RECYCLED WATER FEASIBILITY STUDY ADDENDUM

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1. INTRODUCTION

1.1 Background

Oro Loma Sanitary District (OLSD or District) treats an average of 12 million gallons per day (MGD) at its wastewater treatment plant (WWTP) to a secondary level. Treated wastewater is then transported to the East Bay Dischargers Authority (EBDA) system for final dechlorination and discharge to the EBDA Common Outfall, with a small portion (an average of 0.2 MGD) sent for beneficial reuse at Skywest Golf Course. Recognizing the potential to enhance water supply reliability for the region with additional reuse, the District completed a Recycled Water Feasibility Study (RWFS) in October 2016, which considered a variety of reuse alternatives including non-potable and potable options. The non-potable analysis identified approximately 1.5 MGD of potential recycled water demand spread over 130 potential customers throughout the RWFS study area which extended north of the District's service area towards the Upper San Leandro Reservoir. Non-potable alternatives were screened out early in the RWFS given the widely distributed nature of the potential demands, which would require numerous customer retrofits and an extensive distribution system for a comparatively small demand.

Since then, there have been changes that warrant re-evaluation of the District's participation in a non-potable supply project. First, East Bay Municipal Utility District (EBMUD), which is the water purveyor for the area, recently completed its Updated Recycled Water Master Plan. The plan concluded that there are various options for incorporating potable reuse into EBMUD's supply portfolio, including potable reuse from OLSD. However, EBMUD is not recommending potable reuse projects for the current planning horizon which extends through 2040. For the near-term, implementing OLSD's vision of using local water supply to meet local demands will require a non-potable project.

Development plans in the area, most notably the adoption of the City of San Leandro's Bay Fair Transit-Oriented Development (TOD), are another driver for reassessing the potential for a non-potable project. New developments are prime targets for recycled water service as the recycled water infrastructure can be incorporated into the initial design for outdoor as well as indoor use. The retrofits required for existing developments generally limit the feasibility of recycled water use to outdoor irrigation. The Bay Fair TOD Specific Plan includes policies to encourage the use of recycled water and recommends further investigation of improvements needed to serve the area with recycled water.

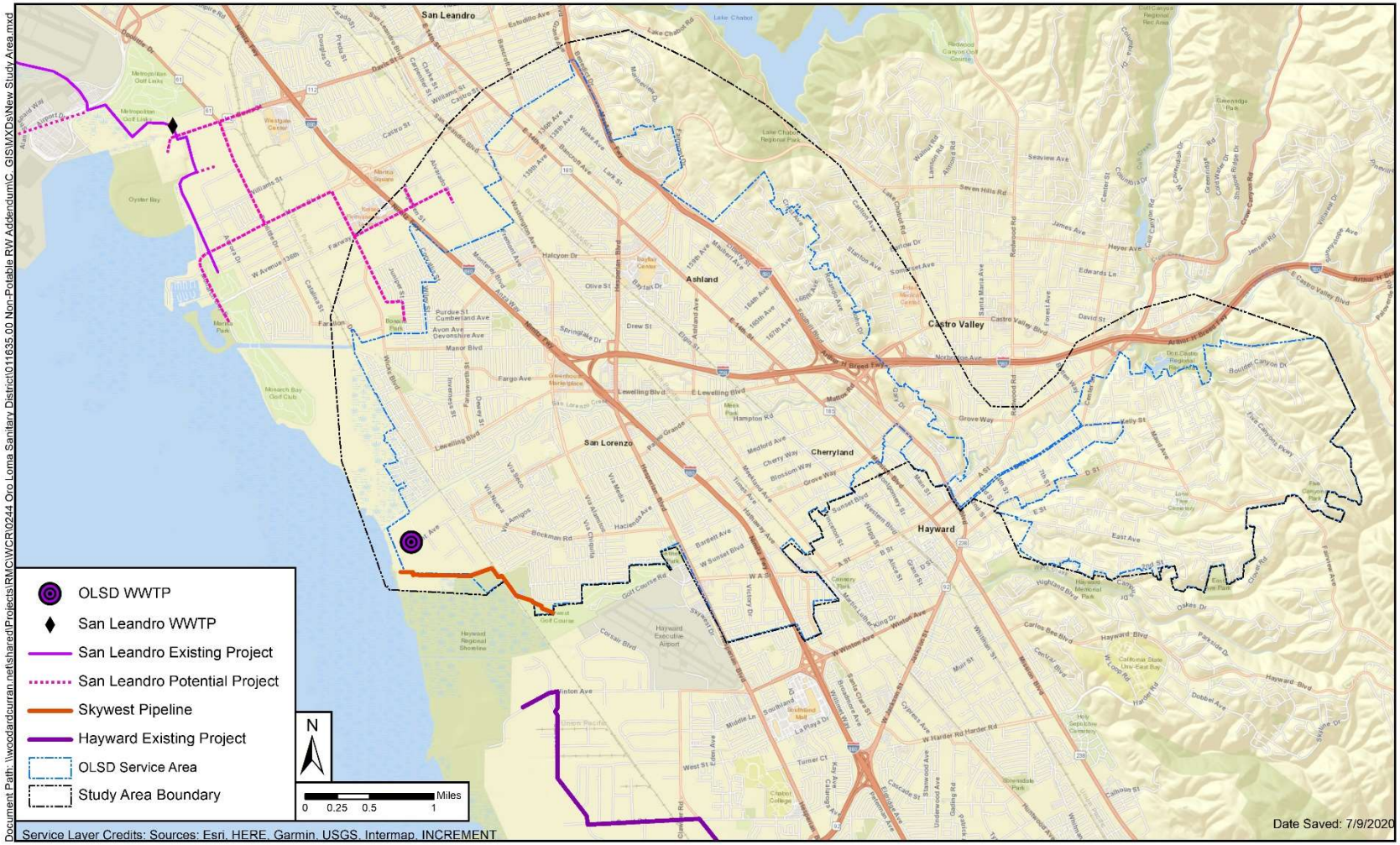
Given these recent changes, this Non-Potable Recycled Water Study Addendum (Addendum) to the RWFS has been prepared to:

- Identify current and future demands for non-potable recycled water within the boundaries of the District and adjacent communities
- Propose potential layouts for a non-potable recycled water distribution system
- Identify costs for proposed systems

1.2 Addendum Study Area

The study area for this Addendum focused on the OLSD service area. The study area boundary is shown in Figure 1-1. The boundary extends into portions of Castro Valley Sanitary District's (CVSD) and City of San Leandro's service areas to allow for consideration of significant recycled water demands immediately outside of the OLSD's service area.

Figure 1-1: Study Area



The City of San Leandro has an existing recycled water distribution system that delivers water from the San Leandro Water Pollution Control Plant (WPCP). In 2016, the city conducted a recycled water market assessment and identified a potential expansion of its recycled water distribution system to serve additional customers close to the WPCP. The identified system extends to the boundary between San Leandro's and OLSD's service area.

The City of Hayward is also implementing a recycled water project. The first phase of the project included construction of a pipeline that extends towards the boundary between Hayward's and OLSD's service areas, ending on Winton Avenue just south of the Hayward Regional Shoreline and Skywest Golf Course.

2. MARKET ASSESSMENT

2.1 Potential Non-Potable Demands

The 2106 RWFS market assessment was updated to include the Bay Fair TOD and other new developments proposed within the study area. The websites for the Alameda County Community Development Agency, City of San Leandro Community Development and City of Hayward Development Services were reviewed to identify sizeable developments that are proposed in the study area. Developments in the planning phase were included as potential recycled water demands if they met at least one of the following criteria:

- Include at least 100 multi-family units
- Include at least 500,000 square feet of commercial/industrial space

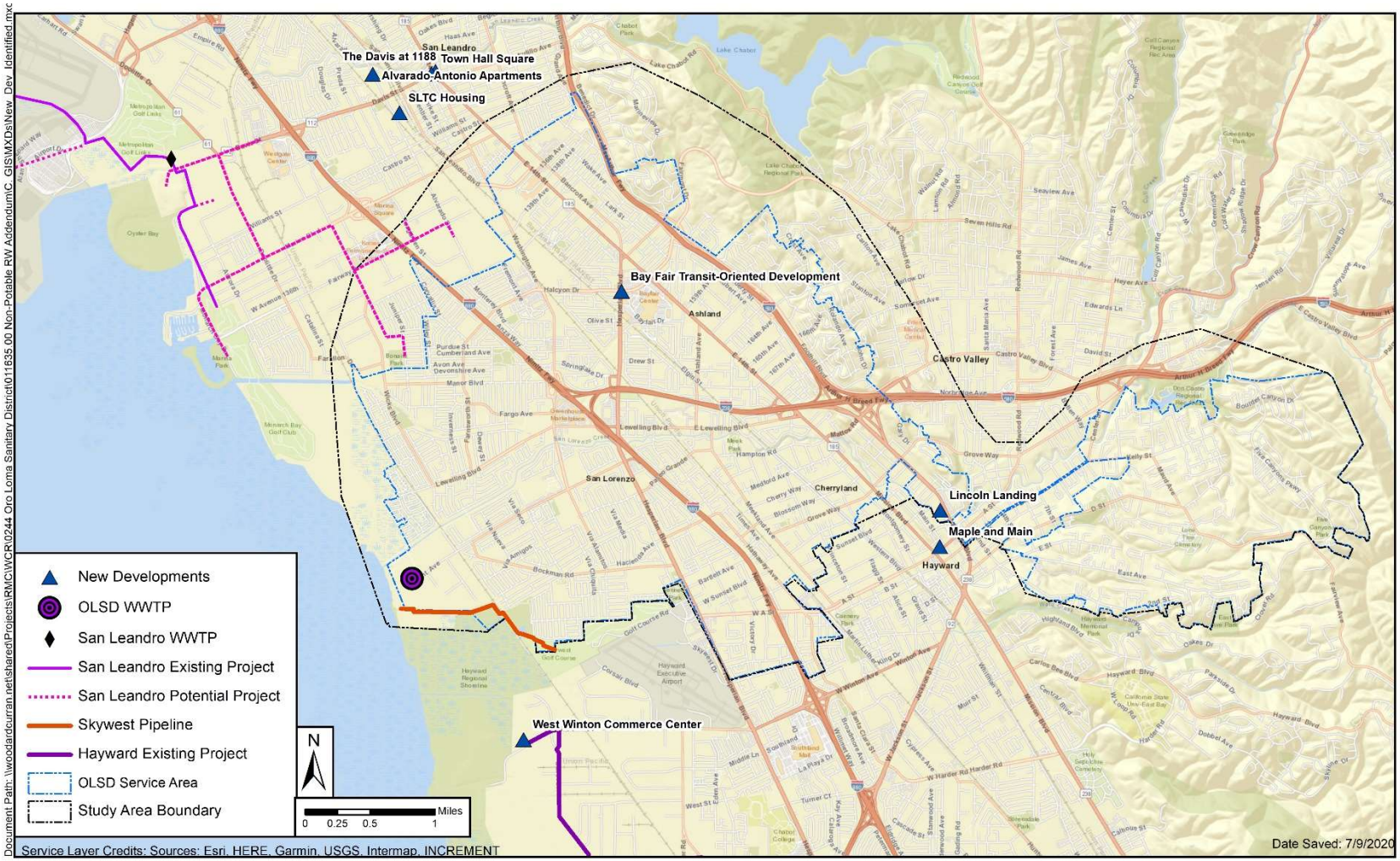
Eight developments were identified as potential recycled water users. Of these, two – Bay Fair and Lincoln Landing – are within the Addendum study area, as shown in Figure 2-1. The estimated recycled water demands for these developments, which are summarized in Table 2-1, are based on the projected number of multifamily residential units and commercial/industrial square footage. For indoor water demand, flow rates for dual plumbed fixtures were based on CalGreen Building Requirements and average daily use for residential and commercial sourced from Leadership in Energy and Environmental Design (LEED) and American Water Works Association (AWWA) publications, and the number of users were based on US Census data for persons per household and LEED building densities. The outdoor irrigation demand was calculated for the Bay Fair TOD using the assumption that 7% of the development area will be vegetated. This is based on the site design standard from the Bay Fair TOD Specific Plan, which states, "Maximum lot coverage is 80% for all development types including mixed-use, residential, office, and retail. Minimum open area coverage for all development types is 20% of lot area. Open area may be a combination of public and private, consistent with standards and guidelines. At least one-third of the required open area should be vegetated with grass, trees, or other landscaping."

Table 2-1: New Developments Estimated Recycled Water Demand

	Total Average Annual Demand	
Name	**MGD**	**AFY**
Within OLSD		
Bay Fair Transit-Oriented Development	0.05	56
Lincoln Landing	0.01	12
Adjacent to OLSD		
West Winton Commerce Center	0.0007	0.6
Maple and Main	0.006	6
SLTC Housing	0.004	4
Alvarado-Antonio Apartments	0.01	14
The Davis at 1188	0.004	4
Town Hall Square	0.003	3
Total	**0.09**	**100**

Note: These demand estimates are based on projected size of developments and assumed occupancy density. The demand that is realized will depend on the approved development plans and actual household sizes and building densities.

Figure 2-1: New Developments Identified as Potential Recycled Water Users



In the 2016 RWFS, customers with average demand less than 5,000 gallons per day (approximately 5 AFY) were eliminated from the market assessment. Agencies, even those with mandatory use ordinances, typically do not pursue conversion of such small users because the customer coordination along with the connection cost outweighs the benefit. For this Addendum, these customers were included to provide a fuller understanding of the existing non-potable demand that could be converted to recycled water irrespective of likelihood of conversion. Based on the market assessment presented herein, the non-potable water demand within the study area is approximately 0.8 MGD spread across 572 different customers. Most of these customers are those averaging less than 0.005 MGD of demand. Only 37 of the customers, just over 5%, are greater than 0.005 MGD, and these account for half of the study area's demand. The current and potential future non-potable demands identified within the study area boundary are shown in Figure 2-2.

Table 2-2 contains a summary of the potential non-potable water demands from existing industrial and irrigation customers as well as the new developments. A list of customers with demands larger than approximately 5 AFY are included in Appendix A.

Table 2-2: Summary of Potential Non-Potable Demands

Customer Types	Potential Average Annual Demand (MGD)	No. of Customers[a]
Existing Industrial		
<0.005 MGD	0.12	194
>0.005 MGD	0.09	9
Existing Irrigation		
<0.005 MGD	0.27	341
>0.005 MGD	0.24	26
New Development		
>0.005 MGD	0.06	2[a]
TOTAL	**0.79**	**572**

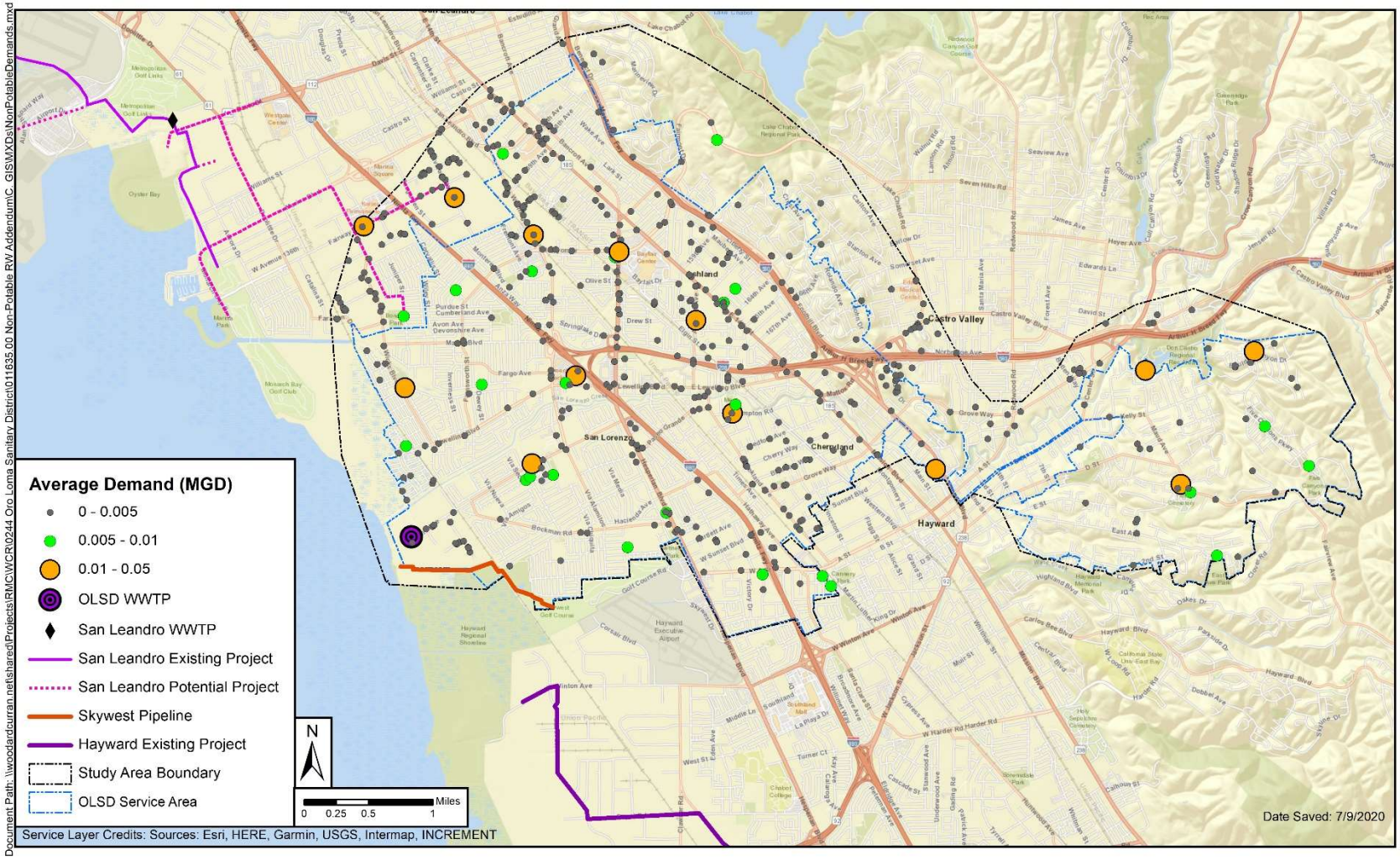
Note: a) For existing industrial and irrigation customers, the number of customers is based on the number of existing accounts. For new developments, an entire development is counted as a single customer.

2.2 Recommended Target Uses

Both centralized treatment and satellite treatment scenarios were considered in identifying recommended target uses. The eastern edge of the OLSD service area was initially considered a prime candidate for a satellite facility. This area is furthest from the WWTP, contains three of the largest existing non-potable demands and has an upcoming single-family residential development that OLSD staff were interested in assessing for potential recycled water use. However, a satellite in the eastern basin was screened out due to the limited number of OLSD properties to site a facility, the distributed nature of the demands, the challenging topography and communication with the residential developer who indicated that the new homes would have low water use landscaping.

A satellite facility serving the Bay Fair TOD was also considered and screened out during development of alternatives, as discussed in the following chapter.

Figure 2-2: Non-Potable Demands



The focus of this Addendum is on potential facilities and associated costs for the District to produce and distribute recycled water from its WWTP only. To maximize cost effectiveness, the density of potential customers and the opportunity to capture multiple large demands were considered when identifying target areas for a recycled water project from the OLSD WWTP. Again, the distributed nature of the largest users posed a challenge here. Besides the physical distance, the creeks, freeways, and rail lines that separate the largest customers increase the cost of constructing a system to connect them.

Bay Fair TOD is a primary focus of this Addendum. The following section lays out potential facilities centered around recycled water service to Bay Fair TOD, assessing the strength of this development as an anchor customer. Opportunities to connect to San Leandro and Hayward's recycled water system to enhance regional water supply reliability are also considered given the proximity of these neighboring recycled water systems to the study area.

3. PROJECT ALTERNATIVES

This Section documents the Project recycled water assumptions, development of project alternatives and the recommended action.

3.1 Recycled Water Project Alternatives Overview

Based on the results from the market assessment, four centralized recycled water Project Alternatives were developed and evaluated:

- **Alternative 1 – Pipeline to Bay Fair via Grant Avenue.** This alternative includes non-potable treatment at the OLSD WWTP and conveying water to customers along Grant Avenue, Hesperian Boulevard, and ultimately to Bay Fair.
- **Alternative 2 – Pipeline to Bay Fair via Grant Avenue with San Leandro Intertie.** This alternative is the same as Alternative 1 and also includes a connection to San Leandro's potential recycled water system at the point of their closest future project. The alignment travels along Halcyon Drive and Alvarado Street.
- **Alternative 3 – Pipeline to Bay Fair via San Lorenzo Creek with San Leandro Intertie.** This alterative is the same as Alternative 2, but instead of traveling along Grant Avenue, the alignment would be parallel to San Leandro Creek before reaching Hesperian Boulevard to travel to Bay Fair.
- **Alternative 4 – Hayward Intertie.** This alternative includes non-potable treatment at the OLSD WWTP and would allow for a connection between the OLSD WWTP and the Hayward recycled water pipeline. The alignment would travel parallel to the existing Skywest pipeline before turning to run parallel to the railroad tracks along the Hayward Regional Shoreline to the connection point with the Hayward recycled water pipeline.

A satellite opportunity for Bay Fair was also considered and screened out after preliminary development.

3.2 Cost Estimate Basis

Planning level cost estimates were prepared to evaluate and compare project alternatives and to support the alternative selection/decision process. The final costs of the project will depend on a variety factors, including but not limited to, actual labor and material costs, competitive market conditions, actual site conditions, final project scope, and implementation schedule. Estimated costs are referenced to the May 2020 Engineering Construction Cost Index (ENR CCI) for San Francisco 12,819.17.

The capital cost estimates for the alternatives were developed based on other similar recycled water projects and industry publications. Depending on the stage of the project and the level of detail understood, different estimating accuracies can be assumed. Since the Recycled Water Feasibility Study Addendum is a preliminary planning phase project, these estimates are considered Class 5 estimates based on the AACE International Recommended Practice No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries (2005). Class 5 estimates are based on a level of project definition of 0 to 2 percent and are suitable for alternatives analysis. The typical accuracy ranges for a Class 5 estimate are -20 to -50 percent on the low end, and +30 to +100 on the high end.

A detailed cost estimate, including unit costs, contingencies and mark-ups is provided in Appendix B

3.2.1 Contingencies

The following contingencies are included in the cost estimate:

- Construction Contingency (planning-level): 40%
- Market Adjustment Factor (to account for bidding market price increases): 10%
- Sales Tax: 9% on materials, which is estimated as ½ of the direct costs
- Project Cost Factor: %, including:
    - Engineering and Administrative Services (Design): 15%
    - Construction Management: 10%
    - Engineering Services During Construction: 3%

3.2.2 Capital Financing Assumptions

Financing assumptions used to annualize capital costs are:

- Annual Interest Rate: 3%
- Term of Financing: 30 years

The SWRCB Clean Water State Revolving Fund (SRF) offers low interest financing for recycled water projects eligible to public utilities. The SRF program offers 30-year financing at an interest rate of one-half the most recent General Obligation (GO) Bond Rate at time of funding approval. The interest rate has ranged from 1.2% to 2.7% over the last 10 years. The rates for SRF financing do change based on the current market conditions, so actual project financing rate will likely differ from the assumption above if an SRF loan is secured.

3.3 Infrastructure Sizing Criteria

3.3.1 Hydraulic Criteria

The criteria used to size the distribution infrastructure for alternatives developed as part of this study addendum are summarized in Table 3-1. In general, the minimum pressure criterion establishes the hydraulic grade line (HGL) required, which in turn helps define pumping requirements. The maximum flow velocity criterion generally governs pipe sizing.

A spreadsheet was developed to model each alternative's pipe network and optimized backbone pipe sizes. Each alignment was divided into segments, and peak hour flows for each customer along or downstream of a given segment were aggregated to determine the minimum pipeline diameter needed to convey maximum flows. This model was utilized to check pressure at customer connections and determine each alternative's pump station sizes.

The results for each alternative's hydraulic analysis, including pipeline and pump station sizing, are summarized in Section 3.5 through Section 3.9.

Table 3-1: Hydraulic Criteria

Description	Value
Pipelines	
Minimum Pressure at Standard Pressurized Customer Connections	60 psi
Maximum Customer Pressure	120 psi
Minimum Pipe Size	6 in
Maximum Flow Velocity	8 ft/s
Maximum Head Loss per 1,000 feet	10 ft
Pump Stations	
Assumed Pumping Efficiency	75%
Non-Overloading Horsepower Adjustment	10%
Maximum Standard Motor Size, Each Pump	100 hp

3.3.2 Treatment Criteria

3.3.2.1 Non-Potable Reuse Water Quality Requirements

The regulatory criteria governing wastewater reuse are found in the California Code of Regulations (CCR), Title 22, Division 4, Section 60301, et seq., commonly referred to as Title 22. For the non-potable end uses identified in the market assessment, recycled water meeting the requirements for disinfected tertiary recycled water would be required. Table 3-2 provides a summary of the water quality requirements.

Table 3-2: Summary of Title 22 Disinfected Tertiary Requirements

Treatment Requirements	Parameter	Limit
Filtration	Turbidity	2 NTU[1] (24-hr average) <5 NTU (95% of time within a 24hour period) 10 NTU (maximum)
Disinfection	Total Coliform	≤ 2.2 per 100 ml MPN[2] (7-day median) ≤23 per 100 ml MPN (in no more than one sample/30 days) ≤240 per 100 ml MPN (maximum)

Notes:
1. Nephelometric Turbidity Unit
2. Most Probable Number

3.3.2.2 Treatment Criteria

For this Addendum, it was assumed that recycled water would be produced through a side-stream tertiary treatment system consisting of microfiltration (MF) and ultraviolet disinfection (UV). The tertiary treatment facilities would be sized to meet the maximum month average day flow. MF and UV are both steps in full advanced treatment (FAT), so having these processes in place would allow the District to gain familiarity with operating components of a future potable recycled water system.

3.3.3 Storage Criteria

A storage tank would be included and for planning purposes was sized to meet a volume equal to the max month average day demand.

3.4 Operation and Maintenance Criteria

O&M requirements and annual costs were derived from experience on similar projects.

3.4.1 Treatment Operation and Maintenance

Consumable and energy costs were estimated as a percentage of the raw construction cost for UV treatment and on a per unit of water basis (cost per MGD) for MF treatment.

Labor was calculated on an hourly basis. The average hourly cost of O&M personnel, which includes all wages and benefits to the operator, is assumed to be $150 per hour.

3.4.2 Conveyance Operation and Maintenance

Maintenance of the distribution system was based on a cost metric per linear foot of pipeline. For alternatives with customers within OLSD's service area, an additional 0.15 FTE was assumed for assisting customers with implementation of recycled water on their sites; it is assumed the District would offer this service to increase customer's willingness to accept recycled water.

3.4.3 Pump Station Operation and Maintenance

Consumables for the pump station were estimated as percentages of the raw construction cost. Energy costs for pump stations are a combination of an energy charge (per kWh) and the kWh required input for each pump station. Labor was calculated on an hourly basis.

3.4.4 Storage Operation and Maintenance

Annual inspection and maintenance for storage tanks were estimated as a percent of the raw construction cost for that element

3.5 Satellite Opportunity

The opportunity to serve the Bay Fair TOD with a satellite non-potable treatment facility was considered and screened out. The concept involved localized recycled water treatment of an average of 0.05 MGD using flows pulled from the collection system at Bay Fair to serve customers within the Bay Fair development.

Unlike the other alternatives in which the primary cost is related to distribution, the primary cost for this alternative would be related to treatment. Based upon preliminary vendor discussions, construction of a package plant treating 0.05 MGD is expected to cost approximately $1.7 million, and annual operations and maintenance cost are estimated at $60,000/year. Table 3-3 outlines a cost estimate for a satellite at Bay Fair based on treatment and storage cost. This unit cost is outside what is considered an attractive water supply cost for this area and would only increase with the addition of costs for the distribution system. Given the unfavorable cost and lack of opportunities to grow this alternative to benefit a larger portion of OLSD service area, this satellite alternative was dropped from further development.

Table 3-3: Satellite Screening-Level Cost Estimate

	Estimated Costs ($M)
Capital Costs	
Treatment	$1,700,000
Pump Station[1]	TBD
Pipeline[1]	TBD
Storage	$750,000
Mobilization (10%)	$178,000
Subtotal	
Sales Tax (9%)	$80,000
Construction Cost Subtotal	**$2,033,000**
Market Adjustment Factor (10%)	$203,000
Construction Contingency (40%)	$813,000
Construction Cost Total	**$3,049,000**
Engineering and Admin Services – Design (15%)	$457,000
Construction Management (10%)	$305,000
Engineering Services During Construction (3%)	$91,000
Total Capital Cost	**$3,902,000**
O&M Costs	
Annual Costs[1]	$60,000
Estimate Annual Water Yield (AF)	**56**
Estimated Unit Cost ($/AF)[2]	**$4,600**

1. Pump station and pipeline construction and O&M costs were not included in this screening cost estimate
2. Annualized capital cost based on annual interest rate of 3% and 30 year financing

3.6 Alternative 1 – Pipeline to Bay Fair via Grant Avenue

Alternative 1 involves conveyance of an average of 0.12 MGD (or 132 AFY) of non-potable recycled water to customers along Grant Avenue, Hesperian Boulevard, and ultimately to Bay Fair.

3.6.1 Conveyance Alignment

The Alternative 1 conveyance alignment, shown in Figure 3-1, is 3.4 miles and 6 inches in diameter. It includes two Caltrans crossings, three Union Pacific Railroad crossings and two creek crossings.

3.6.2 Pump Station

A pump station would be installed at the OLSD WWTP. The total dynamic head required by the pump station would be 215 ft to pump 208 gpm of water through a 6-inch pipeline.

Figure 3-1: Pipeline to Bay Fair via Grant Avenue

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3.6.3 Demand and Facilities Summary

See Table 3-4 below for a summary of the total demand served by Alternative 1 and the treatment, conveyance, storage tank, and pump station sizing and performance requirements.

Table 3-4: Alternative 1 Demand and Facilities Summary

Customer Location	Demand		
	Annual Average		Average Day Max Month
Within OLSD Service Area	0.12 MGD	132 AFY	0.2 MGD
Outside OLSD Service Area	0 MGD	0 AFY	0 MGD
Total Potential	0.12 MGD	132 AFY	0.2 MGD
Conveyance Pipeline (in)	**Approximate Length of Pipe (LF)**		
6	18,000		
Total Length (LF)	18,000		
Total Length (mi)	3.4		
Treatment Sizing	0.2 MGD		
Storage Tank	0.2 MG		
Description	**Pump Station Performance Requirements**		
Required Flow	208 gpm		
Discharge Head	215 ft		
Pump Configuration (duty + standby)	1+1		
Pump Motor Rating	20 hp		
Total Installed Motor Horsepower	40 hp		

3.6.4 Preliminary Cost Estimate

Table 3-5 outlines a preliminary cost estimate for Alternative 1. Detailed cost information is provided in Appendix B.

Table 3-5: Alternative 1 Preliminary Cost Estimate

	Estimated Costs ($M)
Capital Costs	
Treatment	$587,000
Pump Station	$676,000
Pipeline	$7,782,000
Storage	$300,000
Mobilization (10%)	$934,000
Subtotal	$10,278,000
Sales Tax (9%)	$420,000
Construction Cost Subtotal	$10,698,000
Market Adjustment Factor (10%)	$1,070,000
Construction Contingency (40%)	$4,279,000
Construction Cost Total	$16,100,000
Engineering and Admin Services – Design (15%)	$1,605,000
Construction Management (10%)	$1,070,000
Engineering Services During Construction (3%)	$321,000
Total Capital Costs	$19,000,000
O&M Costs	
Annual Costs	$330,000
Estimate Annual Demand	**132 AF**
Estimated Unit Cost ($/AF)[1]	**$9,800**

1. Annualized capital cost based on annual interest rate of 3% and 30 year financing

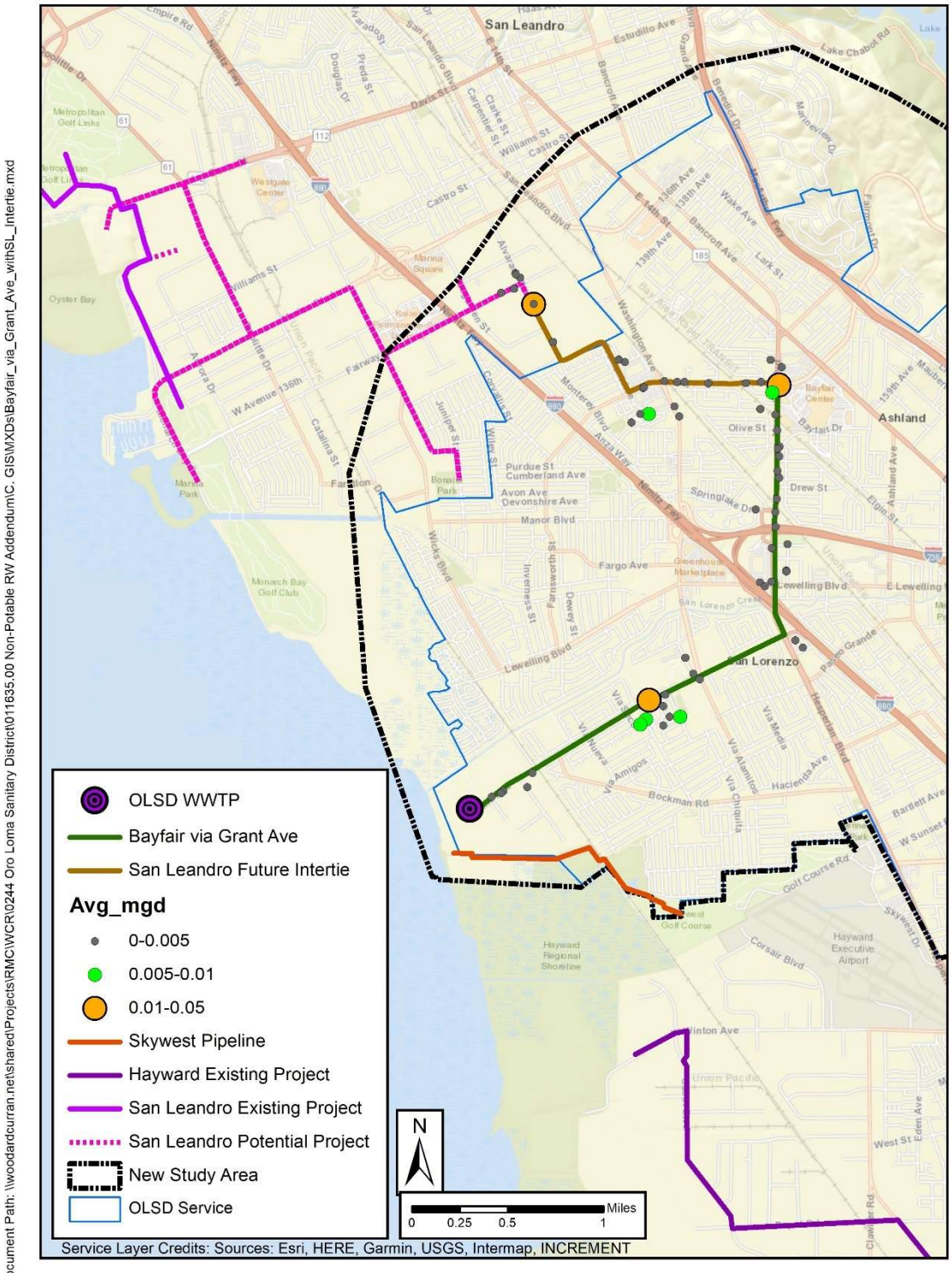
3.7 Alternative 2 – Pipeline to Bay Fair via Grant Avenue with San Leandro Intertie

Alternative 2 involves conveyance of an average of 0.12 MGD of non-potable recycled water to customers along Grant Avenue, Hesperian Boulevard, and ultimately to Bay Fair; it also includes an intertie with the potential San Leandro recycled water project. The alignment between Bay Fair and the intertie captures an additional 0.02 MGD of demand within OLSD and could deliver an additional 0.18 MGD of non-potable recycled water to San Leandro, if needed. The total potential demand served by Alternative 2 is 0.34 MGD (or 376 AFY).

3.7.1 Conveyance Alignment

The Alternative 2 conveyance alignment, shown in Figure 3-2, is 5.3 miles in total; about 2.2 miles, which travels along Grant Avenue to Hesperian Boulevard, is 12 inches in diameter, and the remaining 3.1 miles is 8 inches in diameter. It includes two Caltrans crossings, five Union Pacific Railroad crossings and two creek crossings.

Figure 3-2: Pipeline to Bay Fair via Grant Avenue with San Leandro Intertie



3.7.2 Pump Station

A pump station would be installed at the OLSD WWTP. The total dynamic head required by the pump station would be 260 ft to pump 663 gpm of water through a pipeline ranging from 12-inch to 8-inch.

3.7.1 Demand and Facilities Summary

See Table 3-6 below for a summary of the total demand served by Alternative 2 and the treatment, conveyance, storage tank, and pump station sizing and performance requirements.

Table 3-6: Alternative 2 Demand and Facilities Summary

Customer Location	Demand		
	Annual Average		Average Day Max Month
Within OLSD Service Area	0.14 MGD	155 AFY	0.2 MGD
Outside OLSD Service Area	0.20 MGD	221 AFY	0.3 MGD
Total Potential	0.34 MGD	376 AFY	0.5 MGD
Conveyance Pipeline (in)	**Approximate Length of Pipe (LF)**		
8	16,250		
12	11,650		
Total Length (LF)	27,900		
Total Length (mi)	5.3		
Treatment Sizing	0.5 MGD		
Storage Tank	0.5 MG		
Description	**Pump Station Performance Requirements**		
Required Flow	663 gpm		
Discharge Head	260 ft		
Pump Configuration (duty + standby)	1+1		
Pump Motor Rating	75 hp		
Total Installed Motor Horsepower	150 hp		

3.7.2 Preliminary Cost Estimate

Table 3-7 outlines a preliminary cost estimate for Alternative 2. Detailed cost information is provided in Appendix B.

Table 3-7: Alternative 2 Preliminary Cost Estimate

	Estimated Costs ($M)
Capital Costs	
Treatment	$1,400,000
Pump Station	$1,608,000
Pipeline	$13,222,000
Storage	$750,000
Mobilization (10%)	$1,674,000
Subtotal	$18,687,000
Sales Tax (9%)	$764,000
Construction Cost Subtotal	$19,442,000
Market Adjustment Factor (10%)	$1,944,000
Construction Contingency (40%)	$7,777,000
Construction Cost Total	$29,200,000
Engineering and Admin Services – Design (15%)	$2,916,000
Construction Management (10%)	$1,944,000
Engineering Services During Construction (3%)	$583,000
Total Capital Cost	$34,600,000
O&M Costs	
Annual Costs	$710,000
Estimate Product Water Yield	**376 AF**
Estimated Unit Cost ($/AF)[1]	**$6,600**

1. Annualized capital cost based on annual interest rate of 3% and 30 year financing

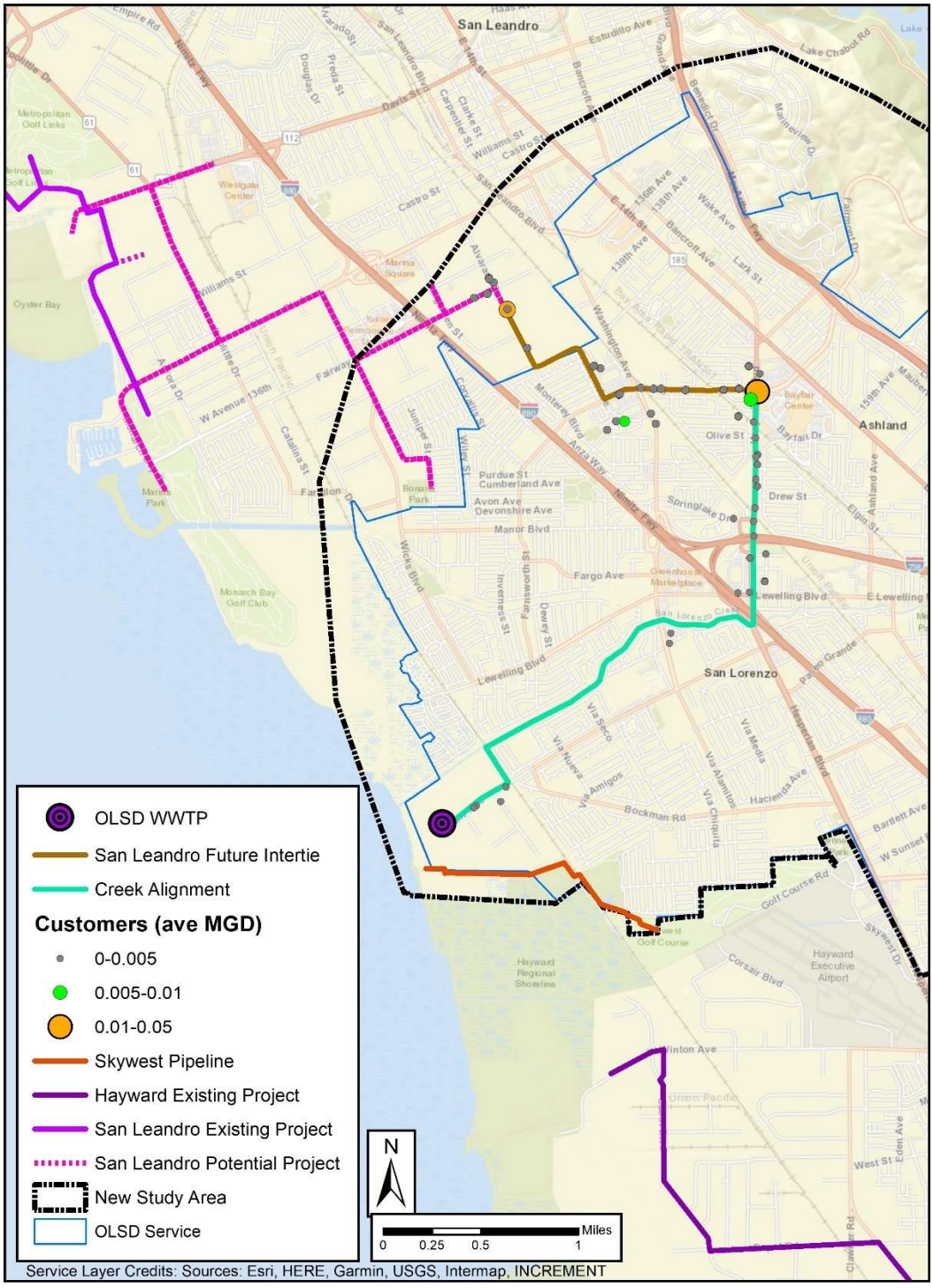
3.8 Alternative 3 – Pipeline to Bay Fair via San Lorenzo Creek with San Leandro Intertie

Alternative 3 involves conveyance of an average of 0.09 MGD of non-potable recycled water to customers between the OLSD WWTP and Bay Fair. Compared to Alternative 2 which follows Grant Avenue, Alternative 3 which diverts from Grant Avenue and uses the San Lorenzo Creek corridor to Hesperian Boulevard captures less customers. Like Alternative 2, Alternative 3 also includes an intertie with the potential San Leandro recycled water project. The alignment between Bay Fair and the intertie captures an additional 0.02 MGD of demand within OLSD and could deliver an additional 0.18 MGD of non-potable recycled water to San Leandro, if needed. The total potential demand served by Alternative 3 is 0.29 MGD (or 325 AFY).

3.8.1 Conveyance Alignment

The Alternative 3 conveyance alignment, shown in Figure 3-3, is 5.4 miles in total; about 2.3 miles, which travels along San Lorenzo Creek to Hesperian Boulevard, is 12 inches in diameter, and the remaining 3.1 miles is 8 inches in diameter. It includes two Caltrans crossings, five Union Pacific Railroad crossings and two creek crossings. Construction of this alignment is intended to coincide with or precede construction of Hayward Area Recreation and Park District's bike path along the creek.

Figure 3-3: Pipeline to Bay Fair via San Lorenzo Creek with San Leandro Intertie



3.8.2 Pump Station

A pump station would be installed at the OLSD WWTP. The total dynamic head required by the pump station would be 256 ft to pump 535 gpm of water through a pipeline ranging from 12-inch to 8-inch.

3.8.3 Demand and Facilities Summary

See Table 3-8 below for a summary of the total demand served by Alternative 3 and the treatment, conveyance, storage tank, and pump station sizing and performance requirements.

Table 3-8: Alternative 3 Demand and Facilities Summary

Customer Location	Demand		
	Annual Average		Average Day Max Month
Within OLSD Service Area	0.09 MGD	104 AFY	0.1 MGD
Outside OLSD Service Area	0.20 MGD	221 AFY	0.3 MGD
Total Potential	0.29 MGD	325 AFY	0.4 MGD
Conveyance Pipeline (in)	**Approximate Length of Pipe (LF)**		
8	16,250		
12	12,050		
Total Length (LF)	28,300		
Total Length (mi)	5.4		
Treatment Sizing	0.4 MGD		
Storage Tank	0.4 MG		
Description	**Pump Station Performance Requirements**		
Required Flow	535 gpm		
Discharge Head	256 ft		
Pump Configuration (duty + standby)	1+1		
Pump Motor Rating	60 hp		
Total Installed Motor Horsepower	120 hp		

3.8.4 Preliminary Cost Estimate

Table 3-9 outlines a preliminary cost estimate for Alternative 3. Detailed cost information is provided in Appendix B.

Table 3-9: Alternative 3 Preliminary Cost Estimate

	Estimated Costs ($M)
Capital Costs	
Treatment	$1,176,000
Pump Station	$1,408,000
Pipeline	$10,463,000
Storage	$600,000
Mobilization (10%)	$1,365,000
Subtotal	$15,012,000
Sales Tax (9%)	$614,000
Construction Cost Subtotal	$15,626,000
Market Adjustment Factor (10%)	$1,563,000
Construction Contingency (40%)	$6,250,000
Construction Cost Total	$23,500,000
Engineering and Admin Services – Design (15%)	$2,344,000
Construction Management (10%)	$1,563,000
Engineering Services During Construction (3%)	$469,000
Total Capital Cost	$27,800,000
O&M Costs	
Annual Costs	$600,000
Estimate Product Water Yield	**325 AF**
Estimated Unit Cost ($/AF)[1]	**$6,200**

1. Annualized capital cost based on annual interest rate of 3% and 30 year financing

3.9 Alternative 4: Hayward Intertie

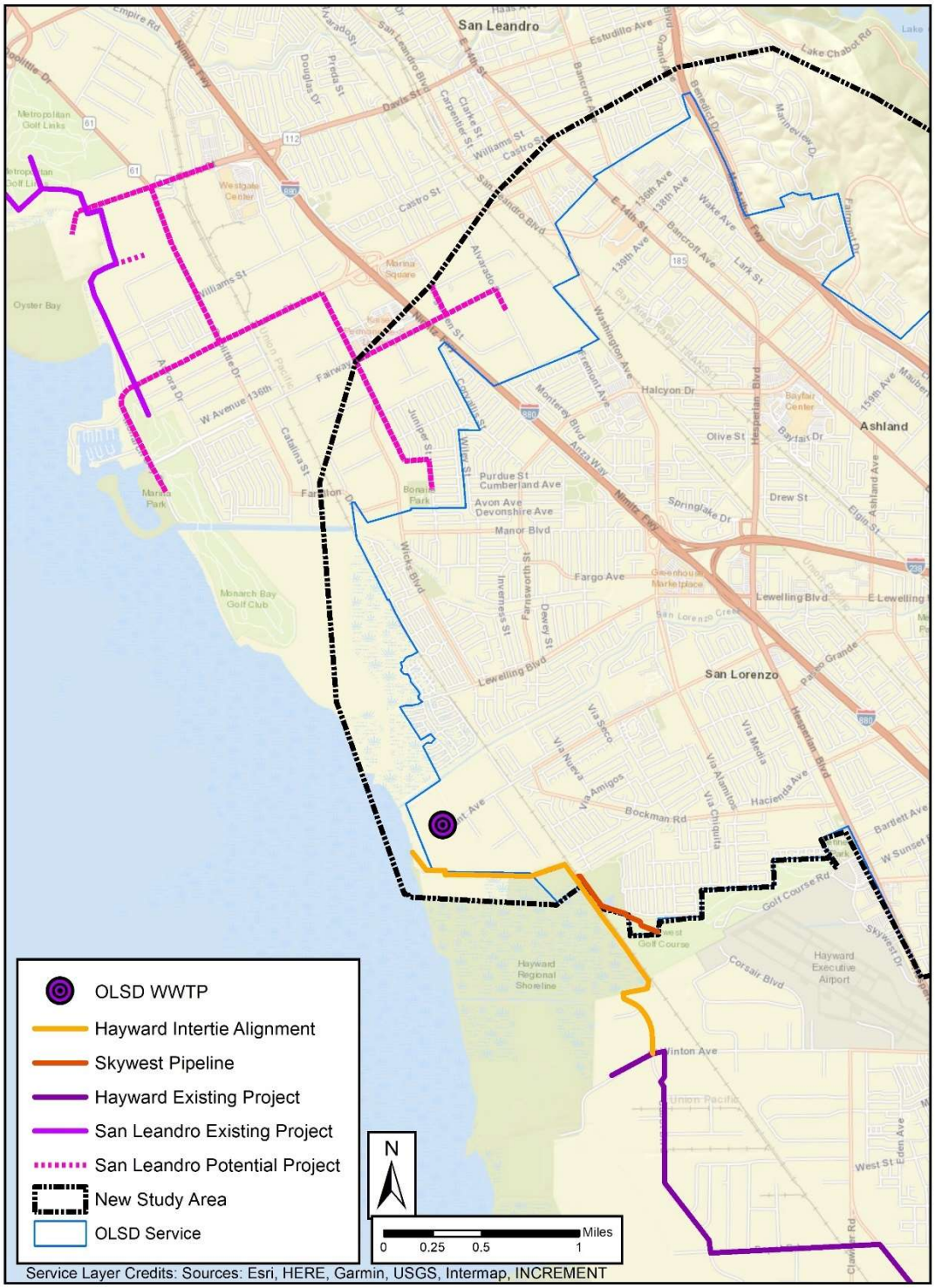
Alternative 4 provides a connection from the OLSD WWTP to the Hayward recycled water pipeline to offer redundancy for Hayward's system. It can convey an average of 0.29 MGD (325 AFY) of non-potable recycled water to Hayward, if needed.

3.9.1 Conveyance

3.9.1.1 Alignment

The Alternative 4 conveyance alignment, shown in Figure 3-4, is 2.2 miles in total and is 12 inches in diameter. It includes two creek crossings.

Figure 3-4: Hayward Intertie



Document Path: \\woodardcurran.net\shared\Projects\RM\C\WCR\0244 Oro Loma Sanitary District\011635.00 Non-Potable RW Addendum\C. GIS\MXDs\Hayward_Intertie.mxd

3.9.1.2 Pump Station

A pump station would be installed at the OLSD WWTP. The total dynamic head required by the pump station would be 168 ft to pump 925 gpm of water through a 12-inch pipeline.

3.9.2 Demand and Facilities Summary

See Table 3-10 below for a summary of the total demand served by Alternative 4 and the treatment, conveyance, storage tank, and pump station sizing and performance requirements.

Table 3-10: Alternative 4 Demand and Facilities Summary

Customer Location	Demand		
	Annual Average		Average Day Max Month
Within OLSD Service Area	0 MGD	0 AFY	0 MGD
Outside OLSD Service Area	0.29 MGD	325 AFY	0.5 MGD
Total Potential	0.29 MGD	325 AFY	0.5 MGD
Conveyance Pipeline (in)	**Approximate Length of Pipe (LF)**		
12	11,400		
Total Length (LF)	11,400		
Total Length (mi)	2.2		
Treatment Sizing	0.5 MGD		
Storage Tank	0.5 MG		
Description	**Pump Station Performance Requirements**		
Required Flow	925 gpm		
Discharge Head	168 ft		
Pump Configuration (duty + standby)	1+1		
Pump Motor Rating	60 hp		
Total Installed Motor Horsepower	120 hp		

3.9.3 Preliminary Cost Estimate

Table 3-11 outlines a preliminary cost estimate for Alternative 4. Detailed cost information is provided in Appendix B.

Table 3-11: Alternative 4 Preliminary Cost Estimate

	Estimated Costs ($M)
Capital Costs	
Treatment	$1,400,000
Pump Station	$1,468,000
Pipeline	$4,523,000
Storage	$750,000
Mobilization (10%)	$814,000
Subtotal	$8,955,000
Sales Tax (9%)	$366,000
Construction Cost Subtotal	$9,321,000
Market Adjustment Factor (10%)	$932,000
Construction Contingency (40%)	$3,728,000
Construction Cost Total	$14,000,000
Engineering and Admin Services – Design (15%)	$1,398,000
Construction Management (10%)	$932,000
Engineering Services During Construction (3%)	$280,000
Total Capital Cost	$16,600,000
O&M Costs	
Annual Costs	$650,000
Estimate Annual Water Yield (AF)	**325**
Estimated Unit Cost ($/AF)[1]	**$4,600**

1. Annualized capital cost based on annual interest rate of 3% and 30 year financing

3.10 Alternatives Comparison

Table 3-12provides a summary comparison of the non-potable alternatives. Capital and O&M costs are in May 2020 dollars as presented previously in this chapter.

Comparing Alternatives 1, 2 and 3 shows that Bay Fair TOD, as currently envisioned, does not provide sufficient demand to justify development of an OLSD recycled water system. Extending a pipeline from Bay Fair TOD to provide flows to San Leandro's system and capturing additional customers between the two points results in a more favorable, though still substantial, unit cost. The unit costs shown for Alternatives 2 and 3 assume the annual demand for San Leandro's system is served from OLSD. Assuming occasional use of the intertie, rather than year-round use, would result in greater unit costs.

Similarly, Alternative 4 assumes the annual demand for Hayward's system is served from OLSD whereas, in practice, an intertie would only be used to provide a backup source of water. The unit cost shown for Alternative 4 represents the best-case scenario, and even the best case does not present an attractive unit cost. The lack of customers between the OLSD WWTP and connection with Hayward's system is another limitation of the Hayward Intertie alternative.

Table 3-12: Alternatives Comparison

		Alternative			
		Pipeline to Bay Fair via Grant Avenue	Pipeline to Bay Fair via Grant Avenue with San Leandro Intertie	Pipeline to Bay Fair via San Lorenzo Creek with San Leandro Intertie	Hayward Intertie
Demands					
Average Annual Demand (MGD)	Within OLSD	0.12	0.14	0.09	0
	Total Potential	0.12	0.34	0.29	0.29
Average Annual Demand (AFY)	Within OLSD	132	155	104	0
	Total Potential	132	376	325	325
Infrastructure					
Pipeline Length (ft)		18,000	27,900	28,300	11,400
Pipe Size(s)		6-inch	8-inch and 12-inch	8-inch and 12-inch	12-inch
No. of Caltrans Crossings		2	2	2	0
No. of Railroad Crossings		3	5	5	0
No. of Creek Crossings		2	2	2	2
Pump Station Size (hp)		40	150	120	120
Storage Size (MG)		0.2	0.5	0.4	0.5
Estimated Savings					
Estimated Annual EBDA Savings assuming Total Potential Demand[1]		$2,800/yr	$7,900/yr	$6,800/yr	$6,800/yr
Estimated Costs					
Estimated Capital Cost[2]		$19,000,000	$34,600,000	$27,800,000	$16,600,000
Estimated Annual O&M Cost assuming Total Potential Demand		$330,000/yr	$710,000/yr	$600,000/yr	$650,000/yr
Unit Cost assuming Total Potential Demand[3]		$9,800/AF	$6,600/AF	$6,200/AF	$4,600/AF

Notes:

2. EBDA savings based on variable cost of $64.42/MG
3. Cost includes pipelines, customer services, pump station and side stream tertiary recycled water treatment facilities. Refer to Table 3-5, Table 3-7, Table 3-9 and Table 3-11 for additional details.
4. Annualized capital cost based on annual interest rate of 3% and 30 year financing

For comparison, the costs of the recommended potable reuse project from the 2016 RWFS are shown in Table 3-13. The recommendation was a groundwater recharge project with an extraction yield of 8.8 MGD (9,800 AFY). While the estimated capital and O&M costs for the four non-potable alternatives are much lower than the 2016 RWFS estimated costs, their unit costs are significantly higher than the 2016 RWFS recommendation.

Table 3-13: 2016 RWFS Recommended Groundwater Recharge Project Costs

	2016 RWFS Recommended Project (May 2020 Dollars)
Estimated Construction Cost	$231,509,000
Estimated Capital Cost	$324,113,000
Estimated Annual O&M Cost assuming Total Potential Demand	$7,704,000
Estimated Annualized Capital Cost	$17,536,000
Estimated Annual Water Yield (AF)	**9,800**
Unit Cost ($/AF)	**$2,600**

3.11 Recommended Action

Based on the results of this alternatives analysis, it is recommended that the District not proceed with a non-potable recycled water project at this time. There is limited demand within OLSD, and it is likely that the demand realized would be even less due to uncertainty regarding the actual number of customers who would accept the recycled water. OLSD would have to offer a substantial discount from its supply cost to entice customers.

Currently customers in this area receiving potable water from EBMUD pay approximately $2,500/AF. As part of the EBMUD Recycled Water Master Plan Update, it was estimated that customers' willingness to pay for recycled water may approach $4,600/AF, but only during times when potable water rationing was required due to drought. The unit costs for the non-potable alternatives serving Bay Fair TOD are significantly higher than EBMUD's rate or even customer's willingness to pay. Under the best-case condition, the Hayward Intertie approaches customers' willingness to pay during periods of rationing, but under normal conditions there are no customers to accept the recycled water.

For additional context, through a review of water agency websites and water recycling grant proposals, the Pacific Institute identified an expected cost range for implementation of small, non-potable reuse projects (defined as projects less than 10,000 AF) to be $1,500/AF to $2,100/AF (Cooley 2016).

While implementation of a non-potable project from the OLSD WWTP is not recommended at this time, market conditions could evolve to make consideration of a non-potable project worthwhile again in the future.

4. NEXT STEPS

As plans for the Bay Fair TOD progress, the District should coordinate with the City of San Leandro to understand the potential for developer contributions to fund a recycled water project from OLSD WWTP. The combination of developer contributions and grant funding opportunities could improve the economics of a non-potable project from OLSD's perspective.

Additionally, if plans for additional development districts emerge, the District may conduct a new alternatives analysis to incorporate the potential demands from such developments. Of particular interest would be developments between the OLSD WWTP and Bay Fair TOD. Industrial development within San Lorenzo surrounding the WWTP could provide sufficient demand to justify construction of a larger distribution system extending all the way to Bay Fair TOD, or if not at least construction of a pipeline along the Grant Avenue corridor.

OLSD should also continue coordination with EBMUD regarding recycled water. EBMUD will be exploring recycled water opportunities again in 2024.

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Woodard & Curran. City of Palo Alto in collaboration with Valley Water – Northwest County Recycle Water Strategic Plan Report. July 2019

Woodard & Curran. East Bay Municipal Utility District – Recycled Water Master Plan Update Final Interim Report. December 2018

Woodard & Curran. Santa Clara Valley Water District – Expedited Purified Water Program Plan Final Report. April 2018

APPENDIX A: LIST OF CUSTOMERS IN STUDY AREA (DEMANDS >5AFY)

Non-Potable Customers List

Category	Address	City	Average Demand (AFY)	Average Demand (MGD)	Private or Public	Name	Type
Irrigation	15061 Wicks Bl	SAN LEANDRO	5	0.005	Public	Unknown	
Irrigation	198 Grove Way	HAYWARD	5	0.005	Public	Cherryland Park	
Irrigation	14432 Bancroft Ave	SAN LEANDRO	5	0.005	Public	Toyon Park	
Irrigation	18250 Bengal Ave	HAYWARD	5	0.005	Public	Lorenzo Manor Elementary School	
Irrigation	3960 North Canyon Ct	CASTRO VALLEY	5	0.005	Public	Hydrant	
Irrigation	21954 Dolores St	CASTRO VALLEY	6	0.005	Private	Baywood Court Retirement Community	
Irrigation	14790 Corvallis St	SAN LEANDRO	6	0.005	Public	Corvallis Elementary School	
Irrigation	1170 Fargo Ave	SAN LEANDRO	6	0.005	Public	Washington Manor Middle School	
Irrigation	1511 163rd Ave	SAN LEANDRO	6	0.005	Public	Hydrant	
Industrial	422 W A St	HAYWARD	6	0.005	Private	Advantage Laundry	Laundry
Irrigation	22780 Amador St	HAYWARD	6	0.005	Public	Hydrant	
Industrial	15869 Channel St	SAN LORENZO	6	0.005	Private	Friendly Wash and Dry	Laundry
Irrigation	22540 Amador St	HAYWARD	6	0.006	Public	Hydrant	
Irrigation	258 Greenhouse Market Pl	SAN LEANDRO	6	0.006	Private	Greenhouse Marketplace Shopping Center	
Irrigation	360 Caliente Dr	SAN LEANDRO	6	0.006	Public	Unknown	
Irrigation	24591 Fairview Ave	HAYWARD	7	0.006	Public	Lone Tree Cemetery	
Irrigation	820 Bockman Rd	SAN LORENZO	7	0.006	Public	San Lorenzo Adult School	
Irrigation	2600 Fairmont Dr	SAN LEANDRO	8	0.007	Public	Camp Sweeney	
Irrigation	2600 San Leandro Bl # 900A	SAN LEANDRO	8	0.007	Public	San Leandro Racquet Club	
Irrigation	25585 Five Canyons Pky	CASTRO VALLEY	8	0.007	Public	Five Canyons Park	
Irrigation	1150 Grant Ave	SAN LORENZO	8	0.008	Public	Mervin Morris Park	
Industrial	15101 Hesperian Bl	SAN LEANDRO	8	0.008	Private	Launderland	Laundry
Industrial	16314 E 14th St	SAN LEANDRO	9	0.008	Private	San Leandro Launderland	Laundry
Irrigation	25839 Five Canyons Pky	CASTRO VALLEY	9	0.008	Public	Five Canyons Park	
Irrigation	15484 Heron Dr	SAN LEANDRO	9	0.008	Public	Unknown	
Irrigation	15840 Channel St	SAN LORENZO	10	0.009	Public	Street Side Landscaping	
Irrigation	14841 Juniper St	SAN LEANDRO	10	0.009	Public	Bonaire Park	
Irrigation	3221 East Ave	HAYWARD	10	0.009	Public	East Avenue Park	
Industrial	17945 Hesperian Bl	SAN LORENZO	11	0.010	Private	Hutch's San Lorenzo Car Wash	Car Wash
Irrigation	17365 Boston Rd	HAYWARD	11	0.010	Public	Meek Park	
Industrial	2700 Merced St	SAN LEANDRO	11	0.010	Public	L3 Communications Pulse Sciences (XRay Manufact.)	Other Industrial
Industrial	22301 Foothill Boulevard and 1155 Hazel Ave	HAYWARD	12	0.011	Private	Lincoln Landing	Mixed-Use
Irrigation	17365 Boston Rd	HAYWARD	12	0.011	Public	Meek Park	
Irrigation	16160 Ashland Ave	SAN LORENZO	13	0.011	Public	Edendale Middle School	
Industrial	2750 Halcyon Dr	SAN LEANDRO	13	0.012	Public	Street Median Landscaping	Other Industrial
Industrial	260 Greenhouse Market Pl	SAN LEANDRO	14	0.013	Private	Shopping Center	Commercial
Irrigation	24591 Fairview Ave	HAYWARD	15	0.014	Public	Lone Tree Cemetery	
Irrigation	15200 Elvina Dr	SAN LEANDRO	16	0.014	Public	Stenzel Park	
Irrigation	22400 Woodroe Ave	HAYWARD	20	0.018	Public	Don Castro Regional Recreation Area	
Irrigation	15701 Lorenzo Ave	SAN LORENZO	21	0.019	Public	Arroyo High School	
Irrigation	25036 Five Canyons Pky	CASTRO VALLEY	24	0.021	Public	Five Canyons Park	
Industrial	2800 Alvarado St	SAN LEANDRO	25	0.023	Private	Georgia Pacific Coorporation (paper)	Other Industrial
Industrial	15555 E 14th St	SAN LEANDRO	56	0.050	Public	Bay Fair Transit-Oriented Development	Mixed-Use Development High-Growth

APPENDIX B: COST ESTIMATES

Alternative 1						Oro Loma Recycled Water Feasibility Study Addendum
Last Updated:	9-Jul-20		**Discount Rate**			**Project Life**
Updated by:	K. Bradley		3%			30 Years
CCI (SF, May 2020): 12819.17						
Item	**Size**	**Qty**	**Unit**		**Unit Cost**	**Total Cost**
Capital Costs						
General Requirements						
Mobilization			*Applied to all capital costs*		10%	$934,000
Treatment						
UV	0.2		MGD	$	494,000	$99,000
MF/UF system	0.2		MGD	$	1,611,000	$320,000
Sitework/Piping/Structures					40%	$167,600
Conveyance						
PVC, DR 25						
6 Inch		17,400	LF	$	200	$3,480,000
PTGAB						
6 Inch (inside 20-inch steel casing)		600	LF	$	1,600	$960,000
Jacking Shafts		4	EA	$	316,000	$1,264,000
Receiving Shafts		4	EA	$	181,000	$724,000
Pipe Bridge						
Pipe Bridge Support and Pipe		1	LS	$	500,000	$500,000
Cathodic Protection	*3% of Pipeline Installation Cost*				3%	$133,200
Customer Services (with meter replacement)		48	EA	$	15,000	$720,000
Pump Stations						
Pump Station #1	40		Total installed HP, including standby	$	16,000	$640,000
Hydropneumatic Tank - Pump Station #1	900		Gal	$	40	$36,000
Storage Tank						
Storage Tank	0.2		MG	$	1,500,000	$300,000
Subtotal						**$10,278,000**
Sales Tax	*Applied to half of capital costs (not including General)*				9%	$420,000
Construction Cost Subtotal						**$10,698,000**
Market Adjustment Factor					10%	$1,070,000
Construction Contingency					40%	$4,279,000
Construction Cost Total						**$16,100,000**
Engineering and Admin Services (Design)					15%	$1,605,000
Construction Management					10%	$1,070,000
Engineering Services During Construction					3%	$321,000
Total Capital Cost						**$19,000,000**
O&M Costs (Annual)						
Advanced Water Treatment						
UV					10%	$9,900
MF/UF system	0.2		MGD	$	906,000	$180,000
Labor for Treatment		208	Hours	$	150	$31,200
Conveyance						
Annual Inspection and Maintenance of Pipeline - Average	Annual Opera	18,000	LF		$0.60	$10,800
Customer Services		312	Hours		$150	$46,800
Pump Stations						
Consumables						
Equipment					1%	$6,400
Mechanical					1%	$6,400
Electrical/Instrumentation					1%	$6,400
Electricity Requirement						
Energy Charge		32,745	kWh/year	$	0.20	$6,549
Labor Costs						
Total Operator Hours per Year		168	Hours	$	150	$25,200
Storage Tanks						
Annual O&M					1%	$3,000
Total O&M Costs ($/yr)						**$330,000**
Annualized Costs ($ / Year)						
Annualized Capital Costs ($/Year)	*One payment per year, spread over Project Life*					$969,000
Annual O&M Costs						$330,000
Total Annualized Cost						$1,299,000
Deliveries of Recycled Water	132 AFY					
Estimated Unit Cost ($/AF)						**$9,800**

Alternative 2						Oro Loma Recycled Water Feasibility Study Addendum
Last Updated:	9-Jul-20		**Discount Rate**			**Project Life**
Updated by:	K. Bradley		3%			30 Years
CCI (SF, May 2020): 12819.17						
Item	**Size**	**Qty**	**Unit**		**Unit Cost**	**Total Cost**
Capital Costs						
General Requirements						
Mobilization			*Applied to all capital costs*		10%	$1,698,000
Treatment						
UV	0.5		MGD	$	385,000	$190,000
MF/UF system	0.5		MGD	$	1,611,000	$810,000
Sitework/Piping/Structures					40%	$400,000
Conveyance						
PVC, DR 25						
8 Inch		15,500	LF	$	200	$3,100,000
12 inch		11,500	LF	$	300	$3,450,000
PTGAB						
8 Inch (inside 24-inch steel casing)		750	LF	$	1,900	$1,425,000
12 Inch (inside 30-inch steel casing)		150	LF	$	2,300	$345,000
Jacking Shafts		6	EA	$	316,000	$1,896,000
Receiving Shafts		6	EA	$	181,000	$1,086,000
Pipe Bridge						
Pipe Bridge Support and Pipe		1	LS	$	500,000	$500,000
Cathodic Protection	*3% of Pipeline Installation Cost*				3%	$249,600
Customer Services (with meter replacement)		78	EA	$	15,000	$1,170,000
Pump Stations						
Pump Station #1	150		Total installed HP, including standby	$	10,000	$1,500,000
Hydropneumatic Tank - Pump Station #1	2,700		Gal	$	40	$108,000
Storage Tank						
Storage Tank	0.5		MG	$	1,500,000	$750,000
Subtotal						**$18,678,000**
Sales Tax	*Applied to half of capital costs (not including General)*				9%	$764,000
Construction Cost Subtotal						**$19,442,000**
Market Adjustment Factor					10%	$1,944,000
Construction Contingency					40%	$7,777,000
Construction Cost Total						**$29,200,000**
Engineering and Admin Services (Design)					15%	$2,916,000
Construction Management					10%	$1,944,000
Engineering Services During Construction					3%	$583,000
Total Capital Cost						**$34,600,000**
O&M Costs (Annual)						
Advanced Water Treatment						
UV					10%	$19,000
MF/UF system	0.5		MGD	$	906,000	$450,000
Labor for Treatment		520	Hours	$	150	$78,000
Conveyance						
Annual Inspection and Maintenance of Pipeline - Average Annual Operat		27,900	LF		$0.60	$16,740
Customer Services		312	Hours		$150.00	$46,800
Pump Stations						
Consumables						
Equipment					1%	$15,000
Mechanical					1%	$15,000
Electrical/Instrumentation					1%	$15,000
Electricity Requirement						
Energy Charge		126,324	kWh/year	$	0.20	$25,265
Labor Costs						
Total Operator Hours per Year		168	Hours	$	150	$25,200
Storage Tanks						
Annual O&M					1%	$7,500
Total O&M Costs ($/yr)						**$710,000**
Annualized Costs ($ / Year)						
Annualized Capital Costs ($/Year)	*One payment per year, spread over Project Life*					$1,765,000
Annual O&M Costs						$710,000
Total Annualized Cost						$2,475,000
Deliveries of Recycled Water	376 AFY					
Estimated Unit Cost ($/AF)						**$6,600**

Alternative 3						Oro Loma Recycled Water Feasibility Study Addendum
Last Updated:	9-Jul-20		**Discount Rate**			**Project Life**
Updated by:	K. Bradley		3%			30 Years
CCI (SF, May 2020): 12819.17						
Item	**Size**	**Qty**	**Unit**		**Unit Cost**	**Total Cost**
Capital Costs						
General Requirements						
Mobilization			*Applied to all capital costs*		10%	$1,365,000
Treatment						
UV	0.4		MGD	$	494,000	$200,000
MF/UF system	0.4		MGD	$	1,611,000	$640,000
Sitework/Piping/Structures					40%	$336,000
Conveyance						
PVC, DR 25						
8 Inch		15,500	LF	$	200	$3,100,000
12 inch (along Creek, without paving)		8,600		$	200	
12 inch		3,300	LF	$	300	$990,000
PTGAB						
8 Inch (inside 24-inch steel casing)		750	LF	$	1,900	$1,425,000
12 Inch (inside 30-inch steel casing)		150	LF	$	2,300	$345,000
Jacking Shafts		6	EA	$	316,000	$1,896,000
Receiving Shafts		6	EA	$	181,000	$1,086,000
Pipe Bridge						
Pipe Bridge Support and Pipe		1	LS	$	500,000	$500,000
Cathodic Protection	*3% of Pipeline Installation Cost*				3%	$175,800
Customer Services (with meter replacement)		63	EA	$	15,000	$945,000
Pump Stations						
Pump Station #1	120	Total installed HP, including standby		$	11,000	$1,320,000
Hydropneumatic Tank - Pump Station #1	2,200		Gal	$	40	$88,000
Storage Tank						
Storage Tank	0.4		MG	$	1,500,000	$600,000
Subtotal						**$15,012,000**
Sales Tax	*Applied to half of capital costs (not including General)*				9%	$614,000
Construction Cost Subtotal						**$15,626,000**
Market Adjustment Factor					10%	$1,563,000
Construction Contingency					40%	$6,250,000
Construction Cost Total						**$23,500,000**
Engineering and Admin Services (Design)					15%	$2,344,000
Construction Management					10%	$1,563,000
Engineering Services During Construction					3%	$469,000
Total Capital Cost						**$27,800,000**
O&M Costs (Annual)						
Advanced Water Treatment						
UV					10%	$20,000
MF/UF system	0.4		MGD	$	906,000	$360,000
Labor for Treatment		416	Hours	$	150	$62,400
Conveyance						
Annual Inspection and Maintenance of Pipeline - Average						
Annual Operator Hours per Year		28,300	LF		$0.60	$16,980
Customer Services		312	Hours		$150	$46,800
Pump Stations						
Consumables						
Equipment					1%	$13,200
Mechanical					1%	$13,200
Electrical/Instrumentation					1%	$13,200
Electricity Requirement						
Energy Charge		100,520	kWh/year	$	0.20	$20,104
Labor Costs						
Total Operator Hours per Year		168	Hours	$	150	$25,200
Storage Tanks						
Annual O&M					1%	$6,000
Total O&M Costs ($/yr)						**$600,000**
Annualized Costs ($ / Year)						
Annualized Capital Costs ($/Year)	*One payment per year, spread over Project Life*					$1,418,000
Annual O&M Costs						$600,000
Total Annualized Cost						$2,018,000
Deliveries of Recycled Water	325 AFY					
Estimated Unit Cost ($/AF)						**$6,200**

Alternative 4						Oro Loma Recycled Water Feasibility Study Addendum
Last Updated:	9-Jul-20		**Discount Rate**			**Project Life**
Updated by:	K. Bradley		3%			30 Years
CCI (SF, May 2020): 12819.17						
Item	**Size**	**Qty**	**Unit**		**Unit Cost**	**Total Cost**
Capital Costs						
General Requirements						
Mobilization			*Applied to all capital costs*		10%	$814,000
Treatment						
UV	0.5		MGD	$	385,000	$190,000
MF/UF system	0.5		MGD	$	1,611,000	$810,000
Sitework/Piping/Structures					40%	$400,000
Conveyance						
PVC, DR 25						
12 inch		11,400	LF	$	300	$3,420,000
PTGAB						
12 Inch (inside 30-inch steel casing)		0	LF	$	2,300	$0
Jacking Shafts		0	EA	$	316,000	$0
Receiving Shafts		0	EA	$	181,000	$0
Pipe Bridge						
Pipe Bridge Support and Pipe		2	LS	$	500,000	$1,000,000
Cathodic Protection	*3% of Pipeline Installation Cost*				3%	$102,600
Customer Services (with meter replacement)			EA	$	15,000	$0
Pump Stations						
Pump Station #1	120		Total installed HP, including standby	$	11,000	$1,320,000
Hydropneumatic Tank - Pump Station #1	3,700		Gal	$	40	$148,000
Storage Tank						
Storage Tank	0.5		MG	$	1,500,000	$750,000
Subtotal						**$8,955,000**
Sales Tax	*Applied to half of capital costs (not including General)*				9%	$366,000
Construction Cost Subtotal						**$9,321,000**
Market Adjustment Factor					10%	$932,000
Construction Contingency					40%	$3,728,000
Construction Cost Total						**$14,000,000**
Engineering and Admin Services (Design)					15%	$1,398,000
Construction Management					10%	$932,000
Engineering Services During Construction					3%	$280,000
Total Capital Cost						**$16,600,000**
O&M Costs (Annual)						
Advanced Water Treatment						
UV Lamp Replacement					10%	$19,000
MF/UF system	0.5		MGD	$	906,000	$450,000
Labor for Treatment		520	Hours	$	150	$78,000
Conveyance						
Annual Inspection and Maintenance of Pipeline - Average Annual Operator Hours per Year		11,400	LF		$0.60	$6,840
Pump Stations						
Consumables						
Equipment					1%	$13,200
Mechanical					1%	$13,200
Electrical/Instrumentation					1%	$13,200
Electricity Requirement						
Energy Charge		113,644	kWh/year	$	0.20	$22,729
Labor Costs						
Total Operator Hours per Year		168	Hours	$	150	$25,200
Storage Tanks						
Annual O&M					1%	$7,500
Total O&M Costs ($/yr)						**$650,000**
Annualized Costs ($ / Year)						
Annualized Capital Costs ($/Year)	*One payment per year, spread over Project Life*					$847,000
Annual O&M Costs						$650,000
Total Annualized Cost						$1,497,000
Deliveries of Recycled Water	325 AFY					
Estimated Unit Cost ($/AF)						**$4,600**

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