

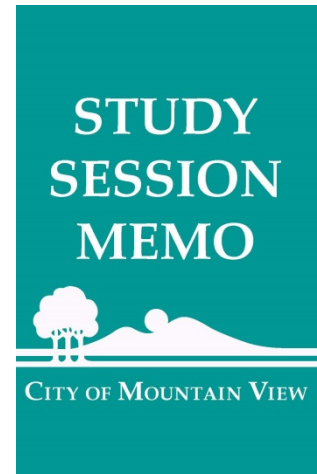
DATE: April 1, 2014

TO: Honorable Mayor and City Council

FROM: Gregg A. Hosfeldt, Assistant Public Works Director
Michael A. Fuller, Public Works Director

VIA: Daniel H. Rich, City Manager

TITLE: **Recycled Water System – Current Operations and Expansion Feasibility Study Results**



PURPOSE

This memorandum provides a report on the status of the City's recycled water system operations and an overview of the system expansion feasibility study.

BACKGROUND

The City of Mountain View supplies potable water to business and residential customers, delivering approximately 10.5 million gallons per day (mgd) to over 17,600 sites. The City also evaluates current and projected future water supplies and consumption to ensure customer needs will be met. The City is required by the California Department of Water Resources to periodically develop an Urban Water Management Plan (UWMP) to compare the City's water supply to current, historical, and projected water demand. The UWMP is used as a water supply planning resource for the City and identifies what actions may be necessary for the City to ensure an adequate supply for residential and business needs.

The UWMPs for 2000 and 2005 illustrated the potential for long-term supply shortages, and the most recent UWMP (2010) included a finding that while the City anticipates being able to meet demands in regular water supply years, a scenario in which the City experiences a single dry year between 2015 and 2035 could lead to a shortfall of potable water ranging from 3 percent in 2015 to 14 percent in 2035. If the City experienced a five-year dry period, the potable supply shortfall could be 2 percent in the first year, increasing to 14 percent to 24 percent in the fifth.

To minimize the potential impacts of a long-term supply shortage, reduce the regional need to develop new potable supplies, and pursue the City's goals for environmental sustainability, in 2009 the cities of Mountain View and Palo Alto completed construction of a distribution system to supply recycled water from the Palo Alto

Regional Water Quality Control Plant (RWQCP) to the North Bayshore Area of Mountain View (north of Highway 101). The system supplies recycled water for irrigation to many of Mountain View's largest water consumers and business customers. Construction was funded by the Shoreline Fund, a revolving fund loan from the California Water Resources Control Board, and a grant from the United States Bureau of Reclamation.

When originally designed, the recycled water system was anticipated to supply an average of 1.0 mgd when all customers were connected. Because many of the anticipated customers incorporated water-saving measures, including installing drought-tolerant landscaping and improved irrigation systems, the estimated average daily consumption for the system has been reduced to approximately 0.86 mgd.

Daily demand peaks during warmer months and will significantly exceed the anticipated average daily use. The recycled water supply agreement with the City of Palo Alto entitles Mountain View to use a daily maximum of 3.0 mgd of recycled water at no cost. Because two of the expansion options increase the maximum demand above 3.0 mgd, in anticipation of a future demand increase, staff is working with the City of Palo Alto to revise the current recycled water supply agreement. Staff anticipates agreement on new contract terms in Fiscal Year 2014-15. The contract extension effort is discussed later in this report. The existing recycled water system is shown in Figure 1.

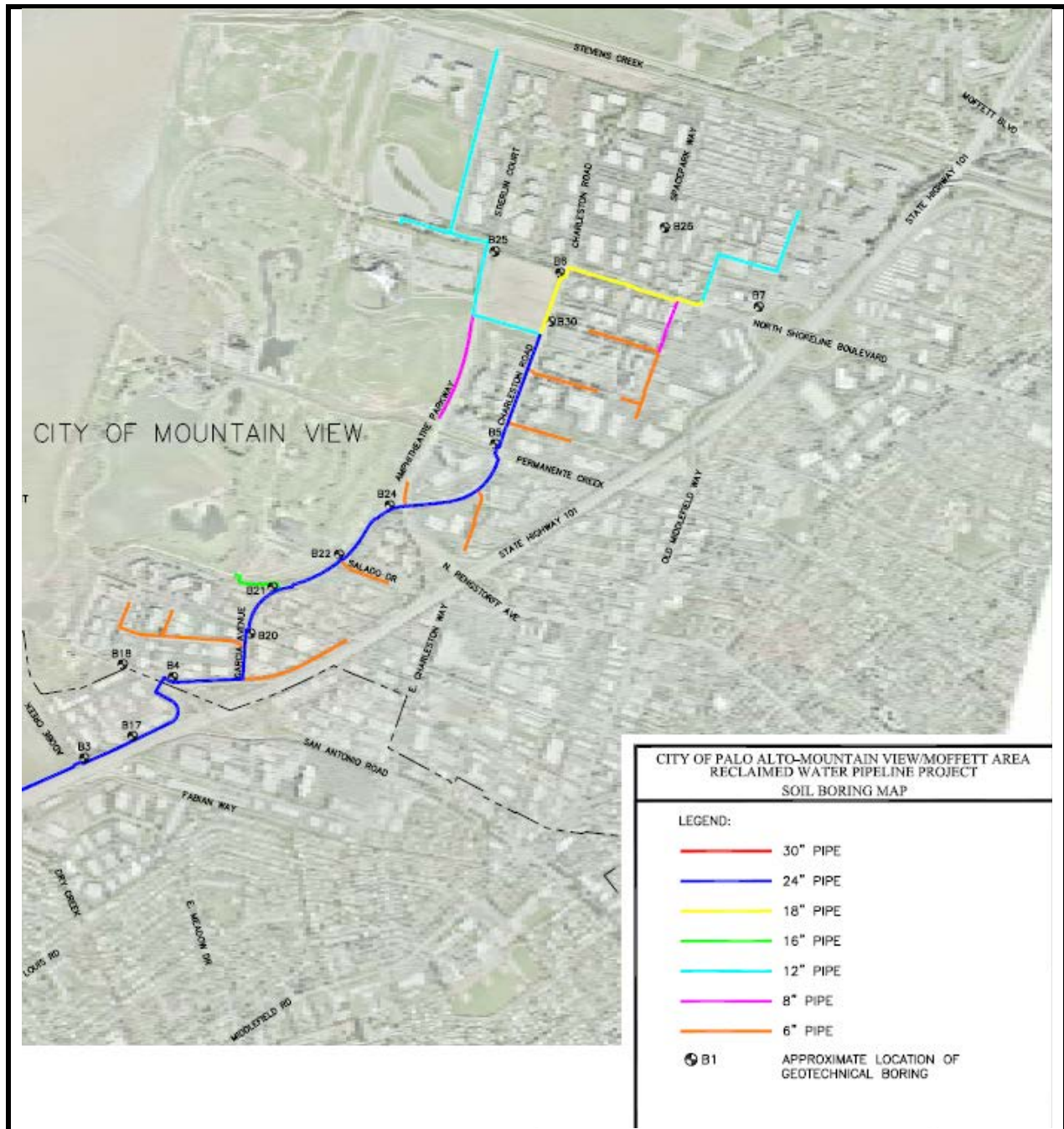


Figure 1

Existing System Operation

The system began operation with recycled water service to 23 sites, which has gradually increased to 32 sites. Between January 2010 and August 2011, average daily recycled water use was 0.40 mgd, with peak use of 0.89 mgd (July 2011).

Consumption in Fiscal Year 2012-13 declined to 0.34 mgd, primarily due to decreased use at the Shoreline Golf Links because of concerns regarding the impact of recycled water quality on landscaping. Water quality issues and improvement measures are discussed later in this report.

DISCUSSION

Expansion Feasibility Study

In 2012 the City contracted with Carollo Engineers (Carollo) to study the feasibility, cost, and benefits of expanding the existing recycled water distribution system. The study was funded with \$300,000 from the Water Fund; City costs will be partially offset by grants from the United States Bureau of Reclamation (\$100,000 received in February) and the State Water Resources Control Board (maximum grant of \$75,000).

Carollo performed an analysis of expansion opportunities, developing alternative scenarios based on the potential to serve commercial, industrial, irrigation, and multi-family customers. The alternatives did not focus on single-family customers as the cost of developing recycled water infrastructure to serve these customers is very high relative to the potential consumption, and service to single-family locations would require installation of dedicated irrigation systems and meters. Figure 2 illustrates the location of customers with significant potential recycled water use.

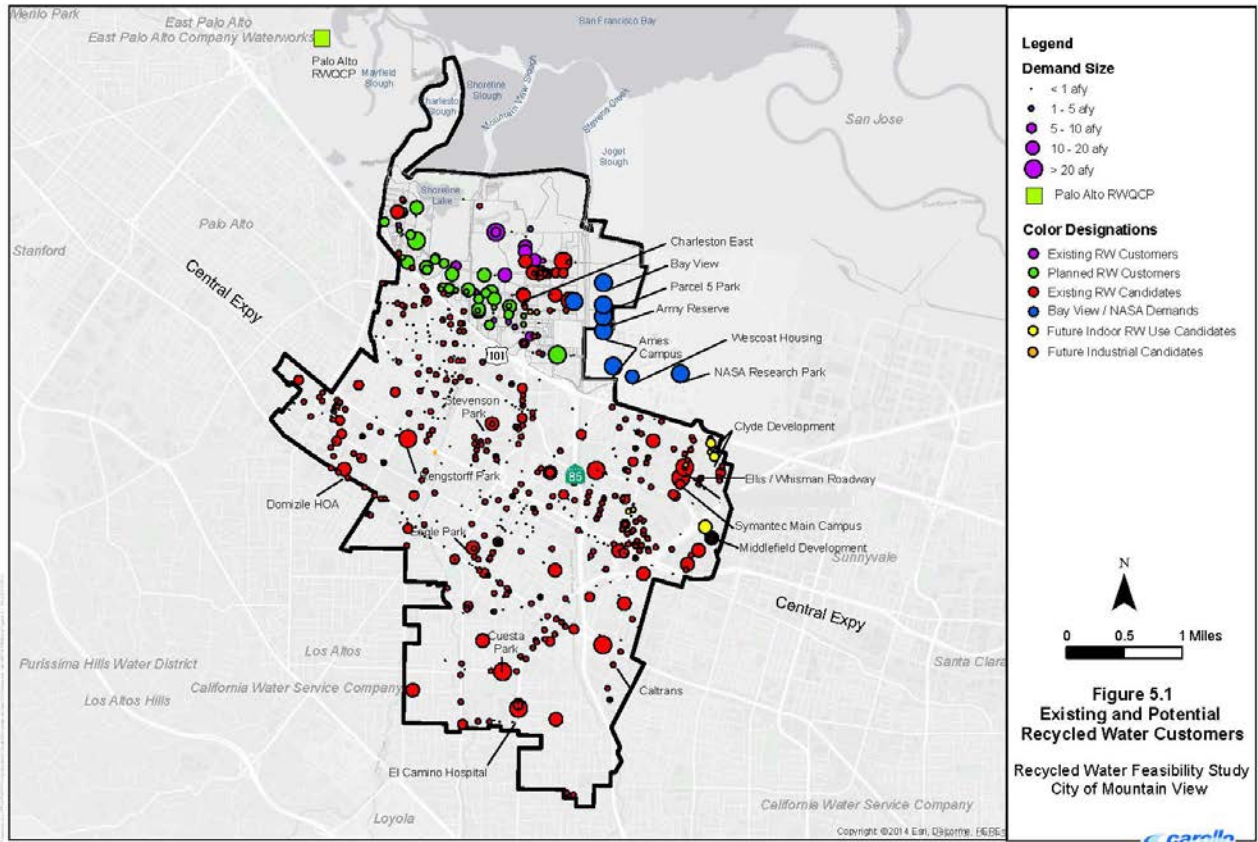


Figure 2

Carollo developed five expansion alternatives and provided an overview of potential customers and consumption, pipeline alignments, and project obstacles. Consumption for each alternative is listed in terms of average daily demand (ADD) and maximum day demand (MDD) to identify when MDD will exceed that amount of water contractually guaranteed to Mountain View. A summary of the alternatives, including capital cost and project costs per acre-foot of water supply, is presented in the following sections. Project costs per acre-foot reflect capital, operation, and maintenance costs over a 30-year period, and provide a standard basis for comparing expansion alternatives as well as other options for developing new water supplies (reservoirs, desalination, etc.).

Alternative 1:

This expansion would add pipelines to serve 24 new customers in the North Bayshore Area and 7 new customers on the National Aeronautics and Space Administration (NASA) site, east of Stevens Creek and north of Highway 101; the proposed pipeline and meter installations are illustrated in Figure 3. New customers include businesses

on Stierlin Court, Shorebird Way, and Charleston Road (east of Shoreline Boulevard), Google sites in the Bay View development, and the Army Reserve and NASA/Ames campus. The alternative includes crossings of Stevens Creek (at Crittenden Lane and Charleston Road).

Alternative 1 would add demand of 0.52 mgd and increase ADD to 1.38 mgd; MDD would increase to 2.8 mgd, slightly less than the current contract limit of 3.0 mgd. This scenario includes 23,000' of new pipeline, a 1.8 MG reservoir (to ensure the City can meet peak-hour flows), and a booster pump station to ensure adequate system pressure. The estimated cost of this alternative ranges from \$13.4 million to \$16.8 million, resulting in an estimated cost of \$1,950 to \$2,450 per acre-foot.

The Bay View development at NASA could include 1 million square feet of business and residential space, and would use recycled water at numerous sites. Based on preliminary discussions with Bay View project staff, a majority of the infrastructure on the east side of Stevens Creek (shown in Figure 3), and a portion of the infrastructure west of Stevens Creek, are anticipated to be constructed as part of the project. Staff will be able to develop a more accurate cost estimate after the City receives project plans, but tentatively estimates 30 percent to 40 percent of the pipelines in Alternative 1 will be constructed with the Bay View development, at their expense.

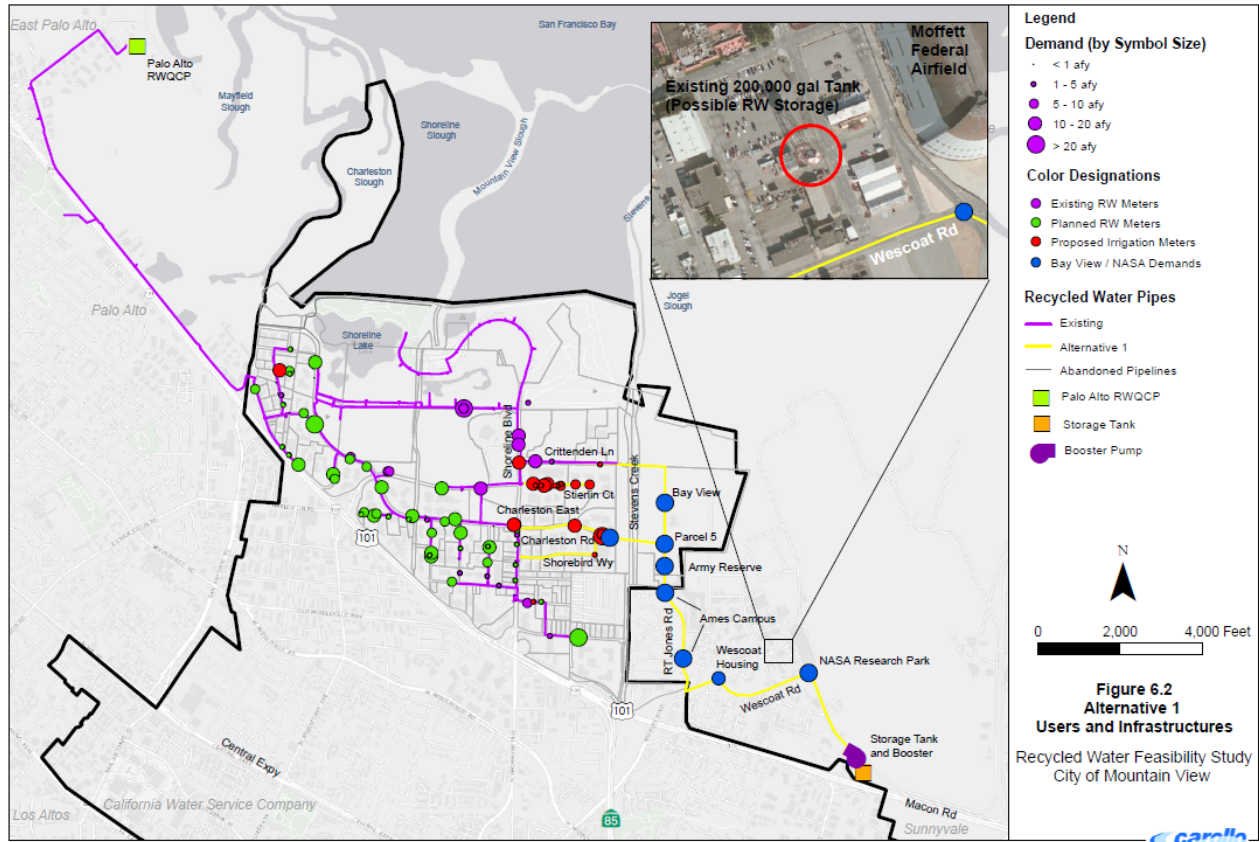


Figure 3 (Alternative 1)

Alternative 2:

Alternative 2 adds infrastructure to the pipelines constructed in Alternative 1 to serve 40 additional customers along Middlefield Road, Ellis Street, Clyde Avenue, and North Whisman Road; the proposed pipeline and meter installations are illustrated in Figure 4.

Alternative 2 would add demand of 0.17 mgd and increase ADD to 1.55 mgd; MDD would increase to 3.2 mgd, higher than the current contract limit of 3.0 mgd. As discussed later in this report, staff is working with the City of Palo Alto to revise the current recycled water supply agreement and anticipates being able to agree on new contract terms in Fiscal Year 2014-15. This scenario includes 39,000' of new pipeline, a 1.9 MG reservoir, and a booster pump station. The estimated cost of this alternative ranges from \$18.2 million to \$22.7 million; because of the relatively small amount of new demand served by this alternative, the estimated cost per acre-foot ranges from \$8,100 to \$10,150 per acre-foot.

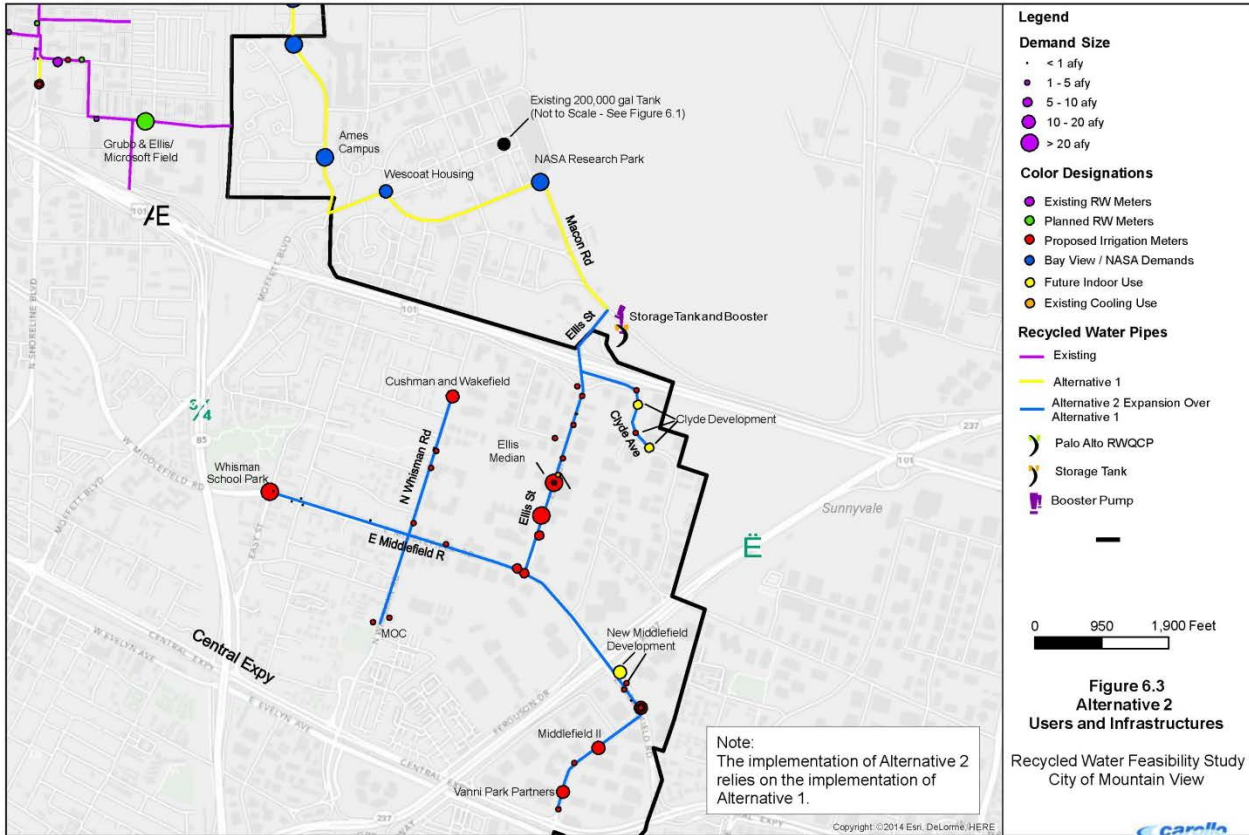


Figure 4 (Alternative 2)

Alternative 3:

Alternative 3 adds infrastructure to the pipelines constructed in Alternatives 1 and 2, serving 53 customers south of Central Expressway, including El Camino Hospital, Sylvan Park, Cuesta Park, and Cooper Park. The proposed pipeline and meter installations are illustrated in Figure 5.

Alternative 3 would add demand of 0.24 mgd and increase ADD to 1.79 mgd; MDD would increase to 3.8 mgd, higher than the current contract limit of 3.0 mgd. This scenario includes a total of 61,000' of pipeline, a 2.3 MG reservoir, and two booster pump stations. The estimated cost of this alternative ranges from \$25.2 million to \$31.5 million; again, because of the small amount of new demand served by this alternative, the estimated cost per acre-foot ranges from \$7,975 to \$9,975 per acre-foot.

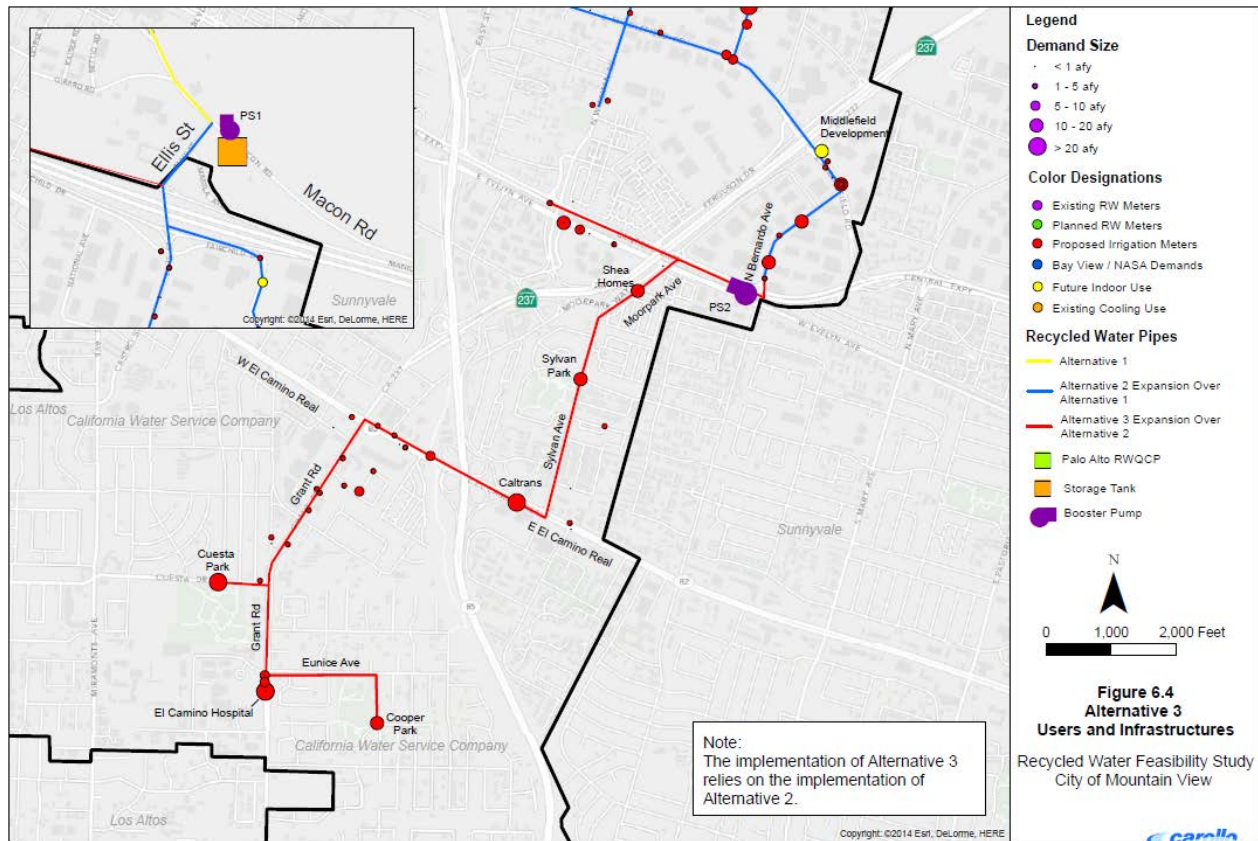


Figure 5 (Alternative 3)

Alternative 4:

Alternative 4 adds infrastructure to the existing system to serve 51 new customers, including businesses on Shoreline Boulevard south of Highway 101, Franklin Street, Castro Street, Miramonte Avenue, Cuesta Drive, and Grant Road. Numerous City facilities, including Stevenson Park, Eagle Park, McKelvey Park, and Cuesta Park would be served. The proposed pipeline and meter installations are illustrated in Figure 6. Alternative 4 would be constructed independently of Alternatives 1, 2, and 3.

Alternative 4 would add demand of 0.24 mgd and increase ADD to 1.10 mgd; MDD would increase to 2.2 mgd. This scenario includes 38,000' of new pipeline, a 2.1 MG reservoir, and three booster pump stations. The estimated cost of this alternative is \$18.2 million to \$28.2 million; because of the small amount of new demand served by this alternative, the estimated cost per acre-foot ranges from \$5,750 to \$8,900 per acre-foot.

The pipeline alignment for Alternative 4 includes potential use of abandoned pipelines; the wide range of estimated costs of this alternative reflects the unknown condition of the pipe. In Fiscal Year 2014-15, staff will consider analyzing the condition of the abandoned lines, which will be necessary to develop a more definitive construction cost estimate.

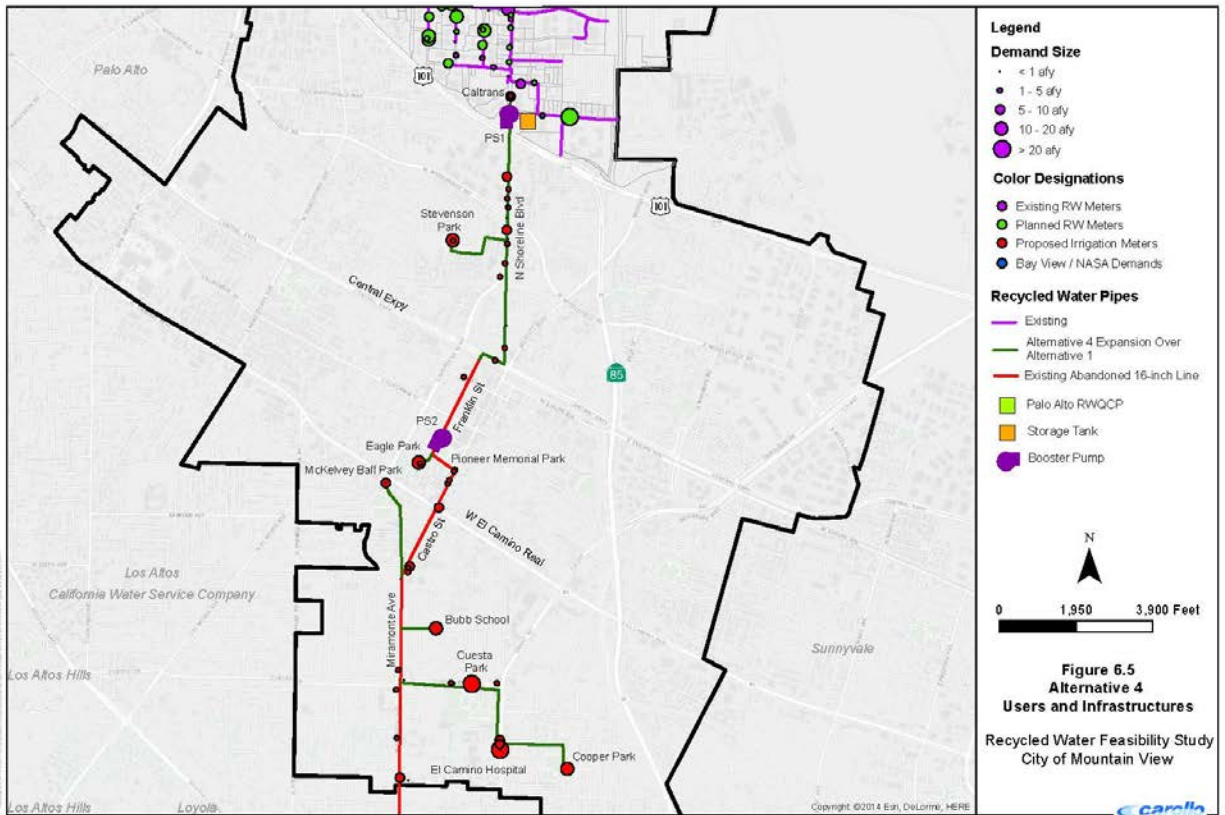


Figure 6 (Alternative 4)

Alternative 5:

Alternative 5 adds infrastructure to the existing system to serve 42 new customers south of Highway 101; the proposed pipeline and meter installations are illustrated in Figure 7. New customers would include primarily multi-family properties along Rengstorff Avenue, Central Expressway, California Street, and Ortega Avenue. Alternative 5 would be constructed independently of Alternatives 1, 2, 3, and 4.

Alternative 5 would add demand of 0.09 mgd and increase ADD to 0.95 mgd; MDD would increase to 1.9 mgd. This scenario includes 41,000' of new pipeline, a 1.9 MG reservoir, and two booster pump stations. The estimated cost of this alternative ranges from \$23.2 million to \$28.2 million; because of the small amount of new demand served

by this alternative, the estimated cost per acre-foot ranges from \$19,575 to \$23,750 per acre-foot.

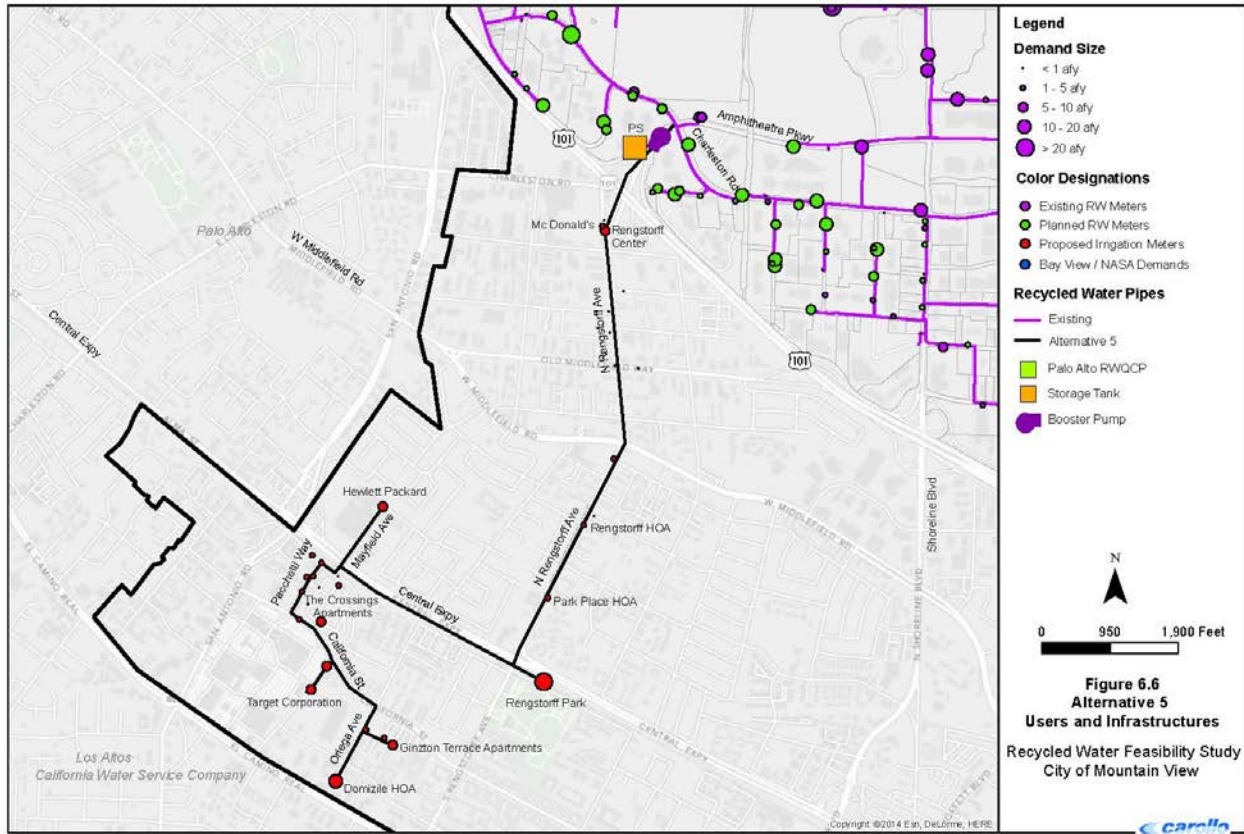


Figure 7 (Alternative 5)

Recommended Project:

The key parameters of each alternative are presented in Figure 8. Staff considers Alternative 1 the most feasible expansion option based on the estimated cost of construction, the additional demand, and the possibility that a significant portion of Alternative 1 could be constructed with the Bay View development. Staff does not recommend pursuing Alternatives 2 through 5 at this time due to the relatively small increases in recycled water consumption, high construction costs, and high per-acre-foot costs when compared to Alternative 1.

The recommended project would add an estimated 31 recycled water customers, increasing consumption (beyond consumption estimated for the existing system) by approximately 0.52 mgd. Mountain View’s potable water use would decrease by an estimated 0.20 mgd; the remaining 0.32 mgd of recycled water would be provided to

customers in the Bay View/NASA area not currently served by the City’s potable water distribution system. Alternative 1 would add recycled service to approximately 145 acres in North Bayshore, and approximately 500 acres in the Bay View development/NASA area.

Carollo developed project costs for evaluation of alternatives and included a conservative markup for design, construction management, environmental, and contingency costs. Staff will continue to evaluate the estimates versus current construction bid results. Favorable bids will positively impact the per-acre-foot cost estimates provided in this report.

	Customers	Consumption (m.g.d.)	Total consumption	Pipe Length (feet)	Estimated Cost	Cost per acre foot
Existing System	84	0.86	0.86	39,000		
Alternative 1	31	0.52	1.38 ⁽¹⁾	23,000	\$13,400,000 - \$16,800,000	\$1,950 - ⁽²⁾ \$2,450
Alternative 2	40	0.17	1.55 ⁽³⁾	39,000	\$18,200,000 - \$22,700,000	\$8,100 - \$10,150
Alternative 3	53	0.24	1.79 ⁽⁴⁾	61,000	\$25,200,000 - \$31,500,000	\$7,975 - \$9,975
Alternative 4	51	0.24	1.10 ⁽⁵⁾	38,000	\$18,200,000 - \$28,200,000 ⁽⁶⁾	\$5,750 - \$8,900
Alternative 5	42	0.09	0.95 ⁽⁷⁾	41,000	\$23,200,000 - \$28,200,000	\$19,575 - \$23,750
Footnotes						
1) Total of Existing System and Alternative 1						
2) Acre foot costs will be reduced by third party funding of construction costs						
3) Total of Existing System and Alternatives 1 & 2						
4) Total of Existing System and Alternatives 1, 2 & 3						
5) Total of Existing System and Alternative 4						
6) Cost of Alternative 4 is a large range due to unknown potential to use abandoned pipes in distribution system						
7) Total of Existing System and Alternative 5						

Figure 8

Grant and Loan Funding

No funding currently exists for design and construction, although staff is investigating potential funding sources, including new grants and low-/no-cost loans that may become available.

The City can pursue grant funding through the Western Recycled Water Coalition (WRWC), a collaboration of cities, water, and wastewater districts, and investor-owned water utilities developing local and regional recycled water projects in the western United States. The WRWC advocates for State and Federal project funding and, since 2009, has secured over \$38 million to construct eight Coalition projects and prepare feasibility studies for 14 new projects. As a direct result of the WRWC's efforts, the City in 2010 received a \$3.3 million grant from the United States Bureau of Reclamation towards construction of the existing system. The WRWC is currently seeking funding for approximately 25 projects that will produce 118,000 acre-feet (over 100 mgd) of recycled water annually; the City's recycled water system expansion is included in the WRWC's list of potential projects for which funding will be requested.

Bay View/NASA Project Development

Google's Bay View development at NASA is anticipated to include 1 million square feet of business and residential space. Google is expected to use recycled water as part of their overall environmental sustainability efforts and to exceed current LEED standards. Use of recycled water will also help NASA meet the requirements of an Executive Order which includes a goal of reducing potable water use by 26 percent (versus 2007 consumption). The design of the Bay View distribution system is nearing completion, although the timing of construction is not yet known. Staff will monitor the Bay View development closely and work with Google and NASA representatives to ensure connections are designed to provide an adequate and secure supply to meet the needs of the new development.

Availability of Recycled Water – City of Palo Alto

The RWQCP operates under the terms of a 1968 agreement (Partner's Agreement) in which the cities of Mountain View and Los Altos agreed to retire their treatment plants and partner with the City of Palo Alto to construct a regional treatment plant. The RWQCP provides recycled water through a 2007 agreement that delineates the cost sharing of the original system construction and allocates 3.0 mgd of recycled water to Mountain View at no cost through 2035, concurrent with the expiration of the Partner's Agreement.

To prepare for a possible expansion of the recycled water system, in 2013, staff from Mountain View and Palo Alto initiated discussions to extend the agreement and amend key operating provisions. Although the amendment process is not complete, the significant discussion points are:

- Extending the contract term from 30 to 50 years, maintaining no charge for recycled water.
- Ensuring Mountain View has sufficient supply to meet the needs of an expanded distribution system.
- Reaffirming the partner agencies' commitment to reduce the salt content of the recycled water to 600 parts per million (ppm).
- The extension will be conditional on Mountain View's ability to meet minimum consumption levels.
- Mountain View will fund a portion of the costs of recycled water production and the costs of recycled water system capital replacement.

Any agreement extension will be dependent on extension of the Partner's Agreement, which is currently set to expire in 2035. Staff anticipates completing contract negotiations in Fiscal Year 2014-15.

Recycled Water Quality – Salinity Identification and Mitigation

The primary water-quality issue of recycled water is the high salinity, which can damage sensitive landscaping. Coastal redwoods are particularly susceptible to damage from highly saline water, and potable water is being blended with recycled water at the Shoreline Golf Links to maintain turf health. Salt enters the wastewater system from human and commercial/industrial activities, infiltration of salty groundwater near the Bay into underground pipes, groundwater extraction systems, water softeners, and illegal sewer connections.

The primary measure of salts in recycled water is total dissolved solids (TDS), which is measured in ppm. In 2010, the cities of Palo Alto, Mountain View, and Los Altos adopted a policy of reducing recycled water TDS levels 600 ppm, a level at which most landscaping can accept recycled water with no damage. Key elements of the policy include determining salinity levels in the waste stream from each partner agency,

identifying sources of salinity, identifying actions that can be implemented to meet the salinity goal, preparing a Salinity Reduction Plan, and monitoring salinity and reporting progress semiannually.

Following adoption of the policy, Mountain View and other partners completed or initiated numerous projects to reduce salt in their wastewater streams. In 2012, Mountain View completed the relining of approximately 3,900' of large sewer line (36" to 42") in the North Bayshore Area, which extended the service life by an estimated 50 years and significantly reduced the intrusion of highly saline groundwater. The City of Palo Alto and the East Palo Alto Sanitary District also relined numerous sections of sewer line to reduce groundwater intrusion. These efforts have significantly reduced the salinity of the wastewater sent to the RWQCP from Mountain View and the recycled water used by the City.

Year	Mountain View Wastewater (TDS)	RWQCP Recycled Water (TDS)
2010 through 2012	1,200	920
2013	880	773

Although the recycled water quality has improved, salt levels are still higher than targeted and vary by season. Mountain View is continuing to identify and eliminate other sources of highly saline groundwater, in addition to pursuing two related projects:

- The City extracts groundwater from two sites around the landfill to capture potential liquid discharges. This highly saline groundwater is discharged to the sanitary sewer, and staff estimates routing the discharge to surface water could reduce recycled water TDS levels by approximately 75 ppm. Staff is continuing to work with RWQCP staff, consultants, and the Regional Water Quality Board to implement strategies to allow the City to reroute the discharge to Permanente Creek or Stevens Creek.
- Mountain View is preparing to perform a video inspection of additional large sewer lines in the North Bayshore to assess pipeline condition and identify other areas of significant infiltration, and will request funding for additional relining work as warranted.

Irrigation Management Strategies

In addition to salt reduction efforts, staff is developing better guidance for customers planning on using recycled water for landscaping irrigation.

Redwood Tree Monitoring: Staff is working with the City of Palo Alto to monitor the response of established redwood trees to irrigation with recycled water. Ongoing monitoring includes nine test sites located in Mountain View, and monitoring will provide feedback on the effectiveness of varying irrigation strategies. Staff is aware that multiple redwoods along and near Shoreline Boulevard, particularly younger trees, are showing signs of damage, and several trees will need to be removed. Damage from high salt levels has been accelerated by recent drought conditions.

Bay Area Guide to Designing and Managing Landscape Irrigated with Recycled Water: Mountain View is participating in a regional project to develop a new irrigation guide. Participating agencies include South Bay Water Recycling, the Santa Clara Valley Water District, Bay Area Clean Water Agencies, Northern California Golf Association, Google, local landscape companies, universities, and regional agencies and retailers. Staff anticipates the guide will be available in Fiscal Year 2014-15.

RECOMMENDATION

Staff recommends pursuing implementation of Alternative 1 to supply recycled water to additional areas of North Bayshore, as well as the Bay View development and NASA facilities. Because Alternative 1 does not reflect pipeline alignments that may be included in the Bay View development, staff also recommends ongoing work with Bay View project representatives to determine the scope of new infrastructure and refine the infrastructure alignment identified in Alternative 1 before finalizing a project strategy.

NEXT STEPS

Based on Council direction, and after the scope of the project is more clearly defined, staff will develop a capital improvement project proposal and funding strategies for Council consideration.

Staff will also continue to increase recycled water consumption and assess opportunities for expanding the City's recycled water distribution system through the following steps:

- Monitoring the progress of the Bay View development.
- Continuing to add customers to the existing distribution system.
- Continuing to work with RWQCP partners to reduce the salt content of recycled water.
- Monitoring opportunities for construction grants and no-cost/low-cost loan funding.
- Developing analyses of expansion alternative costs and associated recycled water sales revenues.
- Continuing to refine construction cost estimates and identify cost-reduction opportunities.
- Updating long-term projected water consumption to analyze potential supply shortages in normal, single, and multiple dry year scenarios.

PUBLIC NOTICING – Agenda posting.

GAH-MAF/TS/7/CAM
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