Coastside County Water District
Recycled Water Feasibility Study

Date: 3/20/2024
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1 Contents

Tables

Figures

1 Executive Summary

Coastside County Water District (CCWD or District) contracted Water Works Engineers to complete a recycled water feasibility study to look at a range of alternatives to diversify their water supply portfolio. The alternatives evaluated include non-potable reuse, indirect potable reuse (IPR), and direct potable reuse (DPR). As part of the feasibility study, a hydrogeologic report was prepared. The purpose of this feasibility study is to provide an adaptable roadmap for the District to implement recycled water projects. Changing water supply reliability and shifting regulatory frameworks will affect the preferred recycled water projects over time.

1.1 Alternatives

The below recycled water alternatives were studied.

- Non-potable reuse alternatives included a fill station, landscape irrigation, agricultural irrigation and irrigation of specific areas including the Skylawn Memorial Park and the Ocean Colony Golf Course.
- Indirect potable reuse alternatives included groundwater replenishment and reservoir augmentation.
- Direct potable reuse included adding advanced treated water to the Nunes Water Treatment Plant.
- Environmental benefit alternatives included including creek augmentation or wetland enhancement.

1.2 Wastewater

Sewer Authority Mid-Coastside (SAM) provides wastewater treatment services and contract collection maintenance services. The majority of the SAM sewer pump stations convey wastewater generated within the CCWD jurisdictional area except for the Montara and Vallemar pump stations. The Montara pump station transfers wastewater to the Vallemar pump station, so the amount of SAM wastewater that is attributable to CCWD may be determined by subtracting the Vallemar pump station flow from the total influent flow at the SAM wastewater treatment plant. To not include inflow and infiltration, available flows were evaluated during the dry season months of April to September. The average dry weather flow of wastewater attributable to CCWD from 2018 to 2022 was 1.18 MGD. Wastewater is evenly distributed throughout the service area. Because the wastewater is evenly distributed through a large geographic area the potential to harvest wastewater and treat it at a remote location is not feasible since there is not enough raw wastewater at one location to use. Harvesting wastewater was not assessed further.

1.3 Half Moon Bay Hydrogeologic Report Summary

The hydrogeologic report was created to determine if using recycled water for environmental benefit or groundwater replenishment options were feasible as discussed below.

1.3.1 Environmental Benefit

There are over 100 water rights filed within the Project Area. If CCWD chooses surface water augmentation, there will need to be consideration as to how it will affect existing surface water rights. For example, along Pilarcitos Creek there are six licensed and/or claimed water rights for domestic purposes. Most of these locations are in the upper reaches of the stream between Pilarcitos Lake and Highway 92. If CCWD were to augment Pilarcitos Creek with recycled water, the quality of the recycled water cannot impair an individual’s source of domestic water.

Additionally, the same can be said about irrigation water. Along Pilarcitos Creek there are seven licensed and/or claimed water rights for irrigation purposes. Most of these rights are along the reach of the creek that runs parallel to Highway 92. The users of these irrigation water rights divert water from Pilarcitos Creek for various agricultural purposes, like crops, flowers, Christmas trees, and some irrigated pasture. Although California allows the use of recycled municipal wastewater for agriculture, if CCWD were to augment Pilarcitos Creek with recycled water, the quality of the recycled water cannot impair an individual's source of irrigation water. For example, if the recycled water has salinity levels above a crop's salinity threshold it could negatively impact the yield of a crop.

1.3.2 Groundwater Replenishment

The key issues that would affect the physical feasibility of this option include the presence or absence of groundwater wells within a 60-day water movement radius from the site based on California state requirements, and to consider the scale and extent of groundwater mounding as a result of percolation or injection of the recycled water. Because of the absence of site-specific hydraulic information, the analyses were conceptual and actual parameter values could vary widely. Despite these uncertainties, the conditions that lead to a slow seepage velocity and therefore, lack of effect on downgradient wells in the 60-day period, also lead to excessive mounding. If hydraulic conditions are such that the mounding presented would be less than assumed, those conditions would likely also indicate conditions producing a higher seepage velocity, and the greater likelihood of affecting downgradient wells in the 60-day period.

While an expensive, site-specific geotechnical and hydrologic field investigation and associated modeling would refine these analyses and provide greater confidence in this alternative as a feasible option for recharging groundwater using recycled water, the relationships between seepage velocity and mounding lead to this alternative unlikely to be a feasible option.

1.3.3 Hydrogeologic Recommendations

There are several data gaps that were identified during the course of this report. These data gaps include:

- The absence of geotechnical or hydrogeologic data in the groundwater replenishment basin area;
- Limited aquifer test data and absence of raw data for previous aquifer tests;
- Limited information relating to effects of faulting on groundwater movement;
- Limited information for much of the basin outside of the Half Moon Bay Terrace Groundwater Basin watershed; and
- Lack of information relating to the number of identified wells that are no longer in use or have been abandoned and where they are located.

To address these issues, three general recommendations were provided to provide information and/or tools for water resource management.

1. The first recommendation is related to the condition whereby private wells (not belonging to CCWD) are allowed within the CCWD service area. Given instances such as in the groundwater replenishment option where distances to domestic wells is a key parameter, the knowledge of which wells are no longer active or have been abandoned could provide substantially more flexibility for decision-making around topics for which there are concerns about domestic wells. A well-canvassing effort is recommended to be

conducted to identify which of those wells are operational and which can be deemed to be unusable or no longer existing to rule out future decisions that may be based on obsolete consideration.

2. The construction of a numerical groundwater flow model is recommended. That would provide CCWD with a tool that could then be used to quantitatively evaluate effects of various groundwater management scenarios that may arise. Numerical groundwater flow modeling not only provides a tool for evaluating groundwater flow and water budget conditions, but also is the only method to evaluate the internal consistency of the assumptions built into the understanding of the groundwater basin. A model would enhance the confidence in construction of new wells or well-fields designed in a manner that reduces well interference and could be used to optimize groundwater use alternatives.
3. The last recommendation is to conduct site-specific hydraulic testing (aquifer testing). The construction of a numerical model would substantially benefit from additional hydraulic testing under controlled pumping and recovery conditions. Thus, evaluating the hydraulic characteristics of aquifer materials in a more widespread area of the Half Moon Bay Terrace Groundwater Basin Watershed.

1.4 Alternative Comparison

Alternatives were compared based on non-cost criteria and cost based on the amount of water produced.

1.4.1 Non-Cost Criteria

The non-cost criteria were divided into four categories:

- environmental and social impacts/benefits
- ease of implementation and regulatory compliance
- engineering, construction, and operations
- climate hazard and resiliency

Without considering how much recycled water is used the top alternatives are the non-potable fill station, landscape irrigation and agricultural irrigation. However, a project that uses more recycled water is desirable for the District. Therefore, when ranking alternatives based on non-cost criteria and by how much recycled water would be used, then the most desirable alternatives included direct potable reuse, reservoir augmentation, and irrigation of Ocean Colony Golf Course.

1.4.2 Cost

The 20-year life cycle costs were developed as well as the cost per million gallons produced over 20 years. Comparing the net present worth per million gallon, the top three alternatives are reservoir augmentation, irrigation at Ocean Colony Golf Course, and direct potable reuse.

1.5 Conclusions

To be feasible, proposed recycled water projects need partners that want to collaborate with CCWD and a reason to pursue the project such as a policy or economic reason. The feasibility of the projects with the current conditions are summarized in Table ES-1.

Table ES-1. Feasibility of Project by Alternative

Alternative	Feasible	Reasoning
Fill Station(s)	No	Little demand for recycled water within service area.
Landscape and Agricultural Irrigation	No	Little demand for recycled water within service area.
Skylawn Memorial Park Irrigation	No	Park not within service area, so would not be able to deliver recycled water.
Ocean Colony Golf Course and Landscape Irrigation	No	Ocean Colony has other water supplies that are more cost effective than recycled water and therefore, does not have a demand for recycled water.
Pilarcitos Creek Augmentation or Other Creek Augmentation	No	Does not offset groundwater use or provide additional water resources from indirect or direct potable reuse.
Wetland Enhancement	No	Does not offset groundwater use or provide additional water resources from indirect or direct potable reuse.
Groundwater Replenishment	No	1. There are private wells in the service area that limits where water may be replenished. 2. A limited amount of water that can be replenished at one location due to mounding
Reservoir Augmentation	No	There is no known partner who has a reservoir available for augmentation.
Direct Potable Reuse at Nunes WTP	Further study needed	Next steps are to find potential funding sources and continue technical studies.

Of the recycled water alternatives evaluated, currently the direct potable reuse alternative is the only alternative that should be pursued because the project has potential to provide diversity to the District's water supply portfolio. However, further study is needed for the direct potable reuse alternative to determine if the project is economically viable.

2 Introduction

Coastside County Water District (CCWD or District) contracted Water Works Engineers to complete a recycled water feasibility study to look at a range of alternatives to diversify their water supply portfolio. The alternatives evaluated included non-potable reuse, indirect potable reuse (IPR), and direct potable reuse (DPR). As part of the feasibility study, ROUX (as a subconsultant to Water Works Engineers) prepared a hydrogeologic report that is included in Appendix A. The purpose of this feasibility study is to provide an adaptable roadmap for the District to implement recycled water projects. Changing water supply reliability and shifting regulatory frameworks will affect the preferred recycled water projects over time.

2.1 Study Area

Per District direction, this study focuses on recycled water uses within the District boundaries or where the water use may benefit the District.

2.2 District Description

CCWD is an urban water district in San Mateo County. CCWD supplies potable water to the City of Half Moon Bay and the unincorporated communities of El Granada, Miramar, and Princeton by the Sea. The wastewater from these communities is treated by Sewer Authority Mid-Coastside (SAM). SAM is a separate agency from CCWD.

CCWD is located on the coast of the Pacific Ocean, approximately 69 feet above sea level. The areas served by CCWD are about 30 miles south of San Francisco. To the east of the District are the northernmost portion of the Santa Cruz Mountains. The District's boundaries are shown in Figure 1.

Figure 1. Coastside County Water District Jurisdictional Area

2.3 Land Use and Land Use Trends

Land use planning within the District is performed by the City of Half Moon Bay and San Mateo County. San Mateo County determines the land use of the unincorporated areas of El Granada, Miramar, and Princeton by the Sea.

Approximately 81% of the land is zoned for residential use. The remainder is about 18% commercial and less than 1% agriculture (floriculture). The commercial zoning is along the highly populated and highly traveled areas near State Route 1 and Highway 92.

Future development within the District has a focus on climate resilient planning and sustainable approaches that support all types of land uses. The City of Half Moon Bay Coastal Land Use Plan prioritizes agricultural and coastal dependent uses over other development types such as visitor-serving commercial recreation facilities.

The District's service area is within the boundaries of the Coastal Zone and the jurisdiction of the California Coastal Commission. Restrictions from Coastal Development Permits issued to the District in 1985 and 2003 prohibit the District from creating more connections or expanding its jurisdictional boundaries until the transportation system on mid-Coastside can meet specific levels of service. As of 2020, the District provided water service to approximately 7,600 interconnections.

Within the City of Half Moon Bay, residential growth is capped at 1.5% per year in downtown units and 1% for the rest of the residential areas in the City. Accessory dwelling units have become common in the City and fall under the City's jurisdiction to approve.

Growth within the unincorporated areas is managed by San Mateo County's Local Coastal Program[1]. For all unincorporated areas of San Mateo County, growth is limited to 125 units/year with only a portion of the unincorporated areas being within the District's jurisdiction. The San Mateo County Local Coastal Program also states that development will not happen without the approval of the District first.

2.4 Population Trends

From the District's 2020 Urban Water Management Plan (UWMP)[2], it was estimated that in 2020 the District's service area population was 18,738. The Association of Bay Area Governments (ABAG) 2040 population projection data was used to forecast the population growth that the District will experience. The current and projected populations served by the District are listed in Table 2.

Table 2. Current and Projected Population

Population Served (a)	2020	2025	2030	2035	2040
	18,738	18,991	19,238	19,371	19,472

(a) From 2020 UWMP

2.5 Tsunami Zone

A portion of the District and the SAM wastewater treatment plant is within a tsunami zone as shown in Figure 2. The tsunami zone designation may limit future construction and development options. For example, in 2013, the Coastal Commission denied the City of Morro Bay's proposal for redevelopment of their wastewater treatment

[1] Accessed October 9 https://www.smcgov.org/planning/local-coastal-program
[2] Accessed October 9 https://www.coastsidewater.org/reports_and_studies/2020-Urban-Water-Management-Plan.pdf

plant in-place based on inconsistencies regarding avoiding coastal hazards, land use priorities, recycled water provisions, and public view protections[3]. The Commission required that Morro Bay relocate their wastewater treatment plant outside of the tsunami zone instead of retrofitting their existing plant. Because of the requirements Morro Bay faced and the precedence of limiting new construction in a tsunami zone, when possible, alternatives were placed outside of the tsunami zone.

Figure 2. Tsunami Zone

2.6 Stakeholders

Collaborating with stakeholders is critical to determine the most beneficial use for the water in the region. There are many potential stakeholders for potential recycled water projects as listed below.

- San Mateo County
  - permitting agency including the Local Coastal Program
- SAM and member agencies
  - provides wastewater collection and treatment
- City of Half Moon Bay
  - permitting agency for projects within city limits
- San Mateo County Resource Conservation District
- Regulators
- Elected officials
- Public and Special Interest Groups
- Recycled water users for non-potable water reuse alternatives
  - landscape irrigation
  - agriculture
- San Mateo County Farm Bureau
- San Francisco Public Utilities Commission (SFPUC)
- Individual residential and nonresidential well owners within the CCWD service area
- Bay Area Water Supply and Conservation Agency (BAWSCA)

[3]Accessed October 9 https://morrobaywrf.com/wp-content/uploads/RevisedFinalPlan.pdf

3 Water and Wastewater Facilities

3.1 Water

CCWD has four water supply sources: Pilarcitos Reservoir, Upper Crystal Springs Reservoir, Pilarcitos Well Field, Denniston Well Field, and Denniston Creek. Approximately 72% of the District's water supply is purchased from SFPUC and comes from Pilarcitos Reservoir and Upper Crystal Springs Reservoir. The remaining 28% is supplied from Pilarcitos Creek Infiltration Well Field and the Denniston supplies, which are owned by CCWD.

3.1.1 Treatment and Distribution Facilities

CCWD operates two water treatment plants (WTPs) to provide drinking water to the District.

3.1.1.1 Nunes WTP

Nunes WTP treats water from Pilarcitos Reservoir, Upper Crystal Springs Reservoir, and Pilarcitos Well Field. Nunes WTP began operating in 1982 with an initial treatment capacity of 2.5 milling gallons per day (MGD). Nunes WTP has since been upgraded and now has a capacity of 4.5 MGD.

3.1.1.2 Denniston WTP

Denniston WTP treats water supplied by the Denniston Reservoir and Denniston Well Field.

3.1.1.3 Distribution System

CCWD is responsible for 100 miles of transmission and distribution pipelines. The distribution system has seven pump stations, 660 hydrants, and 79 miles of water mains. CCWD has a program for ongoing replacement of pipelines depending on age and condition. CCWD also owns 9 treated water storage tanks with a combined capacity of 7.8 million gallons. The water facilities are shown in Figure 3.

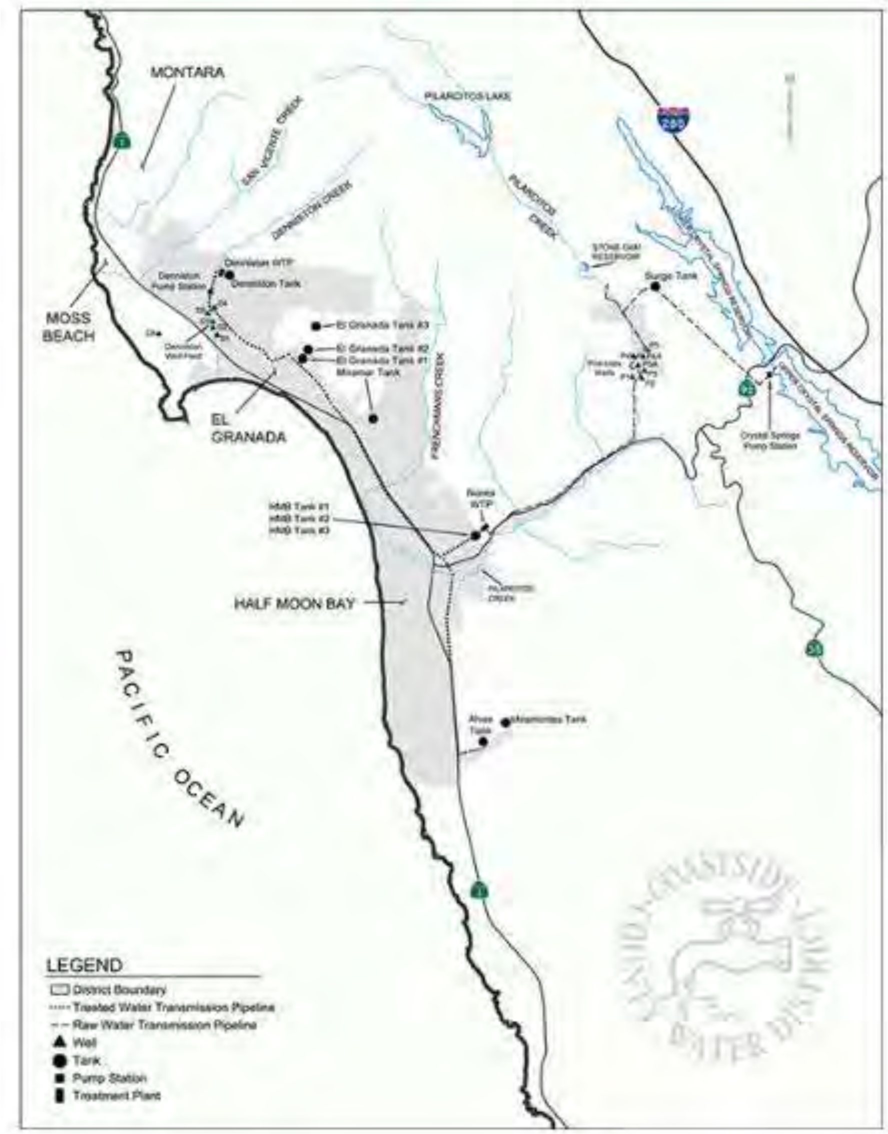


Figure 3. Map Of CCWD's Major Water Facilities

3.2 Wastewater

SAM provides wastewater treatment services and contract collection maintenance services for a population of approximately 27,000 in the following areas:

- City of Half Moon Bay
- El Granada
- Miramar
- Montara
- Moss Beach
- Princeton Harbor

SAM is a California joint powers authority (JPA) with Montara Water and Sanitary District (MWSD), Granada Community Services District (GCSD), and the City of Half Moon Bay. The SAM wastewater treatment plant produces secondary effluent that is discharged through an ocean outfall. The plant is permitted to treat 4.0 MGD average dry weather flow per NPDES Permit CA0038598[4].

The layout of SAM's intertie pipeline system and pump stations is shown in Figure 4, which is taken from the 2009 *Intertie Pipeline System Review And Evaluation Report*[5]. SAM has flow meter data at the pump stations. Most of the SAM sewer pump stations convey wastewater generated within the CCWD jurisdictional area (Figure 1), except for Montara and Vallemar pump stations. The Montara pump station transfers wastewater to the Vallemar pump station, so the amount of SAM wastewater that is attributable to CCWD may be determined by subtracting the Vallemar pump station flow from the total influent flow at the SAM wastewater treatment plant. To not include inflow and infiltration, available flows were evaluated during the dry season months of April to September. The average dry weather flow of CCWD water is shown in Table 3.

Table 3. Average Dry Weather Flow of Wastewater Attributable to CCWD

Time Period	Average Dry Weather Flow of CCWD Attributable Water (MGD) (a)
Apr-Sept 2018	1.23
Apr-Sept 2019	1.29
Apr-Sept 2020	1.15
Apr-Sept 2021	1.11
Apr-Sept 2022	1.12
Average	1.18

(1) Data emailed from SAM on August 11, 2023.

The average dry weather flow of wastewater attributable to CCWD from 2018 to 2022 was 1.18 MGD. Wastewater is evenly distributed throughout the service area. Because the wastewater is evenly distributed through a large geographic area the potential to harvest wastewater and treat it at a remote location is not feasible since there is not enough raw wastewater at one location to use. Harvesting wastewater was not assessed further.

[4] Accessed October 31 https://www.waterboards.ca.gov/sanfranciscobay/board_decisions/adopted_orders/2023/R2-2023-0002.pdf
[5] Accessed October 19 https://samcleanswater.org/vertical/sites/%7B1307B359-C05A-436D-AC1C-9EB8D6FFB4A3%7D/uploads/SAM_Intertie_Pipeline_System_Review_and_Evaluation_SRT_2009.pdf

Figure 4. SAM Collection System Infrastructure

4.1 Half Moon Bay Hydrogeologic Summary

The surface water and groundwater within the study area are discussed in detail in the Hydrogeologic Report in Appendix A. The study area is within the Half Moon Bay Terrace Groundwater Basin and the Pilarcitos Creek Watershed.

The Half Moon Bay Terrace Groundwater Basin watershed drains westward toward Half Moon Bay and the Pacific Ocean. Elevations range from approximately 2,000 feet above mean sea level for Montara Mountain and Kings Mountain to sea level. Vegetation in the Project Area is primarily grassland and herbaceous forest. Most of the land in the Project Area is classified as undeveloped by the CDFW and is privately owned. However, of the land that is developed, most of it is along the stream valleys or the coast.

The hydrogeologic report was created to determine if using recycled water for environmental benefit or groundwater replenishment options were feasible as discussed below.

4.1.1 Environmental Benefit

There are over 100 water rights filed within the Project Area. If CCWD chooses surface water augmentation, there will need to be consideration as to how it will affect existing surface water rights. For example, along Pilarcitos Creek there are six licensed and/or claimed water rights for domestic purposes. Most of these locations are in the upper reaches of the stream between Pilarcitos Lake and Highway 92. If CCWD were to augment Pilarcitos Creek with recycled water, the quality of the recycled water cannot impair an individual’s source of domestic water.

Additionally, the same can be said about irrigation water. Along Pilarcitos Creek there are seven licensed and/or claimed water rights for irrigation purposes. Most of these rights are along the reach of the creek that runs parallel to Highway 92. The users of these irrigation water rights divert water from Pilarcitos Creek for various agricultural purposes, like crops, flowers, Christmas trees, and some irrigated pasture. Although California allows the use of recycled municipal wastewater for agriculture, if CCWD were to augment Pilarcitos Creek with recycled water, the quality of the recycled water cannot impair an individual’s source of irrigation water. For example, if the recycled water has salinity levels above a crop’s salinity threshold it could negatively impact the yield of a crop.

4.1.2 Groundwater Replenishment

The key issues that would affect the physical feasibility of this option include the presence or absence of groundwater wells within a 60-day water movement radius from the site based on California state requirements, and to consider the scale and extent of groundwater mounding as a result of percolation or injection of the recycled water. Because of the absence of site-specific hydraulic information, the analyses were conceptual and actual parameter values could vary widely. Despite these uncertainties, the conditions that lead to a slow seepage velocity and therefore, lack of effect on downgradient wells in the 60-day period, also lead to excessive mounding. If hydraulic conditions are such that the mounding presented would be less than assumed, those conditions would likely also indicate conditions producing a higher seepage velocity, and the greater likelihood of affecting downgradient wells in the 60-day period.

While an expensive, site-specific geotechnical and hydrologic field investigation and associated modeling would refine these analyses and provide greater confidence in this alternative as a feasible option for recharging groundwater using recycled water, the relationships between seepage velocity and mounding lead to this alternative unlikely to be a feasible option.

4.1.3 Hydrogeologic Recommendations

There are several data gaps that were identified during the course of this report. These data gaps include:

- The absence of geotechnical or hydrogeologic data in the groundwater replenishment basin area;
- Limited aquifer test data and absence of raw data for previous aquifer tests;
- Limited information relating to effects of faulting on groundwater movement;
- Limited information for much of the basin outside of the Half Moon Bay Terrace Groundwater Basin watershed; and
- Lack of information relating to the number of identified wells that are no longer in use or have been abandoned and where they are located.

To address these issues, three general recommendations were provided to provide information and/or tools for water resource management.

1. The first recommendation is related to the condition whereby private wells (not belonging to CCWD) are allowed within the CCWD service area. Given instances such as in the groundwater replenishment option where distances to domestic wells is a key parameter, the knowledge of which wells are no longer active or have been abandoned could provide substantially more flexibility for decision-making around topics for which there are concerns about domestic wells. A well-canvassing effort is recommended to be conducted to identify which of those wells are operational and which can be deemed to be unusable or no longer existing to rule out future decisions that may be based on obsolete consideration.
2. The construction of a numerical groundwater flow model is recommended. That would provide CCWD with a tool that could then be used to quantitatively evaluate effects of various groundwater management scenarios that may arise. Numerical groundwater flow modeling not only provides a tool for evaluating groundwater flow and water budget conditions, but also is the only method to evaluate the internal consistency of the assumptions built into the understanding of the groundwater basin. A model would enhance the confidence in construction of new wells or well-fields designed in a manner that reduces well interference and could be used to optimize groundwater use alternatives.
3. The last recommendation is to conduct site-specific hydraulic testing (aquifer testing). The construction of a numerical model would substantially benefit from additional hydraulic testing under controlled pumping and recovery conditions. Thus, evaluating the hydraulic characteristics of aquifer materials in a more widespread area of the Half Moon Bay Terrace Groundwater Basin Watershed.

5 Project Alternatives

Recycled water alternatives studied included non-potable reuse, indirect potable reuse, and direct potable reuse as discussed in this section.

5.1 Non-Potable Reuse Alternatives

The non-potable reuse alternatives analyzed in this study were fill stations, agricultural irrigation, landscape irrigation, and golf course irrigation. To produce non-potable water for reuse, tertiary treatment would be needed including disc filtration and ultraviolet (UV) disinfection would have to be added, as shown in Figure 5. Disinfected tertiary water would be pumped from the WWTP to the use areas. The non-potable reuse alternatives may be combined when the level of necessary treatment is similar.

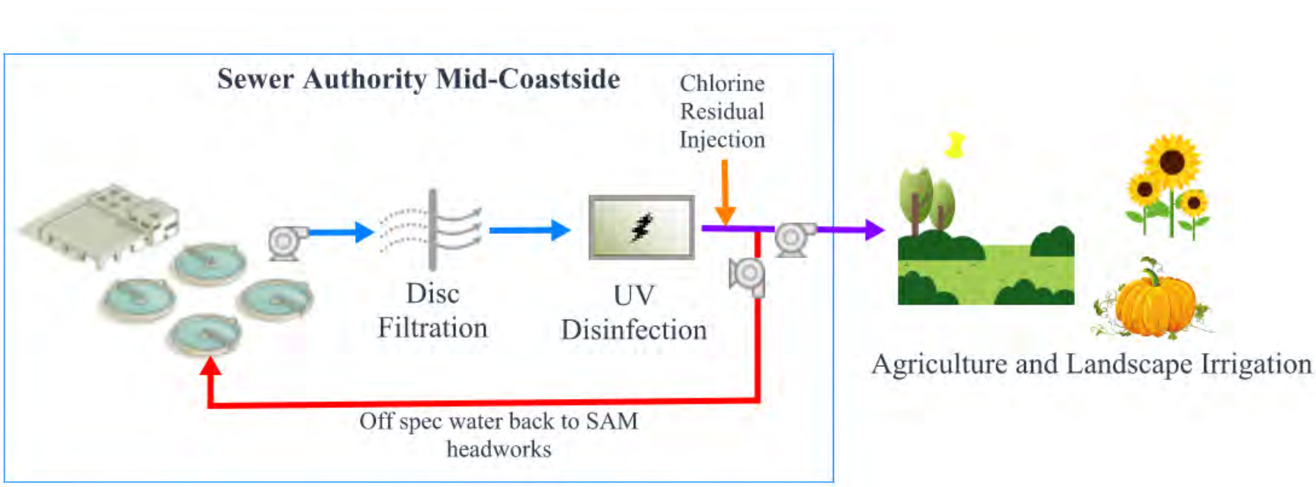


Figure 5. Non-Potable Reuse Process Flow Diagram

5.1.1 Permitting

Permitting for non-potable reuse is through the San Francisco Regional Water Quality Control Board (RWQCB). To produce non-potable water for reuse, a permit is required from the RWQCB that regulates the treatment process for production of the recycled water.

Non-potable reuse also requires a Water Reclamation Requirements for Recycled Water Use (Order WQ 2016-0068-DDW)[6] permit. This permit regulates the use of the recycled water. For the alternatives that include more than one recycled water user (i.e., fill station and agriculture irrigation), this permit should be obtained by an agency who will function as the permit administrator. The permit administrator should be the agency that is legally responsible for the distribution of the recycled water. This agency would likely be CCWD. For the alternatives that have one main recycled water user, that user may obtain the use permit.

[6] Accessed on Oct 19 wqo2016_0068_ddw (ca.gov)

5.1.2 Non-Potable Reuse Projects

5.1.2.1 Fill Station

One or more fill stations could be located throughout the District area. The fill station(s) would provide disinfected tertiary recycled water for unrestricted use on residential landscaping or construction water. The District could require the use of recycled water for construction water if the project were within a certain distance of the fill station. For example, the city of San Jose requires recycled water to be used for construction water if the project is within five miles of a fill station.

5.1.2.1.1 Advantages and Disadvantages

The advantages and disadvantages for this alternative are shown below.

Table 4. Fill Station Advantages and Disadvantages

Advantages for CCWD	Disadvantages for CCWD
• Simple • Combinable with other alternatives • Provides public education • May be used as first step	• Does not offset much potable water use

5.1.2.1.2 Next Steps

The following steps have been identified to implement this project. Implementation of the project is expected to take up to five years from initial design through final design and not including financing.

1. Identify location for fill station(s) and acquire access to the location through easement or purchasing.
2. Coordinate with SAM.
3. Design and implement treatment processes and distribution system.
4. Permit the treatment, distribution, and use of recycled water.
5. Consider enacting an ordinance require using recycled water for construction water within a certain distance from the fill station(s).
6. Determine a recycled water rate schedule.

5.1.2.2 Agricultural and Landscape Irrigation

Disinfected tertiary recycled water may be used for row crops such as brussels sprouts and artichokes. In this study, the District wanted to restrict agricultural irrigation to be within District boundaries. There is not much existing agriculture within District boundaries since the District is an urban water supplier. Furthermore, a portion of the existing agriculture within the District boundary is floriculture which may require a higher level of water treatment then disinfected tertiary recycled water. Areas that could potentially support future agriculture are highlighted on the Figure 6 including the Urban Reserve, Open Space Reserve, and Extensive Floriculture zones from the city of Half Moon Bay zoning map. The advantages and disadvantages for this alternative are shown below.

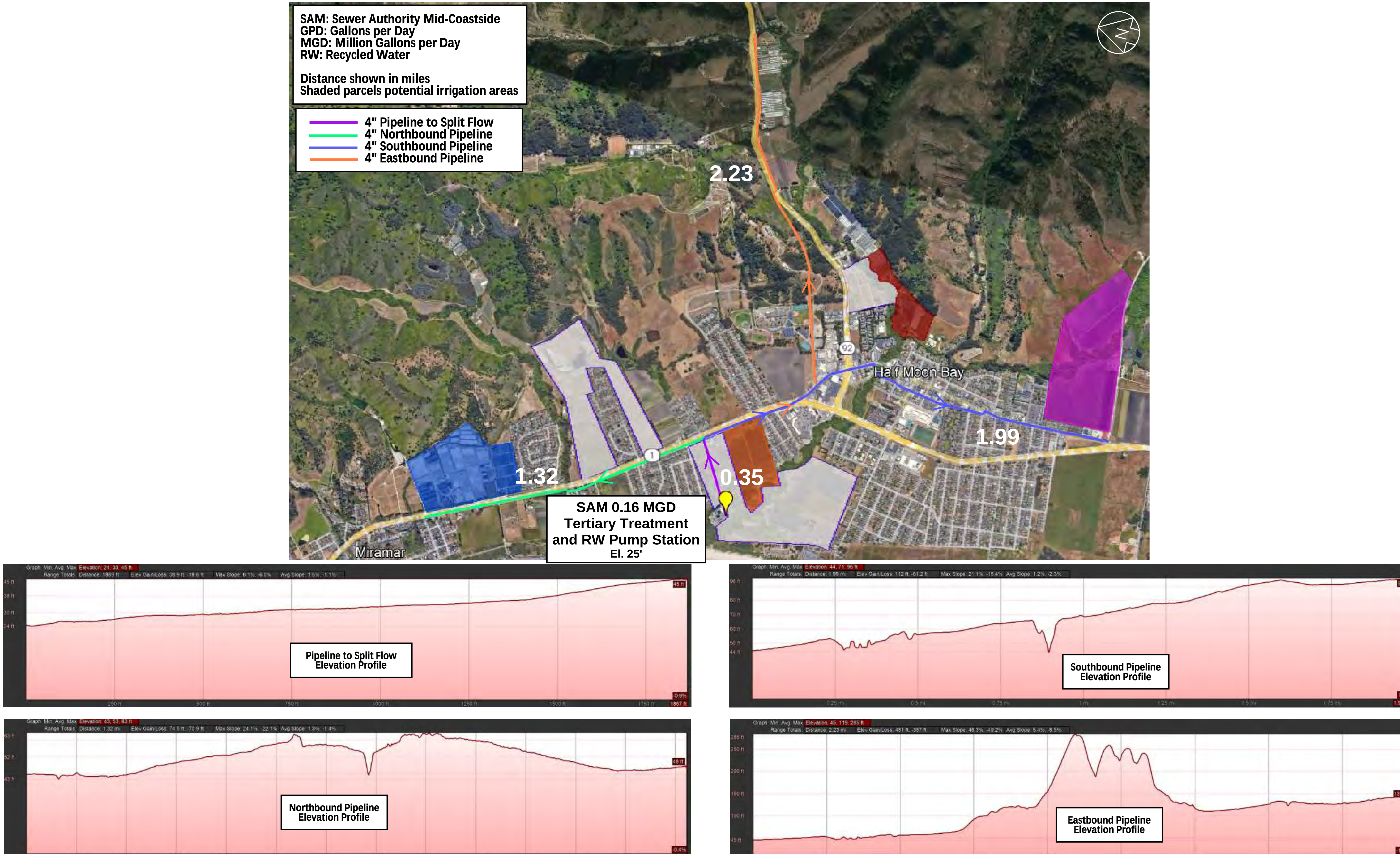
Table 5. Agricultural and Landscape Irrigation Advantages and Disadvantages

Advantages for CCWD	Disadvantages for CCWD
• Supports sustainability	• Recycled water only used during dry season • Water could not be used for other purposes in the future • Limited landscaping and agricultural land within District boundaries • Does not offset much potable water use • Within District there is limited irrigation opportunities near a sewer with enough flow to harvest wastewater at a satellite treatment plant • Existing use sites would require retrofitting to meet recycled water standards

5.1.2.2.1 Next Steps

The following steps have been identified to implement this project. Implementation of the project is expected to take up to 10 years from initial design through final design and not including financing.

1. Identify recycled water users that are interested in recycled water. Confirm if need to stay within District boundary for recycled water deliveries.
2. Coordinate with SAM
3. Design and implement treatment processes and distribution system.
4. Permit the treatment, distribution, and use of recycled water.
5. Determine a recycled water rate schedule.



CCWD Recycled Water Feasibility Study	Non-Potable Reuse: Landscape and Agriculture Irrigation Proposed Distribution System	WATERWORKS ENGINEERS	FIGURE 6

5.1.2.3 Skylawn Memorial Park Irrigation

Skylawn Memorial Park (Park) which is outside of CCWD boundaries has large landscape irrigation needs that disinfected tertiary recycled water could be used for. The layout of the recycled water facilities is shown on Figure 7. The Park currently irrigates with the District's surplus raw water. The Park is approximately 5 miles east and 1,100 feet in elevation above the SAM WWTP. The pipeline route would follow existing District pipeline alignments.

5.1.2.3.1 Advantages and Disadvantages

The advantages and disadvantages for this alternative are shown below.

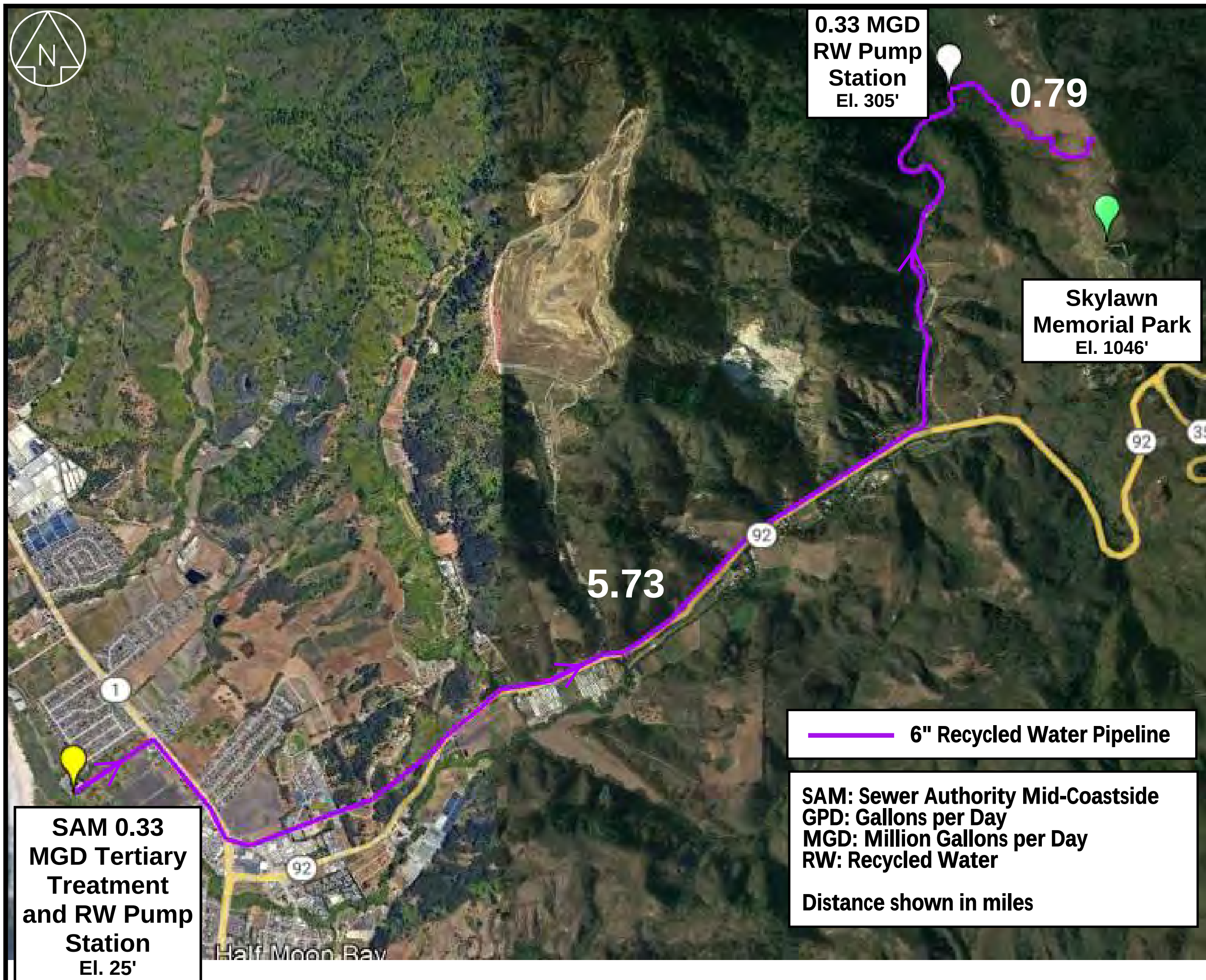
Table 6. Skylawn Memorial Park Irrigation Advantages and Disadvantages

Advantages for CCWD	Disadvantages for CCWD
• May generate a source of income	• Long pipeline route • Water only used during dry season • Water could not be used for other purposes in the future • Existing use sites would require retrofitting to meet recycled water standards • Using recycled water would replace the Park's raw water purchases • Harvesting wastewater at a satellite treatment plant is not feasible for this option

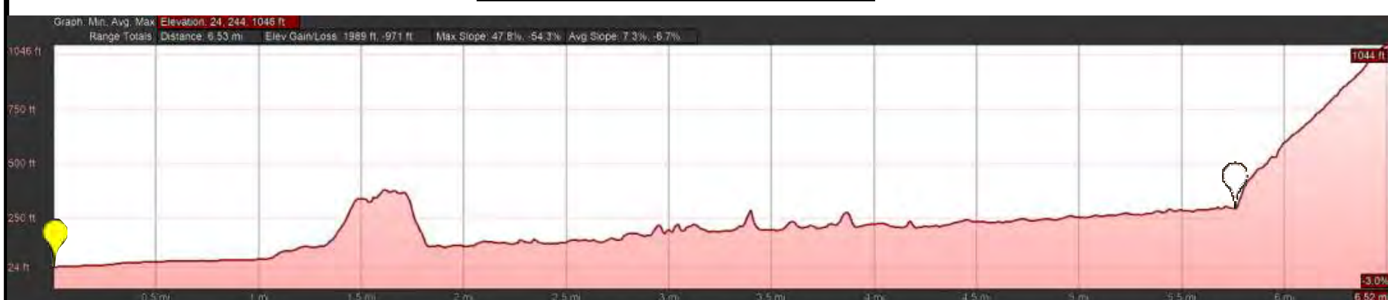
5.1.2.3.2 Next Steps

The following steps have been identified two implement this project. Implementation of the project is expected to take up to 10 years from initial design through final design and not including financing.

1. Coordinate with Skylawn Memorial Park to determine if recycled water makes financial sense for the District and the Park and the quality of water needed for irrigation.
2. Confirm recycled water could be delivered outside of District.
3. Coordinate with SAM.
4. Design and implement treatment processes and distribution system.
5. Permit the treatment, distribution, and use of recycled water.
6. Determine a recycled water rate schedule.



Pipeline Elevation Profile



CCWD Recycled Water Feasibility Study	Non-Potable Reuse: Skylawn Memorial Park Irrigation Proposed Distribution System	WATERWORKS ENGINEERS	FIGURE 7

5.1.2.4 Golf Course and Landscape Irrigation

The landscaping within Ocean Colony neighborhood and the Half Moon Bay Golf Links may be irrigated with disinfected tertiary recycled water. This feasibility study assumes that the total dissolved solids (TDS) levels are not acceptable, and a portion of the effluent flow would need to be treated using reverse osmosis, as shown in Figure 8. The layout of the recycled water facilities is shown in Figure 9. The grasses at golf courses are sensitive to salt, so the TDS in SAM's effluent must be studied prior to final treatment process design, including seasonal TDS fluctuations. There is minimal existing effluent TDS available now.

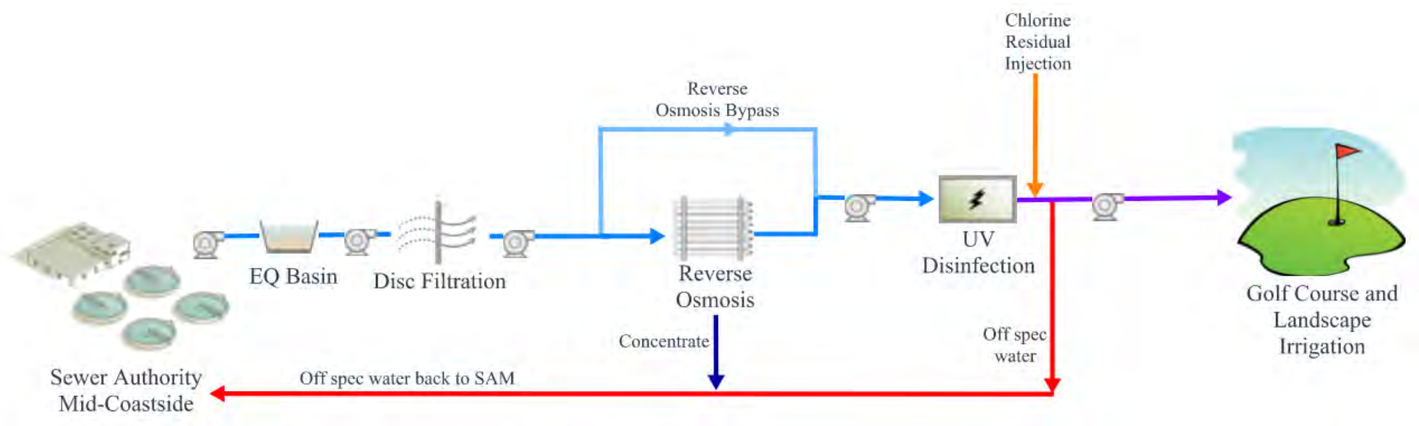


Figure 8. Non-Potable Reuse Golf Course Irrigation Process Flow Diagram

5.1.2.4.1 Advantages and Disadvantages

The advantages and disadvantages for this alternative are shown below.

Table 7. Golf Course and Landscape Irrigation Advantages and Disadvantages

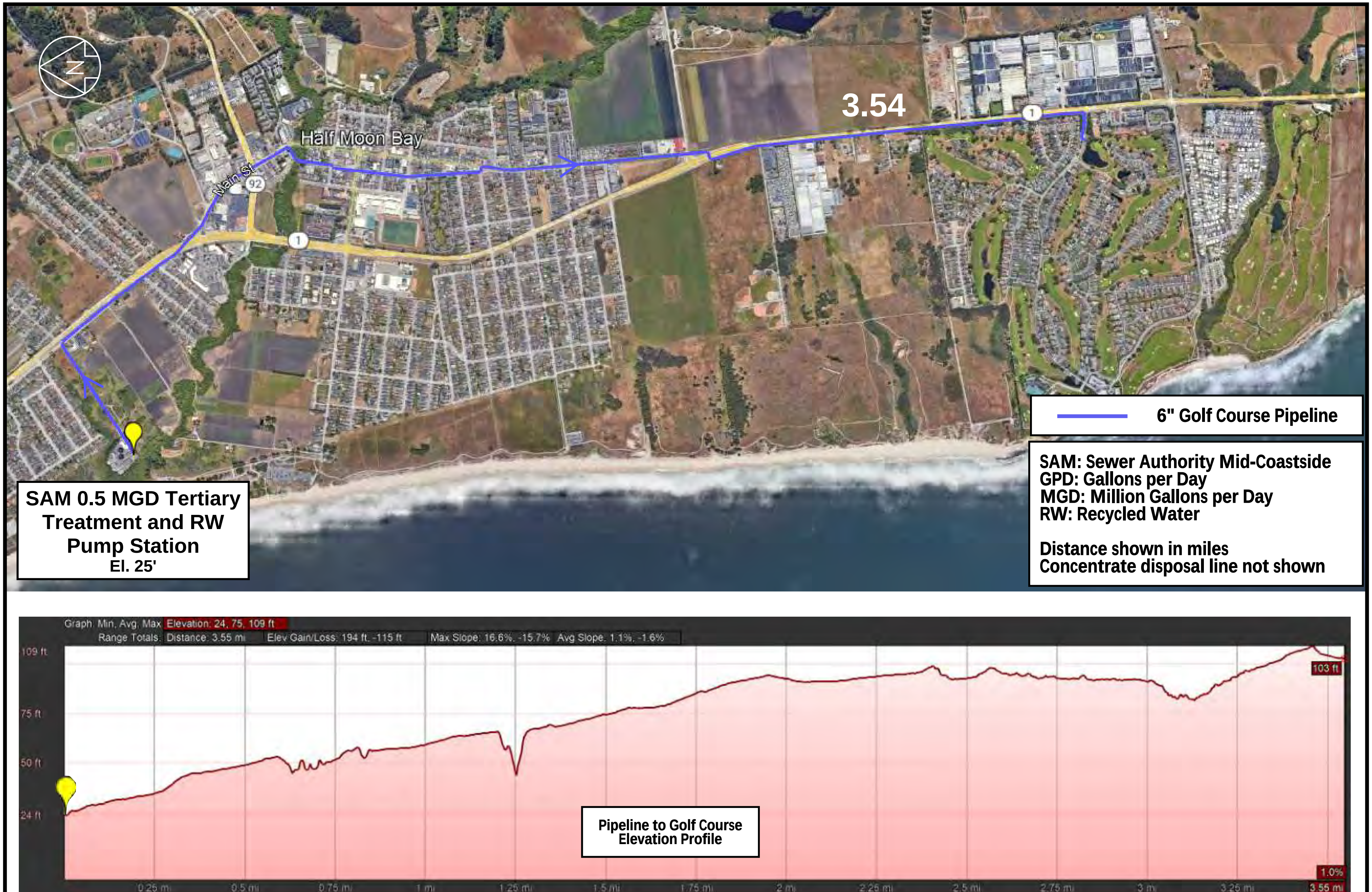
Advantages for CCWD	Disadvantages for CCWD
• May reduce the amount of groundwater pumping. Note that Ocean Colony has stated that they will retain their wells even if using recycled water.	• Additional wastewater sampling needed to determine level of treatment required for irrigation at course • Water only used during growing season • Water could not be used for other purposes in the future • Limited offset of potable water use. Additional groundwater extraction infrastructure would be needed to take advantage of additional available groundwater • There is not sufficient sewage nearby to harvest locally at a satellite treatment facility • Existing use sites would require retrofitting to meet recycled water standards

5.1.2.4.2 Next Steps

The following steps have been identified two implement this project. Implementation of the project is expected to take up to 12 years from initial design through final design and not including financing.

1. Coordinate with Ocean Colony on operational concerns to determine if recycled water makes sense

2. Collect wastewater treatment plant total dissolved solids (TDS) samples for a year to determine if there are seasonal TDS differences.
3. Coordinate with SAM.
4. Design and implement treatment processes and distribution system
5. Permit the treatment, distribution, and use of recycled water.
6. Determine a recycled water rate schedule.



CCWD Recycled Water Feasibility Study	Non-Potable Reuse: Golf Course Irrigation Proposed Distribution System	WATERWORKS ENGINEERS	FIGURE 9

5.1.3 Environmental Benefit Projects

5.1.3.1 Pilarcitos Creek Augmentation or Other Creek Augmentation

Per California Water Code, if recycled water is added to Pilarcitos Creek it may not be used as potable water supply downstream. Therefore, if recycled water is added to Pilarcitos Creek, the recycled water would add environmental benefits such as habitat restoration, but the alternative would not create additional potable water supply.

5.1.3.1.1 Advantages and Disadvantages

The advantages and disadvantages for this alternative are shown below.

Table 8. Pilarcitos Creek Augmentation or Other Creek Augmentation Advantages and Disadvantages

Advantages for CCWD	Disadvantages for CCWD
• Supports regional desire for more water in the creek	• Pilarcitos Creek has six licensed water rights claims for domestic purposes and seven licensed water rights for irrigation. The quality of recycled water cannot impact an individual's source of water • Cannot be used as indirect potable reuse as the creek is not considered an environmental buffer like a reservoir or the groundwater aquifer • Environmental studies required • Additional wastewater treatment infrastructure required • Need partner for funding treatment system upgrades • Need funding for annual O&M costs

5.1.3.1.2 Next Steps

The following steps have been identified two implement this project. Implementation of the project is expected to take up to 25 years from initial design through final design and not including financing.

1. Determine partners who will fund planning, design, and construction.
2. Work with stakeholders to define the project.
3. Determine wastewater treatment location.
4. Work with RWQCB to obtain new NPDES permit.

5.1.3.2 Wetlands Enhancement

Another alternative that would provide environmental benefit, is to create wetlands. For example, the city of Pacifica added a polishing wetland for the treatment of their tertiary effluent in Calera Creek. The wetland restoration improves the referring waters and wetland ecosystem functions including hydrology, water quality, plant community maintenance and habitat support. The San Mateo County Resource Conservation District has studied the improvement of Pilarcitos Creek as described in the 2008 *Pilarcitos Integrated Watershed Management Plan*.

5.1.3.2.1 Advantages and Disadvantages

The advantages and disadvantages for this alternative are shown below.

Table 9. Wetlands Enhancement Advantages and Disadvantages

Advantages for CCWD	Disadvantages for CCWD
• Supports regional desire for more water in the creek	• Environmental studies required • Additional wastewater treatment infrastructure required • Need partner for funding treatment system upgrades • Need funding for annual O&M costs

5.1.3.2.2 Next Steps

The following steps have been identified two implement this project. Implementation of the project is expected to take up to 25 years from initial design through final design and not including financing.

1. Determine partners who will fund planning, design, and construction.
2. Work with stakeholders to define the project.
3. Determine wastewater treatment location.
4. Work with RWQCB to obtain new NPDES permit.

5.2 Indirect Potable Reuse Alternatives

The indirect potable reuse alternatives analyzed in this study were groundwater replenishment and reservoir augmentation. The treatment process flow diagram for indirect potable reuse is shown in Figure 10. Indirect potable reuse would require a new Advanced Purified Water Facility (APWF) consisting of tertiary treatment by disc filters, reverse osmosis (RO), and UV disinfection. It is assumed that this facility would have to be built outside of the tsunami zone based on precedent set by the Coastal Commission with Morro Bay. For the purposes of this feasibility study, an area near the high school was chosen for the APWF because it is outside of this tsunami zone and near the Nunes WTP. Additional studies would be needed to determine the optimal location for the facility.

Secondary effluent pumped from SAM would be treated at the APWF. Approximately 75 percent of the APWF water would be available for use after membrane treatment and 25 percent would be concentrate needing disposal. Concentrate from the membrane filtration would be returned to the SAM treatment plant. There would be no additional TDS load to the ocean outfall compared to if the secondary effluent had been discharged. Any out of specification water from the APWF would also be discharged to the start of the plant.

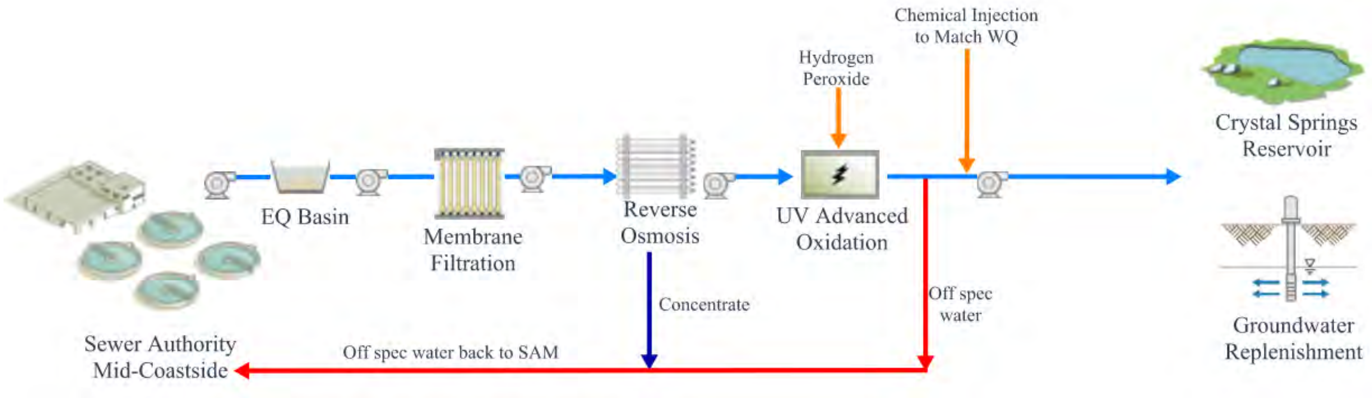


Figure 10. Indirect Potable Reuse Process Flow Diagram

5.2.1 Groundwater Replenishment

Advanced treated water would be used to replenish groundwater by either injection or infiltration/spreading basins. The key issues that would affect the physical feasibility of this option include (1) the presence or absence of groundwater wells within a 60-day water movement radius from the replenishment site based on California state requirements, and (2) to consider the scale and extent of groundwater mounding as a result of percolation or injection of the recycled water. Because of the absence of site-specific hydraulic information, the analyses were conceptual in nature, and actual parameter values could vary widely. However, despite these uncertainties, the conditions that lead to a slow seepage velocity and therefore, lack of effect on downgradient wells in the 60-day period, also lead to excessive mounding. If hydraulic conditions are such that the mounding presented would be less than assumed, those conditions would likely also indicate conditions producing a higher seepage velocity, and the greater likelihood of affecting downgradient wells in the 60-day period.

While an expensive, site-specific geotechnical and hydrologic field investigation and associated modeling would refine these analyses and provide greater confidence in this alternative as a feasible option for recharging groundwater using recycled water, the relationships between seepage velocity and mounding lead to this alternative unlikely to be a feasible option.

For the purposes of this feasibility study, it was assumed that the groundwater replenishment facility would be located at the APWF. Per the Hydrogeologic Report in Appendix A, only about 125,000 gpd could be replenished without significant mounding. The replenished water would need to be stored in the aquifer for the 60 days before reaching any extraction well, including private domestic wells[7]. Tracer tests and additional studies would be required to ensure the 60-day detention time is met. The layout of the recycled water facilities is shown on Figure 11.

5.2.2 Permitting

Indirect potable reuse via groundwater replenishment is regulated by General Waste Discharge Requirements for Aquifer Storage and Recovery Projects that Inject Drinking Water Into Groundwater (Order WQ 2012-0010)[8]. This

[7] Accessed on Oct 19 View Document - California Code of Regulations (westlaw.com)
[8] Accessed on Oct 19 State Water Resources Control Board Water Quality Order 2012-0010 General Waste Discharge Requirements for Aquifer Storage and Recovery Projects That Inject Drinking Water Into Groundwater (ca.gov)

permit should be obtained by the entity that oversees the advanced treatment and injection of the recycled water which likely would be CCWD.

5.2.3 Advantages and Disadvantages

The advantages and disadvantages for this alternative are shown below.

Table 10. Groundwater Replenishment Advantages and Disadvantages

Advantages for CCWD	Disadvantages for CCWD
• Adds to groundwater supply (although minimal volume and very localized location)	• Extensive studies required • Minimal volume of water can be replenished due to mounding and the water not traveling in the aquifer • Limited locations to replenish water because of the numerous domestic wells throughout the service area. Current regulations would allow new homeowner wells to be built. The water cannot be extracted for at least 60 days by any well • Water may need treatment when pumped out of the aquifer • Infrastructure required to pump the water back out of the ground • Extensive infrastructure and management for indirect potable reuse • Needs extensive public outreach

5.2.4 Next Steps

The following steps have been identified to implement this project. Implementation of the project is expected to take up to 25 years from initial design through final design and not including financing.

1. Complete an existing well survey.
2. Prepare a groundwater aquifer model.
3. Perform aquifer testing.
4. Reassess if groundwater replenishment makes sense.

4" Recycled Water Pipeline

SAM: Sewer Authority Mid-Coastside
MGD: Million Gallons per Day
RW: Recycled Water

Distance shown in miles
Concentrate disposal line not shown

Pipeline Elevation Profile

CCWD Recycled Water Feasibility Study	Indirect Potable Reuse: Groundwater Replenishment Proposed Infrastructure	WATERWORKS ENGINEERS	FIGURE 11

5.2.5 Reservoir Augmentation

The closest reservoir to the study area that is large enough for reservoir augmentation is the Lower Crystal Springs Reservoir. SFPUC is also looking to add treated water to the reservoir as part of their future water supply portfolio. However, SFPUC would prefer direct potable reuse compared to putting treated water into the Crystal Springs Reservoir for operational reasons. Crystal Springs Reservoir is used as part of their operational balancing and any additional advanced treated water that is put in the reservoir, would mean less water could be conveyed from the Sierras if the reservoir was full. Before pursuing this alternative further, CCWD should discuss reservoir augmentation possibilities with SFPUC. For this study, it is assumed that SFPUC would credit the amount of water discharged into the reservoir for the District's use. The cost to convey and treat the water from the reservoir at Nunes WTP is not included in this study. The layout of the recycled water facilities is shown on Figure 12.

5.2.5.1 Permitting

There are no general permits that regulate indirect potable reuse via reservoir augmentation. If this alternative is pursued, CCWD should contact the RWQCB to determine if an individual permit is required[9]. A theoretical retention time of the recycled water in Lower Crystal Springs must be proposed by CCWD and approved by the RWQCB prior to construction[10]. Determining a theoretical retention time would require additional studies.

5.2.6 Advantages and Disadvantages

The advantages and disadvantages for this alternative are shown below.

Table 11. Reservoir Augmentation Advantages and Disadvantages

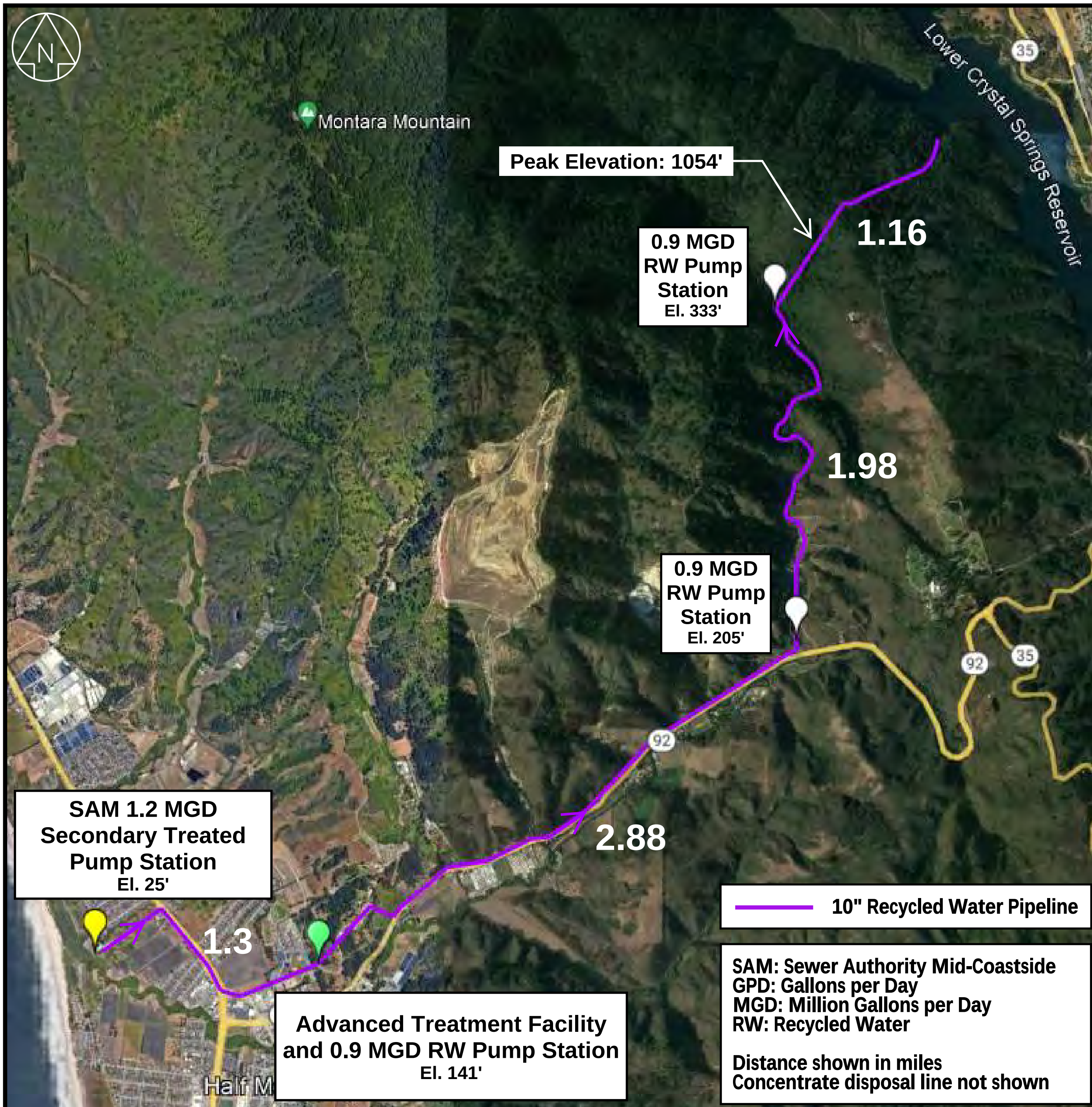
Advantages for CCWD	Disadvantages for CCWD
• Adds a raw water source assuming SFPUC will allow the water to be extracted from reservoir	• Long pipeline route • Extensive infrastructure and management for indirect potable reuse • Infrastructure required to convey and treat additional water from the reservoir • Water would need to be pumped to and from the Lower Crystal Springs Reservoir. • Some water would be lost to evaporation from reservoir

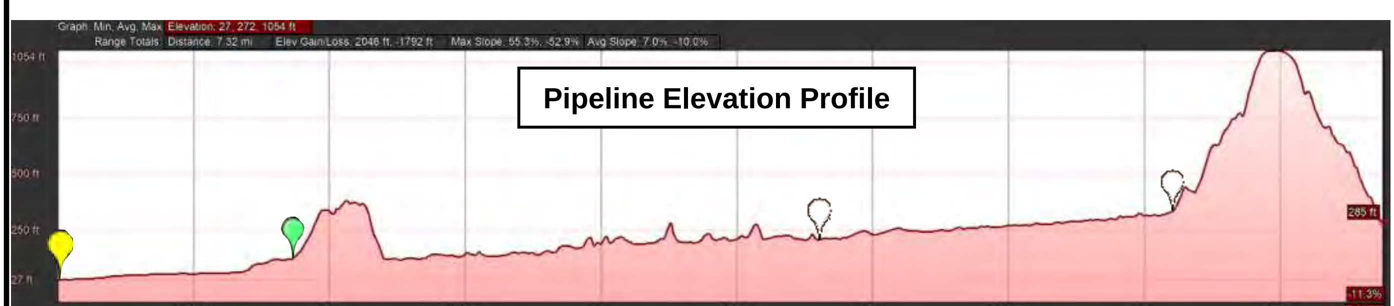
[9] Accessed on Oct 19 wastewaterrecyclingandreuse | San Francisco Bay Regional Water Quality Control Board (ca.gov)
[10] Accessed on Oct 19 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/swa/apregtext.pdf

5.2.7 Next Steps

The following steps have been identified to implement this project. Implementation of the project is expected to take up to 25 years from initial design through final design and not including financing.

1. Coordinate with SFPUC to determine what their requirements will be and if the advanced treated water would be available to use for the District.
2. Start a water planning process including
   a. setting the foundation
   b. establishing direction
   c. developing framework
   d. engaging stakeholders





CCWD Recycled Water Feasibility Study	Indirect Potable Reuse: Reservoir Augmentation Proposed Infrastructure	WATERWORKS ENGINEERS	FIGURE 12

5.3 Direct Potable Reuse

5.3.1 Distribution and Treatment

The treatment process flow diagram for direct potable reuse is shown in Figure 13 . The treatment process was determined based on regulations from the State Water Resources Control Board. The direct potable reuse alternative requires extensive treatment and source water management. The layout of infrastructure for direct potable reuse is shown in Figure 14. The location of the APWF is the same as what is described in the indirect potable reuse section.

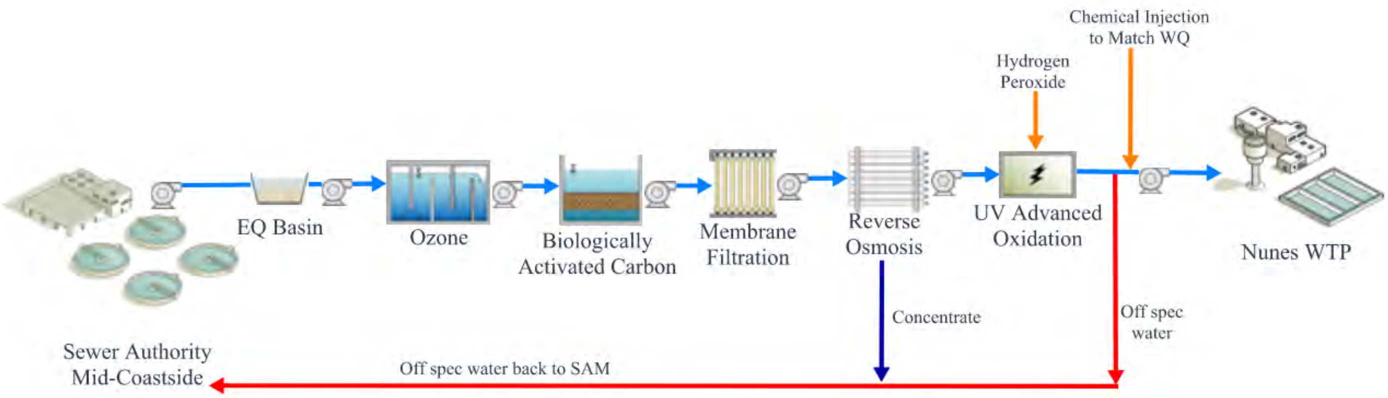


Figure 13. Direct Potable Reuse Process Flow Diagram

The water would be conveyed to the Nunes WTP for further treatment. The cost for treatment at Nunes WTP is not included in this study.

5.3.2 Permitting

Regulations regarding DPR were published by the State Water Resources Control Board (SWRCB) on December 18, 2023[11].

5.3.3 Advantages and Disadvantages

The advantages and disadvantages for this alternative are shown below.

Table 12. Direct Potable Reuse Advantages and Disadvantages

Advantages for CCWD	Disadvantages for CCWD
• Adds a raw water source to the water treatment plant	• Extensive infrastructure and management for direct potable reuse • Infrastructure required to treat additional water • Needs extensive public outreach

[11] Accessed on Oct 19,2023 [Direct Potable Reuse | California State Water Resources Control Board]

5.3.4 Next Steps

The following steps have been identified two implement this project. Implementation of the project is expected to take up to 30 years from initial design through final design and not including financing.

1. Start a water planning process including
    a. setting the foundation
    b. establishing direction
    c. developing framework
    d. engaging stakeholders
2. Identify funding sources for technical studies and constructing the project.

10" Recycled Water Pipeline

SAM: Sewer Authority Mid-Coastside
GPD: Gallons per Day
MGD: Million Gallons per Day
RW: Recycled Water

Distance shown in miles
Concentrate disposal line not shown

Pipeline Elevation Profile

CCWD Recycled Water Feasibility Study	Direct Potable Reuse at Nunes WTP Proposed Infrastructure	WATERWORKS ENGINEERS	FIGURE 14

6 Non-Cost Alternative Evaluation

Alternatives were evaluated based on non-cost criteria and life cycle costs. The District expressed that the volume of produced water was important for this study, so the alternatives were also evaluated on the amount of water that would be produced over 20 years.

6.1 Recycled Water Flow Summary By Alternative

The assumed recycled water flow rates for each alternative are shown in Table 13.

Table 13. Recycled Water Flow Summary by Alternative

Alternative		Flow Rate (MGD) (a)	Days Per Year	Source
Non-Potable Reuse	Fill Station(s)	0.05	183	In design, should be combined with other alternatives. Assumes five 4,000-gallon trucks a day are serviced in a 10-hour period $0.05\ MGD = \frac{5\ trucks\ x\ 4{,}000\frac{gal}{truck}}{10\ hours} * \frac{24\frac{hrs}{day}}{1x10^6 MG}$
	Landscape and Agricultural Irrigation	0.16	183	Users will need to be identified after clarifying if water needs to stay within District boundaries. Assumed to be 30 MG in 6 months based on Fiscal Year 2023 water usage.
	Skylawn Memorial Park Irrigation	0.27	183	Per CCWD uses about 50 MG/year. Assumes the amount is used in 6 months.
	Ocean Colony Golf Course and Landscape Irrigation	0.5	183	Per information provided by the golf course in September 2023, the average use is 550,000 gallons per day.
Indirect Potable Reuse	Groundwater Replenishment	0.125	365	From Hydrogeologic Report
	Reservoir Augmentation	1.2	365	ADWF of the portion of the total SAM wastewater flow from the CCWD service area using 2018 to 2022 SAM flow data.
Direct Potable Reuse	Direct Potable Reuse at Nunes WTP	1.2	365	ADWF of the portion of the total SAM wastewater flow from the CCWD service area using 2018 to 2022 SAM flow data.
Environmental Benefit	Pilarcitos Creek Augmentation or Other Creek Augmentation	0	0	Does not offset groundwater use.
	Wetland Enhancement	0	0	Does not offset groundwater use.

(a) Daily recycled water produced multiplied by the days in service per year and multiplied by twenty years. Recycled water would offset groundwater use or be used for indirect or direct potable reuse.

Without considering how much recycled water is used the top alternatives are the non-potable fill station, landscape irrigation and agricultural irrigation. However, a project that uses more recycled water is desirable for the District. Therefore, when ranking alternatives based on non-cost criteria and by how much recycled water would be used, then the most desirable alternatives included direct potable reuse, reservoir augmentation, and irrigation of Ocean Colony Golf Course.

6.2 Non-Cost Criteria

The alternatives were ranked on a scale of 1 (least desirable) to 3 (most desirable) based on which alternative was most desirable based on non-cost criteria. Each alternative's score was also weighted by the amount of water produced. The non-cost criteria were divided into four categories:

- environmental and social impacts/benefits
- ease of implementation and regulatory compliance
- engineering, construction, and operations
- climate hazard and resiliency

Each non-cost criteria category had subcategories which are defined below.

6.2.1 Environmental and Social Impacts/Benefits

The subcategories analyzed in this category are distribution system energy use, treatment system energy, and public/political acceptance. Higher distribution system and treatment system energy use is less desirable. Public/political acceptance is desired because it reduces the amount of public outreach required for an alternative.

6.2.2 Ease of Implementation and Regulatory Compliance

The subcategories analyzed in this category are whether a stakeholder(s) interested in collaborating, design readiness, and recycled water permit requirements. These subcategories relate to the ease of designing and permitting a recycled water system.

6.2.3 Engineering, Construction, and Operations

The subcategories analyzed in this category are land/easement acquisition, ease of operation, and ease of pipeline construction. These subcategories consider the difficulty in constructing and operating a recycled water system.

6.2.4 Climate and Hazard Resiliency

The subcategories analyzed in this category are tsunami zone construction and susceptibility to climate change. Susceptibility to climate change analyzed how susceptible an alternative is to effects of climate change such as increased flooding, landslides, wildfires, and sea level rise. This subcategory considers the risk of the project compared to potential hazards.

Non-cost criteria are defined in Table B-1 in Appendix B and the full non-cost criteria comparison is shown in Table B-2 in Appendix B. The non-cost criteria are summarized in Table 14.

A higher non-cost criteria score is better. Without taking into account how much recycled water is used then the top alternatives are non-potable reuse including the fill station, landscape irrigation and agricultural irrigation. However, a project that uses more recycled water is desirable. Therefore, when ranking alternatives based on non-cost criteria and by how much recycled water would be used, then the most desirable alternatives include direct potable reuse, reservoir augmentation and irrigation of the golf course.

Table 14. Summary of Non-Cost Criteria

Alternative	Criteria / Sub-criteria	Delivered Water in 20 Years (Million Gallons) (a)	Total Non-Cost Criteria Score	Rank by Non-Cost Score	(Total score) x (delivered water per 20 years)/ (10,000) (b)	Weighted Rank by Produced Water
Non-Potable Reuse	Fill Station(s)	183	30	1	0.5	8
	Landscape Irrigation	600	26	2	1.6	6
	Agricultural Irrigation	600	26	2	1.6	6
	Skylawn Memorial Park Irrigation	1,000	21	5	2.0	4
	Ocean Colony Golf Course and Landscape Irrigation	1,830	25	4	4.6	3
Indirect Potable Reuse	Groundwater Replenishment	913	18	7	1.6	5
	Reservoir Augmentation	6,570	15	10	9.9	2
Direct Potable Reuse	Direct Potable Reuse at Nunes WTP	6,570	19	6	12.5	1
Environmental Benefit	Pilarcitos Creek Augmentation or Other Creek Augmentation	0	18	7	0.0	9
	Wetland Enhancement	0	18	7	0.0	9

(a) Daily recycled water produced multiplied by the days in service per year and multiplied by twenty years. Recycled water would offset groundwater use or be used for indirect or direct potable reuse.
(b) Weighting total score so alternatives that produce more water are higher rated.

6.3 Alternative Summary

The following alternatives are considered further in the next section for their cost.

- Fill Station(s)
- Landscape and Agricultural Irrigation
- Skylawn Memorial Park Irrigation
- Ocean Colony Golf Course and Landscape Irrigation
- Groundwater Replenishment
- Reservoir Augmentation
- Direct Potable Reuse at Nunes WTP

The following alternatives are not considered further because they do not offset groundwater use or provide additional water resources from indirect or direct potable reuse.

- Pilarcitos Creek Augmentation or Other Creek Augmentation Next Steps
- Wetlands Enhancement Option

7 Costs

Planning-level lifecycle costs were estimated for each alternative and shown in Table 15. More detailed cost estimates are shown in Appendix C. Cost estimates are considered Class 5 by AACE International and have an accuracy of plus 50 percent and minus 30 percent.

7.1 Capital Costs

Capital costs include design, construction, and startup of new facilities. Capital costs are estimated based on information from manufacturers and previous projects. The following assumptions were made during the development of the capital cost estimates.

- The new pump stations were located to try to maintain 200 psi or less of pressure in the pipelines.
- SAM WWTP secondary effluent is the source for all advanced treatment processes.
- Treatment processes were based on industry-standard processes by recycled water use.
- Return of the concentrate to SAM is assumed to be by gravity and no pump is included.

7.2 Operational Costs

Operational costs include distribution system and treatment energy costs, replacement of equipment, maintenance, compliance testing and security, labor, and source control costs. The following assumptions were used in the analysis.

- Power cost is 39.3 cents per kilowatt hour.
- The distribution system energy cost is based on pump horsepower.
- The treatment energy costs are estimated on pump horsepower to provide the necessary pressure for the treatment processes.
- For non-potable uses, the pumps are assumed to be run 12 hours a day for six months year.
- For indirect potable reuse and direct potable reuse, the pumps are assumed to run 24 hours a day and 365 days a year.
- The pump efficiency is assumed to be 50 percent.
- Chemical costs are based on the chemicals used for each process.
- Replacement of equipment is assumed to be at 2% of the treatment process capital costs.
- Maintenance costs are assumed to be 1.7% of the treatment process capital costs.
- Compliance Testing and Security costs are based on the type of water being produced and the type of use.
- Labor costs are based on the number of full-time equivalent employees.
- Annual source control costs are based on the type of recycled water produced.

The operational costs and estimated staffing requirements for each alternative are shown in Appendix C.

7.2.1 Life Cycle Costs

A 20-year life cycle cost are shown in Table 15 and the costs per million gallons produced over 20 years are also included. The parameters that were used for the life cycle cost evaluation are listed in Table 16. Comparing the net present worth per million gallon, the top three alternatives are reservoir augmentation, irrigation at Ocean Colony Golf Course and direct potable reuse.

Table 15. Life Cycle Costs

Alternative		Capital Cost (a)	Annual O&M Cost	20 Year Net Present Worth (b)	Delivered Water in 20 Years (MG)	Net Present Worth/ MG	Rank
Non-Potable Reuse	Fill Station(s)	$3.50 M	$0.10 M	$5.07 M	183	$28,000	4
	Landscape and Agricultural Irrigation	$27.2 M	$1.07 M	$44.0 M	600	$73,000	6
	Skylawn Memorial Park Irrigation	$29.4 M	$1.16 M	$47.6 M	1,000	$48,000	5
	Ocean Colony Golf Course and Landscape Irrigation	$22.0 M	$1.20 M	$40.9 M	1,830	$22,000	1
Indirect Potable Reuse	Groundwater Replenishment	$38.8 M	$3.53 M	$94.2 M	913	$103,000	7
	Reservoir Augmentation	$65.7 M	$4.85 M	$142 M	6,570	$22,000	1
Direct Potable Reuse	Direct Potable Reuse at Nunes WTP	$63.0 M	$6.19 M	$160 M	6,570	$24,000	3

(a) Costs are in 2023 dollars. Cost estimates are considered Class 5 by AACE International and have an accuracy of +50 percent and -30 percent.
(b) Assumes Inflation is 3%, nominal discount rate is 5.5%, and real discount rate is 2.4%.
(c) Flow rate for fill station, irrigation, and flow rate available after advanced water treatment accounting for concentrate.
(d) Assumes irrigation and fill station use occurs for 6 months of the year. Assumes indirect and direct potable reuse occur year-round.

Table 16. Net Present Worth Values

Parameter	Value	Notes
Inflation	3.0%	
Nominal Discount Rate	5.5%	
Real Discount Rate	2.4%	((1+discount rate)/(1+inflation rate))-1
Years	20	
Present Worth Factor	15.70	

8 Conclusions

To be feasible, proposed recycled water projects need partners that want to collaborate with CCWD and a reason to pursue the project such as a policy or economic reason. The feasibility of each alternative is discussed in this section.

8.1 Fill Station

8.1.1 Potential Partners

Potentially the fill station could offset the use of potable water for construction water. However, there is not much construction water use in the District.

8.1.2 Project Driver

Since there would be little demand for the recycled water, there is no economic driver for this project.

8.1.3 Feasibility

This project is currently considered infeasible because there are no partners, and the project is not economically viable. CCWD should consider whether adding a fill station is useful for other reasons such as public outreach about recycled water.

8.2 Landscape and Agricultural Irrigation

8.2.1 Potential Partners

Within the District there is limited landscaping or agricultural irrigation that could be offset by recycled water use.

8.2.2 Project Driver

Since there would be little demand for the recycled water, there is no economic driver for this project.

8.2.3 Feasibility

This project is currently considered infeasible because there are no partners, and the project is not economically viable. CCWD should determine if recycled water could be served outside of District boundaries to potentially develop a larger customer base.

8.3 Skylawn Memorial Park Irrigation

8.3.1 Potential Partners

Since the Park is outside of District boundaries, recycled water cannot be delivered and used there. Therefore, there is no partner for this project.

8.3.2 Project Driver

There is no economic driver for this project since there is no partner to sell the water to.

8.3.3 Feasibility

This project is currently considered infeasible because there are no partners, and the project is not economically viable. CCWD should determine if recycled water could be used outside of District boundaries.

8.4 Ocean Colony Golf Course and Landscape Irrigation

8.4.1 Potential Partners

Ocean Colony has other water supplies that are more cost effective than recycled water so does not have a demand for recycled water.

8.4.2 Project Driver

Since there is no demand for the recycled water at the golf course and associated landscaping, there is no economic driver for this project.

8.4.3 Feasibility

This project is currently considered infeasible because there are no partners, and the project is not economically viable. CCWD should check in with the Ocean Colony periodically to see if their water needs have changed.

8.5 Pilarcitos Creek Augmentation or Other Creek Augmentation Next Steps

8.5.1 Potential Partners

There are currently no partners for this alternative. CCWD would need to identify partners if there is an interest in creek augmentation. An example of potential partners would be local environmental protection groups.

8.5.2 Project Driver

There is no economic reason to pursue this project.

8.5.3 Feasibility

This project is currently considered infeasible because there are no partners, and the project is not economically viable. CCWD should periodically check with neighboring agencies to see if there is an interest in creek augmentation.

8.6 Wetlands Enhancement Option

8.6.1 Potential Partners

There are currently no partners for this alternative. CCWD would need to identify partners if there is an interest in wetland enhancement.

8.6.2 Project Driver

There is no economic reason to pursue this project.

8.6.3 Feasibility

This project is currently considered infeasible because there are no partners, and the project is not economically viable. CCWD should periodically check with neighboring agencies to see if there is an interest in wetlands enhancement.

8.7 Groundwater Replenishment

8.7.1 Potential Partners

There are currently no partners for this alternative. CCWD would need to identify partners if there is an interest in groundwater replenishment. Local private well users will need to be a partner if this project is to be feasible.

8.7.2 Project Driver

There is no economic reason to pursue this project as it would add a limited quantity of new water supply to the District.

8.7.3 Feasibility

This project is currently considered infeasible because there are no partners, and the project is not economically viable.

8.8 Reservoir Augmentation

8.8.1 Potential Partners

There is no known partner who has a reservoir available for augmentation. SFPUC may be a potential partner.

8.8.2 Project Driver

The project driver is providing a new water source to the District's water supply portfolio.

8.8.3 Feasibility

This project is currently considered infeasible because there is no reservoir available to augment. CCWD should discuss potential reservoir augmentation alternatives with SFPUC.

8.9 Direct Potable Reuse at Nunes WTP

8.9.1 Potential Partners

Partners would need to be defined to make this alternative feasible.

8.9.2 Project Driver

The project driver is providing a new water source to the District's water supply portfolio.

8.9.3 Feasibility

Further study is needed to determine if this project is an economically viable alternative to add a new water supply to the District's water portfolio.

8.10 Summary

The feasibility of the projects with the current conditions are present summarized in Table 17.

Table 17. Feasibility of Project by Alternative

Alternative	Feasible	Reasoning
Fill Station(s)	No	Little demand for recycled water within service area
Landscape and Agricultural Irrigation	No	Little demand for recycled water within service area
Skylawn Memorial Park Irrigation	No	Park not within service area, so would not be able to deliver recycled water.
Ocean Colony Golf Course and Landscape Irrigation	No	Ocean Colony has other water supplies that are more cost effective than recycled water and therefore, does not have a demand for recycled water.
Pilarcitos Creek Augmentation or Other Creek Augmentation	No	Does not offset groundwater use or provide additional water resources from indirect or direct potable reuse.
Wetland Enhancement	No	Does not offset groundwater use or provide additional water resources from indirect or direct potable reuse.
Groundwater Replenishment	No	1. There are private wells in the service area that limits where water may be replenished. 2. A limited amount of water that can be replenished at one location due to mounding
Reservoir Augmentation	No	There is no known partner who has a reservoir available for augmentation.
Direct Potable Reuse at Nunes WTP	Further study needed	Next steps are to find potential funding sources and continue technical studies.

Of the recycled water alternatives evaluated, currently the direct potable reuse alternative is the only alternative that should be pursued because the project has potential to provide diversity to the District's water supply portfolio. However, further study is needed for the direct potable reuse alternative to determine if the project is economically viable.

1. Start a water planning process including
    a. setting the foundation
    b. establishing direction
    c. developing framework
    d. engaging stakeholders
2. Establish contracts with partners
3. Identify funding source for the studies and construction of the project.
4. Collaborate with stakeholders to further define the project and perform the required studies necessary for final design.
5. Implement an extensive public education program.
6. Design the advanced water treatment plant
7. Construct the improvements.
8. Complete permitting.
9. Increased staffing to operate the new facilities.

9 References

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PWA, 2018. Pilarcitos Integrated Watershed Management Plan prepared for San Mateo County Resource Conservation District and California State Water Resources Control Board, dated 24 October 2008.

SFPUC, 2018. Amended and Restated Water Supply Agreement between the City and County of San Francisco and Wholesale Customers in Alameda County, San Mateo and Santa Clara County, prepared by SFPUC, dated November 2018.

SRT Consultants, 2015. 2015 Update of the 2010 Recycled Water Facilities Planning Study, prepared for SAM, dated 12 August 2015.

West Yost, 2021. Coastside County Water District 2020 Urban Water Management Plan, prepared for CCWD, dated 10 June 2021.

Appendix A – Hydrogeologic Report

(Provided under separate cover)

Appendix B – Alternative Comparison Using Non-Cost Criteria

Table B-1. Decision Matrix Criteria and Ranking Definitions

Criteria	Sub-criteria	Score range/scale		
		1	2	3
1. Environmental and social impacts/benefits	Distribution system energy use	• Highest energy use compared to other alternatives.	• Average energy use.	• Lowest energy use compared to other alternatives.
	Treatment system energy use	• Highest energy use compared to other alternatives.	• Average energy use.	• Lowest energy use compared to other alternatives.
	Public/political acceptance	• Known public unease with potable reuse or known public unease with proposed use of site(s) for new facilities.	• Public support neutral or unknown.	• Known public support of elements of potable reuse plans and/or proposed use of site(s) for new facilities.
2. Ease of implementation and regulatory compliance	Willing stakeholder(s) interested in collaborating	• Stakeholders have not communicated in past about collaboration. Unsure of how willing partners will be to collaborate.	• Stakeholders have communicated in the past and have expressed interest.	• Stakeholders have communicated recently and direct interest has been expressed.
	SAM collaboration	• Majority of new facilities will be at SAM, so CCWD has little control over recycled water quality. Requires more coordination with SAM.	• Part of new facilities will be at SAM, so CCWD has little control over recycled water quality. Requires more coordination with SAM.	• All new facilities will not be located at SAM. SAM only required for flow diversion approval and use of outfall for concentrate.
	Design readiness	• Alternative requires further testing (tracer studies) and alternative specific feasibility studies before design can begin.	• Alternative requires further research before design can begin.	• Alternative may begin design.
	Recycled water permit requirements	• Permitting requirements have not been defined.	• Permitting is known to be difficult.	• Permitting is known to be straight forward.
3. Engineering, construction, and operations	Land and easement acquisition	• Land for treatment is not currently available for use and has known litigation or zoned for other uses. • Many easements need to be acquired for distribution system.	• Land for treatment is not currently available for use. Land is held privately and will need to be purchased. • Some easements need to be acquired for distribution system.	• No known land acquisition issues other than price negotiation. • Little to no easements need to be acquired for distribution system.
	Ease of operation	• Facility operation requires more technical expertise. • Operator must be on call 24/7.	• Facility operation requires moderate technical expertise.	• Facility operation is simple.
	Ease of pipeline construction	• Proposed pipeline alignments have significant potential construction or engineering challenges, such as Caltrans longitudinal highway piping, creek crossings, and steep grades.	• Proposed pipeline alignments have moderate potential construction or engineering challenges.	• Proposed pipeline construction is straightforward. • Majority of pipeline construction is not longitudinally on Caltrans highway.
4. Climate and hazard resiliency	Tsunami Zone Construction	• Majority of construction in tsunami zone.	• Some of construction in tsunami zone.	• Majority of construction not in tsunami zone.
	Susceptibility to Climate Change (a)	• At risk of serious damage.	• Moderate risk.	• Little to no risk.

Acronyms

SAM - Sewer Authority Mid-Coastside

WTP - Water Treatment Plant

Notes:

(a) How will the project be effected by increased flooding, landslides, wildfires, and sea level rise.

Table B-2. Non-Cost Criteria

Alternative	Criteria	1. Environmental and social impacts/benefits			2. Ease of implementation and regulatory compliance			3. Engineering, construction, and operations			4. Climate and hazard resiliency		Delivered Water in 20 Years (Million Gallons) (a)	Total non-cost criteria score	Rank by non-cost score	(Total score) x (delivered water per 20 years)/ (10,000) (b)	Weighted rank by produced water
	Sub-criteria	Distribution system energy use	Treatment system energy use	Public/ political acceptance	Willing stakeholder(s) interested in collaborating	Design readiness	Recycled water permit requirements	Land and easement acquisition	Ease of operation	Ease of pipeline construction	Tsunami zone construction	Susceptibility to climate change					
Non-Potable Reuse	Fill Station(s)	3	3	3	3	3	3	3	3	3	1	2	183	30	1	0.5	8
	Landscape Irrigation	3	3	3	1	3	3	2	3	2	1	2	600	26	2	1.6	6
	Agricultural Irrigation	3	3	3	1	3	3	2	3	2	1	2	600	26	2	1.6	6
	Skylawn Memorial Park Irrigation	1	3	3	2	2	3	1	2	1	1	1	1,000	20	5	2.0	4
	Ocean Colony Golf Course and Landscape Irrigation	3	2	3	3	2	3	2	2	2	1	2	1,830	25	4	4.6	3
Indirect Potable Reuse	Groundwater Replenishment	2	1	2	1	1	2	1	1	2	3	2	913	18	7	1.6	5
	Reservoir Augmentation	1	1	2	1	1	2	1	1	1	3	1	6,570	15	10	9.9	2
Direct Potable Reuse	Direct Potable Reuse at Nunes WTP	2	1	1	3	1	1	1	1	2	3	3	6,570	19	6	12.5	1
Environmental Benefit	Pilarcitos Creek Augmentation or Other Creek	3	1	3	1	1	2	1	1	3	1	1	0	18	7	0.0	9
	Wetland Enhancement	3	1	3	1	1	2	1	1	3	1	1	0	18	7	0.0	9

Scoring

See Table B-1. with 1 being less desirable and 3 being more desirable

Acronyms

SAM - Sewer Authority Mid-Coastside

WTP - Water Treatment Plant

Notes:

(a) Daily recycled water produced multiplied by the days in service per year and multiplied by twenty years. Recycled water would offset groundwater use or be used for indirect or direct potable reuse.

(b) Weighting total score so alternatives that produce more water are higher rated.

Appendix C - Cost Opinions

WATERWORKS ENGINEERS	Title:	Summary of Costs
	Date:	10/31/2023

Alternative		Capital Cost (a)	Annual O&M Cost	20 Year Net Present Worth (b)	Delivered Water (MGD) (c)	Days in Service per Year (d)	Delivered Water in 20 Years (MG)	Net Present Worth/ MG	Rank
Non-Potable Reuse	Fill station(s) for unrestricted residential or commercial use	$3.50 M	$0.10 M	$5.07 M	0.05	183	183	$28,000	4
	Landscape and agricultural irrigation with disinfected tertiary recycled water	$27.2 M	$1.07 M	$44.0 M	0.16	183	600	$73,000	6
	Skylawn Memorial Park irrigation with disinfected tertiary recycled water	$29.4 M	$1.16 M	$47.6 M	0.27	183	1,000	$48,000	5
	Ocean Colony golf course and landscape irrigation with reverse osmosis treated water	$22.0 M	$1.20 M	$40.9 M	0.50	183	1,830	$22,000	1
Indirect Potable Reuse	Groundwater replenishment with advanced treated water	$38.8 M	$3.53 M	$94.2 M	0.125	365	913	$103,000	7
	Reservoir augmentation with advanced treated water	$65.7 M	$4.85 M	$142 M	0.90	365	6,570	$22,000	1
Direct Potable Reuse	Advanced treated water to Nunes WTP	$63.0 M	$6.19 M	$160 M	0.90	365	6,570	$24,000	3

Acronyms:
MG - Million Gallons
MGD - Million Gallons per Day
O&M - Operations and Maintenance
WTP - Water Treatment Plant

Notes:
(a) Costs are in 2023 dollars. Cost estimates are considered Class 5 by AACE International and have an accuracy of +50 percent and -30 percent.
(b) Assumes Inflation is 3%, nominal discount rate is 5.5%, and real discount rate is 2.4%.
(c) Flow rate for fill station, irrigation, and flow rate available after advanced water treatment accounting for concentrate.
(d) Assumes irrigation and fill station use occurs for 6 months of the year. Assumes indirect and direct potable reuse occur year round.

WATERWORKS ENGINEERS		Title:	CCWD Recycled Water Feasibility Study	
		Date:	10/31/2023	

Distribution - Fill Station

ITEM	QUANTITY	UNIT	UNIT COST	TOTAL COST
50,000 Gallon Equalization Basin at SAM	50,000	Gallon	$2	$100,000
Pump Station at SAM	5	Horsepower	$5,000	$25,000
3" Pipeline to Fill Station	0.35	Mile	$2,000,000	$700,000
50,000 Gallon Tank at Fill Station	50,000	Gallon	$2	$100,000
Construction Subtotal				**$900,000**
Project Preliminary Design Contingency			30%	$300,000
Subtotal				**$1,200,000**
Contractor General, Mobilization, Overhead & Profit			15%	$200,000
General Conditions, Bonds, Insurance & Taxes			4%	$48,000
PROBABLE CONSTRUCTION COST				**$1,448,000**
Construction Contingency			10%	$140,000
Design and Services During Construction			12%	$170,000
Permitting (effort and fees)			2%	$30,000
TOTAL CAPITAL PROJECT COST				**$1,800,000**

Acronyms:

SAM - Sewer Authority Mid-Coastside

Notes:

1. No cost escalation is used.
2. No land or easement acquisition is included.
3. Assumed pipeline distance as the location of the fill station needs to be determined.

WATERWORKS ENGINEERS

	Title:	CCWD Recycled Water Feasibility Study
	Date:	10/31/2023

Distribution - Landscape and Agricultural Irrigation

	ITEM	QUANTITY	UNIT	UNIT COST	TOTAL COST
	50,000 Gallon Equalization Basin at SAM	50,000	Gallon	$2	$100,000
	50,000 Gallon Storage Tank at SAM	50,000	Gallon	$2	$100,000
	Pump Station at SAM	10	Horsepower	$5,000	$50,000
	4" Pipeline to Flow Split	0.35	Mile	$2,000,000	$700,000
	4" Recycled Water Pipe North of SAM	1.32	Mile	$2,000,000	$2,640,000
	4" Recycled Water Pipe East of SAM	2.23	Mile	$2,000,000	$4,460,000
	4" Recycled Water Pipe South of SAM	1.99	Mile	$2,000,000	$3,980,000
	4"/8" Pipe-Bore and Jack	1,000	Linear feet	$600	$600,000
			Construction Subtotal		**$12,600,000**
			Project Preliminary Design Contingency	30%	$3,800,000
			Subtotal		**$16,400,000**
			Contractor General, Mobilization, Overhead & Profit	15%	$2,500,000
			General Conditions, Bonds, Insurance & Taxes	4%	$700,000
PROBABLE CONSTRUCTION COST					**$19,600,000**
			Construction Contingency	10%	$1,960,000
			Design and Services During Construction	12%	$2,350,000
			Permitting (effort and fees)	2%	$390,000
TOTAL CAPITAL PROJECT COST					**$24,300,000**

Acronyms:

SAM - Sewer Authority Mid-Coastside

Notes:

1. Does not include the cost to retrofit the recycled water use sites.
2. No cost escalation is used.
3. No land or easement acquisition is included.

	Title:	CCWD Recycled Water Feasibility Study
WATERWORKS ENGINEERS	Date:	10/31/2023

Distribution - Golf Course Irrigation

	ITEM	QUANTITY	UNIT	UNIT COST	TOTAL COST
	50,000 Gallon Equalization Basin at SAM	50,000	Gallon	$2	$100,000
	Pump Station at SAM	50	Horsepower	$5,000	$250,000
	6"/10" Pipe-Bore and Jack	600	Linear Feet	$600	$360,000
	6" Recycled Water Pipe South of SAM	3.54	Mile	$2,000,000	$7,080,000
			Construction Subtotal		**$7,800,000**
			Project Preliminary Design Contingency	30%	$2,300,000
			Subtotal		**$10,100,000**
			Contractor General, Mobilization, Overhead & Profit	15%	$1,500,000
			General Conditions, Bonds, Insurance & Taxes	4%	$400,000
PROBABLE CONSTRUCTION COST					**$12,000,000**
			Construction Contingency	10%	$1,200,000
			Design and Services During Construction	12%	$1,440,000
			Permitting (effort and fees)	2%	$240,000
TOTAL CAPITAL PROJECT COST					**$14,900,000**

Acronyms:

SAM - Sewer Authority Mid-Coastside

Notes:

1. Does not include the cost to retrofit the recycled water use sites.
2. No cost escalation is used.
3. No land or easement acquisition is included.
4. Assumes storage is available at golf course ponds.

WATERWORKS ENGINEERS	Title:	CCWD Recycled Water Feasibility Study
	Date:	10/31/2023

Distribution - Skylawn Memorial Park Irrigation

ITEM		QUANTITY	UNIT	UNIT COST	TOTAL COST
	50,000 Gallon Equalization Basin at SAM	50,000	Gallon	$2	$100,000
	Pump Station at SAM	50	Horsepower	$5,000	$250,000
	6" Pipeline to Pump Station 1	5.73	Mile	$2,000,000	$11,460,000
	Pump Station 1	90	Horsepower	$5,000	$450,000
	6" Pipeline to Skylawn	0.79	Mile	$2,000,000	$1,580,000
			Construction Subtotal		**$13,700,000**
			Project Preliminary Design Contingency	30%	$4,100,000
			Subtotal		**$17,800,000**
			Contractor General, Mobilization, Overhead & Profit	15%	$2,700,000
			General Conditions, Bonds, Insurance & Taxes	4%	$700,000
PROBABLE CONSTRUCTION COST					**$21,200,000**
			Construction Contingency	10%	$2,120,000
			Design and Services During Construction	12%	$2,540,000
			Permitting	3%	$640,000
TOTAL CAPITAL PROJECT COST					**$26,500,000**

Acronyms:

SAM - Sewer Authority Mid-Coastside

Notes:

1. Does not include the cost to retrofit the recycled water use sites.
2. No cost escalation is used.
3. No land or easement acquisition is included.
4. Assumes storage is available in Skylawn Pond.

	Title:	CCWD Recycled Water Feasibility Study
WATERWORKS ENGINEERS	Date:	10/31/2023

Distribution - Reservoir Augmentation

ITEM	QUANTITY	UNIT	UNIT COST	TOTAL COST
Pump station at SAM to APWF	70	Horsepower	$5,000	$350,000
10" Pipeline to APWF	1.30	Mile	$2,000,000	$2,600,000
4" Concentrate Pipeline	1.48	Mile	$2,000,000	$2,960,000
APWF Influent Equalization Basin	250,000	Gallons	$2	$500,000
Pump station at APWF to Pump Station 1	80	Horsepower	$5,000	$400,000
10" Pipeline to Pump Station 1	2.88	Mile	$2,000,000	$5,760,000
Pump station 1	40	Horsepower	$5,000	$200,000
10" Pipeline to Pump Station 2	1.98	Mile	$2,000,000	$3,960,000
Pump station 2	280	Horsepower	$5,000	$1,400,000
10" Pipeline to Reservoir	1.16	Mile	$2,000,000	$2,320,000
		Construction Subtotal		**$20,500,000**
		Project Preliminary Design Contingency	30%	$6,200,000
		Subtotal		**$26,700,000**
		Contractor General, Mobilization, Overhead & Profit	15%	$4,000,000
		General Conditions, Bonds, Insurance & Taxes	4%	$1,100,000
PROBABLE CONSTRUCTION COST				**$31,800,000**
		Construction Contingency	10%	$3,180,000
		Design and Services During Construction	12%	$3,820,000
		Permitting	3%	$950,000
TOTAL CAPITAL PROJECT COST				**$39,800,000**

Acronyms:

SAM - Sewer Authority Mid-Coastside

APWF - Advanced Purified Water Facility

Notes:

1. No cost escalation is used.
2. No land or easement acquisition is included.
3. Does not include cost to convey or treat the additional water from Crystal Springs Reservoir.

WATERWORKS ENGINEERS

	Title:	CCWD Recycled Water Feasibility Study
	Date:	10/31/2023

Distribution - Groundwater Replenishment

ITEM		QUANTITY	UNIT	UNIT COST	TOTAL COST
	Pump station at SAM to APWF	20	Horsepower	$5,000	$100,000
	4" Pipeline to APWF	1.48	Mile	$2,000,000	$2,960,000
	APWF Influent Equalization Basin	250,000	Gallons	$2	$500,000
	4" Concentrate Pipeline	1.48	Mile	$2,000,000	$2,960,000
	Pump station at APWF to Replenishment	20	Horsepower	$5,000	$100,000
			Construction Subtotal		**$6,600,000**
			Project Preliminary Design Contingency	30%	$2,000,000
			Subtotal		**$8,600,000**
			Contractor General, Mobilization, Overhead & Profit	15%	$1,300,000
			General Conditions, Bonds, Insurance & Taxes	4%	$300,000
PROBABLE CONSTRUCTION COST					**$10,200,000**
			Construction Contingency	10%	$1,020,000
			Design and Services During Construction	12%	$1,220,000
			Permitting	4%	$410,000
TOTAL CAPITAL PROJECT COST					**$12,900,000**

Acronyms:

SAM - Sewer Authority Mid-Coastside

APWF - Advanced Purified Water Facility

Notes:

1. Does not include the cost to inject or percolate water.
2. No cost escalation is used.
3. No land or easement acquisition is included.
4. Assumes percolation/injection at APWF for replenishment.

WATERWORKS ENGINEERS		Title:	CCWD Recycled Water Feasibility Study	
		Date:	10/31/2023	

Distribution - Direct Potable Reuse

ITEM	QUANTITY	UNIT	UNIT COST	TOTAL COST
Pump Station at SAM to APWF	180	Horsepower	$5,000	$900,000
12" Pipeline to APWF	1.48	Mile	$2,000,000	$2,960,000
APWF Influent Equalization Basin	250,000	Gallons	$2	$500,000
4" Concentrate Pipeline	1.48	Mile	$2,000,000	$2,960,000
Pump station at APWF to Nunes WTP	90	Horsepower	$5,000	$450,000
10" Pipeline to Nunes WTP	0.29	Mile	$2,000,000	$580,000
Construction Subtotal				**$8,400,000**
Project Preliminary Design Contingency			30%	$2,500,000
Subtotal				**$10,900,000**
Contractor General, Mobilization, Overhead & Profit			15%	$1,600,000
General Conditions, Bonds, Insurance & Taxes			4%	$400,000
PROBABLE CONSTRUCTION COST				**$12,900,000**
Construction Contingency			10%	$1,290,000
Design and Services During Construction			12%	$1,550,000
Permitting			4%	$520,000
TOTAL CAPITAL PROJECT COST				**$16,300,000**

Acronyms:

SAM - Sewer Authority Mid-Coastside

WTP - Water Treatment Plant

APWF - Advanced Purified Water Facility

Notes:

1. No cost escalation is used.
2. No land or easement acquisition is included.
3. Does not include cost for treatment of additional water at Nunes WTP.

WATERWORKS ENGINEERS	Title:	CCWD Recycled Water Feasibility Study
	Date:	10/31/2023

Non-Potable Reuse Treatment: Fill Station

ITEM		COST
Treatment Processes		$400,000
Process Equipment Install	25%	$100,000
Site Work	5%	$20,000
Electrical and Instrumentation	30%	$120,000
Mechanical	15%	$60,000
Piping and Valves	20%	$80,000
Construction Subtotal		**$800,000**
Project Preliminary Design Contingency	30%	$200,000
Subtotal		**$1,000,000**
Contractor General, Mobilization, Overhead & Profit	15%	$200,000
General Conditions, Bonds, Insurance & Taxes	4%	$40,000
PROBABLE CONSTRUCTION COST		**$1,240,000**
Construction Contingency	10%	$120,000
Design and Services During Construction	12%	$150,000
Construction Management	10%	$120,000
Permitting	2%	$20,000
TOTAL CAPITAL COST (Construction Total + Implementation Total)		**$1,700,000**

Notes:

1. No cost escalation is used.
2. No land or easement acquisition is included.
3. No public outreach is included.

WATERWORKS ENGINEERS	Title:	CCWD Recycled Water Feasibility Study
	Date:	10/31/2023

Non-Potable Reuse Treatment: Landscape and Agriculture Irrigation

ITEM		COST	
	Treatment Processes		$700,000
	Process Equipment Install	25%	$180,000
	Site work	5%	$40,000
	Electrical and Instrumentation	30%	$210,000
	Mechanical	15%	$110,000
	Piping and Valves	20%	$140,000
Construction Subtotal			**$1,400,000**
Project Preliminary Design Contingency		30%	$400,000
Subtotal			**$1,800,000**
Contractor General, Mobilization, Overhead & Profit		15%	$300,000
General Conditions, Bonds, Insurance & Taxes		4%	$100,000
PROBABLE CONSTRUCTION COST			**$2,200,000**
Construction Contingency		10%	$220,000
Design and Services During Construction		12%	$260,000
Construction Management		10%	$220,000
Permitting		2%	$40,000
TOTAL CAPITAL COST (Construction Total + Implementation Total)			**$2,900,000**

Notes:

1. No cost escalation is used.
2. No land or easement acquisition is included.
3. No public outreach is included.

WATERWORKS ENGINEERS	Title:	CCWD Recycled Water Feasibility Study
	Date:	10/31/2023

Non-Potable Reuse Treatment: Golf Course Irrigation

ITEM		COST
Treatment Processes		$1,600,000
Process Equipment Install	25%	$400,000
Site work	5%	$80,000
Electrical and Instrumentation	50%	$800,000
Mechanical	15%	$240,000
Piping and Valves	20%	$320,000
Construction Subtotal		**$3,400,000**
Project Preliminary Design Contingency	30%	$1,000,000
Subtotal		**$4,400,000**
Contractor General, Mobilization, Overhead & Profit	15%	$700,000
General Conditions, Bonds, Insurance & Taxes	4%	$200,000
PROBABLE CONSTRUCTION COST		**$5,300,000**
Construction Contingency	10%	$530,000
Design and Services During Construction	12%	$640,000
Construction Management	10%	$530,000
Permitting	2%	$110,000
TOTAL CAPITAL COST (Construction Total + Implementation Total)		**$7,110,000**

Notes:

1. No cost escalation is used.
2. No land or easement acquisition is included.
3. No public outreach is included.

WATERWORKS ENGINEERS	Title:	CCWD Recycled Water Feasibility Study
	Date:	10/31/2023

Indirect Potable Reuse Treatment

ITEM		COST
Treatment Processes		$4,900,000
Process Equipment Install	25%	$1,230,000
Site Work	15%	$740,000
Electrical and Instrumentation	50%	$2,450,000
Mechanical	15%	$740,000
Piping and Valves	20%	$980,000
Upfront Source Control		$400,000
Treatment Building		$1,500,000
Construction Subtotal		**$12,900,000**
Project Preliminary Design Contingency	30%	$3,900,000
Subtotal		**$16,800,000**
Contractor General, Mobilization, Overhead & Profit	15%	$1,900,000
General Conditions, Bonds, Insurance & Taxes	4%	$500,000
PROBABLE CONSTRUCTION COST		**$19,200,000**
Construction Contingency	10%	$1,920,000
Engineering	20%	$3,840,000
Permitting (effort and fees)	4%	$770,000
Construction Management	10%	$190,000
TOTAL CAPITAL COST (Construction Total + Implementation Total)		**$25,900,000**

Notes:

1. No cost escalation is used.
2. No land or easement acquisition is included.
3. No public outreach is included.

WATERWORKS ENGINEERS	Title:	CCWD Recycled Water Feasibility Study
	Date:	10/31/2023

Direct Potable Reuse Treatment

ITEM		COST
Treatment Processes		$8,600,000
Process Equipment Install	25%	$2,150,000
Site work	15%	$1,290,000
Electrical and Instrumentation	60%	$5,160,000
Mechanical	15%	$1,290,000
Piping and Valves	20%	$1,720,000
Upfront Source Control		$500,000
Treatment Building		$2,500,000
Construction Subtotal		**$23,200,000**
Project Preliminary Design Contingency	30%	$7,000,000
Subtotal		**$30,200,000**
Contractor General, Mobilization, Overhead & Profit	15%	$3,500,000
General Conditions, Bonds, Insurance & Taxes	4%	$900,000
PROBABLE CONSTRUCTION COST		**$34,600,000**
Construction Contingency	10%	$3,460,000
Engineering	20%	$6,920,000
Permitting (effort and fees)	4%	$1,380,000
Construction Management	10%	$350,000
TOTAL CAPITAL COST (Construction Total + Implementation Total)		**$46,700,000**

Notes:

1. No cost escalation is used.
2. No land or easement acquisition is included.
3. No public outreach is included.

WATERWORKS ENGINEERS	Title:	CCWD Recycled Water Feasibility Study
	Date:	10/31/2023

Operational and Maintenance Costs

Alternative		Distribution System Energy Costs	Treatment Energy Costs	Treatment Chemical Costs	Equipment Replacement (a)	Maintenance Costs (b)	Other Costs (c)	Labor Costs	Annual Source Control Costs	Total Annual O&M Cost
Non-Potable Reuse	Fill station(s) for unrestricted residential or commercial use	$ 3,200	$ 40,000	$ 25,000	$ 8,000	$ 7,000	$ 5,000	$ 10,000	$ -	**$ 100,000**
	Landscape and agricultural irrigation with disinfected tertiary recycled water	$ 6,400	$ 90,000	$ 25,000	$ 14,000	$ 12,000	$ 25,000	$ 900,000	$ -	**$ 1,070,000**
	Skylawn Memorial Park irrigation with disinfected tertiary recycled water	$ 90,000	$ 90,000	$ 25,000	$ 14,000	$ 12,000	$ 25,000	$ 900,000	$ -	**$ 1,160,000**
	Ocean Colony golf course and landscape irrigation with reverse osmosis treated water	$ 32,000	$ 150,000	$ 35,000	$ 32,000	$ 27,000	$ 25,000	$ 900,000	$ -	**$ 1,200,000**
Indirect Potable Reuse	Groundwater replenishment with advanced treated water	$ 51,000	$ 80,000	$ 100,000	$ 98,000	$ 83,000	$ 100,000	$3,000,000	$20,000	**$ 3,530,000**
	Reservoir augmentation with advanced treated water	$1,000,000	$ 450,000	$ 100,000	$ 98,000	$ 83,000	$ 100,000	$3,000,000	$20,000	**$ 4,850,000**
Direct Potable Reuse	Advanced treated water to Nunes WTP	$ 620,000	$1,100,000	$ 150,000	$ 172,000	$ 146,000	$ 150,000	$3,800,000	$50,000	**$ 6,190,000**

Notes:

(a) 2% of treatment processes cost.

(b) 1.7% of treatment processes cost.

(c) Compliance Testing and Security

Title:	CCWD Recycled Water Feasibility Study
Date:	10/31/2023

Staff Requirements: Full-Time Equivalents (FTE)

Alternative		Advanced Purified Water Facility	Senior Maintenance Staff	Maintenance Staff	Senior Instrumentation Tech	Senior Lab Staff	Lab Staff	Regulatory and Compliance	Other Administrative	Total
Non-Potable Reuse	FTE	0	1	1	1	0	0	1	0	
	Salary	$ 252,000	$ 252,000	$ 210,000	$ 252,000	$ 252,000	$ 210,000	$ 210,000	$ 252,000	
	Cost	$ -	$ 252,000	$ 210,000	$ 252,000	$ -	$ -	$ 210,000	$ -	**$ 900,000**
Indirect Potable Reuse	FTE	2	1	1	1	1	4	2	1	
	Salary	$ 252,000	$ 252,000	$ 210,000	$ 252,000	$ 252,000	$ 210,000	$ 210,000	$ 252,000	
	Cost	$ 504,000	$ 252,000	$ 210,000	$ 252,000	$ 252,000	$ 840,000	$ 420,000	$ 252,000	**$ 3,000,000**
Direct Potable Reuse	FTE	5	1	1	1	1	4	2.5	1	
	Salary	$ 252,000	$ 252,000	$ 210,000	$ 252,000	$ 252,000	$ 210,000	$ 210,000	$ 252,000	
	Cost	$ 1,260,000	$ 252,000	$ 210,000	$ 252,000	$ 252,000	$ 840,000	$ 525,000	$ 252,000	**$ 3,800,000**