. is a two-lane road with several stoplight intersections, including a high traffic volume intersection at East Charleston Rd.			
Potential Issues	Traffic control issues. Potential temporary issues with disruption of recreation activities at Mitchell Park.			
Next Steps	• Investigate utilities on Middlefield Road to refine alignment			

Table 1: Meeting with City Staff and Site Visit Summary

Site Photos	Looking south from East Meadow Drive at the Middlefield Road intersection 	Looking east from Middlefield Road at the East Charleston Road intersection 	Mitchel Park from Middlefield Road 	Cubberly Community Center from Middlefield Road 
#5: East Meadow Drive Railroad Crossing				
General Description	The alignment along East Meadow Drive would cross the CalTrain railroad tracks between Alma St. and Park Blvd. It is assumed that a trenchless crossing under railroad tracks will be required.			
Potential Issues	Potential traffic issues during construction.			
Next Steps	• Investigate utilities along railroad tracks to determine length of the crossing Crossing may need to cross one or both roads (also see subalternatives to area of interest #6 as they might affect the crossing location) • Contact Caltrans and City for crossing requirements, perhaps modeling after earlier project.			
Site Photos	Traveling north on East Meadow approaching the railroad tracks 	Railroad tracks 	Looking north from railroad tracks to the East Meadow-Alma St. intersection 	Looking north on East Meadow from the Alma St. intersection 
#6: Park Blvd.				
General Description	The pipeline would turn from East Meadow Drive onto Park Blvd, a two-lane residential road.			
Potential Issues	There may be significant utility congestion on Park Blvd. Further utility investigation is necessary to determine the feasibility of constructing a pipeline on Park Blvd. Using Alma St. is the primary alignment alternative at this time. Half of the reach has been newly paved. Potential traffic issues during construction.			
Sub-alternatives to Be Considered	• Alignment on Alma with Caltrain crossing at Page Mill Road and Park Blvd (ample room for pit on Park Blvd side) • Alignment on Cowper Street/El Dorado Av/Alma (if feasible, it would educe disruption on Alma and allow to serve Hoover Park) • Alignment on W. Meadow Dr/El Camino Way/El Camino Real • Alignment using the abandoned SFPUC water line. The line is believed to be a 10-inch cast iron line, although no drawing is currently available. The exact alignment is not known. It is believed to start at California and El Camino Real and run south towards Moffett Field via the Alma/Matadero Creek area. • Alignment on Park Boulevard with diversion around narrow stretch of Park Boulevard onto Wilson, Birch and Lambert. This sub-alternative could be combined with connecting to Hansen Way to avoid going to Alma/Page Mill (see #8)			

Table 1: Meeting with City Staff and Site Visit Summary

Next Steps	• Investigate utilities on Park Blvd and alternative roads • Further investigate the feasibility of using the abandoned SFPUC water line (including contact SFPUC to obtain drawings and consider solutions to pipe size constraint) • Coordinate with City Public Works re: pavement moratorium policy and status of Park Blvd • Coordinate with City traffic engineer on all alternatives (particularly alternative involving El Camino Real and Alma)			
Site Photos	Traveling east on Park Blvd. 	Traveling east on Park Blvd. 	Traveling east on Park Blvd. 	Traveling east on Park Blvd. 
#7: Page Mill Road/El Camino Real Crossing				
General Description	The pipeline on Park Blvd. would turn south onto Page Mill Road. Page Mill Road is a heavily-trafficked, four-lane road with several additional turning lanes at major intersections.			
Potential Issues	The crossing of El Camino Real is at a large intersection with four-lanes and additional turning lanes. Traffic control will be an important consideration for implementation.			
Sub-alternatives to Be Considered	• Trenchless vs. open cut (likely night construction) construction across El Camino Real • Lambert to parking lot west of El Camino (trenchless under El Camino) then onto Hansen Way. • See subalternatives under area of interest #6.			
Next Steps	• Evaluate alternative alignments in this reach, considering cost, traffic, permitting, construction disruption • Confirm need/potential location for booster pump station. Could locate in subalternative parking lot site below grade or in landscaped area along Page Mill or at park Page Mill at El Camino			
Site Photos	Traveling South on Page Mill Road, approaching El Camino Real 	Traveling South on Page Mill Road, approaching El Camino Real 	Traveling South on Page Mill Road, approaching El Camino Real 	Traveling South on Page Mill Road, after El Camino Real 
#8: Page Mill				
General Description	Page Mill Road traffic arterial (4 lanes). Bike lanes on each side.			
Potential Issues	Based on the initial site visit, the alternative on Hanover Street/Hansen Way does not seem a preferable alignment. The area between Hansen Way and Hanover Street includes an access road and several private parking lots. The primary issue is that easements would be required from the owners of the private lots.			
Sub-alternatives to Be Considered	• Alignment on Hanover Street/Hansen Way (newly paved) - The “cut through” would begin at Park Blvd and travel southwest over El Camino Real to Hansen Way. From Hansen Way, the pipe would have to travel through several hundred feet of parking lots and private party to Hanover Street. Also see alternative for #7 and #6			
Next Steps	• Investigate utilities to refine alignment on Page Mill (which side of street?) • Evaluate alternative alignment			

Table 1: Meeting with City Staff and Site Visit Summary

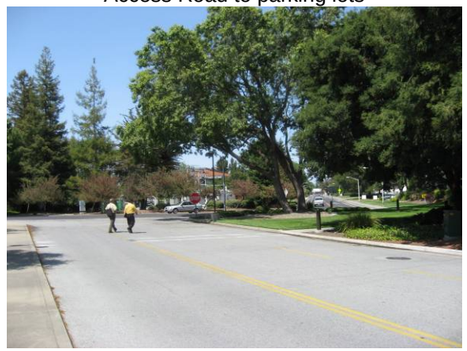
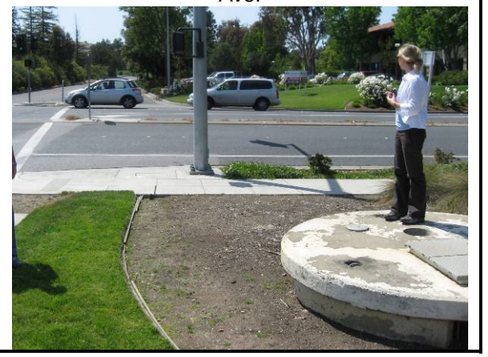
Site Photos	Private loading area between Hanover St. and Hansen Way 	Access road to parking lots 	Access Road to parking lots 	Hansen Way from access road 
#9: Hillview Ave. and Arastradero Road				
General Description	The RW alignment would run from Hansen Way onto Hillview Ave, and then on Arastradero Road. Hillview is a two-lane road with a shoulder and sidewalk on one side. In the middle of the reach is a hill.			
Potential Issues	• Traffic control will be an important consideration for construction due to potential impact to businesses • Creek crossing near Foothill Blvd			
Sub-alternatives to Be Considered	• Alignment from Hillview Ave. along Miranda Ave. to serve customers on Arastredero Road • Alignment from Hillview Ave. to serve customers on Arastredero Road via the back of the VA Hospital			
Next Steps:	• Investigate utilities on Hillview Ave. and Miranda Av. to refine alignment • Evaluate alternative alignment in the back of the VA Hospital at the customer workshop and after verifying location of SFPUC Bay Division pipelines			
Site Photos	Traveling south on Hillview Ave. 	Traveling south on Hillview Ave. 	Traveling south on Hillview 	Several customers are located on Hillview Ave. 
#10: Hillview Ave./Foothill Expy Crossing				
General Description	The pipeline would be aligned on Hillview Ave and cross Foothill Expressway, a four-lane road with a wide median. Hillview Ave. also crosses Miranda Ave., which parallels Foothill Expressway.			
Potential Issues	• SFPUC Bay Division water transmission pipelines are located in the vicinity of Hillview Ave. and Foothill Expressway. As shown in the site photos, a large vault is located on the north east corner of the intersection. • Trenchless crossing of Foothill Expressway and BDPL may be required • Potential traffic issues during construction			
Next Steps	• Investigate crossing requirements with City • Determine location of BDPL facilities • Verify SFPUC Bay Division water transmission pipeline location			

Table 1: Meeting with City Staff and Site Visit Summary

Site Photos	Looking south on Hillview Ave. across Foothill Expressway 	Looking southwest on Hillview Ave. across Foothill Expressway 	Looking west on Foothill Expressway across Hillview Ave. 	SFPUC vault on the northeast corner of Hillview Ave. 

Attachment

From: Stark, Daisy
Sent: Monday, May 21, 2007 2:26 PM
To: Cwiak, Roger; Ratchye, Jane
Cc: Flanigan, Jim; Antonio, Romel; Allen, James
Subject: RE: Preferred Pipeline Alignment for Reclaimed Water Line Phase II

Hi Jane and Roger,
This is a recap of the discussion at our 5/16 meeting, which addresses the questions in your Email below. If there are any discrepancies, please let me know.

1. We will move the stub out that is close to Adobe to the Adobe Creek & E. Bayshore location. You or your consultant will let us know the exact location and the size of the stub out.
2. We will add a valve at the Adobe stub out.
3. If necessary, we will revise the size of the stub out.

You or your consultant will let us know the location and the size of the stub out as soon as possible, and no later than the submittal stage of our project (estimate early October this year). Cost of these changes will be borne by your project.

Please have your consultant review the hydraulic. Under the design of the MV/Moffett project, it is assumed that Palo Alto will take off at either Embarcadero junction or at Metadero Creek, hence the main transmission pipe reduces from 30" to 24" at Metadero.

Daisy

-----Original Message-----
From: Cwiak, Roger
Sent: Wednesday, May 16, 2007 1:24 PM
To: Allen, James; Stark, Daisy
Cc: Flanigan, Jim; Antonio, Romel; Ratchye, Jane
Subject: Preferred Pipeline Alignment for Reclaimed Water Line Phase II

At today's Public Works Coordination meeting we discussed locations of Tees that would be installed in the reclaimed water line extending to Mountain View. The line you are building will supply the reclaimed water to the CPA Phase II of this project that is shown in the following link.

U:\Water Engineering\Reclaimed Water Project\Preferred Alingment.pdf

The Phase II line is shown connecting to your project at Adobe Creek. Please include a provision in your project for the CPA Preferred alignment as shown in the attached file at Adobe Creek and East Bayshore Frontage Road.

We also discussed having valves installed on the tees with blind flanges installed on the valves. The valves will facilitate the future connections to the system without shutting the reclaimed water line down.

Please let me know if you can make these accommodations in your project. Thank you.

Roger Cwiak, PE
Engineering Manager
Water Gas and Wastewater Engineering
City of Palo Alto Utilities
650-566-4507
Roger.Cwiak@cityofpaloalto.org

Appendix E - City of Palo Alto Recycled Water Market Survey (RMC 2006)

City of Palo Alto - Recycled Water Market Survey Report

Final Report

Prepared by:

RMC
Water and Environment

July 2006

Table of Contents

List of Tables

List of Figures

References

Appendices

Acknowledgements

The Palo Alto Recycled Water Market Survey Project represents a collaborative effort between RMC, the City of Palo Alto and local stakeholders. We would like to acknowledge and thank the following key personnel whose contributions and assistance were instrumental in the preparation of this Report.

Jane Ratchye – City of Palo Alto Utilities Department

Virginia Waik – City of Palo Alto Utilities Department

Jerry Brown – City of Palo Alto Utilities Department

Bruce Lesch – City of Palo Alto Utilities Department

List of Abbreviations

AF	acre foot
AFY	acre foot per year
BARWRP	Bay Area Regional Water Recycling Program
BAWSCA	Bay Area Water Supply and Conservation Agency
CCI	Construction Cost Index
CEQA	California Environmental Quality Act
DHS	California Department of Health Services
DWR	Department of Water Resources
EIR	Environmental Impact Report
ENR	Engineering News Record
FPGP	Facilities Planning Grant Program
FY	fiscal year
GIS	geographic information system
gpd	gallons per day
gpm	gallons per minute
HCF	hundred cubic foot
IRWMP	Integrated Regional Water Management Plan
LTGS	Long-Term Goals Study
mgd	million gallons per day
mg/L	milligram per liter
MND	Mitigated Negative Declaration
MPN	Most Probable Number
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
O&M	operations and maintenance
RWQCP	Palo Alto Regional Water Quality Control Plant
SBWR	South Bay Water Recycling
SCVWD	Santa Clara Valley Water District
SFPUC	San Francisco Public Utilities Commission
SRF	State Revolving Fund
SWRCB	State Water Resources Control Board
USBR	United States Bureau of Reclamation
USFWS	United States Fish and Wildlife Service

Executive Summary

ES-1 Background

Recycled water use is expanding in the South San Francisco Bay Area. The Palo Alto Regional recycled water system is expanding into Mountain View and potentially beyond. The South Bay Water Recycling (SBWR) program, the largest in the San Francisco South Bay Area, continues to expand southward. It has been fourteen years since the City of Palo Alto completed its Recycled Water Master Plan. Two key goals of the Palo Alto Regional Water Quality Control Plant (RWQCP), its partners, neighboring communities and other stakeholders (such as the Santa Clara Valley Water District [SCVWD]), include the use of recycled water:

- **Water Supply Management** – A key long-term goal of the RWQCP's stakeholders is to maximize recycled water as a supplemental water source, thus (1) increasing water supply reliability, by freeing up drinking water, currently used for irrigation and other non-potable uses, for strictly potable uses, (2) providing a dependable, locally controlled water source, (3) protecting landscape value as irrigation and other non-potable uses are the first to be cut back during droughts, and most importantly, (4) reducing reliance on imported water.
- **Regional Connectivity** – The RWQCP's long-term endeavor is to establish connectivity with the recycled water producers (e.g. Sunnyvale) and users in the region. Examples of how the regional connectivity will benefit the region include: (1) improving recycled water system redundancy and reliability to the customers, (2) sharing storage and/or system capacity, and (3) helping water agencies in the region reach their recycled water use goals, thereby improving water supply management regionally.

A recycled water project within the City of Palo Alto will meet these criteria, in addition to improving San Francisco Bay Conservation by reducing the discharge of substances that could impact sensitive Bay environment.

ES-2 Study Purpose

The purpose of this study is to:

- Update the Palo Alto Recycled Water market
- Update the Palo Alto Recycled Water system cost estimate

ES-3 Findings and Conclusions

This Study determined the following:

- The market for recycled water is less than that estimated in 1992.
- The total city-wide potential demand is 1,693 AFY (compared to 2,674 AFY in the 1992 study), not including Stanford University.
- The focus of the study was on the irrigation systems served by the City's potable water supply served by SFPUC water.
- Customer surveys showed that customer recycled water concerns focus on salinity. SCVWD has partnered with Mountain View and SBWR to investigate the impact of salinity on redwood trees. Reduction of recycled water salinity from current 900 mg/L (compared to SFPUC water salinity levels of less than 100 mg/L) may be required in the future to meet customer concerns.
- The Stanford Research Park area is the best opportunity for expansion of the Palo Alto recycled water system, with an annual demand of approximately 720 AFY of recycled water. This area is deemed the Project Focus Area.

- Future expansions of recycled water projects within the RWQCP service area include Stanford University, East Palo Alto, and Los Altos, based on requests from those outside interests.
- The proposed pipeline alignment to serve Stanford Research Park was selected to maximize the recycled water market and minimize utility and traffic impacts.
- The pipeline is sized to provide peak hour service to the Project Focus Area. A remote reservoir could enable future pipeline extensions to serve additional markets.
- The project capital cost to serve roughly 840 AFY of recycled water is $16.9 million, which represents roughly a $1959/AF project, including operating and maintenance costs.
- State loan and grant opportunities are anticipated for this project. Without grant assistance, recycled water rate would need to be roughly 130% of the potable water rate in order to cover all costs.
- Market variation and/or the need for salinity management are two factors that could impact unit cost and associated break-even cost of this project.

ES-4 Next Steps

Based on the increasing emphasis on developing local supplies in the region, and the projected availability of state, federal, and possibly local funding for recycled water projects, it is recommended that the City of Palo Alto continue this initiative by performing the following steps:

- Submit an application to the SWRCB requesting planning grant funding assistance (up to $75,000 match) to conduct a facility plan and preliminary engineering for the recommended project.
- Proceed with facility planning and environmental documentation for the recommended project.
- Engage with the Palo Alto RWQCP and the City of Mountain View regarding a regional salinity management initiative.
- Pursue local funding support from SFPUC/BAWSCA and SCVWD.
- Track the Bay Area Integrated Regional Water Management Planning initiative to help assure that this recommended phase of the Palo Alto RWQCP recycling program is eligible for future state grant funding.

Chapter 1 Introduction

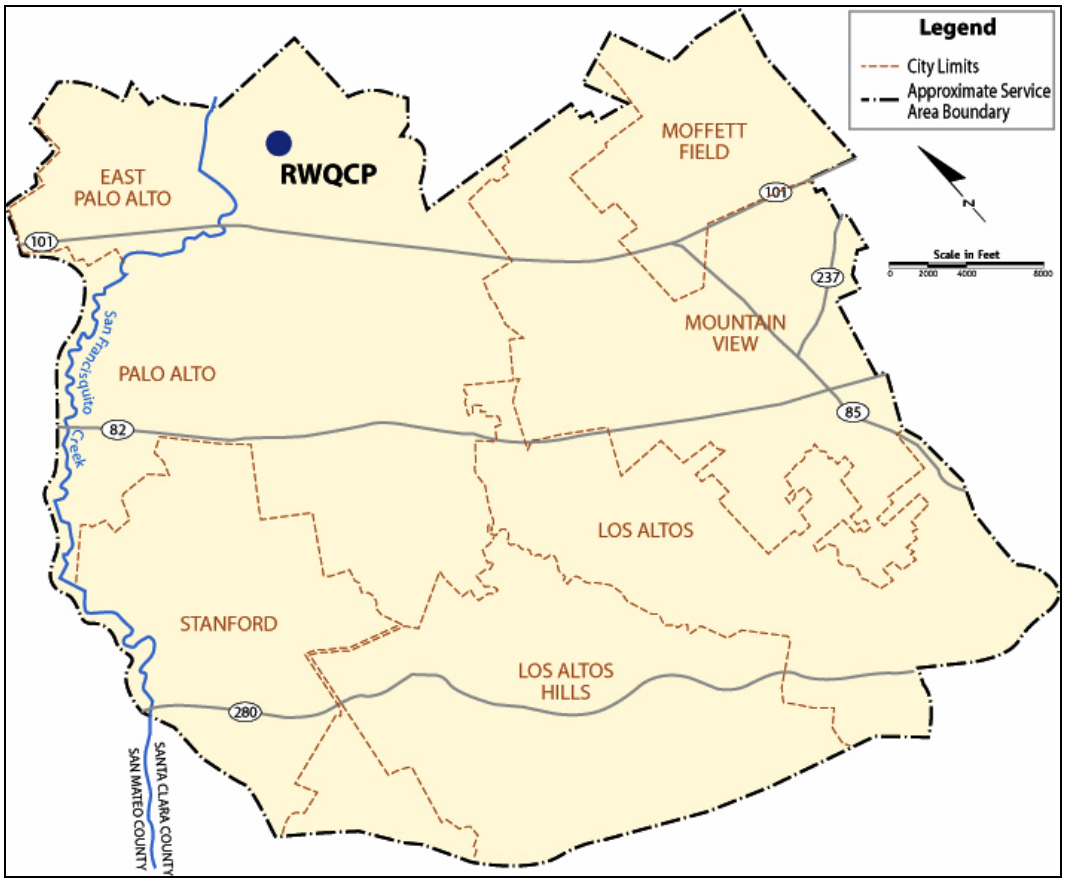
The City of Palo Alto Recycled Water Market Survey Study (Study) was prepared by RMC Water and Environment (RMC), as a consultant to the City of Palo Alto (City). The purpose of the Project is to (1) update the 1992 Water Reclamation Master Plan's Market Survey of the City of Palo Alto and (2) update the Master Plan's project cost estimates based on the Palo Alto recycled water market survey.

This chapter presents the background and the goals of the Study. It also identifies the Study objectives, and describes the report organization.

1.1 Background

The RWQCP is located on the San Francisco Bay, in the northeastern portion of the City of Palo Alto. It provides treatment and disposal of wastewater to the Cities of Palo Alto, Mountain View and Los Altos, the Town of Los Alto Hills, the East Palo Alto Sanitation District and Stanford University, known collectively as the RWQCP Partners. Figure 1-1 shows the RWQCP service area. The RWQCP has a design average dry weather flow capacity of 38 million gallons per day (MGD) and a current flow of about 23 MGD.

Figure 1-1: RWQCP Service Area



Although the disinfected secondary effluent from the RWQCP is predominantly discharged to the San Francisco Bay through an effluent outfall, the RWQCP has a 4 MGD recycled water facility that filters and disinfects the effluent to meet the requirements for "unrestricted use" as defined in California Code of Regulations, Title 22, Sections 60301 through 60355. The RWQCP currently delivers about 1 MGD of

recycled water to a number of irrigation sites during the summer months under its Water Reuse Program. The Mountain View/Moffett Field Area Reclaimed Water Pipeline Project will expand the recycled water use for a total average demand of 1.4 MGD, 3.2 MGD of peak day demand. Although an additional recycled water project serving the City of Palo Alto may exceed the capacity limits of the recycled water facility, the RWQCP decision to move forward with a future UV project at the RWQCP, that would eliminate the need for separate Title 22 facilities, will help with the capacity issue. Coordination between the UV project and any City of Palo Alto recycled water project will help address any capacity concerns.

In 1992 the RWQCP completed a *Water Reclamation Master Plan for the Palo Alto RWQCP* (Brown and Caldwell, 1992) and the accompanying program-level Final Environmental Impact Report (EIR) (CH2M Hill, Inc., 1995) that served as a framework for developing a regional water reuse system for the RWQCP service area. However, the Master Plan recommendations were not implemented because costs of the project were not outweighed by its benefit.

In December 2001, the RWQCP published a Long-Term Goals Study Report that concluded a one-year, stakeholder driven effort to develop long-term goals for the RWQCP. Water recycling was identified as a key priority for the RWQCP. In addition, developing the recycled water activities was also considered as a key means to achieve a number of the other long-term goals such as improving water supply reliability, providing a dependable, locally controlled water source, and reducing reliance on imported water.

Funding opportunities from the State Water Resources Control Board (SWRCB) triggered the RWQCP decision in May 2003 to move forward with the Mountain View/Moffett Field Area Reclaimed Water Pipeline Project, one of the projects identified in the 1992 Master Plan. In 2004, the RWQCP completed a facilities plan (RMC, 2004) and pre-design for the Mountain View/Moffett Field Area Reclaimed Water Pipeline Project. The project will replace an existing deteriorating pipeline to Shoreline Golf Course in Mountain View and extend the pipeline to serve the Mountain View-Moffett area. The pipeline replacement will restore the golf course connection and will provide recycled water services to the Shoreline community. The project is currently in design phase.

Palo Alto Golf Course, RWQCP, Emily Renzel Marsh, and Greer Park are the existing major users of recycled water. The Mountain View/Moffett Field Area Reclaimed Water pipeline is sized to serve future users in the City of Palo Alto via several connections at Embarcadero Road and Bayshore Avenue, at Greer Park, and at San Antonio Road. However, the City of Palo Alto currently has no specific plans for using the connections. The City of Palo Alto has therefore initiated this Study to provide the information necessary to decide whether to extend a recycled water pipeline into Palo Alto.

Extending recycled water pipelines into Palo Alto will enable the City and its partners to achieve several key goals of the City, neighboring communities and other stakeholders:

- **Water Supply Management** – A primary long-term goal of the project is to maximize recycled water as a supplemental water source, hence (1) improving water supply reliability by using drinking water, currently used for irrigation and other non-potable uses, for potable purposes, (2) providing a dependable, locally controlled water source, (3) securing a source that will be available even in droughts to serve in irrigation and other non-potable uses, and (4) reducing reliance on imported water.

- **San Francisco Bay Conservation** – The effluent from the RWQCP is currently discharged to South San Francisco Bay. There are indications that the San Francisco Bay Regional Water Quality Control Board may impose more stringent effluent limits for constituents such as trace metals and trace organics. The project will help conserve the San Francisco Bay by reducing the wastewater constituent mass loadings to the Bay.

1.2 Study Objectives and Approach

There are two main objectives of this study:

- Review and confirm or update the list of potential recycled water users within the City of Palo Alto and potential demand in the neighboring communities such as Stanford and Los Altos.
- Update the proposed project cost estimate required for delivery of recycled water to the City of Palo Alto and potential future expansions.

Technical activities performed by RMC as part of this Study include site investigation, market analysis, conceptual project design, and preparation of a financing and revenue plan. The details and results of these services are presented and discussed in Chapters 2 through 4 of this report.

1.3 Report Content

This report is divided into 4 chapters, as outlined below:

- CHAPTER 1 – INTRODUCTION (this section)
- CHAPTER 2 – MARKET ANALYSIS
- CHAPTER 3 – CONCEPTUAL DESIGN
- CHAPTER 4 – FINANCING PLAN AND REVENUE PROGRAM

This report also contains references and appendices that can be found at the end of this report.

APPENDIX A – Customer Survey Form

APPENDIX B – List of Potential Recycled Water Users

APPENDIX C – List of Potential Recycled Water Users within Focus Area

APPENDIX D – Model Results

APPENDIX E – 20-Year Projection Project Cash Flow

Chapter 2 Market Analysis

A recycled water market assessment was conducted to identify and evaluate probable recycled water users within the City of Palo Alto. The results of the recycled water market assessment presented in this chapter provide the basis for project alternative development and evaluation and expansion of recommended projects.

This chapter describes the regulatory framework affecting recycled water, illustrates the market analysis procedures, and identifies and locates potential and existing recycled water users.

2.1 Treatment Requirements for Discharge and Reuse

In general, recycled water operations in California are governed by California Department of Health Services (DHS) regulations and guidelines. Title 22, Division 4, Chapter 3 of the California Code of Regulations serves as the source for regulations relating to recycled water. Current regulations, including Title 22 are compiled in the publication California Health Laws Related to Recycled Water "The Purple Book" updated in June 2001.

The recycled water produced at the RWQCP meets the requirements for disinfected tertiary recycled water, including the following criteria:

- The filtered wastewater has been disinfected by either: (a) A chlorine disinfection process following filtration that provides a CT value—the product of total chlorine residual (C) and modal contact time (T) measured at the same point—of not less than 450 milligram-minutes per liter at all times with a modal contact time of at least 90 minutes, based on peak dry weather design flow; or (b) A disinfection process that, when combined with the filtration process, has been demonstrated to inactivate and/or remove 99.999% of the plaque-forming units of F-specific bacteriophage MS2, or polio virus in the wastewater. A virus that is at least as resistant to disinfection as polio virus may be used for purposes of demonstration.
- The median concentration of total coliform bacteria measured in the disinfected effluent does not exceed a most probable number (MPN) of 2.2 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed and the number of total coliform bacteria does not exceed an MPN of 23 per 100 milliliters in more than one sample in any one 30-day period. No sample shall exceed an MPN of 240 total coliform bacteria per 100 milliliters.

The use of disinfected tertiary recycled water that is produced at the RWQCP is permitted for all irrigation and industrial uses that were identified through this market analysis.

2.2 Market Analysis Procedures

This section examines the market assessment methodology and criteria that were utilized in this Study.

2.2.1 Methodology

The following resources were considered to gather data on water usage for potential recycled water users:

- Water Reclamation Master Plan for the Palo Alto Regional Water Quality Control Plant (Brown and Caldwell, 1992) – The 1992 Master Plan provides a cursory overview of potential recycled water demands within the City of Palo Alto.
- Regional Recycled Water Facilities Planning Study (RMC, 2004) – The Facilities Planning Study defines the Mountain View/Moffett Field Area Water Reuse Project details with a general examination of recycled water use in the City of Palo Alto. Most of the data for the City of Palo Alto was derived from the 1992 Brown and Caldwell Master Plan.

- Input from staff from the City of Palo Alto (Virginia Waik, Jane Ratchye, Roland Rivera) obtained during meetings, through phone conversations, and through e-mails. Water meter data was provided by the City of Palo Alto in the following forms:
  - Annual and monthly usage data (2003-2005) for city-owned property
  - Monthly usage data (2000-2005) for other locations including the Stanford Research Park and other sites identified in the 1992 Master Plan
  - Monthly usage data for Alta Mesa Hills Memorial Park and Palo Alto Golf and Country Club.
- Acreage analysis – For potential use areas not covered by any of the above documents, an acreage and water usage analysis was performed. Acreage was estimated based on input from Roland Rivera at the City of Palo Alto. The average irrigation requirement was estimated to be two feet per year, based on irrigation at City of Palo Alto parks locations. Average annual demands estimated using this method are considered less accurate and more conservative than those calculated based on actual water meter data provided by the City of Palo Alto.
- Surveys of users with high recycled water usage potential – A survey developed by RMC and distributed by the City of Palo Alto was used to obtain personalized information for potential users of over 10 acre-feet per year (AFY) as described in Section 2.3.1. The survey was administered in order to collect information on average and peak water usage, retrofit needs, irrigation schedules, and any concerns the users might have regarding implementation of a recycled water program. Additionally, some of the larger users were also interviewed (either in person or over the phone) with the intent of reviewing the survey, addressing concerns, and answering any questions.

To obtain the most accurate results, estimated annual recycled water usage for each potential use area was determined using one of the following techniques, presented in preferential order: (1) dedicated irrigation meter data, (2) percentage of actual water usage data averaged over the last two years (fiscal years 2003-2004 and 2004-2005), (3) percentage of actual water usage for the past year (fiscal year 2004-2005), (4) acreage analysis and (5) data from the 1992 Master Plan. For future users, annual water usage is estimated based on potential irrigated acreage and an assumed water demand of two feet per acre per year. This water demand was estimated based on a two year average water usage correlated to acreage for City of Palo Alto parks.

In general, potable water use records indicate that water usage for 2004-2005 was lower than previous years. The City of Palo Alto has determined that water consumption was low for the 2004-2005 due to higher than normal precipitation levels during the spring of 2005. After correcting for weather, water consumption was still down by 2.7 percent for the quarter. As described above, the average potable water usage was determined by averaging the past two years of water usage data to be consistent with users that do not have a long water usage history. The fact that this estimate includes data from an abnormally wet year should be considered. For an annual potable and recycled water usage comparison for 2000-2005 for all potential users, refer to Appendix B.

2.2.2 Assessment Criteria

A number of criteria were used to assess each of the potential recycled water uses and determine if potential recycled water customers should be included in future recycled water projects. These criteria were developed to ensure that sufficient information would be collected through the market assessment to develop sound project alternatives.

A. Average Annual Demand

Average annual demand is the existing or potential average annual recycled water demand for each potential recycled water customer. In conducting this market assessment, actual past water usage based on water meter data was determined to be the best method on which to base average annual

recycled water demand; therefore, complete water meter data was used when available. In order to accurately compare usage patterns among users with different water record lengths, annual usage from the last two years was used when available. If usage data existed for a longer period of time, this information was used to qualitatively examine the annual and monthly usage patterns of large users. Potential recycled water usage was estimated to be:

- Approximately 55% of total potable water usage (based on information that RMC received from the survey interviews) when there was only one combined meter (domestic and irrigation).
- Equal to the total meter flow when the meter is designated an irrigation meter.
- Equal to the sum of the total irrigation flow plus 20% of the domestic flow, in cases where there is both irrigation and a domestic meter on the same site and the customer has the potential of using recycled water as process water or cooling tower water.[1]
- Equal to the total irrigation flow only, in cases where there is both irrigation and a domestic meter on the same site and the customer has no potential of using recycled water as process water.
- If the customer is a Park or Median the potential recycled water flow equals the total meter flow, regardless of meter type.
- If the customer is a School the potential recycled water flow equals 25% of the total meter flows (based on irrigation acreages versus total meter demand)
- Fire meters shall not use recycled water.
- Average annual demand of recycled water was used to locate customer concentrations within the City.

B. Peak Demands

Peak monthly demand – a monthly peaking factor was applied to the average monthly flow to obtain the average daily flow for a peak month. Using data from City of Palo Alto monthly irrigation water records for City parks, a monthly peaking factor was estimated at 2.3. This peaking factor is consistent with the peaking factor used in the 1992 Master Plan and the 2004 Facilities Planning Study.

Peak hourly demand – an hourly peaking factor is applied to the maximum month, average day peak to obtain the maximum month, average day, peak hour flow. This peaking factor was estimated at 3.0 and is consistent with the peaking factor used in the 1992 Master Plan and the 2004 Facilities Planning Study. Peak hourly demands were used to evaluate required pipeline diameters to serve potential concentrations of customers.

C. Water Quality Needs

The water quality needs that were assessed are those that are operational rather than regulatory in nature. Examples of operational water quality issues for urban water recycling customers include salinity, turbidity, and chlorine residual. Water quality needs were used to determine if any potential customers should be eliminated from the consideration for potential future recycled water projects.

[1] Through interviews and surveys with potential recycled water customers, it was determined that some of the current domestic water supply may be used for process or cooling tower water. For most of the potential recycled water customers, minimal information was available to determine the actual percentage of domestic water that is utilized for process water and/or cooling tower water. In the limited cases where information was available, the average use of domestic water for process water and/or cooling tower water was determined to be approximately 20%. For this reason, the 20% average was used for W-4 meter data.

Particular water quality needs were identified through the customer survey that was completed by customers. Most surveyed customers indicated a concern for the salinity content of the recycled water, which is much higher than the salinity content of the current potable supply. The salinity content is of particular concern for water needs for industrial processes such as cooling towers.

D. Retrofit Needs

All existing irrigation systems will be retrofitted to include an additional meter for recycled water and provided with an air gap for the potable system. Other onsite retrofits include purple sprinkler heads installation, purple pipe installation, recycled water valve boxes covers, prevention of cross-connection, and any irrigation pattern changes needed to isolate the recycled water system from water fountains, picnic area, etc. Potential customers were evaluated to determine whether their sites had any infeasible retrofit requirements.

E. Implementation Considerations and Customer Concerns

Key implementation considerations and customers concerns were collected as part of the recycled water survey as described in Section 2.2.1. The main concern was water quality (particularly salinity). Those interviewed expressed concern that existing landscaped areas might be adversely impacted by the higher salinity associated with recycled water. Other typical concerns included site retrofits, service timing, cost and reliability. These considerations were examined to determine whether any customers should not be included as potential recycled water customers.

F. Delivery Pressure and Reliability Needs

Determining the level of reliability in recycled water supply will be necessary when developing design criteria for the storage, conveyance, and distribution components of the project alternatives. However, it is assumed that potable water will continue to be available to each customer to supply necessary water demands in the event that the recycled water system is down for a prolonged period of time. In case of an interruption in recycled water service, RWQCP will limit plant downtime and restore service as quickly as possible. Plant downtimes are typically limited to 72 hours based on other recycled water systems. Since customer connections to the potable water supply would be maintained, users could switch to potable water in the event of a recycled water outage. Additionally, the availability of recycled water for irrigation improves irrigation reliability during drought situations since irrigation customers may have a reduced potable supply under these conditions. Therefore, reliability needs are not further discussed in this Study.

2.3 Market Assessment Results

The predominant potential use of recycled water within the City of Palo Alto was determined to be landscape irrigation based on the Facility Plan and the 1992 Master Plan. Other potential uses of recycled water within the City include some industrial applications (i.e. cooling towers). Dual plumbing retrofits in existing buildings are prohibitively expensive, thus those applications are not included in this Study.[2]

Initially, all identified potential customers within the service area were examined and evaluated based on the assessment criteria described in Section 2.2.2. Because the majority of the customers were landscape irrigators, the assessment criteria did not help in distinguishing certain customer(s) for a preferred recycled water project.

Additionally, information was collected from the customers with high potential water usage (i.e. high water demand) using a written survey administered by the City of Palo Alto to establish water use patterns, peak water use, retrofit needs and general perceptions concerning recycled water. Survey results further backed the preliminary analysis in showing that most of the assessment criteria did not help in

[2] This observation is based on local and statewide jurisdictions. An additional hindrance to dual plumbing includes the required annual inspections.

distinguishing certain customer(s) for a preferred project. Water quality needs, retrofit needs, implementation concerns, and customer concerns were similar throughout.

The main factor that distinguished the potential customers from one another is the potential recycled water demand and the location of that demand relative to other large potential users of recycled water.

The estimated average recycled water demands for potential recycled water customers in the City of Palo Alto were grouped and tabulated based on geography. The estimated average recycled water demand for the entire City of Palo Alto service area is 1,693 AFY with a peak month average day demand of approximately 3.48 million gallons per day (MGD). Approximately, 590 AFY of this calculated demand was calculated from dedicated irrigation only meters (W7 meters). Also approximately 673 AFY of the total calculated demand is assumed irrigation demand calculated as a percentage of combined domestic meters (W4 meters) and from estimates based on site acreages. The remaining 430 AFY is considered non-irrigation demand (process and cooling towers). The total calculated demand does not include the existing recycled water customers within the City of Palo Alto as listed in Table 2-1. The 1992 study estimated 2,844 AFY of total recycled water demand within the City of Palo Alto; however this number included existing recycled water users such as the Palo Alto Municipal Golf Course and Greer Park. If current recycled water demands are subtracted from the 1992 total potential of 2,844 AFY, the calculated 1992 demand is approximately 2,674 AFY, which is about 58% over the calculated 2006 demands. This discrepancy presumably is due to the inaccuracy of assumptions used in the 1992 Master Plan where most of the demand was based on the irrigation acreage and a generous estimate of irrigation demand.

Table 2-1: Existing Recycled Water Users

Location	Current Recycled Water Demand (AFY)	Potential Future Recycled Water Demand (AFY)	Total Potential Recycled Water Demand (AFY)
RWQCP	560	-	560
Palo Alto Municipal Golf Course[a]	119	160	279
Greer Park	51	-	51
Emily Renzel Marsh	29	-	29

a. Palo Alto Municipal Golf Course has the potential for an additional 160 AFY of potable water to be converted to recycled water. The use of recycled water at the golf course could increase by reducing the salinity of the recycled water.

2.3.1 Major Customers

Major customers were grouped together by geography and organization such as the City of Palo Alto owned/operated locations or Stanford Research Park. An overview of these groups' potential recycled water usage follows in Table 2-2. A complete list of potential users can be found in Appendix C.

Table 2-2: Large Potential Recycled Water Customer Demands

Location	Average Annual Demand Estimate (AFY)	Average Annual Demand Estimate (MGD)	Average Daily Demand for Peak Month (MGD)
City of Palo Alto Owned and/or Operated	760	0.68	1.56
Stanford Research Park	608	0.54	1.25
Palo Alto Hills Golf and Country Club	130	0.12	0.27
Stanford Hospital and Clinics	107	0.10	0.22
VA Palo Alto Health Care	42	0.04	0.09
Caltrans	12	0.01	0.02

A. City of Palo Alto Owned and/or Operated Locations

The City of Palo Alto uses water for irrigation at various City parks, road medians, and for industrial uses (e.g. Municipal Service Center vehicle washing). Most of the data used for this portion of the market analysis was derived from annual water usage data for 2003-2005 provided by the City of Palo Alto. Also included in this portion of the Study are the Palo Alto Unified School District schools.

The market analysis identified 107 potential recycled water users for the City of Palo Alto, with 22 users having greater than 10 AFY estimated average annual usage and 5 users having greater than 25 AFY annual usage. The average annual demand for the City was determined to be 760 AFY (0.68 MGD) with an estimated monthly peak flow of approximately 1.56 MGD. A "user" in this context may comprise more than one address and/or water meter if the user has multiple addresses. This total estimated potential demand is less than the estimate provided in the 1992 Master Plan for the City of Palo Alto.

Several locations operated by the City of Palo Alto are currently being supplied recycled water through the existing recycled water pipeline from the RWQCP. Table 2-1 shows the existing recycled water usage for these locations as well as their existing potable water use. Both Greer Park and Palo Alto Municipal Golf Course are limited in their use of recycled water due to higher total dissolved solids (TDS) content in the current recycled water compared to the potable water source. As better technology becomes available causing TDS in the recycled water source to decrease, then these locations could use a larger percentage of recycled water for irrigation compared to potable water. The Palo Alto Municipal Golf Course currently blends its recycled water with potable water to decrease TDS levels. If TDS levels decrease in recycled water, their recycled water use could potentially increase significantly.

B. Stanford Research Park

The Stanford Research Park is a 700 acre business park located near Stanford University. The potential uses for recycled water in this area are landscape irrigation and industrial applications. The data used for this area was derived from City of Palo Alto monthly water records for 2000-2005.

The market analysis identified 61 potential recycled water users for the Stanford Research Park, with 20 customers having greater than 10 AFY estimated average annual usage and 5 customers having greater than 25 AFY. Customers may have more than one potential location and address. The

average annual demand for Stanford Research Park was determined to be 608 AFY (0.54 MGD) with an estimated monthly peak flow of approximately 1.25 MGD.[3]

C. Other Large Customers

Other customers with substantial potential recycled water usage include Palo Alto Hills Golf and Country Club (130 AFY estimated average annual usage), Stanford Hospital and Clinics (107 AFY estimated average annual usage), VA Palo Alto Health Center (42 AFY estimated average annual usage), and Caltrans (12 AFY estimated average annual usage.)[4]

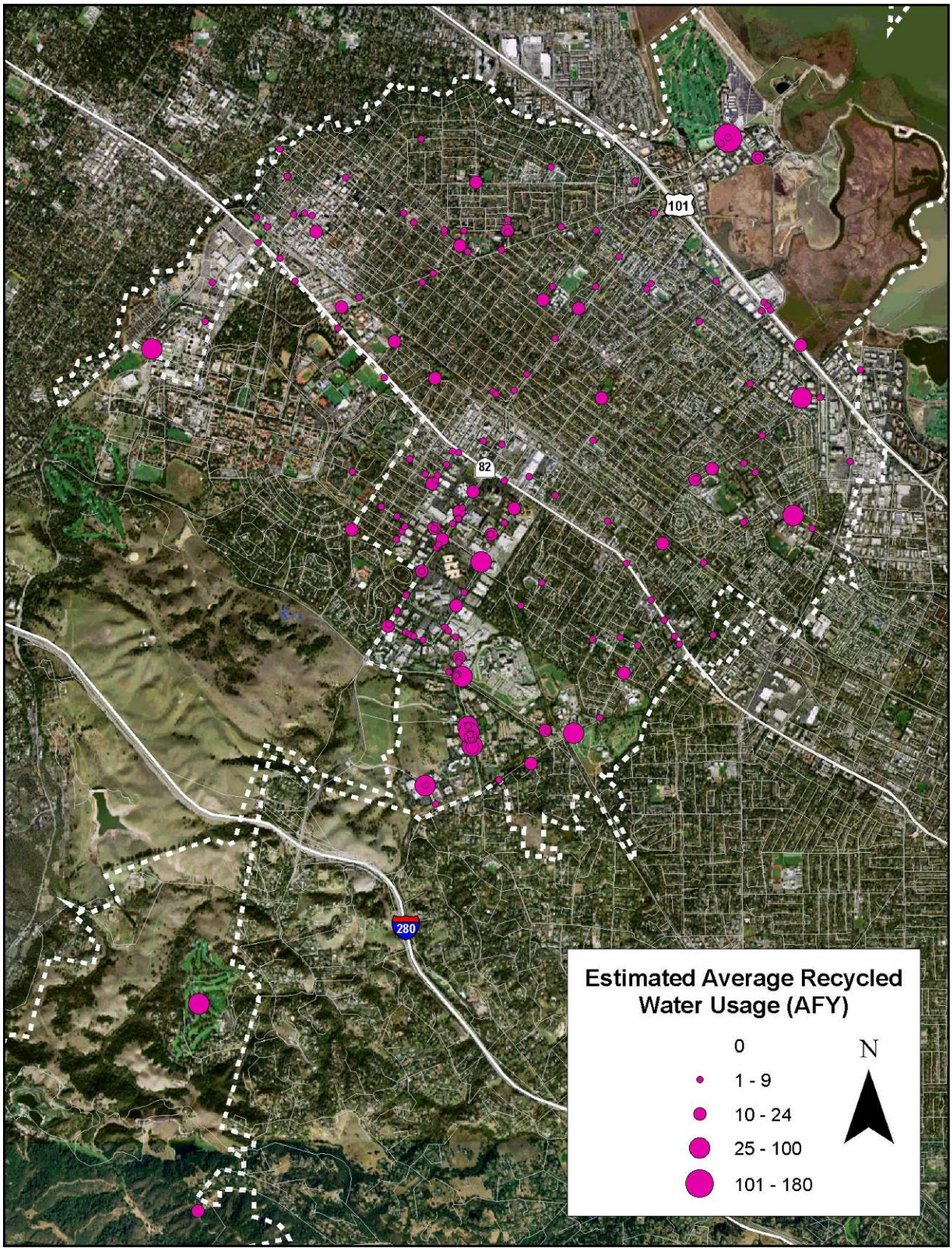
2.3.2 Geographic Analysis

Figure 2-1 shows the locations of potential recycled water users in the City of Palo Alto. Water usage is grouped by address; multiple meters with the same location are summed as a single point.

[3] It should be noted that several customers in this area are currently using recycled water (i.e. treated contaminated groundwater generated on-site) for almost all their irrigation loads currently (and have been for quite some time).

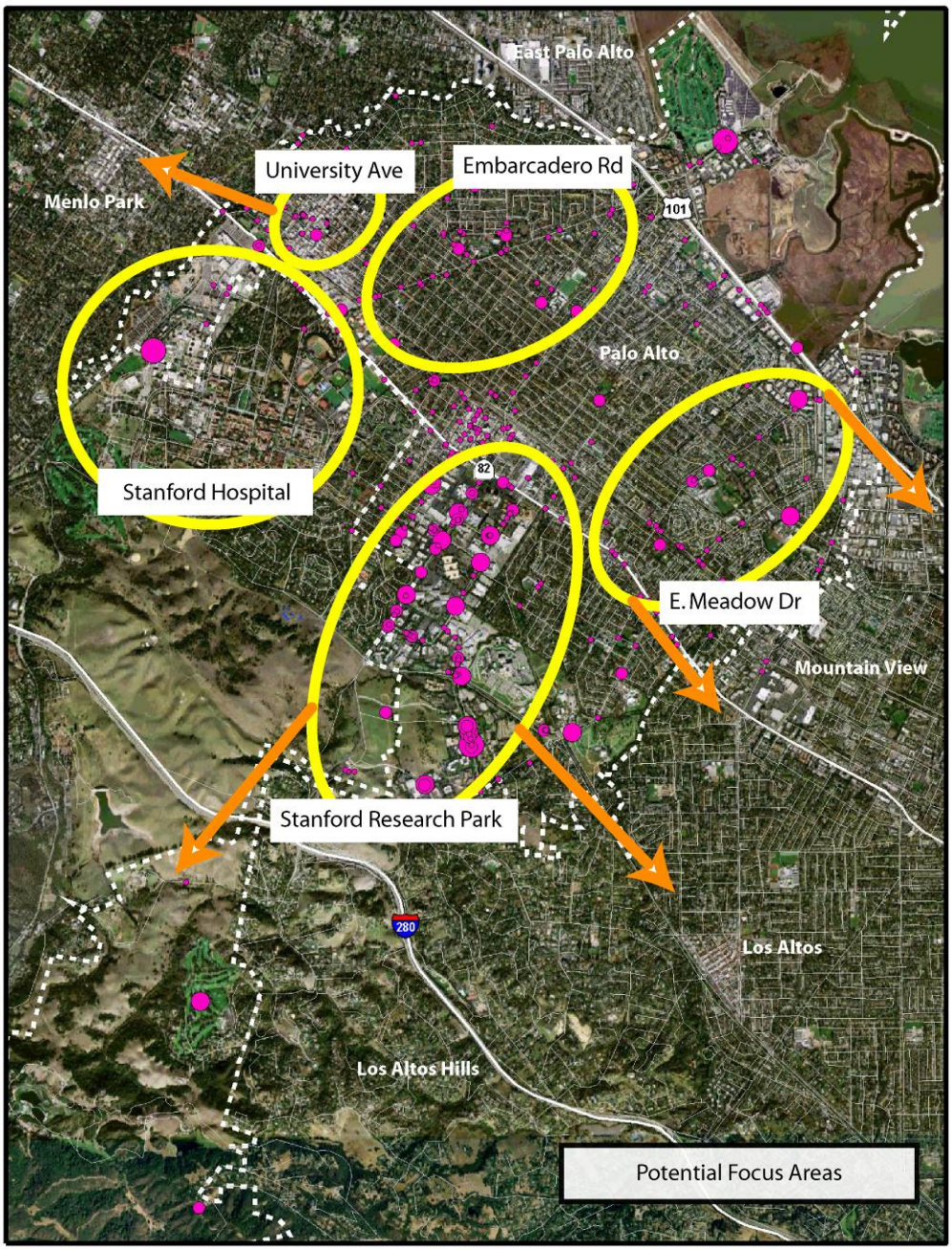
[4] Large water users not included in this Study include Stanford University (500 AFY estimated average annual water usage) and Alta Mesa Memorial Park (100 AFY estimated average annual water usage). Per a meeting between City staff, RMC and a representative from Stanford University, it was determined that Stanford University was less viable as a priority focus area. Stanford University seemed extremely sensitive to water quality, and had other non-potable sources of water to offset potable use (i.e. Lake Lagunita and cooling tower blowdown). Stanford was also more interested in receiving recycled water from a satellite plant. Alta Mesa Memorial Park is a cemetery that currently uses well water for irrigation. It is unlikely that Alta Mesa Memorial Park would switch from well water to another source of water for irrigation.

Figure 2-1: Potential Recycled Water Users



The market assessment described above shows that there are five main geographic customer concentrations/potential focus areas, shown in Figure 2-2.

Figure 2-2: Recycled Water Customer Concentrations/Potential Focus Areas



There are five main areas of concentration of users:

- Area 1 (Stanford Research Park Area) - The largest concentration of users is located near Page Mill Road south of El Camino Real in and around the Stanford Research Park. This area has approximately 720 AFY of average annual demand mainly for landscape irrigation.

- Area 2 (East Meadow Drive Area) - Another concentration of users include the East Meadow Drive Area, which has approximately 121 AFY of average demand for customers including the Cubberley Community Center and Mitchell Park.
- Area 3 (Embarcadero Road Area) - The last concentration of users includes approximately 115 AFY of average demand mainly for median irrigation along Embarcadero Road, Rinconada Park and the Lucie Stern Community Center Area.
- Area 4 (Stanford Hospital Area) - The second concentration of users occurs at Stanford University/Stanford Hospital, with approximately 107 AFY of average demand. These demands include recycled water for irrigation and cooling towers.
- Area 5 (University Avenue Area) - The fourth concentration of users occurs along University Avenue in Palo Alto. Demands in this area include approximately 35 AFY of average demand for irrigation demands at City of Palo Alto parks and City Hall.

The customer concentrations were compared based on the following features:

- Water Quality Needs and Acceptance of Recycled Water
- Pumping/Storage Requirements
- Potential for Expansion to Other Areas

The results of the comparison are presented in the sections below.

2.3.3 Water Quality Needs and Acceptance of Recycled Water

The water quality concerns are the same for all of the customer concentrations. Most potential customers interviewed as part of the market assessment were concerned with the salt content, but are still willing to use recycled water for irrigation if recycled water was available at a lower cost than potable water.

2.3.4 Pumping/Storage Requirements

Pumping for a recycled water project to any of the customer concentrations could be accomplished by adding pumping capacity at the RWQCP or by adding a booster pump station along a preferred project alignment. Additional storage for a recycled water project may be available at the RWQCP or on site. Specific pumping/storage requirements for the preferred project will be further examined in Section 3.1.3 by use of a hydraulic model.

2.3.5 Potential for Expansion to Other Areas

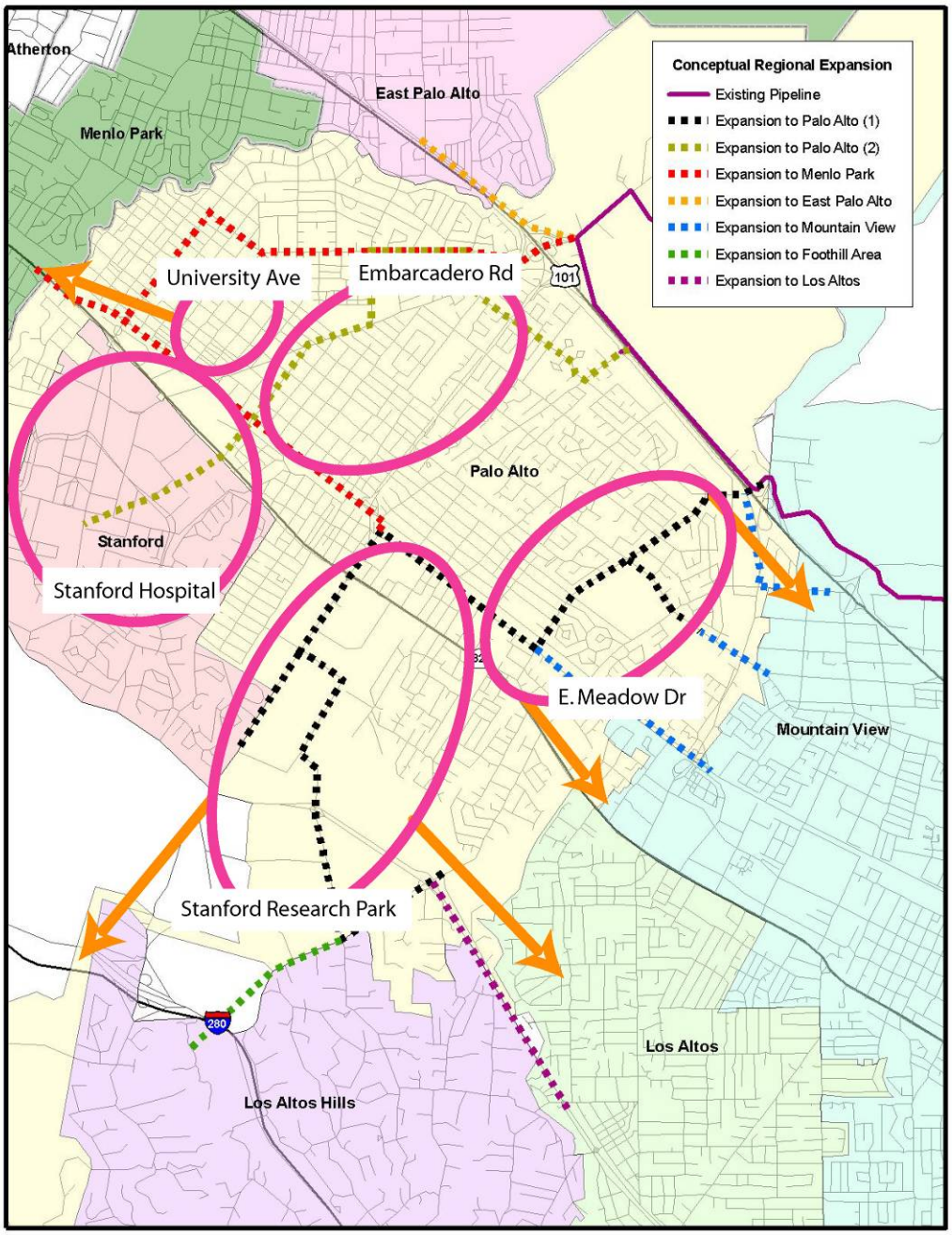
A pipeline constructed to the University Avenue area may serve to begin regionalization of a recycled water system throughout the Peninsula and South San Francisco Bay region. Recycled water from the RWQCP could serve demands located throughout Menlo Park and eventually connect to the South Bayside System in Redwood City.

A pipeline constructed to the Stanford Research Park area may serve to begin regionalization of a recycled water system by eventual expansion to the Los Altos and Los Altos Hills areas. Alternatively, a pipeline constructed to the East Meadow area could be expanded to serve future systems in the City of Mountain View, with a continuous recycled water network through Mountain View, Sunnyvale and the South Bay Water Recycling program in Santa Clara, San Jose and Milpitas.

A pipeline constructed to serve the Embarcadero Road area could be expanded to later serve Stanford University.

Conceptual level pipelines were drawn to depict possible routes to serve the five customer concentrations and for future expansion into neighboring communities. Possible projects to all potential focus areas as well as future expansion points are shown in Figure 2-3.

Figure 2-3: Other Future Recycled Water Projects



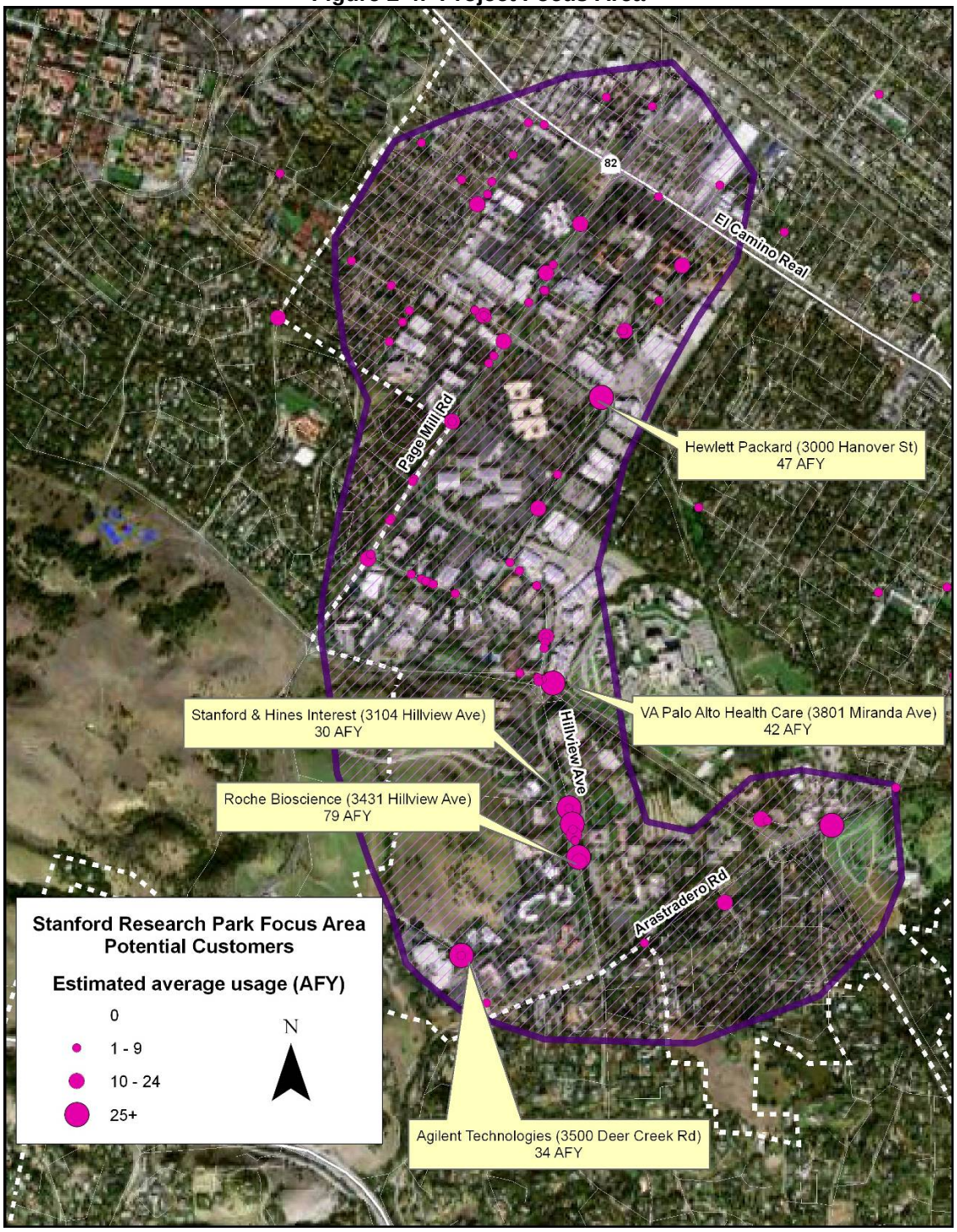
2.4 Project Focus Area

The comparison of customer concentrations determined that the only discernable criteria is the actual demand since all customer concentrations have similar water quality needs, pumping/storage requirements and potential for expansion to other areas. The Stanford Research Park and other nearby customers make up the largest concentration of large users for a feasible recycled water project and thus are hereby defined as the priority *focus area* for a future recycled water project. The project focus area is located in southern Palo Alto along Page Mill Road south of El Camino Real as shown in Figure 2-4. All

customers included in the focus area are listed in Appendix C. The top five largest customers within the focus area are labeled in Figure 2-4.

The selected project focus area includes approximately 720 AF annually of average demand, mainly for irrigational purposes. Because the main demand is for irrigation, the timing of use and seasonal variation is expected to be similar for the majority of customers within the focus area, with heavier uses during the morning/evening hours of summer when irrigation is most prevalent.

Figure 2-4: Project Focus Area



Chapter 3 Conceptual Design

Based on results of the market assessment discussed in Chapter 2, conceptual pipeline alignments to serve the focus area users were developed.

3.1 Basis for Conceptual Design

The following sections discuss how each feature affects the conceptual pipeline alignments development.

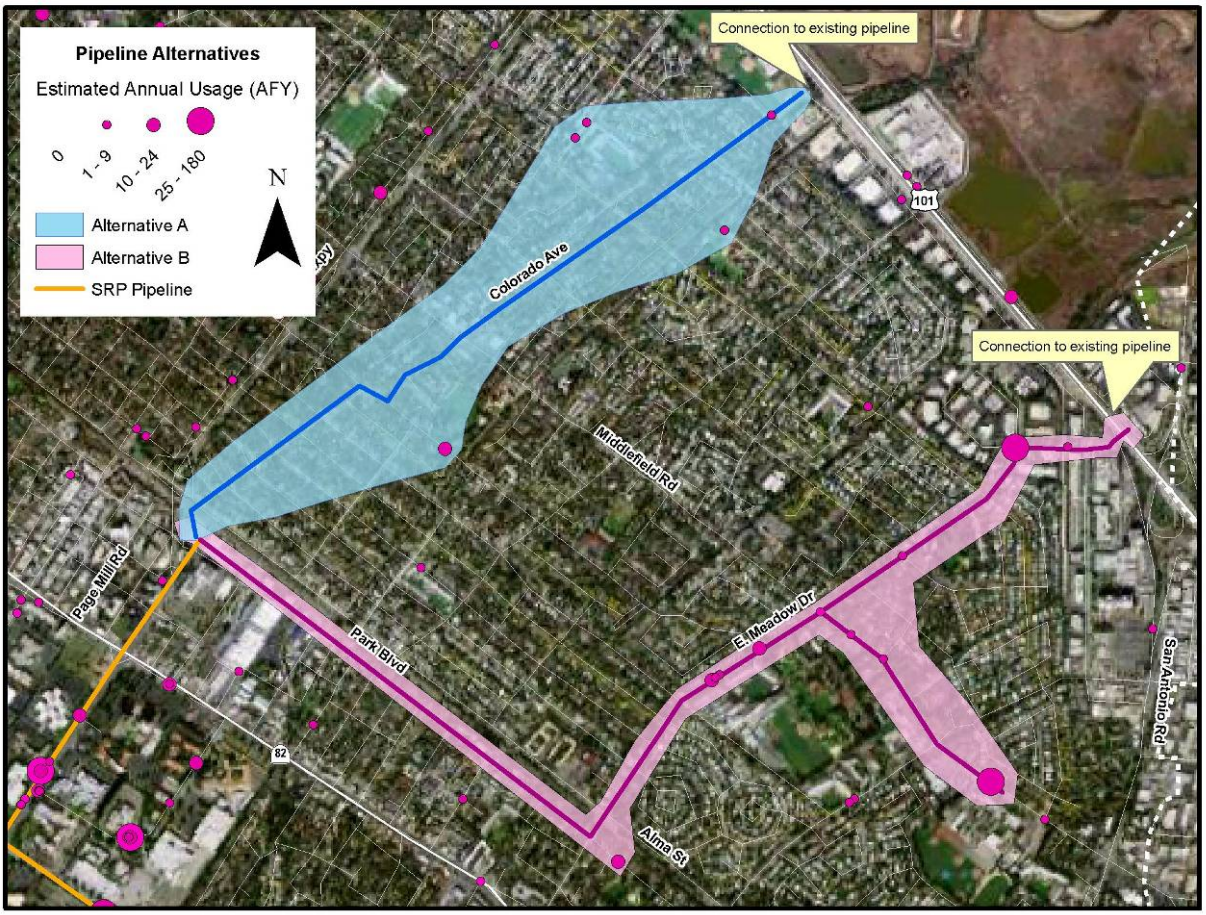
3.1.1 Focus Area Pipeline Alternatives

The focus area proposed alignment was developed using the following criteria:

- Minimize pipe length from the RWQCP to the focus area
- Maximize demand en route to focus area
- Maximize the use of existing public roadway right-of-way
- Minimize traffic interruption during construction

Using the aforementioned criteria, two alternate pipeline alignments were developed to connect the existing recycled water pipeline to the Stanford Research Park focus area. Alternatives are depicted in Figure 3-1.

Figure 3-1: Alignment Alternatives A and B



Alternative A considered a pipeline alignment connecting to the existing system at Greer Park, continuing southwest along Colorado Avenue, and reaching the focus area near the Page Mill Road/Oregon Expressway and Alma Street. The pipeline alignment for this alternative travels approximately 9,100 feet from Greer Park to the focus area connection and provides for an average use of 28 AFY of recycled water en route to the Stanford Research Park focus area. Total project demand is estimated at 748 AFY.

Alternative B considered a pipeline alignment connecting to the existing system at East Bayshore Road northwest of San Antonio Road, continuing southwest along East Meadow Drive, crossing the Alma/Joint Powers Board right-of-way[5], and continuing northwest along Park Boulevard to reach the focus area. A lateral would be extended southeast along Middlefield Road to serve the Cubberley Community Center, Mitchell Park, and the Mitchell Park Library. The pipeline alignment for this alternative travels approximately 15,000 feet and provides for an average use of 120 AFY of recycled water en route to the Stanford Research Park focus area. Total project demand is estimated at 840 AFY. Approximately, 242 AFY of this calculated demand was calculated from dedicated irrigation only meters (W7 meters). Also approximately 272 AFY of the total calculated demand is assumed irrigation demand calculated as a percentage of combined domestic meters (W4 meters) and from estimates based on site acreages. The remaining 326 AFY is considered non-irrigation demand (process and cooling towers).

For both Alternative A and Alternative B, when the proposed alignments reach the focus area, the proposed alignment is the same – traveling southwest on Page Mill Road to serve all customers within the focus area. This portion of the pipeline alignment is approximately 18,000 feet and provides for an average use of 720 AFY of recycled water.

The comparison criteria between Alternative A and Alternative B are shown in Table 3-1.

Table 3-1: Alternative A and B Comparison

Comparison Criteria	Alternative A	Alternative B
Total Recycled Water Served	748 AFY	840 AFY
Total Pipeline Length to Focus Area	9,100 feet	15,000 feet
Total Average Demand Served Prior to Reaching Focus Area	0.0031 AFY/LF	0.0080 AFY/LF
Traffic Concerns	Non-Differentiable	
Utility Concerns	Large Trunk Sewers, Box Culvert Storm Drain, Electrical Substation, Typical Utilities	Typical Utilities
Constructability	Mainly Open-Trench in Public Roadway Right-of-Ways, Railroad Crossing	Mainly Open-Trench in Public Roadway Right-of-Ways, Railroad Crossing
Total Cost of Alternative Project	$14.1 million	$16.9 million

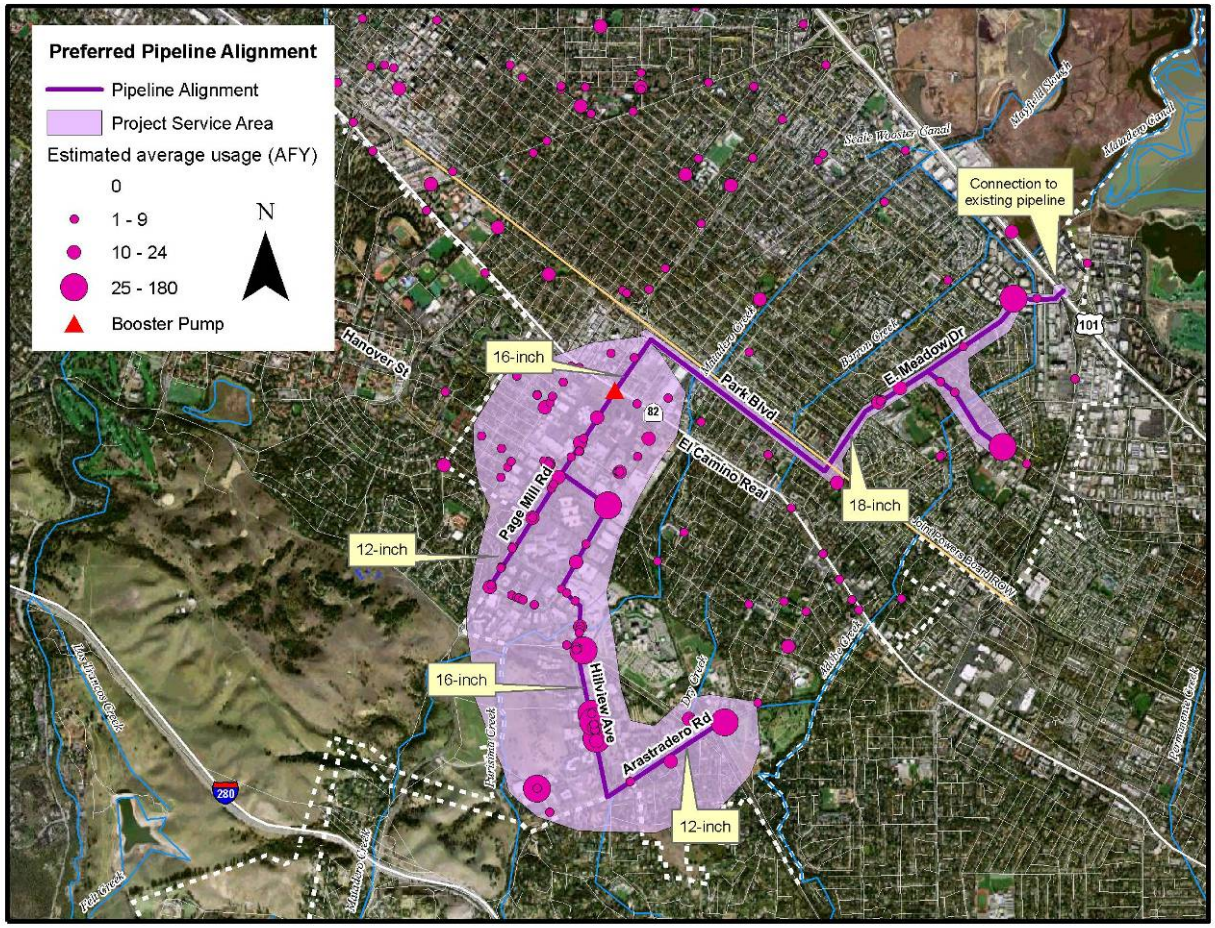
[5] Along the railroad tracks that are parallel to Alma, the right of way is owned by the Joint Powers Board, an agency which is comprised of three counties (San Mateo, Santa Clara and San Francisco). The lead agency is the San Mateo Transportation Agency. Additionally, the City of Palo Alto owns a 10-foot right of way parallel to the Joint Powers Board right of way that could potentially be utilized pending further utility investigation.

Alternative B was selected as the alignment for the preferred focus area project (project) because it has the potential to serve a greater demand of recycled water and avoids some of the utility issues associated with Alternative A.

3.1.2 Preferred Project Description

Figure 3-2 shows the focus area project alignment and potential recycled water customers along the alignment.

Figure 3-2: Preferred Project Alignment



The preferred project alignment connects to the existing recycled water pipeline stub-out at East Bayshore Road near San Antonio Road. An 18-inch diameter pipeline would be extended from the existing pipeline underneath US-101 southwest along East Meadow Drive to Park Boulevard, crossing the Alma Street/Joint Powers Board right-of-ways. The pipeline would then continue northwest along Park Boulevard to Page Mill Road. This section of the pipeline crosses Matadero Creek and Barron Creek. At these crossings, trenchless construction techniques would be used. A 16-inch diameter pipeline would extend from the 18-inch pipeline at Park Boulevard southwest along Page Mill Road to Hanover Street. A booster pump would be installed within this section of pipeline to provide the necessary head to serve the Stanford Research Park focus area.[6] At Hanover Street, a 12-inch diameter pipeline lateral would continue along Page Mill Road to Foothill Expressway. A 16-inch diameter pipeline would extend from

[6] An easement from Stanford may be required to install a booster pump at this location.

Page Mill Road along Hanover Street and Hillview Avenue to Arastradero Road, where a 12-inch diameter pipeline would continue to the end of the alignment at the Foothill Expressway.

3.1.3 Preferred Project Hydraulics

Hydraulics for the preferred project was modeled using H2OMap[7], a software package developed by MWHSoft, Inc.

H2OMap includes integrated Geographic Information System (GIS) capabilities to allow the incorporation of geospatial planning data into a hydraulic model. A GIS shapefile of potential recycled water customers was imported into an existing model that was used to model demands associated with the Palo Alto – Mountain View/Moffett Area Reclaimed Water Pipeline Project. This project is currently in the end of the design phase and construction is expected to start by September 2006. The H2OMap model was used to help define the main recycled water pipeline sizing and alignment for this proposed project, taking into consideration the existing projects and demands. Junctions/nodes were inserted into the model at appropriate locations along the pipeline alignment to represent anticipated demands. Demands determined in the market assessment (Chapter 2) were used in the model. Peak demands were obtained using peaking factors to reflect the maximum month, average day, and peak hour flow. A description of the process to obtain peak flows can be found in Chapter 2. A table of all the customers with their average and peak demands can be found in Appendix B.

Two scenarios were run:

- Scenario 1 modeled the system with peak demands for the preferred project as well as the existing customers in the City of Palo Alto and Mountain View. Scenario 1 assumed that additional pumps at the RWQCP would supply water at the necessary head to serve the entire preferred project using the hydraulic criteria listed in Table 3-2. This scenario determined that an extra 460 hp would be required at the RWQCP assuming an 80% pump efficiency rate. Detailed results from the model output can be found in Appendix D.

Table 3-2: Hydraulic Design Criteria

Item	Value
Minimum Pressure at Customer Connections	65 psi
Maximum Pressure	180 psi
Minimum Pipe Size	6 inches
Maximum Head Loss	5 feet per 100 feet
Velocity	2-8 feet per second

- Scenario 2 modeled the system with peak demands for the preferred project as well as the existing customers in the City of Palo Alto and Mountain View, but assumed that a booster pump would be placed along the preferred alignment closer to the focus area, instead of providing additional pumps at the RWQCP. The model calculated that a 150 hp booster pump station would be necessary along the preferred project alignment, somewhere near the intersection of Page Mill Road and El Camino Real to maintain the hydraulic criteria listed in Table 3-2. The Mayfield

[7] Model information found at: http://www.mwhsoft.com/page/p_product/water/water_overview.htm.

Site soccer field location would be a possible location for the pump.[8] The model also calculated that smaller diameter pipes would be required for this scenario. Detailed results from the model output can be found in Appendix D.

Scenario 2 was chosen as the more feasible preferred project because less horsepower and smaller diameter pipes would be required. However, depending on costs[9], this scenario may be revisited should the City choose to move forward with the preferred project. It is important to note that further hydraulic analysis of this alternative may be necessary based on the existing pipeline design of the Mountain View/Moffett Area Reclaimed Water Pipeline. The capacity of the proposed 24-inch diameter Mountain View/Moffett Area pipeline from Matadero Creek to the intersection of East Bayshore Road and San Antonio Road may not be enough to handle the peak demands of this proposed alternative when all users in Mountain View and Palo Alto are online. Further hydraulic analysis and evaluation is recommended should the City decide to move forward with this project.

3.1.4 Preferred Project Cost Estimate

Capital costs for the project were developed and benchmarked to the *Engineering News Record* (ENR) San Francisco construction cost index (CCI) for December 2005 of 8462.

A variety of different construction methods could be used for areas where trenchless crossings are needed. Hanging pipes on existing bridges was also considered as a potential construction method for traversing creek crossings. For all cases where trenchless construction would be needed, microtunneling was assumed to be used as a conservative cost estimate. Microtunneling includes fixed costs associated with pit construction that vary greatly depending on the depth required and soil conditions. For the purpose of this study, an average unit raw construction cost was assumed as presented in Table 3-3.

[8] Additional investigation regarding the feasibility of locating a pump at or near the Mayfield Site soccer field will be required.
[9] Costs for acquisition of land for the booster pump station were not considered.

Table 3-3: Assumed Unit Raw Construction Costs

Item	Unit Cost	Unit
Open Trench Installation[1]		
18" Ductile Iron Pipe	$190	$/linear foot
16" PVC Pipe	$170	$/linear foot
12" PVC Pipe	$150	$/linear foot
Trenchless Installation[2]		
Average Microtunneling Cost	$1,100	$/linear foot
Other Cost Estimate Criteria		
Appurtenances	2	% of pipeline cost
Contingency	30	% of pipeline cost
Project Mobilization	6	% of pipeline cost
Customer Retrofit Costs[3]	$10,000	$/customer
150 hp Booster Pump Station[4]	$740,000	Lump sum

Notes:
1 – Open trench pipe installation costs include pipe material, installation, excavation, backfill, cathodic protection, traffic control, dewatering, and pavement restoration. These costs are based on 2005 bids.
2 – Trenchless installation costs include jacking and receiving pits, casing, pipe material, grouting, and microtunneling equipment. These costs are based on 2005 bids.
3 – Customer retrofit costs are based on 2005 bids for similar projects. These retrofit costs are assumed for irrigation retrofits only. Process water and/or cooling tower water site retrofits will need to be examined on a case-by-case basis and may be more expensive.
4 – Booster pump station costs include pumps, drives, building, electrical, HVAC, and SCADA. Does not include land acquisition or right-of-way costs.

As shown in Table 3-4 the total estimated capital cost for the preferred project is in December 2005 dollars.

Table 3-4: Estimated Cost of Preferred Project

Item	Quantity	Unit	Unit Cost	Total Cost
Shoring and Bracing	32,834	LF	$25	$821,000
18" Pipe	14,000	LF	$190	$2,660,000
16" Pipe	9,845	LF	$170	$1,674,000
12" Pipe	7,189	LF	$150	$1,078,000
US-101 crossing	500	LF	$825	$413,000
Adobe Creek Crossing	300	LF	$825	$248,000
Alma/Caltrain Crossing	400	LF	$825	$330,000
Barron Creek Crossing	300	LF	$825	$248,000
Matadero Creek Crossing	300	LF	$825	$248,000
Appurtenances	1	LS	$148,000	$138,000
Retrofits	125	each	$10,000	$1,250,000
Mobilization	1	LS	$591,000	$591,000
280 hp booster pump station	1	LS	$740,000	$740,000
Subtotal				**$10,400,000**
Construction Allowance (30%)				*$3,100,000*
Construction Total				**$13,500,000**
Engineering and Construction Management (15%)				*$2,000,000*
Right of Way Costs (3%)				*$400,000*
Connection Cost[1]				*$1,000,000*
Grand Total[1]				**$16,900,000**

Notes:
1 – This connection cost is a payment to the City of Mountain View for connecting to the planned Mountain View/Moffett Field Area Reclaimed Water Pipeline.
2 - Costs do not include additional treatment to obtain additional capacity at the RWQCP.

Operation and maintenance (O&M) costs would be approximately $183,000 per year starting the first year of operation, assuming 1% of the total construction cost per year. Because the O&M costs are calculated as a percentage of the total cost and do not include a special O&M program nor the any additional treatment costs at the RWQCP, additional examination in the next phase is recommended. Annual expenses for the project would also include any debt repayment incurred in the original funding of the project. These costs are further detailed in Chapter 4.

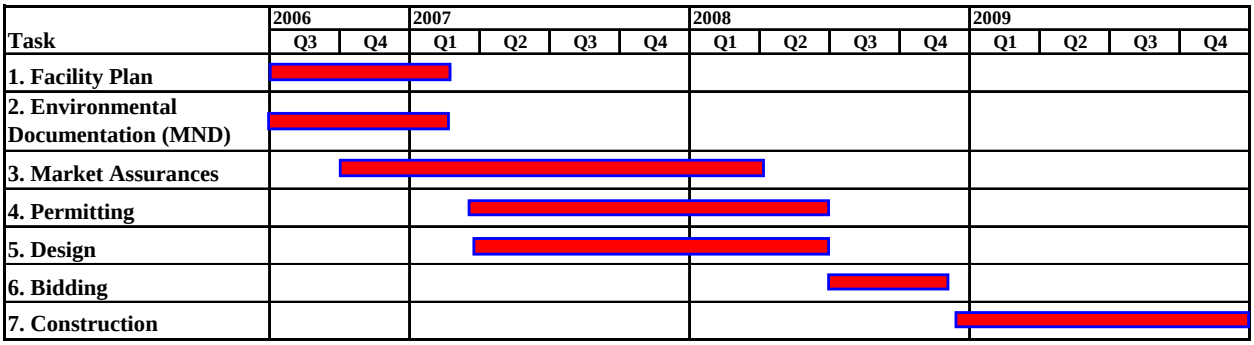
The average annualized cost of the project is $1,645,000 with an annual cost of $1,959 per potential acre-foot of recycled water delivered (see Chapter 4 for details).

Customer willingness to join the program and potential incentives are discussed in Chapter 4.

3.2 Preferred Project Implementation

Preferred project implementation will involve further planning and design. Assuming that the City moves forward with a Facility Plan in fall of 2006, the preferred recycled water project could be online in 2010 as shown in the Figure 3-3. Key immediate term activities are described below.

Figure 3-3: Project Schedule



Notes:
1. IS/MND = Initial Study/Mitigated Negative Declaration; Schedule if an MND is deemed sufficient.

3.2.1 Facility Planning

Based on the proposed project schedule in Figure 3-3, a facility plan will be required and will be completed in early 2007.

3.2.2 Environmental Review

Prior to design and construction of the preferred project, environmental documentation will be required per the California Environmental Quality Act (CEQA). The environmental review could be completed in parallel to the facility plan.

3.2.3 Market Assurances

Several types of market assurances exist that ensure customer usage of recycled water. Possible market assurances include letter of intent, mandatory use ordinance, or none if an existing policy is already in place. For instance, Caltrans currently requires recycled water usage where recycled water is available.

3.2.4 Permitting

Various regulatory permits will be required. Permits will be required from agencies such as Caltrans, California Department of Fish and Game, Santa Clara Valley Water District, and San Francisco Bay Regional Water Quality Control Board.

Obtaining these permits will be done concurrently to the project design should the City decide to move forward with the project.

3.2.5 Public Outreach

Public outreach will aim at presenting the recycled water project to customers and the general public and obtaining feedback and information on customer and existing local irrigation systems. This could be achieved by a series of workshops and interviews. Any questions or concerns will need to be promptly addressed to ensure public support for the project.

Chapter 4 Financing Plan and Revenue Program

This section discusses potential reuse incentives, identifies funding sources, discusses revenue sources and recycled water pricing policy, and outlines the sensitivity of the recycled water rate to recycled water delivery for the project.

4.1 Reuse Incentives

Incentive programs are typically implemented by agencies to assist and encourage possible users to connect to the recycled water system. These incentives typically include some level of financial incentives, and non-monetary incentives, such as level of service provisions during drought conditions. Mandatory use ordinance is usually used in addition rather than in lieu of other incentives.

- Financial Incentives:
    a. Lower recycled water rates than potable water rates – Customers will be less resistant to converting if the overall long-term cost of using recycled water is less than the cost of potable water. The recycled water rate should take into account any perceived negative effects of using recycled water. Agencies throughout the State have typically set the recycled water rate at 20% to 80% of the potable water rate.
    b. City to pay for signage and retrofit needs – Paying for required signage and retrofit costs will decrease the up-front cost taken on by customers allowing the initial conversion to occur more smoothly. Signage and retrofit needs include tasks such as replacing meter box lids with purple lids, printing "Recycled Water" on piping uncovered during construction, and posting "Irrigated with Recycled Water" signs. Signage and retrofit costs are included in the total project costs as shown in Table 3-4.
    c. City to perform required annual cross connection testing.
    d. City to hire contractor dedicated to helping customers with retrofit needs.
    e. Free permit review – By waving the permit review fee for recycled water users, conversion costs will be lowered for potential customers.
    f. Free training for on-site supervisors.
- Non-Monetary Incentives:
    a. Reliability incentives – Increased capacity from recycled water use means less dependence on external potable water sources. The primary non-monetary incentive is reliability or availability of recycled water when shortages of potable water occur.
    b. Positive community image – Converting to a recycled water source carries a positive economic value by projecting the recycled water customer as a "green" company to the community. Public education and information program recognizing the benefits of using recycled water for the community would typically be necessary to enhance the role of this incentive.
- Use Ordinances:
    a. Require installation of dual plumbing in all new and remodeled buildings in anticipation of the future availability of recycled water.
    b. Identify a specific "reuse area" within which recycled water must be used for a particular application (e.g. irrigation).
    c. Maintain and provide to potential recycled water users a list of acceptable plant materials that are tolerant to the recycled water quality.

4.2 Funding Sources

The preferred project will essentially be funded by the City of Palo Alto. Some level of grant funding could be secured through the Proposition 50, Chapter 8 Grant Program for implementation, and the proposed Water Resources Investment Fund. In addition, a low-interest-rate loan could be secured from the SWRCB State Revolving Fund Program. Also, planning-level funding may be available through the Water Recycling Facilities Planning Grant Program. Federal grant money could also be sought through Title XVI. A summary of potential outside funding sources for the project is provided below.

- **Proposition 50, Chapter 8 Grant**– The Grant Program is administered by the SWRCB and the Department of Water Resources (DWR). Funding is available for Feasibility Studies and design and construction projects for up to 90 percent of the project costs. An Integrated Regional Water Management Plan (IRWMP) must have been prepared for the project in order to qualify for a planning and/or implementation grant. As an element of The Palo Alto Regional Water Recycling Project included in the IRWMP being prepared for the second funding cycle, the project will be eligible for Chapter 8 funding. Approximately $220 million is anticipated to be available for the next funding cycle, in 2007 or 2008.
- **Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006** – This initiative will provide for protecting the water quality of the Sacramento-San Joaquin Delta, assist each region of the state in improving local water supply reliability and water quality while resolving water-related conflicts and reducing reliance on imported water. The measure is going to be on the November 2006 ballot. If it passes the Safe Drinking Water and Water Quality Projects portion of the bond has a proposed fund of $1.525 billion, which the Integrated Regional Water Management program has one billion and the Delta Water Quality program has $130 million.
- **State Revolving Fund (SRF)** – The SRF Loan Program is administered by the SWRCB. The Loan Program provides low-interest loan funding for a wide array of design and construction projects, including construction of publicly-owned wastewater treatment facilities, local sewers, sewer interceptors, and water reclamation facilities. The SRF provides 20-year loan with an interest rate set at half of the State Bond General Obligation Rate (typically 2.5% - 3.5%). After a 20-month freeze period, the SWRCB is now preparing to proceed with a Revenue Bond issuance to make funds available for loans again. The State Water Board will begin accepting new applications and resume processing those applications that were previously under review. Future funding will be limited, and may only be available to those projects that are qualified to receive tax-exempt bond funding. In order to qualify for a SRF loan, the sponsor must apply for placement on Priority List. Subsequently, the sponsor must submit a Facility Plan.
- **Water Recycling Facilities Planning Grant Program (FPGP) –** The Water Recycling FPGP program is administered by the State Water Resource Control Board (SWRCB). The Water Recycling FPGP can provide funding of 50 percent of eligible planning costs up to $75,000 to public agencies to study the feasibility of water recycling and to prepare a facilities plan documenting the analyses and conclusions of the investigation. A draft Facility Plan, a letter of intent from the customers and environmental documentation are required in order to be eligible. The grant will result in a Final Facility Report that must be submitted within three years of the grant commitment.
- **Title XVI** – In 1992, Congress authorized the US Bureau of Reclamation (USBR) to participate in local recycled water projects under "The Reclamation Wastewater and Groundwater Studies and Facilities Act," known as Title XVI. Title XVI funds are available for feasibility studies and/or design and construction costs. The Federal contribution is capped at 50 percent of the total study cost, and 25 percent of the total project cost (including construction), or $20 million

per project. The project sponsor is responsible for 75 percent of total design and construction costs, as well as all of operation and maintenance (O&M) costs of the project.

Federal funds for feasibility studies must be included in the President's budget request to Congress. The federal appropriation process typically requires that the project sponsor notifies the USBR two years prior to the year the funds are sought. In order to be eligible, the project must meet legal and institutional requirements, including NEPA compliance. A cost sharing agreement can be approved by the Secretary only after all feasibility and environmental requirements are met.

- **Santa Clara Valley Water District (SCVWD) and Bay Area Water Supply and Conservation Agencies (BAWSCA) Water Recycling Support** – These agencies recognize that it is in their best interests to encourage water recycling, and as such, actively support the development of water recycling activities in the region. The SCVWD has already entered into recycling partnerships with three of the four recycled water producers in Santa Clara County and is pursuing greater involvement with the RWQCP to contribute to meeting SCVWD's recycled water use target of 10 percent of total water use by 2020.
- **San Francisco Public Utility Commission (SFPUC) Water System Improvement Program (WSIP)** – The WSIP includes a series of projects that have been identified by the SFPUC to provide regional water supply benefit. Other projects that could provide regional water supply benefits, such as development of recycled water supplies, may potentially be funded through the WSIP program.

4.3 Project Costs and Revenue Sources

This section presents the project financing costs, the assumptions and results of the financial analysis, including annual revenues and expenditures projections, and a comparison of the cost of recycled water with potable water.

4.3.1 Project Total Costs and Financing Costs

The project total cost is estimated at $16.9 million (see Section 3). Because no outside funding has been secured at this time, it is assumed that design and construction costs could be supported by the passing of a bond measure in 2008. After a 10 percent debt service reserve and a bond cost of five percent are accounted for, the total project financing cost is estimated at approximately $19.5M. A summary of the project total and financing costs is provided in Table 4-1, below.

Table 4-1: Project Total and Financing Costs

Description	Amount
Construction Costs	$13,500,000
Engineering[b] & Construction Management (15%)	$2,000,000
Right of Way Costs (3%)	$400,000
Connection Cost	$1,000,000
Total Project Cost	**$16,900,000**
Debt Service (10%)	$1,700,000
Bond Cost (5%)	$900,000
Project Financing Cost	**$19,500,000**
Bond Annual Debt Service Cost	20 year return at 4% interest rate

Notes:
a. All costs are rounded to the nearest $100,000.
b. Engineering costs include planning and design costs

4.3.2 Financial Analysis

The purpose of this financial analysis is to provide the City of Palo Alto with a preliminary understanding of the costs of developing and maintaining the project.

The following assumptions were made in conducting the financial analysis:

- It is assumed that 50% of the planning costs will be covered by a planning grant. No construction grant contribution is assumed since no construction grant is anticipated to be secured in the short-term.
- Planning costs will be incurred in 2006. Design costs will be incurred in 2007-2008. Construction costs will be incurred in 2008-2009.
- Design and construction costs will be supported by the passing of a bond measure in 2008. As mentioned earlier, a debt service reserve of 10 percent was assumed in addition to a bond cost of 5 percent.
- Annual expenses are assumed to result from annual operations and maintenance (O&M) costs and the debt service. O&M costs are estimated to be 1 percent of total project costs and are adjusted to increase by an inflation rate of 4 percent annually. The debt service assumes a 20-year repayment period at a 4 percent interest rate.
- Project costs (including O&M costs and debt service) will entirely be covered by recycled water sales. An average recycled water yield of 840 acre-feet per year (AFY) is assumed for the project. Using recycled water sales as the only source of revenue allows for a fair comparison of the "cost of water" and means that the project is not dependent on other revenues of the City of Palo Alto.

Table 4-2 shows the annual costs and revenues projections for the first five years of the project implementation and the required recycled water rates needed for the project to break even each year. The first 20 years of the cash-flow projection, shown in Appendix E, show contributions to the debt service.

Table 4-2: Annual Projections of Project Costs and Revenues

	2010	2011	2012	2013	2014
RW Demand (AF)	840	840	840	840	840
Debt Service	$1,434,900	$1,434,900	$1,434,900	$1,434,900	$1,434,900
Annual O&M Costs	$183,400	$190,700	$198,300	$206,200	$214,400
Total Costs	$1,618,300	$1,625,600	$1,633,200	$1,641,100	$1,649,300
Cost Per AF	$1,927	$1,935	$1,944	$1,954	$1,963
Cost Per hcf	$4.42	$4.44	$4.46	$4.49	$4.51

Notes:
a. Assumes a construction start date of July 2008.
c. Assumes recycled water delivery starts in January 2010.

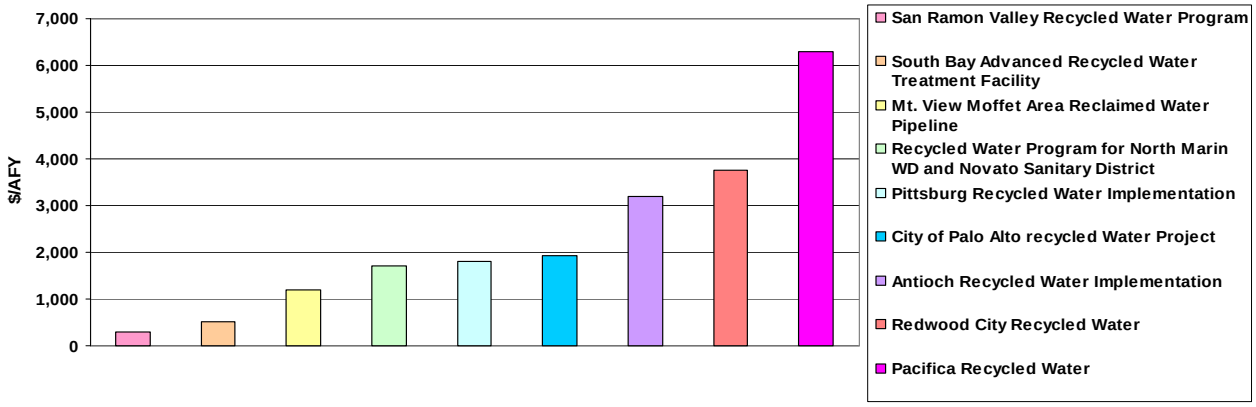
As shown in Table 4-2, the cost of recycled water increases from $1,927/AF to $1,963/AF between 2010 and 2014. The yearly increase reflects inflation-adjusted O&M costs. The average annual recycled water unit cost of $1,959/AF accounts for inflation over the 20-year bond service period. In the 21st year, no more contributions to the debt service are required, greatly reducing the required revenues to cover the incurred costs of the project. At that time, the calculated cost of recycled water is $478/AF which includes the O&M costs plus contributions into an equipment replacement fund. A 20-year projection of the project cash flow can be found in Appendix E.

4.3.3 Potable Water and Recycled Water Cost Comparison

The City of Palo Alto current wholesale potable water cost is $444/AF. As described earlier, in order to break even, the estimated recycled water rate should be approximately $1,959/AF. It is important to note that potable rates will increase over time. In particular, potable water rates will have to be adjusted as SFPUC's capital program begins to be implemented. The potable water costs will reach $1,600/AF in FY 2016. These costs have the potential to increase due to the number of capital program projects that SFPUC will be implementing in the future.

Comparing the annualized cost of current recycled water projects in the area, shown in Figure 4-1, shows that the City of Palo Alto's recycled water project is within the median of these projects which costs range from $300/AF to $6,300/AF.

Figure 4-1: Recycled Water Projects Cost Comparison



4.4 Project Cost and Demand Sensitivity Analysis

This section presents the results of the sensitivity analysis to recycled water unit project cost and demand.

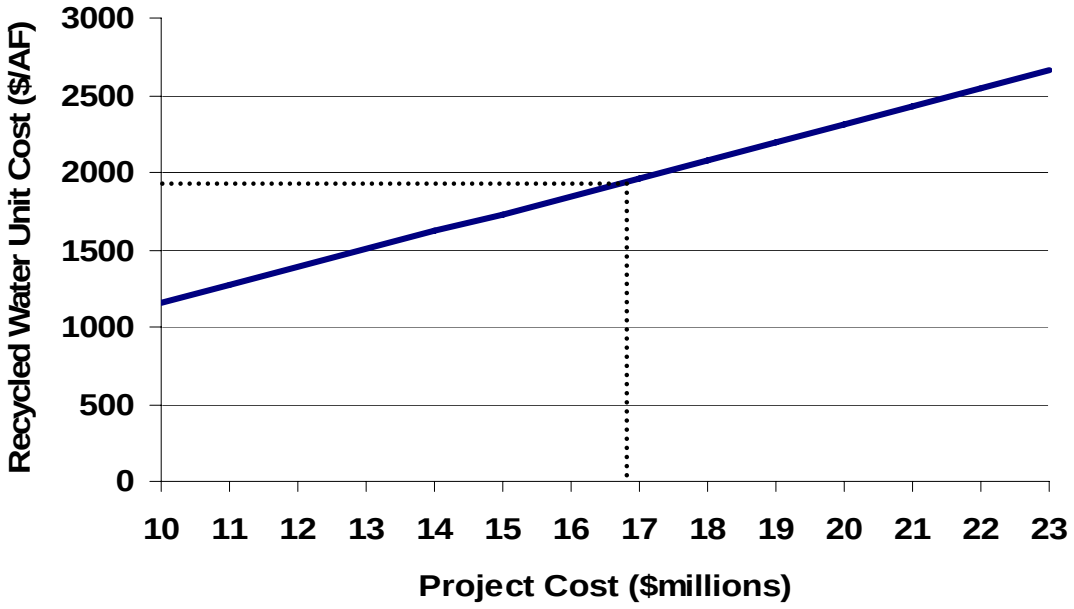
4.4.1 Project Cost Sensitivity

The recycled water unit cost is sensitive to the project capital cost, for a specific demand. For example, a project cost of $15.2 (10 percent cost decrease) results in a recycled water unit cost of $1,757/AF and a project cost of $18.6 (10 percent cost increase) results in a recycled water unit cost of $2,150/AF. Figure 4-2 shows the relationship between project cost and recycled water unit costs.

4.4.2 Demand Sensitivity

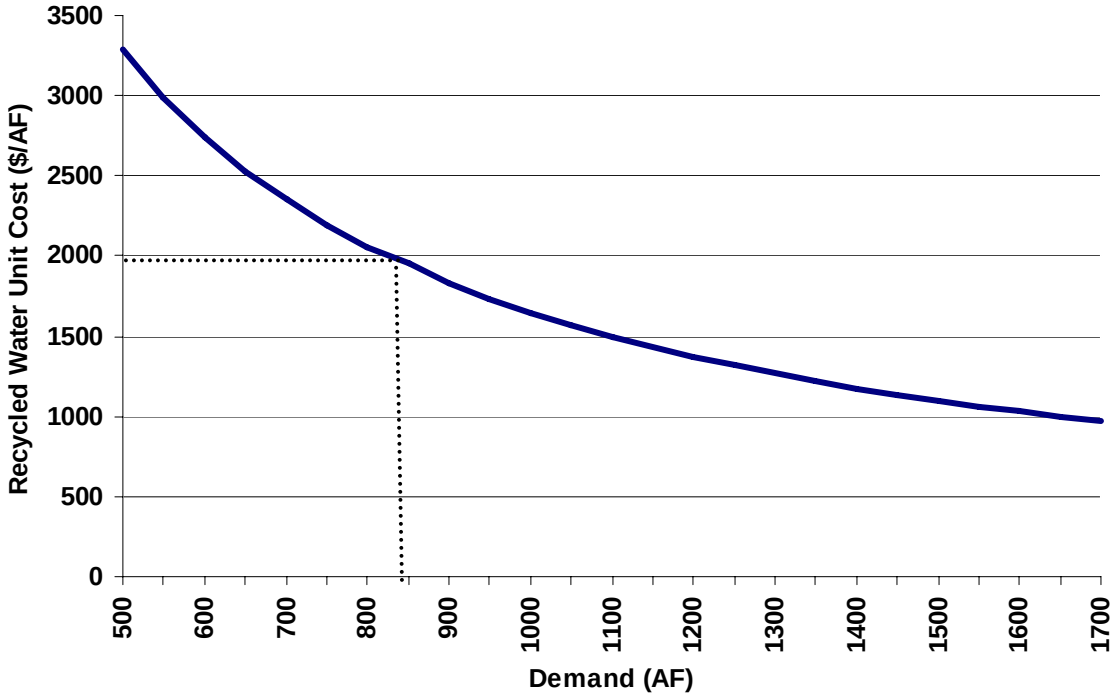
Similarly to cost sensitivity, demand sensitivity can be determined for a given recycled water project cost. The "break-even" recycled water unit cost of $1,959/AF is based on an estimated approximate recycled water demand of 840 AFY. Demand sensitivity was evaluated for demands ranging from 756 AFY (90 percent of anticipated demand) to 924 AFY (110 percent of anticipated demand). Recycled water demands of 756 AFY and 924 AFY resulted in recycled water unit cost of $2,177/AF and $1,781/AF, respectively, assuming a project cost of $16.9 million. Figure 4-3 shows the impact of demand on recycled water unit costs for a given project cost.

Figure 4-2: Recycled Water Unit Cost Sensitivity to Project Costs



Overall, as shown in figure 4-3, for a given project cost, the break-even unit price of recycled water decreases when the recycled water demand increases. Therefore, it is critical to have as many customers as possible to keep the cost of recycled water competitive and enticing.

Figure 4-3: Recycled Water Unit Cost Sensitivity to Recycled Water Demand



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Appendix F - Recommended Project Cash Flow Analysis

City of Palo Alto Recycled Water Project
SWRCB WRFP Project # 3229-010

Design and Construction Cash Flow Analysis[1]

		Design									
	TOTALS	Sep-09	Oct-09	Nov-09	Dec-09	Dec-09	Jan-10	Mar-10	Mar-10	Apr-10	May-10
DESIGN/CONSTRUCTION COSTS[2]											
Eligible Design/Construction Costs	$ 33,800,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000
Engineering/Construction Management Costs by Consultant	$ 4,400,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000
Construction Costs	$ 29,400,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Land and Right of Way	$ 1,200,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -			$ -
Connection Fee	$ 1,100,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -			$ -
TOTAL	**$ 36,100,000**	**$ 220,000**	**$ 220,000**	**$ 220,000**	**$ 220,000**	**$ 220,000**	**$ 220,000**	**$ 220,000**	**$ 220,000**	**$ 220,000**	**$ 220,000**
PAYMENTS FROM PROJECT ACCOUNT											
Design/Construction Payment	$ 36,100,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000
TOTAL	**$ 36,100,000**	**$ 220,000**	**$ 220,000**	**$ 220,000**	**$ 220,000**	**$ 220,000**	**$ 220,000**	**$ 220,000**	**$ 220,000**	**$ 220,000**	**$ 220,000**
PAYMENTS TO PROJECT ACCOUNT											
City of Palo Alto[3]	$ 23,100,000	$ 4,100,000									
Purissima Hills Water District - Future Offset / Connection Fee	$ 1,000,000										
Stanford - Future Offset / Connection Fee	$ 1,000,000										
Title XVI Funds	$ 5,000,000										
Proposition 84 Grant	$ 2,000,000										
SWRCB Construction Grant	$ 4,000,000										
TOTAL	**$ 36,100,000**	**$ 4,100,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
PROJECT ACCOUNT END OF MONTH BALANCE		**$ 3,880,000**	**$ 3,660,000**	**$ 3,440,000**	**$ 3,220,000**	**$ 3,000,000**	**$ 2,780,000**	**$ 2,560,000**	**$ 2,340,000**	**$ 2,120,000**	**$ 1,900,000**

		Advertise, Bidding & Award				Construction					
	TOTALS	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11
DESIGN/CONSTRUCTION COSTS												
Eligible Design/Construction Costs	$ 33,800,000	$ 220,000	$ 220,000	$ 55,000	$ 55,000	$ 55,000	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500
Engineering/Construction Management Costs by Consultant	$ 4,400,000	$ 220,000	$ 220,000	$ 55,000	$ 55,000	$ 55,000	$ 71,500	$ 71,500	$ 71,500	$ 71,500	$ 71,500	$ 71,500
Construction Costs	$ 29,400,000						$ 1,470,000	$ 1,470,000	$ 1,470,000	$ 1,470,000	$ 1,470,000	$ 1,470,000
Land and Right of Way	$ 1,200,000	$ 300,000	$ 300,000	$ 300,000	$ 300,000							
Connection Fee	$ 1,100,000											
TOTAL	**$ 36,100,000**	**$ 520,000**	**$ 520,000**	**$ 355,000**	**$ 355,000**	**$ 55,000**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**
PAYMENTS FROM PROJECT ACCOUNT												
Design/Construction Payment	$ 36,100,000	$ 520,000	$ 520,000	$ 355,000	$ 355,000	$ 55,000	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500
TOTAL	**$ 36,100,000**	**$ 520,000**	**$ 520,000**	**$ 355,000**	**$ 355,000**	**$ 55,000**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**
PAYMENTS TO PROJECT ACCOUNT												
City of Palo Alto[3]	$ 23,100,000						$ 25,000,000					
Purissima Hills Water District - Future Offset / Connection Fee	$ 1,000,000											
Stanford - Future Offset / Connection Fee	$ 1,000,000											
Title XVI Funds	$ 5,000,000									$ 1,000,000		$ 1,000,000
Proposition 84 Grant	$ 2,000,000			$ 1,000,000								
SWRCB Construction Grant	$ 4,000,000											$ 2,000,000
TOTAL	**$ 36,100,000**	**$ -**	**$ -**	**$ 1,000,000**	**$ -**	**$ -**	**$ 25,000,000**	**$ -**	**$ -**	**$ 1,000,000**	**$ -**	**$ 3,000,000**
PROJECT ACCOUNT END OF MONTH BALANCE		**$ 1,380,000**	**$ 860,000**	**$ 1,505,000**	**$ 1,150,000**	**$ 1,095,000**	**$ 24,553,500**	**$ 23,012,000**	**$ 21,470,500**	**$ 20,929,000**	**$ 19,387,500**	**$ 20,846,000**

	TOTALS	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12
EXPENSES (Payments from Project Account)												
Eligible Design/Construction Costs	$ 33,800,000	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500
Engineering/Construction Management Costs by Consultant	$ 4,400,000	$ 71,500	$ 71,500	$ 71,500	$ 71,500	$ 71,500	$ 71,500	$ 71,500	$ 71,500	$ 71,500	$ 71,500	$ 71,500
Construction Costs	$ 29,400,000	$ 1,470,000	$ 1,470,000	$ 1,470,000	$ 1,470,000	$ 1,470,000	$ 1,470,000	$ 1,470,000	$ 1,470,000	$ 1,470,000	$ 1,470,000	$ 1,470,000
Land and Right of Way	$ 1,200,000											
Connection Fee	$ 1,100,000											
TOTAL	**$ 36,100,000**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**
PAYMENTS FROM PROJECT ACCOUNT												
Design/Construction Payment	$ 36,100,000	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 1,541,500
TOTAL	**$ 36,100,000**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**	**$ 1,541,500**
PAYMENTS TO PROJECT ACCOUNT												
City of Palo Alto[3]	$ 23,100,000											
Purissima Hills Water District - Future Offset / Connection Fee	$ 1,000,000											
Stanford - Future Offset / Connection Fee	$ 1,000,000											
Title XVI Funds	$ 5,000,000	$ 1,000,000			$ 1,000,000							
Proposition 84 Grant	$ 2,000,000											
SWRCB Construction Grant	$ 4,000,000											
TOTAL	**$ 36,100,000**	**$ 1,000,000**	**$ -**	**$ -**	**$ 1,000,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
PROJECT ACCOUNT END OF MONTH BALANCE		**$ 20,304,500**	**$ 18,763,000**	**$ 17,221,500**	**$ 16,680,000**	**$ 15,138,500**	**$ 13,597,000**	**$ 12,055,500**	**$ 10,514,000**	**$ 8,972,500**	**$ 7,431,000**	**$ 5,889,500**

					Initiation of Operations/Operations							
	TOTALS	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13
EXPENSES (Payments from Project Account)												
Eligible Design/Construction Costs	$ 33,800,000	$ 1,541,500	$ 1,541,500	$ 1,541,500	$ 55,000	$ 55,000	$ 55,000	$ -	$ -	$ -	$ -	$ -
Engineering/Construction Management Costs by Consultant	$ 4,400,000	$ 71,500	$ 71,500	$ 71,500	$ 55,000	$ 55,000	$ 55,000					
Construction Costs	$ 29,400,000	$ 1,470,000	$ 1,470,000	$ 1,470,000								
Land and Right of Way	$ 1,200,000											
Connection Fee	$ 1,100,000			$ 1,100,000								
TOTAL	**$ 36,100,000**	**$ 1,541,500**	**$ 1,541,500**	**$ 2,641,500**	**$ 55,000**	**$ 55,000**	**$ 55,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
PAYMENTS FROM PROJECT ACCOUNT												
Design/Construction Payment	$ 36,100,000	$ 1,541,500	$ 1,541,500	$ 2,641,500	$ 55,000	$ 55,000	$ 55,000	$ -	$ -	$ -	$ -	$ -
TOTAL	**$ 36,100,000**	**$ 1,541,500**	**$ 1,541,500**	**$ 2,641,500**	**$ 55,000**	**$ 55,000**	**$ 55,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
PAYMENTS TO PROJECT ACCOUNT												
City of Palo Alto[3]	$ 23,100,000				$ (6,000,000)							
Purissima Hills Water District - Future Offset / Connection Fee	$ 1,000,000				$ 1,000,000							
Stanford - Future Offset / Connection Fee	$ 1,000,000				$ 1,000,000							
Title XVI Funds	$ 5,000,000				$ 1,000,000							
Proposition 84 Grant	$ 2,000,000				$ 1,000,000							
SWRCB Construction Grant	$ 4,000,000				$ 2,000,000							
TOTAL	**$ 36,100,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**					
PROJECT ACCOUNT END OF MONTH BALANCE		**$ 4,348,000**	**$ 2,806,500**	**$ 165,000**	**$ 110,000**	**$ 55,000**	**$ -**					

Notes:
1. Cash flow analysis does not consider the financing costs, which would be paid back over a period longer than project implementaion, so the financing mechanism (e.g. bonds, SRF, etc.) is not considered here.
2. Capital costs were escalated from Plan estimate in March 2008 dollars to estimated mid-point of construction in November 2010. An annual inflation rate of 3% was applied.
3. Negative value indicates reimbursement to the City for funds put up for construction in anticipation of refunds from various sources.

Appendix G - Stakeholder Meeting Summary or Material

Facilities Managers Meeting
Palo Alto Recycled Water Project

Presenters:
Jane Ratchye, Palo Alto
Helene Kubler, RMC

June 13, 2007

RMC *Innovative Solutions for Water and the Environment*

Presentation in Brief

- What is the Palo Alto Recycled Water Project?
- What is the status of the Project?
- What are the next steps?
- Do you have questions or comments?

RMC

Recycled Water is Part of Palo Alto's Long-Term Water Resources Strategy

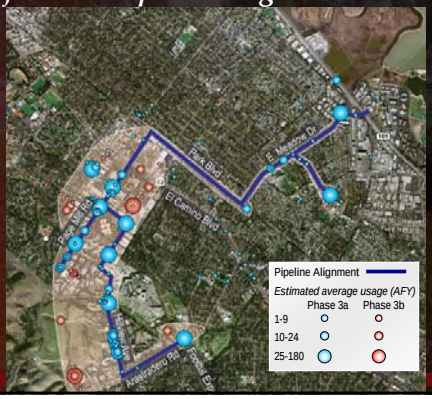
RMC

Project Concept in Numbers

- 800 acre-feet per year of recycled water
- Over 50 use sites
- About 70% landscape irrigation
- 6 miles of 12 to 18-in pipes
- 1 booster station

RMC

Project Concept in Image



RMC

Primary Benefits to Potential Customers

- Provides reliable, locally controlled supply
- Reduces water rationing in droughts
- Is in-line with green business practices
- Results in potential cost savings on your water bill

RMC

Who is a Potential Customer?

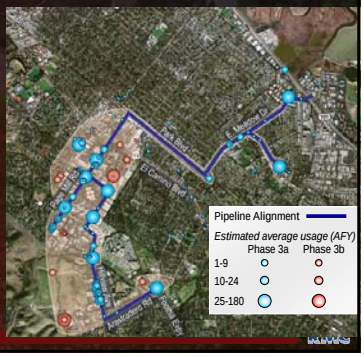
- Anyone along the pipeline path with irrigation or other uses for non-potable water
- The greater your usage of non-potable water, the more we are interested in your participation to make this project work

Project Schedule

- Facility Planning and Environmental Review Work is Starting; Scheduled to be Completed in early 2008
- If City Decides to Move Forward with Implementation:
  - Design Would Start in late 2008/2009
  - Recycled Water Would Be Available in 2011

Immediate Next Steps

- Refining Recycled Water Demand Estimates
- Refining Project Alignment
- Pursuing State, Federal, and other Outside Sources of Funding
- Getting Potential Customer Input/Feedback



Questions or Comments?

Jane Ratchye
jane.ratchye@cityofpaloalto.org

Helene Kubler
hkubler@rmcwater.com

Visit the Water Reuse Program Website

http://www.city.palo-alto.ca.us/waterreuse/

Meeting Summary

Palo Alto Recycled Water Project

Subject:	Public Scoping Meeting
Prepared For:	Jane Ratchye
Prepared By:	Erin Darling
Date/Time:	September 18, 2007 (6:30 – 8:00 pm)
Location:	Cubberley Community Center
Project Number:	0038-009

Attendees: Jane Ratchye, Rosalie Lefkowitz, Wynn Grcich, Trish Mulvey, Mike Francois, Phil Bobel, Mike Goff, Marty Laporte, Jamie Allen, Tom W. Zigterman, Eric Clow, Helene Kubler, Erin Darling

1. Purpose of Meeting

The meeting was a public scoping meeting to present the proposed Palo Alto Recycled Water Project and environmental review process and hear comments from the public regarding issues to be addressed in the Initial Study.

2. Discussion Summary

The meeting agenda was as follows:

- Introductions
- Presentation
    - Recycled Water Overview
    - Overview of Palo Alto's Recycled Water Project
    - Environmental Review Process
- Public Comments
- Closing Remarks

The City of Palo Alto and RMC presented the proposed project and the public was provided the opportunity to speak out in support or opposition to the project and submit oral and written comments addressing issues related to the project and the environmental review process. Public comments on the Palo Alto Recycled Water Project are summarized in Section 2.2. The presentation is attached to this document. Discussions at any future public meetings will be assisted by the use of recording comments on large paper during the meeting.

2.1 Attendee Information

Twelve people attended the meeting in addition to RMC staff and Jane Ratchye, Project Manager, City of Palo Alto.

Name	Affiliation	Address	Phone or Email
Rosalie Lefkowitz	None specified	3468 Greer Rd., Palo Alto, CA 94303	rlef@earthlink.net
Wynn Grcich	A.T.O.W.N.	Union City, Mira Loma	None specified
Trish Mulvey	CLEAN South Bay	527 Rhodes Dr., Palo Alto, CA 94303	mulvey@ix.netcom.com
Mike Francois	A.T.O.W.N	224 Gargella Way E., Palo Alto, CA 94303	650-322-1502
Phil Bobel	Palo Alto Water Quality Control Plant	2501 Embarcadero Way, Palo Alto, 94303	phil.bobel@cityofpaloalto.org
Mike Goff	Stanford University, Utilities Division	327 Bonair Siding, Stanford, CA 94305	mikeg@bonair.stanford.edu
Marty Laporte	Stanford University, Utilities Division	327 Bonair Siding, Stanford, CA 94305	martyl@bonair.stanford.edu
Jamie Allen	Palo Alto Water Quality Control Plant	2501 Embarcadero Way, Palo Alto, CA 94303	james.allen@cityofpaloalto.org
Tom W. Zigterman	Stanford University	None specified	twz@stanford.edu
Eric Clow	Los Altos Hills Planning Commission	27660 Central Dr., Los Altos Hills, CA	eclow@hinagroup.com 650-949-4914

2.2 Public Comments

Eric Clow

1. This is a great project and I would love to see how we could extend it to Los Altos Hills (written comment).

Wynn Grcich

1. Concerned with recycled water quality compared to drinking water quality. In particular, concerned with the chemical composition of recycled water. The chemical composition and potential health risks should be communicated to the public and people using the parks and areas that would be using recycled water.
2. Concerned with use of recycled water in fountains, ponds, pooled water, sprinklers, in public areas where children and adults can get the water on their hands and shoes and become contaminated and sick. No recycled water should be used in this manner. Used the example of a fountain in San Jose where people got sick (salmonella case?). Phil Bobel commented – kids got in the fountain with fecal matter and the recirculating of potable water is what caused the issue in this case; not recycled water.

3. Signage – signs should be posted that explain the use of recycled water and inform people about its use and effects. Standard signage should be improved to state that hands should be washed and shoes should be sprayed off after playing/walking on grass that has been irrigated with recycled water. Suggested that sinks be installed at schools and recreation areas (parks) with potable water that people can use to wash their hands and shoes with after playing on the fields that have been irrigated with recycled water.
4. Concerned with percolation of recycled water into the groundwater and groundwater quality – arsenic
5. Concerned with over how the recycled water will be stored at the recycled water treatment plant. Referred to the Geyser project as an example of "underground storage" of concern.
6. Concerned over chloramination of the recycled water and the health effects of chloramination.
7. Prop 84 funds should be used to clean up water and make sure that we are treating recycled water to the maximum extent possible before use.
8. Chloramine in drinking water in such places as Washington D.C. has resulted in the leaching of lead into the water supply. The question was asked whether this will be a problem in this service area since chloramine is used as a disinfectant by SFPUC and whether lead will appear in the waste water.
9. Submitted three articles – "Recycled Water Plant Set to Open" (Redwood City), "Treated Sewage Still Contaminated", "End Palo Alto's 'exploding toilets'".
10. Was provided with an opportunity to clarify all comments in writing.

Tom Zigterman

1. Can customers connect to their existing irrigation systems (or do they need to replace the entire system with purple pipe)? Response by RMC – Customers with existing irrigation systems do not need to replace the entire system. Only relatively minor retrofits such as signage installation or replacing valve covers and sprinkler heads will be required. Cross connection testing is also required.
2. What is the limiting factor for the 900 AFY of recycled water? Response by RMC – The potential market within the service area is currently the primary limiting factor. Pipe size (18-inch) is a secondary limiting factor.

Other Comments and Questions

1. Could there be an issue with flooding in Adobe Creek associated with installation of an 18-inch line under the bridge? Response by RMC – It should not be a problem. The City is working with the Santa Clara Valley Water District to confirm that this is also their perspective.
2. What will be the cost to customers? Response by RMC – Recycled water is typically priced lower than potable water to provide an incentive to customers to connect. However, the City has not yet made decision on recycled water pricing.
3. When will the recycled water be available? Response by RMC – If the project is implemented according to current plans, recycled water would be available in 2012.
4. Is Nixon School part of the project? Response by RMC – it was included as a potential user but left out from the recommended project because of high lateral cost. We have confirmed this

response: Nixon School was included in the 2006 Recycled Water Market Survey. It was identified as a potential user and its demand was estimated. However, it was not included as a user in the proposed project, most likely due to its distance from the backbone alignment. Nixon is not included in the proposed project in the current study because it was not identified as a user under the proposed project in the previous study. The final recycled water users will be confirmed in the design phase of the current proposed project, so Nixon School could be added.

5. The maps on slide 10 and slide 12 of the presentation differ from each other. Response by RMC – the pipeline alignment map on slide 12 is most current. For example, the proposed pipeline would not go all the way to Junipero Serra along Page Mill.
6. What is the cost of the project? Response by RMC – The project is currently estimated to cost between $20 and $30 million.
7. What percent of the treatment plant flows will be used? Response by Phil Bobel – Less than 10%.
8. Have you considered working with Purissima Hills Water District? Response by RMC and Jane Ratchye – The City has been in contact with Purissima Hills Water District although no action has been taken as of now regarding either prolonging the pipeline to Los Altos Hills or evaluating potential for water exchange.
9. Where will the extra water be stored? Response by RMC – Recycled water would be stored in a tank at the treatment plant site.
10. Where are the pipes connecting the major pipeline to the customer? Response by RMC – Small pipes –also called laterals- would connect the major pipeline to the customer's irrigation system. The connection would be made near the property line.
11. Trish Mulvey recommended a fact sheet listing the chemical composition of the recycled water, perhaps in comparison to potable water.
12. Phil Bobel mentioned that the plant takes every precaution to ensure that people do not drink recycled water as there is no guarantee that it will be totally free of pathogens and chemicals. Controls will be put in place to ensure it will not be ponded anywhere or be used in fountains.

Public Scoping Meeting
Palo Alto's Recycled Water Project

Presenters:
Jane Ratchye, Palo Alto
Helene Kubler, RMC
Erin Darling, RMC

September 18, 2007

RMC *Innovative Solutions for Water and the Environment*

Meeting Purpose

- Hear public comment on proposed scope and focus of the Initial Study for Palo Alto's Recycled Water Project
- Gather public input on:
  - Environmental effects
  - Methods of assessment
  - Mitigation measures to reduce impacts of the proposed project

RMC

Project Team Introductions

- City of Palo Alto
  - Jane Ratchye, Project Manager
- RMC Water and Environment
  - Helene Kubler, Consultant Team Project Manager
  - Erin Darling, Environmental Lead
- Meeting Reminders
  - Check-in at the sign-in table
  - Please hold all comments until the end of the presentation

RMC

Meeting Agenda

- Introductions
- Presentation
  - Recycled Water Overview
  - Overview of Palo Alto's Recycled Water Project
  - Environmental Review Process
- Public Comments
- Closing Remarks

RMC

Recycled Water Overview

RMC

Recycled Water Overview

- 1991 California Water Recycling Act (California Water Code 13577)
  - Goal of recycling one million acre feet of water annually by 2010
  - Prohibits the use of potable water for landscape irrigation wherever suitable recycled water is available at a reasonable cost.

RMC

Recycled Water Overview

- Using recycled water assists in meeting water supply needs by decreasing the amount of drinking water that is used for irrigation and industrial purposes.

RMC

Palo Alto's Recycled Water Project

RMC

Palo Alto Regional Water Quality Control Plant (RWQCP) Water Reuse Program

- Reliable, sustainable and drought-proof supply of water in the South Bay and Santa Clara County since 1980.
- Suitable for landscape irrigation, commercial and industrial use and habitat restoration.
- Program meets and exceeds standards set by the California Department of Public Health.

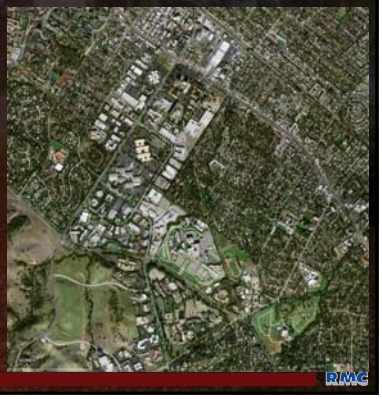
RMC

Palo Alto's Recycled Water Project Would Be Phase 3 of Program Expansion

RMC

Target Market

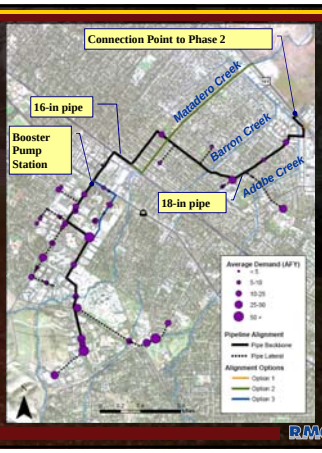
- Initially serve approximately 900 acre-feet per year (AFY), mostly in Stanford Research Park Area
- Predominantly used for landscape irrigation



RMC

Proposed Facilities

- 5 miles of 12 to 18-inch pipes
- 1 booster station
- 5 miles of laterals to over fifty use sites
- Three alignment options
- Additional storage and pumping at Treatment Plant



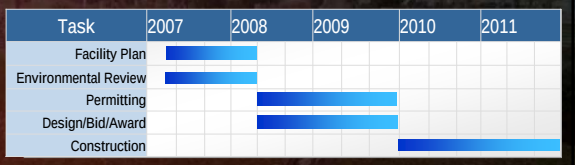
RMC

Primary Benefits

Customers	City	Other Stakeholders
• Provides reliable, locally controlled supply to reduce the level of potable water rationing in droughts	• Offsets need to purchase approximately 900 AFY of potable water • Improves supply reliability • Advances the City's green initiative	• Contributes to Santa Clara Valley Water District meeting recycled water goal • Reduces San Francisco Public Utilities Commission reliance on imported water • Reduces effluent discharge to the South Bay

RMC

Tentative Schedule



RMC

Environmental Review Process

RMC

California Environmental Quality Act

- Projects require environmental review under California Environmental Quality Act (CEQA) before they can be considered for approval
- Lead Agency – City of Palo Alto
- Responsible Agency – Regional Water Quality Control Plant

RMC

CEQA Objectives

- Present environmental impacts of proposed projects
- Identify ways to avoid or reduce environmental impacts
- Support the agency decision-making process
- Encourage public participation
- Enhance interagency coordination

RMC

Initial Study

- Detailed description of project and environment
- Identify potential environmental effects
- Identify ways to avoid or reduce significant environmental effects through mitigation
- Prepared by a Lead Agency to determine whether an EIR or a Negative Declaration is needed.

RMC

Environmental Review Schedule

- Public Scoping Meeting – September 18, 2007
- Public Review of Draft Initial Study – Fall 2007
- Release of Proposed Final Initial Study – Early 2008
- If no significant impacts, adopt Negative Declaration – Early 2008

RMC

Environmental Topics to Evaluated in the Initial Study

- Aesthetics
- Agricultural Resources
- Air Quality
- Biological Resources
- Cultural and Historic Resources
- Geology and Soils
- Hazards and Hazardous Materials
- Hydrology and Water Quality
- Land Use and Planning
- Mineral Resources
- Noise
- Population and Housing
- Public Services
- Recreation
- Transportation and Traffic
- Utilities and Service Systems

RMC

Public Comment

RMC

For More Information

About the Environmental Review Process and Palo Alto Recycled Water Project

Jane Ratchye (City of Palo Alto)
(650) 329-2119
jane.ratchye@cityofpaloalto.org

RMC

Appendix H - Recycled Water Use Ordinance

ORDINANCE NO. 5002

ORDINANCE OF THE COUNCIL OF THE CITY OF PALO ALTO ADDING CHAPTER 16.12 (RECYCLED WATER) TO TITLE 16 OF THE PALO ALTO MUNICIPAL CODE TO REQUIRE THE USE OF RECYCLED WATER FOR IRRIGATION, TOILET AND URINAL FLUSHING AND TRAP PRIMING

The Council of the City of Palo Alto does ORDAIN as follows:

SECTION 1. Findings and Declarations. The City Council finds and declares as follows:

(a) Potable water is one of our most precious natural resources and is becoming increasingly scarce in the semiarid State of California.

(b) The use of treated, nonpotable water for construction, toilet and urinal flushing and irrigation will increase the amount of potable water available for other uses in the City. The City of Palo Alto is dedicated to conserving the potable water supply, and this Chapter will assist in preserving this precious commodity.

(c) Recycled water is a sustainable water source that reduces potable water consumption and is not subject to rationing during drought. After careful study, the City Council has determined that recycled water shall be used within the boundaries of Recycled Water Project Areas for construction, toilet and urinal flushing and irrigation purposes whenever it is available and beneficial to the customer.

(d) In adopting this program, the Council has balanced the needs of all water users and through this implementation strategy will allow water users sufficient flexibility to meet their potable and nonpotable water needs.

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SECTION 2. A new Chapter 16.12 is hereby added to Title 16 of the Palo Alto Municipal Code to read as follows:

CHAPTER 16.12
RECYCLED WATER

Sections:

16.12.010 Definitions.

(a) "Dual plumbing" means a system of two sets of water pipes, one for recycled water for toilets and urinals and one for potable water for other interior uses.

(b) "Floortrap priming" means the practice of adding water to traps beneath floor drains to ensure a barrier from sewer gas.

(c) "Identified Customers" are entities purchasing water from the City of Palo Alto who are adjacent to a recycled water pipeline shown in a Final Palo Alto Recycled Water Project Plan. Identified customers do not include single family residences.

(d) "Recycled water" means wastewater treated by the Palo Alto Regional Water Quality Control Plant that meets State requirements for reuse.

(e) "Recycled Water Permit" means a permit issued by the City Manager or his/her designee to allow a customer to use recycled water at its facility.

(f) "Recycled Water Project Area" means a geographical area of the City designated by resolution of City Council as an area where recycled water will be served.

16.12.015 Compliance with state and local regulations.

All users of recycled water shall comply with the California Department of Public Health regulations contained in Title 17 and Title 22 of the California Code of Regulations, and with the Palo Alto Water Reuse Rules and Regulations for the use of recycled water.

16.12.020 Converting existing potable water users to recycled water for irrigation.

Within the boundaries of any Recycled Water Project Area, Identified Customers who are notified by mail by the City shall use recycled water for irrigation when available. Any such notification shall include the conditions of use, pricing, and construction schedule for the City's recycled water pipeline and the connections to it.

16.12.025 Converting existing potable water users (with existing dual plumbing) to recycled water for toilet and urinal flushing and floor trap priming.

For facilities with existing dual plumbing within the boundaries of any Recycled Water Project Area, Identified Customers shall use recycled water when it is available following notification by mail by the City that a conversion to recycled water for toilet and urinal flushing and floor trap priming purposes is required. Any such notification shall include the conditions of use, pricing, and construction schedule for the City's pipeline and the connections to it.

16.12.030 New construction; recycled water use for irrigation.

(a) All applications for land use permits, building permits and other discretionary actions for projects other than single family homes, within the boundaries of any Recycled Water Project Area, filed after the adoption of this ordinance, shall include the following:

(1) Plans demonstrating that recycled water will be used, when available, for all irrigation.

(2) Consideration of plants suitable for irrigation with recycled water.

(3) The installation of the on-site infrastructure necessary to connect the irrigation system to the City's recycled water supply when it becomes available.

(b) All applications for land use permits, building permits and other discretionary actions for projects other than single family homes, in geographic areas not within the boundaries of a Recycled Water Project Area, where the total landscape area exceeds 1500 square feet, filed after the adoption of this ordinance, shall include the following:

(1) Plans demonstrating that recycled water will be used, when available, for all irrigation.

(2) Consideration of plants suitable for irrigation with recycled water.

(3) The installation of on-site infrastructure necessary to connect the site's irrigation system to the City's recycled water supply when it becomes available.

16.12.035 New construction; recycled water use for toilet and urinal flushing and floor trap priming.

(a) All applications for building permits for new or remodeled buildings or groups of buildings within the boundaries of a Recycled Water Project Area, filed after the adoption of this ordinance, where the building square footage total, including both the original square footage and any addition, is greater than 10,000 square feet or where installation of 25 or more toilets and urinals is proposed, shall incorporate dual plumbing in the design of the facility to allow the use of recycled water, when it becomes available, for flushing toilets and urinals and priming floor traps. Dual plumbing requirements shall not apply to single family homes.

(b) All applications for building permits for new or remodeled buildings or groups of buildings in geographic areas not within the boundaries of a Recycled Water Project Area, filed after the adoption of this ordinance, where the building square footage total, including both the original square footage and any addition, is greater than 100,000 square feet or where installation of 100 or more toilets and urinals is proposed, shall incorporate dual plumbing in the design of the facility to allow the use of recycled water, when it becomes available, for flushing toilets and urinals and priming floor traps. Dual plumbing requirements shall not apply to single family homes.

(c) When dual plumbing requirements are triggered by remodeling, only those restroom facilities located within the remodel project area shall be required to incorporate dual plumbing.

16.12.040 Recycled Water Permit required.

Upon written notification pursuant to Sections 16.12.020 and 16.12.025 that recycled water is available and must be used, the recycled water customer shall obtain a Recycled Water Permit by submitting a Recycled Water Permit application, which shall include plans detailing the recycled and potable water distribution systems at the facility. A City representative shall review the plans and conduct a field inspection before the Recycled Water Permit is issued. The applicant must make any required changes as directed by the City before a Recycled Water Permit may be issued.

16.12.045 Recycled water permit conditions; verification of compliance.

The recycled water permit shall specify the requirements for the applicant's use of recycled water based on the Water Reuse Rules and Regulations adopted pursuant to 16.12.015, and shall require compliance with the California Department of Public Health regulations contained in Title 17 and Title 22 of the California Code of Regulations and with any additional requirements specified by the State Water Resources Control Board. Recycled water shall not be

supplied to a facility until inspection by a City representative determines that the applicant is in compliance with the permit conditions.

16.12.050 Exemptions and adjustments.

An application for an exemption or an adjustment to the requirements of this chapter shall be made to the Director of Public Works or his/her designee. Requests for an exemption or adjustment may be made consistent with state law and shall be based on the finding by the Director of Public Works that the use of recycled water demonstrates an adverse effect to the applicant's landscaping installed prior to the effective date of the ordinance codified herein. The Director of Public Works may also consider any additional factors, including any special costs or hardships which may be created by the use of recycled water. A written determination will be made on all requests for exemptions or adjustments within ten (10) business days and mailed to the applicant. If the exemption or adjustment is not granted, the applicant must fully comply with the requirements of this section.

16.12.055 Appeals.

Denial of any application for an exemption and/or adjustment to the provisions of recycled water use may be appealed to the City Manager or his/her designee, whose decision shall be final. An application for appeal shall be filed with the City Clerk in writing within ten (10) business days after the Director of Public Works' decision and shall state the specific grounds for the appeal. The City Manager or his/her designee shall hear the appeal within sixty (60) calendar days after the appeal has been filed with the City Clerk and shall issue a written decision within thirty (30) days.

16.12.060 Failure to comply with this chapter.

In addition to existing penalties in state and local law for violation of the provisions of this chapter, the City Manager or his/her designee may assess the following penalties, subject to the appeal provisions set forth above:

(a) A water service surcharge of fifty percent (50%) of the general water service rate, as set forth in Utility Rate Schedule, for each billing period during which potable water is used for irrigation.

(b) Continued use of potable water for irrigation, after a written warning by the City Manager or his/her designee, may result in the discontinuation of water service supplied for irrigation by the City of Palo Alto following a noticed hearing. A charge as set forth in the City's administrative fee schedule shall be paid prior to the reactivation or restoration of water service.

(c) Any use of recycled water in a manner contrary to the provisions of this title, is hereby declared to be a nuisance and may be abated in the manner provided for the abatement of nuisances in Chapter 9.56 of the Palo Alto Municipal Code.

16.12.065 Monitoring.

Representatives of the City and the San Francisco Bay Regional Water Quality Control Board shall be authorized to enter, the premises of any recycled water user to carry out inspections and monitoring to assure compliance with this chapter and applicable state of California regulations.

16.12.070 Severability.

If any provision or clause of this chapter is held to be unconstitutional or otherwise invalid by any court of competent jurisdiction, such invalidity shall not affect other provisions of this chapter, and clauses of this chapter are declared to be severable.

SECTION 3. The Council hereby finds this ordinance is categorically exempt from the requirements of the California Environmental Quality Act ("CEQA") pursuant to Sections 15307 and 15308 of the CEQA Guidelines (exempting actions taken by regulatory agencies for the protection of natural resources and the environment), and pursuant to Sections 13554 and 13552.4 of the California Water Code (exempting projects which involve the repiping, redesign, or use of recycled water necessary to comply with a requirement to use recycled water for toilet and urinal flushing or residential landscaping).

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SECTION 4. This ordinance shall be effective on the thirty-first day after the date of its adoption.

INTRODUCED: April 28, 2008

PASSED: May 12, 2008

AYES: BARTON, BURT, DREKMEIER, ESPINOSA, KISHIMOTO, KLEIN, MORTON, SCHMID, YEH

NOES:

ABSENT:

ABSTENTIONS:

ATTEST:

City Clerk

Mayor

APPROVED AS TO FORM:

Deputy City Attorney

APPROVED:

City Manager

Director of Public Works

Director of Administrative Services