Santa Nella County Water District

Wastewater Treatment Plant System Evaluation Water Recycling Project No. C-06-8323-110

Recycled Water Feasibility Study

FEBRUARY 2021

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STATE WATER RESOURCES CONTROL BOARD
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LIST OF ABBREVIATIONS

2000 CSP	Santa Nella Community Specific Plan
2030 General Plan	2030 Merced County General Plan
ADD	Average Day Demand
ADWF	Average Dry Weather Flow
Agreement	Agreement No. D17-04018
bgs	Below Ground Surface
BOD_5	Biological Oxygen Demand
CCCSD	Central Contra Costa Sanitary District
CCID	Central California Irrigation District
CCWD	Contra Costa Water District
Central DM GSA	Central Delta-Mendota Groundwater Sustainability Agency
Central DM Region	Central Delta-Mendota Region
County	Merced County
CVP	Central Valley Project
CWSRF	Clean Water State Revolving Fund
DAC	Disadvantaged Community
DDW	Division of Drinking Water
District	Santa Nella County Water District
DFA	Division of Financial Assistance
DM Subbasin	Delta-Mendota Subbasin
DPWD	Del Puerto Water District
DWR	Department of Water Resources
DWSRF	Drinking Water State Revolving Fund
EAC	Equivalent Annual Cost
ENPV	Expected Net Present Value
Feasibility Study	Recycled Water Feasibility Study
Forebay Golf Course	Golf Course
Gal	Gallons
gpd	Gallons per Day
GSA	Groundwater Sustainability Agencies
GSP	Groundwater Sustainability Plans
hcf	Hectare-Foot
HDD	Horizontal Directional Drilling
hp	Horsepower
I-5	Interstate 5
IUP	Intended Use Plan
kWh	Kilowatt-hour
LAFCo	Local Agency Formation Commission
M&I WSP	Municipal and Industrial Water Shortage Policy Guidelines and Procedures
MCL	Maximum Contaminant Level
mgd	Million Gallons per Day
MHI	Median Household Income
MMD	Maximum Month Demand

MPN	Most Probable Number
MRP	Monitoring and Reporting Program
O&M	Operation and Maintenance
Order 88-104	Order No. 88-104
Order WQ 2016-0068-DDW	Water Reclamation Requirements for Recycled Water Use
Parkway	Parkway/Parkway South Development and Parkway East Development
PF	Peaking Factor
PHD	Peak Hour Irrigation Demand
PWWF	Peak Wet Weather Flow
Regional Board	California Regional Water Quality Control Board
R-O-W	Right-of-way
ROWD	Report of Waste Discharge
SB X7-7	Senate Bill X7-7
SCG	Small Community Grant
SGMA	Sustainable Groundwater Management Act of 2014
Sludge	Biosolids
SLWD	San Luis Water District
SOI	Sphere of Influence
SR-33	State Route 33
SUDP	Specific Urban Development Plan
SWRCB	California State Water Resources Control Board
SWTP	Surface Water Treatment Plant
TDS	Total Dissolved Solids
TTHM	Trihalomethanes
USBR	United States Bureau of Reclamation
UV	Ultraviolet
WDRs	Waste Discharge Requirements
WRFP	Water Recycling Funding Program
WWTP	Wastewater Treatment Plant
WRC	Water Recycling Criteria

1 Introduction

This Recycled Water Feasibility Study (Feasibility Study) has been prepared for Santa Nella County Water District (District/SNCWD) to evaluate the existing wastewater treatment plant (WWTP) system. This Feasibility Study was funded as part of the California State Water Resources Control Board (SWRCB), Clean Water State Revolving Fund (CWSRF) Project No. C-06-8323-110 and Agreement No. D17-04018 (Agreement). The District's receipt of funding under this Agreement is not a commitment to and does not obligate the SWRCB to provide funding for any eventual construction/implementation project. This Feasibility Study follows the SWRCB Water Recycling Program Funding Guidelines, "Recommended Outline for Recycled Water Project Reports."

Background information regarding the District and objectives for the Feasibility Study are discussed in this section.

1.1 Background

Santa Nella is an unincorporated community located in Merced County (County) within California's Central Valley, along the Interstate 5 (I-5) corridor at the junction of State Route 33 (SR-33). Santa Nella's nearest neighbors are the City of Gustine, which is located 10 miles to the north, and the City of Los Banos which is located 12 miles to the southeast. The Delta-Mendota Canal and California Aqueduct/San Luis Canal, and San Luis Wasteway traverse the community. The District was formed in 1965 to provide water and wastewater service to the community which consisted of a mobile home park during the construction of the San Luis Dam. The District WWTP process produces undisinfected secondary water through an aerated pond system. The WWTP has a permitted treatment capacity of 0.4 million gallons per day (mgd).

Engineering reports reviewed and referenced in this Feasibility Study include the following. References to these documents are designated with brackets and the corresponding number shown in the list below.

1. *2030 Merced County General Plan*, Adopted December 10, 2013, Amended July 12, 2016.
2. *Water Master Plan*, prepared by Stoddard & Associates Civil Engineers, September 1992, revised May 1994. Hereafter referred to as 1994 Water Master Plan.
3. *Santa Nella Community Specific Plan Recirculated Program Environmental Impact Report*, County of Merced, prepared by The Planning Center, dated May 5, 2000.
4. *Santa Nella County Water District Disinfection Byproduct Precursor Removal Action Plan Technical Memorandum,* prepared by Nolte Associates, Inc. (a subsidiary of NV5, Inc.), dated March 2012.
5. *Santa Nella County Water District Water Facilities Assessment, Upgrade, and Water Connection Fee Evaluation Technical Memorandum*, prepared by Nolte Associates, Inc., October 2013.
6. *Santa Nella County Water District Water Master Plan,* prepared by Black Water Consulting Engineers, Inc., dated January 2019, Adopted February 14, 2019. Hereafter referred to as 2019 Water Master Plan.
7. Santa Nella County Water District Sewer Master Plan, prepared by Black Water Consulting Engineers, Inc., dated January 2019, Adopted February 14, 2019. Hereafter referred to as 2019 Sewer Master Plan.

8. *Final Draft Groundwater Sustainability Plan for the Northern and Central Delta-Mendota Regions,* prepared by Woodard & Curran Inc. and Provost & Pritchard Consulting Group, Inc., November 2019.
9. *Technical Memorandum No. 1 - Target Depth and Well Design Technical Memo*, prepared by Dunn Environmental Inc., dated October 1, 2012.
10. *Technical Memorandum No. 2 - Test Hole Investigation, Isolation Zone Sampling and Analytical Results for SNCWD, CDPH Test Hole No. 1*, prepared by Dunn Environmental Inc, dated June 19, 2013.
11. *Technical Memorandum No. 3 - Test Hole No. 2 Investigation and Future Recommendations for SNCWD*, prepared by Dunn Environmental Inc., dated December 6, 2013.
12. *Technical Memorandum No. 4 - Evaluation of Increased Ground Water Supplies near SNCWD,* prepared by Dunn Environmental Inc., dated June 10, 2014.
13. *Technical Memorandum No. 5 - Test Hole (TH-3) Investigation, Isolation Zone Sampling and Analytical Results for Volta and SNCWD*, prepared by Dunn Environmental Inc., dated November 25, 2014.
14. *Technical Memorandum No. 6 - Test Hole (TH-3 Volta) Resampling and Limited Test Pump Results for SNCWD*, prepared by Dunn Environmental Inc., dated May 2, 2016.
15. *Guidelines for Preparing Economic Analysis for Water Recycling Projected*, prepared for the State Water Resources Control Board by the Economic Analysis Task Force for Water Recycling in California, April 2011.
16. *Water Rate Study Santa Nella County Water District*, prepared by Black Water Consulting Engineers, Inc., March 2020.
17. *Total Energy Consumption for Municipal Wastewater Treatment,* prepared by Wastewater Research Division Municipal Environmental Research Laboratory U.S Environmental Protection Agency, August 1978.
18. *Electrical Power Consumption for Municipal Wastewater Treatment*, prepared by the National Environmental Research Center Office of Reach and Development U.S. Environmental Protection Agency, July 1973.
19. *California's Water – Energy Relationship,* prepared by the California Energy Commission, November 2005.

1.2 Objective

The main objectives of this Feasibility Study are as follows:

1. Determine the potential of recycled water users and demands.
2. Evaluate treatment alternatives to produce, dispose, and reuse tertiary treated water.
3. Identify improvements and related costs to produce disinfected tertiary recycled water to supplement irrigation demands and meet the anticipated reduction in the availability of potable water as a result of drought intensity in California.

The Feasibility Study had originally been planned to evaluate the following five alternatives:

- Alternative 1: No Project
- Alternative 2: Upgrade of the existing WWTP treatment process to produce disinfected tertiary effluent for disposal via landscape irrigation within the public right-of-way (R-O-W) throughout the District service area but primarily along the SR-33 corridor.

- Alternative 3: Upgrade of the existing WWTP treatment process to produce disinfected tertiary effluent for disposal via landscape irrigation within the public R-O-W and at the Forebay Golf Course.
- Alternative 4: Upgrade of the existing WWTP treatment process to produce disinfected tertiary effluent for disposal via landscape irrigation within the public R-O-W, at the Forebay Golf Course, and at future developments.
- Alternative 5: Upgrade of the existing WWTP treatment process to produce disinfected tertiary treated effluent to enter into an exchange agreement with surface water contractors.

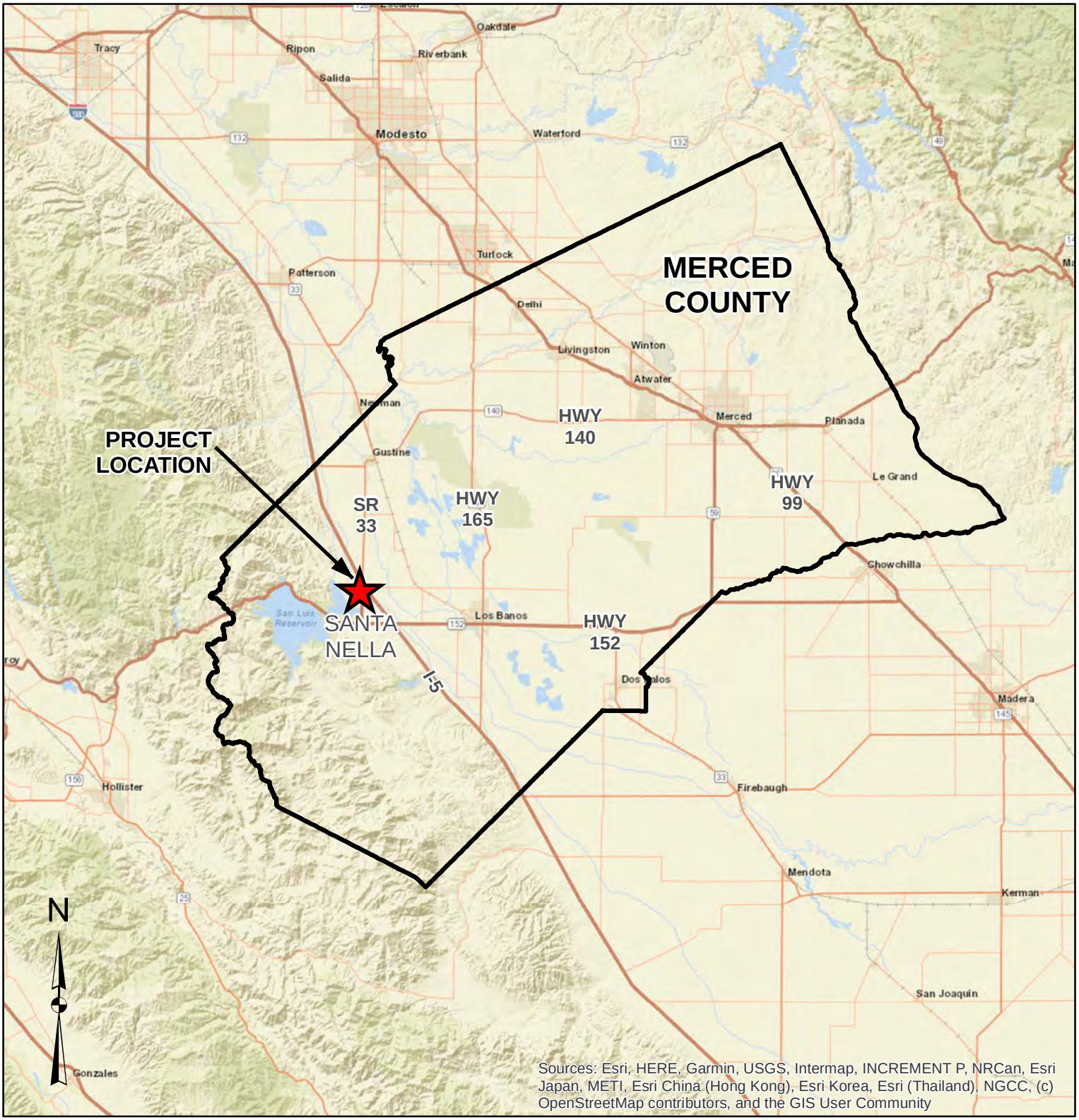
Alternative 5 is no longer a viable option and was not evaluated. The District is pursuing their own contract with the United States Bureau of Reclamation (USBR) for direct purchase of surface water. If and when the contract with the USBR is executed, the District would be able to enter into exchange agreements with surface water contractors.

2 Study Area Characteristics

The District's existing service area boundary and sphere of influence boundary is based on the 2030 Merced County General Plan, Adopted December 10, 2013, Amended July 12, 2016 (2030 General Plan) and Santa Nella Community Specific Plan, County of Merced, May 5, 2000 (2000 CSP). The District is designated as an Urban Community in the 2030 General Plan; referred to under the previous general plan as "Specific Urban Development Plan (SUDP)." The 2030 General Plan Urban Community boundary designates the ultimate growth boundary for the community over the life of the General Plan or the Community Plan and is intended to be consistent with the sphere of influence (SOI) boundary adopted by the Merced County Local Agency Formation Commission (LAFCo).

The study area for this Feasibility Study includes the SUDP boundary and the future CSP boundary. Refer to **Figure 2-1** for a vicinity map and **Figure 2-2** for a map of the study area.

In general, the topography of the District service area slopes down from south to north with an elevation range of approximately 227 feet at the southern border of the service area to 154 feet near the WWTP, for an overall elevation change of 73 feet. **Figure 2-3** presents the topography of the study area. The facilities are in the NW 1/4 of the NE 1/4 of Section 6, T10S, R9E, and SE 1/4 of Section 31, T9S, R9E, MDB&M.



0 25,000 50,000 75,000 100,000

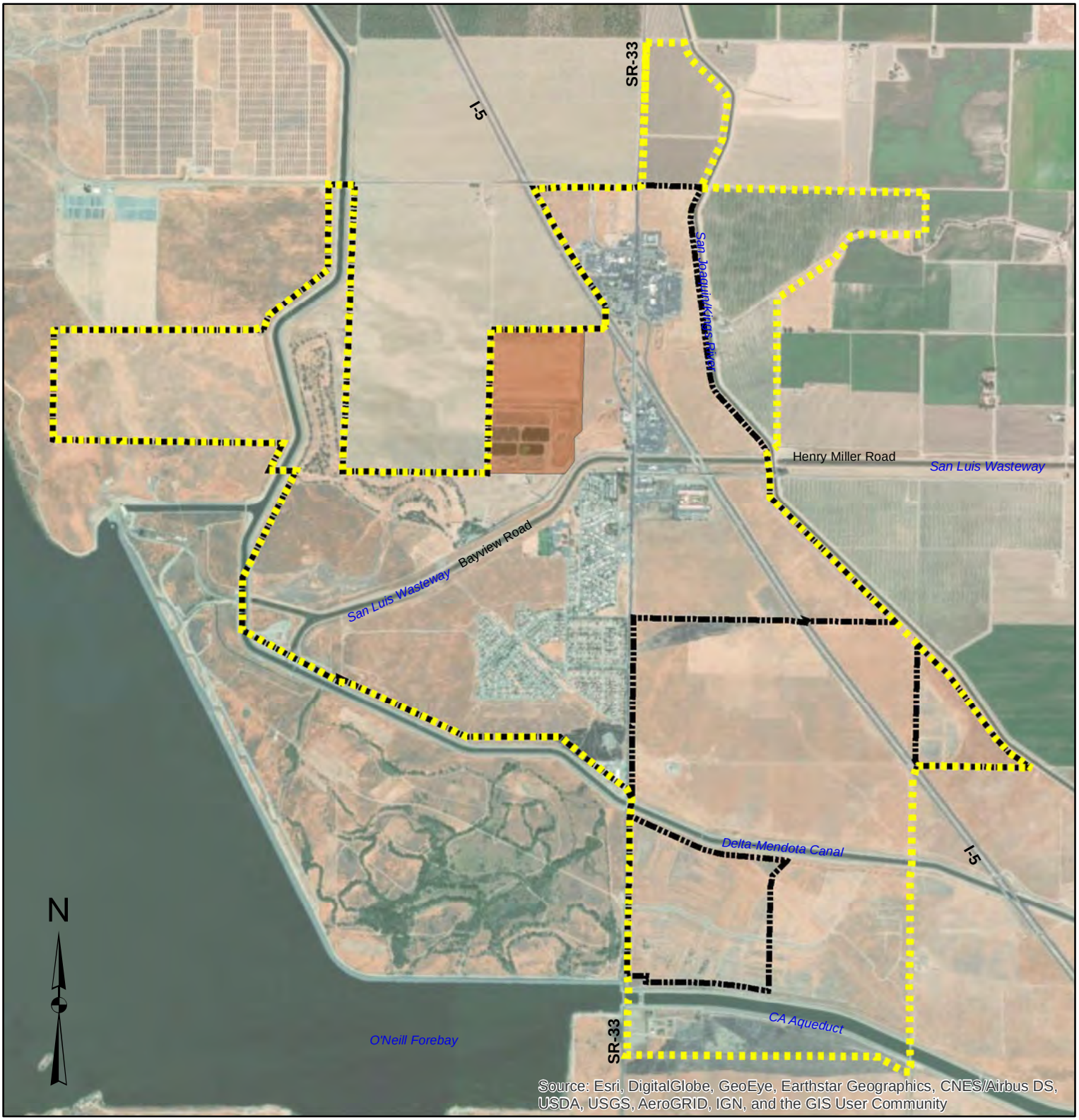
Feet

Legend

Merced County Boundary

SANTA NELLA COUNTY WATER DISTRICT
RECYCLED WATER FEASIBILITY STUDY

FIGURE 2-1
VICINITY MAP



0 1,100 2,200 3,300 4,400

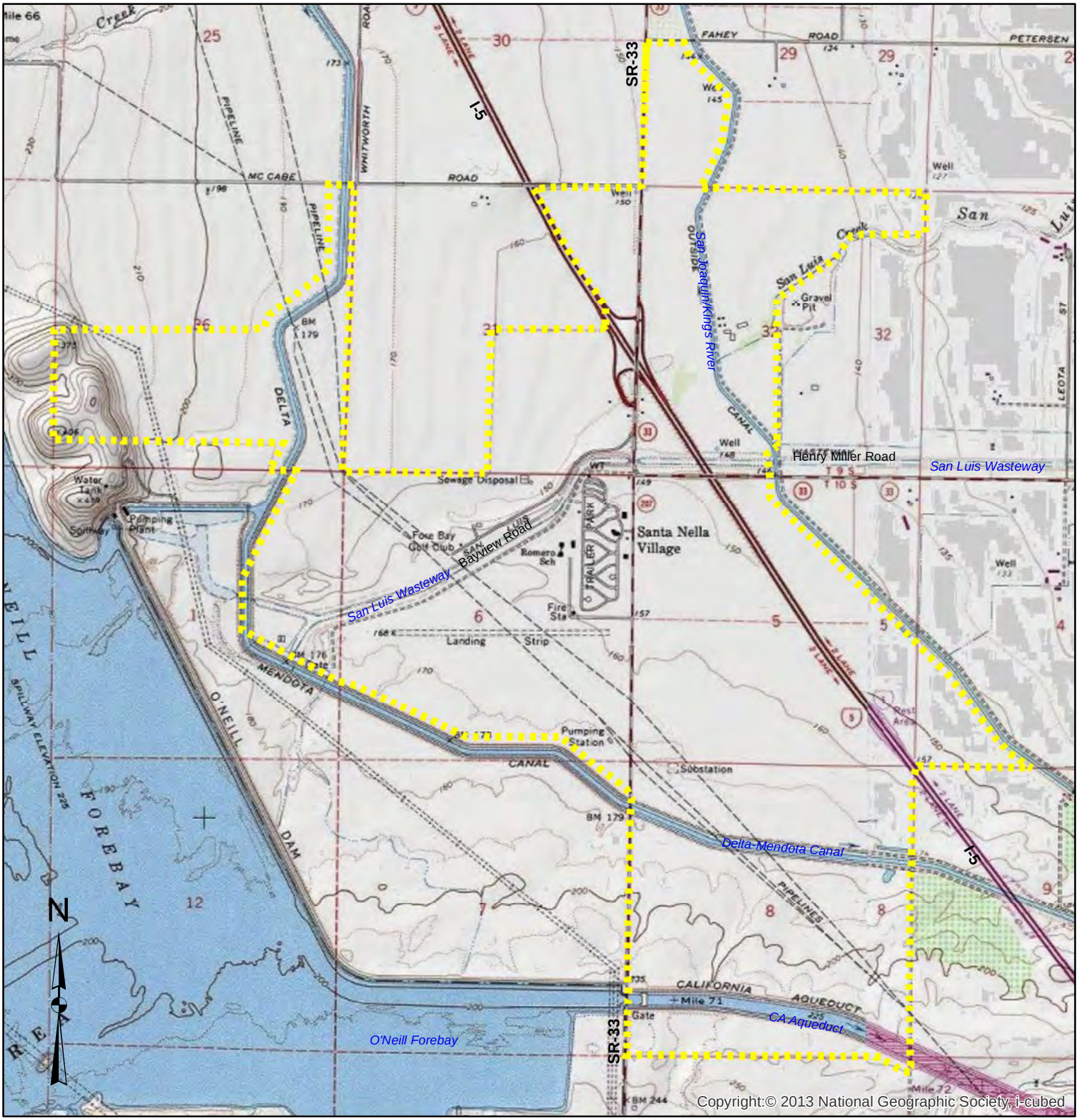
Feet

Legend

- Community Specific Plan Area
- Specific Urban Development Area
- SNCWD Wastewater Treatment Plant

SANTA NELLA COUNTY WATER DISTRICT
RECYCLED WATER FEASIBILITY STUDY

FIGURE 2-2
STUDY AREA



0 1,100 2,200 3,300 4,400

Feet

Legend

- Community Specific Plan Area\ Study Area

SANTA NELLA COUNTY WATER DISTRICT
RECYCLED WATER FEASIBILITY STUDY

FIGURE 2-3
TOPOGRAPHIC MAP

2.1.1 Hydrologic Features

Santa Nella is part of the San Luis Creek Watershed. The Diablo Range divide is located at the westerly boundary along the Santa Clara County-Merced County line. The basin extends northeasterly to the confluence of the San Luis Creek and Los Banos Creek. Surface water features within the SNCWD service area include the San Luis Wasteway, San Joaquin River, the Delta-Mendota Canal and the California Aqueduct. [3]

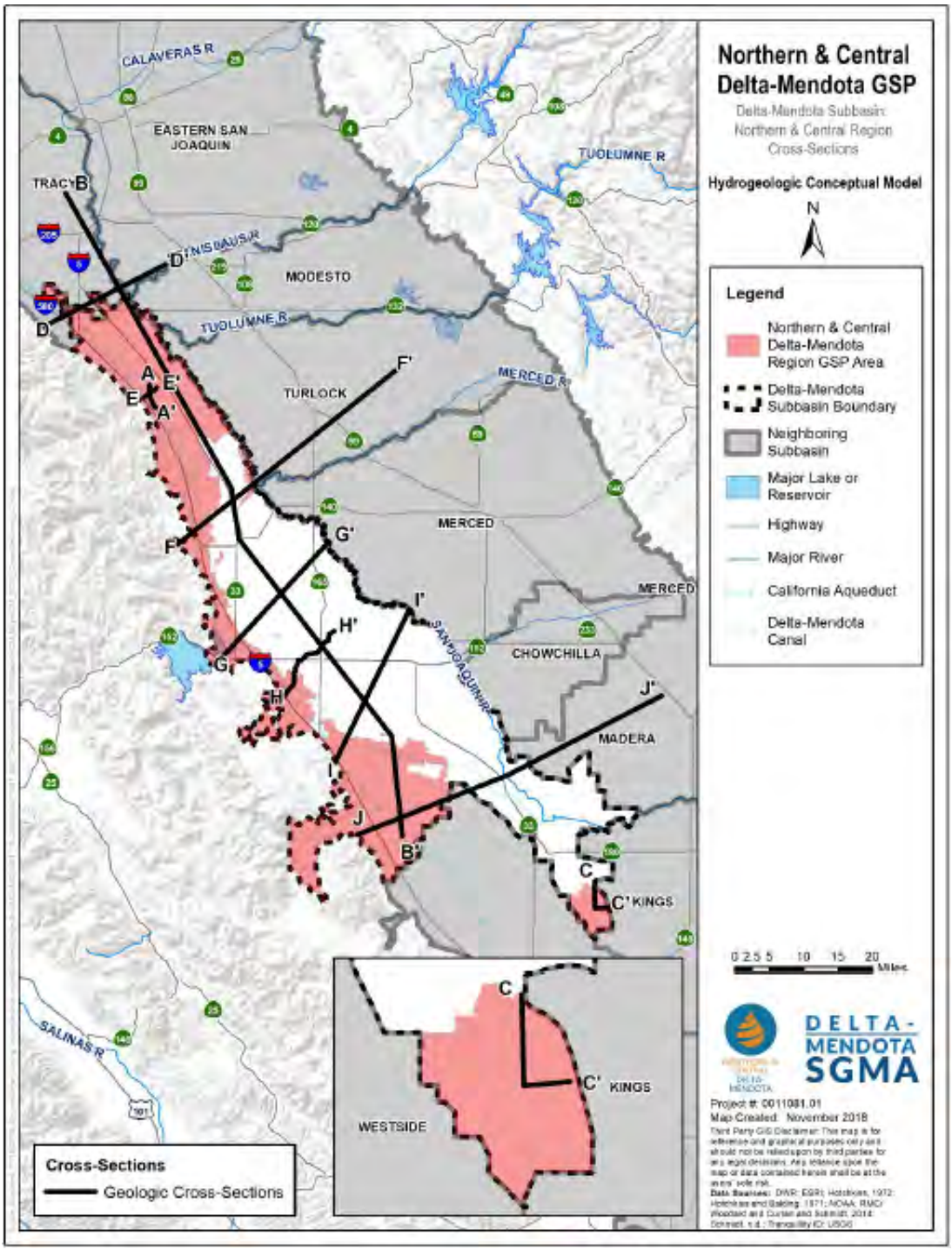
2.1.2 Groundwater Basins

The District service area is located in a portion of the Delta-Mendota Subbasin (DM Subbasin) number 5-22.07 of the San Joaquin Valley Groundwater Basin identified in the California Department of Water Resources (DWR) Bulletin 118 with said portion being designated as the Central Delta-Mendota Region (Central DM Region). The Central DM Region is bound by the San Joaquin River on the east, the Coastal Range Mountains on the west, the Stanislaus/San Joaquin County line to the north, and on the south by the Tranquility Irrigation District and Westlands Water District boundaries and including the San Luis Water District (SLWD) service area until reaching the Coastal Range. Water-bearing formations are expected to range from unconsolidated alluvium and terrace deposits to consolidated sediments with the Tulare Formation. The Corcoran Clay Member of the Tulare Formation is a prominent aquitard in the Eastern San Joaquin Valley, found in this Subbasin at a depth ranging from 100 feet to 500 feet below ground surface (bgs). Groundwater above the Corcoran Clay exists under confined conditions. The Corcoran Clay is not as prominent with the DM Subbasin.

Groundwater is a key component of water supplies in the DM Subbasin. To protect the long-term sustainability of groundwater resources, pumping has been significantly reduced in past years, allowing the groundwater subbasin to recover to some extent. During the most recent drought period, groundwater was heavily relied upon throughout the DM Subbasin for irrigation as surface water deliveries were essentially non-existent for many water users, resulting in increased groundwater pumping. The DM Subbasin is identified as subject to critical conditions of overdraft with an average well yield of 800 gpm to 2,000 gpm and a maximum well yield of 5,000 gpm. Well depths range from 50 to 800 feet bgs. Significant and gravel water-bearing formations beyond 500 feet have been identified in the area.

Refer to **Figure 2-4** for the groundwater basin boundaries.

Figure 2-4: Groundwater Basin Boundaries



Source:

Northern & Central Delta-Mendota Region GSP Groundwater Sustainability Plan
30November2019

2.1.3 Land Use and Population Projections

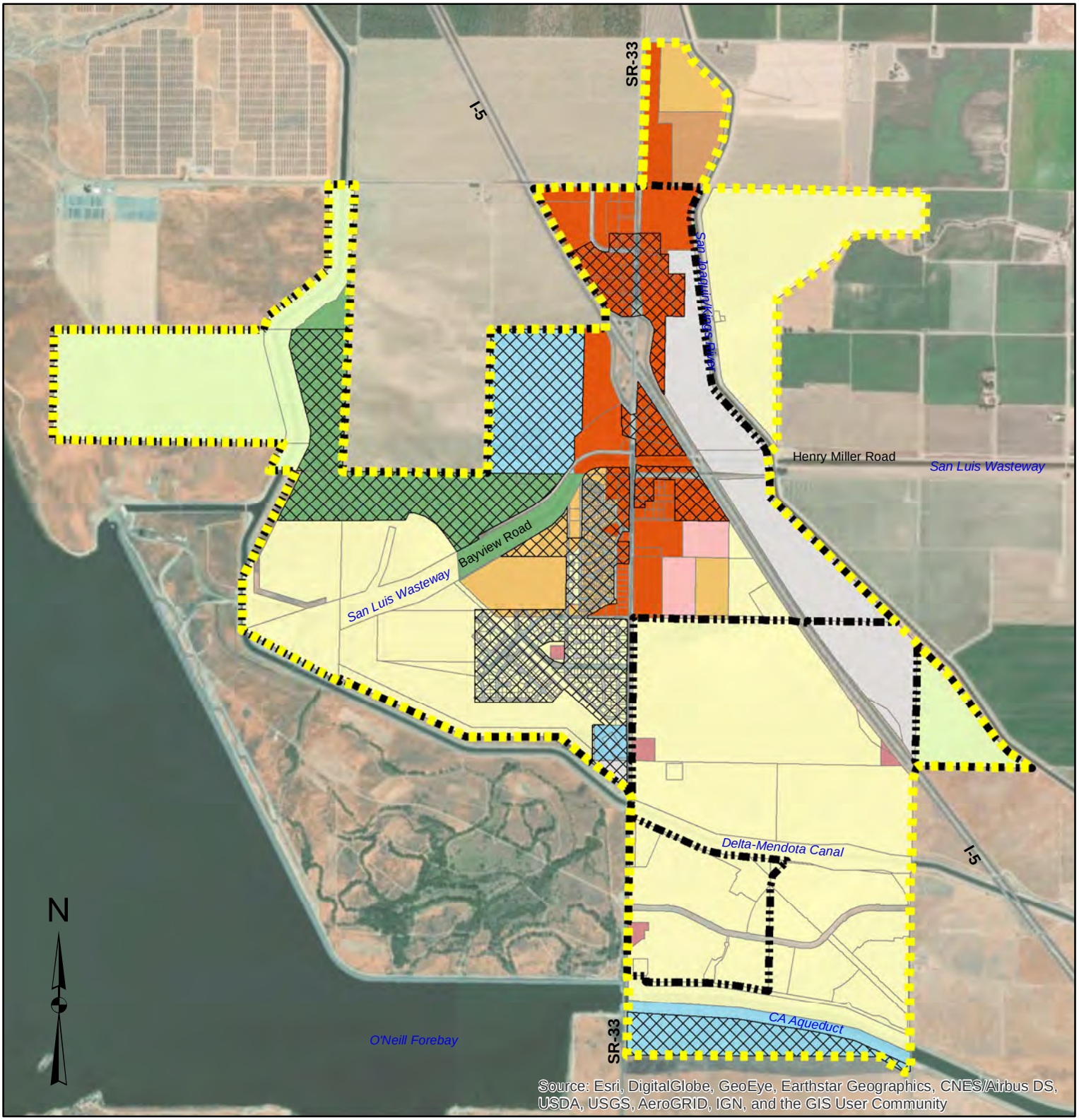
The community of Santa Nella has historically been a small community consisting of the mobile home park with commercial businesses providing services to travelers along I-5 and SR-33. The District serves approximately 40 commercial retail/businesses, a mobile home park comprised of individual properties/parcels with approximately 316 residential services, and a residential subdivision comprised of approximately 335 single-family dwellings. There is also a fire station, library, school, and District facilities that include the District office, water treatment plant, and wastewater treatment plant. The developed golf land-use area currently meets irrigation demands with direct diversion of surface water from SLWD. District water service to the golf course is for domestic use only. **Figure 2-5** provides an overview of the existing and projected land use.

Since 2000, residential development has resulted in an overall 12.75 percent (%) increase in population from 1,224 people to 1,380 people in 2010, per the U.S. Census Bureau Data, which is equivalent to an annual growth rate of 1.27 percent. Land use is not expected to shift significantly in the future, although residential development is expected to occur in the near-term. Population projections in the year 2040 results in a population of 1,978, based on the percent growth in population assuming a continuation of trends for a 10-year period.

2.1.4 Beneficial Uses of Receiving Waters and Water Quality Relative to WWTP Discharges

Beneficial uses of surface water features in the area are municipal and industrial supply, irrigation, recreation, freshwater habitat, fish spawning, and wildlife habitat as defined by the California Water Code §13050. The District is classified as an urban water provider under general public beneficial use. Existing beneficial uses of receiving groundwater in the region include municipal and domestic water supply, industrial water supply, and freshwater replenishment to surface waters.

The District WWTP process produces undisinfected secondary effluent which is disposed of by land application to approximately 60 acres of pasture land at the WWTP site. No effluent is discharged to receiving waters. A tailwater return pump station routes all runoff from the disposal area back to the WWTP pond storage. The majority of the effluent is assimilated by the grasses grown on the pasture land and minimal effluent is estimated to enter the groundwater. Effluent is sampled twice a month for 5-day Biological Oxygen Demand (BOD_5) and weekly for dissolved oxygen and settleable matter. In accordance with the District's Waste Discharge Requirements (WDRs) Order No. 88-104 (Order 88-104), the effluent BOD_5 has a monthly average below 40 mg/L and settleable matter below 0.5 ml/L.



0 1,100 2,200 3,300 4,400

Feet

Legend

- Community Specific Plan Boundary
- Specific Urban Development Plan Boundary
- Developed Areas
- Agricultural
- Golf
- General Commercial
- Neighborhood Commercial
- Office Commercial
- Inst/Public Facility
- Light Industrial
- Low Density Residential
- Medium Density Residential
- High Density Residential

SANTA NELLA COUNTY WATER DISTRICT
RECYCLED WATER FEASIBILITY STUDY

FIGURE 2-5
EXISTING AND PROJECTED LAND USE

3 Water Supply Characteristics and Facilities

This section summarizes the District's existing water supply characteristics and facilities and planning strategies for supply and facilities to meet future demands.

3.1 Description of All Wholesale and Retail Entities

The District purchases raw surface water on a wholesale basis from SLWD. The raw surface water is allocated to SLWD through a Central Valley Project (CVP) contract with the USBR. The District CSP encompasses portions of three water districts: Del Puerto Water District (DPWD), Central California Irrigation District (CCID), and SLWD. The land that is within the DPWD and CCID is designated as non-CVP use area by the District. The District currently provides water service to some developed areas within the DPWD, refer to **Figure 3-1**. There is no existing service to lands within the CCID.

Surface water purchased from SLWD is delivered from a turn-out on the San Luis Canal/California Aqueduct, downstream of the O'Neill Forebay and east of SR-33. The District purchases water directly from SLWD in the same manner as any other landowner within the SLWD service area. The District's water allocation received from SLWD is based on USBR allocation policies for Agriculture Water and the Central Valley Project Municipal and Industrial Water Shortage Policy Guidelines and Procedures (M&I WSP) effective February 1, 2017. The District has approximately 1,210 acres of land within the SLWD service area. The total water allocation in a 100-percent allocation water year is approximately 2,521 acre-feet of water according to a SLWD policy of 2.1 acre-feet of water per land acre. The cost to purchase water from SLWD changes annually and depends on the total water allocation. The cost is comprised of standby, raw water, and delivery charges, as well as property-related assessments. Refer to **Table 3-1**.

Table 3-1: Purchased Price of Raw Water

Description	Unit	Cost
Raw Water Cost[1]		
Average	per ac-ft	$89.09
Minimum	per ac-ft	$49.60
Maximum	per ac-ft	$141.75
Delivery Charges	per ac-ft	$92.53
Rescheduling	per ac-ft	$9.68
Additional Charges		
Supplemental Water Cost[2]	per ac-ft	$1,400.00
Additional Water Cost[3]	per ac-ft	$111.57
SLWD Annual Assessments[4]	per year	$80,000.00
Standby Charges	per land acre	$4.70

[1]Cost of raw water purchase from 2010 to 2020
[2]When the District purchases extra water that is available from the SLWD.
[3]When the USBR increases water allocation and the SLWD provides additional water to the District.
[4]Proposed fees that will cover standby charges, contract compliance capital debt, and contract compliance fees imposed by the SLWD to the District.

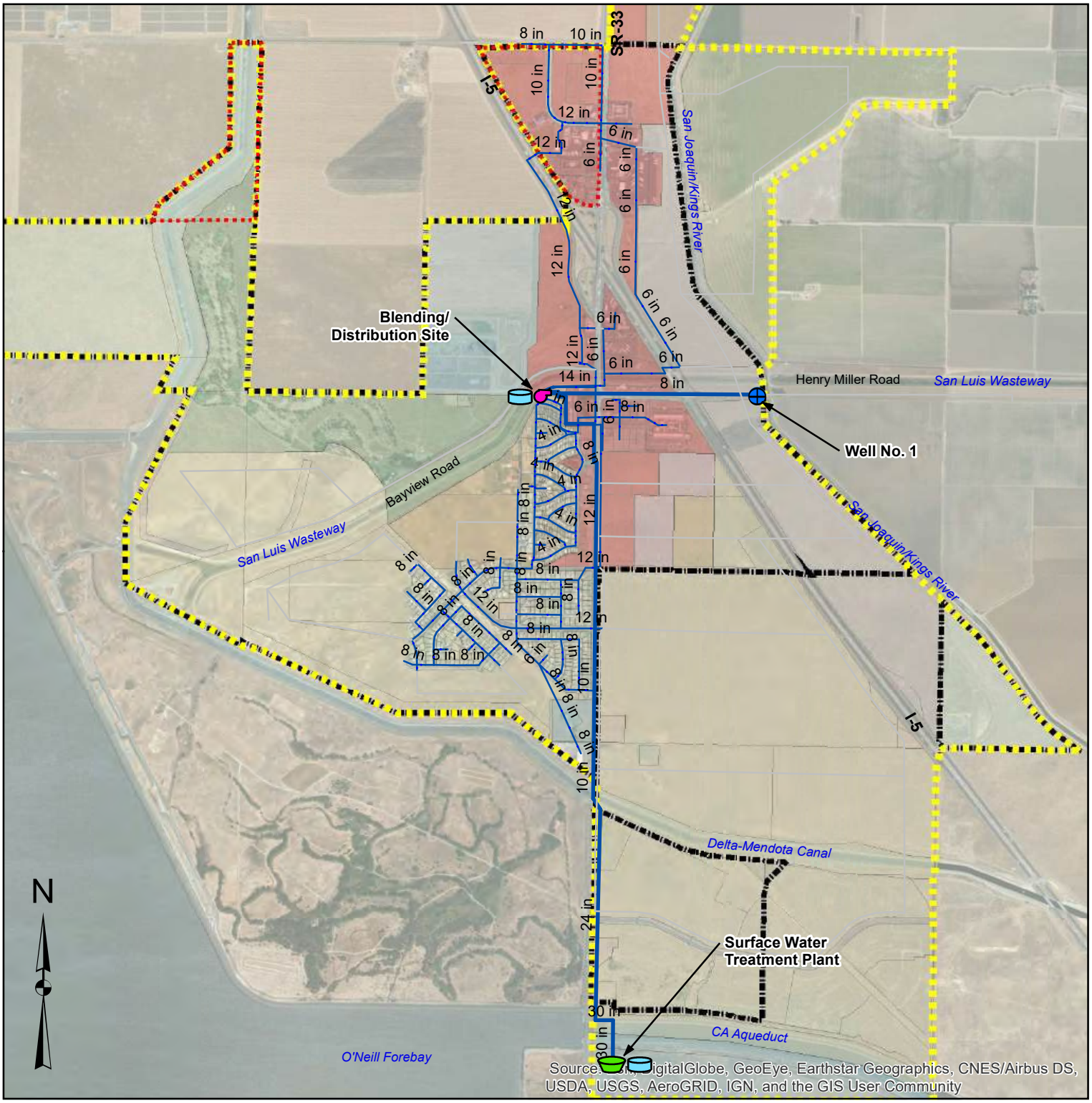
The District and SLWD have completed and executed an amended Memorandum of Understanding to enable the partial assignment of SLWD's CVP water contract to the District. Both districts have been in contact with the USBR to process the contract assignment and are moving forward with the associated tasks to complete the process. Completion of this process will result in a CVP contract for the District, and the District's ability to purchase raw surface water directly from the USBR instead of purchasing raw water as a SLWD customer.

3.2 Water Sources and Facilities

The District's water sources include surface water and a groundwater well. Raw surface water is pumped from the San Luis Canal/California Aqueduct and treated at the Surface Water Treatment Plant (SWTP). The SWTP is located south of the San Luis Canal at the southern end of the CSP boundary. The SWTP was constructed in 1987 to treat raw surface water by chemical flocculation, sedimentation, filtration, and chlorination processes. The SWTP is permitted to treat an average daily demand of 1.2 mgd and a peak demand of 1.8 mgd. The reliable water treatment plant capacity with one filter out of service is 0.9 mgd.

The District has one well, Well No. 1, that supplies the system with groundwater. The Well No. 1 site is located on the south side of Henry Miller Road, east of I-5. Well No. 1 is the primary water source for the non-CVP use area that is excluded from the SLWD surface water supply allocation. Originally, the Well No. 1 site had a pumping capacity of approximately 300 gpm. Due to the well's age and conditions, the current capacity has been reduced to approximately 200 gpm. Groundwater pumped from Well No. 1 is conveyed via a 6-inch diameter transmission pipeline along Henry Miller Road to the distribution site located approximately 0.6 miles to the west.

Groundwater from Well No. 1 is blended with surface water before being distributed to the system from the District's blending/distribution site. The blending/distribution site is located on District-owned property south of Bay View Road, west of Hwy 33. Facilities include a 10,000-gallon groundwater storage tank and booster pump system that discharges water to a 14-inch diameter water main. Surface water is also boosted into the 14-inch diameter water main from a 330,000-gallon surface water storage tank. Water from both sources is blended in the 14-inch diameter water main prior to being distributed to the system. The blending of the well water and surface water is required to reduce the trihalomethanes (TTHM) in the surface water produced as a disinfection byproduct of the treatment process. Blended water is distributed via the 14-inch diameter water distribution main to the system**. Figure 3-1** provides an overview of the existing water system.



0 920 1,840 2,760 3,680

Feet

Legend

- Surface Water Treatment Plant
- Groundwater Well
- Storage Tank
- Booster Pump Station
- Existing Distribution Water Pipeline
- Existing Transmission Water Pipeline
- Community Specific Plan Area
- Specific Plan Development Area
- Non-C.V.P. Use Area

SANTA NELLA COUNTY WATER DISTRICT
RECYCLED WATER FEASIBILITY STUDY

FIGURE 3-1
EXISTING WATER SYSTEM

3.3 Capacity of Water Facilities

The system's combined groundwater and surface water supply is sufficient to meet existing demands. However, due to the age of the facilities or lack of reliability and redundancy of existing facilities, repair, replacement, and/or addition of equipment and site infrastructure within the system are needed for continued reliable operation. Upgrade of existing equipment and additional facilities at the SWTP are needed to meet current maximum day demands and improve the reliability of the system. The existing packaged treatment units were installed in 1987 and have reached the end of their useful life. Additionally, the treatment units do not have the redundant capacity to allow for backwash or maintenance during maximum day demand conditions. The current maximum day demand of the system is 1.17 mgd. The reliable capacity with one filter out of service is 0.9 mgd. The 2019 Water Master Plan recommends the replacement of the treatment filter media and tube settlers, adding a new treatment filter to meet existing needs and address existing operational deficiencies.

3.4 Groundwater Management and Recharge

In August 2014, the California Legislature passed comprehensive groundwater legislation creating the Sustainable Groundwater Management Act of 2014 (SGMA), which is intended "to provide local groundwater agencies with the authority and technical and financial assistance necessary to sustainably manage groundwater." [California Water Code Section 10720(d)] The SGMA anticipates that each affected groundwater basin or subbasin will be regulated separately by one or more Groundwater Sustainability Agencies (GSA). A local agency may elect to be the GSA for a basin or subbasin within its boundaries. The SGMA also provides that a combination of local agencies may form a GSA through a joint powers agreement, a memorandum of agreement, or other legal agreement [California Water Code Section 10723.6].

Groundwater sustainability under the SGMA is to be achieved through groundwater sustainability plans (GSP) which can be a single plan developed by one or more GSAs or multiple coordinated plans within a basin or subbasin [California Water Code Section 10727]. DWR has designated the entire DM Subbasin as critically over-drafted, and under the SGMA, each GSA was required to assume its regulatory role by June 30, 2017, and to submit a GSP to DWR by January 31, 2020.

The District entered into an agreement with ten other local water agencies and formed the Central Delta-Mendota Groundwater Sustainability Agency (Central DM GSA) through a joint powers agreement, acting as a separate and independent public agency and as a single GSA for the Central DM Region. The purpose of the Central DM GSA is to implement the SGMA's requirements and achieve sustainability goals provided in the SGMA by developing, adopting, submitting, implementing, enforcing, and revising a GSP for the Central DM Region. The GSP may be part of a broader GSP coordinated with other GSAs in the Central DM Subbasin, and to exercise all the power and authorities of a GSA under the SGMA. The District is required to cooperate in the development of the GSP by submitting groundwater and surface water data, and other types of information to ensure the sustainability of the DM Subbasin. The District has an active role in the GSA and Joint Powers Authority (JPA).

The primary process for groundwater recharge within the Central Valley floor area is from the percolation of applied irrigation water. The Corcoran Clay is a known barrier restricting vertical flow between the Upper and Lower Aquifers. Therefore, recharge of the Lower Aquifer is most likely restricted where the Corcoran Clay is present, including across most of the Central Valley floor. Primary recharge areas to the Lower Aquifer are most likely in western parts of the Central Valley floor, particularly in the vicinity and west of Los Banos, Orestimba, and Del Puerto Creeks, along the western margin of the DM Subbasin.

3.5 Water Use Trends and Future Demands

This section summarizes the District's historical water production, percentage of use by the water source, and estimated future water demands.

3.5.1 Historical Water Production

Historical water production data is presented in **Table 3-2** for the years 2010-2016.

Table 3-2: Historical Water Production

Source	Total Water Production (gal)						
	2010	2011	2012	2013	2014	2015	2016
Surface Water	77,288,000	140,380,000	148,702,000	136,053,000	105,476,000	89,184,900	84,335,200
Well No. 1	14,960,250	33,864,500	38,805,376	33,214,940	50,297,764	45,122,352	52,097,452
Total	92,248,250	174,244,500	187,507,376	169,267,940	155,773,764	134,307,252	136,432,652

Trends in water production for 2011 and 2012 show significant increases as compared to 2010. The increase in water production may be related to increases in residential service connections as a result of development. Water production decreased from 2012 through 2016, despite the continued increase in residential service connections. A strict water conservation plan was implemented by the District, as a direct result of Senate Bill X7-7 (SB X7-7) Water Conservation Act of 2009 and issuance of the California Drought State of Emergency proclaimed by the Governor on January 17, 2014. During drought years, from 2014-2016, the percentage of water supply by surface water significantly decreased from 80 percent in previous years to an average of 65 percent, as a result of water curtailments, forcing the District to rely more on groundwater to meet system demands. **Table 3-3** presents the historical percentages of surface water and groundwater production by source.

Table 3-3: Historical Percentages of Production by Source

Year	Surface Water (ac-ft/yr)	Groundwater Well No. 1 (ac-ft/yr)	Total Production (ac-ft/yr)	Total Production (MG)	Surface Water (Percent)	Groundwater (Percent)
2010[1]	237	46	283	92	84%	16%
2011	431	104	535	174	81%	19%
2012	456	119	575	188	79%	21%
2013	418	102	519	169	81%	20%
2014	324	154	478	156	68%	32%
2015	274	138	412	134	67%	33%
2016	259	160	419	136	62%	38%

[1]Water production data from July 2010 to December 2010.

Annual water demands for the system are based on water production data for 2006-2016. Consistent with Title 22, Chapter 16 § 64554.b(2), the highest monthly demands from 2006-2016, occurred in September 2012 with a total demand of 23.4 MG, which corresponds to an average day demand of 0.78 mgd. This annual water demand is representative of the current District annual water demand and will be used in further analyses for evaluating the existing system's ability to meet current and projected demands.

3.5.2 Projected Future Demands

The District 2019 Water Master Plan projected future water demands for the 10-year and 25-year planning horizon. **Table 3-4** summarizes the existing and projected water demands.

Table 3-4: Existing and Projected Demands

Planning Horizon	Annual Potable Water Demand (ac-ft/yr)
Existing	874
10-Year	2,242
25-Year	3,862

The development of the 10-year planning horizon requires new source capacity to supply an additional 1,368 acre-ft/year. Development of the 25-year planning horizon requires new source capacity to supply an additional 1,620 acre-ft/year.

3.5.3 Water Prices and Costs

Table 3-5 summarizes the current District customer water rate structure.

Table 3-5: Customer Water Rates

Water		Fees[1]
Mobile Homes		
	Flat Rate ($/mo)	$35.90
Metered Residential		
Fixed ($/mo)		$19.00
	PLUS	
Volume ($/hcf)	Single Tier	$1.78
Commercial Rates		
Fixed ($/mo)	Meter Size	
	5/8"-3/4"	$46.84
	1"	$76.39
	1.5"	$149.61
	2"	$237.82
	3" or larger	$517.46
	PLUS	
Volume ($/hcf)	Single Tier	$1.25
Flat Rate		
Un-Metered Commercial ($/mo)		$102.65

[1]SNCWD adopted water rate and fee structure effective on July 1, 2010.

A Water Rate Study [15] was recently completed for the District. The Water Rate Study reviewed the fixed and variable costs for providing water service and recommended water rates for Fiscal Years 2020-21 through 2023-24. **Table 3-6** summarizes the recommended water rates. Refer to the Water Rate Study for more detailed information on the costs for providing potable water.

Table 3-6: Projected Water Rate Increases

Customer Class	Rate (Units)	Current 2019	Four-Year Phase-In 2020-21	2021-22	2022-23	2023-24
Residential Water Rates		Residential Fixed & Variable Monthly Charges				
Mobile Homes	*Flat Rate ($/mo)*	$ 35.90				
Fixed	*Mo. Fixed-Rate ($/mo)*		**$ 33.54**	**$ 38.24**	**$ 40.18**	**$ 41.30**
Variable, average 610 cf month	*Mo. Volume Rate ($/hcf)*		**$ 1.70**	**$ 1.76**	**$ 1.83**	**$ 1.89**
Metered Homes						
Fixed	*Mo. Fixed Rate ($/mo)*	$ 19.00	**$ 36.86**	**$ 42.02**	**$ 45.25**	**$ 46.37**
Variable, *average 1,200 cf month*	*Mo. Volume Rate ($/hcf)*	$ 1.78	**$ 1.45**	**$ 1.51**	**$ 1.56**	**$ 1.61**
Commercial Water Rates		Fixed Monthly Charges				
Fixed						
5/8" - 3/4" meter	*Mo. Fixed Rate ($/mo)*	$ 46.84	**$ 44.97**	**$ 51.27**	**$ 58.96**	**$ 60.73**
1" meter	*Mo. Fixed Rate ($/mo)*	$ 76.39	**$ 73.33**	**$ 83.60**	**$ 96.14**	**$ 99.02**
1.5" meter	*Mo. Fixed Rate ($/mo)*	$ 149.61	**$ 143.63**	**$ 163.74**	**$ 188.30**	**$ 193.95**
2" meter	*Mo. Fixed Rate ($/mo)*	$ 237.82	**$ 228.31**	**$ 260.27**	**$ 299.31**	**$ 308.29**
3" + meter	*Mo. Fixed Rate ($/mo)*	$ 517.46	**$ 496.76**	**$ 566.31**	**$ 651.26**	**$ 670.80**
Variable,	*Mo. Volume Rate ($/hcf)*	$ 1.25	**$ 1.33**	**$ 1.38**	**$ 1.41**	**$ 1.45**
SGMA/GSA/GSP		Fee for GSA Membership				
Monthly Rate Per Active Connection	*Mo. Fixed-Rate ($/mo)*	$ -	**$ 9.00**	**$ 9.00**	**$ 9.00**	**$ 9.00**

3.6 Quality of Water Supplies

The District SWTP was previously under a compliance order for violation of the Stage 2 Disinfection Byproduct Rule Total Trihalomethanes Maximum Contaminant Level (MCL). The TTHM MCL Compliance Order No. 03-11-14R-011 was issued by the SWRCB Division of Drinking Water (DDW) on December 12, 2014. Prior to 2014, the District was in violation of the TTHM MCL under the Stage 1 Disinfection Byproduct Rule under Compliance Order No. 03-11-07O-006 issued to the District on April 24, 2008. In October 2011, the District secured planning funds through the SWRCB Drinking Water State Revolving Fund (DWSRF) to plan the Blending/Distribution Site and Well No. 2 Project. The planning project objective was to review improvements to the blending and distribution facilities necessary to provide sufficient blending of groundwater sources with surface water in an effort to reduce TTHM. Although Compliance Order No. 03-11-14R-011 was rescinded on April 19, 2018, the District is currently seeking construction funds for completing the design and for construction of a new well and blending facility improvements. The improvement project will provide an additional and redundant source of groundwater for blending with the surface water supply to allow for more uniform water quality and reduce TTHM levels in the water system. The proposed project will also address existing storage capacity deficiencies. The existing system has a total storage capacity of 0.34 MG, which is insufficient to meet maximum day demands. The timeline for completion of the improvements is unknown, as funding is dependent on the availability of SWRCB program funds.

Historically, water supplied from Well No. 1 has elevated levels of Total Dissolved Solids (TDS) and aluminum. Previous studies indicate that near surface groundwater has elevated nitrogen, TDS, arsenic and other organics. [8]

3.7 Sources of Additional Water and Plans for New Facilities

Future water supply sources may be met by groundwater, surface water, or a combination of both. However, both sources may not be reliable. Reduced water allocations due to drought conditions will affect the allocations of surface water in future years. Hydrogeological investigations within the District SUDP area and surrounding areas within and outside of the CSP boundary have shown limited potential for future groundwater supplies. Future groundwater supply within the District will also be subject to the requirements of the GSP once it is developed. Due to anticipated continued curtailment of surface water supply and future sustainability regulations for groundwater, alternative sources to offset potable water use are recommended.

Source capacity met by additional surface water development will require improvements to accommodate the proposed capacity of surface water supply delivered via the existing San Luis Canal/California Aqueduct turnout to the SWTP. The system must have an adequate groundwater supply to blend with surface water supplies to reduce TTHM. Alternatively, treatment for removal of TTHMs may be provided at the SWTP.

4 Wastewater Characteristics and Facilities

This section summarizes the District's historical wastewater characteristics and facilities.

4.1 Description of Entities, Facilities, and Compliance

Wastewater generated by the District service area is collected and conveyed to the District's WWTP through a network of gravity sewer pipelines, lift stations, and force mains. **Figure 4-1** provides an overview of the sewer system. The WWTP is located west of SR- 33 on Bayview Road, east of Henry Miller Avenue in Santa Nella. The WWTP is operated in accordance with WDRs Order 88-104.

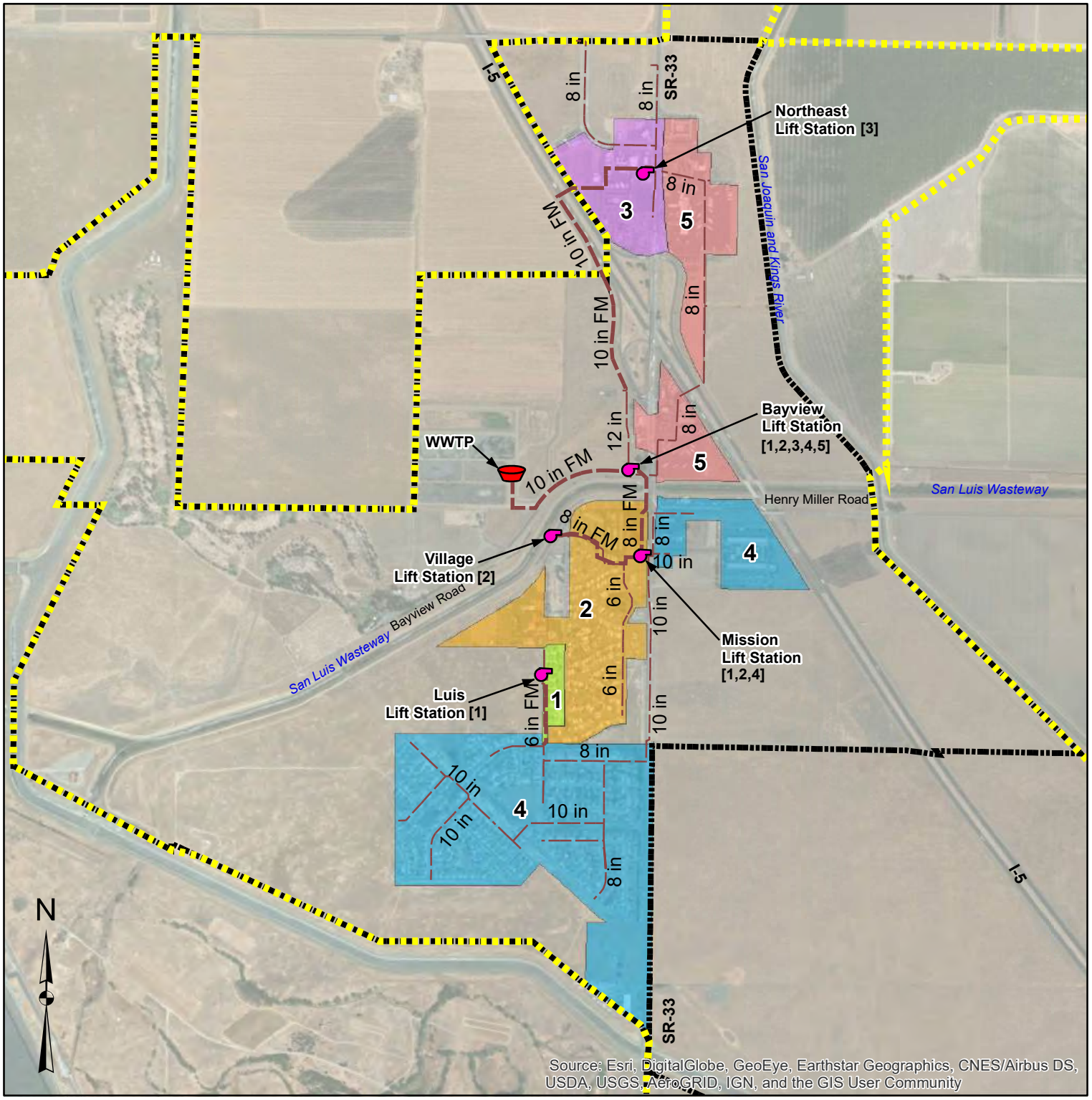
The WWTP process produces undisinfected secondary water through an aerated pond system. The WWTP facilities include a headworks, six ponds – two lined treatment ponds and four unlined storage ponds, an effluent/recirculation pump station, and a tailwater pump station. The WWTP is situated on a 100-acre parcel, of which, approximately 40 acres comprise the treatment and storage area and 60 acres is pasture land for effluent discharge/disposal.

Wastewater pumped from the Bayview lift station is conveyed to the WWTP headworks structure. The headworks structure consists of a fine screen, washer/compactor, and flow meter. Screened wastewater flows by gravity to Pond 5 then Pond 4 for treatment. Ponds 4 and 5 are equipped with four 15-HP horizontal floating brush aerators each. Treated wastewater is then routed to Pond 6, Pond 3, Pond 2, and then Pond 1 for storage. Treated effluent is pumped by the effluent pump station for pasture irrigation. The WWTP site is surrounded by a containment berm and a tailwater pump station to return any runoff to Pond 6. The WWTP has a permitted treatment capacity of 0.4 mgd. **Figure 4-2** presents the existing WWTP layout and treatment process schematic.

Table 4-1 summarized the WWTP pond storage volumes.

Table 4-1: WWTP Pond Volume

Pond	Type	Storage Volume, acre-ft
1	Storage	24.1
2	Storage	11.9
3	Storage	11.9
4	Treatment	23.2
5	Treatment	23.2
6	Storage	53.2
	Total	147.5



0 680 1,360 2,040 2,720

Feet

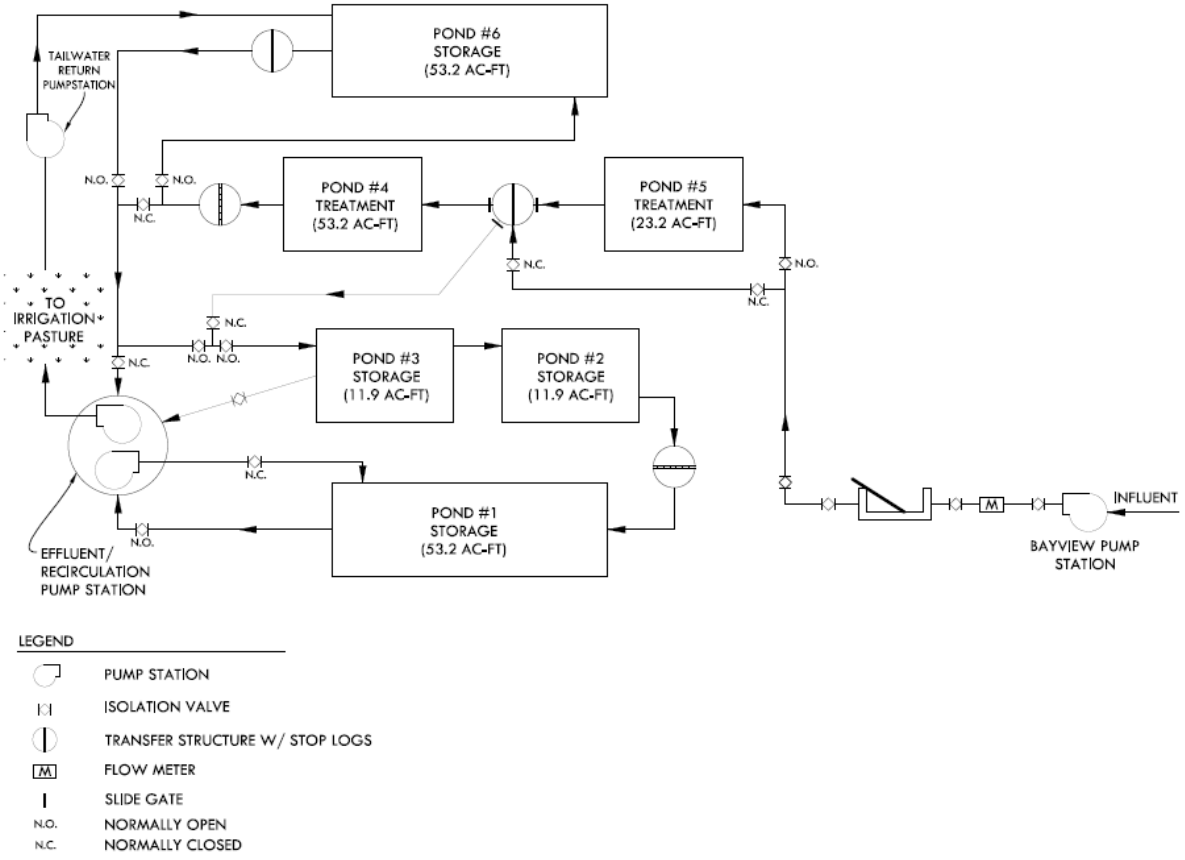
Legend

- Community Specific Plan Area
- Specific Urban Development Area
- Existing Gravity Sewer Pipeline
- Existing Sewer Force Main
- Service Area 1
- Service Area 2
- Service Area 3
- Service Area 4
- Service Area 5
- Sewer Lift Station
- Wastewater Treatment Plant
- [#] Lift Station Service Area

SANTA NELLA COUNTY WATER DISTRICT RECYCLED WATER FEASIBILITY STUDY

FIGURE 4-1 EXISTING SEWER SYSTEM

Figure 4-2: Existing WWTP Process Flow Schematic



4.2 Existing and Projected Wastewater Flows

This section summarizes the District's existing wastewater flows and future wastewater flow projections.

4.2.1 Historical Wastewater Flows

Table 4-2 summarizes the historical flow data for the WWTP for 2009-2016 (consistent with the years evaluated in the 2019 Sewer Master Plan). The average dry weather flows (ADWF) are assumed to occur during the months of May through September. Peak hourly flows are not recorded at the WWTP. Flow into the WWTP is relatively consistent through the year and exhibit minimal seasonal variations in general. Monthly flows tended to be within 1.3 to 8.4 percent of the average monthly flow for a particular year.

Table 4-2: Historical Flow Data

Month	WWTP Flows, gal								Average, gal (2009-2016)
	2009	2010	2011	2012	2013	2014	2015	2016	
Jan	9,285,000	8,010,309	6,104,021	5,479,274	5,002,844	6,032,276	5,891,238	6,234,341	6,504,913
Feb	7,269,000	7,583,366	5,819,299	5,268,346	4,511,916	5,229,233	5,056,804	5,703,778	5,805,218
Mar	7,397,000	7,949,006	5,457,198	6,051,295	6,082,084	5,971,901	5,966,774	6,407,982	6,410,405
Apr	6,610,000	7,498,381	5,277,557	5,925,798	5,966,700	5,789,079	5,725,348	6,404,687	6,149,694
May	7,330,000	6,826,810	5,052,240	4,262,596	6,090,389	5,942,572	6,029,217	6,693,381	6,028,401
Jun	7,490,000	5,798,686	5,036,799	4,921,730	6,199,977	6,134,478	6,547,303	6,764,560	6,111,692
Jul	8,043,000	6,360,666	5,305,830	5,087,613	6,098,010	6,532,949	7,210,505	7,313,668	6,494,030
Aug	7,959,800	6,124,461	5,038,458	6,945,444	6,522,192	6,687,611	7,006,050	7,051,655	6,666,959
Sep	7,541,600	6,213,798	6,006,058	6,559,059	5,914,816	5,914,934	6,576,017	6,675,756	6,425,255
Oct	7,332,098	5,558,367	5,925,836	5,410,800	6,140,333	6,143,501	6,438,511	6,697,566	6,205,877
Nov	7,428,699	6,364,695	5,552,213	5,571,300	5,929,323	5,972,240	6,299,886	6,358,722	6,184,635
Dec	8,585,617	6,127,971	5,892,115	5,925,145	6,094,017	6,326,598	6,333,257	6,407,918	6,461,580
Average Monthly Flow, gal									6,287,388
Average Dry Weather Monthly Flow, gal									6,345,267
Average Daily Flow[1], gpd									209,580
Average Dry Weather Flow[2], gpd									211,509
Maximum Monthly Flow[3], gpd									309,500

[1]ADF = average of WWTP flows from January 2009-December 2016.
[2]ADWF = average of WWTP flows from May 2009-September 2016.
[3]Highest WWTP flow from January 2009-2016.

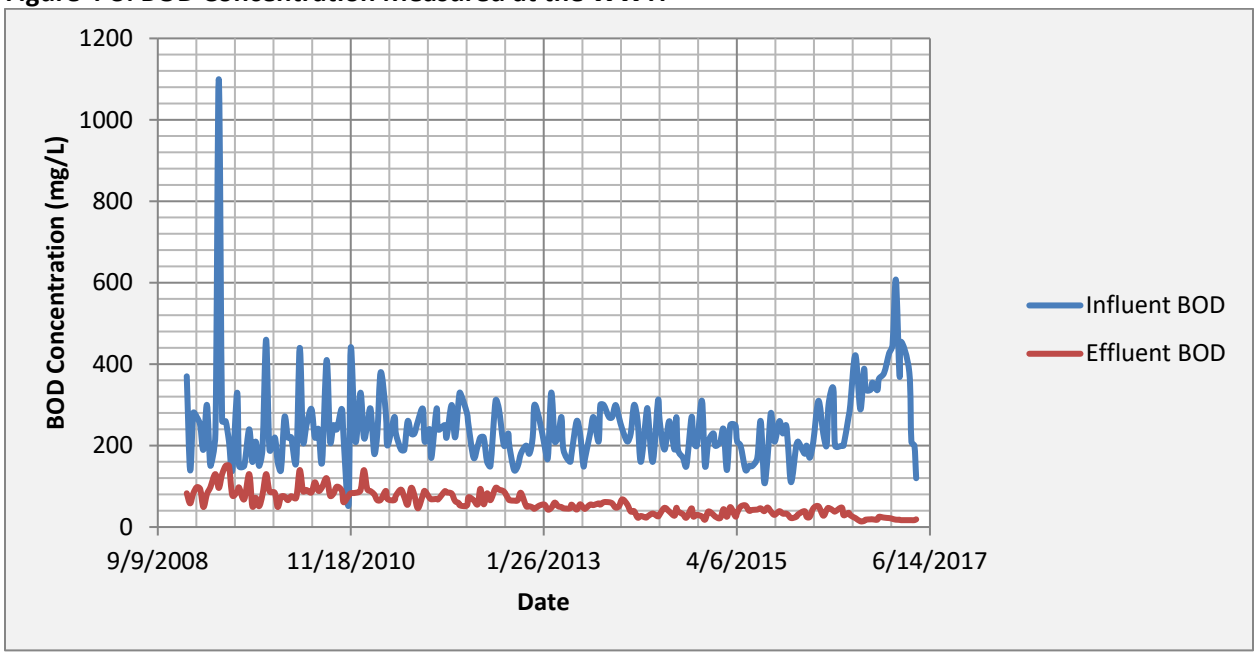
4.2.2 Projected Wastewater Flows

Wastewater flows projected for the 10-year planning horizon are approximately 0.9 mgd ADWF and 2.6 mgd peak wet weather flow (PWWF). Wastewater flows projected for the 25-year planning horizon are approximately 1.6 mgd ADWF and 4.8 mgd PWWF. Projected wastewater flows are based on the wastewater generation rates developed in the 2019 Sewer Master Plan and gross acreages and dwelling units for planned developments with the SUDP and CSP boundaries. Projected flows were developed considering water conservation requirements for new development for residential land uses only to account for low use water fixtures as required by the CA Green Building Code.

4.3 Effluent Quality and any Seasonal Variation

Monthly reports for Influent and effluent wastewater data were obtained from SNCWD. The average influent BOD measured is 250 mg/L and the average effluent BOD is approximately 60 mg/L. Refer to **Figure 4-3** for historical BOD concentrations measured at the WWTP.

Figure 4-3: BOD Concentration Measured at the WWTP



4.4 Existing Waste Discharge Requirements

The WDRs establish discharge prohibitions, flow limitations, effluent limitations, groundwater limitations, discharge specifications, and provisions for the WWTP. **Table 4-3** summarizes the major flow and effluent limitations listed in the WDRs. A copy of the WDRs is provided in **Appendix A**.

Table 4-3: District WWTP Summary of Waste Discharge Requirements

Parameter	Requirement
Average Dry Weather Flow	<0.4 million gallons per days
BOD_5[1]	Monthly average of 40 mg/L
	Daily maximum of 80 mg/L
Settleable Matter	Monthly average of 0.5 mL/L
	Daily Maximum of 1.0 mL/L
Dissolved Oxygen[2]	>1.0 mg/L for 16 hours in any 24-hour period

[1]Five-day, 20° Celsius BOD_5. BOD_5 limitation shall apply to discharge from the package treatment plant.
[2]Dissolved oxygen content of holding ponds shall not exceed requirements.

The groundwater depth ranges between 12 feet to 16 feet, with a specific electrical conductivity of 880 umhos/cm. The average precipitation and evaporation rates for the area are approximately 8 and 65 inches per year, respectively. The WDRs also include influent and effluent monitoring requirements as shown in **Table 4-4**.

Table 4-4: Influent and Effluent Monitoring Requirements

Monitoring	Constituent	Units	Type of Sample	Sampling Frequency
Influent	Total Daily Flow	mgd	Continuous	Daily
Influent	BOD_5[1]	mg/L	Grab	Monthly
Effluent	BOD_5[2]	mg/L	Grab	2/month
Effluent	Dissolved Oxygen[3]	mg/L	Grab	Weekly
Effluent	Settleable Matter[4]	mg/L	Grab	Weekly

[1] Five-day, 20° Celsius Biochemical Oxygen Demand
[2] BOD_5 samples shall be collected at the outfall from final pond prior to disposal.
[3] Samples to be collected from opposite the inlet structure of each pond and lagoon between the hours of 0800 and 0900.
[4] The Settleable Matter shall be determined during the periods when the pasture area is used for disposal.

4.4.1 Compliance with Waste Discharge Requirements

In February 2005, SNCWD received a Notice of Violation leading to improvements to WWTP facilities to increase treatment capacity, enhance operational flexibility, and provide storage. These improvements included: construction of the headworks, construction of the lined treatment pond (Pond 5) and unlined storage pond for treated effluent and site runoff (Pond 6); addition of surface aerators at Pond 4 and Pond 5; the construction of the site containment berm; reconstruction of the tailwater recovery pump station; rehabilitation of the influent lift station (Bayview Lift Station) and installation of chopper pumps; and electrical system upgrades, extension of water pipeline for potable supply, and upgrades to site access and security. The objective of the project, funded by the SWRCB CWSRF, was to comply with water quality effluent limitations under the WDRs and allow the District to lift the self-imposed sewer connection moratorium. The improvements became operational in January 2013. The WWTP exceeded the monthly average discharge limit of 40 mg/L for BOD_5 during the initial performance period beginning in January 2013 through July 2014, after the improvements were completed. The District took Ponds 1, 2, and 3 offline due to the visible amount of biosolids (sludge) accumulation in the ponds which was believed to be affecting the effluent BOD_5 results. Corrective action measures for sludge removal in Ponds 1, 2, and 3 were completed in 2017. Following these operational changes in the treatment process, the resulting BOD_5 sample results came back in compliance with discharge limitations for the months between February 2014 and May 2014.

The District's WWTP is currently in compliance with the existing WDRs. There are no sources of industrial or problem constituents in the influent wastewater, as there are limited industrial users.

4.4.2 Existing Water Recycling

All of the undisinfected secondary effluent produced at the WWTP is used for the irrigation of pasture land owned by the District. There are no other existing users and no contractual and pricing arrangements for the recycled water.

5 Treatment Requirements for Discharge and Reuse

Regulatory requirements pertaining to water recycling include: Title 22 of the CCR, Division 4, Chapter 3 (commonly referred to as the Water Recycling Criteria [WRC] or Title 22), the SWRCB Recycled Water Policy and the SWRCB Order WQ 2016-0068-DDW Water Reclamation Requirements for Recycled Water Use (Order WQ 2016-0068-DDW). The regulations specify requirements related to levels of treatment, use areas, dual plumbed systems, indirect potable reuse via groundwater replenishment, sampling analysis, reporting, operations, design and reliability of treatment processes for recycled water, standard conditions for the use of recycled water, reporting requirements, and permit approval process.

This section reviews the potential regulatory requirements for the production and use of recycled water. The recycled water use under consideration by the District for this Feasibility Study is for non-potable reuse to offset potable water use through the irrigation of unrestricted areas.

5.1 Required Water Qualities and Treatment for Potential Recycled Water Uses

Current WRC treatment requirements for various non-potable recycled water uses are summarized in **Table 5-1**. In general, the treatment levels correspond to typical terminology for secondary and tertiary wastewater treatment processes. These treatment levels were developed to provide adequate protection to public health based on the different types of recycled water uses.

Table 5-1: Title 22 Water Recycling Criteria Treatment Level Requirements for Acceptable Non-Potable Recycled Water Uses

Treatment Level	Acceptable Recycled Water Use
Undisinfected secondary	Orchards where the recycled water does not come into contact with the edible portion of the crop Vineyards where the recycled water does not come into contact with the edible portion of the crop Non-food-bearing trees Fodder and fiber crops and pasture for animals not producing milk for human consumptions Seed crops not eaten by humans Food crops that must undergo commercial pathogen-destroying processing before being consumed by humans Ornamental nursery stock and sod farms (provided no irrigation with recycled water occurs for a period of 14 days prior to harvesting), retail sale, or allowing access by the general public Flushing sanitary sewers
Disinfected secondary-2.2	Surface irrigation of food crops where the edible portion is produced above ground and not contacted by the recycled water Restricted recreational impoundments and any publicly accessible impoundments at fish hatcheries
Disinfected secondary-23	Surface irrigation of cemeteries, freeway landscaping, restricted access golf courses, ornamental nursery stock and sod farms with restricted access, pasture for animals producing milk for human consumptions, and any non-edible vegetation where access is controlled so that the irrigated area cannot be used as if it were part of a park, playground or schoolyard

Treatment Level	Acceptable Recycled Water Use
Disinfected tertiary, with < 2.2 MPN/mL Total Coliform 7-day median concentration and < 23 MPN/100 mL 30-day maximum	Surface irrigation of food crops, parks, playgrounds, school yards, residential landscaping, unrestricted access golf courses Nonrestricted recreational impoundments Industrial or commercial cooling or air conditioning that involves the use of a cooling tower, evaporative condenser, spraying, or any mechanism that creates a mist Flushing toilets and urinals Priming drain taps, Industrial process water that may come into contact with workers Structural fire fighting Decorative fountains Commercial laundries Consolidation of backfill around potable water pipelines Artificial snowmaking for commercial outdoor use Commercial car washes where the general public is excluded from the washing process

As shown in **Table 5-1**, the levels of treatment limit the acceptable uses of produced recycled water. Disinfected secondary-23 recycled water means recycled water that has been oxidized and disinfected so that the median concentration of total coliform bacteria in the disinfected effluent does not exceed a most probable number (MPN) of 23 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed, and the number of total coliform bacteria does not exceed an MPN of 240 per 100 milliliters in more than one sample in any 30-day period.

Disinfected tertiary recycled water means a filtered and subsequently disinfected wastewater that meets the following criteria:

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

5.2 Operational and On-site Requirements

Title 22 §60310 and Order WQ 2016-0068-DDW specify operational requirements for irrigation using recycled water including the following:

- Irrigation runoff shall be confined to the recycled water use area.
- Spray, mist, or runoff shall not enter dwellings.
- Drinking water fountains shall be protected against contact with recycled water.
- Recycled water use areas shall be posted with signs stating its use.
- No physical connections shall be made between the recycled water and potable water systems.
- Hose bibs shall not be included in public areas where recycled water is in use.

The District is responsible for preparing and submitting an Operation and Maintenance Plan for recycled water to ensure compliance with applicable requirements.

5.3 Anticipated Wastewater Discharge Requirements

Based on a review of waste discharge requirements for other agencies that produce disinfected tertiary recycled water, **Table 5-2** summarizes the projected recycled water quality requirements for surface irrigation of parks, playgrounds, school yards, residential landscaping, and unrestricted access golf courses.

Table 5-2: Projected Recycled Water Quality Limitations

Constituent	Units	Water Quality Limitations		
		Average Monthly	Average Weekly	Maximum Daily
BOD_5	mg/L	10	15	20
TSS	mg/L	10	15	20
Total Nitrogen	mg/L	10	17	-
Total Dissolved Solids	mg/L	varies [1]	-	-
Turbidity	NTU	-	-	10 [2]
Total Coliform	MPN/100 mL	-	2.2	23 / 240 [3]

[1] Total Dissolved Solids limits in permits vary depending on the naturally occurring background concentrations and applicable Water Quality Control Plan (Basin Plan) objectives.
[2] Turbidity of the filtered effluent prior to disinfection must not exceed 2.0 NTU as a daily average; shall not exceed 5 NTU more than 5 percent of the time during a 24-hour period; and shall never exceed 10 NTU.
[3] The number of total coliform bacteria shall not exceed an MPN of 23 per 100 milliliters in more than one sample in any 30-day period. The number of total coliform bacteria shall not exceed an MPN of 240 per 100 milliliters at any time.

5.4 Water Quality Requirements to Protect Surface or Groundwater

The WRC and Order WQ 2016-0068-DDW include water quality-related requirements to protect surface or groundwater. In addition to the requirements stated earlier in this chapter, additional measures which will protect surface or groundwater include, but are not limited to:

- Based on the General Order, recycled water used for irrigation has the potential to increase salts and other constituents in groundwater. The nitrogen found in recycled water are beneficial nutrients to promote plant growth but can degrade groundwater quality. Therefore, effluent limitations for salt and nitrogen are anticipated to be required and are included in **Table 5-2**.
- Recycled water must be applied at an agronomic rate to reduce the nutrients in groundwater supplies. Applying recycled water at an agronomic rate balances the amount of nutrients applied using recycled water with the amount of nutrients used by the plants.
- Order WQ 2016-0068-DDW includes a monitoring and reporting program (MRP) related to a recycled water system. Recycled water used for landscape irrigation will need to be sampled for priority pollutants at the frequency listed in **Table 5-3**.

Table 5-3: Monitoring and Reporting Program for Recycled Water Use

Constituent	Treatment System Flow Rate	Sample Frequency	Reporting Frequency
Priority Pollutants	<1mgd	5 years	The next annual report
	>1mgd	Annually	Annually

- Use areas will need to be monitored for recycled water flow, acreage applied, application rate, soil saturation/ponding, nuisance odors/vectors, and discharge off-site. Annual reports summarizing this information must be submitted to the California Regional Water Quality Control Board (Regional Board).

6 Recycled Water Market

The District's priority in consideration of producing recycled water is to supplement potable water used for irrigation in an effort to reduce demands on the groundwater supply and surrounding basin and supplement surface water supply reductions due to drought conditions. This section reviews the potential for use of recycled water for irrigation within the District service area.

6.1 Market Assessment Procedures

Landscape irrigation is considered the highest use category for the recycled water within the District. Recycled water for landscape irrigation can be used at non-residential land use categories such as office commercial, neighborhood commercial, general commercial, open space, golf, industrial, and institutional/public facilities. Assessment of the market is based on a review of existing customers currently using potable water for irrigation where recycled water use would be acceptable. Undeveloped land uses anticipated to have irrigated areas where recycled water use would be acceptable are also considered.

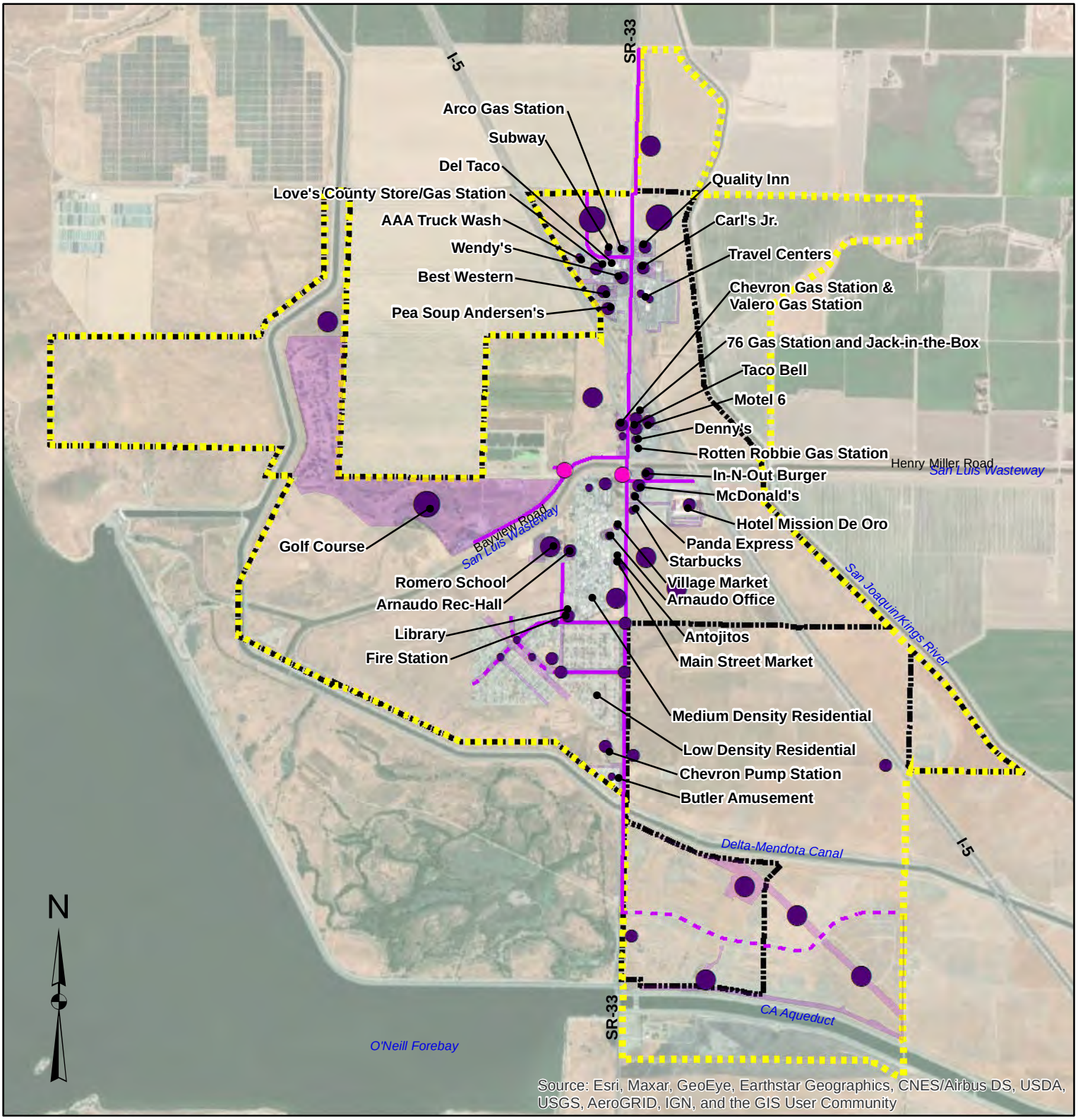
6.2 Potential Recycled Water Use Categories and Users

The District serves mainly residential and commercial customers, with limited industrial customers. Development trends for future land uses are consistent with the existing land uses, as discussed in Section 2. **Table 6-1** summarizes the existing land uses and customers that currently use potable water for landscape irrigation.

Table 6-1: Potential Recycled Water Customers

Land Use Designation for Irrigation Customer	Customer Description
Office Commercial	Arnaudo Office
Neighborhood Commercial	Laundry Mat
General Commercial - Restaurant	Carl's Jr., Del Taco, Starbucks; Quiznos/Pizza Factory, Wendy's, In-N-Out Burger, McDonald', Taco Bell, Antojitos, Denny's, Panda Express Subway
General Commercial - Retail	Main Street Market, Village Market, AAA Truck Wash, Chevron Gas Station, Rotten Robbie Gas Station, Valero Gas Station, Arco Gas Station, Love's Country Store; Gas Station
General Commercial - Hotel	Motel 6, Best Western, Holiday Inn Express
General Commercial - Mixed-Use	Travel Truck Wash; Travel Septic Dump; Travel Centers, Shell/76 Gas Station and Jack-in-the-Box, Pea Soup Service Station; Andersen's, Hotel Mission de Oro; Restaurant
Open Space (Irrigated)	Merced County
Industrial	Butler Amusement Ride Manufacturer
Institutional/Public Facilities	Arnaudo Rec-Hall, Romero Grammar School, Merced County (MC) Fire Department; MC Library, Community Park, Chevron Pump Station, California Highway Patrol (CHP) Scales

Distribution of recycled water to potential customers would be achieved through a recycled water distribution system to the recycled water use areas that include street medians, freeway corridors, and commercial institutional, community parks, and school turf areas. Purple pipes for a recycled water system are already constructed at the existing Santa Nella Village Phase 4A and Phase 4B developments, and at the future Parkway and Parkway South Developments. Recycled water pipelines are constructed along the street medians on West Centinella Avenue, Vera Cruz Drive, and proposed Parkway Boulevard. **Figure 6-1** presents the potential recycled water service areas based on the results of the market assessment.



0 1,100 2,200 3,300 4,400

Feet

Legend

- Community Specific Plan Area
- Specific Urban Development Area
- Irrigated Areas
- Potential Recycled Water Pipeline
- Existing Recycled Water Pipeline
- Recycled Water Hydrant

Demand Size

- < 1 afy
- 1 - 10 afy
- 10 - 50 afy
- > 50 afy

SANTA NELLA COUNTY WATER DISTRICT
RECYCLED WATER FEASIBILITY STUDY

FIGURE 6-1
POTENTIAL RECYCLED WATER IRRIGATION USE AREAS AND CUSTOMERS

6.3 Expected Recycled Water Use

The expected recycled water use is estimated based on the estimated irrigation use by existing commercial customers, estimated irrigation use for irrigated land within the District service areas, and estimated irrigation demand by future land uses.

6.3.1 Estimated Commercial Irrigation Usage

All District customers use potable water for irrigation. Some commercial connections have two meters, one for domestic use and one for irrigation use. Other commercial customers have a single meter for both domestic and irrigation. There are 36 irrigation water meters in the District. The District's commercial irrigation data is used to determine the existing annual irrigation usage and peak usage.

Table 6-2 presents the historical average day demand for irrigation water-based metered data from March 2006 through December 2016. The maximum month demand (MMD) peaking factor (PF) for recycled water was determined for each year by dividing the maximum month usage and by the average day demand (ADD). The average MMD PF is 2.6 as shown in **Table 6-2**.

Table 6-2: Annual Irrigation Use and Maximum Month Demand Peaking Factor

Year	ADD (gpd)	Max Month (gpd)	MMD/ADD PF
2006	56,754	124,573	2.2
2007	71,907	316,928	4.4
2008	74,543	355,316	4.8
2009	39,162	80,289	2.1
2010	45,005	115,611	2.6
2011	39,490	92,062	2.3
2012	91,370	193,649	2.1
2013	80,938	153,841	1.9
2014	57,416	101,108	1.8
2015	30,925	56,643	1.8
2016	34,431	79,145	2.3
		Average	2.6

[1] Based on District irrigation data for metered customers.

Hourly flow data is not recorded for commercial irrigation water usage. The peak hour irrigation demand (PHD) PF is assumed to be 3.0 since recycled water is expected to be irrigated 8 hours per day.

Table 6-3 provides a summary of the recycled water peaking factors used to estimate the MMD and PHD for landscape irrigation.

Table 6-3: Summary of Irrigation Usage Peaking Factors

Parameter	PF
ADD	1.0
MMD/ADD	2.6
PHD/MMD	3.0

To estimate the MMD for commercial irrigation usage, the ADD is multiplied by the MDD PF of 2.6 for each commercial customer. Refer to **Table 6-4** for a summary of the annual usage, MMD, and PHD irrigation usage for metered commercial customers.

Table 6-4: Metered Irrigation Annual Usage, MMD, and PHD from March 2006 to December 2016

Customer	Meter No.	Average Annual Demand (gallons)	Average Annual Demand (acre-ft)	Max Month Demand[1] (gpd)	Peak Hour Demand[2] (gpd)
Irrigation Use Area					
ARCO AM/PM (IRRIGATION)	COM001	223,872	0.69	1,574	4,722
ARNAUDO GOLF COURSE	COM003	2,331,870	7.16	16,396	49,188
ARNAUDO OFFICE	COM004	140,080	0.43	985	2,955
HOLIDAY INN EXPRESS (W/S)	COM014	863,369	2.65	6,071	18,212
MCDONALDS (IRRIGATION)	COM018	783,775	2.41	5,511	16,533
IN-N-OUT BURGER (IRRIGATION)	COM067	688,255	2.11	4,839	14,518
LOVE'S/PILOT TRUCK STOP (IRRIGATION)	COM025	1,872,944	5.75	13,169	39,508
MERCED CTY LANDSCAPE P-2 (IRR)		401	0.00	3	8
MERCY SPRINGS PRODUCE (IRR)		4,559	0.01	32	96
PANDA EXPRESS (IRRIGATION)	COM070	48,384	0.15	340	1,021
ROMERO GRAMMAR SCHOOL (IRRIGATION)	COM031	3,731,099	11.45	26,235	78,704
SHELL (IRRIGATION)	COM033	291,026	0.89	2,046	6,139
STARBUCKS (IRRIGATION)	COM037	318,534	0.98	2,240	6,719
TACO BELL (IRRIGATION)	COM041	735,944	2.26	5,175	15,524
TRAVEL CENTERS (IRRIGATION)	COM043	303,368	0.93	2,133	6,399
RAMADA INN #1 (IRRIGATION) GALLONS	COM028-1	476	0.00	3	10
RAMADA INN #2 (IRRIGATION) GALLONS	COM028-2	43,609	0.13	307	920

Customer	Meter No.	Average Annual Demand (gallons)	Average Annual Demand (acre-ft)	Max Month Demand[1] (gpd)	Peak Hour Demand[2] (gpd)
RAMADA INN #3 (IRRIGATION) GALLONS	COM028-3	1,274,373	3.91	8,961	26,882
RAMADA INN #4 (IRRIGATION) GALLONS	COM028-4	375,070	1.15	2,637	7,912
RAMADA INN #5 (IRRIGATION) GALLONS	COM028-5	122,982	0.38	865	2,594
RAMADA INN #6 (IRRIGATION) GALLONS	COM028-6	261,815	0.80	1,841	5,523
CENTINELLA & 33 (IRRIGATION) PHASE 1	COM050	557,614	1.71	3,921	11,762
VERA CRUZ & 33 (IRRIGATION) PHASE 2	COM051	543,884	1.67	3,824	11,473
VERA CRUZ & LUIS (IRRIGATION) PHASE 2	COM052	1,802,537	5.53	12,674	38,023
CENTINELLA & LUIS/LAS FLORES PHASE 4	COM053	106,884	0.33	752	2,255
CENTINELLA & VERA CRUZ (PHASE 4)	COM054	53,175	0.16	374	1,122
CENTINELLA & VERA CRUZ (PHASE 4) (SOUTH)	COM065	43,429	0.13	305	916
CENTINELLA & SANTA ROSA (PHASE 4) (SOUTH)	COM066	74,312	0.23	523	1,568
ARNAUDO IRRIGATION METER	COM073	1,647,152	5.05	11,582	34,745
RV PARK IRRIGATION METER	COM034	337,001	1.03	2,370	7,109
AAA TRUCK SERVICES (IRRIGATION)	COM077	544	0.00	4	11
SNMHP MAIN (W/S)	COM035	362,617	1.11	2,550	7,649
SUB-TOTAL		19,944,954	61.21	140,239	420,718
NO SEWER-DOMESTIC WATER ONLY					
BUTLER AMUSEMENTS	COM008	230,268	0.71	1,619	4,857
CHP	COM062	188,550	0.58	1,326	3,977
TALBOT	COM057	36,499	0.11	257	770
SUB-TOTAL		455,318	1.40	3,201	9,604
HYDRANT METER USAGE[3]					
HYDRANT METER	COM048	41,589	0.13	91	91
HYDRANT METER	COM049	195,248	0.60	254	254
SUB-TOTAL		236,837	0.73	345	345
TOTAL		20,637,109	63.33	143,786	430,667

[1]MMD = Average Annual Demand * 2.6
[2]PHD = MMD * 3.0
[3]MMD and PHD is the highest usage from 2006 to 2016

Approximately 63.3 acre-ft/yr of potable water is used for landscape irrigation. It is expected that commercial irrigation usage is more than 63.3 acre-ft/yr because some commercial irrigation users are not metered. An irrigation demand factor of 3.5 ac-ft/yr/ac, based on the 2019 Water Master Plan unit demand factor for open space/park land use, was used to estimate the annual irrigation usage for non-metered irrigation customers. **Table 6-5** summarizes the estimated irrigation usage for non-metered customers. The total estimated annual irrigation is 33.68 ac-ft. The estimated MMD is 77,171 gpd and the PHD is 231,513 gpd by using the peaking factors listed in **Table 6-3**.

Table 6-5: Estimated Non-Metered Irrigation Annual Usage, MMD, and PHD

Description	Parcel Area[1] (Acres)	Irrigation Area[2] (Acres)	Irrigation Demand Factor[3] (ac-ft/yr/ac)	Annual Irrigation (ac-ft)	MMD[4] (gpd)	PHD[5] (gpd)
Antojitos Mexicanos	0.51	0.24	3.5	0.83	1,899	5,696
Arnaudo Rec-Hall	1.28	0.94	3.5	3.29	7,529	22,588
Best Western	3.78	1.43	3.5	5.00	11,448	34,345
Carl's Jr	2.33	1.29	3.5	4.52	10,347	31,040
Chevron Gas Station	1.14	0.71	3.5	2.49	5,701	17,104
Chevron Pump	1.62	0.48	3.5	1.68	3,851	11,552
Denny's	0.90	0.35	3.5	1.21	2,778	8,335
Fire Station/Library	0.91	0.67	3.5	2.36	5,405	16,215
Laundry Mat	0.04	0.04	3.5	0.13	290	870
Main Street Market	0.51	0.06	3.5	0.21	479	1,437
Motel 6	2.09	0.86	3.5	3.02	6,927	20,781
Pea Soup Andersen's	3.54	1.46	3.5	5.13	11,745	35,236
Rotten Robbie	4.81	0.14	3.5	0.49	1,115	3,344
Subway Restaurant	0.86	0.08	3.5	0.30	680	2,039
Valero Gas Station	0.55	0.24	3.5	0.84	1,914	5,742
Village Market	0.72	0.10	3.5	0.35	801	2,403
Wendy's	1.38	0.53	3.5	1.86	4,262	12,786
TOTAL	26.97	9.62		33.68	77,171	231,513

[1]Merced County Assessment Parcels 09 2018 data.
[2]Estimated turf area.
[3]2019 Water Master Plan.
[4]MDD = Average Irrigation * 2.6
[5]PHD = MMD * 3.0

Commercial businesses are expected to use approximately 97 acre-ft annually for landscape irrigation. A summary of the estimated recycled water irrigation usage for metered and non-metered customers is listed in **Table 6-6**.

Table 6-6: Summary of Metered and Non-Metered Commercial Irrigation Usage

Recycled Water Irrigation Data	Average Demand		MMD[1]		PHD[2]	
	(ac-ft/yr)	(gpm)	(gpd)	(gpm)	(gpd)	(gpm)
Metered	63	39	143,786	100	430,667	299
Non-metered	34	21	77,171	54	231,513	161
Total	97	60	220,957	153	662,180	460

[1]MDD = Average Demand * 2.6
[2]PHD = MMD * 3.0

6.3.2 Estimated Golf Course Irrigation Usage

The SNCWD service area includes one (1) golf course (Forebay Golf Course) located west and south of the WWTP. The District has provided water service to the golf course for domestic use only. Golf course irrigation water supply is via a direct diversion of surface water from the SLWD. The golf course is considered to be a potential recycled water user for landscape irrigation, although it is currently closed for public use.

The Forebay Golf Course is estimated to irrigate approximately 136 acres of land within the 154-acre parcel. Approximately 9.5 acres of the golf course is still undeveloped. By multiplying the irrigation area (136 acres) with the irrigation demand factor (3.5 ac-ft/yr/ac), the total annual irrigation for the golf course is estimated to be 476 ac-ft. Using the same methodology to estimate the MMD and PHD for commercial users, the MMD and PHD for the golf course are 1.1 mgd and 3.3 mgd, respectively. Refer to **Table 6-7** for a summary of the golf course recycled water irrigation usage.

Table 6-7: Summary of Golf Course Recycled Water Irrigation Usage

Recycled Water Irrigation Data	Average Demand		MMD[1]		PHD[2]	
	(ac-ft/yr)	(gpm)	(gpd)	(gpm)	(gpd)	(gpm)
Golf Course	476	295	1,090,254	757	3,270,762	2,271

[1]MDD = Average Demand * 2.6
[2]PHD = MMD * 3.0

6.3.3 Estimated Future Commercial Land Use Irrigation Usage

Future irrigation demands were estimated based on anticipated future development within the District service area and were divided into four (4) different land-use categories to estimate the total recycled water annual irrigation usage. To estimate the future development irrigation area, information for developed commercial parcels was used. The irrigation area (9.62 acres) divided by the parcel area (26.97 acres) is equal to 36 percent. Approximately 36% of the total parcel area is dedicated to irrigation.

For future development, the area for each land use designation was estimated based on the 2030 General Plan and County GIS data. The irrigation area for each land use designation was assumed to be 36% of the total area. Multiplying the irrigation demand factor (3.5 ac-ft/yr/ac) by the estimated irrigation area, results in a total annual irrigation usage of 234 ac-ft per year. The MMD and PHD for the future developments are 0.67 mgd and 2.00 mgd, respectively, by using the peaking factors listed in **Table 6-3**. Refer to **Table 6-8** for a summary of the estimated recycled water irrigation usage from future commercial developments.

Table 6-8: Future Commercial Developments Recycled Water Irrigation Usage

Future Development Land Use Designation	Total Area[1] (ac)	Estimated Irrigation Area[2] (ac)	Irrigation Demand Factor[3] (ac-ft/yr/ac)	Annual Irrigation (ac-ft)	MMD[4] (gpd)	PHD[5] (gpd)
Office Commercial	28.2	10.1	3.5	35	80,701	242,103
Neighborhood Commercial	5.4	1.9	3.5	7	15,473	46,419
General Commercial	190.9	68.1	3.5	238	546,282	1,638,846
Golf	9.5	3.4	3.5	12	27,061	81,184
Total	234.0	83.5		292	669,517	2,008,551

[1]The area for each land use was obtained from the 2030 General Plan and the GIS data.
[2]The irrigation area for each land use was estimated by multiplying the total area with 36%.
[3]The irrigation demand factor (3.5 ac-ft/yr/ac) is from the SNCWD Water Master Plan prepared by Black Water Consulting Engineers, Inc. in September 2018.
[4]MDD = Average Demand * 2.6
[5]PHD = MMD * 3.0

6.3.4 Future Parkway Development Irrigation Usage

The Parkway/Parkway South Development and Parkway East Development (Parkway) are expected to be developed within the 10-year planning horizon. The planned Parkway is expected to have a total irrigation area of 21.6 acres. The area for each land use designation was estimated based on the 2030 General Plan, County GIS data, and the Improvement Plans for Parkway Boulevard. The same methodology for the future commercial developments was used to calculate the annual irrigation, MMD, and PHD. Refer to **Table 6-9**.

Table 6-9: Parkway Irrigation Usage

Parkway Irrigation Land Use Designation	Total Area[1] (ac)	Estimated Irrigation Area[2] (ac)	Irrigation Demand Factor[3] (ac-ft/yr/ac)	Annual Irrigation (ac-ft)	MMD[4] (gpd)	PHD[5] (gpd)
Neighborhood Commercial	3.0	1.1	3.5	4	8,539	25,616
Parkway Community Park[6]	18.6	18.6	3.5	65	148,914	446,742
Total	21.6	19.6		69	157,453	472,358

[1]The area for each land use was obtained from the 2030 General Plan and GIS data.
[2]The irrigation area for each land use was estimated by multiplying the total area with 36%.
[3]The irrigation demand factor (3.5 ac-ft/yr/ac) is from the SNCWD Water Master Plan prepared by Black Water Consulting Engineers, Inc. in January 2019.
[4]MDD = Average Demand * 2.6
[5]PHD = MMD * 3.0
[6]Total and estimated irrigation area is from Improvement Plans for Parkway Boulevard, the Parkway, MSA #04016

6.3.5 Commercial Truck Fill Station Program

For construction purposes, many wastewater agencies in California have opened a Recycled Water Commercial Truck Fill Station program to supply disinfected tertiary recycled water to licensed contractors for the use of soil compaction, dust control, landscape irrigation, power washing, and sewer flushing. The licensed contractor can access the recycled water through a commercial fill station or a purple recycled water hydrant. The District currently has two metered hydrants that are used for the sale of water for construction or other approved uses. A truck fill program is being considered to provide recycled water to licensed contractors for approved uses.

The recycled water usage for the truck fill program is estimated based on the water truck capacity and the total amount of use per year. Typically, a water truck can hold approximately 2,000 gallons of water. The truck fill program is expected to be open 12 hours per day from Monday through Friday (5 days per week). Assuming the water trucks carry 5 loads per day (1 load = 2,000 gallons) for 8 months, the total estimated recycled water usage is approximately 5.33 ac-ft/yr. Refer to **Table 6-10** for a summary of the truck fill program usage calculations.

Table 6-10: Estimated Recycled Water Commercial Truck Fill Program Demand

Parameter	Value	Unit
Estimating the Amount of Recycled Water Usage		
Water truck capacity	2,000	gals/load
Number of water truck loads	5	loads/day
Total Amount of Recycled Water Use[1]	*10,000*	*gpd*
Estimating Time of Recycled Water Usage		
Time of use per week	5	days/week
Time of use per year	8	months/yr
Total Time of Recycled Water Use[2]	*174*	*days/yr*
Determining Recycled Water Usage		
Total Amount of Use	10,000	gpd
Total Time of Use	174	days/yr
Total Recycled Water Demand[3]	*1,738,097*	*gals/yr*
Total Recycled Water Demand	*5.33*	*ac-ft/yr*

[1]Multiply truck capacity with no. of loads per day to generate the amount of recycled water use.
[2]Convert total recycled water usage time to days per year.
[3]Multiply the total amount by the total time to generate the total recycled water usage per year.

6.3.6 Summary of Potential Recycled Water Demand

The projected annual demand for recycled water is 939 ac-ft. If the District plans to provide recycled water to all potential users, a MMD of 1,485 gpm will be used to size the treatment plant and a PHD of 4,454 gpm will be used to size the transmission and distribution recycled water pipelines. **Table 6-11** summarizes the demand for the potential recycled water users within the District service area.

Table 6-11: Summary of Potential Recycled Water User Demands

User	Average Demand		MMD[1]		PHD[2]	
	(ac-ft/yr)	(gpm)	(gpd)	(gpm)	(gpd)	(gpm)
Commercial Irrigation	97	60	220,957	153	662,180	460
Parkway Irrigation	69	43	157,453	109	472,358	328
Golf Course Irrigation	476	295	1,090,254	757	3,270,762	2,271
Future Commercial Irrigation	292	181	669,517	465	2,008,551	1,395
Commercial Truck Fill Station	5	3	-	-	-	-
Total	939	582	2,138,180	1,485	6,413,851	4,454

[1]MDD = Average Demand * 2.6
[2]PHD = MMD * 3.0

6.4 Estimated Internal Capital Investment Required

Section 8.5 includes estimates on the internal capital investment required for implementing recycled water alternatives.

6.5 Needed Water Cost Savings

Potable water costs for the District are expected to rise due to the need for improvements to the SWTP and the construction of an additional well. The demand for recycled water is expected to increase due to the rising costs of potable water. A recycled water system will reduce the amount of potable water being applied to landscape irrigation.

6.6 Desire to Use Recycled Water

Recycled water has become an important resource in California, especially during the drought years. The drought in 2015 caused many residents, farmers, and companies to reduce their water consumption by 25 percent. The District plans to produce recycled water to help conserve water and reduce the amount of potable water being used for landscape irrigation. Providing recycled water to the community will offset potable water use during the drought years when surface water curtailments occur. It is anticipated that the desire to use recycled water will increase as water use regulations, specifically due to drought within the region, will increase in the near-term. Recycled water is much more affordable compared to potable water. Many agencies throughout California are charging customers at a much lower rate when using recycled water. **Table 6-12** provides a comparison of potable and recycled water rates from different agencies in California.

Table 6-12: Comparison of Recycled Water and Potable Water Rates for Various Agencies

Agency	Recycled Water Rate	Potable Water Rate
City of San Diego	$1.734 per HCF	$6.032 per HCF
City of Santa Clara	$3.74 per HCF	$6.22 per HCF
City of San Jose[1]	$3.114 per HCF	$2.10 - $5.13 per HCF
City of Milpitas	$2.78 per HCF	$5.63 per HCF
CCCSD and CCWD[2]	$1.32 - $2.76 per HCF	$4.59 per HCF
City of Glendale[1]	$2.67 per HCF	$3.95 per HCF
City of Livermore[1]	$2.97 per HCF	$3.67 per HCF

[1]Additional fee for meter size

[2]Central Contra Costa Sanitary District (CCSD) and Contra Costa Water District (CCWD)

6.7 Date of Possible Initial Use of Recycled Water

The design and construction of improvements to provide recycled water are estimated to take 5 years from the date the project authorized and funded.

6.8 Present and Future Source of Water and Quantity of Use

Chapter 3 discussed the present and future sources of potable water for the District and the existing and future potable water demands.

The source for recycled water would be disinfected tertiary effluent produced by the WWTP. The quantity of recycled water use has been estimated and summarized in Section 6.3.

6.9 Quality and Reliability Needs

The District is experiencing issues with the quality and reliability of their water system as discussed in Chapter 3.

The quality and reliability needs for recycled water would be determined by waste discharge requirements issued by the Regional Board. The requirements will most likely be consistent with the WRC.

6.10 Wastewater Disposal Methods

As described in Section 4.3.2, all of the effluent from the WWTP is used for irrigation of pasture land owned by the District.

7 Project Alternative Analysis

7.1 Planning and Design Assumptions

Design criteria are established for planning and design to maintain operational and performance required by the District. **Table 7-1** summarizes the operational and performance criteria for recycled water transmission and distribution pipelines, system pressures and storage capacity.

Table 7-1: Operational and Performance Design Criteria

Component	Criteria
Distribution and Transmission Main Sizing	
Minimum Pressure	40 psi
Maximum Velocity	7 fps
Recycled Water Pipelines	
Existing Pipeline Material[1]	PVC C900 CL150
Future Pipeline Material	PVC C900 CL150
Hazen-Williams "C" Factor	150
Recycled Water Peaking Factors	
MMD/ADD	2.6
PHD/MMD	3.0
Hours of Irrigation	8 hrs/d
Storage Sizing	
Operational Storage[2]	MMD

[1]Existing pipelines are polyvinyl chloride (PVC) C900 CL150 based on the Improvement plans for Parkway Boulevard, Santa Nella Village Phase 4B, MSA #04007, and Santa Nella Village Phase 4A, MSA #99005.
[2]Operational storage is based on providing storage equivalent to one day of maximum month demand.

7.1.1 Cost Index, Discount Rate, Useful Lives

Capital costs and operation and maintenance costs for each alternative were developed and incorporated into a 40-year equivalent annual cost (EAC). The EAC assumed a real interest rate of 2 percent and a discount rate of 6 percent. The District uses the Consumer Price Index to determine a percentage inflation rate, according to the service provided and the current year of service. For the purposes of this Feasibility Study, a 3.4% increase per year was used to estimate future costs and revenue requirements.

The overall project is estimated to have a useful life of 40 years. This was based on the assumption that the distribution piping has an expected useful life of 40 years and assets with shorter expected useful lives will be replaced or rehabilitated as needed.

7.1.2 Planning Period

The estimated planning period for providing recycled water and financing the project is as follows:

- Implementation Schedule = 10 years
- Useful Life of Project = 40 years
- Financing Period = 40 years

7.2 Water Recycling Alternatives to be Evaluated

Four (4) different recycled water alternatives were evaluated and analyzed to determine the recommended alternative for this Feasibility Study. All alternatives, except the 'No Project' alternative, will include upgrading the existing WWTP to produce disinfected tertiary treatment effluent. Alternatives to be considered for this project are described in **Table 7-2**.

Table 7-2: Water Recycling Alternatives

Alternative	Description
1	No Project
2	Upgrade of the existing WWTP treatment process to produce disinfected tertiary effluent for disposal via landscape irrigation within the public R-O-W throughout the District service area but primarily along the SR-33 corridor.
3	Upgrade of the existing WWTP treatment process to produce disinfected tertiary effluent for disposal via landscape irrigation within the public R-O-W and at the Forebay Golf Course.
4	Upgrade of the existing WWTP treatment process to produce disinfected tertiary effluent for disposal via landscape irrigation within the public R-O-W, at the Forebay Golf Course, and at future developments.

7.3 Alternative Levels of Treatment

The level of treatment required for the different water recycling alternatives is determined by the end use of the effluent. For Alternative 1, the no project alternative, the WWTP will continue to produce undisinfected secondary effluent for irrigation at the site. For Alternatives 2-4, the WWTP will be upgraded to produce disinfected tertiary effluent suitable for irrigation of parks, landscaping, and unrestricted access golf courses.

7.4 Alternative Unit Processes

For each alternative, three different types of unit processes were evaluated to determine which technology best meets the project objective. To achieve tertiary treatment, the District may keep its existing aerated pond system and add pre-treatment filtration prior to installing a tertiary filter (Process A). Another method to achieve tertiary treatment is to convert the existing aerated ponds to an extended aeration pond system and add a secondary clarifier. Part of the effluent from the secondary clarifier will flow into a tertiary filtration system and the remainder will be discharged into the existing on-site disposal area (Process B). An attached growth system could be used instead of an extended aeration system (Process C). Refer to **Table 7-3** for a summary of the three different types of unit processes evaluated for each recycled water alternative.

Table 7-3: Alternative Unit Processes Evaluated

Treatment Unit Process A	Treatment Unit Process B	Treatment Unit Process C
Undisinfected Secondary Treatment • Keep existing aerated pond system (two lined treatment ponds and four unlined storage ponds) • Install a pre-filter treatment after the existing aerated pond system to remove the algae in the unlined storage pond prior to tertiary treatment	**Undisinfected Secondary Treatment** • Convert existing aeration pond system to an extended aeration pond system for higher quality treatment and smaller treatment area • Install a secondary clarifier to settle and remove the microorganisms from the treated wastewater	**Undisinfected Secondary Treatment** • Upgrade existing aeration pond system to an attached growth system for lower energy requirements, simpler operation, and less maintenance • Install a secondary clarifier to settle and remove the microorganisms from the treated wastewater
Tertiary Treatment • Install a tertiary filtration system to treat a portion of the wastewater to tertiary level for the use of commercial and residential landscape irrigation, school grounds, golf courses, and parks • Install a chlorine contact tank or an ultraviolet light to disinfect the tertiary treated wastewater prior to storage • Install a storage tank prior to distributing the tertiary treated recycled water to potential customers	**Tertiary Treatment** • Install a tertiary filtration system to treat a portion of the wastewater to tertiary level for the use of commercial and residential landscape irrigation, school grounds, golf courses, and parks • Install a chlorine contact tank or an ultraviolet light to disinfect the tertiary treated wastewater prior to storage • Install a storage tank prior to distributing the tertiary treated recycled water to potential customers	**Tertiary Treatment** • Install a tertiary filtration system to treat a portion of the wastewater to tertiary level for the use of commercial and residential landscape irrigation, school grounds, golf courses, and parks • Install a chlorine contact tank or an ultraviolet light to disinfect the tertiary treated wastewater prior to storage • Install a storage tank prior to distributing the tertiary treated recycled water to potential customers

7.4.1 Secondary Treatment

Secondary treatment uses biological processes to remove organic matter from wastewater. Microorganisms convert the organic matter into new cells which can be easily removed from the wastewater by either settling or filtration and through byproducts such as carbon dioxide and water. The microorganisms can be grown in suspension and/or attached to a type of media as part of the treatment process.

Several manufacturers offer extended aeration package plants, which are cost-effective options for small wastewater treatment plants. These package plants are designed to have small footprints and include design drawings and equipment for a complete wastewater treatment plant. The attached growth processes system is another technology used for secondary treatment. The technology has lower energy requirements and is easier to operate and maintain. It is very effective for BOD removal, nitrification, and denitrification.

7.4.2 Secondary Clarification

Secondary clarification is typically required after secondary treatment to settle and remove the microorganisms from the treated wastewater. Secondary treatment options include secondary clarifiers (package plants) or replace the need for clarifiers. Secondary clarifiers are most commonly circular, although rectangular clarifiers can also perform acceptably.

7.4.3 Pre-Filter Treatment

Pre-filter treatment may be installed prior to the tertiary filtration process to capture large amounts of solids and remove any algae in the wastewater. This technology is easy to operate and consists of an automatic backwash mechanism. It provides long-term operation with minimal maintenance and permanently eliminates the need to replace the filter media.

7.4.4 Tertiary Filtration

Tertiary Treatment is defined as wastewater receiving advanced treatment beyond secondary treatment by removing suspended solids remaining in the secondary effluents. Recycled water used for landscape irrigation, unrestricted-access golf courses, residential landscaping, school grounds, parks and playgrounds, and food crops must be disinfected tertiary treated recycled water.

Several manufacturers offer a continuously backwashing granular media filter. This type of filter is similar to a typical sand filter, except that the sand is continuously backwashing with an internal air-scour washing system. Another tertiary treatment is the membrane filtration which relies on membranes to remove small particles from the treated wastewater.

Cloth media filters are a low energy process that uses cloth media to filter out solids. The pore size for the cloth is limited to 10 microns. The media is mounted on discs that rotate in a submerged basin, allowing the wastewater to flow by gravity through the media. The media is routinely cleaned using vacuum headers that remove solids from the cloth media surface.

7.4.5 Disinfection

Chlorine is the most widely used disinfectant for municipal wastewater. Chlorine destroys target organisms by oxidizing cellular material and can be supplied in several forms, including chlorine gas and sodium hypochlorite solutions of different concentrations. Chlorine is advantageous because it is cost-effective and has a residual that can be measured to confirm adequate dosage and prolong disinfection beyond the initial treatment. Because of safety concerns associated with chlorine gas, facilities most commonly use sodium hypochlorite solution which is either delivered or generated on-site.

An ultraviolet (UV) disinfection system transfers electromagnetic energy from a mercury arc lamp to an organism's genetic material. UV disinfection systems can be open or enclosed type reactors and can have low pressure or medium pressure lamps. UV disinfection is a physical process rather than the chemical

process, which eliminates the need to handle toxic or hazardous chemicals. Therefore, this type of disinfection process has no residual effect that can be harmful to human or aquatic life. Also, UV disinfection requires a smaller footprint compared to other types of disinfection systems because less exposure time is required. Disadvantages associated with UV disinfection are the need for higher energy requirements than other technologies, potential ineffectiveness if the channels, equipment, and upstream piping are not kept clean, potential ineffectiveness if the effluent contains particulate matter which can shield the pathogens and prevent penetration of the UV light and potential high operator requirements associated with maintaining the lamps and control system. UV disinfection systems are also rapidly changing, and the availability of replacement parts may become limited soon after the system has been installed.

7.5 Water Recycling Alternatives to be Evaluated

7.5.1 Alternative 1 – No Project

Alternative 1, the "No Project" alternative assumes the treatment plant will continue to operate in its present condition. The treatment and disposal facilities at the WWTP site would remain the same and provide undisinfected secondary treatment only. No improvements to existing equipment, facilities, or the treatment process are considered. This alternative will be used as a baseline for comparison of the other alternatives.

7.5.2 Alternative 2 – Landscape Irrigation within the Public Right-of-way

Alternative 2 consists of upgrading the existing WWTP treatment process to produce tertiary treated effluent for disposal via landscape irrigation within the public R-O-W throughout SNCWD service area but primarily along the SR-33 corridor. Existing commercial businesses, the Parkway, and a commercial truck fill station program are being considered as potential recycled water customers for this alternative. Refer to **Table 7-4** for a summary of the potential recycled water customers and demands.

Table 7-4: Potential Recycled Water Customers and Demands for Alternative 2

User	Average Demand		MMD[1]		PHD[2]	
	(ac-ft/yr)	(gpm)	(gpd)	(gpm)	(gpd)	(gpm)
Commercial Irrigation						
Metered Commercial	63	39	143,786	100	430,667	299
Non-metered Commercial	34	21	77,171	54	231,513	161
Parkway Irrigation	69	43	157,453	109	472,358	328
Commercial Truck Fill Station	5	3	-	-	-	-
Total	171	106	378,409	263	1,134,538	788

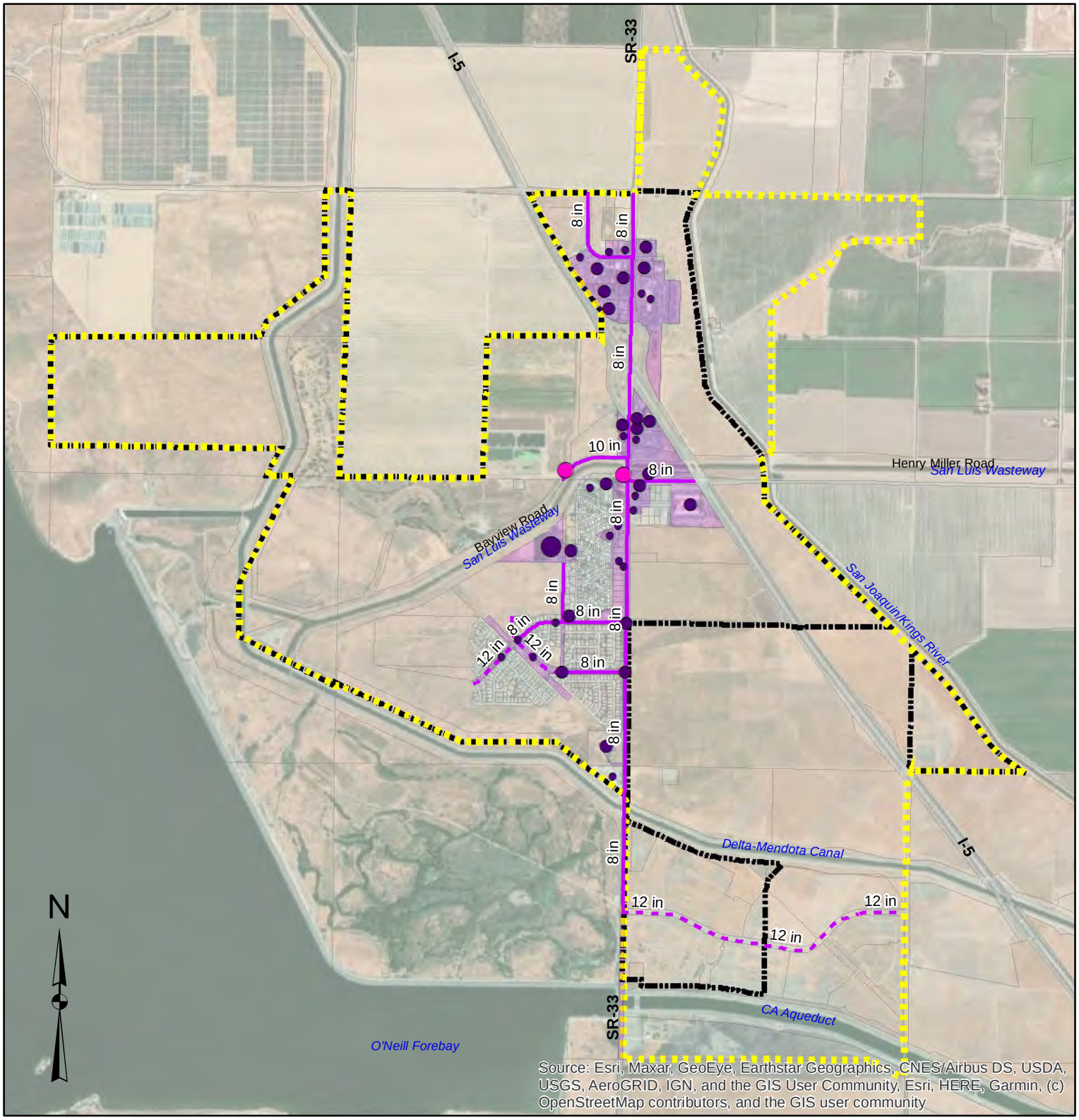
[1]MDD = Average Demand * 2.6
[2]PHD = MMD * 3.0

For Alternative 2, a PHD of 788 gpm is used to design the transmission and distribution pipelines. Sizing for future recycled water pipelines is based on the design pipe velocity and peak hour flow rate. The minimum required pipe diameter to serve the customers for this alternative is 8-inch. **Table 7-5** provides a summary of the minimum required pipe diameter for Alternative 2.

Table 7-5: Minimum Required Pipe Diameter for Alternative 2

Status	Minimum Required Pipe Diameter (in)	Length (ft)
Future	8	20,717
Future	10	1,354
Existing	12	8,112

A MMD of 263 gpm is used to design the recycled water facility and storage capacity. The operational storage is assumed to be the MMD. Based on this assumption, the recommended operational storage is equal to 380,000 gallons. **Appendix B** provides the hydraulic calculations for this alternative. The locations of the potential customers, treatment technologies, and approximate pipeline routes for Alternative 2 are shown in **Figure 7-1**.



0 1,100 2,200 3,300 4,400

Feet

Legend

- Community Specific Plan Area
- Specific Urban Development Area
- Potential Recycled Water Use Area
- Potential Recycled Water Pipeline
- Existing Recycled Water Pipeline
- Recycled Water Hydrant

Demand Size

- < 1 afy
- 1 - 10 afy
- 10 - 50 afy

SANTA NELLA COUNTY WATER DISTRICT
RECYCLED WATER FEASIBILITY STUDY

FIGURE 7-1
PROPOSED RECYCLED WATER DISTRIBUTION SYSTEM FOR ALTERNATIVE 2

7.5.3 Alternative 3 – Landscape Irrigation within the Public Right-of-way and Golf Course

Alternative 3 consists of upgrading the existing WWTP treatment process to produce tertiary treated effluent for disposal via landscape irrigation within the public R-O-W and at the Forebay Golf Course. Existing commercial businesses, the Parkway, the golf course, and a commercial truck fill station program are being considered as potential recycled water customers for this alternative. Refer to **Table 7-6** for a summary of the potential recycled water customers and demands used to design the tertiary treated treatment plant and the transmission and distribution pipelines.

Table 7-6: Potential Recycled Water Customers and Demands for Alternative 3

User	Average Demand		MMD[1]		PHD[2]	
	(ac-ft/yr)	(gpm)	(gpd)	(gpm)	(gpd)	(gpm)
Commercial Irrigation						
Metered Commercial	63	39	143,786	100	430,667	299
Non-metered Commercial	34	21	77,171	54	231,513	161
Parkway Irrigation	69	43	157,453	109	472,358	328
Commercial Truck Fill Station	5	3	-	-	-	-
Golf Course Irrigation	476	295	1,090,254	757	3,270,762	2,271
Total	647	401	1,468,663	1,020	4,405,300	3,059

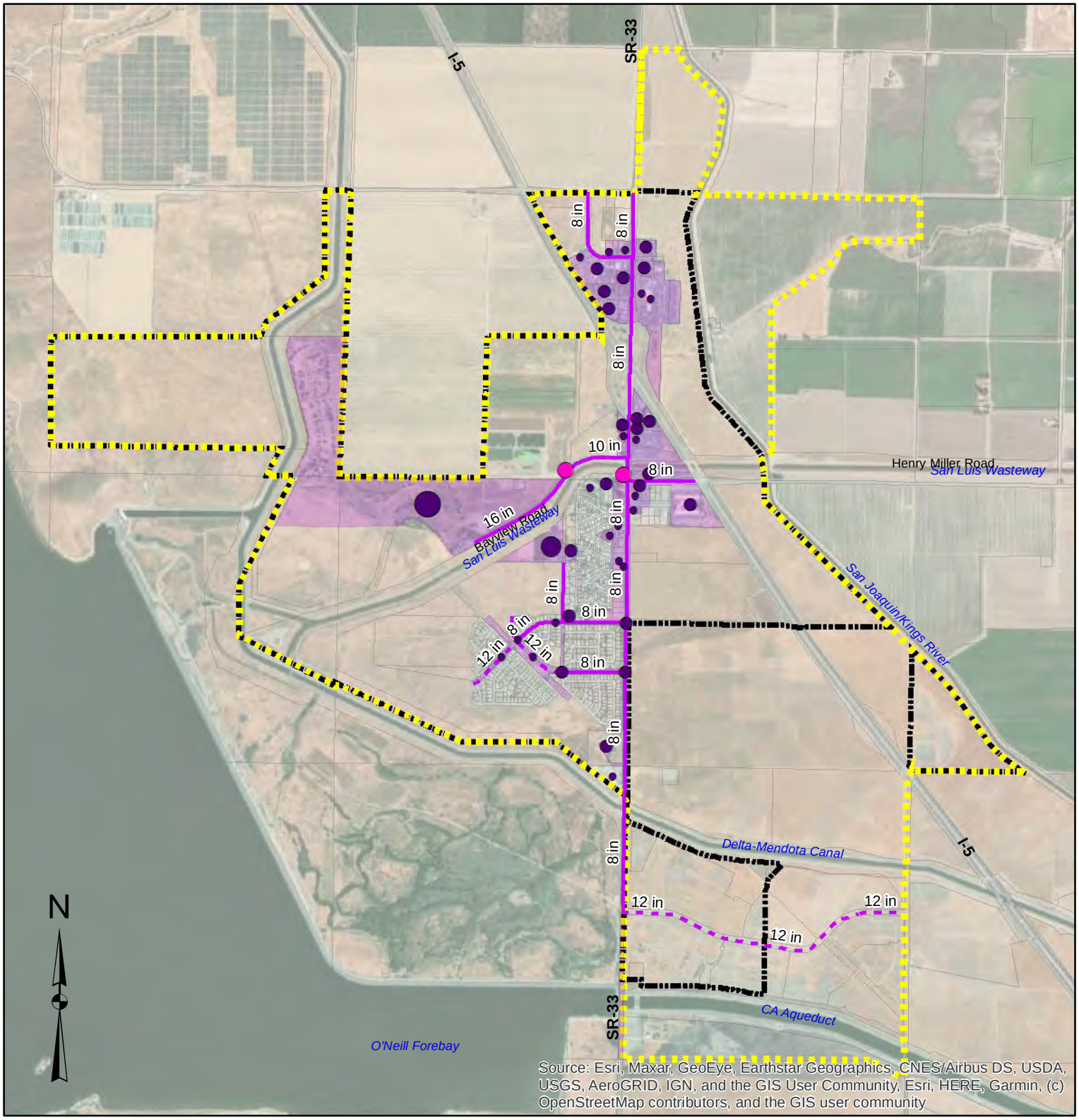
[1]MDD = Average Demand * 2.6
[2]PHD = MMD * 3.0

For Alternative 3, a PHD of 3,059 gpm is used to design the transmission and distribution pipelines. Sizing for future recycled water pipelines is based on the design pipe velocity and peak hour flow rate. The minimum required pipe diameter to serve the customers for this alternative is shown in **Table 7-7**.

Table 7-7: Minimum Required Pipe Diameter for Alternative 3

Status	Minimum Required Pipe Diameter (in)	Length (ft)
Future	8	20,717
Future	10	1,354
Future	16	2,002
Existing	12	8,112

A MMD of 1,020 gpm is used to design the recycled water facility and storage capacity. The operational storage is assumed to be the MMD. Based on this assumption, the recommended operational storage is equal to 1.5 MG. **Appendix B** provides the hydraulic calculations for this alternative. The locations of the potential customers, treatment technologies, and approximate pipeline routes for Alternative 3 are shown in **Figure 7-2**.



0 1,100 2,200 3,300 4,400

Feet

Legend

- Community Specific Plan Area
- Specific Urban Development Area
- Potential Recycled Water Use Area
- Potential Recycled Water Pipeline
- Existing Recycled Water Pipeline
- Recycled Water Hydrant

Demand Size

- < 1 afy
- 1 - 10 afy
- 10 - 50 afy
- > 50 afy

SANTA NELLA COUNTY WATER DISTRICT
RECYCLED WATER FEASIBILITY STUDY

FIGURE 7-2
PROPOSED RECYCLED WATER DISTRIBUTION SYSTEM FOR ALTERNATIVE 3

7.5.4 Alternative 4 – Upgrade WWTP within the Public Right-of-way

Alternative 4 consists of upgrading the existing WWTP treatment process to produce tertiary treated effluent for disposal via landscape irrigation within the public R-O-W, at the Forebay Golf Course, and at future developments, via a purple pipe recycled water system. Existing commercial businesses, the Parkway, the golf course, future commercial planned development, and a commercial truck fill station program are being considered as potential recycled water customers for this alternative. Refer to **Table 7-8** for a summary of the potential recycled water customers and demands used to design the tertiary treated treatment plant and the transmission and distribution pipelines.

Table 7-8: Potential Recycled Water Customers and Demands for Alternative 4

User	Average Demand		MMD[1]		PHD[2]	
	(ac-ft/yr)	(gpm)	(gpd)	(gpm)	(gpd)	(gpm)
Commercial Irrigation						
Metered Commercial	63	39	143,786	100	430,667	299
Non-metered Commercial	34	21	77,171	54	231,513	161
Parkway Irrigation	69	43	157,453	109	472,358	328
Commercial Truck Fill Station	5	3	-	-	-	-
Golf Course Irrigation	476	295	1,090,254	757	3,270,762	2,271
Future Commercial Irrigation	292	181	669,517	465	2,008,551	1,395
Total	939	582	2,138,180	1,485	6,413,851	4,454

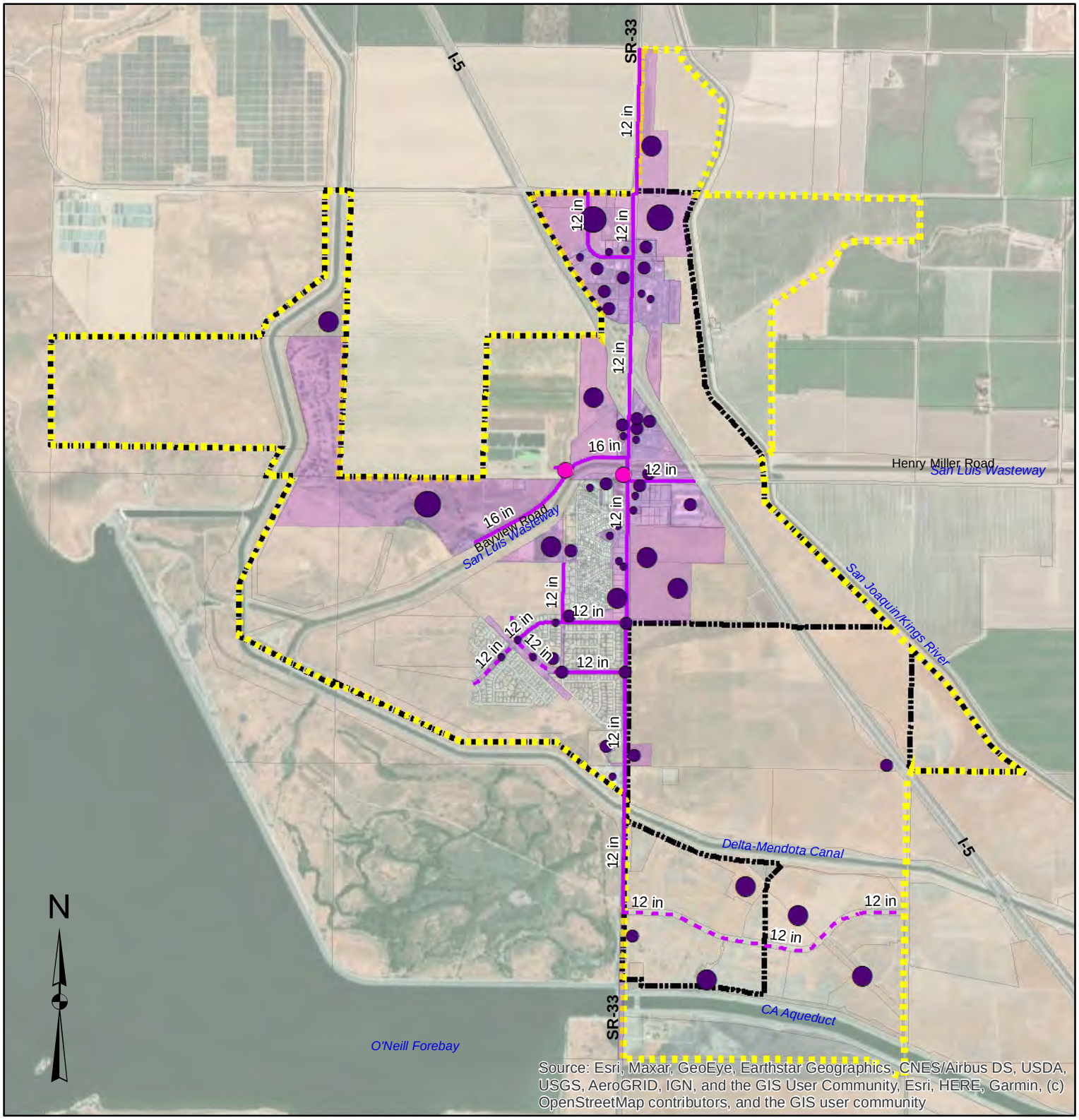
[1]MDD = Average Demand * 2.6
[2]PHD = MMD * 3.0

For Alternative 4, a PHD of 4,454 gpm is used to design the transmission and distribution pipelines. Sizing for future recycled water pipelines is based on the design pipe velocity and peak hour flow rate. The minimum required pipe diameter to serve the customers for this alternative is shown in **Table 7-9**.

Table 7-9: Minimum Required Pipe Diameter for Alternative 4

Status	Minimum Required Pipe Diameter (in)	Length (ft)
Future	12	23,416
Future	16	3,356
Existing	12	8,112

A MMD of 1,485 gpm is used to design the recycled water facility and storage capacity. The operational storage is assumed to be the MMD. Based on this assumption, the recommended operational storage is equal to 2,200,000 gallons. **Appendix B** provides the hydraulic calculations for this alternative. The locations of the potential customers, treatment technologies, and approximate pipeline routes for Alternative 4 are shown in **Figure 7-3**.



0 1,100 2,200 3,300 4,400
Feet

Legend

- Community Specific Plan Area
- Specific Urban Development Area
- Potential Recycled Water Use Area
- Potential Recycled Water Pipeline
- Existing Recycled Water Pipeline
- Recycled Water Hydrant

Demand Size
- < 1 afy
- 1 - 10 afy
- 10 - 50 afy
- > 50 afy

SANTA NELLA COUNTY WATER DISTRICT
RECYCLED WATER FEASIBILITY STUDY

FIGURE 7-3
PROPOSED RECYCLED WATER DISTRIBUTION SYSTEM FOR ALTERNATIVE 4

7.6 Non-Recycled Water Alternative

No other potentially viable new sources of water have been identified. The District currently relies on both groundwater and surface water from the San Luis Canal/California Aqueduct. Access to other surface water sources in the area is not considered viable. The District has plans to add a well to their system. However, groundwater is a key component of water supplies in the area and the groundwater basin is subject to overdraft conditions. The District water rates are representative of the costs for a non-recycled water alternative.

7.7 Water Conservation/Reduction Analysis

Drought conditions and resulting potential water delivery reductions make the District's water conservation strategies essential. The District has implemented voluntary and mandatory water conservation programs since 2009 in response to SLWD water delivery reductions and decreased reliability and production of Well No. 1. Since the implementation of SB X7-7 in 2009, the District has established strict irrigation schedules for customers through a water conservation program that is reviewed and updated annually. The District reviews irrigation schedules annually, based on estimated water deliveries for the upcoming year, as well as State mandated water conservation requirements.

In addition to the Water Conservation Program, the District requires that all new water services be equipped with meters to promote water conservation and monitor water usage. The District received grant funding through the SWRCB DWSRF Program to install water meters and replace water mains at the unmetered mobile home and RV park in an effort to reduce system water loss and promote water conservation through consumption-based water billings.

During drought conditions, water conservation strategies will require decreased use of potable water for irrigation. If recycled water becomes available, it will be used in lieu of potable water for irrigation and water conservation/reduction will not have an impact on the recycled water demand.

7.8 Pollution Control Alternative

Not applicable. The WWTP is in compliance with their WDRs. However, improvements to the WWTP could potentially be allocated to pollution control because they will improve the performance of the treatment facility.

8 Recycled Water Costs

8.1 Capital Costs

Capital costs are one-time fixed costs used for planning, designing, and construction of a project. The cost of the recycled system depends on many factors such as the level of treatment, population, topography, land use, and type of community. The total cost developed for each alternative is considered a planning-level cost estimate and is based on current information.

8.1.1 Pipelines

The pipelines installed in urban areas tend to cost more compared to pipelines installed within rural areas. This is because urban communities consist of utilities, canals, roadways, buildings, and houses that make it more difficult to install underground pipelines. Purple color coding is standardized for recycled water pipelines. Purple pipelines installed within the public R-O-W must meet design standards to provide assurance for the health, safety, and general warfare of the community. No cross-connection is allowed between any recycled water system and the potable water system.

The District is designated as an Urban Community based on the 2030 General Plan. Transmission and distribution recycled water pipeline will be sized based on the PHD and the maximum design velocity. The unit costs for the pipelines include appurtenances, fittings, valves, meters, boxes, backflow preventers, tracer wires, excavation, and installations. Refer to **Table 8-1** for the recycled water system pipeline unit costs.

Table 8-1: Recycled Water Pipeline and Appurtenances Unit Costs

Pipeline Diameter	Unit	Unit Cost
Urban Area		
6-inch	per lf	$140
8-inch	per lf	$200
10-inch	per lf	$240
12-inch	per lf	$260
14-inch	per lf	$280
16-inch	per lf	$300
18-inch	per lf	$320
20-inch	per lf	$340
24-inch	per lf	$360
30-inch	per lf	$380
36-inch	per lf	$400

8.1.2 Trenchless Crossing

Bore and jack and horizontal directional drilling (HDD) are two different types of methods used for trenchless crossings under highways and waterways. The main difference between these two methods is the pipeline diameter and length that needs to be drilled. Typically, the bore and jack method is used for smaller pipeline diameter and requires the length of drilling to be smaller compared to the HDD method. The HDD method is mainly used for trenchless crossings under major roadways and canals. HDD provides lower costs, deeper and longer installation, shorter completion time, and less traffic disruption. Installing trenchless crossings under major highways is based on the Caltrans Encroachment Permits, Guidelines and Specifications for Trenchless Technology Projects. Installing trenchless crossing under canals is based on the USBR Guidelines for Crossing requirements. **Table 8-2** provides the unit costs for trenchless crossing under highways and canals.

Table 8-2: Trenchless Crossing Unit Costs

Trenchless	Unit	Unit Cost
Highway Crossing		
Bore and Jack 6-inch pipeline	per lf	$800
Bore and Jack 8-inch pipeline	per lf	$900
Bore and Jack 10-inch pipeline	per lf	$1,000
Bore and Jack 12-inch pipeline	per lf	$1,100
Bore and Jack 14-inch pipeline	per lf	$1,200
Bore and Jack 16-inch pipeline	per lf	$1,300
Bore and Jack 18-inch pipeline	per lf	$1,400
Bore and Jack 20-inch pipeline	per lf	$1,500
Canal Crossing		
Horizontal Directional Drilling (Pipeline <=24-inch)	per in-dia-lf	$50
Horizontal Directional Drilling (Pipeline >24-inch)	per in-dia-lf	$60

8.1.3 Pump Stations

The unit cost of a pump station is estimated based on the horsepower (hp) of the pump as shown in **Table 8-3**. The hp of a pump depends on many factors such as the total dynamic head required, pump capacity, and pump efficiency. The pump station will be sized based on the MMD to pump enough recycled water to the distribution system. Usually, the pump curve will be provided by the pump manufacturer to select an ideal pump for the project.

Table 8-3: Pump Station Unit Costs

Pump Station (hp)	Unit	Unit Cost
< 20	per hp	$17,500
50	per hp	$11,000
100	per hp	$7,000
200	per hp	$6,500
300	per hp	$6,000
400	per hp	$5,500
500	per hp	$5,000

8.1.4 Storage Tanks

Operational storage is required to provide recycled water to the community when demands are high. Recycled water is expected to be irrigated approximately 8 hours per day between 10 p.m. to 6 a.m. to reduce the risk of contact with the public. The required operational storage volume for each alternative is equal to the MMD. Refer to **Table 8-4** for the unit cost of each storage tank sizing. Unit costs include equipping of the tanks with continuous mixing system to prevent algal growth and additional chemical treatment to prevent the growth of microorganisms.

Table 8-4: Storage Tank Unit Costs

Storage Tank Size (gallon)	Unit	Unit Cost
10,000	per gallon	$5.00
20,000	per gallon	$4.75
40,000	per gallon	$4.50
60,000	per gallon	$4.25
80,000	per gallon	$4.00
100,000	per gallon	$3.75
150,000	per gallon	$3.65
200,000	per gallon	$3.50
300,000	per gallon	$3.25
400,000	per gallon	$3.15
500,000	per gallon	$3.00
800,000	per gallon	$2.75
1,000,000	per gallon	$2.50
1,500,000	per gallon	$2.40
2,000,000	per gallon	$2.25
2,500,000	per gallon	$2.00

8.1.5 Treatment Facilities

The tertiary treatment plant is sized based on the MMD. The unit cost of the tertiary treatment facility was established from quotations for filtration equipment. Refer to **Table 8-5** for the treatment facility unit costs.

Table 8-5: Treatment Facilities Unit Costs

Treatment Facility	Unit	Unit Cost
Tertiary Treatment (Flow = 150,000 gpd)	ls	$355,000
Tertiary Treatment (MMD = 500,000 gpd)	ls	$795,000
Tertiary Treatment (MMD = 1,500,000 gpd)	ls	$1,050,000
Tertiary Treatment (MMD = 2,500,000 gpd)	ls	$1,395,000
Site Work	ls	$200,000
Building	ls	$300,000
Purple Hydrant	ea	$10,000

8.2 Disinfection

The cost of the disinfection process is dependent on the tertiary treatment capacity, characteristics of the wastewater, and effluent requirements. Effluent salt requirements will determine whether the District can use sodium hypochlorite solution and a chlorine contact tank as the disinfection process. If salt is an issue, UV disinfection will be required. Refer to **Table 8-6** for the disinfection unit costs.

Table 8-6: Disinfection Unit Costs

Disinfection	Unit	Unit Cost
Flow = 150,000 gpd	per gpd	$1.76
MMD = 500,000 gpd	per gpd	$1.13
MMD = 1,500,000 gpd	per gpd	$0.50
MMD = 2,500,000 gpd	per gpd	$0.40

8.3 Construction Energy Cost

Diesel is an energy currency used to power most construction equipment during the construction of the plant and distribution system. Refer to **Table 8-7** for the diesel energy unit cost.

Table 8-7: Construction Energy Unit Cost

Element	Unit Cost
Diesel Energy	$3.164 per gal

8.4 Implementation Costs

Implementation costs include categories such as engineering, construction management, administration, and design. Refer to **Table 8-8** for the basis of the implementation unit costs.

Table 8-8: Implementation Unit Costs

Element	Unit Cost
Construction Contingency	25% of Construction Cost
Engineering, Construction Management, Administration, and Design	25% of Construction Cost

8.5 Operation and Maintenance Costs

Operation and maintenance (O&M) costs of the recycled water system will be estimated based on the project construction cost. Refer to **Table 8-9** for the recycled water system O&M unit costs.

Table 8-9: Recycled Water O&M Unit Costs

Element	Unit Cost
Distribution System	2% of Piping Cost
Pump Station	5% of Pump Cost
Storage Tank	2% of Storage Tank Cost
Tertiary Treatment Plant	10% of Treatment Cost
Electrical Energy	$0.15 per kWh
Labor	$90,000 per year per O&M personnel

8.6 Annualized Cost

The total annualized cost is calculated from the capital construction cost based on a real interest rate of 2% over a 40-year period. A Capital Recovery Method was used to determine the discount factor for discrete compounding. Based on a real interest rate of 2% over a 40-year period, the discount factor is 0.0366. The formula below was used to estimate the annualized cost for each alternative.

Capital Recovery Formula (A/P, i%, n):

$$A = P\left[\frac{i(1+i)^n}{(1+i)^n - 1}\right] \quad or$$

$$A = P(0.0366)$$

Where,

A/P = To find A, given P
A = Annual Amount
P = Present Worth (Total Capital Cost)
i = Interest Rate per Interest Period (%)
n = Number of Interest Periods (years)

8.7 Recycled Water Construction Funding

Funding for recycled water varies over time depending on the State's requirements. To be eligible for the water recycling grants, 50% of the project capacity must serve existing users. The District may qualify for funding through the CWSRF program and Water Recycling Funding Program (WRFP).

The District is considered a disadvantaged community (DAC). Based on the recent American Community Survey, the community currently has a median household income (MHI) of $55,333 which is less than the statewide average. To receive the Small Community Grant (SCG) funding for construction, the State requires a wastewater rate of at least 1.5% of the MHI. The District may be eligible for a 75% grant up to $5.7 million ($6 million minus $295,000 planning costs) and a low interest loan. Refer to **Table 8-10** for the SCG construction grant eligibility criteria.

Table 8-10: SCG Construction Grant Eligibility Criteria

Affordability Criteria			Grant Amount		
Population	**Community MHI**	**Wastewater Rates as a Percentage of MHI**	**Percentage of Total Eligible Project Cost**	**Maximum Grant Amount per Project**	**Maximum Cost per Household/ Project**
<20,000	MHI<= 100% Statewide MHI	>=4%	50%	**$6,000,000**	$30,000
	DAC<80% of Statewide MHI	>=1.5%	75%		
	SDAC<60% of Statewide MHI	NA	100%		

If the wastewater rates are not high enough to qualify for the SCG construction grant funding, the District may be eligible for the WRFP grant which is a 35% grant up to $5,000,000 and the remainder as a loan. Refer to **Table 8-11** for the WRFP grant and loan eligibility criteria.

Table 8-11: WRFP Grant and Loan Calculations

Funding Type	Eligible Project Costs	Percentage of Total Eligible Project Cost		Maximum Grant Amount per Project
		DAC	Non-DAC	
Planning Grant	Planning	100%	50%	150,000
Construction Grant	Construction, not including construction allowances	35%	35%	**5,000,000**
Construction Loan	Planning, Design, and Construction	100%	50%	N/A

8.8 Capital and Annual Costs

Total capital, O&M, and EACs were developed for each alternative using the unit costs presented in Sections 8.1 through 8.6.

8.8.1 Capital and Equivalent Annual Costs for Alternative 1

There are no capital costs associated with Alternative 1 because it is the No Action alternative and the District will continue to use the existing potable water facilities for providing water for irrigation. Annual costs for Alternative 1 are the same as the potable water system operating costs and are summarized in the Water Rate Study.

8.8.2 Capital and Equivalent Annual Cost for Alternative 2

The estimated capital cost for Alternative 2 is $13,804,923. Refer to **Table 8-12** for the detailed capital cost estimate for Alternative 2. The equivalent annual cost of recycled water for each funding scenario is shown in **Table 8-13**.

Table 8-12: Capital Cost for Alternative 2

Element	Quantity		Unit Cost		Capital Cost
8-inch Distribution Pipelines and Appurtenances	20,717	lf	$200	per lf	$4,143,400
10-inch Distribution Pipelines and Appurtenances	1,354	lf	$240	per lf	$324,960
Highway Trenchless Crossing Bore and Jack (8-inch Pipeline)	960	lf	$900	per lf	$864,000
Canal Trenchless Crossing HDD (8-inch Pipeline)	1,246	in-dia-lf	$50	per in-dia-lf	$498,400
Pump Station	20	hp	$17,500	per hp	$350,000
Storage Tank	378,409	gal	$3.15	per gal	$1,191,988
Tertiary Treatment	1	ls	$795,000	ls	$795,000
Disinfection Process	378,409	gpd	$1.13	per gpd	$428,796
Site Work	1	ls	$200,000	ls	$200,000
Building	1	ls	$300,000	ls	$300,000
Purple Hydrant	2	ea	$10,000	ea	$20,000
Diesel Energy	27,579	gal	$3.16	per gal	$87,260
				Total Construction Cost Estimate:	$9,203,283
				Contingencies (25%):	$2,300,820
				Engineering, Construction Management, Administration, and Design (25%):	$2,300,820
				Estimated Total Project Capital Cost:	$13,804,923

Table 8-13: Equivalent Annual Costs for Alternative 2

Element	WRFP		SCG	WRFP + SCG
	0% Grant, 100% Loan	$5 Million Grant[3]	$5.7 Million Grant[4]	$10.7 Million Grant[5]
Annualized Capital[1]	$504,678	$321,899	$296,127	$113,349
Distribution System	$116,615	$116,615	$116,615	$116,615
Pump Station	$17,500	$17,500	$17,500	$17,500
Storage Tank	$23,840	$23,840	$23,840	$23,840
Tertiary Treatment Plant	$79,500	$79,500	$79,500	$79,500
Electrical Energy	$7,994	$7,994	$7,994	$7,994
Labor	$90,000	$90,000	$90,000	$90,000
Estimated Total Project Annual O&M Cost:	$840,127	$657,348	$631,576	$448,798
Estimated Usage[2] (ac-ft/yr):	171	171	171	171
Equivalent Annual Cost of Recycled Water (per ac-ft/yr):	$4,911	$3,843	$3,692	$2,623

[1]Annualized capital costs based on an interest rate of 2% over a 40-year period (A/P=0.0366).
[2]Based on recycled water average annual demand. Refer to **Table 7-4**.
[3]The District would be eligible for $5,000,000 in grant funding from the WRFP.
[4]The District would be eligible for $5,705,000 ($6,000,000 minus $295,000 planning cost) in grant funding from the SCG.
[5]The District could potentially be eligible for $10,705,000 in grant funding ($5,000,000 from WRFP plus $5,705,000 from SCG).

8.8.3 Capital and Equivalent Annual Costs for Alternative 3

The capital cost for Alternative 3 is $19,314,012. Refer to **Table 8-14** for the detailed capital cost estimate for Alternative 3. The equivalent annual cost of recycled water for each funding scenario is shown in **Table 8-15**.

Table 8-14: Capital Cost for Alternative 3

Element	Quantity		Unit Cost		Capital Cost
8-inch Distribution Pipelines and Appurtenances	20,717	lf	$200	per lf	$4,143,400
10-inch Distribution Pipelines and Appurtenances	1,354	lf	$240	per lf	$324,960
16-inch Distribution Pipelines and Appurtenances	2,002	lf	$300	per lf	$600,600
Highway Trenchless Crossing Bore and Jack (8-inch Pipeline)	960	lf	$900	per lf	$864,000
Canal Trenchless Crossing HDD (8-inch Pipeline)	1,246	in-dia-lf	$50	per in-dia-lf	$498,400
Pump Station	75	hp	$7,000	per hp	$525,000
Storage Tank	1,468,663	gal	$2.40	per gal	$3,524,791
Tertiary Treatment	1	ls	$1,050,000	ls	$1,050,000
Disinfection Process	1,468,663	gpd	$0.50	per gpd	$732,677
Site Work	1	ls	$200,000	ls	$200,000
Building	1	ls	$300,000	ls	$300,000
Purple Hydrant	2	ea	$10,000	ea	$20,000
Diesel Energy	29,298	gal	$3.16	per gal	$92,699
				Total Construction Cost Estimate:	$12,876,008
				Contingencies (25%):	$3,219,002
				Engineering, Construction Management, Administration, and Design (25%):	$3,219,002
				Estimated Total Project Capital Cost:	$19,314,012

Table 8-15: Equivalent Annual Costs for Alternative 3

Element	WRFP		SCG	WRFP + SCG
	0% Grant, 100% Loan	$5 Million Grant[3]	$5.7 Million Grant[4]	$10.7 Million Grant[5]
Annualized Capital[1]	$706,067	523,288	497,516	314,737
Distribution System	$118,659	$118,659	$118,659	$118,659
Pump Station	$26,250	$26,250	$26,250	$26,250
Storage Tank	$70,496	$70,496	$70,496	$70,496
Tertiary Treatment Plant	$105,000	$105,000	$105,000	$105,000
Electrical Energy	$19,643	$19,643	$19,643	$19,643
Labor	$90,000	$90,000	$90,000	$90,000
Estimated Total Project Annual O&M Cost:	$1,136,115	$953,336	$927,564	$744,785
Estimated Usage[2] (ac-ft/yr):	647	647	647	647
Equivalent Annual Cost of Recycled Water (per ac-ft/yr):	$1,756	$1,474	$1,434	$1,151

[1]Annualized capital costs based on an interest rate of 2% over a 40-year period (A/P=0.0366).
[2]Based on recycled water average annual demand. Refer to **Table 7-6**.
[3]The District would be eligible for $5,000,000 in grant funding from the WRFP.
[4]The District would be eligible for $5,705,000 ($6,000,000 minus $295,000 planning cost) in grant funding from the SCG.
[5]The District could potentially be eligible for $10,705,000 in grant funding ($5,000,000 from WRFP plus $5,705,000 from SCG).

8.8.4 Capital and Equivalent Annual Cost for Alternative 4

The estimated capital cost for Alternative 3 is $24,476,081. Refer to **Table 8-16** for the total capital cost for Alternative 4. The equivalent annual cost of recycled water for each funding scenario is shown in **Table 8-17**.

Table 8-16: Capital Cost for Alternative 4

Element	Quantity		Unit Cost		Capital Cost
12-inch Distribution Pipelines and Appurtenances	23,416	lf	$260	per lf	$6,088,160
16-inch Distribution Pipelines and Appurtenances	3,356	lf	$300	per lf	$1,006,800
Highway Trenchless Crossing Bore and Jack (8-inch Pipeline)	960	lf	$900	per lf	$864,000
Canal Trenchless Crossing HDD (8-inch Pipeline)	1,246	in-dia-lf	$50	per in-dia-lf	$498,400
Pump Station	110	hp	$6,500	per hp	$715,000
Storage Tank	2,138,180	gal	$2.00	per gal	$4,276,360
Tertiary Treatment	1	ls	$1,395,000	ls	$1,395,000
Disinfection Process	2,138,180	gpd	$0.40	per gpd	$850,297
Site Work	1	ls	$200,000	ls	$200,000
Building	1	ls	$300,000	ls	$300,000
Purple Hydrant	2	ea	$10,000	ea	$20,000
Diesel Energy	32,192	gal	$3.16	per gal	$101,855
				Total Construction Cost Estimate:	$16,315,387
				Contingencies (25%):	$4,078,847
				Engineering, Construction Management, Administration, and Design (25%):	$4,078,847
				Estimated Total Project Capital Cost:	$24,473,081

Table 8-17 Equivalent Annual Costs for Alternative 4

Element	WRFP		SCG	WRFP + SCG
	0% Grant, 100% Loan	$5 Million Grant[3]	$5.7 Million Grant[4]	$10.7 Million Grant[5]
Annualized Capital[1]	$894,658	711,880	686,108	503,329
Distribution System	$169,147	$169,147	$169,147	$169,147
Pump Station	$35,750	$35,750	$35,750	$35,750
Storage Tank	$85,527	$85,527	$85,527	$85,527
Tertiary Treatment Plant	$139,500	$139,500	$139,500	$139,500
Electrical Energy	$27,306	$27,306	$27,306	$27,306
Labor	$90,000	$90,000	$90,000	$90,000
Estimated Total Project O&M Cost:	$1,441,889	$1,259,110	$1,233,338	$1,050,559
Estimated Usage[2] (ac-ft/yr):	939	939	939	939
Equivalent Annual Cost of Recycled Water (per ac-ft/yr):	$1,535	$1,341	$1,313	$1,119

[1]Annualized capital costs based on an interest rate of 2% over a 40-year period (A/P=0.0366).
[2]Based on recycled water average annual demand. Refer to **Table 7-8**.
[3]The District would be eligible for $5,000,000 in grant funding from the WRFP.
[4]The District would be eligible for $5,705,000 ($6,000,000 minus $295,000 planning cost) in grant funding from the SCG.
[5]The District could potentially be eligible for $10,705,000 in grant funding ($5,000,000 from WRFP plus $5,705,000 from SCG).

8.8.5 Summary

A summary of the estimated annualized capital cost and the EAC for each alternative with different funding scenarios is provided in **Table 8-18** and **Table 8-19**, respectively.

Table 8-18: Summary of Annualized Capital Cost for each Alternative

Alternatives	Annual O&M	Annual Recycled Water (ac-ft)	Annualized Capital			
			0% Grant, 100% Loan	$5 Million Grant	$5.7 Million Grant	$10.7 Million Grant
1	-	-	-	-	-	-
2	$335,449	171	$504,678	$321,899	$296,127	$113,349
3	$430,048	647	$706,067	$523,288	$497,516	$314,737
4	$547,230	939	$894,658	$711,880	$686,108	$503,329

Table 8-19: Summary of Recycled Water EAC for each Alternative

Alternatives	EAC per acre-ft			
	0% Grant, 100% Loan	$5 Million Grant[3]	$5.7 Million Grant[4]	$10.7 Million Grant[5]
1	-	-	-	-
2	$4,911	$3,843	$3,692	$2,623
3	$1,756	$1,474	$1,434	$1,151
4	$1,535	$1,341	$1,313	$1,119

The EAC per acre-ft for recycled water generally decreases when more recycled water is produced. As shown in **Table 8-19**, Alternative 4 has the lowest EAC per acre-ft therefore this alternative is expected to be the most feasible. When more recycled water is used, the recycled water sales revenue will increase and the cost to purchase raw surface water or produce groundwater will decrease.

9 Economic Analysis

An economic analysis is concerned with the viability of a project from a societal perspective and determines whether it is economically rational to proceed with a project, considering the broader benefits and costs of a project. Planning reports funded by the WRFP are required to include an economic analysis. The SWRCB provides two economic analysis models and model guidance on their website to evaluate the costs and benefits of the recycled water project. The Guidelines for Preparing Economic Analysis for Water Recycling Projects (Economic Analysis Guidelines) [14] and companion Economic Analysis Template, created using Microsoft Excel, were used to conduct an economic analysis for the four alternatives being evaluated in this Feasibility Study. **Appendix C** provides detailed calculations for each alternative completed using the Economic Analysis Template.

9.1 Benefits of the Recycled Water Project

The District currently charges a monthly volumetric water rate of $1.33 per hcf ($579 per acre-ft) to its commercial users. For this Feasibility Study, the recycled water rate must be lower than potable water rate. The District will benefit from the recycled water sales revenues and avoid any additional costs to purchase raw surface water or produce groundwater for landscape irrigation.

To benefit from the recycled water program, the District would need to charge the potential recycled water users a monthly usage fee. The estimated recycled water rate is $1.44 per hcf (assuming the project will be constructed by fiscal year 2030-31). The recycled water rate was developed by reducing the estimated potable water rate ($1.81 per hcf) in fiscal year 2030-31 by approximately 20%.

Since the Santa Nella community would also benefit from the recycled water program, the District would need to charge all customers additional fees. Refer to **Appendix C, Section 4.0** for the recycled water fees estimated for each alternative.

There are several benefits that were not assigned monetary value due to difficulty associating with determining a value. These benefits include:

- Reduces groundwater pumping and overdraft conditions in the groundwater basin.
- Improves reliability of existing water supply system by making the system less sensitive to drought conditions.
- Increases degree of local control on water supply, by reducing water demand, a portion of which is dependent on water allocations from the CVP.
- Reduces surface water demand; consistent with State policies for restoring and protecting fish and wildlife.
- Provides aesthetic benefits for the community by supporting the irrigation of areas, even during drought conditions.
- Reduces the need for future water system improvements and expansion.

An alternatives evaluation, summarized in the next section, was undertaken to provide a method accounting for the importance of these non-monetary benefits and selecting a recommended alternative.

9.2 Economic Analysis Results

The economic analysis results indicate that all the alternatives have a negative expected net present value (ENPV) for no grant funding, $5 million grant funding, and $5.7 million grant funding. With $10.7 million in grant funding, Alternatives 3 and 4 have a positive ENPV. Refer to **Table 9-1** for a summary of the economic analysis for each alternative with grants included. In general, economies of scale occur when more recycled water is provided. Therefore, Alternative 4 generates the highest positive net present value compared to Alternatives 2 and 3.

Table 9-1: Economic Assessment Summary

Alternative	Expected Net Present Value			
	0% Grant, 100% Loan	$5 Million Grant	$5.7 Million Grant	$10.7 Million Grant
2	-$17,781,678	-$11,654,765	-$10,790,870	-$4,989,647
3	-$12,021,009	-$5,894,096	-$5,030,201	$876,188
4	-$11,733,304	-$5,606,391	-$4,742,497	$1,384,416

Water Recycling is not economically cost-effective since the ENPV is negative

Water Recycling is economically cost-effective since the ENPV is positive

10 Energy Analysis

The District's existing WWTP consists of multiple stages where energy is consumed. Energy is consumed during pumping, treating, transporting, and disposing the wastewater. The District collection system relies heavily upon gravity to transport the wastewater into the lift stations where the wastewater is pumped into the WWTP. In the primary stage, the influent pumps tend to consume a significant amount of energy compared to the other components. The WWTP currently produces undisinfected secondary water through an aerated pond system. The WWTP includes a headworks, two (2) lined treatment ponds, four (4) unlined storage ponds, an effluent/recirculation pump station, and a tailwater pump station. The headworks consists of a fine screen, washer/compactor, and a flow meter where energy is consumed. Wastewater from the headworks gravity flow into the two treatment ponds that are equipped with four 15-HP horizontal floating brush aerators each. After treatment, the wastewater flows into the storage ponds before being pumped into the disposal area. Energy is mainly consumed during the influent/effluent pumping stage, the headworks process, and the treatment process. There is currently no energy production at the District WWTP.

10.1 Tertiary Treatment Energy Consumption

Additional energy consumption is required for further treatment and to pump recycled water to potential users. Although a recycled water treatment plant will increase the energy consumption, recycled water is considered the least energy-intensive source in the State's water supply. An energy analysis for each alternative consists of direct and construction energy. Direct energy consumption is usually measured in kilowatt-hour (kWh) and construction diesel energy is measured in gallon (gal).

10.1.1 Construction Energy

Energy consumed during the construction phase contributes a significant fraction of the total energy budget. Energy embodied in a recycled water system is estimated by summing the energy used in the manufacture of the materials and the energy used for on-site work. The types of equipment used to construct the plant and distribution system are shown in **Table 10-1**. Refer to **Appendix D** for a summary of the construction diesel energy estimated for each alternative.

Table 10-1: Construction Equipment Horsepower

Type of Equipment	Horsepower[1] (HP)
Front End Loader	250-500
Excavator	158-500
Vibratory rollers	175-250
Backhoe	97-120
Paving Machine	175
Concrete Truck	200
Crane	231-250
Concrete Power Saw	25
Air Compressor	78
Welding Unit	50
HDD Rig	221
Fusion Machine	250
Forklift	89
Vac Truck	220
Generator	84
Separation Plant	100
Pump	84

[1]49.1 Horsepower-hours = 1 gallon of diesel oil

10.1.2 Direct Energy

Direct energy includes the energy used to treat, operate, and maintain the recycled water system. The initial stage of the tertiary treatment plant is the pre-filter treatment stage which consists of an automatic backwash mechanism. Wastewater from the pre-filter treatment stage will enter the media filtration treatment stage. During media filtration stage, energy may be used for backwashing, surface spray, feeding the chemicals, and the control panel system. The energy consumption in a media filtration depends on the types to media filters being used. Several media filters are designed to reduce energy costs by providing an efficient backwash mechanism.

Treated wastewater from the filtration system is disinfected prior to storage. UV disinfection systems are more energy intensive compared to a chlorine dosage system. Although a UV disinfection system uses more energy, the system eliminates the need to handle or store toxic/hazardous chemicals. From the storage tank, the tertiary treated water is diverted to the customers. Recycled water requires a tremendous amount of energy to move water from the treatment plant and out into the distribution system. Electric loads consist primarily of pump motors, equipment, controls, lighting, and disinfection. Refer to **Appendix D** for a summary of the O&M electrical loads estimated for each alternative.

10.2 Summary

Table 10-2 provides a summary of the direct and construction energy for each alternative. Based on the energy analysis results, Alternative 4 has the highest energy consumption.

Table 10-2: Summary of Energy Consumption for Each Alternative

Alternative No.	Estimated Usage[1] (ac-ft/yr)	Construction Energy[2] (gal)	Annual Direct Energy Consumption[3] (kWh)
1	0	0	0
2	171	27,579	53,293
3	647	29,298	130,951
4	939	32,192	182,040

[1]Based on recycled water average annual demand
[2]49.1 Horsepower-hours = 1 gallon of diesel oil
[3]0.746 kW = 1 hp

11 Comparison of Alternatives

To incorporate the benefits associated with non-financial criteria into the selection of a recommended project, the four alternatives were evaluated using a scoring system that includes financial and non-financial criteria. The evaluation criteria include considerations for equivalent annual costs, State planning priorities described in Section 65041.1 of the Government Code, climate change, and opportunities for water and energy efficiency. Each criterion was assigned a weighting factor based on the criterion's relative importance to the District. Criteria with higher weighting factors were thought to have a greater importance in the evaluation. The total weighting factors for all the criteria equals 100 percent. Each of the criterion is described in further detail below. **Table 11-1** summarizes the evaluation criteria and assigned weighting values.

Table 11-1: Evaluation Criteria

#	Evaluation Criteria	Weighting Factor, %
1	Environmental Sustainability	10
2	Operations and Maintenance	25
3	Reliability and Redundancy	25
4	Benefits to the Community	30
5	40-year EAC/acre-ft	10

11.1 Environmental Sustainability (10%)

Environmental sustainability considerations include the protection of natural resources such as surface water bodies and groundwater, climate change, water efficiency, energy efficiency, water quality impacts, and efficient use of land. The State Planning Priorities, as listed in Section 6504.1 of the Government Code were key factors that were also used to assign a score to an alternative's environmental sustainability. This portion of the Government Code is intended to promote equity, strengthen the economy, protect the environment, and promote public health and safety in the state. The factors specifically listed in the State Planning Priorities include: 1) Promote infill development; 2) Protect environmental and agricultural resources; and 3) Encourage efficient development patterns.

Examples of adverse environmental sustainability include groundwater degradation, reduction of water quality, high energy requirements, degradation of any other natural resources, and greenhouse gas emissions from processes. Potential positive impacts on the environment are occurrences such as water recycling, which offsets potable water use, protection of groundwater and other natural resources, and overall project sustainability.

11.2 Operations and Maintenance (25%)

Operations and maintenance consider the ease associated with each alternative for operating and maintaining the infrastructure for the proposed alternative. Alternatives that are simpler or require less equipment and labor per unit of production would receive the highest scores.

11.3 Reliability and Redundancy (25%)

Reliability refers to the relative risk of failure for a particular alternative. Newer facilities will generally be more reliable than older facilities and would receive higher reliability scores. Redundancy refers to having multiple units or facilities available for use in cases when the main unit is not functional. Facilities with multiple units performing the same function would receive higher scores than facilities with only one unit per treatment process.

11.4 Benefits to the Community (30%)

Benefits to the community refer to the potential for each alternative to provide a positive impact on the community or that can provide an additional end-product that can be used by the community. This evaluation criterion has the highest weighting factor.

11.5 40-Year Equivalent Annual Cost (10%)

Forty-year equivalent annual costs per acre-ft for each alternative were calculated in Section 8.8. The EAC cost includes costs for construction and operation and maintenance of the alternative for forty years and is calculated for an annual period. The alternative with the lowest equivalent annual cost per acre-ft was assigned the highest score for this category.

11.6 Alternatives Evaluation

The alternatives were assigned a score between 1 and 4 for each criterion, with 1 being the least desirable, and 4 being the most desirable. The score was multiplied by the weighting factor and totaled to develop a weighted score. The alternative with the highest weighted score was the recommended alternative. The assigned scores for each criterion are described in the following sections.

11.6.1 Environmental Sustainability

The four alternatives were rated from most desirable (highest score) to least desirable (lowest score) with regard to environmental sustainability. **Table 11-2** summarizes the scores for environmental sustainability.

Table 11-2: Environmental Sustainability Scores

Score	Alternative and Description
1	Alternative 1 - No Project
2	Alternative 2 - Upgrade existing WWTP, Tertiary Treatment, Irrigation within public R-O-W
3	Alternative 3 - Upgrade existing WWTP, Tertiary Treatment, Irrigation within public R-O-W and at golf course
4	Alternative 4 - Upgrade existing WWTP, Tertiary Treatment, Irrigation within public R-O-W, at the golf course, and at future developments

Environmental sustainability includes the protection of natural resources such as surface water bodies and groundwater, climate change, water and energy efficiency, and efficient use of land. The following were considered in determining the environmental sustainability score for the project alternatives:

- Alternative 1 received the lowest score because pond treatment produces a lower quality effluent and has a higher potential to adversely affect groundwater quality.
- A recycled water system will provide many benefits that promote environmental sustainability. These benefits were summarized in Section 9 and include offsetting potable water use while promoting aesthetic benefits for the community, and the protection of wildlife through potentially reduced surface water demands. Alternatives 2-4 were rated in the order corresponding to the amount of recycled water produced.
- Of the three alternatives which provide recycled water, Alternative 4 requires the least amount of energy per volume of recycled water provided, considering both direct and construction energy. Estimated energy requirements for the alternatives are provided in **Appendix D**.

11.6.2 Operations and Maintenance

The scores of the four alternatives in order from least operations and maintenance-intensive to most intensive (rated highest score to lowest score) is provided in **Table 11-3**.

Table 11-3: Operations and Maintenance Scores

Score	Alternative and Description
4	Alternative 1 - No Project
3	Alternative 2 - Upgrade existing WWTP, Tertiary Treatment, Irrigation within public R-O-W
2	Alternative 3 - Upgrade existing WWTP, Tertiary Treatment, Irrigation within public R-O-W and at golf course
1	Alternative 4 - Upgrade existing WWTP, Tertiary Treatment, Irrigation within public R-O-W, at the golf course, and at future developments

The following were considered in determining the operations and maintenance score for the project alternatives:

- Alternative 1 receives the highest score because pond treatment systems require less operation and maintenance compared to a tertiary treatment plant.
- Alternative 4 receives the lowest score because a recycled water system will increase operation and maintenance for the District. Alternative 4 will have the most operations and maintenance requirements because it includes the largest recycled water system of all the alternatives.
- A higher-grade operator is required for a recycled water system that produces tertiary treated effluent. The District currently has a Grade I operator to operate the existing WWTP and would need to upgrade to a Grade III operator to operate the tertiary treatment plant.

11.6.3 Reliability and Redundancy

The scores for the four alternatives in order from lowest score to highest score for reliability and redundancy is provided in **Table 11-4**.

Table 11-4: Reliability and Redundancy Scores

Score	Alternative and Description
1	Alternative 1 - No Project
2	Alternative 2 - Upgrade existing WWTP, Tertiary Treatment, Irrigation within public R-O-W
3	Alternative 3 - Upgrade existing WWTP, Tertiary Treatment, Irrigation within public R-O-W and at golf course
4	Alternative 4 - Upgrade existing WWTP, Tertiary Treatment, Irrigation within public R-O-W, at the golf course, and at future developments

The following were considered in determining the reliability and redundancy score for the project alternatives:

- District currently purchases raw surface water from SLWD and groundwater from the GSA. A recycled water system is a more reliable source of water for irrigation because it is minimally impacted during drought conditions, whereas irrigation of landscaping using potable water is subject to drought restrictions.
- There is uncertainty regarding the surface water and groundwater supply for the District. Recycled water will provide a reliable and redundant source of water for irrigation. Alternatives that provide recycled water were scored higher than the alternative that did not provide recycled water. Alternatives were scored in order of the amount of recycled.
- Alternative 1 also receive the lowest score because there is less flexibility with a pond system to modifying operational parameters to improve the effluent quality.

11.6.4 Benefits to the Community

Table 11-5 lists the scores for the four alternatives in terms of benefits to the community in order from lowest score to highest score.

Table 11-5: Benefits to the Community Scores

Score	Alternative and Description
1	Alternative 1 - No Project
2	Alternative 2 - Upgrade existing WWTP, Tertiary Treatment, Irrigation within public R-O-W
3	Alternative 3 - Upgrade existing WWTP, Tertiary Treatment, Irrigation within public R-O-W and at golf course
4	Alternative 4 - Upgrade existing WWTP, Tertiary Treatment, Irrigation within public R-O-W, at the golf course, and at future developments

The following were considered in determining the benefits to the community scores for the project alternatives:

- Alternative 4 received the highest score because it will provide recycled water to the greatest number of customers and also will result in the largest reduction in potable water demand.
- Alternative 1 receives the lowest score because the community will not benefit from the existing WWTP. Effluent from the existing WWTP is currently being discharged to the pasture land located just north of the WWTP.
- A higher-level treatment process provides more beneficial uses of effluent for the community.

11.6.5 Comparison of All Alternatives Based on Equivalent Annual Cost

Table 8-19 provides a summary of the EAC per acre-ft for each alternative. The alternative with the lowest EAC per acre-ft was given the highest score. The alternative with the highest EAC per acre-ft was given the lowest score. The scores for the four alternatives in order from highest score to lowest score for EAC per acre-ft is provided in **Table 11-6**.

Table 11-6: Equivalent Annual per acre-ft Cost Scores

Score	Alternative and Description
4	Alternative 1 - No Project
1	Alternative 2 - Upgrade existing WWTP, Tertiary Treatment, Irrigation within public R-O-W
2	Alternative 3 - Upgrade existing WWTP, Tertiary Treatment, Irrigation within public R-O-W and at golf course
3	Alternative 4 - Upgrade existing WWTP, Tertiary Treatment, Irrigation within public R-O-W, at the golf course, and at future developments

11.7 Summary

Table 11-7 summarizes the raw and weighted scores assigned to each alternative.

Table 11-7: Evaluation of Alternatives

			Alternative 1		Alternative 2		Alternative 3		Alternative 4	
			No Project		Upgrade existing WWTP to tertiary treatment; Irrigation within public R-O-W		Upgrade existing WWTP to tertiary treatment; Irrigation within public R-O-W and at golf course		Upgrade existing WWTP to tertiary treatment; Irrigation within public R-O-W, at the golf course, and at future developments	
#	Evaluation Criteria	Weighting Factor	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
1	Environmental Sustainability	0.10	1	0.10	2	0.20	3	0.30	4	0.40
2	Operations and Maintenance	0.25	4	1.00	3	0.75	2	0.50	1	0.25
3	Reliability and Redundancy	0.25	1	0.25	2	0.50	3	0.75	4	1.00
4	Benefits to the Community	0.30	1	0.30	2	0.60	3	0.90	4	1.20
5	Equivalent Annual Cost per acre-ft	0.10	4	0.40	1	0.10	2	0.20	3	0.30
Total Weighted Score		1.00		2.05		2.15		2.65		3.15

12 Recommended Project

This chapter provides a detailed description, summary of key issues, and an implementation plan for the recommended project.

12.1 District Capabilities and Willingness to Take on Loans

The production of recycled water is currently not economically cost-effective based on the economic analysis. The District is only eligible for a maximum grant amount of $5.7 million or $5 million. The District cannot afford to take on any additional loans to construct the recycled water system. The District is currently in the process of upgrading the water system facilities and distribution system to provide safe and reliable drinking water to the community.

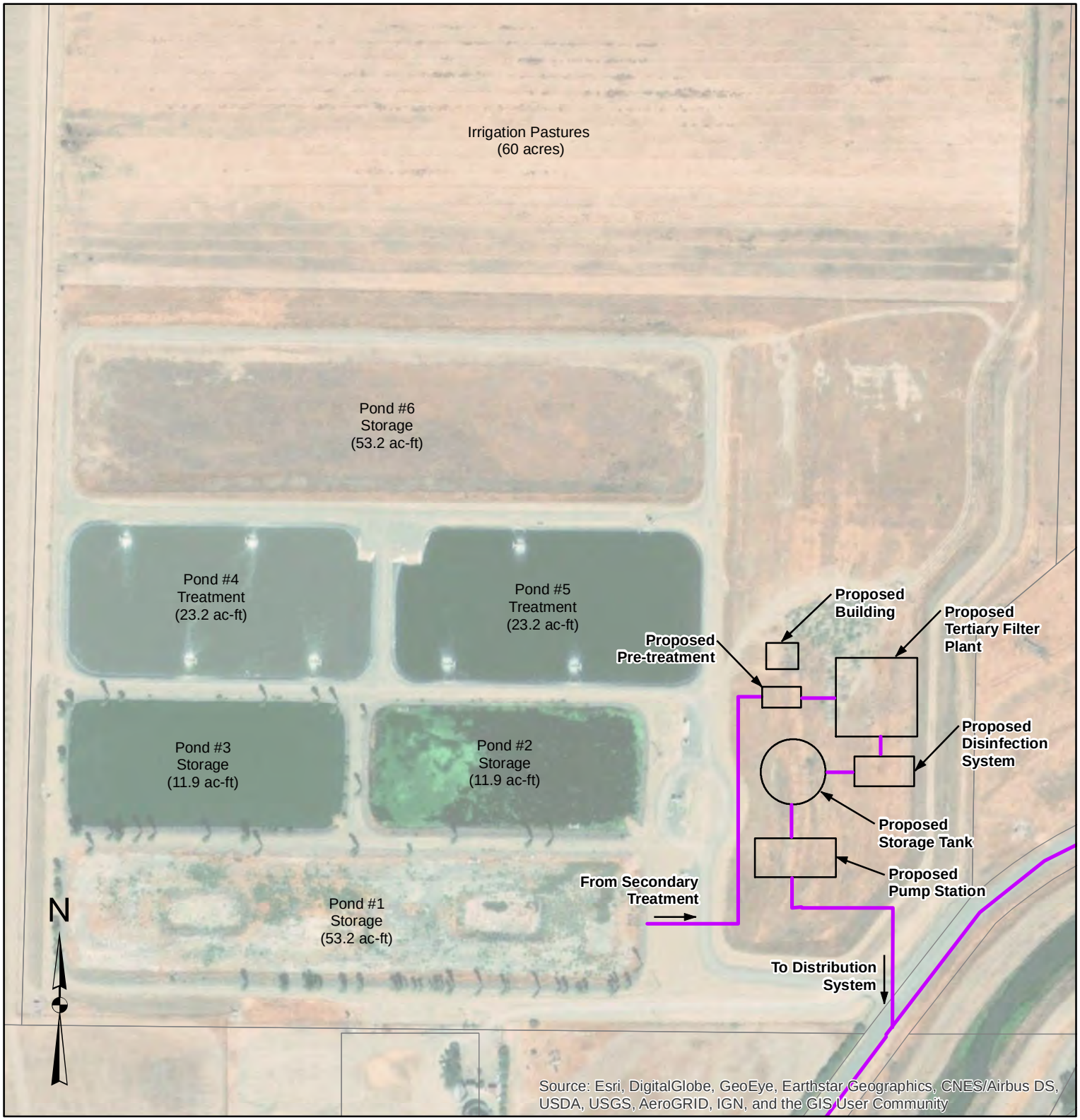
If the State's requirements for recycled water changes in the future, the District may be eligible up to $10.7 million in combined grant funding. Alternative 4 is the most economically cost-effective if the $10.7 million grant funding is available. Alternative 4 had the highest total weighted score in the alternative analysis. Alternative 4 is the recommended project.

12.2 Recommended Treatment Process and Distribution System

Alternative 4 includes upgrade of the existing WWTP treatment process to produce tertiary treated effluent for disposal via landscape irrigation within the public R-O-W throughout the District service area, at the Forebay Golf Course, and at the future developments. A 16-inch diameter pipeline would be installed along Bayview Road from the WWTP to Hwy 33 and a 12-inch diameter pipeline would be installed along SR-33 within the public R-O-W to supply tertiary treated water to the community for landscape irrigation. Purple pipelines installed within residential areas would be used to irrigate medians and parks. Two purple hydrants would be installed at easily accessible locations to be used as truck fill stations for construction water.

The recommended treatment process is to upgrade the existing aeration system in the aerated ponds to provide nitrogen removal. A pre-filter will be installed to remove the algae in the storage pond prior to tertiary filtration. The effluent from the filter plant will be disinfected (either using sodium hypochlorite solution and a chlorine contact tank or a UV system) to meet WRC requirements for disinfected tertiary effluent. The effluent will be stored in a tank and pumped to the distribution system. Refer to **Figure 12-1** for a process schematic of the recommended recycled water treatment plant. Pilot testing of the proposed recycled water treatment plant is recommended prior to construction. Preliminary research conducted as part of this Feasibility Study indicates that this treatment process scheme is the one that is most easily added onto the existing facilities and most energy efficient.

The estimated project cost for Alternative 4 is $24,473,01.



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Feet

Legend

Potential Recycled Water Pipeline

SANTA NELLA COUNTY WATER DISTRICT RECYCLED WATER FEASIBILITY STUDY

FIGURE 12-1 RECOMMENDED RECYCLED WATER TREATMENT SYSTEM

12.3 Recommended Potential Users and Usage

As discussed in Section 7.5.4, the potential recycled water customers for Alternative 4 are existing and future commercial businesses, the Parkway development community park, the Forebay Golf Course, and a truck fill station.

12.4 Implementation Plan

The District should implement a public outreach and customer marketing program to inform the community about the use of recycled water. The public outreach program will help potential customers support the District's efforts to design and construct the recycled water facilities.

The District will complete the Report of Waste Discharge (ROWD) and encroachment permits for the Regional Board, California Department of Fish and Game, and California Department of Transportation prior to construction. To operate the recycled water facility, several permits are required. The District would need to obtain permits or approval from the Regional Board, and DDW. After approval from the agencies, the District would be able to issue a recycled water use permit to each potential user for the use of landscape irrigation.

Based on the California Water Code Sections 1210, 1211, and 1212, the District will need to file a wastewater petition with the California State Water Resources Control Board Division of Water Rights if the recycled water project decreases the amount of water in a stream or waterway. A petition is not required if the effluent wastewater does not decrease the flow in any portion of a watercourse. No action is needed by the District because they do not discharge to a waterway.

Prior to producing recycled and as part of the permitting process, the District will need to develop recycled water use ordinances, rules and regulations, user agreements, and other documentation required for a recycled water program. The ability and timing of users to connect to the recycled water system will be established as part of the recycled water use ordinance and user agreements.

The cost of the recommended project will be significant for the District and is the highest of all the alternatives evaluated. However, Alternative 4 will provide the greatest long-term benefit by constructing treatment facilities and a recycled water system capable offsetting potable water uses throughout the SUDP. As part of the preliminary design process, the District should determine if phasing is warranted to assist with reducing the financial impacts associated with one large project as compared to several smaller projects. Project phases could be established for incrementally increasing the disinfected tertiary treatment capacity and recycled water distribution system.

12.4.1 Implementation Schedule

The implementation of the recommended project is estimated to require 8 years. **Table 12-1** summarizes an implementation plan with tasks for proceeding with the recommended alternative from this Feasibility Study. The plan assumes the recommended project will not be phased.

Table 12-1: Implementation Schedule

#	Task	Cumulative Estimated Schedule
Planning		
1	Complete Feasibility Study	0 months
2	Complete Field Investigation and Geotechnical Report	6 months
3	Complete Land Use Review and Land Appraisal	6 months
4	Complete Environmental Documentation Package	12 months
5	Complete Construction Application	12 months
6	Begin Design Report	12 months
7	Pilot Testing	12 months
8	Complete Design Level Field Investigations	12 months
9	Complete Design Report	12 months
Funding		
10	Secure Funding	30 months
Design		
11	Begin Final Design	30 months
12	Complete Final Design	54 months
Construction		
13	Bidding	60 months
14	Begin Construction (Notice to Proceed)	66 months
15	Complete Construction	96 months

12.5 Operational Plan

Copies of the District's organization chart, certificate requirements, and SWTP Operations Plan are included in **Appendix E**. The District currently has a Grade I operator to operate the existing WWTP and would need to upgrade to a Grade III operator to operate the tertiary treatment plant.

The District will be responsible for the operation and maintenance of the recycled water treatment and distribution facilities. An operation and maintenance plan for the recycled water will be developed during the design for the recommended project. User agreements which specify requirements for recycled water irrigation with private landowners will also be developed. The operation and maintenance plan, as well as the user agreements, will specify irrigation scheduling and restrictions to comply with the WRC and Order WQ 2016-0068-DDW. The District would be responsible for monitoring users for compliance and all reporting requirements.

13 Construction Financing Plan and Revenue Program

13.1 Sources and Timing of Funds for Design and Construction

The District would pursue funding through the WRFP for the design and construction of the recommended project. Additional funding programs will also be researched and pursued. As indicated in the implementation schedule, obtaining funding for this project is estimated to take approximately 18 months and 5-6 years from the design to construction completion.

In addition to planning grants and loans, the WRFP provides funding for construction loans and grants. Specific terms, limitations, and eligibilities of the WRFP construction funding will generally be noted in the annual CWSRF IUP but may also be described in a separate solicitation for applications.

The following costs are generally eligible for WRFP funding. The applicant must separate the eligible and ineligible costs in application documents and its disbursement requests, as appropriate.

Eligible Costs

- Construction of recycled water treatment facilities, storage facilities, pumping facilities, and groundwater recharge facilities.
- Construction of recycled water distribution systems, including on-site improvements.
- Planning, design, construction management, value engineering, and administration directly related to project implementation.
- Development, construction, and monitoring of a pilot-scale or demonstration-scale plant as part of the construction of a full-scale treatment facility project.
- Reasonable costs to provide an emergency backup water supply for the recycled water system.
- Contingency for change orders approved by the Division of Financial Assistance (DFA) for increased costs, provided the costs are eligible and consistent with the original scope of the project.

Ineligible Costs

- Operation and maintenance costs.
- Project components not included in the application and original scope of the project.
- Costs previously reimbursed by the State Board or other funding sources.

13.2 Pricing Policy for Recycled Water

A conceptual policy for pricing recycled water is to add a cost per hundred cubic feet of recycled water to the billing statements for potable water. Because the implementation of the project is beyond the timeframe of the adopted Water Rate Study, the final pricing policy may be adjusted. Many agencies in California use a market pricing approach and set recycled water rates as a percentage of potable irrigation water in the range of 50 to 90 percent. The District will most likely use a similar approach to pricing the recycled water.

13.3 Costs that can be Allocated to Water Pollution Control

A portion of the project costs can be allocated to water pollution control because the project will improve the treatment facilities and provide a second method for disposal of wastewater effluent.

13.4 Annual Projections for Recycled Water Use and Pricing

The water rates for Fiscal Years 2020-21 through 2023-24 were presented in **Table 3-5**.

Table 7-8 summarizes the projected recycled water use by category of user. **Tables 8-16** and **8-17** summarize estimated annual costs for the recommended project for providing recycled water with and without grants.

A sensitivity analysis that varied the recycled water use and annual costs for providing recycled water by a discount rate of 6% were conducted, refer to **Appendix C**. As rates for recycled water are being established in future studies, the potential financial impacts of lower recycled water use and higher operating costs should be considered to ensure adequate revenue is collected to fund the operating expenses associated with providing recycled water.

The District does not currently have any sunk costs or indebtedness related to providing recycled water.

APPENDIX A

Waste Discharge Requirements

NPDES

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. 88-104

WASTE DISCHARGE REQUIREMENTS
FOR
SANTA NELLA COUNTY WATER DISTRICT
MERCED COUNTY

The California Regional Water Quality Control Board, Central Valley Region, (hereafter Board) finds that:

1. Santa Nella County Water District (hereafter Discharger) submitted a Report of Waste Discharge, dated 23 September 1986, and a site evaluation report, dated 10 October 1986.

2. The Board, on 13 December 1969, adopted Resolution No. 69-86 which prescribed requirements for a discharge from a secondary treatment unit to stabilization ponds.

3. Present waste discharge requirements established by Resolution No. 69-86 are neither adequate nor consistent with plans and policies of the Board.

4. The Discharger currently discharges about 0.13 mgd from a package treatment plant and an aerated lagoon to three holding ponds and on to a privately owned 30-acre pasture area. The current design capacity for these facilities is 0.205 mgd.

5. The Discharger plans to purchase the 30-acre pasture area and an additional 70 acres for additional treatment and disposal capacity. The expanded facility will have a design capacity of 0.4 mgd and will consist of the current treatment facility (a package treatment plant and an aerated lagoon followed by three holding ponds) with additional treatment provided by three facultative lagoons. Effluent from all the treatment facilities will be combined prior to final disposal to a 90-acre pasture area.

6. The facilities are in the NW 1/4 of the NE 1/4 of Section 6, T10S, R9E, and the SE 1/4 of Section 31, T9S, R9E, MDB&M, with surface water drainage to the San Luis Wasteway and thence to the San Luis Holding Reservoir.

7. The beneficial uses of the San Luis Holding Reservoir are municipal and industrial supply; recreation; fresh water habitat; fish spawning; and wildlife habitat.

8. The beneficial uses of the ground water are domestic and agricultural supply.

9. The Board, on 25 July 1975, adopted a Water Quality Control Plan for the San Joaquin River Basin (5C) which contains water quality objectives. These requirements are consistent with that Plan.

10. Santa Nella County Water District has adopted a final negative declaration in accordance with the California Environmental Quality Act (Public Resources Code Section 21000, et seq.), and the State Guidelines.

11. The Board has reviewed the negative declaration and concurs there are no significant impacts on water quality.

12. The Board has notified the Discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for this discharge.

13. The Board, in a public meeting, heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED that Resolution No. 69-86 be rescinded and Santa Nella County Water District, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder, shall comply with the following:

A. Discharge Prohibitions:

1. The direct discharge of wastes to surface waters or surface water drainage courses is prohibited.

2. The by-pass or overflow of untreated or partially treated waste is prohibited.

B. Discharge Specifications:

1. Neither the treatment nor the discharge shall cause a pollution or nuisance as defined by the California Water Code, Section 13050.

2. The discharge shall not cause degradation of any water supply.

3. The discharge shall remain within the designated disposal area at all times.

4. The 30-day average daily dry weather discharge flow shall not exceed 0.4 million gallons.

5. The discharge shall not contain constituents in excess of the following concentrations:

Constituents	Units	Monthly Average	Daily Maximum
BOD_5 1/	mg/l	40	80
Settleable Matter	ml/l	0.5	1.0

1/ Five-day, 20° Celsius Biochemical Oxygen Demand. BOD_5 limitation shall apply to discharge from the package treatment plant.

6. The dissolved oxygen content of holding ponds shall not be less than 1.0 mg/l for 16 hours in any 24-hour period.

7. There shall be no irrigation or impoundment of wastewater within 500 feet of any domestic water well and within 100 feet of any irrigation well unless it is demonstrated to the satisfaction of the Executive Officer that a lesser distance is justified.

8. The direct use of reclaimed wastewater is limited to surface irrigation of pasture area for non-dairy cattle.

9. Wastewater shall not be a source of water supply for beef cattle.

10. Cattle shall be precluded from the disposal area until the field is thoroughly dry.

11. There shall be no visible standing water in any disposal area for more than 48 consecutive hours.

12. Uses made of reclaimed wastewaters must comply with the provisions of Articles 2, 3, 4, and 5, Chapter 3, Division 4, Title 22, California Code of Regulations, and further, the landowner or operator must obtain written approval from the Executive Officer prior to use of reclaimed wastewater for uses other than those listed in Specification No. 8.

13. Public access to the treatment and disposal facilities shall be precluded through a satisfactory combination of signing and/or fencing, or some other equivalent alternative.

14. Collected screenings, sludges, and other solids removed from liquid wastes shall be disposed of in a manner approved by the Executive Officer.

C. Provisions:

1. The Discharger may be required to submit technical reports as directed by the Executive Officer.

2. The Discharger shall comply with the attached Monitoring and Reporting Program No. 88-104 .

3. The Discharger shall comply with the Standard Provisions and Reporting Requirements, dated 1 September 1985, which are a part of this Order.

4. The Discharger shall report promptly to the Board any material change or proposed change in the character, locations, or volume of the discharge.

5. In the event of any change in control or ownership of land or waste discharge facilities presently owned or controlled by the Discharger, the Discharger shall notify the succeeding owner or operator of the existence of this Order by letter, a copy of which shall be forwarded to this office.

6. The Board will review this Order periodically and may revise requirements when necessary.

I, WILLIAM H. CROOKS, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on 24 June 1988 .

William H. Crooks

WILLIAM H. CROOKS, Executive Officer

BY:bro:5/16/88

Attachments

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. 88-104

FOR
SANTA NELLA COUNTY WATER DISTRICT
MERCED COUNTY

INFLUENT MONITORING

Influent samples shall be collected at approximately the same time as effluent samples and shall be representative of the influent for the period sampled. The following shall constitute the influent monitoring program:

Constituent	Units	Type of Sample	Sampling Frequency
Total Daily Flow	mgd	Continuous	Daily
BOD_5 1/	mg/l	Grab	Monthly

1/ Five-day, 20° Celsius Biochemical Oxygen Demand.

EFFLUENT MONITORING

Effluent samples shall be collected downstream from the last connection through which wastes can be admitted into the outfall and prior to discharge to disposal sites. Effluent samples should be representative of the volume and nature of the discharge. Samples collected from the outlet structure of ponds will be considered adequately composited. Time of collection of a grab sample shall be recorded. The following shall constitute the effluent monitoring program:

Constituent	Units	Type of Sample	Sampling Frequency
BOD_5 1/	mg/l	Grab	2/month
Dissolved Oxygen 2/	mg/l	Grab	Weekly
Settleable Matter 3/	ml/l	Grab	Weekly

1/ Five-day, 20° Celsius Biochemical Oxygen Demand. BOD_5 samples shall be collected at the outfall from the package treatment plant and at the outfall from final pond prior to disposal.

2/ Samples to be collected from opposite the inlet structure of each pond and lagoon between the hours of 0800 and 0900.

3/ The Settleable Matter shall be determined during periods when the pasture area is used for disposal.

If the discharge is intermittent rather than continuous, then on the first day of each such intermittent discharge, the Discharger shall monitor and record data for all of the constituents listed above, after which the frequencies of analysis given in the schedule shall apply for the duration of each such intermittent discharge. In no event shall the Discharger be required to monitor and record data more often than twice the frequencies listed in the schedule.

REPORTING

In reporting the monitoring data, the Discharger shall arrange the data in tabular form so that the date, the constituents, and the concentrations are readily discernible. The data shall be summarized in such a manner to illustrate clearly the compliance with waste discharge requirements.

Monthly monitoring reports shall be submitted to the Regional Board by the 15th day of the following month.

The results of any monitoring done more frequently than required at the locations specified in the Monitoring and Reporting Program shall be reported to the Board.

Upon written request of the Board, the Discharger shall submit a report to the Board by 30 January of each year. The report shall contain both tabular and graphical summaries of the monitoring data obtained during the previous year. In addition, the Discharger shall discuss the compliance record and the corrective actions taken or planned which may be needed to bring the discharge into full compliance with the waste discharge requirements.

The Discharger shall implement the above monitoring program on the effective date of this Order.

Ordered by William H. Crooks
WILLIAM H. CROOKS, Executive Officer

24 June 1988
(Date)

BY:bro

5/16/88

INFORMATION SHEET

SANTA NELLA COUNTY WATER DISTRICT
MERCED COUNTY

The Santa Nella County Water District currently owns and operates a wastewater treatment facility 1/4 mile west of Highway 33 on San Luis Road in the NW 1/4 of the NE 1/4 of Section 6, T10S, R9E, MDB&M. This facility consists of a package treatment plant, an aerated lagoon and three holding ponds. Disposal is to a privately owned 30-acre pasture for beef cattle. Present design capacity is 0.205 mgd.

The Discharger plans to purchase the 30-acre pasture area and an additional 70 acres for expansion of the treatment and disposal facilities. The additional 100 acres are adjacent and to the north of the current facility in the SE 1/4 of Section 31, T9S, R9E, MDB&M. The expanded treatment facility will have, in addition to the current treatment facility, three facultative lagoons. Effluent from all the treatment facilities will be combined prior to final disposal to a 90-acre pasture for beef cattle. The design capacity of the expanded facility will be 0.4 mgd.

Resolution No. 69-86, which regulates the discharge from this facility, is neither adequate nor consistent with plans and policies of the Board.

Surface water drainage is to the San Luis Wasteway and thence to the San Luis Holding Reservoir. The beneficial uses of the San Luis Holding Reservoir are municipal and industrial supply, recreation, fresh water habitat, fish spawning, and wildlife habitat.

Ground water in the area is found at a depth of 12 to 16 feet with a specific electrical conductivity of about 880 umhos/cm.

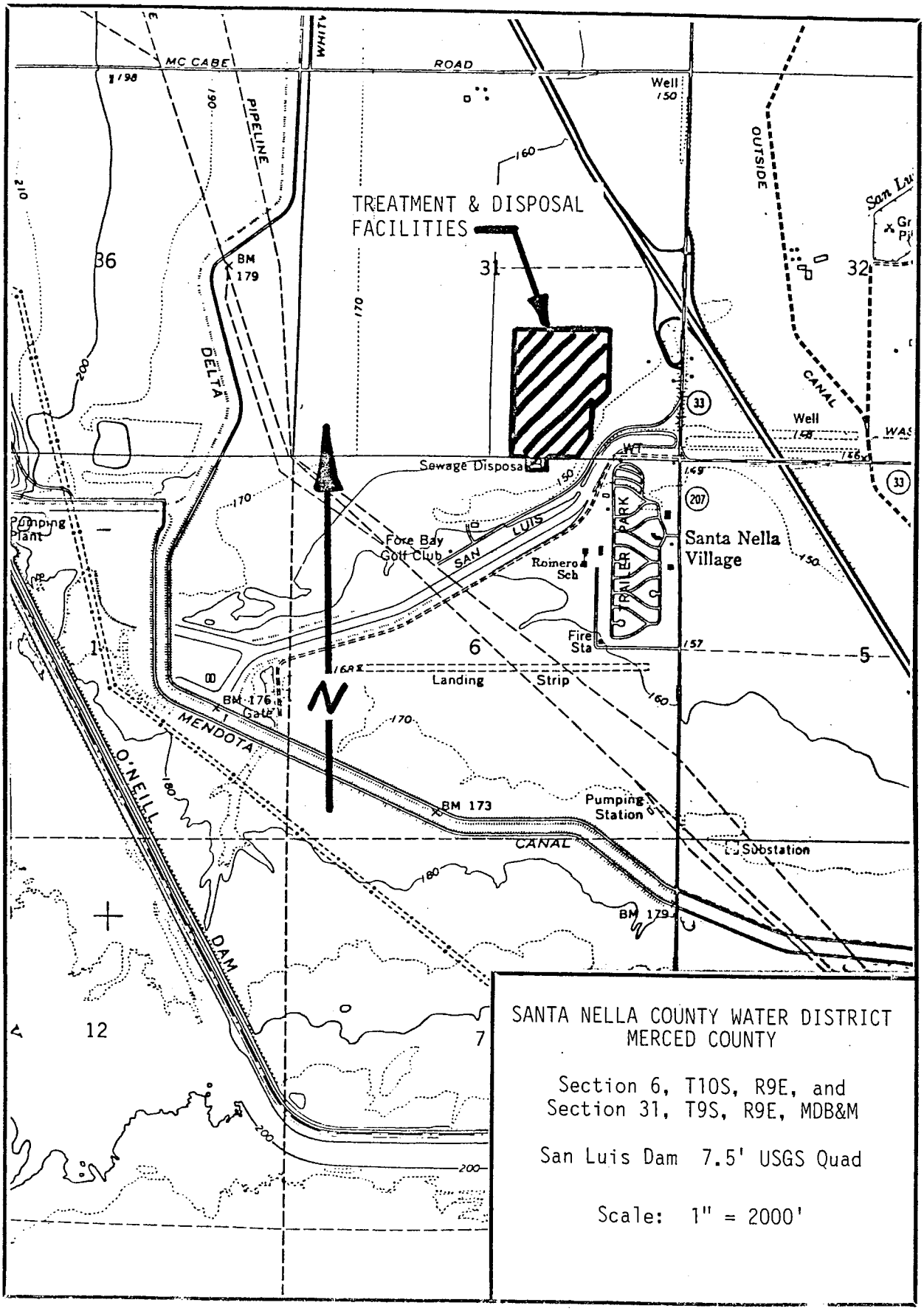
Average precipitation and evaporation rates for the area are about 8 and 65 inches per year, respectively.

Soils in the area consist of "Westside" Alluvium of relatively low permeability.

Santa Nella County Water District has adopted a final negative declaration in accordance with the California Environmental Quality Act (Public Resources Code Section 21000, et.seq.), and the the State Guidelines.

BY:bro

5/16/88



SANTA NELLA COUNTY WATER DISTRICT
MERCED COUNTY

Section 6, T10S, R9E, and
Section 31, T9S, R9E, MDB&M

San Luis Dam 7.5' USGS Quad

Scale: 1" = 2000'

APPENDIX B

Hydraulic Calculations

Hydraulic Calculations
SNCWD Recycled Water Feasibility Study

Pipe Sizing

Transmission and distribution pipeline for each alternative is size based on the design pipe velocity and the peak hour flow rate (PHD). The recommended pipe diameter for each alternative is determined by applying the continuity equation.

Continuity Equation:

$$Q = V * A$$

Where,

Q = Volumetric Flow Rate, cfs
V = Mean Velocity, fps
A = Cross Sectional Area, ft^2

For Alternative 2, a PHD of 788 gpm is used to design the transmission and distribution pipelines. Table 1 provides a summary of the recommended pipe diameter for Alternative 2.

Table 1 – Proposed Recycled Water Pipeline Route for Alternative 2

Parameter	Along Hwy 33 south of Henry Miller Road	Along Hwy 33 north of Henry Miller Road	Along Bayview Road to the WWTP
Flow Rate	1.27 cfs	0.48 cfs	1.76 cfs
Velocity	7 fps	7 fps	7 fps
Area	0.18 ft^2	0.07 ft^2	0.25 ft^2
Minimum Required Diameter	5.78-inch	3.54-inch	6.78-inch
Recommended Diameter	8-inch	8-inch	10-inch

For Alternative 3, a PHD of 3,059 gpm is used to design the transmission and distribution pipelines. Table 2 provides a summary of the recommended pipe diameter for Alternative 3.

Table 2 – Proposed Recycled Water Pipeline Route for Alternative 3

Parameter	Along Hwy 33 south of Henry Miller Road	Along Hwy 33 north of Henry Miller Road	Along Bayview Road from HWY 33 to the WWTP	Along Bayview Road from Golf Course to the WWTP
Flow Rate	1.27 cfs	0.48 cfs	1.76 cfs	5.06 cfs
Velocity	7 fps	7 fps	7 fps	7 fps
Area	0.18 ft^2	0.07 ft^2	0.25 ft^2	0.72 ft^2
Minimum Required Diameter	5.78-inch	3.54-inch	6.78-inch	11.50-inch
Recommended Diameter	8-inch	8-inch	10-inch	16-inch

For Alternative 4, a PHD of 4,454 gpm is used to design the transmission and distribution pipelines. Table 3 provides a summary of the recommended pipe diameter for Alternative 4.

Table 3 – Proposed Recycled Water Pipeline Route for Alternative 4

Parameter	Along Hwy 33 south of Henry Miller Road	Along Hwy 33 north of Henry Miller Road	Along Bayview Road from HWY 33 to the WWTP	Along Bayview Road from Golf Course to the WWTP
Flow Rate	2.31 cfs	2.43 cfs	4.74 cfs	5.19 cfs
Velocity	7 fps	7 fps	7 fps	7 fps
Area	0.33 ft^2	0.35 ft^2	0.68 ft^2	0.74 ft^2
Minimum Required Diameter	7.77-inch	7.98-inch	11.14-inch	11.66-inch
Recommended Diameter	12-inch	12-inch	16-inch	16-inch

Storage Tank Sizing

Recycled water is expected to be irrigated approximately 8 hours per day between 10 p.m. to 6 a.m. to reduce the risk of contact with the public. Refer to Table 4 for the recommended operational storage for each alternative.

Table 4 – Operational Storage Sizing

Alternative	MDD (gpm)	Estimated Operational Storage[1] (gallons)
2	263	378,409
3	1,020	1,468,663
4	1,485	2,138,180

[1] Operational storage is based on the maximum month demand

Treatment Plant Sizing

Refer to Table 5 for the treatment plant sizing for each alternative.

Table 5 – Treatment Plant Sizing

Alternative	MDD (gpm)	Estimated Treatment Plant[1] (gpd)
2	263	378,409
3	1,020	1,468,663
4	1,485	2,138,180

[1]The treatment plant is size based on the maximum month demand

Chlorine Contact Tank Sizing

Refer to Table 6 for the chlorine contact tank sizing for each alternative.

Table 6 – Chlorine Contact Tank Sizing

Alternative	MMD (gpm)	Chlorine Contact Tank Sizing[1] (gpd)
2	263	378,409
3	1,020	1,468,663
4	1,485	2,138,180

[1]Chlorine Contact Tank is size based on the maximum month demand

Pump Station Sizing

Pump station for each alternative is size based on the maximum month demand, refer to Table 6. The formula used to estimate the pump horsepower is shown below.

Pump Horsepower Equation:

$$hp = \frac{Q(gpm) * H(ft) * SG}{3{,}960 * \mu}$$

Where,

hp = horsepower, hp
Q = Flow Rate, gpm
H = Head, ft
SG = Specific Gravity of Recycled Water
μ = Pump Efficiency Coefficient

Table 6 – Pump Station Sizing

Alternative	Capacity (gpm)	Head (ft)	Specific Gravity	Efficiency	Estimated HP (hp)	Recommended HP (hp)
2	263	177	1	0.60	19.5	20
3	1,020	171	1	0.60	73.4	75
4	1,485	169	1	0.60	105.9	110

ALTERNATIVE 2

South of Henry Miller Road

Customer	Peak Hour Demand (gpd)
ARNAUDO OFFICE	2,955
MCDONALDS (IRRIGATION)	16,533
IN-N-OUT BURGER (IRRIGATION)	14,518
PANDA EXPRESS (IRRIGATION)	1,021
ROMERO GRAMMAR SCHOOL (IRRIGATION)	78,704
STARBUCKS (IRRIGATION)	6,719
RAMADA INN #1 (IRRIGATION) GALLONS	10
RAMADA INN #2 (IRRIGATION) GALLONS	920
RAMADA INN #3 (IRRIGATION) GALLONS	26,882
RAMADA INN #4 (IRRIGATION) GALLONS	7,912
RAMADA INN #5 (IRRIGATION) GALLONS	2,594
RAMADA INN #6 (IRRIGATION) GALLONS	5,523
CENTINELLA & 33 (IRRIGATION) PHASE 1	11,762
VERA CRUZ & 33 (IRRIGATION) PHASE 2	11,473
VERA CRUZ & LUIS (IRRIGATION) PHASE 2	38,023
CENTINELLA & LUIS/LAS FLORES PHASE 4	2,255
CENTINELLA & VERA CRUZ (PHASE 4)	1,122
CENTINELLA & VERA CRUZ (PHASE 4) (SOUTH)	916
CENTINELLA & SANTA ROSA (PHASE 4) (SOUTH)	1,568
ARNAUDO IRRIGATION METER	34,745
RV PARK IRRIGATION METER	7,109
SNMHP MAIN (W/S)	7,649
BUTLER AMUSEMENTS	4,857
CHP	3,977
TALBOT	770
HYDRANT METER	91
HYDRANT METER	254
SUB-TOTAL	290,859
Antojitos Mexicanos	5,696
Arnaudo Rec-Hall	22,588
Chevron Pump	11,552
Fire Station/Library	16,215
Laundry Mat	870
Main Street Market	1,437
Village Market	2,403
SUB-TOTAL	60,762
Parkway	
Neighborhood Commercial	25,615.9
Parkway Community Park	446,741.9
SUB-TOTAL	472,358
TOTAL	823,978

Flow (Q) = Velocity (V) * Area (A)	Value	Unit
Flow, Q	1.27	cfs
Velocity, V	7	fps
Area, A	0.18	ft^2
Diameter, D	5.78	in
Recommended Diameter, D	**8**	**in**
Diameter	8	in
Area	0.35	ft^2
Flow	1.27	cfs
Velocity	3.65	fps

North of Henry Miller Road

Customer	Peak Hour Demand (gpd)
ARCO AM/PM (IRRIGATION)	4,722
ARNAUDO GOLF COURSE	49,188
HOLIDAY INN EXPRESS (W/S)	18,212
LOVE'S/PILOT TRUCK STOP (IRRIGATION)	39,508
MERCED CTY LANDSCAPE P-2 (IRR)	8
MERCY SPRINGS PRODUCE (IRR)	96
SHELL (IRRIGATION)	6,139
TACO BELL (IRRIGATION)	15,524
TRAVEL CENTERS (IRRIGATION)	6,399
AAA TRUCK SERVICES (IRRIGATION)	11
SUB-TOTAL	139,808
Best Western	34,345
Carl's Jr	31,040
Chevron Gas Station	17,104
Denny's	8,335
Motel 6	20,781
Pea Soup Andersen's	35,236
Rotten Robbie	3,344
Subway Restaurant	2,039
Valero Gas Station	5,742
Wendy's	12,786
SUB-TOTAL	170,751
TOTAL	310,560

Flow (Q) = Velocity (V) * Area (A)	Value	Unit
Flow, Q	0.48	cfs
Velocity, V	7	fps
Area, A	0.07	ft^2
Diameter, D	3.55	in
Recommended Diameter, D	**8**	**in**
Diameter	8	in
Area	0.35	ft^2
Flow	0.48	cfs
Velocity	1.38	fps

TOTAL	Unit
1,134,538	gpd
788	gpm
1271	ac-ft/yr

Flow (Q) = Velocity (V) * Area (A)	Value	Unit
Flow, Q	1.76	cfs
Velocity, V	7	fps
Area, A	0.25	ft^2
Diameter, D	6.78	in
Recommended Diameter, D	**10**	**in**
Diameter	10	in
Area	0.55	ft^2
Flow	1.76	cfs
Velocity	3.22	fps

South of Henry Miller Road

Customer	Peak Hour Demand (gpd)
ARNAUDO OFFICE	2,955
MCDONALDS (IRRIGATION)	16,533
IN-N-OUT BURGER (IRRIGATION)	14,518
PANDA EXPRESS (IRRIGATION)	1,021
ROMERO GRAMMAR SCHOOL (IRRIGATION)	78,704
STARBUCKS (IRRIGATION)	6,719
RAMADA INN #1 (IRRIGATION) GALLONS	10
RAMADA INN #2 (IRRIGATION) GALLONS	920
RAMADA INN #3 (IRRIGATION) GALLONS	26,882
RAMADA INN #4 (IRRIGATION) GALLONS	7,912
RAMADA INN #5 (IRRIGATION) GALLONS	2,594
RAMADA INN #6 (IRRIGATION) GALLONS	5,523
CENTINELLA & 33 (IRRIGATION) PHASE 1	11,762
VERA CRUZ & 33 (IRRIGATION) PHASE 2	11,473
VERA CRUZ & LUIS (IRRIGATION) PHASE 2	38,023
CENTINELLA & LUIS/LAS FLORES PHASE 4	2,255
CENTINELLA & VERA CRUZ (PHASE 4)	1,122
CENTINELLA & VERA CRUZ (PHASE 4) (SOUTH)	916
CENTINELLA & SANTA ROSA (PHASE 4) (SOUTH)	1,568
ARNAUDO IRRIGATION METER	34,745
RV PARK IRRIGATION METER	7,109
SNMHP MAIN (W/S)	7,649
BUTLER AMUSEMENTS	4,857
CHP	3,977
TALBOT	770
HYDRANT METER	91
HYDRANT METER	254
SUB-TOTAL	290,859
Antojitos Mexicanos	5,696
Arnaudo Rec-Hall	22,588
Chevron Pump	11,552
Fire Station/Library	16,215
Laundry Mat	870
Main Street Market	1,437
Village Market	2,403
SUB-TOTAL	60,762
Parkway	
Neighborhood Commercial	25,615.9
Community Park	446,741.9
SUB-TOTAL	472,358
TOTAL	823,978

Flow (Q) = Velocity (V) * Area (A)	Value	Unit
Flow, Q	1.27	cfs
Velocity, V	7	fps
Area, A	0.18	ft^2
Diameter, D	5.78	in
Recommended Diameter, D	**8**	**in**
Diameter	8	in
Area	0.35	ft^2
Flow	1.27	cfs
Velocity	3.65	fps

North of Henry Miller Road

Customer	Peak Hour Demand (gpd)
ARCO AM/PM (IRRIGATION)	4,722
ARNAUDO GOLF COURSE	49,188
HOLIDAY INN EXPRESS (W/S)	18,212
LOVE'S/PILOT TRUCK STOP (IRRIGATION)	39,508
MERCED CTY LANDSCAPE P-2 (IRR)	8
MERCY SPRINGS PRODUCE (IRR)	96
SHELL (IRRIGATION)	6,139
TACO BELL (IRRIGATION)	15,524
TRAVEL CENTERS (IRRIGATION)	6,399
AAA TRUCK SERVICES (IRRIGATION)	11
SUB-TOTAL	139,808
Best Western	34,345
Carl's Jr	31,040
Chevron Gas Station	17,104
Denny's	8,335
Motel 6	20,781
Pea Soup Andersen's	35,236
Rotten Robbie	3,344
Subway Restaurant	2,039
Valero Gas Station	5,742
Wendy's	12,786
SUB-TOTAL	170,751
TOTAL	310,560

Flow (Q) = Velocity (V) * Area (A)	Value	Unit
Flow, Q	0.48	cfs
Velocity, V	7	fps
Area, A	0.07	ft^2
Diameter, D	3.55	in
Recommended Diameter, D	**8**	**in**
Diameter	8	in
Area	0.35	ft^2
Flow	0.48	cfs
Velocity	1.38	fps

South of Henry Miller Road, West of SR-33

Customer	Peak Hour Demand (gpd)
Golf	3,270,762
TOTAL	3,270,762

Flow (Q) = Velocity (V) * Area (A)	Value	Unit
Flow, Q	5.06	cfs
Velocity, V	7	fps
Area, A	0.72	ft^2
Diameter, D	11.51	in
Recommended Diameter, D	**16**	**in**
Diameter	16	in
Area	1.40	ft^2
Flow	5.06	cfs
Velocity	3.62	fps

TOTAL	Unit
4,405,300	gpd
3059	gpm
4935	ac-ft/yr

Flow (Q) = Velocity (V) * Area (A)	Value	Unit
Flow, Q	6.82	cfs
Velocity, V	7	fps
Area, A	0.97	ft^2
Diameter, D	13.36	in
Recommended Diameter, D	**18**	**in**
Diameter	18	in
Area	1.77	ft^2
Flow	6.82	cfs
Velocity	3.86	fps

North and South of Henry Miller Road Combine

Flow (Q) = Velocity (V) * Area (A)	Value	Unit
Flow, Q	1.76	cfs
Velocity, V	7	fps
Area, A	0.25	ft^2
Diameter, D	6.78	in
Recommended Diameter, D	**10**	**in**
Diameter	10	in
Area	0.55	ft^2
Flow	1.76	cfs
Velocity	3.22	fps

South of Henry Miller Road

Customer	Peak Hour Demand (gpd)
ARNAUDO OFFICE	2,955
MCDONALDS (IRRIGATION)	16,533
IN-N-OUT BURGER (IRRIGATION)	14,518
PANDA EXPRESS (IRRIGATION)	1,021
ROMERO GRAMMAR SCHOOL (IRRIGATION)	78,704
STARBUCKS (IRRIGATION)	6,719
RAMADA INN #1 (IRRIGATION) GALLONS	10
RAMADA INN #2 (IRRIGATION) GALLONS	920
RAMADA INN #3 (IRRIGATION) GALLONS	26,882
RAMADA INN #4 (IRRIGATION) GALLONS	7,912
RAMADA INN #5 (IRRIGATION) GALLONS	2,594
RAMADA INN #6 (IRRIGATION) GALLONS	5,523
CENTINELLA & 33 (IRRIGATION) PHASE 1	11,762
VERA CRUZ & 33 (IRRIGATION) PHASE 2	11,473
VERA CRUZ & LUIS (IRRIGATION) PHASE 2	38,023
CENTINELLA & LUIS/LAS FLORES PHASE 4	2,255
CENTINELLA & VERA CRUZ (PHASE 4)	1,122
CENTINELLA & VERA CRUZ (PHASE 4) (SOUTH)	916
CENTINELLA & SANTA ROSA (PHASE 4) (SOUTH)	1,568
ARNAUDO IRRIGATION METER	34,745
RV PARK IRRIGATION METER	7,109
SNMHP MAIN (W/S)	7,649
BUTLER AMUSEMENTS	4,857
CHP	3,977
TALBOT	770
HYDRANT METER	91
HYDRANT METER	254
SUB-TOTAL	290,859
Antojitos Mexicanos	5,696
Arnaudo Rec-Hall	22,588
Chevron Pump	11,552
Fire Station/Library	16,215
Laundry Mat	870
Main Street Market	1,437
Village Market	2,403
SUB-TOTAL	60,762
Parkway	
Neighborhood Commercial	25,615.9
Community Park	446,741.9
SUB-TOTAL	472,358
Arnaudo (West of State RT 33/South of Spillway)	
Neighborhood Commercial	12,403.3
Arnaudo (East of State RT 33)	
General Commercial	257,065.3
Office Commercial	242,102.6
Undeveloped (South of Henry Miller Road)	
General Commercial	155,769.4
SUB-TOTAL	667,341
TOTAL	1,491,319

Flow (Q) = Velocity (V) * Area (A)	Value	Unit
Flow, Q	2.31	cfs
Velocity, V	7	fps
Area, A	0.33	ft^2
Diameter, D	7.77	in
Recommended Diameter, D	**12**	**in**
Diameter	12	in
Area	0.79	ft^2
Flow	2.31	cfs
Velocity	2.94	fps

North of Henry Miller Road

Customer	Peak Hour Demand (gpd)
ARCO AM/PM (IRRIGATION)	4,722
ARNAUDO GOLF COURSE	49,188
HOLIDAY INN EXPRESS (W/S)	18,212
LOVE'S/PILOT TRUCK STOP (IRRIGATION)	39,508
MERCED CTY LANDSCAPE P-2 (IRR)	8
MERCY SPRINGS PRODUCE (IRR)	96
SHELL (IRRIGATION)	6,139
TACO BELL (IRRIGATION)	15,524
TRAVEL CENTERS (IRRIGATION)	6,399
AAA TRUCK SERVICES (IRRIGATION)	11
SUB-TOTAL	139,808
Best Western	34,345
Carl's Jr	31,040
Chevron Gas Station	17,104
Denny's	8,335
Motel 6	20,781
Pea Soup Andersen's	35,236
Rotten Robbie	3,344
Subway Restaurant	2,039
Valero Gas Station	5,742
Wendy's	12,786
SUB-TOTAL	170,751
Undeveloped (North of Henry Miller Road)	
General Commercial	358,357.2
General Commercial	456,101.6
General Commercial	211,214.6
Neighborhood Commercial	34,015.5
General Commercial	200,337.8
SUB-TOTAL	1,260,027
TOTAL	1,570,586

Flow (Q) = Velocity (V) * Area (A)	Value	Unit
Flow, Q	2.43	cfs
Velocity, V	7	fps
Area, A	0.35	ft^2
Diameter, D	7.98	in
Recommended Diameter, D	**12**	**in**
Diameter	12	in
Area	0.79	ft^2
Flow	2.43	cfs
Velocity	3.09	fps

South of Henry Miller Road, West of SR-33

Customer	Peak Hour Demand (gpd)
Golf	3,270,762
SUB-TOTAL	3,270,762
Golf	81,183.8
SUB-TOTAL	81,184
TOTAL	3,351,946

Flow (Q) = Velocity (V) * Area (A)	Value	Unit
Flow, Q	5.19	cfs
Velocity, V	7	fps
Area, A	0.74	ft^2
Diameter, D	11.66	in
Recommended Diameter, D	**16**	**in**
Diameter	16	in
Area	1.40	ft^2
Flow	5.19	cfs
Velocity	3.71	fps

TOTAL	Unit
6,413,851	gpd
4454	gpm
7184	ac-ft/yr

Flow (Q) = Velocity (V) * Area (A)	Value	Unit
Flow, Q	9.92	cfs
Velocity, V	7	fps
Area, A	1.42	ft^2
Diameter, D	16.12	in
Recommended Diameter, D	**24**	**in**
Diameter	24	in
Area	3.14	ft^2
Flow	9.92	cfs
Velocity	3.16	fps

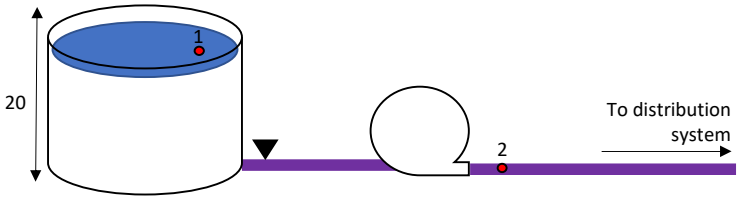
North and South of Henry Miller Road Combine

Flow (Q) = Velocity (V) * Area (A)	Value	Unit
Flow, Q	4.74	cfs
Velocity, V	7	fps
Area, A	0.68	ft^2
Diameter, D	11.14	in
Recommended Diameter, D	**16**	**in**
Diameter	16	in
Area	1.40	ft^2
Flow	4.74	cfs
Velocity	3.39	fps

Total Dynamic Head (TDH) Calculations

Input Value

TDH = - Elevation Head + Friction Headloss + Pressure Head + Velocity Head



$$TDH = H_p = \frac{P_2}{\gamma} + \frac{v_2^2}{2g} + z_2 - \left(\frac{P_1}{\gamma} + \frac{v_1^2}{2g} + z_1\right) + H_F$$

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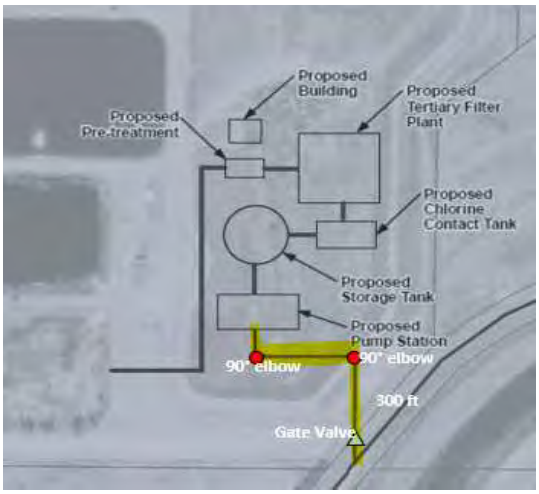


Elevation Head (z_1)

Vertical Rise	-20	ft
(Assume 20 ft vertical rise to storage tank)		
Elevation Head	-20	ft

Friction Head loss (Major + Minor Head Losses) (H_F)

Major Head Loss (due to friction in pipes and ducts)

Hazen-Williams Equation (for turbulent flow)

$$h_{f,ft} = \frac{10.44\, L_{ft}\, Q_{gpm}^{1.85}}{C^{1.85}\, d_{in}^{4.87}}$$

L	Length	300	ft
Q	Flow Rate	257	gpm
C	Coefficient	150	(for new recyced water pipeline)
d	Diameter	4.00	in
h_f	Major Head Loss	9.92	ft

Minor Head Loss (due to components as valves, bends, tees, and the like in the pipe or duct system)

$$h_{m,ft} = K_L \frac{V^2}{2g}$$

V	Velocity	6.56	ft/s
g	Gravitational Acceleration	32.2	ft/s^2

K_L	Fittings	K_L	Qty	
	Standard 90° Elbow	0.9	2	(K_L values from Civil Engineering Reference Manual)
	Gate Valve, fully open	0.19	1	

h_m	Minor Head Loss	1.33	ft
Total Head Loss		11.25	ft

Pressure Head (P^2/γ)

Maximum Discharge Pressure		80	psi (at Distribution System)
Pressure Head		185	ft

Velocity Head ($v^2/2g$)

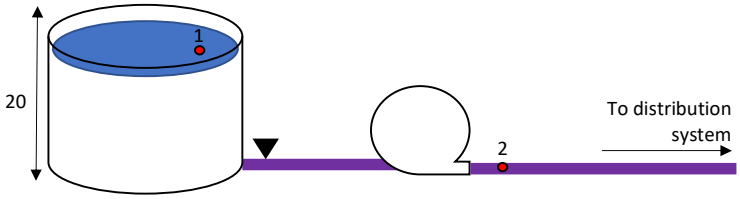
v	Velocity	6.56	ft/s
g	Gravity	32.2	ft/s^2
Velocity Head		0.67	ft

Total Dynamic Head	**177**	**ft**
Estimated Pump HP	**20**	**hp**

Total Dynamic Head (TDH) Calculations

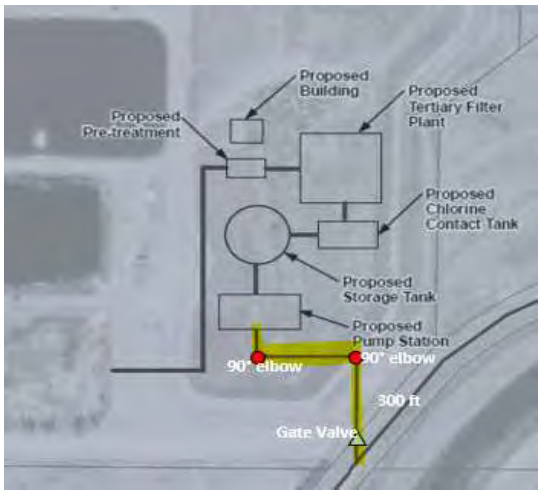
Input Value

TDH = - Elevation Head + Friction Headloss + Pressure Head + Velocity Head



$$TDH = H_p = \frac{P_2}{\gamma} + \frac{v_2^2}{2g} + z_2 - \left(\frac{P_1}{\gamma} + \frac{v_1^2}{2g} + z_1\right) + H_F$$

(0, 0, 0)



Elevation Head (z_1)

Vertical Rise	-20	ft
(Assume 20 ft vertical rise to storage tank)		
Elevation Head	-20	ft

Friction Head loss (Major + Minor Head Losses) (H_F)

Major Head Loss (due to friction in pipes and ducts)

Hazen-Williams Equation (for turbulent flow)

$$h_{f,ft} = \frac{10.44\, L_{ft}\, Q_{gpm}^{1.85}}{C^{1.85}\, d_{in}^{4.87}}$$

L	Length	300	ft
Q	Flow Rate	1013	gpm
C	Coefficient	150	(for new recyced water pipeline)
d	Diameter	8.00	in
h_f	Major Head Loss	4.29	ft

Minor Head Loss (due to components as valves, bends, tees, and the like in the pipe or duct system)

$$h_{m,ft} = K_L \frac{V^2}{2g}$$

V	Velocity	6.47	ft/s
g	Gravitational Acceleration	32.2	ft/s^2

K_L	Fittings	K_L	Qty	
	Standard 90° Elbow	0.9	2	(K_L values from Civil Engineering Reference Manual)
	Gate Valve, fully open	0.19	1	

h_m	Minor Head Loss	1.29	ft
Total Head Loss		5.58	ft

Pressure Head (P^2/γ)

Maximum Discharge Pressure	80	psi	(at Distribution System)
Pressure Head	185	ft	

Velocity Head ($v^2/2g$)

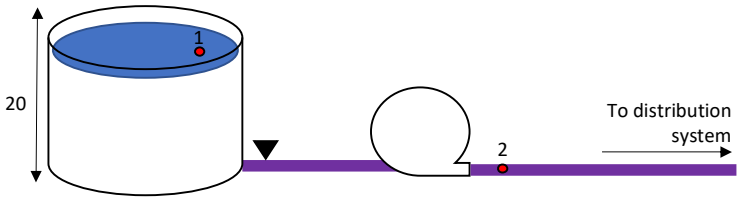
v	Velocity	6.47	ft/s
g	Gravity	32.2	ft/s^2
Velocity Head		0.65	ft

Total Dynamic Head	**171**	**ft**
Estimated Pump HP	**75**	**hp**

Total Dynamic Head (TDH) Calculations

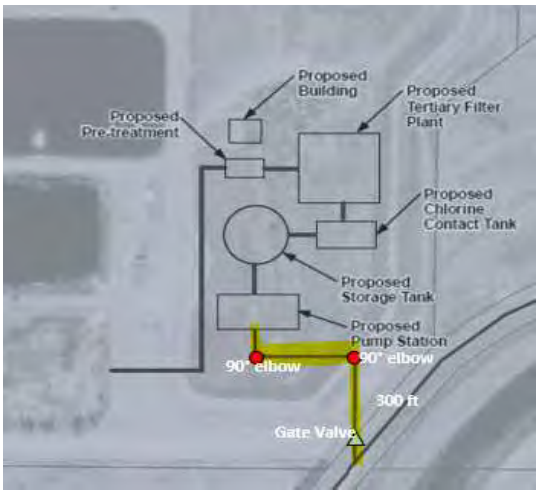
Input Value

TDH = - Elevation Head + Friction Headloss + Pressure Head + Velocity Head



$$TDH = H_p = \frac{P_2}{\gamma} + \frac{v_2^2}{2g} + z_2 - \left(\frac{P_1}{\gamma} + \frac{v_1^2}{2g} + z_1\right) + H_F$$

(0, 0, 0 cancel)



Elevation Head (z_1)

Vertical Rise	-20	ft
(Assume 20 ft vertical rise to storage tank)		
Elevation Head	-20	ft

Friction Head loss (Major + Minor Head Losses) (H_F)

Major Head Loss (due to friction in pipes and ducts)

Hazen-Williams Equation (for turbulent flow)

$$h_{f,ft} = \frac{10.44\, L_{ft}\, Q_{gpm}^{1.85}}{C^{1.85}\, d_{in}^{4.87}}$$

L	Length	300	ft
Q	Flow Rate	1482	gpm
C	Coefficient	150	(for new recyced water pipeline)
d	Diameter	10.00	in
h_f	Major Head Loss	2.92	ft

Minor Head Loss (due to components as valves, bends, tees, and the like in the pipe or duct system)

$$h_{m,ft} = K_L \frac{V^2}{2g}$$

V	Velocity	6.05	ft/s
g	Gravitational Acceleration	32.2	ft/s^2

K_L	Fittings	K_L	Qty	
	Standard 90° Elbow	0.9	2	(K_L values from Civil Engineering Reference Manual)
	Gate Valve, fully open	0.19	1	

h_m	Minor Head Loss	1.13	ft
Total Head Loss		4.06	ft

Pressure Head (P^2/γ)

Maximum Discharge Pressure	80	psi	(at Distribution System)
Pressure Head	185	ft	

Velocity Head ($v^2/2g$)

v	Velocity	6.05	ft/s
g	Gravity	32.2	ft/s^2
Velocity Head		0.57	ft

Total Dynamic Head	**169**	**ft**
Estimated Pump HP	**110**	**hp**

APPENDIX C

Economic Analysis

Project Information	*User Input*
Name of Agency	Santa Nella County Water District
Name of person conducting analsysis	Bao Cha
Phone number	(209) 694-4766
email:	bao@blackwater-eng.com
Reuse project information	
Project name	Recycled Water Feasibility Study
Project location	Santa Nella, California
Indirect potable, or non-potable water production	Non-potable water production
Does the project operate year-round or seasonally	Seasonally
Phases of operation (with years)	40
Accounting Perspective	Statewide
Name Of Alternative	Alternative 2: Updating the existing WWTP treatment process to produce tertiary treated effluent for disposal via landscape irrigation within the public right-of-way throughout SNCWD service area but primarily along the SR-33 corridor.
Project Users	Commercial Landscape Irrigation Parkway Community Park Truck Fill Station

2. Standard Assumptions

User Input

Table 2A: Time and Interest

Description	Amount	Unit
Useful Life of Project	40	years
Installed Capacity (final project)	171	AF per year
Recycled Water Market Price	$4,911	per AF
Potable Water Replacement Factor (for RW)	20	
Project Design Year	2024	
Reference Cost Year (Ref Yr)	2020	
First Year of Project Construction	2026	APPROVED
Project First Year of Operation (Last Year of Construction)	2030	APPROVED
Project Last Year of Operation	2066	
Financing Period	40	years
Annual Interest Rate	2.00%	
Discount Rate	6.00%	

Notes:

'Project Last Year of Operation' is equal to 'Project First Year of Operation' and 'Period of Analysis'
'Project Reference Year' is set by 'Project First Year of Operation'
Maximum analysis is 100 years + 2 years for design & construction

3.1 Fresh Water Supply Alternative *User Input*

Table 3A: Annual Fresh Water Alternative Cost	Costs (2020 $)	Comments
Office R&M		
Repairs & Maintenance	$500	
Professional Services		
Engineering Fees	$20,000	
Contract Services	$500	
Operations/R&M		
Chemicals	$24,000	
Fuel	$5,000	
Vehicle Maintenance	$2,500	
Plant Supplies	$18,100	
Plant Equipment Rental	$1,000	
Repair/Maint Plants	$16,990	
R&M Manhole Pumping Wendy's	$0	
Inspection Fees	$4,482	
Utilities		
Utilities-Solid Waste	$354	
Utilities-Well Meter	$15,500	
Utilities-Plant	$36,500	
Water Purchase/Fees		
Standby Charges	$7,860	
Delivery Charges	$25,000	
Water Purchase M&I SLC WC0004	$49,000	
Water Purcase M&I DMC WC0003	$0	
Water Purchase AG DMC WC0001	$0	
Water Purchase AG SLC WC0002	$0	
Total	**$227,286**	

Notes:
Costs represented as present worth values
Without Project assumes future unmet water demand will incur a shortage cost

3.2 Baseline - Total Volume For Entire Project

Table 3B: Total Volume For Entire Project

User Input

	Total Volume (af)
Total Lifetime Recycled Water Produced	**6,849**
Total Lifetime Fresh Water Alternative Produced	**8,903**

*Note: Total lifetime fresh water alternative must be equal to or greater than the total lifetime recycled water produced in order to demonstrate that there is fresh water supply throughout the project

4.0 BENEFITS OF RECYCLED WATER PROGRAM FOR ALTERNATIVE 2

Table 1 - Projected Commercial Water Rates

Parameters	Current	From 2020 Water Rate Study ($/hcf)				Projected Water Rates ($/hcf)						
Fiscal Year	2019	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Rate ($/hcf)	1.25	1.33	1.37	1.42	1.47	1.51	1.56	1.60	1.65	1.70	1.75	1.81
Percent Increase		6%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%

Recycled water rates should be less than potable water rates

For this feasibility study, the cost of the recycled water is 20% less than potable water

Estimated Potable Water Rate in FY 2030-31 ($/hcf) 1.81

Estimated Recycled Water Rate in FY 2030-31 ($/hcf) 1.44

ADD (ac-ft/yr) 171

Estimated revenue of recycled water by FY 2030-31 ($) 107,640 (BENEFITS)

ADDITIONAL FEES FROM ALL CUSTOMERS WHO WILL BENEFIT FROM THE RECYCLED WATER PROGRAM

Table 2 - Benefits of Recycled Water Program

Parameters	Current	From 2020 Water Rate Study				Projected Water Costs						
Fiscal Year	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Water Expenses[1] ($)	312,237	321,526	329,902	338,562	347,517	359,333	371,550	384,183	397,245	410,752	424,717	439,158
Percentage Inflation Rate		3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%
Water Production[2] (acre-ft/yr)	488	488	488	488	488	488	488	488	488	488	488	488
Potable Water Cost[3] ($/acre-ft)	640	659	676	694	712	736	761	787	814	841	870	900
Recycled Water Usage[4] (acre-ft/yr)	171	171	171	171	171	171	171	171	171	171	171	171
Recycled Water Benefits ($)	109,428	112,683	115,619	118,654	121,792	125,933	130,215	134,642	139,220	143,954	148,848	153,909 (BENEFITS)

[1]Variable expenses consist of office repairs and maintenance, professional services, operations, utilities, water purchase fees, and SLWD assessments

[2]Raw surface water and groundwater production in 2018

[3]Cost of Potable Water is equal to variable water expenses ($) divided by the water production (acre-ft)

[4]Recycled Water Average Day Demand

4.1 Identify and Quantify Benefits

Alternative: Alternat | User Input | Rate 3.40% (from water rate study)

Project Participant: Project Part

Table 4A: Identification and Quantification of Benefits

A | B | C | D | F: Expected Value

Item	Benefit	Comments	Quantifiable	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
1	Avoided costs of water supply development/purchase (potable water)		YES															
			High Estimate															
			Best Estimate							$153,909	$159,142	$164,553	$170,147	$175,932	$181,914	$188,099	$194,494	$201,107
			Low Estimate															
			Expected Value							**$153,909**	**$159,142**	**$164,553**	**$170,147**	**$175,932**	**$181,914**	**$188,099**	**$194,494**	**$201,107**
2	Reclaimed water sales revenues		YES															
			High Estimate															
			Best Estimate							$107,640	$111,300	$115,084	$118,997	$123,042	$127,226	$131,552	$136,024	$140,649
			Low Estimate															
			Expected Value							**$107,640**	**$111,300**	**$115,084**	**$118,997**	**$123,042**	**$127,226**	**$131,552**	**$136,024**	**$140,649**
3	Avoided increased groundwater pumping costs with declining groundwater levels		NO															
	Reduces groundwater pumping and overdraft conditions in the groundwater basin.																	
4	Increased supply reliability (customer perspective)		NO															
	Improves reliability of existing water supply system by making the system less sensitive to drought conditions.																	
5	Local control over water resources (not relying on imported water)		NO															
	Increases degree of local control on water supply, by reducing water demand, a portion of which is dependent on water allocations from the CVP.																	
6	Source water protection		NO															
	Reduces surface water demand; consistent with State policies for restoring and protecting fish and wildlife.																	
7	Aesthetic values		NO															
	Provides aesthetic benefits for the community by supporting irrigation of areas, even during drought conditions.																	
8	Other (specify):		NO															
	Reduces need for future water system improvements and expansion.																	
			Annual Total	$0	$0	$0	$0	$0	$0	$261,549	$270,441	$279,636	$289,144	$298,975	$309,140	$319,651	$330,519	$341,756

Item	Quantifiable	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
1	YES														
	High Estimate														
	Best Estimate	$207,945	$215,015	$222,326	$229,885	$237,701	$245,782	$254,139	$262,780	$271,714	$280,953	$290,505	$300,382	$310,595	$321,155
	Low Estimate														
	Expected Value	**$207,945**	**$215,015**	**$222,326**	**$229,885**	**$237,701**	**$245,782**	**$254,139**	**$262,780**	**$271,714**	**$280,953**	**$290,505**	**$300,382**	**$310,595**	**$321,155**
2	YES														
	High Estimate														
	Best Estimate	$145,431	$150,376	$155,489	$160,775	$166,242	$171,894	$177,738	$183,781	$190,030	$196,491	$203,172	$210,079	$217,222	$224,608
	Low Estimate														
	Expected Value	**$145,431**	**$150,376**	**$155,489**	**$160,775**	**$166,242**	**$171,894**	**$177,738**	**$183,781**	**$190,030**	**$196,491**	**$203,172**	**$210,079**	**$217,222**	**$224,608**
	Annual Total	$353,376	$365,391	$377,814	$390,660	$403,942	$417,676	$431,877	$446,561	$461,744	$477,444	$493,677	$510,462	$527,817	$545,763

Item	Quantifiable	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
1	YES														
	High Estimate														
	Best Estimate	$332,075	$343,365	$355,040	$367,111	$379,593	$392,499	$405,844	$419,643	$433,910	$448,663	$463,918	$479,691	$496,001	$512,865
	Low Estimate														
	Expected Value	**$332,075**	**$343,365**	**$355,040**	**$367,111**	**$379,593**	**$392,499**	**$405,844**	**$419,643**	**$433,910**	**$448,663**	**$463,918**	**$479,691**	**$496,001**	**$512,865**
2	YES														
	High Estimate														
	Best Estimate	$232,244	$240,141	$248,305	$256,748	$265,477	$274,504	$283,837	$293,487	$303,466	$313,784	$324,452	$335,484	$346,890	$358,684
	Low Estimate														
	Expected Value	**$232,244**	**$240,141**	**$248,305**	**$256,748**	**$265,477**	**$274,504**	**$283,837**	**$293,487**	**$303,466**	**$313,784**	**$324,452**	**$335,484**	**$346,890**	**$358,684**
	Annual Total	$564,319	$583,506	$603,345	$623,859	$645,070	$667,002	$689,681	$713,130	$737,376	$762,447	$788,370	$815,175	$842,891	$871,549

4.2 Identify and Quantify Costs

Alternative | **Alternati**
Project Participant | **Project Parti**

User Input

Rate 3.40% (from water rate study)

Table 4B: Identification and Quantification of Costs

A | B | C | D | F Expected Value

Item	Cost	Comments	Quantifiable	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
1	Capital costs for recycled water distribution		YES																					
			Best Estimate			$4,468,416																		
			Expected Value			**$4,468,416**																		
2	Capital costs for storage		YES																					
			High Estimate																					
			Best Estimate			$1,191,990																		
			Low Estimate																					
			Expected Value			**$1,191,990**																		
3	Capital costs for reclamation treatment		YES																					
			High Estimate																					
			Best Estimate			$795,000																		
			Low Estimate																					
			Expected Value			**$795,000**																		
4	Other (specify):		YES																					
	Capital costs for trenchless crossing		High Estimate																					
			Best Estimate			$1,361,818																		
			Low Estimate																					
			Expected Value			**$1,361,818**																		
5	Other (specify):		YES																					
	Capital costs for pump station		High Estimate																					
			Best Estimate			$350,000																		
			Low Estimate																					
			Expected Value			**$350,000**																		
6	Other (specify):		YES																					
	Capital costs for site work		High Estimate																					
			Best Estimate			$200,000																		
			Low Estimate																					
			Expected Value			**$200,000**																		
7	Other (specify):		YES																					
	Capital costs for building		High Estimate																					
			Best Estimate			$300,000																		
			Low Estimate																					
			Expected Value			**$300,000**																		
8	Other (specify):		YES																					
	Capital costs for recycled water hydrants		High Estimate																					
			Best Estimate			$20,000																		
			Low Estimate																					
			Expected Value			**$20,000**																		
9	O&M costs for recycled water distribution		YES																					
			High Estimate																					
			Best Estimate							$116,605	$120,569	$124,669	$128,907	$133,290	$137,822	$142,508	$147,353	$152,363	$157,544	$162,900	$168,439	$174,166	$180,087	$186,210
			Low Estimate																					
			Expected Value							**$116,605**	**$120,569**	**$124,669**	**$128,907**	**$133,290**	**$137,822**	**$142,508**	**$147,353**	**$152,363**	**$157,544**	**$162,900**	**$168,439**	**$174,166**	**$180,087**	**$186,210**
10	O&M costs for storage		YES																					
			High Estimate																					
			Best Estimate							$23,840	$24,650	$25,488	$26,355	$27,251	$28,178	$29,136	$30,126	$31,151	$32,210	$33,305	$34,437	$35,608	$36,819	$38,071
			Low Estimate																					
			Expected Value							**$23,840**	**$24,650**	**$25,488**	**$26,355**	**$27,251**	**$28,178**	**$29,136**	**$30,126**	**$31,151**	**$32,210**	**$33,305**	**$34,437**	**$35,608**	**$36,819**	**$38,071**
11	O&M costs for reclamation treatment		YES																					
			High Estimate																					
			Best Estimate							$79,500	$82,203	$84,998	$87,888	$90,876	$93,966	$97,161	$100,464	$103,880	$107,412	$111,064	$114,840	$118,745	$122,782	$126,956
			Low Estimate																					
			Expected Value							**$79,500**	**$82,203**	**$84,998**	**$87,888**	**$90,876**	**$93,966**	**$97,161**	**$100,464**	**$103,880**	**$107,412**	**$111,064**	**$114,840**	**$118,745**	**$122,782**	**$126,956**
12	Other (specify):		YES																					
	O&M costs for pump station		High Estimate																					
			Best Estimate							$17,500	$18,095	$18,710	$19,346	$20,004	$20,684	$21,388	$22,115	$22,867	$23,644	$24,448	$25,279	$26,139	$27,027	$27,946
			Low Estimate																					
			Expected Value							**$17,500**	**$18,095**	**$18,710**	**$19,346**	**$20,004**	**$20,684**	**$21,388**	**$22,115**	**$22,867**	**$23,644**	**$24,448**	**$25,279**	**$26,139**	**$27,027**	**$27,946**
13	Other (specify):		YES																					
	O&M costs for energy		High Estimate																					
			Best Estimate							$7,994	$8,266	$8,547	$8,837	$9,138	$9,449	$9,770	$10,102	$10,445	$10,801	$11,168	$11,548	$11,940	$12,346	$12,766
			Low Estimate																					
			Expected Value							**$7,994**	**$8,266**	**$8,547**	**$8,837**	**$9,138**	**$9,449**	**$9,770**	**$10,102**	**$10,445**	**$10,801**	**$11,168**	**$11,548**	**$11,940**	**$12,346**	**$12,766**
14	Other (specify):		YES																					
	O&M costs for labor		High Estimate																					
			Best Estimate							$90,000	$93,060	$96,224	$99,496	$102,879	$106,376	$109,993	$113,733	$117,600	$121,598	$125,733	$130,008	$134,428	$138,998	$143,724
			Low Estimate																					
			Expected Value							**$90,000**	**$93,060**	**$96,224**	**$99,496**	**$102,879**	**$106,376**	**$109,993**	**$113,733**	**$117,600**	**$121,598**	**$125,733**	**$130,008**	**$134,428**	**$138,998**	**$143,724**
15	Other (specify):		YES																					
	Contingencies		High Estimate																					
			Best Estimate	$2,300,820																				
			Low Estimate																					
			Expected Value	**$2,300,820**																				
16	Other (specify):		YES																					
	Engineering, Construction Management, Administration, and Design		High Estimate																					
			Best Estimate	$2,300,820																				
			Low Estimate																					
			Expected Value	**$2,300,820**																				
17	Other (specify):		YES																					
	Disinfection Process		High Estimate																					
			Best Estimate			$428,797																		
			Low Estimate																					
			Expected Value			**$428,797**																		
18	Other (specify):		YES																					
	Diesel Energy		High Estimate																					
			Best Estimate			$87,262																		
			Low Estimate																					
			Expected Value			**$87,262**																		
19	Other (specify):		YES																					
	2% Loan Interest		High Estimate																					
			Best Estimate							$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526
			Low Estimate																					
			Expected Value							**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**
			Annual Total	$4,601,641	$0	$9,203,282	$0	$0	$0	$494,965	$506,370	$518,162	$530,356	$542,964	$556,001	$569,481	$583,420	$597,832	$612,734	$628,143	$644,076	$660,551	$677,586	$695,200

Item	Quantifiable	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
9	Best Estimate	$192,541	$199,088	$205,857	$212,856	$220,093	$227,576	$235,314	$243,314	$251,587	$260,141	$268,986	$278,131	$287,588	$297,366	$307,476	$317,930	$328,740	$339,917	$351,474	$363,425	$375,781	$388,558
9	**Expected Value**	**$192,541**	**$199,088**	**$205,857**	**$212,856**	**$220,093**	**$227,576**	**$235,314**	**$243,314**	**$251,587**	**$260,141**	**$268,986**	**$278,131**	**$287,588**	**$297,366**	**$307,476**	**$317,930**	**$328,740**	**$339,917**	**$351,474**	**$363,425**	**$375,781**	**$388,558**
10	Best Estimate	$39,365	$40,703	$42,087	$43,518	$44,998	$46,528	$48,110	$49,746	$51,437	$53,186	$54,994	$56,864	$58,797	$60,796	$62,863	$65,001	$67,211	$69,496	$71,859	$74,302	$76,828	$79,440
10	**Expected Value**	**$39,365**	**$40,703**	**$42,087**	**$43,518**	**$44,998**	**$46,528**	**$48,110**	**$49,746**	**$51,437**	**$53,186**	**$54,994**	**$56,864**	**$58,797**	**$60,796**	**$62,863**	**$65,001**	**$67,211**	**$69,496**	**$71,859**	**$74,302**	**$76,828**	**$79,440**
11	Best Estimate	$131,273	$135,736	$140,351	$145,123	$150,057	$155,159	$160,435	$165,890	$171,530	$177,362	$183,392	$189,627	$196,075	$202,741	$209,634	$216,762	$224,132	$231,752	$239,632	$247,780	$256,204	$264,915
11	**Expected Value**	**$131,273**	**$135,736**	**$140,351**	**$145,123**	**$150,057**	**$155,159**	**$160,435**	**$165,890**	**$171,530**	**$177,362**	**$183,392**	**$189,627**	**$196,075**	**$202,741**	**$209,634**	**$216,762**	**$224,132**	**$231,752**	**$239,632**	**$247,780**	**$256,204**	**$264,915**
12	Best Estimate	$28,897	$29,879	$30,895	$31,945	$33,031	$34,155	$35,316	$36,517	$37,758	$39,042	$40,369	$41,742	$43,161	$44,629	$46,146	$47,715	$49,337	$51,015	$52,749	$54,543	$56,397	$58,315
12	**Expected Value**	**$28,897**	**$29,879**	**$30,895**	**$31,945**	**$33,031**	**$34,155**	**$35,316**	**$36,517**	**$37,758**	**$39,042**	**$40,369**	**$41,742**	**$43,161**	**$44,629**	**$46,146**	**$47,715**	**$49,337**	**$51,015**	**$52,749**	**$54,543**	**$56,397**	**$58,315**
13	Best Estimate	$13,200	$13,649	$14,113	$14,593	$15,089	$15,602	$16,132	$16,681	$17,248	$17,834	$18,441	$19,068	$19,716	$20,386	$21,079	$21,796	$22,537	$23,303	$24,096	$24,915	$25,762	$26,638
13	**Expected Value**	**$13,200**	**$13,649**	**$14,113**	**$14,593**	**$15,089**	**$15,602**	**$16,132**	**$16,681**	**$17,248**	**$17,834**	**$18,441**	**$19,068**	**$19,716**	**$20,386**	**$21,079**	**$21,796**	**$22,537**	**$23,303**	**$24,096**	**$24,915**	**$25,762**	**$26,638**
14	Best Estimate	$148,611	$153,664	$158,888	$164,290	$169,876	$175,652	$181,624	$187,799	$194,185	$200,787	$207,614	$214,673	$221,971	$229,518	$237,322	$245,391	$253,734	$262,361	$271,282	$280,505	$290,042	$299,904
14	**Expected Value**	**$148,611**	**$153,664**	**$158,888**	**$164,290**	**$169,876**	**$175,652**	**$181,624**	**$187,799**	**$194,185**	**$200,787**	**$207,614**	**$214,673**	**$221,971**	**$229,518**	**$237,322**	**$245,391**	**$253,734**	**$262,361**	**$271,282**	**$280,505**	**$290,042**	**$299,904**
19	Best Estimate	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526	$159,526
19	**Expected Value**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**	**$159,526**
	Annual Total	$713,413	$732,245	$751,717	$771,852	$792,671	$814,198	$836,457	$859,472	$883,271	$907,878	$933,322	$959,631	$986,834	$1,014,963	$1,044,048	$1,074,122	$1,105,218	$1,137,371	$1,170,618	$1,204,995	$1,240,541	$1,277,296

4.3 Evaluate Project

Alternative: **Name Of Alternative**
Project Participant: **Project Users**

User Input

Discount Rate 6.00%

Table 4C: Project Evaluation

A	B	C	D	E	F
Year	Annual Benefits	Discounted Benefits	Annual Costs	Discounted Costs	Net Benefits (discounted)
2024	$0	$0	$4,601,641	$5,170,404	-$5,170,404
2025	$0	$0	$0	$0	$0
2026	$0	$0	$9,203,282	$9,203,282	-$9,203,282
2027	$0	$0	$0	$0	$0
2028	$0	$0	$0	$0	$0
2029	$0	$0	$0	$0	$0
2030	$261,549	$207,171	$494,965	$392,058	-$184,887
2031	$270,441	$202,089	$506,370	$378,389	-$176,299
2032	$279,636	$197,133	$518,162	$365,284	-$168,151
2033	$289,144	$192,297	$530,356	$352,717	-$160,420
2034	$298,975	$187,580	$542,964	$340,662	-$153,082
2035	$309,140	$182,979	$556,001	$329,096	-$146,117
2036	$319,651	$178,491	$569,481	$317,995	-$139,504
2037	$330,519	$174,113	$583,420	$307,338	-$133,225
2038	$341,756	$169,842	$597,832	$297,104	-$127,262
2039	$353,376	$165,677	$612,734	$287,274	-$121,597
2040	$365,391	$161,613	$628,143	$277,828	-$116,216
2041	$377,814	$157,649	$644,076	$268,751	-$111,102
2042	$390,660	$153,782	$660,551	$260,023	-$106,242
2043	$403,942	$150,010	$677,586	$251,631	-$101,621
2044	$417,676	$146,330	$695,200	$243,559	-$97,229
2045	$431,877	$142,741	$713,413	$235,792	-$93,051
2046	$446,561	$139,240	$732,245	$228,317	-$89,078
2047	$461,744	$135,825	$751,717	$221,122	-$85,297
2048	$477,444	$132,493	$771,852	$214,193	-$81,700
2049	$493,677	$129,243	$792,671	$207,519	-$78,276
2050	$510,462	$126,073	$814,198	$201,089	-$75,016
2051	$527,817	$122,981	$836,457	$194,893	-$71,913
2052	$545,763	$119,964	$859,472	$188,921	-$68,956
2053	$564,319	$117,022	$883,271	$183,162	-$66,140
2054	$583,506	$114,151	$907,878	$177,608	-$63,457
2055	$603,345	$111,351	$933,322	$172,251	-$60,899
2056	$623,859	$108,620	$959,631	$167,081	-$58,461
2057	$645,070	$105,956	$986,834	$162,092	-$56,136
2058	$667,002	$103,357	$1,014,963	$157,276	-$53,919
2059	$689,681	$100,822	$1,044,048	$152,625	-$51,804
2060	$713,130	$98,349	$1,074,122	$148,134	-$49,785
2061	$737,376	$95,936	$1,105,218	$143,795	-$47,858
2062	$762,447	$93,583	$1,137,371	$139,602	-$46,019
2063	$788,370	$91,288	$1,170,618	$135,550	-$44,262
2064	$815,175	$89,049	$1,204,995	$131,632	-$42,584
2065	$842,891	$86,865	$1,240,541	$127,845	-$40,980
2066	$871,549	$84,734	$1,277,296	$124,181	-$39,448
	$18,812,735	**$5,076,400**	**$43,834,896**	**$22,858,077**	**-$17,781,678**

Supplementary Table for Project Evaluation

	Volume (AF)	Net Benefit/AF
Total RW Delivered	**6,849**	**-$2,596**
Total Fresh Water Alternative	**8,903**	**-$1,997**

4.4 Sensitivity Analysis

Alternative	**Alternative**	*User Input*
Project Participant	**Project Participant**	

Table 4D: Summary of Sensitivity Analysis

A	B	C	D
Variable 1 - Discount Rate			
Discount Rate Values	Total Monetized Benefit Discounted	Total Monetized Cost Discounted	Total Monetized Net Benefit Discounted
3.00%	$9,227,343	$29,155,489	-$19,928,145
4.00%	$7,468,248	$26,473,279	-$19,005,031
5.00%	$6,120,409	$24,428,966	-$18,308,557
6.00%	$5,076,400	$22,858,077	-$17,781,678
7.00%	$4,258,897	$21,641,885	-$17,382,987
8.00%	$3,611,815	$20,693,994	-$17,082,180
9.00%	$3,094,144	$19,951,032	-$16,856,888

*Note: Please see guidance for assessment of values

Discount Rate Incremental Change

1.00 %

Table 4D: Economic Assessment

ECONOMIC ASSESSMENT

RECYCLED WATER		
annual cost/acre-ft	$6,400.36	/acre-ft
Expected Net Present Value (NPV)	($17,781,677.69)	
Expected Net Present Value (NPV)/acre-ft	($1,997.16)	/acre-ft

Water Recycling is not economically cost-effective

Not Cost-Effective:
Since the expected net present value of the recycling water project is negative, the project is not recommended.

Project Information	*User Input*
Name of Agency	Santa Nella County Water District
Name of person conducting analsysis	Bao Cha
Phone number	(209) 694-4766
email:	bao@blackwater-eng.com
Reuse project information	
Project name	Recycled Water Feasibility Study
Project location	Santa Nella, California
Indirect potable, or non-potable water production	Non-potable water production
Does the project operate year-round or seasonally	Seasonally
Phases of operation (with years)	40
Accounting Perspective	Statewide
Name Of Alternative	Alternative 3: Upgrade of the existing WWTP treatment process to produce tertiary treated effluent for disposal via landscape irrigation within the public right-of-way and at the Forebay Golf Course, via a purple pipe recycled water system.
Project Users	Commercial Landscape Irrigation Parkway Community Park Truck Fill Station Golf Course

2. Standard Assumptions

User Input

Table 2A: Time and Interest

Description	Amount	Unit
Useful Life of Project	40	years
Installed Capacity (final project)	647	AF per year
Recycled Water Market Price	$1,756	per AF
Potable Water Replacement Factor (for RW)	29	
Project Design Year	2024	
Reference Cost Year (Ref Yr)	2020	
First Year of Project Construction	2026	APPROVED
Project First Year of Operation (Last Year of Construction)	2030	APPROVED
Project Last Year of Operation	2066	
Financing Period	40	years
Annual Interest Rate	2.00%	
Discount Rate	6.00%	

Notes:

'Project Last Year of Operation' is equal to 'Project First Year of Operation' and 'Period of Analysis'
'Project Reference Year' is set by 'Project First Year of Operation'
Maximum analysis is 100 years + 2 years for design & construction

3.1 Fresh Water Supply Alternative *User Input*

Table 3A: Annual Fresh Water Alternative Cost	Costs (2020 $)	Comments
Office R&M		
Repairs & Maintenance	$500	
Professional Services		
Engineering Fees	$20,000	
Contract Services	$500	
Operations/R&M		
Chemicals	$24,000	
Fuel	$5,000	
Vehicle Maintenance	$2,500	
Plant Supplies	$18,100	
Plant Equipment Rental	$1,000	
Repair/Maint Plants	$16,990	
R&M Manhole Pumping Wendy's	$0	
Inspection Fees	$4,482	
Utilities		
Utilities-Solid Waste	$354	
Utilities-Well Meter	$15,500	
Utilities-Plant	$36,500	
Water Purchase/Fees		
Standby Charges	$7,860	
Delivery Charges	$25,000	
Water Purchase M&I SLC WC0004	$49,000	
Water Purcase M&I DMC WC0003	$0	
Water Purchase AG DMC WC0001	$0	
Water Purchase AG SLC WC0002	$0	
Total	**$227,286**	

Notes:
Costs represented as present worth values
Without Project assumes future unmet water demand will incur a shortage cost

3.2 Baseline - Total Volume For Entire Project

Table 3B: Total Volume For Entire Project

User Input

	Total Volume (af)
Total Lifetime Recycled Water Produced	**25,883**
Total Lifetime Fresh Water Alternative Produced	**33,648**

*Note: Total lifetime fresh water alternative must be equal to or greater than the total lifetime recycled water produced in order to demonstrate that there is fresh water supply throughout the project

4.0 BENEFITS OF RECYCLED WATER PROGRAM FOR ALTERNATIVE 3

Table 1 - Projected Commercial Water Rates

Parameters	Current	From 2020 Water Rate Study ($/hcf)				Projected Water Rates ($/hcf)						
Fiscal Year	2019	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Rate ($/hcf)	1.25	1.33	1.37	1.42	1.47	1.51	1.56	1.60	1.65	1.70	1.75	1.81
Percent Increase		6%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%

Recycled water rates should be less than potable water rates

For this feasibility study, the cost of the recycled water is 20% less than potable water

Estimated Potable Water Rate in FY 2030-31 ($/hcf) 1.81

Estimated Recycled Water Rate in FY 2030-31 ($/hcf) 1.44

ADD (ac-ft/yr) 647

Estimated revenue of recycled water by FY 2030-31 ($) 407,052 (BENEFITS)

ADDITIONAL FEES FROM ALL CUSTOMERS WHO WILL BENEFIT FROM THE RECYCLED WATER PROGRAM

Table 2 - Benefits of Recycled Water Program

Parameters	Current	From 2020 Water Rate Study				Projected Water Costs						
Fiscal Year	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Water Expenses[1] ($)	312,237	321,526	329,902	338,562	347,517	359,333	371,550	384,183	397,245	410,752	424,717	439,158
Percentage Inflation Rate		3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%
Water Production[2] (acre-ft/yr)	488	488	488	488	488	488	488	488	488	488	488	488
Potable Water Cost[3] ($/acre-ft)	640	659	676	694	712	736	761	787	814	841	870	900
Recycled Water Usage[4] (acre-ft/yr)	647	647	647	647	647	647	647	647	647	647	647	647
Recycled Water Benefits ($)	413,813	426,124	437,224	448,703	460,571	476,230	492,422	509,164	526,476	544,376	562,885	582,023 (BENEFITS)

[1]Variable expenses consist of office repairs and maintenance, professional services, operations, utilities, water purchase fees, and SLWD assessments

[2]Raw surface water and groundwater production in 2018

[3]Cost of Potable Water is equal to variable water expenses ($) divided by the water production (acre-ft)

[4]Recycled Water Average Day Demand

4.1 Identify and Quantify Benefits

Alternative: **Alternat**
Project Participant: **Project Par**

User Input

Rate 3.40% (from water rate study)

Table 4A: Identification and Quantification of Benefits

Item	Benefit	Comments	Quantifiable	Expected Value	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056
1	Avoided costs of water supply development/purchase (potable water)		YES																																		
				High Estimate																																		
				Best Estimate							$582,023	$601,812	$622,273	$643,431	$665,307	$687,928	$711,317	$735,502	$760,509	$786,367	$813,103	$840,749	$869,334	$898,891	$929,454	$961,055	$993,731	$1,027,518	$1,062,453	$1,098,577	$1,135,928	$1,174,550	$1,214,485	$1,255,777	$1,298,474	$1,342,622	$1,388,271
				Low Estimate																																	
				Expected Value							**$582,023**	**$601,812**	**$622,273**	**$643,431**	**$665,307**	**$687,928**	**$711,317**	**$735,502**	**$760,509**	**$786,367**	**$813,103**	**$840,749**	**$869,334**	**$898,891**	**$929,454**	**$961,055**	**$993,731**	**$1,027,518**	**$1,062,453**	**$1,098,577**	**$1,135,928**	**$1,174,550**	**$1,214,485**	**$1,255,777**	**$1,298,474**	**$1,342,622**	**$1,388,271**
2	Reclaimed water sales revenues		YES																																	
				High Estimate																																		
				Best Estimate							$407,052	$420,892	$435,202	$449,999	$465,299	$481,119	$497,477	$514,391	$531,880	$549,964	$568,663	$587,998	$607,990	$628,661	$650,036	$672,137	$694,990	$718,619	$743,052	$768,316	$794,439	$821,450	$849,379	$878,258	$908,119	$938,995	$970,921
				Low Estimate																																	
				Expected Value							**$407,052**	**$420,892**	**$435,202**	**$449,999**	**$465,299**	**$481,119**	**$497,477**	**$514,391**	**$531,880**	**$549,964**	**$568,663**	**$587,998**	**$607,990**	**$628,661**	**$650,036**	**$672,137**	**$694,990**	**$718,619**	**$743,052**	**$768,316**	**$794,439**	**$821,450**	**$849,379**	**$878,258**	**$908,119**	**$938,995**	**$970,921**
3	Avoided increased groundwater pumping costs with declining groundwater levels Reduces groundwater pumping and overdraft conditions in the groundwater basin.		NO																																	
4	Increased supply reliability (customer perspective) Improves reliability of existing water supply system by making the system less sensitive to drought conditions.		NO																																	
5	Local control over water resources (not relying on imported water) Increases degree of local control on water supply, by reducing water demand, a portion of which is dependent on water allocations from the CVP.		NO																																	
6	Source water protection Reduces surface water demand; consistent with State policies for restoring and protecting fish and wildlife.		NO																																	
7	Aesthetic values Provides aesthetic benefits for the community by supporting irrigation of areas, even during drought conditions.		NO																																	
8	Other (specify): Reduces need for future water system improvements and expansion.		NO																																	

4.1 Identify and Quantify Benefits

Alternative: **Alternat**
Project Participant: **Project Par**

User Input

Rate 3.40% (from water rate study)

Table 4A: Identification and Quantification of Benefits

A	B	C	D	F																													
				Expected Value																													
Item	Benefit	Comments	Quantifiable	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056

4.1 Identify and Quantify Benefits

Alternative: **Alternat**
Project Participant: **Project Par**

User Input

Rate 3.40% (from water rate study)

Table 4A: Identification and Quantification of Benefits

A	B	C	D	F																													
				Expected Value																															
Item	**Benefit**	**Comments**	**Quantifiable**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**	**2051**	**2052**	**2053**	**2054**	**2055**	**2056**
			Annual Total	$0	$0	$0	$0	$0	$0	$989,075	$1,022,703	$1,057,475	$1,093,430	$1,130,606	$1,169,047	$1,208,794	$1,249,893	$1,292,390	$1,336,331	$1,381,766	$1,428,746	$1,477,324	$1,527,553	$1,579,489	$1,633,192	$1,688,721	$1,746,137	$1,805,506	$1,866,893	$1,930,367	$1,996,000	$2,063,864	$2,134,035	$2,206,592	$2,281,616	$2,359,191

4.1 Identify and Quantify Benefits

Alternative	**Alternat**
Project Participant	**Project Par**

Table 4A: Identification and Quantification of Benefits

A	B	C	D									
Item	**Benefit**	**Comments**	**Quantifiable**	**2057**	**2058**	**2059**	**2060**	**2061**	**2062**	**2063**	**2064**	**2065**	**2066**
1	Avoided costs of water supply development/purchase (potable water)		YES										
			High Estimate										
			Best Estimate	$1,435,472	$1,484,278	$1,534,744	$1,586,925	$1,640,880	$1,696,670	$1,754,357	$1,814,005	$1,875,681	$1,939,455
			Low Estimate										
			Expected Value	**$1,435,472**	**$1,484,278**	**$1,534,744**	**$1,586,925**	**$1,640,880**	**$1,696,670**	**$1,754,357**	**$1,814,005**	**$1,875,681**	**$1,939,455**
2	Reclaimed water sales revenues		YES										
			High Estimate										
			Best Estimate	$1,003,932	$1,038,065	$1,073,360	$1,109,854	$1,147,589	$1,186,607	$1,226,952	$1,268,668	$1,311,803	$1,356,404
			Low Estimate										
			Expected Value	**$1,003,932**	**$1,038,065**	**$1,073,360**	**$1,109,854**	**$1,147,589**	**$1,186,607**	**$1,226,952**	**$1,268,668**	**$1,311,803**	**$1,356,404**
3	Avoided increased groundwater pumping costs with declining groundwater levels Reduces groundwater pumping and overdraft conditions in the groundwater basin.		NO										
4	Increased supply reliability (customer perspective) Improves reliability of existing water supply system by making the system less sensitive to drought conditions.		NO										
5	Local control over water resources (not relying on imported water) Increases degree of local control on water supply, by reducing water demand, a portion of which is dependent on water allocations from the CVP.		NO										
6	Source water protection Reduces surface water demand; consistent with State policies for restoring and protecting fish and wildlife.		NO										
7	Aesthetic values Provides aesthetic benefits for the community by supporting irrigation of areas, even during drought conditions.		NO										
8	Other (specify): Reduces need for future water system improvements and expansion.		NO										

4.1 Identify and Quantify Benefits

Alternative: **Alternat**
Project Participant: **Project Par**

Table 4A: Identification and Quantification of Benefits

A	B	C	D										
Item	**Benefit**	**Comments**	**Quantifiable**	**2057**	**2058**	**2059**	**2060**	**2061**	**2062**	**2063**	**2064**	**2065**	**2066**

4.1 Identify and Quantify Benefits

Alternative: **Alternat**
Project Participant: **Project Par**

Table 4A: Identification and Quantification of Benefits

A	B	C	D									
Item	**Benefit**	**Comments**	**Quantifiable**	**2057**	**2058**	**2059**	**2060**	**2061**	**2062**	**2063**	**2064**	**2065**	**2066**
			Annual Total	$2,439,404	$2,522,344	$2,608,103	$2,696,779	$2,788,469	$2,883,277	$2,981,309	$3,082,673	$3,187,484	$3,295,859

4.2 Identify and Quantify Costs

Alternative / Project Participant: **Alternative / Project Participant**

User input

Rate: 3.40% (from water rate study)

Table 4B: Identification and Quantification of Costs

Item	Cost	Comments	Quantifiable	Expected Value	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
1	Capital costs for recycled water distribution		YES																																											
			High Estimate																																													
			Best Estimate				$5,069,024																																									
			Low Estimate																																												
			Exected Value	**$5,069,024**																																										
2	Capital costs for storage		YES																																												
			High Estimate																																													
			Best Estimate				$3,524,792																																									
			Low Estimate																																												
			Exected Value	**$3,524,792**																																										
3	Capital costs for reclamation treatment		YES																																												
			High Estimate																																													
			Best Estimate				$1,050,000																																									
			Low Estimate																																												
			Exected Value	**$1,050,000**																																										
4	Other (specify):		YES																																												
	Capital costs for trenchless crossing		High Estimate																																												
			Best Estimate				$1,361,818																																									
			Low Estimate																																												
			Exected Value	**$1,361,818**																																										
5	Other (specify):		YES																																												
	Capital costs for pump station		High Estimate																																												
			Best Estimate				$525,000																																									
			Low Estimate																																												
			Exected Value	**$525,000**																																										
6	Other (specify):		YES																																												
	Capital costs for site work		High Estimate																																												
			Best Estimate				$200,000																																									
			Low Estimate																																												
			Exected Value	**$200,000**																																										
7	Other (specify):		YES																																												
	Capital costs for building		High Estimate																																												
			Best Estimate				$300,000																																									
			Low Estimate																																												
			Exected Value	**$300,000**																																										
8	Other (specify):		YES																																												
	Capital costs for recycled water hydrants		High Estimate																																												
			Best Estimate				$20,000																																									
			Low Estimate																																												
			Exected Value	**$20,000**																																										
9	O&M costs for recycled water distribution		YES																																												
			High Estimate																																													
			Best Estimate								$118,652	$122,686	$126,857	$131,170	$135,630	$140,242	$145,010	$149,940	$155,038	$160,310	$165,760	$171,396	$177,223	$183,249	$189,479	$195,922	$202,583	$209,471	$216,593	$223,957	$231,572	$239,445	$247,586	$256,004	$264,708	$273,708	$283,014	$292,637	$302,586	$312,874	$323,512	$334,512	$345,885	$357,645	$369,805	$382,378	$395,379
			Low Estimate																																												
			Exected Value								**$118,652**	**$122,686**	**$126,857**	**$131,170**	**$135,630**	**$140,242**	**$145,010**	**$149,940**	**$155,038**	**$160,310**	**$165,760**	**$171,396**	**$177,223**	**$183,249**	**$189,479**	**$195,922**	**$202,583**	**$209,471**	**$216,593**	**$223,957**	**$231,572**	**$239,445**	**$247,586**	**$256,004**	**$264,708**	**$273,708**	**$283,014**	**$292,637**	**$302,586**	**$312,874**	**$323,512**	**$334,512**	**$345,885**	**$357,645**	**$369,805**	**$382,378**	**$395,379**
10	O&M costs for storage		YES																																												
			High Estimate																																													
			Best Estimate								$70,496	$72,893	$75,371	$77,934	$80,583	$83,323	$86,156	$89,086	$92,114	$95,246	$98,485	$101,833	$105,296	$108,876	$112,577	$116,405	$120,363	$124,455	$128,687	$133,062	$137,586	$142,264	$147,101	$152,102	$157,274	$162,621	$168,150	$173,867	$179,779	$185,891	$192,212	$198,747	$205,504	$212,491	$219,716	$227,186	$234,911
			Low Estimate																																												
			Exected Value								**$70,496**	**$72,893**	**$75,371**	**$77,934**	**$80,583**	**$83,323**	**$86,156**	**$89,086**	**$92,114**	**$95,246**	**$98,485**	**$101,833**	**$105,296**	**$108,876**	**$112,577**	**$116,405**	**$120,363**	**$124,455**	**$128,687**	**$133,062**	**$137,586**	**$142,264**	**$147,101**	**$152,102**	**$157,274**	**$162,621**	**$168,150**	**$173,867**	**$179,779**	**$185,891**	**$192,212**	**$198,747**	**$205,504**	**$212,491**	**$219,716**	**$227,186**	**$234,911**
11	O&M costs for reclamation treatment		YES																																												
			High Estimate																																													
			Best Estimate								$105,000	$108,570	$112,261	$116,078	$120,025	$124,106	$128,325	$132,688	$137,200	$141,865	$146,688	$151,675	$156,832	$162,165	$167,678	$173,379	$179,274	$185,370	$191,672	$198,189	$204,927	$211,895	$219,099	$226,549	$234,251	$242,216	$250,451	$258,967	$267,772	$276,876	$286,290	$296,023	$306,088	$316,495	$327,256	$338,383	$349,888
			Low Estimate																																												
			Exected Value								**$105,000**	**$108,570**	**$112,261**	**$116,078**	**$120,025**	**$124,106**	**$128,325**	**$132,688**	**$137,200**	**$141,865**	**$146,688**	**$151,675**	**$156,832**	**$162,165**	**$167,678**	**$173,379**	**$179,274**	**$185,370**	**$191,672**	**$198,189**	**$204,927**	**$211,895**	**$219,099**	**$226,549**	**$234,251**	**$242,216**	**$250,451**	**$258,967**	**$267,772**	**$276,876**	**$286,290**	**$296,023**	**$306,088**	**$316,495**	**$327,256**	**$338,383**	**$349,888**
12	Other (specify):		YES																																											
	O&M costs for pump station		High Estimate																																												
			Best Estimate								$26,250	$27,143	$28,065	$29,020	$30,006	$31,026	$32,081	$33,172	$34,300	$35,466	$36,672	$37,919	$39,208	$40,541	$41,920	$43,345	$44,819	$46,342	$47,918	$49,547	$51,232	$52,974	$54,775	$56,637	$58,563	$60,554	$62,613	$64,742	$66,943	$69,219	$71,572	$74,006	$76,522	$79,124	$81,814	$84,596	$87,472
			Low Estimate																																												
			Exected Value								**$26,250**	**$27,143**	**$28,065**	**$29,020**	**$30,006**	**$31,026**	**$32,081**	**$33,172**	**$34,300**	**$35,466**	**$36,672**	**$37,919**	**$39,208**	**$40,541**	**$41,920**	**$43,345**	**$44,819**	**$46,342**	**$47,918**	**$49,547**	**$51,232**	**$52,974**	**$54,775**	**$56,637**	**$58,563**	**$60,554**	**$62,613**	**$64,742**	**$66,943**	**$69,219**	**$71,572**	**$74,006**	**$76,522**	**$79,124**	**$81,814**	**$84,596**	**$87,472**
13	Other (specify):		YES																																											
	O&M costs for energy		High Estimate																																												
			Best Estimate								$19,643	$20,311	$21,001	$21,715	$22,453	$23,217	$24,006	$24,822	$25,666	$26,539	$27,441	$28,374	$29,339	$30,337	$31,368	$32,435	$33,537	$34,678	$35,857	$37,076	$38,336	$39,640	$40,988	$42,381	$43,822	$45,312	$46,853	$48,446	$50,093	$51,796	$53,557	$55,378	$57,261	$59,208	$61,221	$63,302	$65,455
			Low Estimate																																												
			Exected Value								**$19,643**	**$20,311**	**$21,001**	**$21,715**	**$22,453**	**$23,217**	**$24,006**	**$24,822**	**$25,666**	**$26,539**	**$27,441**	**$28,374**	**$29,339**	**$30,337**	**$31,368**	**$32,435**	**$33,537**	**$34,678**	**$35,857**	**$37,076**	**$38,336**	**$39,640**	**$40,988**	**$42,381**	**$43,822**	**$45,312**	**$46,853**	**$48,446**	**$50,093**	**$51,796**	**$53,557**	**$55,378**	**$57,261**	**$59,208**	**$61,221**	**$63,302**	**$65,455**
14	Other (specify):		YES																																											
	O&M costs for labor		High Estimate																																												
			Best Estimate								$90,000	$93,060	$96,224	$99,496	$102,879	$106,376	$109,993	$113,733	$117,600	$121,598	$125,733	$130,008	$134,428	$138,998	$143,724	$148,611	$153,664	$158,888	$164,290	$169,876	$175,652	$181,624	$187,799	$194,185	$200,787	$207,614	$214,673	$221,971	$229,518	$237,322	$245,391	$253,734	$262,361	$271,282	$280,505	$290,042	$299,904
			Low Estimate																																												
			Exected Value								**$90,000**	**$93,060**	**$96,224**	**$99,496**	**$102,879**	**$106,376**	**$109,993**	**$113,733**	**$117,600**	**$121,598**	**$125,733**	**$130,008**	**$134,428**	**$138,998**	**$143,724**	**$148,611**	**$153,664**	**$158,888**	**$164,290**	**$169,876**	**$175,652**	**$181,624**	**$187,799**	**$194,185**	**$200,787**	**$207,614**	**$214,673**	**$221,971**	**$229,518**	**$237,322**	**$245,391**	**$253,734**	**$262,361**	**$271,282**	**$280,505**	**$290,042**	**$299,904**
15	Other (specify):		YES																																											
	Contingencies		High Estimate																																												
			Best Estimate	$3,219,002																																											
			Low Estimate																																												
			Exected Value	**$3,219,002**																																										
16	Other (specify):		YES																																												
	Engineering, Construction Management, Administration, and Design		High Estimate																																												
			Best Estimate	$3,219,002																																											
			Low Estimate																																												
			Exected Value	**$3,219,002**																																										
17	Other (specify):		YES																																												
	Disinfection Process		High Estimate																																												
			Best Estimate				$732,677																																									
			Low Estimate																																												
			Exected Value				**$732,677**																																								
18	Other (specify):		YES																																												
	Diesel Energy		High Estimate																																												
			Best Estimate				$92,698																																									
			Low Estimate																																												
			Exected Value				**$92,698**																																								
19	Other (specify):		YES																																												
	2% Loan Interest		High Estimate																																												
			Best Estimate								$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188	$223,188
			Low Estimate																																												
			Exected Value								**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**	**$223,188**
			Annual Total	$6,438,004	$0	$12,876,008	$0	$0	$0	$653,228	$667,850	$682,968	$698,601	$714,765	$731,478	$748,760	$766,630	$785,107	$804,212	$823,967	$844,393	$865,514	$887,353	$909,935	$933,284	$957,428	$982,392	$1,008,205	$1,034,895	$1,062,493	$1,091,030	$1,120,536	$1,151,046	$1,182,593	$1,215,213	$1,248,942	$1,283,818	$1,319,879	$1,357,166	$1,395,722	$1,435,588	$1,476,809	$1,519,433	$1,563,505	$1,609,076	$1,656,196

4.3 Evaluate Project

Alternative: **Name Of Alternative**
Project Participant: **Project Users**

User Input

Discount Rate 6.00%

Table 4C: Project Evaluation

A	B	C	D	E	F
Year	Annual Benefits	Discounted Benefits	Annual Costs	Discounted Costs	Net Benefits (discounted)
2024	$0	$0	$6,438,004	$7,233,741	-$7,233,741
2025	$0	$0	$0	$0	$0
2026	$0	$0	$12,876,008	$12,876,008	-$12,876,008
2027	$0	$0	$0	$0	$0
2028	$0	$0	$0	$0	$0
2029	$0	$0	$0	$0	$0
2030	$989,075	$783,440	$653,228	$517,418	$266,022
2031	$1,022,703	$764,223	$667,850	$499,056	$265,167
2032	$1,057,475	$745,478	$682,968	$481,466	$264,013
2033	$1,093,430	$727,193	$698,601	$464,609	$262,584
2034	$1,130,606	$709,356	$714,765	$448,452	$260,904
2035	$1,169,047	$691,957	$731,478	$432,961	$258,996
2036	$1,208,794	$674,984	$748,760	$418,104	$256,881
2037	$1,249,893	$658,428	$766,630	$403,851	$254,577
2038	$1,292,390	$642,278	$785,107	$390,174	$252,104
2039	$1,336,331	$626,524	$804,212	$377,046	$249,478
2040	$1,381,766	$611,157	$823,967	$364,441	$246,715
2041	$1,428,746	$596,166	$844,393	$352,336	$243,830
2042	$1,477,324	$581,543	$865,514	$340,706	$240,837
2043	$1,527,553	$567,279	$887,353	$329,531	$237,747
2044	$1,579,489	$553,364	$909,935	$318,790	$234,574
2045	$1,633,192	$539,791	$933,284	$308,463	$231,329
2046	$1,688,721	$526,551	$957,428	$298,530	$228,021
2047	$1,746,137	$513,636	$982,392	$288,976	$224,660
2048	$1,805,506	$501,037	$1,008,205	$279,782	$221,255
2049	$1,866,893	$488,747	$1,034,895	$270,933	$217,815
2050	$1,930,367	$476,759	$1,062,493	$262,413	$214,346
2051	$1,996,000	$465,065	$1,091,030	$254,208	$210,857
2052	$2,063,864	$453,658	$1,120,536	$246,305	$207,353
2053	$2,134,035	$442,530	$1,151,046	$238,690	$203,840
2054	$2,206,592	$431,676	$1,182,593	$231,351	$200,325
2055	$2,281,616	$421,088	$1,215,213	$224,276	$196,812
2056	$2,359,191	$410,759	$1,248,942	$217,453	$193,306
2057	$2,439,404	$400,684	$1,283,818	$210,873	$189,811
2058	$2,522,344	$390,856	$1,319,879	$204,525	$186,331
2059	$2,608,103	$381,269	$1,357,166	$198,399	$182,870
2060	$2,696,779	$371,917	$1,395,722	$192,486	$179,431
2061	$2,788,469	$362,794	$1,435,588	$186,777	$176,017
2062	$2,883,277	$353,896	$1,476,809	$181,265	$172,631
2063	$2,981,309	$345,215	$1,519,433	$175,940	$169,275
2064	$3,082,673	$336,748	$1,563,505	$170,795	$165,952
2065	$3,187,484	$328,488	$1,609,076	$165,824	$162,664
2066	$3,295,859	$320,431	$1,656,196	$161,019	$159,412
	$71,142,438	**$19,196,966**	**$58,504,019**	**$31,217,975**	**-$12,021,009**

Supplementary Table for Project Evaluation

	Volume (AF)	Net Benefit/AF
Total RW Delivered	**25,883**	**-$464**
Total Fresh Water Alternative	**33,648**	**-$357**

4.4 Sensitivity Analysis

Alternative	**Alternative**	*User Input*
Project Participant	**Project Participant**	

Table 4D: Summary of Sensitivity Analysis

A	B	C	D
Variable 1 - Discount Rate			
Discount Rate Values	Total Monetized Benefit Discounted	Total Monetized Cost Discounted	Total Monetized Net Benefit Discounted
3.00%	$34,894,219	$39,405,387	-$4,511,168
4.00%	$28,242,005	$35,916,849	-$7,674,844
5.00%	$23,145,004	$33,259,040	-$10,114,035
6.00%	$19,196,966	$31,217,975	-$12,021,009
7.00%	$16,105,491	$29,639,154	-$13,533,663
8.00%	$13,658,476	$28,410,124	-$14,751,648
9.00%	$11,700,847	$27,448,376	-$15,747,529

*Note: Please see guidance for assessment of values

Discount Rate Incremental Change

1.00 %

Table 4D: Economic Assessment

ECONOMIC ASSESSMENT

RECYCLED WATER

annual cost/acre-ft	**$2,260.33**	/acre-ft
Expected Net Present Value (NPV)	**($12,021,008.96)**	
Expected Net Present Value (NPV)/acre-ft	**($357.26)**	/acre-ft

Water Recycling is not economically cost-effective

Not Cost-Effective:
Since the expected net present value of the recycling water project is negative, the project is not recommended.

Project Information	*User Input*
Name of Agency	Santa Nella County Water District
Name of person conducting analsysis	Bao Cha
Phone number	(209) 694-4766
email:	bao@blackwater-eng.com
Reuse project information	
Project name	Recycled Water Feasibility Study
Project location	Santa Nella, California
Indirect potable, or non-potable water production	Non-potable water production
Does the project operate year-round or seasonally	Seasonally
Phases of operation (with years)	40
Accounting Perspective	Statewide
Name Of Alternative	Alternative 4: Upgrade of the existing WWTP treatment process to produce tertiary treated effluent for disposal via landscape irrigation within the public right-of-way, at the Forebay Golf Course, and at future developments, via a purple pipe recycled water system.
Project Users	Commercial Landscape Irrigation Parkway Community Park Truck Fill Station Golf Course Future Development

2. Standard Assumptions

User Input

Table 2A: Time and Interest

Description	Amount	Unit
Useful Life of Project	40	years
Installed Capacity (final project)	939	AF per year
Recycled Water Market Price	$1,535	per AF
Potable Water Replacement Factor (for RW)	24.3	
Project Design Year	2024	
Reference Cost Year (Ref Yr)	2020	
First Year of Project Construction	2026	APPROVED
Project First Year of Operation (Last Year of Construction)	2030	APPROVED
Project Last Year of Operation	2066	
Financing Period	40	years
Annual Interest Rate	2.00%	
Discount Rate	6.00%	

Notes:

'Project Last Year of Operation' is equal to 'Project First Year of Operation' and 'Period of Analysis'
'Project Reference Year' is set by 'Project First Year of Operation'
Maximum analysis is 100 years + 2 years for design & construction

3.1 Fresh Water Supply Alternative *User Input*

Table 3A: Annual Fresh Water Alternative Cost	Costs (2020 $)	Comments
Office R&M		
Repairs & Maintenance	$500	
Professional Services		
Engineering Fees	$20,000	
Contract Services	$500	
Operations/R&M		
Chemicals	$24,000	
Fuel	$5,000	
Vehicle Maintenance	$2,500	
Plant Supplies	$18,100	
Plant Equipment Rental	$1,000	
Repair/Maint Plants	$16,990	
R&M Manhole Pumping Wendy's	$0	
Inspection Fees	$4,482	
Utilities		
Utilities-Solid Waste	$354	
Utilities-Well Meter	$15,500	
Utilities-Plant	$36,500	
Water Purchase/Fees		
Standby Charges	$7,860	
Delivery Charges	$25,000	
Water Purchase M&I SLC WC0004	$49,000	
Water Purcase M&I DMC WC0003	$0	
Water Purchase AG DMC WC0001	$0	
Water Purchase AG SLC WC0002	$0	
Total	**$227,286**	

Notes:
Costs represented as present worth values
Without Project assumes future unmet water demand will incur a shortage cost

3.2 Baseline - Total Volume For Entire Project

Table 3B: Total Volume For Entire Project

User Input

	Total Volume (af)
Total Lifetime Recycled Water Produced	**37,572**
Total Lifetime Fresh Water Alternative Produced	**48,843**

*Note: Total lifetime fresh water alternative must be equal to or greater than the total lifetime recycled water produced in order to demonstrate that there is fresh water supply throughout the project

4.0 BENEFITS OF RECYCLED WATER PROGRAM FOR ALTERNATIVE 4

Table 1 - Projected Commercial Water Rates

Parameters	Current	From 2020 Water Rate Study ($/hcf)				Projected Water Rates ($/hcf)						
Fiscal Year	2019	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Rate ($/hcf)	1.25	1.33	1.37	1.42	1.47	1.51	1.56	1.60	1.65	1.70	1.75	1.81
Percent Increase		6%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%

Recycled water rates should be less than potable water rates

For this feasibility study, the cost of the recycled water is 20% less than potable water

Estimated Potable Water Rate in FY 2030-31 ($/hcf) 1.81

Estimated Recycled Water Rate in FY 2030-31 ($/hcf) 1.44

ADD (ac-ft/yr) 939

Estimated revenue of recycled water by FY 2030-31 ($) 590,919 (BENEFITS)

ADDITIONAL FEES FROM ALL CUSTOMERS WHO WILL BENEFIT FROM THE RECYCLED WATER PROGRAM

Table 2 - Benefits of Recycled Water Program

Parameters	Current	From 2020 Water Rate Study				Projected Water Costs						
Fiscal Year	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Water Expenses[1] ($)	312,237	321,526	329,902	338,562	347,517	359,333	371,550	384,183	397,245	410,752	424,717	439,158
Percentage Inflation Rate		3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%
Water Production[2] (acre-ft/yr)	488	488	488	488	488	488	488	488	488	488	488	488
Potable Water Cost[3] ($/acre-ft)	640	659	676	694	712	736	761	787	814	841	870	900
Recycled Water Usage[4] (acre-ft/yr)	939	939	939	939	939	939	939	939	939	939	939	939
Recycled Water Benefits ($)	600,734	618,605	634,720	651,383	668,612	691,345	714,851	739,156	764,287	790,273	817,142	844,925 (BENEFITS)

[1]Variable expenses consist of office repairs and maintenance, professional services, operations, utilities, water purchase fees, and SLWD assessments

[2]Raw surface water and groundwater production in 2018

[3]Cost of Potable Water is equal to variable water expenses ($) divided by the water production (acre-ft)

[4]Recycled Water Average Day Demand

4.1 Identify and Quantify Benefits

Alternative: **Alternat**
Project Participant: **Project Par**

User input

Rate: 3.40% (from water rate study)

Table 4A: Identification and Quantification of Benefits

A	B	C	D	F
				Expected Value
Item	**Benefit**	**Comments**	**Quantifiable**	**2024**
1	Avoided costs of water supply development/purchase (potable water)		YES	
			High Estimate	
			Best Estimate	
			Low Estimate	
			Expected Value	**$844,925**
2	Reclaimed water sales revenues		YES	
			High Estimate	
			Best Estimate	$590,919
			Low Estimate	
			Expected Value	**$590,919**
3	Avoided increased groundwater pumping costs with declining groundwater levels Reduces groundwater pumping and overdraft conditions in the groundwater basin.		NO	
4	Increased supply reliability (customer perspective) Improves reliability of existing water supply system by making the system less sensitive to drought conditions.		NO	
5	Local control over water resources (not relying on imported water) Increases degree of local control on water supply, by reducing water demand, a portion of which is dependent on water allocations from the CVP.		NO	
6	Source water protection Reduces surface water demand; consistent with State policies for restoring and protecting fish and wildlife.		NO	
7	Aesthetic values Provides aesthetic benefits for the community by supporting irrigation of areas, even during drought conditions.		NO	
8	Other (specify): Reduces need for future water system improvements and expansion.		NO	
			Annual Total	$0

2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
					$844,925	$873,652	$903,357	$934,071	$965,829	$998,667	$1,032,622	$1,067,731	$1,104,034	$1,141,571	$1,180,385	$1,220,518	$1,262,015	$1,304,924	$1,349,291	$1,395,167	$1,442,603	$1,491,651	$1,542,367	$1,594,808	$1,649,031	$1,705,098	$1,763,072	$1,823,016	$1,884,999	$1,949,089	$2,015,358	$2,083,880	$2,154,732	$2,227,993	$2,303,744	$2,382,072	$2,463,062	$2,546,806	$2,633,398	$2,722,933	$2,815,513
					$844,925	**$873,652**	**$903,357**	**$934,071**	**$965,829**	**$998,667**	**$1,032,622**	**$1,067,731**	**$1,104,034**	**$1,141,571**	**$1,180,385**	**$1,220,518**	**$1,262,015**	**$1,304,924**	**$1,349,291**	**$1,395,167**	**$1,442,603**	**$1,491,651**	**$1,542,367**	**$1,594,808**	**$1,649,031**	**$1,705,098**	**$1,763,072**	**$1,823,016**	**$1,884,999**	**$1,949,089**	**$2,015,358**	**$2,083,880**	**$2,154,732**	**$2,227,993**	**$2,303,744**	**$2,382,072**	**$2,463,062**	**$2,546,806**	**$2,633,398**	**$2,722,933**	**$2,815,513**
					$590,919	$611,010	$631,784	$653,265	$675,476	$698,442	$722,189	$746,743	$772,133	$798,385	$825,530	$853,598	$882,621	$912,630	$943,659	$975,744	$1,008,919	$1,043,222	$1,078,692	$1,115,367	$1,153,290	$1,192,501	$1,233,046	$1,274,970	$1,318,319	$1,363,142	$1,409,489	$1,457,411	$1,506,963	$1,558,200	$1,611,179	$1,665,959	$1,722,602	$1,781,170	$1,841,730	$1,904,349	$1,969,096
					$590,919	**$611,010**	**$631,784**	**$653,265**	**$675,476**	**$698,442**	**$722,189**	**$746,743**	**$772,133**	**$798,385**	**$825,530**	**$853,598**	**$882,621**	**$912,630**	**$943,659**	**$975,744**	**$1,008,919**	**$1,043,222**	**$1,078,692**	**$1,115,367**	**$1,153,290**	**$1,192,501**	**$1,233,046**	**$1,274,970**	**$1,318,319**	**$1,363,142**	**$1,409,489**	**$1,457,411**	**$1,506,963**	**$1,558,200**	**$1,611,179**	**$1,665,959**	**$1,722,602**	**$1,781,170**	**$1,841,730**	**$1,904,349**	**$1,969,096**
$0	$0	$0	$0	$0	$1,435,843	$1,484,662	$1,535,141	$1,587,335	$1,641,305	$1,697,109	$1,754,811	$1,814,474	$1,876,167	$1,939,956	$2,005,915	$2,074,116	$2,144,636	$2,217,553	$2,292,950	$2,370,911	$2,451,522	$2,534,873	$2,621,059	$2,710,175	$2,802,321	$2,897,600	$2,996,118	$3,097,986	$3,203,318	$3,312,231	$3,424,846	$3,541,291	$3,661,695	$3,786,193	$3,914,923	$4,048,031	$4,185,664	$4,327,976	$4,475,128	$4,627,282	$4,784,609

4.2 Identify and Quantify Costs

Alternative / Project Participant: **Alternative Project Participant**

User input

Rate: 3.40% (from water rate study)

Table 4B: Identification and Quantification of Costs

Item	Cost	Comments		Quantifiable	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
					Expected Value																																									
1	Capital costs for recycled water distribution			YES																																								
				High Estimate																																									
				Best Estimate			$7,095,055																																							
				Low Estimate																																									
				Expected Value			**$7,095,055**																																							
2	Capital costs for storage			YES																																									
				High Estimate																																									
				Best Estimate			$4,276,361																																							
				Low Estimate																																									
				Expected Value			**$4,276,361**																																							
3	Capital costs for reclamation treatment			YES																																								
				High Estimate																																									
				Best Estimate			$1,395,000																																							
				Low Estimate																																									
				Expected Value			**$1,395,000**																																							
4	Other (specify):			YES																																								
	Capital costs for trenchless crossing			High Estimate																																									
				Best Estimate			$1,361,818																																							
				Low Estimate																																									
				Expected Value			**$1,361,818**																																							
5	Other (specify):			YES																																								
	Capital costs for pump station			High Estimate																																									
				Best Estimate			$715,000																																							
				Low Estimate																																									
				Expected Value			**$715,000**																																							
6	Other (specify):			YES																																								
	Capital costs for site work			High Estimate																																									
				Best Estimate			$200,000																																							
				Low Estimate																																									
				Expected Value			**$200,000**																																							
7	Other (specify):			YES																																								
	Capital costs for building			High Estimate																																									
				Best Estimate			$300,000																																							
				Low Estimate																																									
				Expected Value			**$300,000**																																							
8	Other (specify):			YES																																								
	Capital costs for recycled water hydrants			High Estimate																																								
				Best Estimate			$20,000																																							
				Low Estimate																																									
				Expected Value			**$20,000**																																							
9	O&M costs for recycled water distribution			YES																																								
				High Estimate																																									
				Best Estimate							$169,137	$174,888	$180,834	$186,983	$193,340	$199,914	$206,711	$213,739	$221,006	$228,520	$236,290	$244,324	$252,631	$261,220	$270,102	$279,285	$288,781	$298,599	$308,752	$319,249	$330,104	$341,327	$352,933	$364,932	$377,340	$390,169	$403,435	$417,152	$431,335	$446,001	$461,165	$476,844	$493,057	$509,821	$527,155	$545,078	$563,611
				Low Estimate																																									
				Expected Value							**$169,137**	**$174,888**	**$180,834**	**$186,983**	**$193,340**	**$199,914**	**$206,711**	**$213,739**	**$221,006**	**$228,520**	**$236,290**	**$244,324**	**$252,631**	**$261,220**	**$270,102**	**$279,285**	**$288,781**	**$298,599**	**$308,752**	**$319,249**	**$330,104**	**$341,327**	**$352,933**	**$364,932**	**$377,340**	**$390,169**	**$403,435**	**$417,152**	**$431,335**	**$446,001**	**$461,165**	**$476,844**	**$493,057**	**$509,821**	**$527,155**	**$545,078**	**$563,611**
10	O&M costs for storage			YES																																									
				High Estimate																																									
				Best Estimate							$85,527	$88,435	$91,442	$94,551	$97,766	$101,090	$104,527	$108,081	$111,755	$115,555	$119,484	$123,546	$127,747	$132,090	$136,582	$141,225	$146,027	$150,992	$156,126	$161,434	$166,923	$172,598	$178,466	$184,534	$190,808	$197,296	$204,004	$210,940	$218,112	$225,528	$233,196	$241,124	$249,323	$257,800	$266,565	$275,628	$284,999
				Low Estimate																																									
				Expected Value							**$85,527**	**$88,435**	**$91,442**	**$94,551**	**$97,766**	**$101,090**	**$104,527**	**$108,081**	**$111,755**	**$115,555**	**$119,484**	**$123,546**	**$127,747**	**$132,090**	**$136,582**	**$141,225**	**$146,027**	**$150,992**	**$156,126**	**$161,434**	**$166,923**	**$172,598**	**$178,466**	**$184,534**	**$190,808**	**$197,296**	**$204,004**	**$210,940**	**$218,112**	**$225,528**	**$233,196**	**$241,124**	**$249,323**	**$257,800**	**$266,565**	**$275,628**	**$284,999**
11	O&M costs for reclamation treatment			YES																																									
				High Estimate																																									
				Best Estimate							$139,500	$144,243	$149,147	$154,218	$159,462	$164,883	$170,489	$176,286	$182,280	$188,477	$194,886	$201,512	$208,363	$215,447	$222,773	$230,347	$238,179	$246,277	$254,650	$263,308	$272,261	$281,518	$291,089	$300,986	$311,220	$321,801	$332,742	$344,056	$355,754	$367,849	$380,356	$393,288	$406,660	$420,486	$434,783	$449,566	$464,851
				Low Estimate																																									
				Expected Value							**$139,500**	**$144,243**	**$149,147**	**$154,218**	**$159,462**	**$164,883**	**$170,489**	**$176,286**	**$182,280**	**$188,477**	**$194,886**	**$201,512**	**$208,363**	**$215,447**	**$222,773**	**$230,347**	**$238,179**	**$246,277**	**$254,650**	**$263,308**	**$272,261**	**$281,518**	**$291,089**	**$300,986**	**$311,220**	**$321,801**	**$332,742**	**$344,056**	**$355,754**	**$367,849**	**$380,356**	**$393,288**	**$406,660**	**$420,486**	**$434,783**	**$449,566**	**$464,851**
12	Other (specify):			YES																																									
	O&M costs for pump station			High Estimate																																									
				Best Estimate							$35,750	$36,966	$38,222	$39,522	$40,866	$42,255	$43,692	$45,177	$46,713	$48,302	$49,944	$51,642	$53,398	$55,213	$57,090	$59,032	$61,039	$63,114	$65,260	$67,479	$69,773	$72,145	$74,598	$77,134	$79,757	$82,469	$85,273	$88,172	$91,170	$94,270	$97,475	$100,789	$104,216	$107,759	$111,423	$115,211	$119,128
				Low Estimate																																									
				Expected Value							**$35,750**	**$36,966**	**$38,222**	**$39,522**	**$40,866**	**$42,255**	**$43,692**	**$45,177**	**$46,713**	**$48,302**	**$49,944**	**$51,642**	**$53,398**	**$55,213**	**$57,090**	**$59,032**	**$61,039**	**$63,114**	**$65,260**	**$67,479**	**$69,773**	**$72,145**	**$74,598**	**$77,134**	**$79,757**	**$82,469**	**$85,273**	**$88,172**	**$91,170**	**$94,270**	**$97,475**	**$100,789**	**$104,216**	**$107,759**	**$111,423**	**$115,211**	**$119,128**
13	Other (specify):			YES																																									
	O&M costs for energy			High Estimate																																									
				Best Estimate							$27,306	$28,234	$29,194	$30,187	$31,213	$32,275	$33,372	$34,507	$35,680	$36,893	$38,147	$39,444	$40,785	$42,172	$43,606	$45,088	$46,621	$48,207	$49,846	$51,540	$53,293	$55,105	$56,978	$58,916	$60,919	$62,990	$65,132	$67,346	$69,636	$72,003	$74,452	$76,983	$79,600	$82,307	$85,105	$87,999	$90,991
				Low Estimate																																									
				Expected Value							**$27,306**	**$28,234**	**$29,194**	**$30,187**	**$31,213**	**$32,275**	**$33,372**	**$34,507**	**$35,680**	**$36,893**	**$38,147**	**$39,444**	**$40,785**	**$42,172**	**$43,606**	**$45,088**	**$46,621**	**$48,207**	**$49,846**	**$51,540**	**$53,293**	**$55,105**	**$56,978**	**$58,916**	**$60,919**	**$62,990**	**$65,132**	**$67,346**	**$69,636**	**$72,003**	**$74,452**	**$76,983**	**$79,600**	**$82,307**	**$85,105**	**$87,999**	**$90,991**
14	Other (specify):			YES																																									
	O&M costs for labor			High Estimate																																									
				Best Estimate							$90,000	$93,060	$96,224	$99,496	$102,879	$106,376	$109,993	$113,733	$117,600	$121,598	$125,733	$130,008	$134,428	$138,998	$143,724	$148,611	$153,664	$158,888	$164,290	$169,876	$175,652	$181,624	$187,799	$194,185	$200,787	$207,614	$214,673	$221,971	$229,518	$237,322	$245,391	$253,734	$262,361	$271,282	$280,505	$290,042	$299,904
				Low Estimate																																									
				Expected Value							**$90,000**	**$93,060**	**$96,224**	**$99,496**	**$102,879**	**$106,376**	**$109,993**	**$113,733**	**$117,600**	**$121,598**	**$125,733**	**$130,008**	**$134,428**	**$138,998**	**$143,724**	**$148,611**	**$153,664**	**$158,888**	**$164,290**	**$169,876**	**$175,652**	**$181,624**	**$187,799**	**$194,185**	**$200,787**	**$207,614**	**$214,673**	**$221,971**	**$229,518**	**$237,322**	**$245,391**	**$253,734**	**$262,361**	**$271,282**	**$280,505**	**$290,042**	**$299,904**
15	Other (specify):			YES																																									
	Contingencies			High Estimate																																									
				Best Estimate	$4,078,847																																									
				Low Estimate																																									
				Expected Value	**$4,078,847**																																								
16	Other (specify):			YES																																									
	Engineering, Construction Management, Administration, and Design			High Estimate																																									
				Best Estimate	$4,078,847																																								
				Low Estimate																																									
				Expected Value	**$4,078,847**																																								
17	Other (specify):			YES																																									
	Disinfection Process			High Estimate																																									
				Best Estimate			$650,297																																							
				Low Estimate																																									
				Expected Value			**$650,297**																																							
18	Other (specify):			YES																																									
	Diesel Energy			High Estimate																																									
				Best Estimate			$101,856																																							
				Low Estimate																																									
				Expected Value			**$101,856**																																							
19	Other (specify):			YES																																									
	2% Loan Interest			High Estimate																																									
				Best Estimate							$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805	$282,805
				Low Estimate																																									
				Expected Value							**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**	**$282,805**
				Annual Total	$8,157,694	$0	$16,315,387	$0	$0	$0	$830,025	$848,631	$867,869	$887,761	$908,330	$929,598	$951,588	$974,327	$997,839	$1,022,150	$1,047,288	$1,073,280	$1,100,156	$1,127,946	$1,156,681	$1,186,393	$1,217,115	$1,248,881	$1,281,728	$1,315,691	$1,350,810	$1,387,122	$1,424,669	$1,463,492	$1,503,635	$1,545,144	$1,588,063	$1,632,442	$1,678,330	$1,725,777	$1,774,838	$1,825,568	$1,878,022	$1,932,259	$1,988,340	$2,046,329	$2,106,288

4.3 Evaluate Project

Alternative: **Name Of Alternative**
Project Participant: **Project Users**

User Input

Discount Rate 6.00%

Table 4C: Project Evaluation

A	B	C	D	E	F
Year	Annual Benefits	Discounted Benefits	Annual Costs	Discounted Costs	Net Benefits (discounted)
2024	$0	$0	$8,157,694	$9,165,985	-$9,165,985
2025	$0	$0	$0	$0	$0
2026	$0	$0	$16,315,387	$16,315,387	-$16,315,387
2027	$0	$0	$0	$0	$0
2028	$0	$0	$0	$0	$0
2029	$0	$0	$0	$0	$0
2030	$1,435,843	$1,137,323	$830,025	$657,458	$479,865
2031	$1,484,662	$1,109,426	$848,631	$634,146	$475,280
2032	$1,535,141	$1,082,214	$867,869	$611,813	$470,400
2033	$1,587,335	$1,055,669	$887,761	$590,412	$465,257
2034	$1,641,305	$1,029,775	$908,330	$569,897	$459,878
2035	$1,697,109	$1,004,516	$929,598	$550,227	$454,289
2036	$1,754,811	$979,877	$951,588	$531,362	$448,515
2037	$1,814,474	$955,843	$974,327	$513,263	$442,579
2038	$1,876,167	$932,397	$997,839	$495,895	$436,502
2039	$1,939,956	$909,527	$1,022,150	$479,224	$430,303
2040	$2,005,915	$887,218	$1,047,288	$463,216	$424,002
2041	$2,074,116	$865,456	$1,073,280	$447,842	$417,614
2042	$2,144,636	$844,228	$1,100,156	$433,072	$411,155
2043	$2,217,553	$823,520	$1,127,946	$418,879	$404,641
2044	$2,292,950	$803,321	$1,156,681	$405,236	$398,085
2045	$2,370,911	$783,617	$1,186,393	$392,118	$391,498
2046	$2,451,522	$764,396	$1,217,115	$379,502	$384,894
2047	$2,534,873	$745,647	$1,248,881	$367,365	$378,281
2048	$2,621,059	$727,357	$1,281,728	$355,686	$371,671
2049	$2,710,175	$709,516	$1,315,691	$344,444	$365,072
2050	$2,802,321	$692,113	$1,350,810	$333,621	$358,492
2051	$2,897,600	$675,137	$1,387,122	$323,197	$351,939
2052	$2,996,118	$658,577	$1,424,669	$313,156	$345,420
2053	$3,097,986	$642,423	$1,463,492	$303,481	$338,942
2054	$3,203,318	$626,666	$1,503,635	$294,156	$332,509
2055	$3,312,231	$611,294	$1,545,144	$285,167	$326,128
2056	$3,424,846	$596,300	$1,588,063	$276,498	$319,803
2057	$3,541,291	$581,674	$1,632,442	$268,136	$313,538
2058	$3,661,695	$567,407	$1,678,330	$260,070	$307,337
2059	$3,786,193	$553,489	$1,725,777	$252,285	$301,204
2060	$3,914,923	$539,913	$1,774,838	$244,771	$295,142
2061	$4,048,031	$526,670	$1,825,568	$237,516	$289,154
2062	$4,185,664	$513,752	$1,878,022	$230,510	$283,242
2063	$4,327,976	$501,150	$1,932,259	$223,742	$277,408
2064	$4,475,128	$488,858	$1,988,340	$217,204	$271,654
2065	$4,627,282	$476,867	$2,046,329	$210,885	$265,981
2066	$4,784,609	$465,170	$2,106,288	$204,778	$260,392
	$103,277,726	**$27,868,303**	**$74,297,486**	**$39,601,607**	**-$11,733,304**

Supplementary Table for Project Evaluation

	Volume (AF)	Net Benefit/AF
Total RW Delivered	**37,572**	**-$312**
Total Fresh Water Alternative	**48,843**	**-$240**

4.4 Sensitivity Analysis

Alternative	**Alternative**	*User Input*
Project Participant	**Project Participant**	

Table 4D: Summary of Sensitivity Analysis

A	B	C	D
Variable 1 - Discount Rate			
Discount Rate Values	Total Monetized Benefit Discounted	Total Monetized Cost Discounted	Total Monetized Net Benefit Discounted
3.00%	$50,656,060	$50,012,661	$643,399
4.00%	$40,999,018	$45,576,747	-$4,577,728
5.00%	$33,599,684	$42,197,091	-$8,597,408
6.00%	$27,868,303	$39,601,607	-$11,733,304
7.00%	$23,380,398	$37,593,839	-$14,213,441
8.00%	$19,828,057	$36,030,801	-$16,202,744
9.00%	$16,986,160	$34,807,584	-$17,821,423

*Note: Please see guidance for assessment of values

Discount Rate Incremental Change

1.00 %

Table 4D: Economic Assessment

ECONOMIC ASSESSMENT

RECYCLED WATER

annual cost/acre-ft	**$1,977.49**	/acre-ft
Expected Net Present Value (NPV)	**($11,733,304.13)**	
Expected Net Present Value (NPV)/acre-ft	**($240.22)**	/acre-ft

Water Recycling is not economically cost-effective

Not Cost-Effective:
Since the expected net present value of the recycling water project is negative, the project is not recommended.

Project Information	*User Input*
Name of Agency	Santa Nella County Water District
Name of person conducting analsysis	Bao Cha
Phone number	(209) 694-4766
email:	bao@blackwater-eng.com
Reuse project information	
Project name	Recycled Water Feasibility Study
Project location	Santa Nella, California
Indirect potable, or non-potable water production	Non-potable water production
Does the project operate year-round or seasonally	Seasonally
Phases of operation (with years)	40
Accounting Perspective	Statewide
Name Of Alternative	Alternative 2: Updating the existing WWTP treatment process to produce tertiary treated effluent for disposal via landscape irrigation within the public right-of-way throughout SNCWD service area but primarily along the SR-33 corridor.
Project Users	Commercial Landscape Irrigation Parkway Community Park Truck Fill Station

2. Standard Assumptions

User Input

Table 2A: Time and Interest

Description	Amount	Unit
Useful Life of Project	40	years
Installed Capacity (final project)	171	AF per year
Recycled Water Market Price	$3,842	per AF
Potable Water Replacement Factor (for RW)	20	
Project Design Year	2024	
Reference Cost Year (Ref Yr)	2020	
First Year of Project Construction	2026	APPROVED
Project First Year of Operation (Last Year of Construction)	2030	APPROVED
Project Last Year of Operation	2066	
Financing Period	40	years
Annual Interest Rate	2.00%	
Discount Rate	6.00%	

Notes:

'Project Last Year of Operation' is equal to 'Project First Year of Operation' and 'Period of Analysis'
'Project Reference Year' is set by 'Project First Year of Operation'
Maximum analysis is 100 years + 2 years for design & construction

3.1 Fresh Water Supply Alternative *User Input*

Table 3A: Annual Fresh Water Alternative Cost	Costs (2020 $)	Comments
Office R&M		
Repairs & Maintenance	$500	
Professional Services		
Engineering Fees	$20,000	
Contract Services	$500	
Operations/R&M		
Chemicals	$24,000	
Fuel	$5,000	
Vehicle Maintenance	$2,500	
Plant Supplies	$18,100	
Plant Equipment Rental	$1,000	
Repair/Maint Plants	$16,990	
R&M Manhole Pumping Wendy's	$0	
Inspection Fees	$4,482	
Utilities		
Utilities-Solid Waste	$354	
Utilities-Well Meter	$15,500	
Utilities-Plant	$36,500	
Water Purchase/Fees		
Standby Charges	$7,860	
Delivery Charges	$25,000	
Water Purchase M&I SLC WC0004	$49,000	
Water Purcase M&I DMC WC0003	$0	
Water Purchase AG DMC WC0001	$0	
Water Purchase AG SLC WC0002	$0	
Total	**$227,286**	

Notes:
Costs represented as present worth values
Without Project assumes future unmet water demand will incur a shortage cost

3.2 Baseline - Total Volume For Entire Project

Table 3B: Total Volume For Entire Project

User Input

	Total Volume (af)
Total Lifetime Recycled Water Produced	**6,849**
Total Lifetime Fresh Water Alternative Produced	**8,903**

*Note: Total lifetime fresh water alternative must be equal to or greater than the total lifetime recycled water produced in order to demonstrate that there is fresh water supply throughout the project

4.0 BENEFITS OF RECYCLED WATER PROGRAM FOR ALTERNATIVE 2

Table 1 - Projected Commercial Water Rates

Parameters	Current	From 2020 Water Rate Study ($/hcf)				Projected Water Rates ($/hcf)						
Fiscal Year	2019	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Rate ($/hcf)	1.25	1.33	1.37	1.42	1.47	1.51	1.56	1.60	1.65	1.70	1.75	1.81
Percent Increase		6%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%

Recycled water rates should be less than potable water rates

For this feasibility study, the cost of the recycled water is 20% less than potable water

Estimated Potable Water Rate in FY 2030-31 ($/hcf) 1.81

Estimated Recycled Water Rate in FY 2030-31 ($/hcf) 1.44

ADD (ac-ft/yr) 171

Estimated revenue of recycled water by FY 2030-31 ($) 107,640 (BENEFITS)

ADDITIONAL FEES FROM ALL CUSTOMERS WHO WILL BENEFIT FROM THE RECYCLED WATER PROGRAM

Table 2 - Benefits of Recycled Water Program

Parameters	Current	From 2020 Water Rate Study				Projected Water Costs						
Fiscal Year	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Water Expenses[1] ($)	312,237	321,526	329,902	338,562	347,517	359,333	371,550	384,183	397,245	410,752	424,717	439,158
Percentage Inflation Rate		3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%
Water Production[2] (acre-ft/yr)	488	488	488	488	488	488	488	488	488	488	488	488
Potable Water Cost[3] ($/acre-ft)	640	659	676	694	712	736	761	787	814	841	870	900
Recycled Water Usage[4] (acre-ft/yr)	171	171	171	171	171	171	171	171	171	171	171	171
Recycled Water Benefits ($)	109,428	112,683	115,619	118,654	121,792	125,933	130,215	134,642	139,220	143,954	148,848	153,909 (BENEFITS)

[1]Variable expenses consist of office repairs and maintenance, professional services, operations, utilities, water purchase fees, and SLWD assessments

[2]Raw surface water and groundwater production in 2018

[3]Cost of Potable Water is equal to variable water expenses ($) divided by the water production (acre-ft)

[4]Recycled Water Average Day Demand

4.1 Identify and Quantify Benefits

Alternative: Alternat

Project Participant: Project Part

User Input

Rate 3.40% (from water rate study)

Table 4A: Identification and Quantification of Benefits

A | B | C | D | F — Expected Value

Item	Benefit	Comments	Quantifiable	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
1	Avoided costs of water supply development/purchase (potable water)		YES														
			High Estimate														
			Best Estimate							$153,909	$159,142	$164,553	$170,147	$175,932	$181,914	$188,099	$194,494
			Low Estimate														
			Expected Value							**$153,909**	**$159,142**	**$164,553**	**$170,147**	**$175,932**	**$181,914**	**$188,099**	**$194,494**
2	Reclaimed water sales revenues		YES														
			High Estimate														
			Best Estimate							$107,640	$111,300	$115,084	$118,997	$123,042	$127,226	$131,552	$136,024
			Low Estimate														
			Expected Value							**$107,640**	**$111,300**	**$115,084**	**$118,997**	**$123,042**	**$127,226**	**$131,552**	**$136,024**
3	Avoided increased groundwater pumping costs with declining groundwater levels		NO														
	Reduces groundwater pumping and overdraft conditions in the groundwater basin.																
4	Increased supply reliability (customer perspective)		NO														
	Improves reliability of existing water supply system by making the system less sensitive to drought conditions.																
5	Local control over water resources (not relying on imported water)		NO														
	Increases degree of local control on water supply, by reducing water demand, a portion of which is dependent on water allocations from the CVP.																
6	Source water protection		NO														
	Reduces surface water demand; consistent with State policies for restoring and protecting fish and wildlife.																
7	Aesthetic values		NO														
	Provides aesthetic benefits for the community by supporting irrigation of areas, even during drought conditions.																
8	Other (specify):		NO														
	Reduces need for future water system improvements and expansion.																
			Annual Total	$0	$0	$0	$0	$0	$0	$261,549	$270,441	$279,636	$289,144	$298,975	$309,140	$319,651	$330,519

Item	Quantifiable	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051
1	YES														
	High Estimate														
	Best Estimate	$201,107	$207,945	$215,015	$222,326	$229,885	$237,701	$245,782	$254,139	$262,780	$271,714	$280,953	$290,505	$300,382	$310,595
	Low Estimate														
	Expected Value	**$201,107**	**$207,945**	**$215,015**	**$222,326**	**$229,885**	**$237,701**	**$245,782**	**$254,139**	**$262,780**	**$271,714**	**$280,953**	**$290,505**	**$300,382**	**$310,595**
2	YES														
	High Estimate														
	Best Estimate	$140,649	$145,431	$150,376	$155,489	$160,775	$166,242	$171,894	$177,738	$183,781	$190,030	$196,491	$203,172	$210,079	$217,222
	Low Estimate														
	Expected Value	**$140,649**	**$145,431**	**$150,376**	**$155,489**	**$160,775**	**$166,242**	**$171,894**	**$177,738**	**$183,781**	**$190,030**	**$196,491**	**$203,172**	**$210,079**	**$217,222**
3	NO														
4	NO														
5	NO														
6	NO														
7	NO														
8	NO														
	Annual Total	$341,756	$353,376	$365,391	$377,814	$390,660	$403,942	$417,676	$431,877	$446,561	$461,744	$477,444	$493,677	$510,462	$527,817

Item	Quantifiable	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
1	YES															
	High Estimate															
	Best Estimate	$321,155	$332,075	$343,365	$355,040	$367,111	$379,593	$392,499	$405,844	$419,643	$433,910	$448,663	$463,918	$479,691	$496,001	$512,865
	Low Estimate															
	Expected Value	**$321,155**	**$332,075**	**$343,365**	**$355,040**	**$367,111**	**$379,593**	**$392,499**	**$405,844**	**$419,643**	**$433,910**	**$448,663**	**$463,918**	**$479,691**	**$496,001**	**$512,865**
2	YES															
	High Estimate															
	Best Estimate	$224,608	$232,244	$240,141	$248,305	$256,748	$265,477	$274,504	$283,837	$293,487	$303,466	$313,784	$324,452	$335,484	$346,890	$358,684
	Low Estimate															
	Expected Value	**$224,608**	**$232,244**	**$240,141**	**$248,305**	**$256,748**	**$265,477**	**$274,504**	**$283,837**	**$293,487**	**$303,466**	**$313,784**	**$324,452**	**$335,484**	**$346,890**	**$358,684**
3	NO															
4	NO															
5	NO															
6	NO															
7	NO															
8	NO															
	Annual Total	$545,763	$564,319	$583,506	$603,345	$623,859	$645,070	$667,002	$689,681	$713,130	$737,376	$762,447	$788,370	$815,175	$842,891	$871,549

4.2 Identify and Quantify Costs

Alternative: Alternati
Project Participant: Project Parti

User Input

Rate 3.40% (from water rate study)

Table 4B: Identification and Quantification of Costs

A | B | C | D | F: Expected Value

Item	Cost	Comments	Quantifiable	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
1	Capital costs for recycled water distribution		YES													
			Best Estimate			$2,801,749										
			Expected Value			**$2,801,749**										
2	Capital costs for storage		YES													
			High Estimate													
			Best Estimate			$1,191,990										
			Low Estimate													
			Expected Value			**$1,191,990**										
3	Capital costs for reclamation treatment		YES													
			High Estimate													
			Best Estimate			$795,000										
			Low Estimate													
			Expected Value			**$795,000**										
4	Other (specify):		YES													
	Capital costs for trenchless crossing		High Estimate													
			Best Estimate			$1,361,818										
			Low Estimate													
			Expected Value			**$1,361,818**										
5	Other (specify):		YES													
	Capital costs for pump station		High Estimate													
			Best Estimate			$350,000										
			Low Estimate													
			Expected Value			**$350,000**										
6	Other (specify):		YES													
	Capital costs for site work		High Estimate													
			Best Estimate			$200,000										
			Low Estimate													
			Expected Value			**$200,000**										
7	Other (specify):		YES													
	Capital costs for building		High Estimate													
			Best Estimate			$300,000										
			Low Estimate													
			Expected Value			**$300,000**										
8	Other (specify):		YES													
	Capital costs for recycled water hydrants		High Estimate													
			Best Estimate			$20,000										
			Low Estimate													
			Expected Value			**$20,000**										
9	O&M costs for recycled water distribution		YES													
			High Estimate													
			Best Estimate							$116,605	$120,569	$124,669	$128,907	$133,290	$137,822	$142,508
			Low Estimate													
			Expected Value							**$116,605**	**$120,569**	**$124,669**	**$128,907**	**$133,290**	**$137,822**	**$142,508**
10	O&M costs for storage		YES													
			High Estimate													
			Best Estimate							$23,840	$24,650	$25,488	$26,355	$27,251	$28,178	$29,136
			Low Estimate													
			Expected Value							**$23,840**	**$24,650**	**$25,488**	**$26,355**	**$27,251**	**$28,178**	**$29,136**
11	O&M costs for reclamation treatment		YES													
			High Estimate													
			Best Estimate							$79,500	$82,203	$84,998	$87,888	$90,876	$93,966	$97,161
			Low Estimate													
			Expected Value							**$79,500**	**$82,203**	**$84,998**	**$87,888**	**$90,876**	**$93,966**	**$97,161**
12	Other (specify):		YES													
	O&M costs for pump station		High Estimate													
			Best Estimate							$17,500	$18,095	$18,710	$19,346	$20,004	$20,684	$21,388
			Low Estimate													
			Expected Value							**$17,500**	**$18,095**	**$18,710**	**$19,346**	**$20,004**	**$20,684**	**$21,388**
13	Other (specify):		YES													
	O&M costs for energy		High Estimate													
			Best Estimate							$7,994	$8,266	$8,547	$8,837	$9,138	$9,449	$9,770
			Low Estimate													
			Expected Value							**$7,994**	**$8,266**	**$8,547**	**$8,837**	**$9,138**	**$9,449**	**$9,770**
14	Other (specify):		YES													
	O&M costs for labor		High Estimate													
			Best Estimate							$90,000	$93,060	$96,224	$99,496	$102,879	$106,376	$109,993
			Low Estimate													
			Expected Value							**$90,000**	**$93,060**	**$96,224**	**$99,496**	**$102,879**	**$106,376**	**$109,993**
15	Other (specify):		YES													
	Contingencies		High Estimate													
			Best Estimate	$634,154												
			Low Estimate													
			Expected Value	**$634,154**												
16	Other (specify):		YES													
	Engineering, Construction Management, Administration, and Design		High Estimate													
			Best Estimate	$634,154												
			Low Estimate													
			Expected Value	**$634,154**												
17	Other (specify):		YES													
	Disinfection Process		High Estimate													
			Best Estimate			$428,797										
			Low Estimate													
			Expected Value			**$428,797**										
18	Other (specify):		YES													
	Diesel Energy		High Estimate													
			Best Estimate			$87,262										
			Low Estimate													
			Expected Value			**$87,262**										
19	Other (specify):		YES													
	2% Loan Interest		High Estimate													
			Best Estimate							$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747
			Low Estimate													
			Expected Value							**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**
			Annual Total	$1,268,308	$0	$7,536,615	$0	$0	$0	$437,186	$448,591	$460,383	$472,577	$485,185	$498,222	$511,702

Item	Quantifiable	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051
9	Best Estimate	$147,353	$152,363	$157,544	$162,900	$168,439	$174,166	$180,087	$186,210	$192,541	$199,088	$205,857	$212,856	$220,093	$227,576	$235,314
9	**Expected Value**	**$147,353**	**$152,363**	**$157,544**	**$162,900**	**$168,439**	**$174,166**	**$180,087**	**$186,210**	**$192,541**	**$199,088**	**$205,857**	**$212,856**	**$220,093**	**$227,576**	**$235,314**
10	Best Estimate	$30,126	$31,151	$32,210	$33,305	$34,437	$35,608	$36,819	$38,071	$39,365	$40,703	$42,087	$43,518	$44,998	$46,528	$48,110
10	**Expected Value**	**$30,126**	**$31,151**	**$32,210**	**$33,305**	**$34,437**	**$35,608**	**$36,819**	**$38,071**	**$39,365**	**$40,703**	**$42,087**	**$43,518**	**$44,998**	**$46,528**	**$48,110**
11	Best Estimate	$100,464	$103,880	$107,412	$111,064	$114,840	$118,745	$122,782	$126,956	$131,273	$135,736	$140,351	$145,123	$150,057	$155,159	$160,435
11	**Expected Value**	**$100,464**	**$103,880**	**$107,412**	**$111,064**	**$114,840**	**$118,745**	**$122,782**	**$126,956**	**$131,273**	**$135,736**	**$140,351**	**$145,123**	**$150,057**	**$155,159**	**$160,435**
12	Best Estimate	$22,115	$22,867	$23,644	$24,448	$25,279	$26,139	$27,027	$27,946	$28,897	$29,879	$30,895	$31,945	$33,031	$34,155	$35,316
12	**Expected Value**	**$22,115**	**$22,867**	**$23,644**	**$24,448**	**$25,279**	**$26,139**	**$27,027**	**$27,946**	**$28,897**	**$29,879**	**$30,895**	**$31,945**	**$33,031**	**$34,155**	**$35,316**
13	Best Estimate	$10,102	$10,445	$10,801	$11,168	$11,548	$11,940	$12,346	$12,766	$13,200	$13,649	$14,113	$14,593	$15,089	$15,602	$16,132
13	**Expected Value**	**$10,102**	**$10,445**	**$10,801**	**$11,168**	**$11,548**	**$11,940**	**$12,346**	**$12,766**	**$13,200**	**$13,649**	**$14,113**	**$14,593**	**$15,089**	**$15,602**	**$16,132**
14	Best Estimate	$113,733	$117,600	$121,598	$125,733	$130,008	$134,428	$138,998	$143,724	$148,611	$153,664	$158,888	$164,290	$169,876	$175,652	$181,624
14	**Expected Value**	**$113,733**	**$117,600**	**$121,598**	**$125,733**	**$130,008**	**$134,428**	**$138,998**	**$143,724**	**$148,611**	**$153,664**	**$158,888**	**$164,290**	**$169,876**	**$175,652**	**$181,624**
19	Best Estimate	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747
19	**Expected Value**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**
	Annual Total	$525,641	$540,053	$554,956	$570,365	$586,298	$602,772	$619,807	$637,421	$655,634	$674,466	$693,939	$714,073	$734,892	$756,419	$778,678

Item	Quantifiable	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
9	Best Estimate	$243,314	$251,587	$260,141	$268,986	$278,131	$287,588	$297,366	$307,476	$317,930	$328,740	$339,917	$351,474	$363,425	$375,781	$388,558
9	**Expected Value**	**$243,314**	**$251,587**	**$260,141**	**$268,986**	**$278,131**	**$287,588**	**$297,366**	**$307,476**	**$317,930**	**$328,740**	**$339,917**	**$351,474**	**$363,425**	**$375,781**	**$388,558**
10	Best Estimate	$49,746	$51,437	$53,186	$54,994	$56,864	$58,797	$60,796	$62,863	$65,001	$67,211	$69,496	$71,859	$74,302	$76,828	$79,440
10	**Expected Value**	**$49,746**	**$51,437**	**$53,186**	**$54,994**	**$56,864**	**$58,797**	**$60,796**	**$62,863**	**$65,001**	**$67,211**	**$69,496**	**$71,859**	**$74,302**	**$76,828**	**$79,440**
11	Best Estimate	$165,890	$171,530	$177,362	$183,392	$189,627	$196,075	$202,741	$209,634	$216,762	$224,132	$231,752	$239,632	$247,780	$256,204	$264,915
11	**Expected Value**	**$165,890**	**$171,530**	**$177,362**	**$183,392**	**$189,627**	**$196,075**	**$202,741**	**$209,634**	**$216,762**	**$224,132**	**$231,752**	**$239,632**	**$247,780**	**$256,204**	**$264,915**
12	Best Estimate	$36,517	$37,758	$39,042	$40,369	$41,742	$43,161	$44,629	$46,146	$47,715	$49,337	$51,015	$52,749	$54,543	$56,397	$58,315
12	**Expected Value**	**$36,517**	**$37,758**	**$39,042**	**$40,369**	**$41,742**	**$43,161**	**$44,629**	**$46,146**	**$47,715**	**$49,337**	**$51,015**	**$52,749**	**$54,543**	**$56,397**	**$58,315**
13	Best Estimate	$16,681	$17,248	$17,834	$18,441	$19,068	$19,716	$20,386	$21,079	$21,796	$22,537	$23,303	$24,096	$24,915	$25,762	$26,638
13	**Expected Value**	**$16,681**	**$17,248**	**$17,834**	**$18,441**	**$19,068**	**$19,716**	**$20,386**	**$21,079**	**$21,796**	**$22,537**	**$23,303**	**$24,096**	**$24,915**	**$25,762**	**$26,638**
14	Best Estimate	$187,799	$194,185	$200,787	$207,614	$214,673	$221,971	$229,518	$237,322	$245,391	$253,734	$262,361	$271,282	$280,505	$290,042	$299,904
14	**Expected Value**	**$187,799**	**$194,185**	**$200,787**	**$207,614**	**$214,673**	**$221,971**	**$229,518**	**$237,322**	**$245,391**	**$253,734**	**$262,361**	**$271,282**	**$280,505**	**$290,042**	**$299,904**
19	Best Estimate	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747	$101,747
19	**Expected Value**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**	**$101,747**
	Annual Total	$801,694	$825,492	$850,099	$875,543	$901,852	$929,056	$957,184	$986,269	$1,016,343	$1,047,439	$1,079,593	$1,112,839	$1,147,216	$1,182,762	$1,219,517

4.3 Evaluate Project

Alternative: **Name Of Alternative**
Project Participant: **Project Users**

User Input

Discount Rate 6.00%

Table 4C: Project Evaluation

A	B	C	D	E	F
Year	Annual Benefits	Discounted Benefits	Annual Costs	Discounted Costs	Net Benefits (discounted)
2024	$0	$0	$1,268,308	$1,425,070	-$1,425,070
2025	$0	$0	$0	$0	$0
2026	$0	$0	$7,536,615	$7,536,615	-$7,536,615
2027	$0	$0	$0	$0	$0
2028	$0	$0	$0	$0	$0
2029	$0	$0	$0	$0	$0
2030	$261,549	$207,171	$437,186	$346,292	-$139,121
2031	$270,441	$202,089	$448,591	$335,213	-$133,124
2032	$279,636	$197,133	$460,383	$324,552	-$127,420
2033	$289,144	$192,297	$472,577	$314,291	-$121,994
2034	$298,975	$187,580	$485,185	$304,411	-$116,831
2035	$309,140	$182,979	$498,222	$294,897	-$111,918
2036	$319,651	$178,491	$511,702	$285,732	-$107,241
2037	$330,519	$174,113	$525,641	$276,901	-$102,788
2038	$341,756	$169,842	$540,053	$268,390	-$98,547
2039	$353,376	$165,677	$554,956	$260,185	-$94,508
2040	$365,391	$161,613	$570,365	$252,273	-$90,660
2041	$377,814	$157,649	$586,298	$244,642	-$86,993
2042	$390,660	$153,782	$602,772	$237,279	-$83,497
2043	$403,942	$150,010	$619,807	$230,174	-$80,165
2044	$417,676	$146,330	$637,421	$223,317	-$76,986
2045	$431,877	$142,741	$655,634	$216,696	-$73,955
2046	$446,561	$139,240	$674,466	$210,302	-$71,062
2047	$461,744	$135,825	$693,939	$204,126	-$68,301
2048	$477,444	$132,493	$714,073	$198,159	-$65,666
2049	$493,677	$129,243	$734,892	$192,393	-$63,150
2050	$510,462	$126,073	$756,419	$186,819	-$60,746
2051	$527,817	$122,981	$778,678	$181,431	-$58,450
2052	$545,763	$119,964	$801,694	$176,220	-$56,256
2053	$564,319	$117,022	$825,492	$171,181	-$54,159
2054	$583,506	$114,151	$850,099	$166,305	-$52,154
2055	$603,345	$111,351	$875,543	$161,587	-$50,236
2056	$623,859	$108,620	$901,852	$157,022	-$48,401
2057	$645,070	$105,956	$929,056	$152,602	-$46,646
2058	$667,002	$103,357	$957,184	$148,323	-$44,966
2059	$689,681	$100,822	$986,269	$144,179	-$43,357
2060	$713,130	$98,349	$1,016,343	$140,165	-$41,817
2061	$737,376	$95,936	$1,047,439	$136,277	-$40,341
2062	$762,447	$93,583	$1,079,593	$132,510	-$38,927
2063	$788,370	$91,288	$1,112,839	$128,859	-$37,571
2064	$815,175	$89,049	$1,147,216	$125,321	-$36,272
2065	$842,891	$86,865	$1,182,762	$121,890	-$35,026
2066	$871,549	$84,734	$1,219,517	$118,564	-$33,830
	$18,812,735	**$5,076,400**	**$36,697,083**	**$16,731,164**	**-$11,654,765**

Supplementary Table for Project Evaluation

	Volume (AF)	Net Benefit/AF
Total RW Delivered	**6,849**	**-$1,702**
Total Fresh Water Alternative	**8,903**	**-$1,309**

4.4 Sensitivity Analysis

Alternative	**Alternative**	*User Input*
Project Participant	**Project Participant**	

Table 4D: Summary of Sensitivity Analysis

A	B	C	D
Variable 1 - Discount Rate			
Discount Rate Values	Total Monetized Benefit Discounted	Total Monetized Cost Discounted	Total Monetized Net Benefit Discounted
3.00%	$9,227,343	$22,780,380	-$13,553,037
4.00%	$7,468,248	$20,218,019	-$12,749,771
5.00%	$6,120,409	$18,253,215	-$12,132,805
6.00%	$5,076,400	$16,731,164	-$11,654,765
7.00%	$4,258,897	$15,540,225	-$11,281,328
8.00%	$3,611,815	$14,599,240	-$10,987,426
9.00%	$3,094,144	$13,848,740	-$10,754,596

*Note: Please see guidance for assessment of values

Discount Rate Incremental Change

1.00 %

Table 4D: Economic Assessment

ECONOMIC ASSESSMENT

RECYCLED WATER

annual cost/acre-ft	**$5,358.16**	/acre-ft
Expected Net Present Value (NPV)	**($11,654,764.89)**	
Expected Net Present Value (NPV)/acre-ft	**($1,309.01)**	/acre-ft

Water Recycling is not economically cost-effective

Not Cost-Effective:
Since the expected net present value of the recycling water project is negative, the project is not recommended.

Project Information	*User Input*
Name of Agency	Santa Nella County Water District
Name of person conducting analsysis	Bao Cha
Phone number	(209) 694-4766
email:	bao@blackwater-eng.com
Reuse project information	
Project name	Recycled Water Feasibility Study
Project location	Santa Nella, California
Indirect potable, or non-potable water production	Non-potable water production
Does the project operate year-round or seasonally	Seasonally
Phases of operation (with years)	40
Accounting Perspective	Statewide
Name Of Alternative	Alternative 3: Upgrade of the existing WWTP treatment process to produce tertiary treated effluent for disposal via landscape irrigation within the public right-of-way and at the Forebay Golf Course, via a purple pipe recycled water system.
Project Users	Commercial Landscape Irrigation Parkway Community Park Truck Fill Station Golf Course

2. Standard Assumptions

User Input

Table 2A: Time and Interest

Description	Amount	Unit
Useful Life of Project	40	years
Installed Capacity (final project)	647	AF per year
Recycled Water Market Price	$1,474	per AF
Potable Water Replacement Factor (for RW)	29	
Project Design Year	2024	
Reference Cost Year (Ref Yr)	2020	
First Year of Project Construction	2026	APPROVED
Project First Year of Operation (Last Year of Construction)	2030	APPROVED
Project Last Year of Operation	2066	
Financing Period	40	years
Annual Interest Rate	2.00%	
Discount Rate	6.00%	

Notes:

'Project Last Year of Operation' is equal to 'Project First Year of Operation' and 'Period of Analysis'
'Project Reference Year' is set by 'Project First Year of Operation'
Maximum analysis is 100 years + 2 years for design & construction

3.1 Fresh Water Supply Alternative *User Input*

Table 3A: Annual Fresh Water Alternative Cost	Costs (2020 $)	Comments
Office R&M		
Repairs & Maintenance	$500	
Professional Services		
Engineering Fees	$20,000	
Contract Services	$500	
Operations/R&M		
Chemicals	$24,000	
Fuel	$5,000	
Vehicle Maintenance	$2,500	
Plant Supplies	$18,100	
Plant Equipment Rental	$1,000	
Repair/Maint Plants	$16,990	
R&M Manhole Pumping Wendy's	$0	
Inspection Fees	$4,482	
Utilities		
Utilities-Solid Waste	$354	
Utilities-Well Meter	$15,500	
Utilities-Plant	$36,500	
Water Purchase/Fees		
Standby Charges	$7,860	
Delivery Charges	$25,000	
Water Purchase M&I SLC WC0004	$49,000	
Water Purcase M&I DMC WC0003	$0	
Water Purchase AG DMC WC0001	$0	
Water Purchase AG SLC WC0002	$0	
Total	**$227,286**	

Notes:
Costs represented as present worth values
Without Project assumes future unmet water demand will incur a shortage cost

3.2 Baseline - Total Volume For Entire Project

Table 3B: Total Volume For Entire Project

User Input

	Total Volume (af)
Total Lifetime Recycled Water Produced	**25,883**
Total Lifetime Fresh Water Alternative Produced	**33,648**

*Note: Total lifetime fresh water alternative must be equal to or greater than the total lifetime recycled water produced in order to demonstrate that there is fresh water supply throughout the project

4.0 BENEFITS OF RECYCLED WATER PROGRAM FOR ALTERNATIVE 3

Table 1 - Projected Commercial Water Rates

Parameters	Current	From 2020 Water Rate Study ($/hcf)				Projected Water Rates ($/hcf)						
Fiscal Year	2019	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Rate ($/hcf)	1.25	1.33	1.37	1.42	1.47	1.51	1.56	1.60	1.65	1.70	1.75	1.81
Percent Increase		6%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%

Recycled water rates should be less than potable water rates

For this feasibility study, the cost of the recycled water is 20% less than potable water

Estimated Potable Water Rate in FY 2030-31 ($/hcf) 1.81

Estimated Recycled Water Rate in FY 2030-31 ($/hcf) 1.44

ADD (ac-ft/yr) 647

Estimated revenue of recycled water by FY 2030-31 ($) 407,052 (BENEFITS)

ADDITIONAL FEES FROM ALL CUSTOMERS WHO WILL BENEFIT FROM THE RECYCLED WATER PROGRAM

Table 2 - Benefits of Recycled Water Program

Parameters	Current	From 2020 Water Rate Study				Projected Water Costs						
Fiscal Year	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Water Expenses[1] ($)	312,237	321,526	329,902	338,562	347,517	359,333	371,550	384,183	397,245	410,752	424,717	439,158
Percentage Inflation Rate		3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%
Water Production[2] (acre-ft/yr)	488	488	488	488	488	488	488	488	488	488	488	488
Potable Water Cost[3] ($/acre-ft)	640	659	676	694	712	736	761	787	814	841	870	900
Recycled Water Usage[4] (acre-ft/yr)	647	647	647	647	647	647	647	647	647	647	647	647
Recycled Water Benefits ($)	413,813	426,124	437,224	448,703	460,571	476,230	492,422	509,164	526,476	544,376	562,885	582,023 (BENEFITS)

[1]Variable expenses consist of office repairs and maintenance, professional services, operations, utilities, water purchase fees, and SLWD assessments

[2]Raw surface water and groundwater production in 2018

[3]Cost of Potable Water is equal to variable water expenses ($) divided by the water production (acre-ft)

[4]Recycled Water Average Day Demand

4.1 Identify and Quantify Benefits

Alternative: **Alternat**
Project Participant: **Project Part**

User input

Rate: 3.40% (from water rate study)

Table 4A: Identification and Quantification of Benefits

Item	Benefit	Comments	Quantifiable	F Expected Value	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
1	Avoided costs of water supply development/purchase (potable water)		YES																																										
			High Estimate																																											
			Best Estimate								$582,023	$601,812	$622,273	$643,431	$665,307	$687,928	$711,317	$735,502	$760,509	$786,367	$813,103	$840,749	$869,334	$898,891	$929,454	$961,055	$993,731	$1,027,518	$1,062,453	$1,098,577	$1,135,928	$1,174,550	$1,214,485	$1,255,777	$1,298,474	$1,342,622	$1,388,271	$1,435,472	$1,484,278	$1,534,744	$1,586,925	$1,640,880	$1,696,670	$1,754,357	$1,814,005	$1,875,681	$1,939,455
			Low Estimate																																										
			Expected Value								**$582,023**	**$601,812**	**$622,273**	**$643,431**	**$665,307**	**$687,928**	**$711,317**	**$735,502**	**$760,509**	**$786,367**	**$813,103**	**$840,749**	**$869,334**	**$898,891**	**$929,454**	**$961,055**	**$993,731**	**$1,027,518**	**$1,062,453**	**$1,098,577**	**$1,135,928**	**$1,174,550**	**$1,214,485**	**$1,255,777**	**$1,298,474**	**$1,342,622**	**$1,388,271**	**$1,435,472**	**$1,484,278**	**$1,534,744**	**$1,586,925**	**$1,640,880**	**$1,696,670**	**$1,754,357**	**$1,814,005**	**$1,875,681**	**$1,939,455**
2	Reclaimed water sales revenues		YES																																										
			High Estimate																																											
			Best Estimate								$407,052	$420,892	$435,202	$449,999	$465,299	$481,119	$497,477	$514,391	$531,880	$549,964	$568,663	$587,998	$607,990	$628,661	$650,036	$672,137	$694,990	$718,619	$743,052	$768,316	$794,439	$821,450	$849,379	$878,258	$908,119	$938,995	$970,921	$1,003,932	$1,038,065	$1,073,360	$1,109,854	$1,147,589	$1,186,607	$1,226,952	$1,268,668	$1,311,803	$1,356,404
			Low Estimate																																										
			Expected Value								**$407,052**	**$420,892**	**$435,202**	**$449,999**	**$465,299**	**$481,119**	**$497,477**	**$514,391**	**$531,880**	**$549,964**	**$568,663**	**$587,998**	**$607,990**	**$628,661**	**$650,036**	**$672,137**	**$694,990**	**$718,619**	**$743,052**	**$768,316**	**$794,439**	**$821,450**	**$849,379**	**$878,258**	**$908,119**	**$938,995**	**$970,921**	**$1,003,932**	**$1,038,065**	**$1,073,360**	**$1,109,854**	**$1,147,589**	**$1,186,607**	**$1,226,952**	**$1,268,668**	**$1,311,803**	**$1,356,404**
3	Avoided increased groundwater pumping costs with declining groundwater levels Reduces groundwater pumping and overdraft conditions in the groundwater basin.		NO																																										
4	Increased supply reliability (customer perspective) Improves reliability of existing water supply system by making the system less sensitive to drought conditions.		NO																																										
5	Local control over water resources (not relying on imported water) Increases degree of local control on water supply, by reducing water demand, a portion of which is dependent on water allocations from the CVP.		NO																																										
6	Source water protection Reduces surface water demand; consistent with State policies for restoring and protecting fish and wildlife.		NO																																										
7	Aesthetic values Provides aesthetic benefits for the community by supporting irrigation of areas, even during drought conditions.		NO																																										
8	Other (specify): Reduces need for future water system improvements and expansion.		NO																																										
			Annual Total		$0	$0	$0	$0	$0	$0	$989,075	$1,022,703	$1,057,475	$1,093,430	$1,130,606	$1,169,047	$1,208,794	$1,249,893	$1,292,390	$1,336,331	$1,381,766	$1,428,746	$1,477,324	$1,527,553	$1,579,489	$1,633,192	$1,688,721	$1,746,137	$1,805,506	$1,866,893	$1,930,367	$1,996,000	$2,063,864	$2,134,035	$2,206,592	$2,281,616	$2,359,191	$2,439,404	$2,522,344	$2,608,103	$2,696,779	$2,788,469	$2,883,277	$2,981,309	$3,082,673	$3,187,484	$3,295,859

4.2 Identify and Quantify Costs

Alternative / Project Participant: **Alternative Project Participant**

User input

Rate: 3.40% (from water rate study)

Table 4B: Identification and Quantification of Costs

Item	Cost	Comments	Quantifiable	Expected Value	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
1	Capital costs for recycled water distribution		YES																																										
			High Estimate																																												
			Best Estimate				$3,402,357																																								
			Low Estimate																																												
			Expected Value	**$3,402,357**																																										
2	Capital costs for storage		YES																																											
			High Estimate																																												
			Best Estimate				$3,524,792																																								
			Low Estimate																																												
			Expected Value	**$3,524,792**																																										
3	Capital costs for reclamation treatment		YES																																											
			High Estimate																																												
			Best Estimate				$1,050,000																																								
			Low Estimate																																												
			Expected Value	**$1,050,000**																																										
4	Other (specify):		YES																																											
	Capital costs for trenchless crossing		High Estimate																																												
			Best Estimate				$1,361,818																																								
			Low Estimate																																												
			Expected Value	**$1,361,818**																																										
5	Other (specify):		YES																																											
	Capital costs for pump station		High Estimate																																												
			Best Estimate				$525,000																																								
			Low Estimate																																												
			Expected Value	**$525,000**																																										
6	Other (specify):		YES																																											
	Capital costs for site work		High Estimate																																												
			Best Estimate				$200,000																																								
			Low Estimate																																												
			Expected Value	**$200,000**																																										
7	Other (specify):		YES																																											
	Capital costs for building		High Estimate																																											
			Best Estimate				$300,000																																							
			Low Estimate																																												
			Expected Value	**$300,000**																																										
8	Other (specify):		YES																																											
	Capital costs for recycled water hydrants		High Estimate																																												
			Best Estimate				$20,000																																								
			Low Estimate																																												
			Expected Value	**$20,000**																																										
9	O&M costs for recycled water distribution		YES																																											
			High Estimate																																												
			Best Estimate								$118,652	$122,686	$126,857	$131,170	$135,630	$140,242	$145,010	$149,940	$155,038	$160,310	$165,760	$171,396	$177,223	$183,249	$189,479	$195,922	$202,583	$209,471	$216,593	$223,957	$231,572	$239,445	$247,586	$256,004	$264,708	$273,708	$283,014	$292,637	$302,586	$312,874	$323,512	$334,512	$345,885	$357,645	$369,805	$382,378	$395,379
			Low Estimate																																												
			Expected Value								**$118,652**	**$122,686**	**$126,857**	**$131,170**	**$135,630**	**$140,242**	**$145,010**	**$149,940**	**$155,038**	**$160,310**	**$165,760**	**$171,396**	**$177,223**	**$183,249**	**$189,479**	**$195,922**	**$202,583**	**$209,471**	**$216,593**	**$223,957**	**$231,572**	**$239,445**	**$247,586**	**$256,004**	**$264,708**	**$273,708**	**$283,014**	**$292,637**	**$302,586**	**$312,874**	**$323,512**	**$334,512**	**$345,885**	**$357,645**	**$369,805**	**$382,378**	**$395,379**
10	O&M costs for storage		YES																																											
			High Estimate																																												
			Best Estimate								$70,496	$72,893	$75,371	$77,934	$80,583	$83,323	$86,156	$89,086	$92,114	$95,246	$98,485	$101,833	$105,296	$108,876	$112,577	$116,405	$120,363	$124,455	$128,687	$133,062	$137,586	$142,264	$147,101	$152,102	$157,274	$162,621	$168,150	$173,867	$179,779	$185,891	$192,212	$198,747	$205,504	$212,491	$219,716	$227,186	$234,911
			Low Estimate																																												
			Expected Value								**$70,496**	**$72,893**	**$75,371**	**$77,934**	**$80,583**	**$83,323**	**$86,156**	**$89,086**	**$92,114**	**$95,246**	**$98,485**	**$101,833**	**$105,296**	**$108,876**	**$112,577**	**$116,405**	**$120,363**	**$124,455**	**$128,687**	**$133,062**	**$137,586**	**$142,264**	**$147,101**	**$152,102**	**$157,274**	**$162,621**	**$168,150**	**$173,867**	**$179,779**	**$185,891**	**$192,212**	**$198,747**	**$205,504**	**$212,491**	**$219,716**	**$227,186**	**$234,911**
11	O&M costs for reclamation treatment		YES																																											
			High Estimate																																												
			Best Estimate								$105,000	$108,570	$112,261	$116,078	$120,025	$124,106	$128,325	$132,688	$137,200	$141,865	$146,688	$151,675	$156,832	$162,165	$167,678	$173,379	$179,274	$185,370	$191,672	$198,189	$204,927	$211,895	$219,099	$226,549	$234,251	$242,216	$250,451	$258,967	$267,772	$276,876	$286,290	$296,023	$306,088	$316,495	$327,256	$338,383	$349,888
			Low Estimate																																												
			Expected Value								**$105,000**	**$108,570**	**$112,261**	**$116,078**	**$120,025**	**$124,106**	**$128,325**	**$132,688**	**$137,200**	**$141,865**	**$146,688**	**$151,675**	**$156,832**	**$162,165**	**$167,678**	**$173,379**	**$179,274**	**$185,370**	**$191,672**	**$198,189**	**$204,927**	**$211,895**	**$219,099**	**$226,549**	**$234,251**	**$242,216**	**$250,451**	**$258,967**	**$267,772**	**$276,876**	**$286,290**	**$296,023**	**$306,088**	**$316,495**	**$327,256**	**$338,383**	**$349,888**
12	Other (specify):		YES																																											
	O&M costs for pump station		High Estimate																																												
			Best Estimate								$26,250	$27,143	$28,065	$29,020	$30,006	$31,026	$32,081	$33,172	$34,300	$35,466	$36,672	$37,919	$39,208	$40,541	$41,920	$43,345	$44,819	$46,342	$47,918	$49,547	$51,232	$52,974	$54,775	$56,637	$58,563	$60,554	$62,613	$64,742	$66,943	$69,219	$71,572	$74,006	$76,522	$79,124	$81,814	$84,596	$87,472
			Low Estimate																																												
			Expected Value								**$26,250**	**$27,143**	**$28,065**	**$29,020**	**$30,006**	**$31,026**	**$32,081**	**$33,172**	**$34,300**	**$35,466**	**$36,672**	**$37,919**	**$39,208**	**$40,541**	**$41,920**	**$43,345**	**$44,819**	**$46,342**	**$47,918**	**$49,547**	**$51,232**	**$52,974**	**$54,775**	**$56,637**	**$58,563**	**$60,554**	**$62,613**	**$64,742**	**$66,943**	**$69,219**	**$71,572**	**$74,006**	**$76,522**	**$79,124**	**$81,814**	**$84,596**	**$87,472**
13	Other (specify):		YES																																											
	O&M costs for energy		High Estimate																																											
			Best Estimate								$19,643	$20,311	$21,001	$21,715	$22,453	$23,217	$24,006	$24,822	$25,666	$26,539	$27,441	$28,374	$29,339	$30,337	$31,368	$32,435	$33,537	$34,678	$35,857	$37,076	$38,336	$39,640	$40,988	$42,381	$43,822	$45,312	$46,853	$48,446	$50,093	$51,796	$53,557	$55,378	$57,261	$59,208	$61,221	$63,302	$65,455
			Low Estimate																																												
			Expected Value								**$19,643**	**$20,311**	**$21,001**	**$21,715**	**$22,453**	**$23,217**	**$24,006**	**$24,822**	**$25,666**	**$26,539**	**$27,441**	**$28,374**	**$29,339**	**$30,337**	**$31,368**	**$32,435**	**$33,537**	**$34,678**	**$35,857**	**$37,076**	**$38,336**	**$39,640**	**$40,988**	**$42,381**	**$43,822**	**$45,312**	**$46,853**	**$48,446**	**$50,093**	**$51,796**	**$53,557**	**$55,378**	**$57,261**	**$59,208**	**$61,221**	**$63,302**	**$65,455**
14	Other (specify):		YES																																										
	O&M costs for labor		High Estimate																																											
			Best Estimate								$90,000	$93,060	$96,224	$99,496	$102,879	$106,376	$109,993	$113,733	$117,600	$121,598	$125,733	$130,008	$134,428	$138,998	$143,724	$148,611	$153,664	$158,888	$164,290	$169,876	$175,652	$181,624	$187,799	$194,185	$200,787	$207,614	$214,673	$221,971	$229,518	$237,322	$245,391	$253,734	$262,361	$271,282	$280,505	$290,042	$299,904
			Low Estimate																																												
			Expected Value								**$90,000**	**$93,060**	**$96,224**	**$99,496**	**$102,879**	**$106,376**	**$109,993**	**$113,733**	**$117,600**	**$121,598**	**$125,733**	**$130,008**	**$134,428**	**$138,998**	**$143,724**	**$148,611**	**$153,664**	**$158,888**	**$164,290**	**$169,876**	**$175,652**	**$181,624**	**$187,799**	**$194,185**	**$200,787**	**$207,614**	**$214,673**	**$221,971**	**$229,518**	**$237,322**	**$245,391**	**$253,734**	**$262,361**	**$271,282**	**$280,505**	**$290,042**	**$299,904**
15	Other (specify):		YES																																										
	Contingencies		High Estimate																																											
			Best Estimate	$1,552,335																																											
			Low Estimate																																												
			Expected Value	**$1,552,335**																																										
16	Other (specify):		YES																																											
	Engineering, Construction Management, Administration, and Design		High Estimate																																											
			Best Estimate	$1,552,335																																										
			Low Estimate																																												
			Expected Value	**$1,552,335**																																										
17	Other (specify):		YES																																											
	Disinfection Process		High Estimate																																											
			Best Estimate				$732,677																																								
			Low Estimate																																												
			Expected Value				**$732,677**																																							
18	Other (specify):		YES																																											
	Diesel Energy		High Estimate																																											
			Best Estimate				$92,698																																								
			Low Estimate																																												
			Expected Value				**$92,698**																																							
19	Other (specify):		YES																																											
	2% Loan Interest		High Estimate																																											
			Best Estimate								$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409	$165,409
			Low Estimate																																												
			Expected Value								**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**	**$165,409**
			Annual Total	$3,104,671	$0	$11,209,342	$0	$0	$0	$595,449	$610,071	$625,189	$640,822	$656,986	$673,700	$690,981	$708,851	$727,328	$746,433	$766,188	$786,614	$807,735	$829,574	$852,156	$875,506	$899,649	$924,613	$950,426	$977,116	$1,004,714	$1,033,251	$1,062,757	$1,093,267	$1,124,815	$1,157,434	$1,191,163	$1,226,039	$1,262,100	$1,299,388	$1,337,943	$1,377,809	$1,419,031	$1,461,654	$1,505,726	$1,551,297	$1,598,417

4.3 Evaluate Project

Alternative: **Name Of Alternative**
Project Participant: **Project Users**

User Input

Discount Rate 6.00%

Table 4C: Project Evaluation

A	B	C	D	E	F
Year	Annual Benefits	Discounted Benefits	Annual Costs	Discounted Costs	Net Benefits (discounted)
2024	$0	$0	$3,104,671	$3,488,408	-$3,488,408
2025	$0	$0	$0	$0	$0
2026	$0	$0	$11,209,342	$11,209,342	-$11,209,342
2027	$0	$0	$0	$0	$0
2028	$0	$0	$0	$0	$0
2029	$0	$0	$0	$0	$0
2030	$989,075	$783,440	$595,449	$471,652	$311,788
2031	$1,022,703	$764,223	$610,071	$455,880	$308,343
2032	$1,057,475	$745,478	$625,189	$440,734	$304,745
2033	$1,093,430	$727,193	$640,822	$426,183	$301,010
2034	$1,130,606	$709,356	$656,986	$412,201	$297,155
2035	$1,169,047	$691,957	$673,700	$398,762	$293,195
2036	$1,208,794	$674,984	$690,981	$385,840	$289,144
2037	$1,249,893	$658,428	$708,851	$373,414	$285,014
2038	$1,292,390	$642,278	$727,328	$361,460	$280,818
2039	$1,336,331	$626,524	$746,433	$349,957	$276,567
2040	$1,381,766	$611,157	$766,188	$338,886	$272,271
2041	$1,428,746	$596,166	$786,614	$328,227	$267,939
2042	$1,477,324	$581,543	$807,735	$317,962	$263,581
2043	$1,527,553	$567,279	$829,574	$308,074	$259,204
2044	$1,579,489	$553,364	$852,156	$298,548	$254,817
2045	$1,633,192	$539,791	$875,506	$289,366	$250,425
2046	$1,688,721	$526,551	$899,649	$280,515	$246,036
2047	$1,746,137	$513,636	$924,613	$271,980	$241,656
2048	$1,805,506	$501,037	$950,426	$263,748	$237,289
2049	$1,866,893	$488,747	$977,116	$255,806	$232,941
2050	$1,930,367	$476,759	$1,004,714	$248,143	$228,616
2051	$1,996,000	$465,065	$1,033,251	$240,746	$224,319
2052	$2,063,864	$453,658	$1,062,757	$233,605	$220,053
2053	$2,134,035	$442,530	$1,093,267	$226,709	$215,822
2054	$2,206,592	$431,676	$1,124,815	$220,048	$211,628
2055	$2,281,616	$421,088	$1,157,434	$213,612	$207,475
2056	$2,359,191	$410,759	$1,191,163	$207,394	$203,366
2057	$2,439,404	$400,684	$1,226,039	$201,383	$199,301
2058	$2,522,344	$390,856	$1,262,100	$195,572	$195,284
2059	$2,608,103	$381,269	$1,299,388	$189,953	$191,316
2060	$2,696,779	$371,917	$1,337,943	$184,518	$187,399
2061	$2,788,469	$362,794	$1,377,809	$179,260	$183,534
2062	$2,883,277	$353,896	$1,419,031	$174,173	$179,723
2063	$2,981,309	$345,215	$1,461,654	$169,250	$175,966
2064	$3,082,673	$336,748	$1,505,726	$164,484	$172,264
2065	$3,187,484	$328,488	$1,551,297	$159,870	$168,618
2066	$3,295,859	$320,431	$1,598,417	$155,402	$165,029
	$71,142,438	**$19,196,966**	**$51,366,206**	**$25,091,062**	**-$5,894,096**

Supplementary Table for Project Evaluation

	Volume (AF)	Net Benefit/AF
Total RW Delivered	**25,883**	**-$228**
Total Fresh Water Alternative	**33,648**	**-$175**

4.4 Sensitivity Analysis

Alternative	**Alternative**	*User Input*
Project Participant	**Project Participant**	

Table 4D: Summary of Sensitivity Analysis

A	B	C	D
Variable 1 - Discount Rate			
Discount Rate Values	Total Monetized Benefit Discounted	Total Monetized Cost Discounted	Total Monetized Net Benefit Discounted
3.00%	$34,894,219	$33,030,278	$1,863,941
4.00%	$28,242,005	$29,661,589	-$1,419,584
5.00%	$23,145,004	$27,083,288	-$3,938,284
6.00%	$19,196,966	$25,091,062	-$5,894,096
7.00%	$16,105,491	$23,537,494	-$7,432,003
8.00%	$13,658,476	$22,315,370	-$8,656,894
9.00%	$11,700,847	$21,346,084	-$9,645,237

*Note: Please see guidance for assessment of values

Discount Rate Incremental Change

1.00 %

Table 4D: Economic Assessment

ECONOMIC ASSESSMENT

RECYCLED WATER

annual cost/acre-ft	**$1,984.56**	/acre-ft
Expected Net Present Value (NPV)	**($5,894,096.16)**	
Expected Net Present Value (NPV)/acre-ft	**($175.17)**	/acre-ft

Water Recycling is not economically cost-effective

Not Cost-Effective:
Since the expected net present value of the recycling water project is negative, the project is not recommended.

Project Information	*User Input*
Name of Agency	Santa Nella County Water District
Name of person conducting analsysis	Bao Cha
Phone number	(209) 694-4766
email:	bao@blackwater-eng.com
Reuse project information	
Project name	Recycled Water Feasibility Study
Project location	Santa Nella, California
Indirect potable, or non-potable water production	Non-potable water production
Does the project operate year-round or seasonally	Seasonally
Phases of operation (with years)	40
Accounting Perspective	Statewide
Name Of Alternative	Alternative 4: Upgrade of the existing WWTP treatment process to produce tertiary treated effluent for disposal via landscape irrigation within the public right-of-way, at the Forebay Golf Course, and at future developments, via a purple pipe recycled water system.
Project Users	Commercial Landscape Irrigation Parkway Community Park Truck Fill Station Golf Course Future Development

2. Standard Assumptions

User Input

Table 2A: Time and Interest

Description	Amount	Unit
Useful Life of Project	40	years
Installed Capacity (final project)	939	AF per year
Recycled Water Market Price	$1,341	per AF
Potable Water Replacement Factor (for RW)	24.3	
Project Design Year	2024	
Reference Cost Year (Ref Yr)	2020	
First Year of Project Construction	2026	APPROVED
Project First Year of Operation (Last Year of Construction)	2030	APPROVED
Project Last Year of Operation	2066	
Financing Period	40	years
Annual Interest Rate	2.00%	
Discount Rate	6.00%	

Notes:

'Project Last Year of Operation' is equal to 'Project First Year of Operation' and 'Period of Analysis'
'Project Reference Year' is set by 'Project First Year of Operation'
Maximum analysis is 100 years + 2 years for design & construction

3.1 Fresh Water Supply Alternative *User Input*

Table 3A: Annual Fresh Water Alternative Cost	Costs (2020 $)	Comments
Office R&M		
Repairs & Maintenance	$500	
Professional Services		
Engineering Fees	$20,000	
Contract Services	$500	
Operations/R&M		
Chemicals	$24,000	
Fuel	$5,000	
Vehicle Maintenance	$2,500	
Plant Supplies	$18,100	
Plant Equipment Rental	$1,000	
Repair/Maint Plants	$16,990	
R&M Manhole Pumping Wendy's	$0	
Inspection Fees	$4,482	
Utilities		
Utilities-Solid Waste	$354	
Utilities-Well Meter	$15,500	
Utilities-Plant	$36,500	
Water Purchase/Fees		
Standby Charges	$7,860	
Delivery Charges	$25,000	
Water Purchase M&I SLC WC0004	$49,000	
Water Purcase M&I DMC WC0003	$0	
Water Purchase AG DMC WC0001	$0	
Water Purchase AG SLC WC0002	$0	
Total	**$227,286**	

Notes:
Costs represented as present worth values
Without Project assumes future unmet water demand will incur a shortage cost

3.2 Baseline - Total Volume For Entire Project

Table 3B: Total Volume For Entire Project

User Input

	Total Volume (af)
Total Lifetime Recycled Water Produced	**37,572**
Total Lifetime Fresh Water Alternative Produced	**48,843**

*Note: Total lifetime fresh water alternative must be equal to or greater than the total lifetime recycled water produced in order to demonstrate that there is fresh water supply throughout the project

4.0 BENEFITS OF RECYCLED WATER PROGRAM FOR ALTERNATIVE 4

Table 1 - Projected Commercial Water Rates

Parameters	Current	From 2020 Water Rate Study ($/hcf)				Projected Water Rates ($/hcf)						
Fiscal Year	2019	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Rate ($/hcf)	1.25	1.33	1.37	1.42	1.47	1.51	1.56	1.60	1.65	1.70	1.75	1.81
Percent Increase		6%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%

Recycled water rates should be less than potable water rates

For this feasibility study, the cost of the recycled water is 20% less than potable water

Estimated Potable Water Rate in FY 2030-31 ($/hcf) 1.81

Estimated Recycled Water Rate in FY 2030-31 ($/hcf) 1.44

ADD (ac-ft/yr) 939

Estimated revenue of recycled water by FY 2030-31 ($) 590,919 (BENEFITS)

ADDITIONAL FEES FROM ALL CUSTOMERS WHO WILL BENEFIT FROM THE RECYCLED WATER PROGRAM

Table 2 - Benefits of Recycled Water Program

Parameters	Current	From 2020 Water Rate Study				Projected Water Costs						
Fiscal Year	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Water Expenses[1] ($)	312,237	321,526	329,902	338,562	347,517	359,333	371,550	384,183	397,245	410,752	424,717	439,158
Percentage Inflation Rate		3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%
Water Production[2] (acre-ft/yr)	488	488	488	488	488	488	488	488	488	488	488	488
Potable Water Cost[3] ($/acre-ft)	640	659	676	694	712	736	761	787	814	841	870	900
Recycled Water Usage[4] (acre-ft/yr)	939	939	939	939	939	939	939	939	939	939	939	939
Recycled Water Benefits ($)	600,734	618,605	634,720	651,383	668,612	691,345	714,851	739,156	764,287	790,273	817,142	844,925 (BENEFITS)

[1]Variable expenses consist of office repairs and maintenance, professional services, operations, utilities, water purchase fees, and SLWD assessments

[2]Raw surface water and groundwater production in 2018

[3]Cost of Potable Water is equal to variable water expenses ($) divided by the water production (acre-ft)

[4]Recycled Water Average Day Demand

4.1 Identify and Quantify Benefits

Alternative: **Alternat**
Project Participant: **Project Par**

User input

Rate: 3.40% (from water rate study)

Table 4A: Identification and Quantification of Benefits

A	B	C	D	F
				Expected Value
Item	**Benefit**	**Comments**	**Quantifiable**	**2024**
1	Avoided costs of water supply development/purchase (potable water)		YES	
			High Estimate	
			Best Estimate	
			Low Estimate	
			Expected Value	**$844,925**
2	Reclaimed water sales revenues		YES	
			High Estimate	
			Best Estimate	$590,919
			Low Estimate	
			Expected Value	**$590,919**
3	Avoided increased groundwater pumping costs with declining groundwater levels Reduces groundwater pumping and overdraft conditions in the groundwater basin.		NO	
4	Increased supply reliability (customer perspective) Improves reliability of existing water supply system by making the system less sensitive to drought conditions.		NO	
5	Local control over water resources (not relying on imported water) Increases degree of local control on water supply, by reducing water demand, a portion of which is dependent on water allocations from the CVP.		NO	
6	Source water protection Reduces surface water demand; consistent with State policies for restoring and protecting fish and wildlife.		NO	
7	Aesthetic values Provides aesthetic benefits for the community by supporting irrigation of areas, even during drought conditions.		NO	
8	Other (specify): Reduces need for future water system improvements and expansion.		NO	
			Annual Total	$0

2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
					$844,925	$873,652	$903,357	$934,071	$965,829	$998,667	$1,032,622	$1,067,731	$1,104,034	$1,141,571	$1,180,385	$1,220,518	$1,262,015	$1,304,924	$1,349,291	$1,395,167	$1,442,603	$1,491,651	$1,542,367	$1,594,808	$1,649,031	$1,705,098	$1,763,072	$1,823,016	$1,884,999	$1,949,089	$2,015,358	$2,083,880	$2,154,732	$2,227,993	$2,303,744	$2,382,072	$2,463,062	$2,546,806	$2,633,398	$2,722,933	$2,815,513
					$844,925	**$873,652**	**$903,357**	**$934,071**	**$965,829**	**$998,667**	**$1,032,622**	**$1,067,731**	**$1,104,034**	**$1,141,571**	**$1,180,385**	**$1,220,518**	**$1,262,015**	**$1,304,924**	**$1,349,291**	**$1,395,167**	**$1,442,603**	**$1,491,651**	**$1,542,367**	**$1,594,808**	**$1,649,031**	**$1,705,098**	**$1,763,072**	**$1,823,016**	**$1,884,999**	**$1,949,089**	**$2,015,358**	**$2,083,880**	**$2,154,732**	**$2,227,993**	**$2,303,744**	**$2,382,072**	**$2,463,062**	**$2,546,806**	**$2,633,398**	**$2,722,933**	**$2,815,513**
					$590,919	$611,010	$631,784	$653,265	$675,476	$698,442	$722,189	$746,743	$772,133	$798,385	$825,530	$853,598	$882,621	$912,630	$943,659	$975,744	$1,008,919	$1,043,222	$1,078,692	$1,115,367	$1,153,290	$1,192,501	$1,233,046	$1,274,970	$1,318,319	$1,363,142	$1,409,489	$1,457,411	$1,506,963	$1,558,200	$1,611,179	$1,665,959	$1,722,602	$1,781,170	$1,841,730	$1,904,349	$1,969,096
					$590,919	**$611,010**	**$631,784**	**$653,265**	**$675,476**	**$698,442**	**$722,189**	**$746,743**	**$772,133**	**$798,385**	**$825,530**	**$853,598**	**$882,621**	**$912,630**	**$943,659**	**$975,744**	**$1,008,919**	**$1,043,222**	**$1,078,692**	**$1,115,367**	**$1,153,290**	**$1,192,501**	**$1,233,046**	**$1,274,970**	**$1,318,319**	**$1,363,142**	**$1,409,489**	**$1,457,411**	**$1,506,963**	**$1,558,200**	**$1,611,179**	**$1,665,959**	**$1,722,602**	**$1,781,170**	**$1,841,730**	**$1,904,349**	**$1,969,096**
$0	$0	$0	$0	$0	$1,435,843	$1,484,662	$1,535,141	$1,587,335	$1,641,305	$1,697,109	$1,754,811	$1,814,474	$1,876,167	$1,939,956	$2,005,915	$2,074,116	$2,144,636	$2,217,553	$2,292,950	$2,370,911	$2,451,522	$2,534,873	$2,621,059	$2,710,175	$2,802,321	$2,897,600	$2,996,118	$3,097,986	$3,203,318	$3,312,231	$3,424,846	$3,541,291	$3,661,695	$3,786,193	$3,914,923	$4,048,031	$4,185,664	$4,327,976	$4,475,128	$4,627,282	$4,784,609

4.2 Identify and Quantify Costs

Alternative: **Alternative**
Project Participant: **Project Participant**

User input

Rate: 3.40% (from water rate study)

Table 4B: Identification and Quantification of Costs

Item	Cost	Comments		Quantifiable	Expected Value	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
1	Capital costs for recycled water distribution			YES	High Estimate																																								
					Best Estimate			$5,428,389																																								
					Low Estimate																																										
					Expected Value			**$5,428,389**																																							
2	Capital costs for storage			YES	High Estimate																																								
					Best Estimate			$4,276,361																																								
					Low Estimate																																										
					Expected Value			**$4,276,361**																																							
3	Capital costs for reclamation treatment			YES	High Estimate																																									
					Best Estimate			$1,395,000																																								
					Low Estimate																																										
					Expected Value			**$1,395,000**																																							
4	Other (specify):			YES	High Estimate																																								
	Capital costs for trenchless crossing				Best Estimate			$1,361,818																																								
					Low Estimate																																										
					Expected Value			**$1,361,818**																																							
5	Other (specify):			YES	High Estimate																																								
	Capital costs for pump station				Best Estimate			$715,000																																								
					Low Estimate																																										
					Expected Value			**$715,000**																																							
6	Other (specify):			YES	High Estimate																																								
	Capital costs for site work				Best Estimate			$200,000																																								
					Low Estimate																																										
					Expected Value			**$200,000**																																							
7	Other (specify):			YES	High Estimate																																								
	Capital costs for building				Best Estimate			$300,000																																								
					Low Estimate																																										
					Expected Value			**$300,000**																																							
8	Other (specify):			YES	High Estimate																																								
	Capital costs for recycled water hydrants				Best Estimate			$20,000																																							
					Low Estimate																																										
					Expected Value			**$20,000**																																							
9	O&M costs for recycled water distribution			YES	High Estimate																																									
					Best Estimate							$169,137	$174,888	$180,834	$186,983	$193,340	$199,914	$206,711	$213,739	$221,006	$228,520	$236,290	$244,324	$252,631	$261,220	$270,102	$279,285	$288,781	$298,599	$308,752	$319,249	$330,104	$341,327	$352,933	$364,932	$377,340	$390,169	$403,435	$417,152	$431,335	$446,001	$461,165	$476,844	$493,057	$509,821	$527,155	$545,078	$563,611
					Low Estimate																																										
					Expected Value							**$169,137**	**$174,888**	**$180,834**	**$186,983**	**$193,340**	**$199,914**	**$206,711**	**$213,739**	**$221,006**	**$228,520**	**$236,290**	**$244,324**	**$252,631**	**$261,220**	**$270,102**	**$279,285**	**$288,781**	**$298,599**	**$308,752**	**$319,249**	**$330,104**	**$341,327**	**$352,933**	**$364,932**	**$377,340**	**$390,169**	**$403,435**	**$417,152**	**$431,335**	**$446,001**	**$461,165**	**$476,844**	**$493,057**	**$509,821**	**$527,155**	**$545,078**	**$563,611**
10	O&M costs for storage			YES	High Estimate																																									
					Best Estimate							$85,527	$88,435	$91,442	$94,551	$97,766	$101,090	$104,527	$108,081	$111,755	$115,555	$119,484	$123,546	$127,747	$132,090	$136,582	$141,225	$146,027	$150,992	$156,126	$161,434	$166,923	$172,598	$178,466	$184,534	$190,808	$197,296	$204,004	$210,940	$218,112	$225,528	$233,196	$241,124	$249,323	$257,800	$266,565	$275,628	$284,999
					Low Estimate																																										
					Expected Value							**$85,527**	**$88,435**	**$91,442**	**$94,551**	**$97,766**	**$101,090**	**$104,527**	**$108,081**	**$111,755**	**$115,555**	**$119,484**	**$123,546**	**$127,747**	**$132,090**	**$136,582**	**$141,225**	**$146,027**	**$150,992**	**$156,126**	**$161,434**	**$166,923**	**$172,598**	**$178,466**	**$184,534**	**$190,808**	**$197,296**	**$204,004**	**$210,940**	**$218,112**	**$225,528**	**$233,196**	**$241,124**	**$249,323**	**$257,800**	**$266,565**	**$275,628**	**$284,999**
11	O&M costs for reclamation treatment			YES	High Estimate																																									
					Best Estimate							$139,500	$144,243	$149,147	$154,218	$159,462	$164,883	$170,489	$176,286	$182,280	$188,477	$194,886	$201,512	$208,363	$215,447	$222,773	$230,347	$238,179	$246,277	$254,650	$263,308	$272,261	$281,518	$291,089	$300,986	$311,220	$321,801	$332,742	$344,056	$355,754	$367,849	$380,356	$393,288	$406,660	$420,486	$434,783	$449,566	$464,851
					Low Estimate																																										
					Expected Value							**$139,500**	**$144,243**	**$149,147**	**$154,218**	**$159,462**	**$164,883**	**$170,489**	**$176,286**	**$182,280**	**$188,477**	**$194,886**	**$201,512**	**$208,363**	**$215,447**	**$222,773**	**$230,347**	**$238,179**	**$246,277**	**$254,650**	**$263,308**	**$272,261**	**$281,518**	**$291,089**	**$300,986**	**$311,220**	**$321,801**	**$332,742**	**$344,056**	**$355,754**	**$367,849**	**$380,356**	**$393,288**	**$406,660**	**$420,486**	**$434,783**	**$449,566**	**$464,851**
12	Other (specify):			YES	High Estimate																																									
	O&M costs for pump station				Best Estimate							$35,750	$36,966	$38,222	$39,522	$40,866	$42,255	$43,692	$45,177	$46,713	$48,302	$49,944	$51,642	$53,398	$55,213	$57,090	$59,032	$61,039	$63,114	$65,260	$67,479	$69,773	$72,145	$74,598	$77,134	$79,757	$82,469	$85,273	$88,172	$91,170	$94,270	$97,475	$100,789	$104,216	$107,759	$111,423	$115,211	$119,128
					Low Estimate																																										
					Expected Value							**$35,750**	**$36,966**	**$38,222**	**$39,522**	**$40,866**	**$42,255**	**$43,692**	**$45,177**	**$46,713**	**$48,302**	**$49,944**	**$51,642**	**$53,398**	**$55,213**	**$57,090**	**$59,032**	**$61,039**	**$63,114**	**$65,260**	**$67,479**	**$69,773**	**$72,145**	**$74,598**	**$77,134**	**$79,757**	**$82,469**	**$85,273**	**$88,172**	**$91,170**	**$94,270**	**$97,475**	**$100,789**	**$104,216**	**$107,759**	**$111,423**	**$115,211**	**$119,128**
13	Other (specify):			YES	High Estimate																																									
	O&M costs for energy				Best Estimate							$27,306	$28,234	$29,194	$30,187	$31,213	$32,275	$33,372	$34,507	$35,680	$36,893	$38,147	$39,444	$40,785	$42,172	$43,606	$45,088	$46,621	$48,207	$49,846	$51,540	$53,293	$55,105	$56,978	$58,916	$60,919	$62,990	$65,132	$67,346	$69,636	$72,003	$74,452	$76,983	$79,600	$82,307	$85,105	$87,999	$90,991
					Low Estimate																																										
					Expected Value							**$27,306**	**$28,234**	**$29,194**	**$30,187**	**$31,213**	**$32,275**	**$33,372**	**$34,507**	**$35,680**	**$36,893**	**$38,147**	**$39,444**	**$40,785**	**$42,172**	**$43,606**	**$45,088**	**$46,621**	**$48,207**	**$49,846**	**$51,540**	**$53,293**	**$55,105**	**$56,978**	**$58,916**	**$60,919**	**$62,990**	**$65,132**	**$67,346**	**$69,636**	**$72,003**	**$74,452**	**$76,983**	**$79,600**	**$82,307**	**$85,105**	**$87,999**	**$90,991**
14	Other (specify):			YES	High Estimate																																									
	O&M costs for labor				Best Estimate							$90,000	$93,060	$96,224	$99,496	$102,879	$106,376	$109,993	$113,733	$117,600	$121,598	$125,733	$130,008	$134,428	$138,998	$143,724	$148,611	$153,664	$158,888	$164,290	$169,876	$175,652	$181,624	$187,799	$194,185	$200,787	$207,614	$214,673	$221,971	$229,518	$237,322	$245,391	$253,734	$262,361	$271,282	$280,505	$290,042	$299,904
					Low Estimate																																										
					Expected Value							**$90,000**	**$93,060**	**$96,224**	**$99,496**	**$102,879**	**$106,376**	**$109,993**	**$113,733**	**$117,600**	**$121,598**	**$125,733**	**$130,008**	**$134,428**	**$138,998**	**$143,724**	**$148,611**	**$153,664**	**$158,888**	**$164,290**	**$169,876**	**$175,652**	**$181,624**	**$187,799**	**$194,185**	**$200,787**	**$207,614**	**$214,673**	**$221,971**	**$229,518**	**$237,322**	**$245,391**	**$253,734**	**$262,361**	**$271,282**	**$280,505**	**$290,042**	**$299,904**
15	Other (specify):			YES	High Estimate																																									
	Contingencies				Best Estimate	$2,412,180																																									
					Low Estimate																																										
					Expected Value	**$2,412,180**																																									
16	Other (specify):			YES	High Estimate																																								
	Engineering, Construction Management, Administration, and Design				Best Estimate	$2,412,180																																								
					Low Estimate																																										
					Expected Value	**$2,412,180**																																									
17	Other (specify):			YES	High Estimate																																								
	Disinfection Process				Best Estimate			$650,297																																								
					Low Estimate																																										
					Expected Value			**$650,297**																																							
18	Other (specify):			YES	High Estimate																																								
	Diesel Energy				Best Estimate			$101,856																																								
					Low Estimate																																										
					Expected Value			**$101,856**																																							
19	Other (specify):				High Estimate																																								
	2% Loan Interest				Best Estimate																																								
					Low Estimate																																										
					Expected Value							$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026	$225,026
					Annual Total	$4,824,360	$0	$14,648,721	$0	$0	$0	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**	**$225,026**
						$772,247	$790,852	$810,090	$829,982	$850,551	$871,819	$893,810	$916,548	$940,060	$964,371	$989,509	$1,015,501	$1,042,378	$1,070,168	$1,098,902	$1,128,614	$1,159,336	$1,191,103	$1,223,949	$1,257,913	$1,293,031	$1,329,343	$1,366,890	$1,405,713	$1,445,857	$1,487,365	$1,530,284	$1,574,663	$1,620,551	$1,667,999	$1,717,060	$1,767,789	$1,820,243	$1,874,480	$1,930,562	$1,988,550	$2,048,510

4.3 Evaluate Project

Alternative: **Name Of Alternative**
Project Participant: **Project Users**

User Input

Discount Rate 6.00%

Table 4C: Project Evaluation

A	B	C	D	E	F
Year	Annual Benefits	Discounted Benefits	Annual Costs	Discounted Costs	Net Benefits (discounted)
2024	$0	$0	$4,824,360	$5,420,651	-$5,420,651
2025	$0	$0	$0	$0	$0
2026	$0	$0	$14,648,721	$14,648,721	-$14,648,721
2027	$0	$0	$0	$0	$0
2028	$0	$0	$0	$0	$0
2029	$0	$0	$0	$0	$0
2030	$1,435,843	$1,137,323	$772,247	$611,692	$525,631
2031	$1,484,662	$1,109,426	$790,852	$590,971	$518,455
2032	$1,535,141	$1,082,214	$810,090	$571,082	$511,132
2033	$1,587,335	$1,055,669	$829,982	$551,986	$503,683
2034	$1,641,305	$1,029,775	$850,551	$533,646	$496,129
2035	$1,697,109	$1,004,516	$871,819	$516,028	$488,488
2036	$1,754,811	$979,877	$893,810	$499,099	$480,779
2037	$1,814,474	$955,843	$916,548	$482,826	$473,016
2038	$1,876,167	$932,397	$940,060	$467,181	$465,216
2039	$1,939,956	$909,527	$964,371	$452,135	$457,392
2040	$2,005,915	$887,218	$989,509	$437,661	$449,557
2041	$2,074,116	$865,456	$1,015,501	$423,733	$441,723
2042	$2,144,636	$844,228	$1,042,378	$410,328	$433,900
2043	$2,217,553	$823,520	$1,070,168	$397,422	$426,098
2044	$2,292,950	$803,321	$1,098,902	$384,994	$418,327
2045	$2,370,911	$783,617	$1,128,614	$373,022	$410,595
2046	$2,451,522	$764,396	$1,159,336	$361,487	$402,910
2047	$2,534,873	$745,647	$1,191,103	$350,369	$395,277
2048	$2,621,059	$727,357	$1,223,949	$339,652	$387,705
2049	$2,710,175	$709,516	$1,257,913	$329,318	$380,198
2050	$2,802,321	$692,113	$1,293,031	$319,351	$372,762
2051	$2,897,600	$675,137	$1,329,343	$309,735	$365,402
2052	$2,996,118	$658,577	$1,366,890	$300,456	$358,121
2053	$3,097,986	$642,423	$1,405,713	$291,500	$350,923
2054	$3,203,318	$626,666	$1,445,857	$282,853	$343,812
2055	$3,312,231	$611,294	$1,487,365	$274,503	$336,791
2056	$3,424,846	$596,300	$1,530,284	$266,438	$329,862
2057	$3,541,291	$581,674	$1,574,663	$258,646	$323,028
2058	$3,661,695	$567,407	$1,620,551	$251,116	$316,290
2059	$3,786,193	$553,489	$1,667,999	$243,838	$309,651
2060	$3,914,923	$539,913	$1,717,060	$236,802	$303,111
2061	$4,048,031	$526,670	$1,767,789	$229,999	$296,671
2062	$4,185,664	$513,752	$1,820,243	$223,418	$290,334
2063	$4,327,976	$501,150	$1,874,480	$217,052	$284,098
2064	$4,475,128	$488,858	$1,930,562	$210,892	$277,965
2065	$4,627,282	$476,867	$1,988,550	$204,931	$271,936
2066	$4,784,609	$465,170	$2,048,510	$199,161	$266,010
	$103,277,726	**$27,868,303**	**$67,159,673**	**$33,474,694**	**-$5,606,391**

Supplementary Table for Project Evaluation

	Volume (AF)	Net Benefit/AF
Total RW Delivered	**37,572**	**-$149**
Total Fresh Water Alternative	**48,843**	**-$115**

4.4 Sensitivity Analysis

Alternative	**Alternative**	*User Input*
Project Participant	**Project Participant**	

Table 4D: Summary of Sensitivity Analysis

A	B	C	D
Variable 1 - Discount Rate			
Discount Rate Values	Total Monetized Benefit Discounted	Total Monetized Cost Discounted	Total Monetized Net Benefit Discounted
3.00%	$50,656,060	$43,637,552	$7,018,508
4.00%	$40,999,018	$39,321,486	$1,677,532
5.00%	$33,599,684	$36,021,340	-$2,421,657
6.00%	$27,868,303	$33,474,694	-$5,606,391
7.00%	$23,380,398	$31,492,179	-$8,111,781
8.00%	$19,828,057	$29,936,047	-$10,107,990
9.00%	$16,986,160	$28,705,292	-$11,719,132

*Note: Please see guidance for assessment of values

Discount Rate Incremental Change

1.00 %

Table 4D: Economic Assessment

ECONOMIC ASSESSMENT

RECYCLED WATER

annual cost/acre-ft	**$1,787.51**	/acre-ft
Expected Net Present Value (NPV)	**($5,606,391.33)**	
Expected Net Present Value (NPV)/acre-ft	**($114.78)**	/acre-ft

Water Recycling is not economically cost-effective

Not Cost-Effective:
Since the expected net present value of the recycling water project is negative, the project is not recommended.

Project Information	*User Input*
Name of Agency	Santa Nella County Water District
Name of person conducting analsysis	Bao Cha
Phone number	(209) 694-4766
email:	bao@blackwater-eng.com
Reuse project information	
Project name	Recycled Water Feasibility Study
Project location	Santa Nella, California
Indirect potable, or non-potable water production	Non-potable water production
Does the project operate year-round or seasonally	Seasonally
Phases of operation (with years)	40
Accounting Perspective	Statewide
Name Of Alternative	Alternative 2: Updating the existing WWTP treatment process to produce tertiary treated effluent for disposal via landscape irrigation within the public right-of-way throughout SNCWD service area but primarily along the SR-33 corridor.
Project Users	Commercial Landscape Irrigation Parkway Community Park Truck Fill Station

2. Standard Assumptions

User Input

Table 2A: Time and Interest

Description	Amount	Unit
Useful Life of Project	40	years
Installed Capacity (final project)	171	AF per year
Recycled Water Market Price	$3,692	per AF
Potable Water Replacement Factor (for RW)	20	
Project Design Year	2024	
Reference Cost Year (Ref Yr)	2020	
First Year of Project Construction	2026	APPROVED
Project First Year of Operation (Last Year of Construction)	2030	APPROVED
Project Last Year of Operation	2066	
Financing Period	40	years
Annual Interest Rate	2.00%	
Discount Rate	6.00%	

Notes:

'Project Last Year of Operation' is equal to 'Project First Year of Operation' and 'Period of Analysis'
'Project Reference Year' is set by 'Project First Year of Operation'
Maximum analysis is 100 years + 2 years for design & construction

3.1 Fresh Water Supply Alternative *User Input*

Table 3A: Annual Fresh Water Alternative Cost	Costs (2020 $)	Comments
Office R&M		
Repairs & Maintenance	$500	
Professional Services		
Engineering Fees	$20,000	
Contract Services	$500	
Operations/R&M		
Chemicals	$24,000	
Fuel	$5,000	
Vehicle Maintenance	$2,500	
Plant Supplies	$18,100	
Plant Equipment Rental	$1,000	
Repair/Maint Plants	$16,990	
R&M Manhole Pumping Wendy's	$0	
Inspection Fees	$4,482	
Utilities		
Utilities-Solid Waste	$354	
Utilities-Well Meter	$15,500	
Utilities-Plant	$36,500	
Water Purchase/Fees		
Standby Charges	$7,860	
Delivery Charges	$25,000	
Water Purchase M&I SLC WC0004	$49,000	
Water Purcase M&I DMC WC0003	$0	
Water Purchase AG DMC WC0001	$0	
Water Purchase AG SLC WC0002	$0	
Total	**$227,286**	

Notes:
Costs represented as present worth values
Without Project assumes future unmet water demand will incur a shortage cost

3.2 Baseline - Total Volume For Entire Project

Table 3B: Total Volume For Entire Project

User Input

	Total Volume (af)
Total Lifetime Recycled Water Produced	**6,849**
Total Lifetime Fresh Water Alternative Produced	**8,903**

*Note: Total lifetime fresh water alternative must be equal to or greater than the total lifetime recycled water produced in order to demonstrate that there is fresh water supply throughout the project

4.0 BENEFITS OF RECYCLED WATER PROGRAM FOR ALTERNATIVE 2

Table 1 - Projected Commercial Water Rates

Parameters	Current	From 2020 Water Rate Study ($/hcf)				Projected Water Rates ($/hcf)						
Fiscal Year	2019	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Rate ($/hcf)	1.25	1.33	1.37	1.42	1.47	1.51	1.56	1.60	1.65	1.70	1.75	1.81
Percent Increase		6%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%

Recycled water rates should be less than potable water rates

For this feasibility study, the cost of the recycled water is 20% less than potable water

Estimated Potable Water Rate in FY 2030-31 ($/hcf) 1.81

Estimated Recycled Water Rate in FY 2030-31 ($/hcf) 1.44

ADD (ac-ft/yr) 171

Estimated revenue of recycled water by FY 2030-31 ($) 107,640 (BENEFITS)

ADDITIONAL FEES FROM ALL CUSTOMERS WHO WILL BENEFIT FROM THE RECYCLED WATER PROGRAM

Table 2 - Benefits of Recycled Water Program

Parameters	Current	From 2020 Water Rate Study				Projected Water Costs						
Fiscal Year	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Water Expenses[1] ($)	312,237	321,526	329,902	338,562	347,517	359,333	371,550	384,183	397,245	410,752	424,717	439,158
Percentage Inflation Rate		3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%
Water Production[2] (acre-ft/yr)	488	488	488	488	488	488	488	488	488	488	488	488
Potable Water Cost[3] ($/acre-ft)	640	659	676	694	712	736	761	787	814	841	870	900
Recycled Water Usage[4] (acre-ft/yr)	171	171	171	171	171	171	171	171	171	171	171	171
Recycled Water Benefits ($)	109,428	112,683	115,619	118,654	121,792	125,933	130,215	134,642	139,220	143,954	148,848	153,909 (BENEFITS)

[1]Variable expenses consist of office repairs and maintenance, professional services, operations, utilities, water purchase fees, and SLWD assessments

[2]Raw surface water and groundwater production in 2018

[3]Cost of Potable Water is equal to variable water expenses ($) divided by the water production (acre-ft)

[4]Recycled Water Average Day Demand

4.1 Identify and Quantify Benefits

Alternative: Alternat | Project Participant: Project Part | *User Input* | Rate 3.40% (from water rate study)

Table 4A: Identification and Quantification of Benefits

A	B	C	D	F Expected Value													
Item	**Benefit**	**Comments**	**Quantifiable**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**
1	Avoided costs of water supply development/purchase (potable water)		YES														
			High Estimate														
			Best Estimate							$153,909	$159,142	$164,553	$170,147	$175,932	$181,914	$188,099	$194,494
			Low Estimate														
			Expected Value							**$153,909**	**$159,142**	**$164,553**	**$170,147**	**$175,932**	**$181,914**	**$188,099**	**$194,494**
2	Reclaimed water sales revenues		YES														
			High Estimate														
			Best Estimate							$107,640	$111,300	$115,084	$118,997	$123,042	$127,226	$131,552	$136,024
			Low Estimate														
			Expected Value							**$107,640**	**$111,300**	**$115,084**	**$118,997**	**$123,042**	**$127,226**	**$131,552**	**$136,024**
3	Avoided increased groundwater pumping costs with declining groundwater levels		NO														
	Reduces groundwater pumping and overdraft conditions in the groundwater basin.																
4	Increased supply reliability (customer perspective)		NO														
	Improves reliability of existing water supply system by making the system less sensitive to drought conditions.																
5	Local control over water resources (not relying on imported water)		NO														
	Increases degree of local control on water supply, by reducing water demand, a portion of which is dependent on water allocations from the CVP.																
6	Source water protection		NO														
	Reduces surface water demand; consistent with State policies for restoring and protecting fish and wildlife.																
7	Aesthetic values		NO														
	Provides aesthetic benefits for the community by supporting irrigation of areas, even during drought conditions.																
8	Other (specify):		NO														
	Reduces need for future water system improvements and expansion.																
			Annual Total	$0	$0	$0	$0	$0	$0	$261,549	$270,441	$279,636	$289,144	$298,975	$309,140	$319,651	$330,519

Item	Quantifiable	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**	**2051**
1	Best Estimate	$201,107	$207,945	$215,015	$222,326	$229,885	$237,701	$245,782	$254,139	$262,780	$271,714	$280,953	$290,505	$300,382	$310,595
1	**Expected Value**	**$201,107**	**$207,945**	**$215,015**	**$222,326**	**$229,885**	**$237,701**	**$245,782**	**$254,139**	**$262,780**	**$271,714**	**$280,953**	**$290,505**	**$300,382**	**$310,595**
2	Best Estimate	$140,649	$145,431	$150,376	$155,489	$160,775	$166,242	$171,894	$177,738	$183,781	$190,030	$196,491	$203,172	$210,079	$217,222
2	**Expected Value**	**$140,649**	**$145,431**	**$150,376**	**$155,489**	**$160,775**	**$166,242**	**$171,894**	**$177,738**	**$183,781**	**$190,030**	**$196,491**	**$203,172**	**$210,079**	**$217,222**
	Annual Total	$341,756	$353,376	$365,391	$377,814	$390,660	$403,942	$417,676	$431,877	$446,561	$461,744	$477,444	$493,677	$510,462	$527,817

Item	Quantifiable	**2052**	**2053**	**2054**	**2055**	**2056**	**2057**	**2058**	**2059**	**2060**	**2061**	**2062**	**2063**	**2064**	**2065**	**2066**
1	Best Estimate	$321,155	$332,075	$343,365	$355,040	$367,111	$379,593	$392,499	$405,844	$419,643	$433,910	$448,663	$463,918	$479,691	$496,001	$512,865
1	**Expected Value**	**$321,155**	**$332,075**	**$343,365**	**$355,040**	**$367,111**	**$379,593**	**$392,499**	**$405,844**	**$419,643**	**$433,910**	**$448,663**	**$463,918**	**$479,691**	**$496,001**	**$512,865**
2	Best Estimate	$224,608	$232,244	$240,141	$248,305	$256,748	$265,477	$274,504	$283,837	$293,487	$303,466	$313,784	$324,452	$335,484	$346,890	$358,684
2	**Expected Value**	**$224,608**	**$232,244**	**$240,141**	**$248,305**	**$256,748**	**$265,477**	**$274,504**	**$283,837**	**$293,487**	**$303,466**	**$313,784**	**$324,452**	**$335,484**	**$346,890**	**$358,684**
	Annual Total	$545,763	$564,319	$583,506	$603,345	$623,859	$645,070	$667,002	$689,681	$713,130	$737,376	$762,447	$788,370	$815,175	$842,891	$871,549

4.2 Identify and Quantify Costs

Alternative
Project Participant

Alternative
Project Participant

User Input

Rate 3.40% (from water rate study)

Table 4B: Identification and Quantification of Costs

Item	Cost	Comments	Quantifiable	F Expected Value	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
1	Capital costs for recycled water distribution		YES																																										
			Best Estimate				$2,566,749																																								
			Expected Value				**$2,566,749**																																								
2	Capital costs for storage		YES																																											
			High Estimate																																											
			Best Estimate				$1,191,990																																								
			Low Estimate																																											
			Expected Value				**$1,191,990**																																								
3	Capital costs for reclamation treatment		YES																																											
			High Estimate																																											
			Best Estimate				$795,000																																								
			Low Estimate																																											
			Expected Value				**$795,000**																																								
4	Other (specify):		YES																																											
	Capital costs for trenchless crossing		High Estimate																																											
			Best Estimate				$1,361,818																																								
			Low Estimate																																											
			Expected Value				**$1,361,818**																																								
5	Other (specify):		YES																																											
	Capital costs for pump station		High Estimate																																											
			Best Estimate				$350,000																																								
			Low Estimate																																											
			Expected Value				**$350,000**																																								
6	Other (specify):		YES																																											
	Capital costs for site work		High Estimate																																											
			Best Estimate				$200,000																																								
			Low Estimate																																											
			Expected Value				**$200,000**																																								
7	Other (specify):		YES																																											
	Capital costs for building		High Estimate																																											
			Best Estimate				$300,000																																								
			Low Estimate																																											
			Expected Value				**$300,000**																																								
8	Other (specify):		YES																																											
	Capital costs for recycled water hydrants		High Estimate																																											
			Best Estimate				$20,000																																								
			Low Estimate																																											
			Expected Value				**$20,000**																																								
9	O&M costs for recycled water distribution		YES																																											
			High Estimate																																											
			Best Estimate								$116,605	$120,569	$124,669	$128,907	$133,290	$137,822	$142,508	$147,353	$152,363	$157,544	$162,900	$168,439	$174,166	$180,087	$186,210	$192,541	$199,088	$205,857	$212,856	$220,093	$227,576	$235,314	$243,314	$251,587	$260,141	$268,986	$278,131	$287,588	$297,366	$307,476	$317,930	$328,740	$339,917	$351,474	$363,425	$375,781	$388,558
			Low Estimate																																											
			Expected Value								**$116,605**	**$120,569**	**$124,669**	**$128,907**	**$133,290**	**$137,822**	**$142,508**	**$147,353**	**$152,363**	**$157,544**	**$162,900**	**$168,439**	**$174,166**	**$180,087**	**$186,210**	**$192,541**	**$199,088**	**$205,857**	**$212,856**	**$220,093**	**$227,576**	**$235,314**	**$243,314**	**$251,587**	**$260,141**	**$268,986**	**$278,131**	**$287,588**	**$297,366**	**$307,476**	**$317,930**	**$328,740**	**$339,917**	**$351,474**	**$363,425**	**$375,781**	**$388,558**
10	O&M costs for storage		YES																																											
			High Estimate																																											
			Best Estimate								$23,840	$24,650	$25,488	$26,355	$27,251	$28,178	$29,136	$30,126	$31,151	$32,210	$33,305	$34,437	$35,608	$36,819	$38,071	$39,365	$40,703	$42,087	$43,518	$44,998	$46,528	$48,110	$49,746	$51,437	$53,186	$54,994	$56,864	$58,797	$60,796	$62,863	$65,001	$67,211	$69,496	$71,859	$74,302	$76,828	$79,440
			Low Estimate																																											
			Expected Value								**$23,840**	**$24,650**	**$25,488**	**$26,355**	**$27,251**	**$28,178**	**$29,136**	**$30,126**	**$31,151**	**$32,210**	**$33,305**	**$34,437**	**$35,608**	**$36,819**	**$38,071**	**$39,365**	**$40,703**	**$42,087**	**$43,518**	**$44,998**	**$46,528**	**$48,110**	**$49,746**	**$51,437**	**$53,186**	**$54,994**	**$56,864**	**$58,797**	**$60,796**	**$62,863**	**$65,001**	**$67,211**	**$69,496**	**$71,859**	**$74,302**	**$76,828**	**$79,440**
11	O&M costs for reclamation treatment		YES																																											
			High Estimate																																											
			Best Estimate								$79,500	$82,203	$84,998	$87,888	$90,876	$93,966	$97,161	$100,464	$103,880	$107,412	$111,064	$114,840	$118,745	$122,782	$126,956	$131,273	$135,736	$140,351	$145,123	$150,057	$155,159	$160,435	$165,890	$171,530	$177,362	$183,392	$189,627	$196,075	$202,741	$209,634	$216,762	$224,132	$231,752	$239,632	$247,780	$256,204	$264,915
			Low Estimate																																											
			Expected Value								**$79,500**	**$82,203**	**$84,998**	**$87,888**	**$90,876**	**$93,966**	**$97,161**	**$100,464**	**$103,880**	**$107,412**	**$111,064**	**$114,840**	**$118,745**	**$122,782**	**$126,956**	**$131,273**	**$135,736**	**$140,351**	**$145,123**	**$150,057**	**$155,159**	**$160,435**	**$165,890**	**$171,530**	**$177,362**	**$183,392**	**$189,627**	**$196,075**	**$202,741**	**$209,634**	**$216,762**	**$224,132**	**$231,752**	**$239,632**	**$247,780**	**$256,204**	**$264,915**
12	Other (specify):		YES																																										
	O&M costs for pump station		High Estimate																																											
			Best Estimate								$17,500	$18,095	$18,710	$19,346	$20,004	$20,684	$21,388	$22,115	$22,867	$23,644	$24,448	$25,279	$26,139	$27,027	$27,946	$28,897	$29,879	$30,895	$31,945	$33,031	$34,155	$35,316	$36,517	$37,758	$39,042	$40,369	$41,742	$43,161	$44,629	$46,146	$47,715	$49,337	$51,015	$52,749	$54,543	$56,397	$58,315
			Low Estimate																																											
			Expected Value								**$17,500**	**$18,095**	**$18,710**	**$19,346**	**$20,004**	**$20,684**	**$21,388**	**$22,115**	**$22,867**	**$23,644**	**$24,448**	**$25,279**	**$26,139**	**$27,027**	**$27,946**	**$28,897**	**$29,879**	**$30,895**	**$31,945**	**$33,031**	**$34,155**	**$35,316**	**$36,517**	**$37,758**	**$39,042**	**$40,369**	**$41,742**	**$43,161**	**$44,629**	**$46,146**	**$47,715**	**$49,337**	**$51,015**	**$52,749**	**$54,543**	**$56,397**	**$58,315**
13	Other (specify):		YES																																										
	O&M costs for energy		High Estimate																																										
			Best Estimate								$7,994	$8,266	$8,547	$8,837	$9,138	$9,449	$9,770	$10,102	$10,445	$10,801	$11,168	$11,548	$11,940	$12,346	$12,766	$13,200	$13,649	$14,113	$14,593	$15,089	$15,602	$16,132	$16,681	$17,248	$17,834	$18,441	$19,068	$19,716	$20,386	$21,079	$21,796	$22,537	$23,303	$24,096	$24,915	$25,762	$26,638
			Low Estimate																																											
			Expected Value								**$7,994**	**$8,266**	**$8,547**	**$8,837**	**$9,138**	**$9,449**	**$9,770**	**$10,102**	**$10,445**	**$10,801**	**$11,168**	**$11,548**	**$11,940**	**$12,346**	**$12,766**	**$13,200**	**$13,649**	**$14,113**	**$14,593**	**$15,089**	**$15,602**	**$16,132**	**$16,681**	**$17,248**	**$17,834**	**$18,441**	**$19,068**	**$19,716**	**$20,386**	**$21,079**	**$21,796**	**$22,537**	**$23,303**	**$24,096**	**$24,915**	**$25,762**	**$26,638**
14	Other (specify):		YES																																										
	O&M costs for labor		High Estimate																																										
			Best Estimate								$90,000	$93,060	$96,224	$99,496	$102,879	$106,376	$109,993	$113,733	$117,600	$121,598	$125,733	$130,008	$134,428	$138,998	$143,724	$148,611	$153,664	$158,888	$164,290	$169,876	$175,652	$181,624	$187,799	$194,185	$200,787	$207,614	$214,673	$221,971	$229,518	$237,322	$245,391	$253,734	$262,361	$271,282	$280,505	$290,042	$299,904
			Low Estimate																																											
			Expected Value								**$90,000**	**$93,060**	**$96,224**	**$99,496**	**$102,879**	**$106,376**	**$109,993**	**$113,733**	**$117,600**	**$121,598**	**$125,733**	**$130,008**	**$134,428**	**$138,998**	**$143,724**	**$148,611**	**$153,664**	**$158,888**	**$164,290**	**$169,876**	**$175,652**	**$181,624**	**$187,799**	**$194,185**	**$200,787**	**$207,614**	**$214,673**	**$221,971**	**$229,518**	**$237,322**	**$245,391**	**$253,734**	**$262,361**	**$271,282**	**$280,505**	**$290,042**	**$299,904**
15	Other (specify):		YES																																										
	Contingencies		High Estimate																																											
			Best Estimate	$399,154																																											
			Low Estimate																																											
			Expected Value	**$399,154**																																										
16	Other (specify):		YES																																										
	Engineering, Construction Management, Administration, and Design		High Estimate																																										
			Best Estimate	$399,154																																										
			Low Estimate																																											
			Expected Value	**$399,154**																																										
17	Other (specify):		YES																																										
	Disinfection Process		High Estimate																																										
			Best Estimate				$428,797																																								
			Low Estimate																																											
			Expected Value				**$428,797**																																								
18	Other (specify):		YES																																											
	Diesel Energy		High Estimate																																										
			Best Estimate				$87,262																																								
			Low Estimate																																											
			Expected Value				**$87,262**																																								
19	Other (specify):		YES																																											
	2% Loan Interest		High Estimate																																											
			Best Estimate								$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601	$93,601
			Low Estimate																																											
			Expected Value								**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**	**$93,601**
			Annual Total	$798,308	$0	$7,301,615	$0	$0	$0	$429,039	$440,444	$452,237	$464,430	$477,039	$490,075	$503,556	$517,494	$531,906	$546,809	$562,218	$578,151	$594,626	$611,660	$629,274	$647,487	$666,319	$685,792	$705,926	$726,745	$748,272	$770,531	$793,547	$817,345	$841,952	$867,396	$893,705	$920,909	$949,037	$978,122	$1,008,196	$1,039,292	$1,071,446	$1,104,693	$1,139,070	$1,174,616	$1,211,370

4.3 Evaluate Project

Alternative: **Name Of Alternative**
Project Participant: **Project Users**

User Input

Discount Rate 6.00%

Table 4C: Project Evaluation

A	B	C	D	E	F
Year	Annual Benefits	Discounted Benefits	Annual Costs	Discounted Costs	Net Benefits (discounted)
2024	$0	$0	$798,308	$896,978	-$896,978
2025	$0	$0	$0	$0	$0
2026	$0	$0	$7,301,615	$7,301,615	-$7,301,615
2027	$0	$0	$0	$0	$0
2028	$0	$0	$0	$0	$0
2029	$0	$0	$0	$0	$0
2030	$261,549	$207,171	$429,039	$339,839	-$132,668
2031	$270,441	$202,089	$440,444	$329,125	-$127,036
2032	$279,636	$197,133	$452,237	$318,809	-$121,677
2033	$289,144	$192,297	$464,430	$308,873	-$116,575
2034	$298,975	$187,580	$477,039	$299,300	-$111,719
2035	$309,140	$182,979	$490,075	$290,075	-$107,095
2036	$319,651	$178,491	$503,556	$281,183	-$102,692
2037	$330,519	$174,113	$517,494	$272,609	-$98,496
2038	$341,756	$169,842	$531,906	$264,341	-$94,499
2039	$353,376	$165,677	$546,809	$256,365	-$90,689
2040	$365,391	$161,613	$562,218	$248,669	-$87,057
2041	$377,814	$157,649	$578,151	$241,242	-$83,593
2042	$390,660	$153,782	$594,626	$234,072	-$80,290
2043	$403,942	$150,010	$611,660	$227,149	-$77,139
2044	$417,676	$146,330	$629,274	$220,462	-$74,132
2045	$431,877	$142,741	$647,487	$214,003	-$71,262
2046	$446,561	$139,240	$666,319	$207,762	-$68,522
2047	$461,744	$135,825	$685,792	$201,729	-$65,905
2048	$477,444	$132,493	$705,926	$195,898	-$63,405
2049	$493,677	$129,243	$726,745	$190,260	-$61,017
2050	$510,462	$126,073	$748,272	$184,807	-$58,734
2051	$527,817	$122,981	$770,531	$179,533	-$56,552
2052	$545,763	$119,964	$793,547	$174,430	-$54,465
2053	$564,319	$117,022	$817,345	$169,491	-$52,469
2054	$583,506	$114,151	$841,952	$164,711	-$50,560
2055	$603,345	$111,351	$867,396	$160,084	-$48,732
2056	$623,859	$108,620	$893,705	$155,603	-$46,983
2057	$645,070	$105,956	$920,909	$151,264	-$45,308
2058	$667,002	$103,357	$949,037	$147,060	-$43,703
2059	$689,681	$100,822	$978,122	$142,988	-$42,166
2060	$713,130	$98,349	$1,008,196	$139,042	-$40,693
2061	$737,376	$95,936	$1,039,292	$135,217	-$39,281
2062	$762,447	$93,583	$1,071,446	$131,510	-$37,927
2063	$788,370	$91,288	$1,104,693	$127,916	-$36,628
2064	$815,175	$89,049	$1,139,070	$124,431	-$35,382
2065	$842,891	$86,865	$1,174,616	$121,051	-$34,186
2066	$871,549	$84,734	$1,211,370	$117,772	-$33,038
	$18,812,735	**$5,076,400**	**$35,690,651**	**$15,867,270**	**-$10,790,870**

Supplementary Table for Project Evaluation

	Volume (AF)	Net Benefit/AF
Total RW Delivered	**6,849**	**-$1,576**
Total Fresh Water Alternative	**8,903**	**-$1,212**

4.4 Sensitivity Analysis

Alternative	**Alternative**	*User Input*
Project Participant	**Project Participant**	

Table 4D: Summary of Sensitivity Analysis

A	B	C	D
Variable 1 - Discount Rate			
Discount Rate Values	Total Monetized Benefit Discounted	Total Monetized Cost Discounted	Total Monetized Net Benefit Discounted
3.00%	$9,227,343	$21,881,489	-$12,654,146
4.00%	$7,468,248	$19,336,027	-$11,867,779
5.00%	$6,120,409	$17,382,434	-$11,262,025
6.00%	$5,076,400	$15,867,270	-$10,790,870
7.00%	$4,258,897	$14,679,891	-$10,420,994
8.00%	$3,611,815	$13,739,880	-$10,128,065
9.00%	$3,094,144	$12,988,317	-$9,894,173

*Note: Please see guidance for assessment of values

Discount Rate Incremental Change

1.00 %

Table 4D: Economic Assessment

ECONOMIC ASSESSMENT

RECYCLED WATER		
annual cost/acre-ft	$5,211.21	/acre-ft
Expected Net Present Value (NPV)	($10,790,870.19)	
Expected Net Present Value (NPV)/acre-ft	($1,211.98)	/acre-ft

Water Recycling is not economically cost-effective

Not Cost-Effective:
Since the expected net present value of the recycling water project is negative, the project is not recommended.

Project Information	*User Input*
Name of Agency	Santa Nella County Water District
Name of person conducting analsysis	Bao Cha
Phone number	(209) 694-4766
email:	bao@blackwater-eng.com
Reuse project information	
Project name	Recycled Water Feasibility Study
Project location	Santa Nella, California
Indirect potable, or non-potable water production	Non-potable water production
Does the project operate year-round or seasonally	Seasonally
Phases of operation (with years)	40
Accounting Perspective	Statewide
Name Of Alternative	Alternative 3: Upgrade of the existing WWTP treatment process to produce tertiary treated effluent for disposal via landscape irrigation within the public right-of-way and at the Forebay Golf Course, via a purple pipe recycled water system.
Project Users	Commercial Landscape Irrigation Parkway Community Park Truck Fill Station Golf Course

2. Standard Assumptions

User Input

Table 2A: Time and Interest

Description	Amount	Unit
Useful Life of Project	40	years
Installed Capacity (final project)	647	AF per year
Recycled Water Market Price	$1,434	per AF
Potable Water Replacement Factor (for RW)	29	
Project Design Year	2024	
Reference Cost Year (Ref Yr)	2020	
First Year of Project Construction	2026	APPROVED
Project First Year of Operation (Last Year of Construction)	2030	APPROVED
Project Last Year of Operation	2066	
Financing Period	40	years
Annual Interest Rate	2.00%	
Discount Rate	6.00%	

Notes:

'Project Last Year of Operation' is equal to 'Project First Year of Operation' and 'Period of Analysis'
'Project Reference Year' is set by 'Project First Year of Operation'
Maximum analysis is 100 years + 2 years for design & construction

3.1 Fresh Water Supply Alternative *User Input*

Table 3A: Annual Fresh Water Alternative Cost	Costs (2020 $)	Comments
Office R&M		
Repairs & Maintenance	$500	
Professional Services		
Engineering Fees	$20,000	
Contract Services	$500	
Operations/R&M		
Chemicals	$24,000	
Fuel	$5,000	
Vehicle Maintenance	$2,500	
Plant Supplies	$18,100	
Plant Equipment Rental	$1,000	
Repair/Maint Plants	$16,990	
R&M Manhole Pumping Wendy's	$0	
Inspection Fees	$4,482	
Utilities		
Utilities-Solid Waste	$354	
Utilities-Well Meter	$15,500	
Utilities-Plant	$36,500	
Water Purchase/Fees		
Standby Charges	$7,860	
Delivery Charges	$25,000	
Water Purchase M&I SLC WC0004	$49,000	
Water Purcase M&I DMC WC0003	$0	
Water Purchase AG DMC WC0001	$0	
Water Purchase AG SLC WC0002	$0	
Total	**$227,286**	

Notes:
Costs represented as present worth values
Without Project assumes future unmet water demand will incur a shortage cost

3.2 Baseline - Total Volume For Entire Project

Table 3B: Total Volume For Entire Project

User Input

	Total Volume (af)
Total Lifetime Recycled Water Produced	**25,883**
Total Lifetime Fresh Water Alternative Produced	**33,648**

*Note: Total lifetime fresh water alternative must be equal to or greater than the total lifetime recycled water produced in order to demonstrate that there is fresh water supply throughout the project

4.0 BENEFITS OF RECYCLED WATER PROGRAM FOR ALTERNATIVE 3

Table 1 - Projected Commercial Water Rates

Parameters	Current	From 2020 Water Rate Study ($/hcf)				Projected Water Rates ($/hcf)						
Fiscal Year	2019	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Rate ($/hcf)	1.25	1.33	1.37	1.42	1.47	1.51	1.56	1.60	1.65	1.70	1.75	1.81
Percent Increase		6%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%

Recycled water rates should be less than potable water rates

For this feasibility study, the cost of the recycled water is 20% less than potable water

Estimated Potable Water Rate in FY 2030-31 ($/hcf) 1.81

Estimated Recycled Water Rate in FY 2030-31 ($/hcf) 1.44

ADD (ac-ft/yr) 647

Estimated revenue of recycled water by FY 2030-31 ($) 407,052 (BENEFITS)

ADDITIONAL FEES FROM ALL CUSTOMERS WHO WILL BENEFIT FROM THE RECYCLED WATER PROGRAM

Table 2 - Benefits of Recycled Water Program

Parameters	Current	From 2020 Water Rate Study				Projected Water Costs						
Fiscal Year	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Water Expenses[1] ($)	312,237	321,526	329,902	338,562	347,517	359,333	371,550	384,183	397,245	410,752	424,717	439,158
Percentage Inflation Rate		3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%
Water Production[2] (acre-ft/yr)	488	488	488	488	488	488	488	488	488	488	488	488
Potable Water Cost[3] ($/acre-ft)	640	659	676	694	712	736	761	787	814	841	870	900
Recycled Water Usage[4] (acre-ft/yr)	647	647	647	647	647	647	647	647	647	647	647	647
Recycled Water Benefits ($)	413,813	426,124	437,224	448,703	460,571	476,230	492,422	509,164	526,476	544,376	562,885	582,023 (BENEFITS)

[1]Variable expenses consist of office repairs and maintenance, professional services, operations, utilities, water purchase fees, and SLWD assessments

[2]Raw surface water and groundwater production in 2018

[3]Cost of Potable Water is equal to variable water expenses ($) divided by the water production (acre-ft)

[4]Recycled Water Average Day Demand

4.1 Identify and Quantify Benefits

Alternative: **Alternat**
Project Participant: **Project Part**

User input

Rate: 3.40% (from water rate study)

Table 4A: Identification and Quantification of Benefits

Item	Benefit	Comments	Quantifiable	F Expected Value	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
1	Avoided costs of water supply development/purchase (potable water)		YES																																										
			High Estimate																																											
			Best Estimate								$582,023	$601,812	$622,273	$643,431	$665,307	$687,928	$711,317	$735,502	$760,509	$786,367	$813,103	$840,749	$869,334	$898,891	$929,454	$961,055	$993,731	$1,027,518	$1,062,453	$1,098,577	$1,135,928	$1,174,550	$1,214,485	$1,255,777	$1,298,474	$1,342,622	$1,388,271	$1,435,472	$1,484,278	$1,534,744	$1,586,925	$1,640,880	$1,696,670	$1,754,357	$1,814,005	$1,875,681	$1,939,455
			Low Estimate																																										
			Expected Value								**$582,023**	**$601,812**	**$622,273**	**$643,431**	**$665,307**	**$687,928**	**$711,317**	**$735,502**	**$760,509**	**$786,367**	**$813,103**	**$840,749**	**$869,334**	**$898,891**	**$929,454**	**$961,055**	**$993,731**	**$1,027,518**	**$1,062,453**	**$1,098,577**	**$1,135,928**	**$1,174,550**	**$1,214,485**	**$1,255,777**	**$1,298,474**	**$1,342,622**	**$1,388,271**	**$1,435,472**	**$1,484,278**	**$1,534,744**	**$1,586,925**	**$1,640,880**	**$1,696,670**	**$1,754,357**	**$1,814,005**	**$1,875,681**	**$1,939,455**
2	Reclaimed water sales revenues		YES																																										
			High Estimate																																											
			Best Estimate								$407,052	$420,892	$435,202	$449,999	$465,299	$481,119	$497,477	$514,391	$531,880	$549,964	$568,663	$587,998	$607,990	$628,661	$650,036	$672,137	$694,990	$718,619	$743,052	$768,316	$794,439	$821,450	$849,379	$878,258	$908,119	$938,995	$970,921	$1,003,932	$1,038,065	$1,073,360	$1,109,854	$1,147,589	$1,186,607	$1,226,952	$1,268,668	$1,311,803	$1,356,404
			Low Estimate																																										
			Expected Value								**$407,052**	**$420,892**	**$435,202**	**$449,999**	**$465,299**	**$481,119**	**$497,477**	**$514,391**	**$531,880**	**$549,964**	**$568,663**	**$587,998**	**$607,990**	**$628,661**	**$650,036**	**$672,137**	**$694,990**	**$718,619**	**$743,052**	**$768,316**	**$794,439**	**$821,450**	**$849,379**	**$878,258**	**$908,119**	**$938,995**	**$970,921**	**$1,003,932**	**$1,038,065**	**$1,073,360**	**$1,109,854**	**$1,147,589**	**$1,186,607**	**$1,226,952**	**$1,268,668**	**$1,311,803**	**$1,356,404**
3	Avoided increased groundwater pumping costs with declining groundwater levels Reduces groundwater pumping and overdraft conditions in the groundwater basin.		NO																																										
4	Increased supply reliability (customer perspective) Improves reliability of existing water supply system by making the system less sensitive to drought conditions.		NO																																										
5	Local control over water resources (not relying on imported water) Increases degree of local control on water supply, by reducing water demand, a portion of which is dependent on water allocations from the CVP.		NO																																										
6	Source water protection Reduces surface water demand; consistent with State policies for restoring and protecting fish and wildlife.		NO																																										
7	Aesthetic values Provides aesthetic benefits for the community by supporting irrigation of areas, even during drought conditions.		NO																																										
8	Other (specify): Reduces need for future water system improvements and expansion.		NO																																										
			Annual Total		$0	$0	$0	$0	$0	$0	$989,075	$1,022,703	$1,057,475	$1,093,430	$1,130,606	$1,169,047	$1,208,794	$1,249,893	$1,292,390	$1,336,331	$1,381,766	$1,428,746	$1,477,324	$1,527,553	$1,579,489	$1,633,192	$1,688,721	$1,746,137	$1,805,506	$1,866,893	$1,930,367	$1,996,000	$2,063,864	$2,134,035	$2,206,592	$2,281,616	$2,359,191	$2,439,404	$2,522,344	$2,608,103	$2,696,779	$2,788,469	$2,883,277	$2,981,309	$3,082,673	$3,187,484	$3,295,859

4.2 Identify and Quantify Costs

Alternative / Project Participant: **Alternative / Project Participant**

User input

Rate: 3.40% (from water rate study)

Table 4B: Identification and Quantification of Costs

Item	Cost	Comments		Quantifiable	Expected Value	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
1	Capital costs for recycled water distribution			YES	High Estimate																																								
					Best Estimate			$3,167,357																																								
					Low Estimate																																										
					Exected Value			**$3,167,357**																																							
2	Capital costs for storage			YES	High Estimate																																								
					Best Estimate			$3,524,792																																								
					Low Estimate																																										
					Exected Value			**$3,524,792**																																							
3	Capital costs for reclamation treatment			YES	High Estimate																																									
					Best Estimate			$1,050,000																																								
					Low Estimate																																										
					Exected Value			**$1,050,000**																																							
4	Other (specify):			YES	High Estimate																																								
	Capital costs for trenchless crossing				Best Estimate			$1,361,818																																								
					Low Estimate																																										
					Exected Value			**$1,361,818**																																							
5	Other (specify):			YES	High Estimate																																								
	Capital costs for pump station				Best Estimate			$525,000																																								
					Low Estimate																																										
					Exected Value			**$525,000**																																							
6	Other (specify):			YES	High Estimate																																								
	Capital costs for site work				Best Estimate			$200,000																																								
					Low Estimate																																										
					Exected Value			**$200,000**																																							
7	Other (specify):			YES	High Estimate																																								
	Capital costs for building				Best Estimate			$300,000																																								
					Low Estimate																																										
					Exected Value			**$300,000**																																							
8	Other (specify):			YES	High Estimate																																								
	Capital costs for recycled water hydrants				Best Estimate			$20,000																																							
					Low Estimate																																										
					Exected Value			**$20,000**																																							
9	O&M costs for recycled water distribution			YES	High Estimate																																									
					Best Estimate						$118,652	$122,686	$126,857	$131,170	$135,630	$140,242	$145,010	$149,940	$155,038	$160,310	$165,760	$171,396	$177,223	$183,249	$189,479	$195,922	$202,583	$209,471	$216,593	$223,957	$231,572	$239,445	$247,586	$256,004	$264,708	$273,708	$283,014	$292,637	$302,586	$312,874	$323,512	$334,512	$345,885	$357,645	$369,805	$382,378	$395,379
					Low Estimate																																										
					Exected Value						**$118,652**	**$122,686**	**$126,857**	**$131,170**	**$135,630**	**$140,242**	**$145,010**	**$149,940**	**$155,038**	**$160,310**	**$165,760**	**$171,396**	**$177,223**	**$183,249**	**$189,479**	**$195,922**	**$202,583**	**$209,471**	**$216,593**	**$223,957**	**$231,572**	**$239,445**	**$247,586**	**$256,004**	**$264,708**	**$273,708**	**$283,014**	**$292,637**	**$302,586**	**$312,874**	**$323,512**	**$334,512**	**$345,885**	**$357,645**	**$369,805**	**$382,378**	**$395,379**
10	O&M costs for storage			YES	High Estimate																																									
					Best Estimate						$70,496	$72,893	$75,371	$77,934	$80,583	$83,323	$86,156	$89,086	$92,114	$95,246	$98,485	$101,833	$105,296	$108,876	$112,577	$116,405	$120,363	$124,455	$128,687	$133,062	$137,586	$142,264	$147,101	$152,102	$157,274	$162,621	$168,150	$173,867	$179,779	$185,891	$192,212	$198,747	$205,504	$212,491	$219,716	$227,186	$234,911
					Low Estimate																																										
					Exected Value						**$70,496**	**$72,893**	**$75,371**	**$77,934**	**$80,583**	**$83,323**	**$86,156**	**$89,086**	**$92,114**	**$95,246**	**$98,485**	**$101,833**	**$105,296**	**$108,876**	**$112,577**	**$116,405**	**$120,363**	**$124,455**	**$128,687**	**$133,062**	**$137,586**	**$142,264**	**$147,101**	**$152,102**	**$157,274**	**$162,621**	**$168,150**	**$173,867**	**$179,779**	**$185,891**	**$192,212**	**$198,747**	**$205,504**	**$212,491**	**$219,716**	**$227,186**	**$234,911**
11	O&M costs for reclamation treatment			YES	High Estimate																																									
					Best Estimate						$105,000	$108,570	$112,261	$116,078	$120,025	$124,106	$128,325	$132,688	$137,200	$141,865	$146,688	$151,675	$156,832	$162,165	$167,678	$173,379	$179,274	$185,370	$191,672	$198,189	$204,927	$211,895	$219,099	$226,549	$234,251	$242,216	$250,451	$258,967	$267,772	$276,876	$286,290	$296,023	$306,088	$316,495	$327,256	$338,383	$349,888
					Low Estimate																																										
					Exected Value						**$105,000**	**$108,570**	**$112,261**	**$116,078**	**$120,025**	**$124,106**	**$128,325**	**$132,688**	**$137,200**	**$141,865**	**$146,688**	**$151,675**	**$156,832**	**$162,165**	**$167,678**	**$173,379**	**$179,274**	**$185,370**	**$191,672**	**$198,189**	**$204,927**	**$211,895**	**$219,099**	**$226,549**	**$234,251**	**$242,216**	**$250,451**	**$258,967**	**$267,772**	**$276,876**	**$286,290**	**$296,023**	**$306,088**	**$316,495**	**$327,256**	**$338,383**	**$349,888**
12	Other (specify):			YES	High Estimate																																									
	O&M costs for pump station				Best Estimate						$26,250	$27,143	$28,065	$29,020	$30,006	$31,026	$32,081	$33,172	$34,300	$35,466	$36,672	$37,919	$39,208	$40,541	$41,920	$43,345	$44,819	$46,342	$47,918	$49,547	$51,232	$52,974	$54,775	$56,637	$58,563	$60,554	$62,613	$64,742	$66,943	$69,219	$71,572	$74,006	$76,522	$79,124	$81,814	$84,596	$87,472
					Low Estimate																																										
					Exected Value						**$26,250**	**$27,143**	**$28,065**	**$29,020**	**$30,006**	**$31,026**	**$32,081**	**$33,172**	**$34,300**	**$35,466**	**$36,672**	**$37,919**	**$39,208**	**$40,541**	**$41,920**	**$43,345**	**$44,819**	**$46,342**	**$47,918**	**$49,547**	**$51,232**	**$52,974**	**$54,775**	**$56,637**	**$58,563**	**$60,554**	**$62,613**	**$64,742**	**$66,943**	**$69,219**	**$71,572**	**$74,006**	**$76,522**	**$79,124**	**$81,814**	**$84,596**	**$87,472**
13	Other (specify):			YES	High Estimate																																									
	O&M costs for energy				Best Estimate						$19,643	$20,311	$21,001	$21,715	$22,453	$23,217	$24,006	$24,822	$25,666	$26,539	$27,441	$28,374	$29,339	$30,337	$31,368	$32,435	$33,537	$34,678	$35,857	$37,076	$38,336	$39,640	$40,988	$42,381	$43,822	$45,312	$46,853	$48,446	$50,093	$51,796	$53,557	$55,378	$57,261	$59,208	$61,221	$63,302	$65,455
					Low Estimate																																										
					Exected Value						**$19,643**	**$20,311**	**$21,001**	**$21,715**	**$22,453**	**$23,217**	**$24,006**	**$24,822**	**$25,666**	**$26,539**	**$27,441**	**$28,374**	**$29,339**	**$30,337**	**$31,368**	**$32,435**	**$33,537**	**$34,678**	**$35,857**	**$37,076**	**$38,336**	**$39,640**	**$40,988**	**$42,381**	**$43,822**	**$45,312**	**$46,853**	**$48,446**	**$50,093**	**$51,796**	**$53,557**	**$55,378**	**$57,261**	**$59,208**	**$61,221**	**$63,302**	**$65,455**
14	Other (specify):			YES	High Estimate																																									
	O&M costs for labor				Best Estimate						$90,000	$93,060	$96,224	$99,496	$102,879	$106,376	$109,993	$113,733	$117,600	$121,598	$125,733	$130,008	$134,428	$138,998	$143,724	$148,611	$153,664	$158,888	$164,290	$169,876	$175,652	$181,624	$187,799	$194,185	$200,787	$207,614	$214,673	$221,971	$229,518	$237,322	$245,391	$253,734	$262,361	$271,282	$280,505	$290,042	$299,904
					Low Estimate																																										
					Exected Value						**$90,000**	**$93,060**	**$96,224**	**$99,496**	**$102,879**	**$106,376**	**$109,993**	**$113,733**	**$117,600**	**$121,598**	**$125,733**	**$130,008**	**$134,428**	**$138,998**	**$143,724**	**$148,611**	**$153,664**	**$158,888**	**$164,290**	**$169,876**	**$175,652**	**$181,624**	**$187,799**	**$194,185**	**$200,787**	**$207,614**	**$214,673**	**$221,971**	**$229,518**	**$237,322**	**$245,391**	**$253,734**	**$262,361**	**$271,282**	**$280,505**	**$290,042**	**$299,904**
15	Other (specify):			YES	High Estimate																																									
	Contingencies				Best Estimate	$1,317,335																																									
					Low Estimate																																										
					Exected Value	**$1,317,335**																																									
16	Other (specify):			YES	High Estimate																																								
	Engineering, Construction Management, Administration, and Design				Best Estimate	$1,317,335																																								
					Low Estimate																																										
					Exected Value	**$1,317,335**																																									
17	Other (specify):			YES	High Estimate																																								
	Disinfection Process				Best Estimate			$732,677																																								
					Low Estimate																																										
					Exected Value			**$732,677**																																							
18	Other (specify):			YES	High Estimate																																								
	Diesel Energy				Best Estimate			$92,698																																								
					Low Estimate																																										
					Exected Value			**$92,698**																																							
19	Other (specify):			YES	High Estimate																																								
	2% Loan Interest				Best Estimate																																								
					Low Estimate																																										
					Exected Value						$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262	$157,262
					Annual Total	$2,634,671	$0	$10,974,342	$0	$0	$0	**$587,303**	**$601,924**	**$617,043**	**$632,675**	**$648,839**	**$665,553**	**$682,835**	**$700,704**	**$719,181**	**$738,286**	**$758,041**	**$778,468**	**$799,589**	**$821,428**	**$844,009**	**$867,359**	**$891,502**	**$916,466**	**$942,279**	**$968,970**	**$996,568**	**$1,025,104**	**$1,054,611**	**$1,085,121**	**$1,116,668**	**$1,149,287**	**$1,183,016**	**$1,217,892**	**$1,253,953**	**$1,291,241**	**$1,329,796**	**$1,369,662**	**$1,410,884**	**$1,453,507**	**$1,497,579**	**$1,543,150**	**$1,590,270**

4.3 Evaluate Project

Alternative: **Name Of Alternative**
Project Participant: **Project Users**

User Input

Discount Rate 6.00%

Table 4C: Project Evaluation

A	B	C	D	E	F
Year	Annual Benefits	Discounted Benefits	Annual Costs	Discounted Costs	Net Benefits (discounted)
2024	$0	$0	$2,634,671	$2,960,316	-$2,960,316
2025	$0	$0	$0	$0	$0
2026	$0	$0	$10,974,342	$10,974,342	-$10,974,342
2027	$0	$0	$0	$0	$0
2028	$0	$0	$0	$0	$0
2029	$0	$0	$0	$0	$0
2030	$989,075	$783,440	$587,303	$465,199	$318,241
2031	$1,022,703	$764,223	$601,924	$449,793	$314,431
2032	$1,057,475	$745,478	$617,043	$434,991	$310,488
2033	$1,093,430	$727,193	$632,675	$420,765	$306,428
2034	$1,130,606	$709,356	$648,839	$407,090	$302,267
2035	$1,169,047	$691,957	$665,553	$393,940	$298,017
2036	$1,208,794	$674,984	$682,835	$381,291	$293,693
2037	$1,249,893	$658,428	$700,704	$369,122	$289,306
2038	$1,292,390	$642,278	$719,181	$357,411	$284,867
2039	$1,336,331	$626,524	$738,286	$346,137	$280,387
2040	$1,381,766	$611,157	$758,041	$335,282	$275,874
2041	$1,428,746	$596,166	$778,468	$324,827	$271,339
2042	$1,477,324	$581,543	$799,589	$314,755	$266,788
2043	$1,527,553	$567,279	$821,428	$305,049	$262,230
2044	$1,579,489	$553,364	$844,009	$295,693	$257,671
2045	$1,633,192	$539,791	$867,359	$286,673	$253,118
2046	$1,688,721	$526,551	$891,502	$277,975	$248,577
2047	$1,746,137	$513,636	$916,466	$269,583	$244,052
2048	$1,805,506	$501,037	$942,279	$261,487	$239,550
2049	$1,866,893	$488,747	$968,970	$253,674	$235,074
2050	$1,930,367	$476,759	$996,568	$246,131	$230,628
2051	$1,996,000	$465,065	$1,025,104	$238,848	$226,217
2052	$2,063,864	$453,658	$1,054,611	$231,814	$221,844
2053	$2,134,035	$442,530	$1,085,121	$225,019	$217,511
2054	$2,206,592	$431,676	$1,116,668	$218,454	$213,222
2055	$2,281,616	$421,088	$1,149,287	$212,109	$208,979
2056	$2,359,191	$410,759	$1,183,016	$205,975	$204,784
2057	$2,439,404	$400,684	$1,217,892	$200,045	$200,639
2058	$2,522,344	$390,856	$1,253,953	$194,309	$196,546
2059	$2,608,103	$381,269	$1,291,241	$188,762	$192,507
2060	$2,696,779	$371,917	$1,329,796	$183,394	$188,523
2061	$2,788,469	$362,794	$1,369,662	$178,200	$184,594
2062	$2,883,277	$353,896	$1,410,884	$173,173	$180,723
2063	$2,981,309	$345,215	$1,453,507	$168,306	$176,909
2064	$3,082,673	$336,748	$1,497,579	$163,594	$173,154
2065	$3,187,484	$328,488	$1,543,150	$159,030	$169,458
2066	$3,295,859	$320,431	$1,590,270	$154,610	$165,821
	$71,142,438	**$19,196,966**	**$50,359,774**	**$24,227,168**	**-$5,030,201**

Supplementary Table for Project Evaluation

	Volume (AF)	Net Benefit/AF
Total RW Delivered	**25,883**	**-$194**
Total Fresh Water Alternative	**33,648**	**-$149**

4.4 Sensitivity Analysis

Alternative	**Alternative**	*User Input*
Project Participant	**Project Participant**	

Table 4D: Summary of Sensitivity Analysis

A	B	C	D
Variable 1 - Discount Rate			
Discount Rate Values	Total Monetized Benefit Discounted	Total Monetized Cost Discounted	Total Monetized Net Benefit Discounted
3.00%	$34,894,219	$32,131,387	$2,762,832
4.00%	$28,242,005	$28,779,597	-$537,592
5.00%	$23,145,004	$26,212,507	-$3,067,503
6.00%	$19,196,966	$24,227,168	-$5,030,201
7.00%	$16,105,491	$22,677,160	-$6,571,669
8.00%	$13,658,476	$21,456,009	-$7,797,533
9.00%	$11,700,847	$20,485,661	-$8,784,814

*Note: Please see guidance for assessment of values

Discount Rate Incremental Change

1.00 %

Table 4D: Economic Assessment

ECONOMIC ASSESSMENT

RECYCLED WATER

annual cost/acre-ft	**$1,945.68**	/acre-ft
Expected Net Present Value (NPV)	**($5,030,201.46)**	
Expected Net Present Value (NPV)/acre-ft	**($149.50)**	/acre-ft

Water Recycling is not economically cost-effective

Not Cost-Effective:
Since the expected net present value of the recycling water project is negative, the project is not recommended.

Project Information	*User Input*
Name of Agency	Santa Nella County Water District
Name of person conducting analsysis	Bao Cha
Phone number	(209) 694-4766
email:	bao@blackwater-eng.com
Reuse project information	
Project name	Recycled Water Feasibility Study
Project location	Santa Nella, California
Indirect potable, or non-potable water production	Non-potable water production
Does the project operate year-round or seasonally	Seasonally
Phases of operation (with years)	40
Accounting Perspective	Statewide
Name Of Alternative	Alternative 4: Upgrade of the existing WWTP treatment process to produce tertiary treated effluent for disposal via landscape irrigation within the public right-of-way, at the Forebay Golf Course, and at future developments, via a purple pipe recycled water system.
Project Users	Commercial Landscape Irrigation Parkway Community Park Truck Fill Station Golf Course Future Development

2. Standard Assumptions

User Input

Table 2A: Time and Interest

Description	Amount	Unit
Useful Life of Project	40	years
Installed Capacity (final project)	939	AF per year
Recycled Water Market Price	$1,313	per AF
Potable Water Replacement Factor (for RW)	24.3	
Project Design Year	2024	
Reference Cost Year (Ref Yr)	2020	
First Year of Project Construction	2026	APPROVED
Project First Year of Operation (Last Year of Construction)	2030	APPROVED
Project Last Year of Operation	2066	
Financing Period	40	years
Annual Interest Rate	2.00%	
Discount Rate	6.00%	

Notes:

'Project Last Year of Operation' is equal to 'Project First Year of Operation' and 'Period of Analysis'
'Project Reference Year' is set by 'Project First Year of Operation'
Maximum analysis is 100 years + 2 years for design & construction

3.1 Fresh Water Supply Alternative *User Input*

Table 3A: Annual Fresh Water Alternative Cost	Costs (2020 $)	Comments
Office R&M		
Repairs & Maintenance	$500	
Professional Services		
Engineering Fees	$20,000	
Contract Services	$500	
Operations/R&M		
Chemicals	$24,000	
Fuel	$5,000	
Vehicle Maintenance	$2,500	
Plant Supplies	$18,100	
Plant Equipment Rental	$1,000	
Repair/Maint Plants	$16,990	
R&M Manhole Pumping Wendy's	$0	
Inspection Fees	$4,482	
Utilities		
Utilities-Solid Waste	$354	
Utilities-Well Meter	$15,500	
Utilities-Plant	$36,500	
Water Purchase/Fees		
Standby Charges	$7,860	
Delivery Charges	$25,000	
Water Purchase M&I SLC WC0004	$49,000	
Water Purcase M&I DMC WC0003	$0	
Water Purchase AG DMC WC0001	$0	
Water Purchase AG SLC WC0002	$0	
Total	**$227,286**	

Notes:
Costs represented as present worth values
Without Project assumes future unmet water demand will incur a shortage cost

3.2 Baseline - Total Volume For Entire Project

Table 3B: Total Volume For Entire Project

User Input

	Total Volume (af)
Total Lifetime Recycled Water Produced	**37,572**
Total Lifetime Fresh Water Alternative Produced	**48,843**

*Note: Total lifetime fresh water alternative must be equal to or greater than the total lifetime recycled water produced in order to demonstrate that there is fresh water supply throughout the project

4.0 BENEFITS OF RECYCLED WATER PROGRAM FOR ALTERNATIVE 4

Table 1 - Projected Commercial Water Rates

Parameters	Current	From 2020 Water Rate Study ($/hcf)				Projected Water Rates ($/hcf)						
Fiscal Year	2019	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Rate ($/hcf)	1.25	1.33	1.37	1.42	1.47	1.51	1.56	1.60	1.65	1.70	1.75	1.81
Percent Increase		6%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%

Recycled water rates should be less than potable water rates

For this feasibility study, the cost of the recycled water is 20% less than potable water

Estimated Potable Water Rate in FY 2030-31 ($/hcf) 1.81

Estimated Recycled Water Rate in FY 2030-31 ($/hcf) 1.44

ADD (ac-ft/yr) 939

Estimated revenue of recycled water by FY 2030-31 ($) 590,919 (BENEFITS)

ADDITIONAL FEES FROM ALL CUSTOMERS WHO WILL BENEFIT FROM THE RECYCLED WATER PROGRAM

Table 2 - Benefits of Recycled Water Program

Parameters	Current	From 2020 Water Rate Study				Projected Water Costs						
Fiscal Year	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Water Expenses[1] ($)	312,237	321,526	329,902	338,562	347,517	359,333	371,550	384,183	397,245	410,752	424,717	439,158
Percentage Inflation Rate		3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%
Water Production[2] (acre-ft/yr)	488	488	488	488	488	488	488	488	488	488	488	488
Potable Water Cost[3] ($/acre-ft)	640	659	676	694	712	736	761	787	814	841	870	900
Recycled Water Usage[4] (acre-ft/yr)	939	939	939	939	939	939	939	939	939	939	939	939
Recycled Water Benefits ($)	600,734	618,605	634,720	651,383	668,612	691,345	714,851	739,156	764,287	790,273	817,142	844,925 (BENEFITS)

[1]Variable expenses consist of office repairs and maintenance, professional services, operations, utilities, water purchase fees, and SLWD assessments

[2]Raw surface water and groundwater production in 2018

[3]Cost of Potable Water is equal to variable water expenses ($) divided by the water production (acre-ft)

[4]Recycled Water Average Day Demand

4.1 Identify and Quantify Benefits

Alternative: **Alternat**
Project Participant: **Project Par**

User input

Rate: 3.40% (from water rate study)

Table 4A: Identification and Quantification of Benefits

A	B	C	D	F
				Expected Value
Item	**Benefit**	**Comments**	**Quantifiable**	**2024**
1	Avoided costs of water supply development/purchase (potable water)		YES	
			High Estimate	
			Best Estimate	
			Low Estimate	
			Expected Value	**$844,925**
2	Reclaimed water sales revenues		YES	
			High Estimate	
			Best Estimate	$590,919
			Low Estimate	
			Expected Value	**$590,919**
3	Avoided increased groundwater pumping costs with declining groundwater levels Reduces groundwater pumping and overdraft conditions in the groundwater basin.		NO	
4	Increased supply reliability (customer perspective) Improves reliability of existing water supply system by making the system less sensitive to drought conditions.		NO	
5	Local control over water resources (not relying on imported water) Increases degree of local control on water supply, by reducing water demand, a portion of which is dependent on water allocations from the CVP.		NO	
6	Source water protection Reduces surface water demand; consistent with State policies for restoring and protecting fish and wildlife.		NO	
7	Aesthetic values Provides aesthetic benefits for the community by supporting irrigation of areas, even during drought conditions.		NO	
8	Other (specify): Reduces need for future water system improvements and expansion.		NO	
			Annual Total	$0

2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
					$844,925	$873,652	$903,357	$934,071	$965,829	$998,667	$1,032,622	$1,067,731	$1,104,034	$1,141,571	$1,180,385	$1,220,518	$1,262,015	$1,304,924	$1,349,291	$1,395,167	$1,442,603	$1,491,651	$1,542,367	$1,594,808	$1,649,031	$1,705,098	$1,763,072	$1,823,016	$1,884,999	$1,949,089	$2,015,358	$2,083,880	$2,154,732	$2,227,993	$2,303,744	$2,382,072	$2,463,062	$2,546,806	$2,633,398	$2,722,933	$2,815,513
					$844,925	**$873,652**	**$903,357**	**$934,071**	**$965,829**	**$998,667**	**$1,032,622**	**$1,067,731**	**$1,104,034**	**$1,141,571**	**$1,180,385**	**$1,220,518**	**$1,262,015**	**$1,304,924**	**$1,349,291**	**$1,395,167**	**$1,442,603**	**$1,491,651**	**$1,542,367**	**$1,594,808**	**$1,649,031**	**$1,705,098**	**$1,763,072**	**$1,823,016**	**$1,884,999**	**$1,949,089**	**$2,015,358**	**$2,083,880**	**$2,154,732**	**$2,227,993**	**$2,303,744**	**$2,382,072**	**$2,463,062**	**$2,546,806**	**$2,633,398**	**$2,722,933**	**$2,815,513**
					$590,919	$611,010	$631,784	$653,265	$675,476	$698,442	$722,189	$746,743	$772,133	$798,385	$825,530	$853,598	$882,621	$912,630	$943,659	$975,744	$1,008,919	$1,043,222	$1,078,692	$1,115,367	$1,153,290	$1,192,501	$1,233,046	$1,274,970	$1,318,319	$1,363,142	$1,409,489	$1,457,411	$1,506,963	$1,558,200	$1,611,179	$1,665,959	$1,722,602	$1,781,170	$1,841,730	$1,904,349	$1,969,096
					$590,919	**$611,010**	**$631,784**	**$653,265**	**$675,476**	**$698,442**	**$722,189**	**$746,743**	**$772,133**	**$798,385**	**$825,530**	**$853,598**	**$882,621**	**$912,630**	**$943,659**	**$975,744**	**$1,008,919**	**$1,043,222**	**$1,078,692**	**$1,115,367**	**$1,153,290**	**$1,192,501**	**$1,233,046**	**$1,274,970**	**$1,318,319**	**$1,363,142**	**$1,409,489**	**$1,457,411**	**$1,506,963**	**$1,558,200**	**$1,611,179**	**$1,665,959**	**$1,722,602**	**$1,781,170**	**$1,841,730**	**$1,904,349**	**$1,969,096**
$0	$0	$0	$0	$0	$1,435,843	$1,484,662	$1,535,141	$1,587,335	$1,641,305	$1,697,109	$1,754,811	$1,814,474	$1,876,167	$1,939,956	$2,005,915	$2,074,116	$2,144,636	$2,217,553	$2,292,950	$2,370,911	$2,451,522	$2,534,873	$2,621,059	$2,710,175	$2,802,321	$2,897,600	$2,996,118	$3,097,986	$3,203,318	$3,312,231	$3,424,846	$3,541,291	$3,661,695	$3,786,193	$3,914,923	$4,048,031	$4,185,664	$4,327,976	$4,475,128	$4,627,282	$4,784,609

4.2 Identify and Quantify Costs

Alternative / Project Participant: **Alternative Project Participant**

User input

Rate: 3.40% (from water rate study)

Table 4B: Identification and Quantification of Costs

Item	Cost	Comments		Quantifiable	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
					Expected Value																																									
1	Capital costs for recycled water distribution			YES																																								
				High Estimate																																									
				Best Estimate			$5,193,389																																							
				Low Estimate																																									
				Exected Value			**$5,193,389**																																							
2	Capital costs for storage			YES																																									
				High Estimate																																									
				Best Estimate			$4,276,361																																							
				Low Estimate																																									
				Exected Value			**$4,276,361**																																							
3	Capital costs for reclamation treatment			YES																																								
				High Estimate																																									
				Best Estimate			$1,395,000																																							
				Low Estimate																																									
				Exected Value			**$1,395,000**																																							
4	Other (specify):			YES																																								
	Capital costs for trenchless crossing			High Estimate																																									
				Best Estimate			$1,361,818																																							
				Low Estimate																																									
				Exected Value			**$1,361,818**																																							
5	Other (specify):			YES																																								
	Capital costs for pump station			High Estimate																																									
				Best Estimate			$715,000																																							
				Low Estimate																																									
				Exected Value			**$715,000**																																							
6	Other (specify):			YES																																								
	Capital costs for site work			High Estimate																																									
				Best Estimate			$200,000																																							
				Low Estimate																																									
				Exected Value			**$200,000**																																							
7	Other (specify):			YES																																								
	Capital costs for building			High Estimate																																									
				Best Estimate			$300,000																																							
				Low Estimate																																									
				Exected Value			**$300,000**																																							
8	Other (specify):			YES																																								
	Capital costs for recycled water hydrants			High Estimate																																								
				Best Estimate			$20,000																																							
				Low Estimate																																									
				Exected Value			**$20,000**																																							
9	O&M costs for recycled water distribution			YES																																								
				High Estimate																																									
				Best Estimate							$169,137	$174,888	$180,834	$186,983	$193,340	$199,914	$206,711	$213,739	$221,006	$228,520	$236,290	$244,324	$252,631	$261,220	$270,102	$279,285	$288,781	$298,599	$308,752	$319,249	$330,104	$341,327	$352,933	$364,932	$377,340	$390,169	$403,435	$417,152	$431,335	$446,001	$461,165	$476,844	$493,057	$509,821	$527,155	$545,078	$563,611
				Low Estimate																																									
				Expected Value							**$169,137**	**$174,888**	**$180,834**	**$186,983**	**$193,340**	**$199,914**	**$206,711**	**$213,739**	**$221,006**	**$228,520**	**$236,290**	**$244,324**	**$252,631**	**$261,220**	**$270,102**	**$279,285**	**$288,781**	**$298,599**	**$308,752**	**$319,249**	**$330,104**	**$341,327**	**$352,933**	**$364,932**	**$377,340**	**$390,169**	**$403,435**	**$417,152**	**$431,335**	**$446,001**	**$461,165**	**$476,844**	**$493,057**	**$509,821**	**$527,155**	**$545,078**	**$563,611**
10	O&M costs for storage			YES																																									
				High Estimate																																									
				Best Estimate							$85,527	$88,435	$91,442	$94,551	$97,766	$101,090	$104,527	$108,081	$111,755	$115,555	$119,484	$123,546	$127,747	$132,090	$136,582	$141,225	$146,027	$150,992	$156,126	$161,434	$166,923	$172,598	$178,466	$184,534	$190,808	$197,296	$204,004	$210,940	$218,112	$225,528	$233,196	$241,124	$249,323	$257,800	$266,565	$275,628	$284,999
				Low Estimate																																									
				Expected Value							**$85,527**	**$88,435**	**$91,442**	**$94,551**	**$97,766**	**$101,090**	**$104,527**	**$108,081**	**$111,755**	**$115,555**	**$119,484**	**$123,546**	**$127,747**	**$132,090**	**$136,582**	**$141,225**	**$146,027**	**$150,992**	**$156,126**	**$161,434**	**$166,923**	**$172,598**	**$178,466**	**$184,534**	**$190,808**	**$197,296**	**$204,004**	**$210,940**	**$218,112**	**$225,528**	**$233,196**	**$241,124**	**$249,323**	**$257,800**	**$266,565**	**$275,628**	**$284,999**
11	O&M costs for reclamation treatment			YES																																									
				High Estimate																																									
				Best Estimate							$139,500	$144,243	$149,147	$154,218	$159,462	$164,883	$170,489	$176,286	$182,280	$188,477	$194,886	$201,512	$208,363	$215,447	$222,773	$230,347	$238,179	$246,277	$254,650	$263,308	$272,261	$281,518	$291,089	$300,986	$311,220	$321,801	$332,742	$344,056	$355,754	$367,849	$380,356	$393,288	$406,660	$420,486	$434,783	$449,566	$464,851
				Low Estimate																																									
				Expected Value							**$139,500**	**$144,243**	**$149,147**	**$154,218**	**$159,462**	**$164,883**	**$170,489**	**$176,286**	**$182,280**	**$188,477**	**$194,886**	**$201,512**	**$208,363**	**$215,447**	**$222,773**	**$230,347**	**$238,179**	**$246,277**	**$254,650**	**$263,308**	**$272,261**	**$281,518**	**$291,089**	**$300,986**	**$311,220**	**$321,801**	**$332,742**	**$344,056**	**$355,754**	**$367,849**	**$380,356**	**$393,288**	**$406,660**	**$420,486**	**$434,783**	**$449,566**	**$464,851**
12	Other (specify):			YES																																									
	O&M costs for pump station			High Estimate																																									
				Best Estimate							$35,750	$36,966	$38,222	$39,522	$40,866	$42,255	$43,692	$45,177	$46,713	$48,302	$49,944	$51,642	$53,398	$55,213	$57,090	$59,032	$61,039	$63,114	$65,260	$67,479	$69,773	$72,145	$74,598	$77,134	$79,757	$82,469	$85,273	$88,172	$91,170	$94,270	$97,475	$100,789	$104,216	$107,759	$111,423	$115,211	$119,128
				Low Estimate																																									
				Expected Value							**$35,750**	**$36,966**	**$38,222**	**$39,522**	**$40,866**	**$42,255**	**$43,692**	**$45,177**	**$46,713**	**$48,302**	**$49,944**	**$51,642**	**$53,398**	**$55,213**	**$57,090**	**$59,032**	**$61,039**	**$63,114**	**$65,260**	**$67,479**	**$69,773**	**$72,145**	**$74,598**	**$77,134**	**$79,757**	**$82,469**	**$85,273**	**$88,172**	**$91,170**	**$94,270**	**$97,475**	**$100,789**	**$104,216**	**$107,759**	**$111,423**	**$115,211**	**$119,128**
13	Other (specify):			YES																																									
	O&M costs for energy			High Estimate																																									
				Best Estimate							$27,306	$28,234	$29,194	$30,187	$31,213	$32,275	$33,372	$34,507	$35,680	$36,893	$38,147	$39,444	$40,785	$42,172	$43,606	$45,088	$46,621	$48,207	$49,846	$51,540	$53,293	$55,105	$56,978	$58,916	$60,919	$62,990	$65,132	$67,346	$69,636	$72,003	$74,452	$76,983	$79,600	$82,307	$85,105	$87,999	$90,991
				Low Estimate																																									
				Expected Value							**$27,306**	**$28,234**	**$29,194**	**$30,187**	**$31,213**	**$32,275**	**$33,372**	**$34,507**	**$35,680**	**$36,893**	**$38,147**	**$39,444**	**$40,785**	**$42,172**	**$43,606**	**$45,088**	**$46,621**	**$48,207**	**$49,846**	**$51,540**	**$53,293**	**$55,105**	**$56,978**	**$58,916**	**$60,919**	**$62,990**	**$65,132**	**$67,346**	**$69,636**	**$72,003**	**$74,452**	**$76,983**	**$79,600**	**$82,307**	**$85,105**	**$87,999**	**$90,991**
14	Other (specify):			YES																																									
	O&M costs for labor			High Estimate																																									
				Best Estimate							$90,000	$93,060	$96,224	$99,496	$102,879	$106,376	$109,993	$113,733	$117,600	$121,598	$125,733	$130,008	$134,428	$138,998	$143,724	$148,611	$153,664	$158,888	$164,290	$169,876	$175,652	$181,624	$187,799	$194,185	$200,787	$207,614	$214,673	$221,971	$229,518	$237,322	$245,391	$253,734	$262,361	$271,282	$280,505	$290,042	$299,904
				Low Estimate																																									
				Expected Value							**$90,000**	**$93,060**	**$96,224**	**$99,496**	**$102,879**	**$106,376**	**$109,993**	**$113,733**	**$117,600**	**$121,598**	**$125,733**	**$130,008**	**$134,428**	**$138,998**	**$143,724**	**$148,611**	**$153,664**	**$158,888**	**$164,290**	**$169,876**	**$175,652**	**$181,624**	**$187,799**	**$194,185**	**$200,787**	**$207,614**	**$214,673**	**$221,971**	**$229,518**	**$237,322**	**$245,391**	**$253,734**	**$262,361**	**$271,282**	**$280,505**	**$290,042**	**$299,904**
15	Other (specify):			YES																																									
	Contingencies			High Estimate																																									
				Best Estimate	$2,177,180																																									
				Low Estimate																																									
				Expected Value	**$2,177,180**																																								
16	Other (specify):			YES																																									
	Engineering, Construction Management, Administration, and Design			High Estimate																																									
				Best Estimate	$2,177,180																																								
				Low Estimate																																									
				Expected Value																																									
17	Other (specify):			YES																																									
	Disinfection Process			High Estimate																																									
				Best Estimate			$650,297																																							
				Low Estimate																																									
				Expected Value			**$650,297**																																							
18	Other (specify):			YES																																									
	Diesel Energy			High Estimate																																									
				Best Estimate			$101,856																																							
				Low Estimate																																									
				Expected Value			**$101,856**																																							
19	Other (specify):			YES																																									
	2% Loan Interest			High Estimate																																									
				Best Estimate							$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879	$216,879
				Low Estimate																																									
				Expected Value							**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**	**$216,879**
				Annual Total	$4,354,360	$0	$14,413,721	$0	$0	$0	$764,100	$782,705	$801,943	$821,836	$842,404	$863,672	$885,663	$908,402	$931,913	$956,225	$981,362	$1,007,355	$1,034,231	$1,062,021	$1,090,756	$1,120,467	$1,151,189	$1,182,956	$1,215,803	$1,249,766	$1,284,884	$1,321,196	$1,358,743	$1,397,565	$1,437,710	$1,479,218	$1,522,138	$1,566,516	$1,612,404	$1,659,852	$1,708,913	$1,759,642	$1,812,096	$1,866,333	$1,922,415	$1,980,403	$2,040,363

4.3 Evaluate Project

Alternative: **Name Of Alternative**
Project Participant: **Project Users**

User Input

Discount Rate 6.00%

Table 4C: Project Evaluation

A	B	C	D	E	F
Year	Annual Benefits	Discounted Benefits	Annual Costs	Discounted Costs	Net Benefits (discounted)
2024	$0	$0	$4,354,360	$4,892,559	-$4,892,559
2025	$0	$0	$0	$0	$0
2026	$0	$0	$14,413,721	$14,413,721	-$14,413,721
2027	$0	$0	$0	$0	$0
2028	$0	$0	$0	$0	$0
2029	$0	$0	$0	$0	$0
2030	$1,435,843	$1,137,323	$764,100	$605,239	$532,084
2031	$1,484,662	$1,109,426	$782,705	$584,883	$524,543
2032	$1,535,141	$1,082,214	$801,943	$565,338	$516,875
2033	$1,587,335	$1,055,669	$821,836	$546,568	$509,101
2034	$1,641,305	$1,029,775	$842,404	$528,535	$501,240
2035	$1,697,109	$1,004,516	$863,672	$511,206	$493,310
2036	$1,754,811	$979,877	$885,663	$494,550	$485,328
2037	$1,814,474	$955,843	$908,402	$478,535	$477,308
2038	$1,876,167	$932,397	$931,913	$463,132	$469,265
2039	$1,939,956	$909,527	$956,225	$448,315	$461,212
2040	$2,005,915	$887,218	$981,362	$434,057	$453,161
2041	$2,074,116	$865,456	$1,007,355	$420,334	$445,122
2042	$2,144,636	$844,228	$1,034,231	$407,121	$437,107
2043	$2,217,553	$823,520	$1,062,021	$394,397	$429,124
2044	$2,292,950	$803,321	$1,090,756	$382,139	$421,181
2045	$2,370,911	$783,617	$1,120,467	$370,329	$413,288
2046	$2,451,522	$764,396	$1,151,189	$358,946	$405,450
2047	$2,534,873	$745,647	$1,182,956	$347,973	$397,674
2048	$2,621,059	$727,357	$1,215,803	$337,391	$389,966
2049	$2,710,175	$709,516	$1,249,766	$327,185	$382,331
2050	$2,802,321	$692,113	$1,284,884	$317,339	$374,774
2051	$2,897,600	$675,137	$1,321,196	$307,837	$367,300
2052	$2,996,118	$658,577	$1,358,743	$298,665	$359,911
2053	$3,097,986	$642,423	$1,397,566	$289,810	$352,613
2054	$3,203,318	$626,666	$1,437,710	$281,259	$345,406
2055	$3,312,231	$611,294	$1,479,218	$273,000	$338,295
2056	$3,424,846	$596,300	$1,522,138	$265,020	$331,281
2057	$3,541,291	$581,674	$1,566,516	$257,308	$324,366
2058	$3,661,695	$567,407	$1,612,404	$249,854	$317,553
2059	$3,786,193	$553,489	$1,659,852	$242,647	$310,842
2060	$3,914,923	$539,913	$1,708,913	$235,679	$304,234
2061	$4,048,031	$526,670	$1,759,642	$228,939	$297,731
2062	$4,185,664	$513,752	$1,812,096	$222,418	$291,334
2063	$4,327,976	$501,150	$1,866,333	$216,109	$285,041
2064	$4,475,128	$488,858	$1,922,415	$210,002	$278,855
2065	$4,627,282	$476,867	$1,980,403	$204,091	$272,775
2066	$4,784,609	$465,170	$2,040,363	$198,369	$266,802
	$103,277,726	**$27,868,303**	**$66,153,241**	**$32,610,800**	**-$4,742,497**

Supplementary Table for Project Evaluation

	Volume (AF)	Net Benefit/AF
Total RW Delivered	**37,572**	**-$126**
Total Fresh Water Alternative	**48,843**	**-$97**

4.4 Sensitivity Analysis

Alternative	**Alternative**	*User Input*
Project Participant	**Project Participant**	

Table 4D: Summary of Sensitivity Analysis

A	B	C	D
Variable 1 - Discount Rate			
Discount Rate Values	Total Monetized Benefit Discounted	Total Monetized Cost Discounted	Total Monetized Net Benefit Discounted
3.00%	$50,656,060	$42,738,662	$7,917,398
4.00%	$40,999,018	$38,439,495	$2,559,523
5.00%	$33,599,684	$35,150,559	-$1,550,876
6.00%	$27,868,303	$32,610,800	-$4,742,497
7.00%	$23,380,398	$30,631,845	-$7,251,447
8.00%	$19,828,057	$29,076,687	-$9,248,629
9.00%	$16,986,160	$27,844,869	-$10,858,709

*Note: Please see guidance for assessment of values

Discount Rate Incremental Change

1.00 %

Table 4D: Economic Assessment

ECONOMIC ASSESSMENT

RECYCLED WATER

annual cost/acre-ft	**$1,760.72**	/acre-ft
Expected Net Present Value (NPV)	**($4,742,496.63)**	
Expected Net Present Value (NPV)/acre-ft	**($97.10)**	/acre-ft

Water Recycling is not economically cost-effective

Not Cost-Effective:
Since the expected net present value of the recycling water project is negative, the project is not recommended.

Project Information	*User Input*
Name of Agency	Santa Nella County Water District
Name of person conducting analsysis	Bao Cha
Phone number	(209) 694-4766
email:	bao@blackwater-eng.com
Reuse project information	
Project name	Recycled Water Feasibility Study
Project location	Santa Nella, California
Indirect potable, or non-potable water production	Non-potable water production
Does the project operate year-round or seasonally	Seasonally
Phases of operation (with years)	40
Accounting Perspective	Statewide
Name Of Alternative	Alternative 2: Updating the existing WWTP treatment process to produce tertiary treated effluent for disposal via landscape irrigation within the public right-of-way throughout SNCWD service area but primarily along the SR-33 corridor.
Project Users	Commercial Landscape Irrigation Parkway Community Park Truck Fill Station

2. Standard Assumptions

User Input

Table 2A: Time and Interest

Description	Amount	Unit
Useful Life of Project	40	years
Installed Capacity (final project)	171	AF per year
Recycled Water Market Price	$2,623	per AF
Potable Water Replacement Factor (for RW)	20	
Project Design Year	2024	
Reference Cost Year (Ref Yr)	2020	
First Year of Project Construction	2026	APPROVED
Project First Year of Operation (Last Year of Construction)	2030	APPROVED
Project Last Year of Operation	2066	
Financing Period	40	years
Annual Interest Rate	2.00%	
Discount Rate	6.00%	

Notes:

'Project Last Year of Operation' is equal to 'Project First Year of Operation' and 'Period of Analysis'
'Project Reference Year' is set by 'Project First Year of Operation'
Maximum analysis is 100 years + 2 years for design & construction

3.1 Fresh Water Supply Alternative *User Input*

Table 3A: Annual Fresh Water Alternative Cost	Costs (2020 $)	Comments
Office R&M		
Repairs & Maintenance	$500	
Professional Services		
Engineering Fees	$20,000	
Contract Services	$500	
Operations/R&M		
Chemicals	$24,000	
Fuel	$5,000	
Vehicle Maintenance	$2,500	
Plant Supplies	$18,100	
Plant Equipment Rental	$1,000	
Repair/Maint Plants	$16,990	
R&M Manhole Pumping Wendy's	$0	
Inspection Fees	$4,482	
Utilities		
Utilities-Solid Waste	$354	
Utilities-Well Meter	$15,500	
Utilities-Plant	$36,500	
Water Purchase/Fees		
Standby Charges	$7,860	
Delivery Charges	$25,000	
Water Purchase M&I SLC WC0004	$49,000	
Water Purcase M&I DMC WC0003	$0	
Water Purchase AG DMC WC0001	$0	
Water Purchase AG SLC WC0002	$0	
Total	**$227,286**	

Notes:
Costs represented as present worth values
Without Project assumes future unmet water demand will incur a shortage cost

3.2 Baseline - Total Volume For Entire Project

Table 3B: Total Volume For Entire Project

User Input

	Total Volume (af)
Total Lifetime Recycled Water Produced	**6,849**
Total Lifetime Fresh Water Alternative Produced	**8,903**

*Note: Total lifetime fresh water alternative must be equal to or greater than the total lifetime recycled water produced in order to demonstrate that there is fresh water supply throughout the project

4.0 BENEFITS OF RECYCLED WATER PROGRAM FOR ALTERNATIVE 2

Table 1 - Projected Commercial Water Rates

Parameters	Current	From 2020 Water Rate Study ($/hcf)				Projected Water Rates ($/hcf)						
Fiscal Year	2019	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Rate ($/hcf)	1.25	1.33	1.37	1.42	1.47	1.51	1.56	1.60	1.65	1.70	1.75	1.81
Percent Increase		6%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%

Recycled water rates should be less than potable water rates

For this feasibility study, the cost of the recycled water is 20% less than potable water

Estimated Potable Water Rate in FY 2030-31 ($/hcf) 1.81

Estimated Recycled Water Rate in FY 2030-31 ($/hcf) 1.44

ADD (ac-ft/yr) 171

Estimated revenue of recycled water by FY 2030-31 ($) 107,640 (BENEFITS)

ADDITIONAL FEES FROM ALL CUSTOMERS WHO WILL BENEFIT FROM THE RECYCLED WATER PROGRAM

Table 2 - Benefits of Recycled Water Program

Parameters	Current	From 2020 Water Rate Study				Projected Water Costs						
Fiscal Year	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Water Expenses[1] ($)	312,237	321,526	329,902	338,562	347,517	359,333	371,550	384,183	397,245	410,752	424,717	439,158
Percentage Inflation Rate		3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%
Water Production[2] (acre-ft/yr)	488	488	488	488	488	488	488	488	488	488	488	488
Potable Water Cost[3] ($/acre-ft)	640	659	676	694	712	736	761	787	814	841	870	900
Recycled Water Usage[4] (acre-ft/yr)	171	171	171	171	171	171	171	171	171	171	171	171
Recycled Water Benefits ($)	109,428	112,683	115,619	118,654	121,792	125,933	130,215	134,642	139,220	143,954	148,848	153,909 (BENEFITS)

[1]Variable expenses consist of office repairs and maintenance, professional services, operations, utilities, water purchase fees, and SLWD assessments

[2]Raw surface water and groundwater production in 2018

[3]Cost of Potable Water is equal to variable water expenses ($) divided by the water production (acre-ft)

[4]Recycled Water Average Day Demand

4.1 Identify and Quantify Benefits

Alternative: **Alternat**

Project Participant: **Project Part**

User Input

Rate 3.40% (from water rate study)

Table 4A: Identification and Quantification of Benefits

A | B | C | D | F Expected Value

Item	Benefit	Comments	Quantifiable	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
1	Avoided costs of water supply development/purchase (potable water)		YES														
			High Estimate														
			Best Estimate							$153,909	$159,142	$164,553	$170,147	$175,932	$181,914	$188,099	$194,494
			Low Estimate														
			Expected Value							**$153,909**	**$159,142**	**$164,553**	**$170,147**	**$175,932**	**$181,914**	**$188,099**	**$194,494**
2	Reclaimed water sales revenues		YES														
			High Estimate														
			Best Estimate							$107,640	$111,300	$115,084	$118,997	$123,042	$127,226	$131,552	$136,024
			Low Estimate														
			Expected Value							**$107,640**	**$111,300**	**$115,084**	**$118,997**	**$123,042**	**$127,226**	**$131,552**	**$136,024**
3	Avoided increased groundwater pumping costs with declining groundwater levels		NO														
	Reduces groundwater pumping and overdraft conditions in the groundwater basin.																
4	Increased supply reliability (customer perspective)		NO														
	Improves reliability of existing water supply system by making the system less sensitive to drought conditions.																
5	Local control over water resources (not relying on imported water)		NO														
	Increases degree of local control on water supply, by reducing water demand, a portion of which is dependent on water allocations from the CVP.																
6	Source water protection		NO														
	Reduces surface water demand; consistent with State policies for restoring and protecting fish and wildlife.																
7	Aesthetic values		NO														
	Provides aesthetic benefits for the community by supporting irrigation of areas, even during drought conditions.																
8	Other (specify):		NO														
	Reduces need for future water system improvements and expansion.																
			Annual Total	$0	$0	$0	$0	$0	$0	$261,549	$270,441	$279,636	$289,144	$298,975	$309,140	$319,651	$330,519

Item	Quantifiable	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051
1	YES														
	High Estimate														
	Best Estimate	$201,107	$207,945	$215,015	$222,326	$229,885	$237,701	$245,782	$254,139	$262,780	$271,714	$280,953	$290,505	$300,382	$310,595
	Low Estimate														
	Expected Value	**$201,107**	**$207,945**	**$215,015**	**$222,326**	**$229,885**	**$237,701**	**$245,782**	**$254,139**	**$262,780**	**$271,714**	**$280,953**	**$290,505**	**$300,382**	**$310,595**
2	YES														
	High Estimate														
	Best Estimate	$140,649	$145,431	$150,376	$155,489	$160,775	$166,242	$171,894	$177,738	$183,781	$190,030	$196,491	$203,172	$210,079	$217,222
	Low Estimate														
	Expected Value	**$140,649**	**$145,431**	**$150,376**	**$155,489**	**$160,775**	**$166,242**	**$171,894**	**$177,738**	**$183,781**	**$190,030**	**$196,491**	**$203,172**	**$210,079**	**$217,222**
3	NO														
4	NO														
5	NO														
6	NO														
7	NO														
8	NO														
	Annual Total	$341,756	$353,376	$365,391	$377,814	$390,660	$403,942	$417,676	$431,877	$446,561	$461,744	$477,444	$493,677	$510,462	$527,817

Item	Quantifiable	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
1	YES															
	High Estimate															
	Best Estimate	$321,155	$332,075	$343,365	$355,040	$367,111	$379,593	$392,499	$405,844	$419,643	$433,910	$448,663	$463,918	$479,691	$496,001	$512,865
	Low Estimate															
	Expected Value	**$321,155**	**$332,075**	**$343,365**	**$355,040**	**$367,111**	**$379,593**	**$392,499**	**$405,844**	**$419,643**	**$433,910**	**$448,663**	**$463,918**	**$479,691**	**$496,001**	**$512,865**
2	YES															
	High Estimate															
	Best Estimate	$224,608	$232,244	$240,141	$248,305	$256,748	$265,477	$274,504	$283,837	$293,487	$303,466	$313,784	$324,452	$335,484	$346,890	$358,684
	Low Estimate															
	Expected Value	**$224,608**	**$232,244**	**$240,141**	**$248,305**	**$256,748**	**$265,477**	**$274,504**	**$283,837**	**$293,487**	**$303,466**	**$313,784**	**$324,452**	**$335,484**	**$346,890**	**$358,684**
3	NO															
4	NO															
5	NO															
6	NO															
7	NO															
8	NO															
	Annual Total	$545,763	$564,319	$583,506	$603,345	$623,859	$645,070	$667,002	$689,681	$713,130	$737,376	$762,447	$788,370	$815,175	$842,891	$871,549

4.2 Identify and Quantify Costs

Alternative
Project Participant

Alternative
Project Participant

User Input

Rate 3.40% (from water rate study)

Table 4B: Identification and Quantification of Costs

Item	A Cost	B Comments	C Quantifiable	D	F Expected Value	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
1	Capital costs for recycled water distribution		YES	Best Estimate				$374,990																																						
				Expected Value				**$374,990**																																						
2	Capital costs for storage		YES	High Estimate																																									
				Best Estimate				$50,000																																						
				Low Estimate																																									
				Expected Value				**$50,000**																																						
3	Capital costs for reclamation treatment		YES	High Estimate																																										
				Best Estimate				$640,624																																						
				Low Estimate																																									
				Expected Value				**$640,624**																																						
4	Other (specify): Capital costs for trenchless crossing		YES	High Estimate																																								
				Best Estimate				$548,250																																						
				Low Estimate																																									
				Expected Value				**$548,250**																																						
5	Other (specify): Capital costs for pump station		YES	High Estimate																																								
				Best Estimate				$350,000																																						
				Low Estimate																																									
				Expected Value				**$350,000**																																						
6	Other (specify): Capital costs for site work		YES	High Estimate																																									
				Best Estimate				$200,000																																						
				Low Estimate																																									
				Expected Value				**$200,000**																																						
7	Other (specify): Capital costs for building		YES	High Estimate																																								
				Best Estimate				$300,000																																						
				Low Estimate																																									
				Expected Value				**$300,000**																																						
8	Other (specify): Capital costs for recycled water hydrants		YES	High Estimate																																								
				Best Estimate				$20,000																																						
				Low Estimate																																									
				Expected Value				**$20,000**																																						
9	O&M costs for recycled water distribution		YES	High Estimate																																									
				Best Estimate								$116,605	$120,569	$124,669	$128,907	$133,290	$137,822	$142,508	$147,353	$152,363	$157,544	$162,900	$168,439	$174,166	$180,087	$186,210	$192,541	$199,088	$205,857	$212,856	$220,093	$227,576	$235,314	$243,314	$251,587	$260,141	$268,986	$278,131	$287,588	$297,366	$307,476	$317,930	$328,740	$339,917	$351,474	$363,425	$375,781	$388,558
				Low Estimate																																											
				Expected Value								**$116,605**	**$120,569**	**$124,669**	**$128,907**	**$133,290**	**$137,822**	**$142,508**	**$147,353**	**$152,363**	**$157,544**	**$162,900**	**$168,439**	**$174,166**	**$180,087**	**$186,210**	**$192,541**	**$199,088**	**$205,857**	**$212,856**	**$220,093**	**$227,576**	**$235,314**	**$243,314**	**$251,587**	**$260,141**	**$268,986**	**$278,131**	**$287,588**	**$297,366**	**$307,476**	**$317,930**	**$328,740**	**$339,917**	**$351,474**	**$363,425**	**$375,781**	**$388,558**
10	O&M costs for storage		YES	High Estimate																																										
				Best Estimate								$23,840	$24,650	$25,488	$26,355	$27,251	$28,178	$29,136	$30,126	$31,151	$32,210	$33,305	$34,437	$35,608	$36,819	$38,071	$39,365	$40,703	$42,087	$43,518	$44,998	$46,528	$48,110	$49,746	$51,437	$53,186	$54,994	$56,864	$58,797	$60,796	$62,863	$65,001	$67,211	$69,496	$71,859	$74,302	$76,828	$79,440
				Low Estimate																																											
				Expected Value								**$23,840**	**$24,650**	**$25,488**	**$26,355**	**$27,251**	**$28,178**	**$29,136**	**$30,126**	**$31,151**	**$32,210**	**$33,305**	**$34,437**	**$35,608**	**$36,819**	**$38,071**	**$39,365**	**$40,703**	**$42,087**	**$43,518**	**$44,998**	**$46,528**	**$48,110**	**$49,746**	**$51,437**	**$53,186**	**$54,994**	**$56,864**	**$58,797**	**$60,796**	**$62,863**	**$65,001**	**$67,211**	**$69,496**	**$71,859**	**$74,302**	**$76,828**	**$79,440**
11	O&M costs for reclamation treatment		YES	High Estimate																																										
				Best Estimate								$79,500	$82,203	$84,998	$87,888	$90,876	$93,966	$97,161	$100,464	$103,880	$107,412	$111,064	$114,840	$118,745	$122,782	$126,956	$131,273	$135,736	$140,351	$145,123	$150,057	$155,159	$160,435	$165,890	$171,530	$177,362	$183,392	$189,627	$196,075	$202,741	$209,634	$216,762	$224,132	$231,752	$239,632	$247,780	$256,204	$264,915
				Low Estimate																																											
				Expected Value								**$79,500**	**$82,203**	**$84,998**	**$87,888**	**$90,876**	**$93,966**	**$97,161**	**$100,464**	**$103,880**	**$107,412**	**$111,064**	**$114,840**	**$118,745**	**$122,782**	**$126,956**	**$131,273**	**$135,736**	**$140,351**	**$145,123**	**$150,057**	**$155,159**	**$160,435**	**$165,890**	**$171,530**	**$177,362**	**$183,392**	**$189,627**	**$196,075**	**$202,741**	**$209,634**	**$216,762**	**$224,132**	**$231,752**	**$239,632**	**$247,780**	**$256,204**	**$264,915**
12	Other (specify): O&M costs for pump station		YES	High Estimate																																										
				Best Estimate								$17,500	$18,095	$18,710	$19,346	$20,004	$20,684	$21,388	$22,115	$22,867	$23,644	$24,448	$25,279	$26,139	$27,027	$27,946	$28,897	$29,879	$30,895	$31,945	$33,031	$34,155	$35,316	$36,517	$37,758	$39,042	$40,369	$41,742	$43,161	$44,629	$46,146	$47,715	$49,337	$51,015	$52,749	$54,543	$56,397	$58,315
				Low Estimate																																											
				Expected Value								**$17,500**	**$18,095**	**$18,710**	**$19,346**	**$20,004**	**$20,684**	**$21,388**	**$22,115**	**$22,867**	**$23,644**	**$24,448**	**$25,279**	**$26,139**	**$27,027**	**$27,946**	**$28,897**	**$29,879**	**$30,895**	**$31,945**	**$33,031**	**$34,155**	**$35,316**	**$36,517**	**$37,758**	**$39,042**	**$40,369**	**$41,742**	**$43,161**	**$44,629**	**$46,146**	**$47,715**	**$49,337**	**$51,015**	**$52,749**	**$54,543**	**$56,397**	**$58,315**
13	Other (specify): O&M costs for energy		YES	High Estimate																																										
				Best Estimate								$7,994	$8,266	$8,547	$8,837	$9,138	$9,449	$9,770	$10,102	$10,445	$10,801	$11,168	$11,548	$11,940	$12,346	$12,766	$13,200	$13,649	$14,113	$14,593	$15,089	$15,602	$16,132	$16,681	$17,248	$17,834	$18,441	$19,068	$19,716	$20,386	$21,079	$21,796	$22,537	$23,303	$24,096	$24,915	$25,762	$26,638
				Low Estimate																																											
				Expected Value								**$7,994**	**$8,266**	**$8,547**	**$8,837**	**$9,138**	**$9,449**	**$9,770**	**$10,102**	**$10,445**	**$10,801**	**$11,168**	**$11,548**	**$11,940**	**$12,346**	**$12,766**	**$13,200**	**$13,649**	**$14,113**	**$14,593**	**$15,089**	**$15,602**	**$16,132**	**$16,681**	**$17,248**	**$17,834**	**$18,441**	**$19,068**	**$19,716**	**$20,386**	**$21,079**	**$21,796**	**$22,537**	**$23,303**	**$24,096**	**$24,915**	**$25,762**	**$26,638**
14	Other (specify): O&M costs for labor		YES	High Estimate																																										
				Best Estimate								$90,000	$93,060	$96,224	$99,496	$102,879	$106,376	$109,993	$113,733	$117,600	$121,598	$125,733	$130,008	$134,428	$138,998	$143,724	$148,611	$153,664	$158,888	$164,290	$169,876	$175,652	$181,624	$187,799	$194,185	$200,787	$207,614	$214,673	$221,971	$229,518	$237,322	$245,391	$253,734	$262,361	$271,282	$280,505	$290,042	$299,904
				Low Estimate																																											
				Expected Value								**$90,000**	**$93,060**	**$96,224**	**$99,496**	**$102,879**	**$106,376**	**$109,993**	**$113,733**	**$117,600**	**$121,598**	**$125,733**	**$130,008**	**$134,428**	**$138,998**	**$143,724**	**$148,611**	**$153,664**	**$158,888**	**$164,290**	**$169,876**	**$175,652**	**$181,624**	**$187,799**	**$194,185**	**$200,787**	**$207,614**	**$214,673**	**$221,971**	**$229,518**	**$237,322**	**$245,391**	**$253,734**	**$262,361**	**$271,282**	**$280,505**	**$290,042**	**$299,904**
15	Other (specify): Contingencies		YES	High Estimate																																										
				Best Estimate	$50,000																																										
				Low Estimate																																											
				Expected Value	**$50,000**																																									
16	Other (specify): Engineering, Construction Management, Administration, and Design		YES	High Estimate																																										
				Best Estimate	$50,000																																										
				Low Estimate																																											
				Expected Value	**$50,000**																																									
17	Other (specify): Disinfection Process		YES	High Estimate																																										
				Best Estimate				$428,797																																						
				Low Estimate																																											
				Expected Value				**$428,797**																																						
18	Other (specify): Diesel Energy		YES	High Estimate																																									
				Best Estimate				$87,262																																						
				Low Estimate																																											
				Expected Value				**$87,262**																																						
19	Other (specify): 2% Loan Interest		YES	High Estimate																																										
				Best Estimate								$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822	$35,822
				Low Estimate																																											
				Expected Value								**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**	**$35,822**
				Annual Total	$100,000	$0	$2,999,923	$0	$0	$0		$371,260	$382,665	$394,458	$406,652	$419,260	$432,297	$445,777	$459,715	$474,128	$489,030	$504,439	$520,372	$536,847	$553,882	$571,496	$589,709	$608,541	$628,013	$648,148	$668,967	$690,494	$712,753	$735,768	$759,566	$784,174	$809,618	$835,927	$863,130	$891,259	$920,344	$950,417	$981,514	$1,013,667	$1,046,914	$1,081,291	$1,116,837	$1,153,591

4.3 Evaluate Project

Alternative: **Name Of Alternative**
Project Participant: **Project Users**

User Input

Discount Rate 6.00%

Table 4C: Project Evaluation

A	B	C	D	E	F
Year	Annual Benefits	Discounted Benefits	Annual Costs	Discounted Costs	Net Benefits (discounted)
2024	$0	$0	$100,000	$112,360	-$112,360
2025	$0	$0	$0	$0	$0
2026	$0	$0	$2,999,923	$2,999,923	-$2,999,923
2027	$0	$0	$0	$0	$0
2028	$0	$0	$0	$0	$0
2029	$0	$0	$0	$0	$0
2030	$261,549	$207,171	$371,260	$294,073	-$86,902
2031	$270,441	$202,089	$382,665	$285,950	-$83,860
2032	$279,636	$197,133	$394,458	$278,077	-$80,945
2033	$289,144	$192,297	$406,652	$270,447	-$78,149
2034	$298,975	$187,580	$419,260	$263,049	-$75,468
2035	$309,140	$182,979	$432,297	$255,876	-$72,896
2036	$319,651	$178,491	$445,777	$248,919	-$70,428
2037	$330,519	$174,113	$459,715	$242,172	-$68,059
2038	$341,756	$169,842	$474,128	$235,627	-$65,784
2039	$353,376	$165,677	$489,030	$229,276	-$63,600
2040	$365,391	$161,613	$504,439	$223,114	-$61,501
2041	$377,814	$157,649	$520,372	$217,133	-$59,484
2042	$390,660	$153,782	$536,847	$211,328	-$57,546
2043	$403,942	$150,010	$553,882	$205,692	-$55,682
2044	$417,676	$146,330	$571,496	$200,220	-$53,890
2045	$431,877	$142,741	$589,709	$194,906	-$52,165
2046	$446,561	$139,240	$608,541	$189,746	-$50,506
2047	$461,744	$135,825	$628,013	$184,733	-$48,909
2048	$477,444	$132,493	$648,148	$179,864	-$47,371
2049	$493,677	$129,243	$668,967	$175,134	-$45,890
2050	$510,462	$126,073	$690,494	$170,537	-$44,464
2051	$527,817	$122,981	$712,753	$166,070	-$43,090
2052	$545,763	$119,964	$735,768	$161,729	-$41,765
2053	$564,319	$117,022	$759,566	$157,510	-$40,488
2054	$583,506	$114,151	$784,174	$153,408	-$39,257
2055	$603,345	$111,351	$809,618	$149,420	-$38,069
2056	$623,859	$108,620	$835,927	$145,543	-$36,923
2057	$645,070	$105,956	$863,130	$141,773	-$35,817
2058	$667,002	$103,357	$891,259	$138,107	-$34,750
2059	$689,681	$100,822	$920,344	$134,542	-$33,720
2060	$713,130	$98,349	$950,417	$131,074	-$32,725
2061	$737,376	$95,936	$981,514	$127,700	-$31,764
2062	$762,447	$93,583	$1,013,667	$124,418	-$30,835
2063	$788,370	$91,288	$1,046,914	$121,225	-$29,938
2064	$815,175	$89,049	$1,081,291	$118,119	-$29,070
2065	$842,891	$86,865	$1,116,837	$115,096	-$28,232
2066	$871,549	$84,734	$1,153,591	$112,155	-$27,421
	$18,812,735	**$5,076,400**	**$28,552,838**	**$10,066,046**	**-$4,989,647**

Supplementary Table for Project Evaluation

	Volume (AF)	Net Benefit/AF
Total RW Delivered	**6,849**	**-$729**
Total Fresh Water Alternative	**8,903**	**-$560**

4.4 Sensitivity Analysis

Alternative	**Alternative**	*User Input*
Project Participant	**Project Participant**	

Table 4D: Summary of Sensitivity Analysis

A	B	C	D
Variable 1 - Discount Rate			
Discount Rate Values	Total Monetized Benefit Discounted	Total Monetized Cost Discounted	Total Monetized Net Benefit Discounted
3.00%	$9,227,343	$15,666,854	-$6,439,510
4.00%	$7,468,248	$13,295,785	-$5,827,537
5.00%	$6,120,409	$11,476,773	-$5,356,363
6.00%	$5,076,400	$10,066,046	-$4,989,647
7.00%	$4,258,897	$8,960,047	-$4,701,149
8.00%	$3,611,815	$8,083,594	-$4,471,779
9.00%	$3,094,144	$7,381,674	-$4,287,530

*Note: Please see guidance for assessment of values

Discount Rate Incremental Change

1.00 %

Table 4D: Economic Assessment

ECONOMIC ASSESSMENT

RECYCLED WATER

annual cost/acre-ft	**$4,169.01**	/acre-ft
Expected Net Present Value (NPV)	**($4,989,646.58)**	
Expected Net Present Value (NPV)/acre-ft	**($560.42)**	/acre-ft

Water Recycling is not economically cost-effective

Not Cost-Effective:
Since the expected net present value of the recycling water project is negative, the project is not recommended.

Project Information	*User Input*
Name of Agency	Santa Nella County Water District
Name of person conducting analsysis	Bao Cha
Phone number	(209) 694-4766
email:	bao@blackwater-eng.com
Reuse project information	
Project name	Recycled Water Feasibility Study
Project location	Santa Nella, California
Indirect potable, or non-potable water production	Non-potable water production
Does the project operate year-round or seasonally	Seasonally
Phases of operation (with years)	40
Accounting Perspective	Statewide
Name Of Alternative	Alternative 3: Upgrade of the existing WWTP treatment process to produce tertiary treated effluent for disposal via landscape irrigation within the public right-of-way and at the Forebay Golf Course, via a purple pipe recycled water system.
Project Users	Commercial Landscape Irrigation Parkway Community Park Truck Fill Station Golf Course

2. Standard Assumptions

User Input

Table 2A: Time and Interest

Description	Amount	Unit
Useful Life of Project	40	years
Installed Capacity (final project)	647	AF per year
Recycled Water Market Price	$1,151	per AF
Potable Water Replacement Factor (for RW)	29	
Project Design Year	2024	
Reference Cost Year (Ref Yr)	2020	
First Year of Project Construction	2026	APPROVED
Project First Year of Operation (Last Year of Construction)	2030	APPROVED
Project Last Year of Operation	2066	
Financing Period	40	years
Annual Interest Rate	2.00%	
Discount Rate	6.00%	

Notes:

'Project Last Year of Operation' is equal to 'Project First Year of Operation' and 'Period of Analysis'
'Project Reference Year' is set by 'Project First Year of Operation'
Maximum analysis is 100 years + 2 years for design & construction

3.1 Fresh Water Supply Alternative *User Input*

Table 3A: Annual Fresh Water Alternative Cost	Costs (2020 $)	Comments
Office R&M		
Repairs & Maintenance	$500	
Professional Services		
Engineering Fees	$20,000	
Contract Services	$500	
Operations/R&M		
Chemicals	$24,000	
Fuel	$5,000	
Vehicle Maintenance	$2,500	
Plant Supplies	$18,100	
Plant Equipment Rental	$1,000	
Repair/Maint Plants	$16,990	
R&M Manhole Pumping Wendy's	$0	
Inspection Fees	$4,482	
Utilities		
Utilities-Solid Waste	$354	
Utilities-Well Meter	$15,500	
Utilities-Plant	$36,500	
Water Purchase/Fees		
Standby Charges	$7,860	
Delivery Charges	$25,000	
Water Purchase M&I SLC WC0004	$49,000	
Water Purcase M&I DMC WC0003	$0	
Water Purchase AG DMC WC0001	$0	
Water Purchase AG SLC WC0002	$0	
Total	**$227,286**	

Notes:
Costs represented as present worth values
Without Project assumes future unmet water demand will incur a shortage cost

3.2 Baseline - Total Volume For Entire Project

Table 3B: Total Volume For Entire Project

User Input

	Total Volume (af)
Total Lifetime Recycled Water Produced	**25,883**
Total Lifetime Fresh Water Alternative Produced	**33,648**

*Note: Total lifetime fresh water alternative must be equal to or greater than the total lifetime recycled water produced in order to demonstrate that there is fresh water supply throughout the project

4.0 BENEFITS OF RECYCLED WATER PROGRAM FOR ALTERNATIVE 3

Table 1 - Projected Commercial Water Rates

Parameters	Current	From 2020 Water Rate Study ($/hcf)				Projected Water Rates ($/hcf)						
Fiscal Year	2019	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Rate ($/hcf)	1.25	1.33	1.37	1.42	1.47	1.51	1.56	1.60	1.65	1.70	1.75	1.81
Percent Increase		6%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%

Recycled water rates should be less than potable water rates

For this feasibility study, the cost of the recycled water is 20% less than potable water

Estimated Potable Water Rate in FY 2030-31 ($/hcf) 1.81

Estimated Recycled Water Rate in FY 2030-31 ($/hcf) 1.44

ADD (ac-ft/yr) 647

Estimated revenue of recycled water by FY 2030-31 ($) 407,052 (BENEFITS)

ADDITIONAL FEES FROM ALL CUSTOMERS WHO WILL BENEFIT FROM THE RECYCLED WATER PROGRAM

Table 2 - Benefits of Recycled Water Program

Parameters	Current	From 2020 Water Rate Study				Projected Water Costs						
Fiscal Year	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Water Expenses[1] ($)	312,237	321,526	329,902	338,562	347,517	359,333	371,550	384,183	397,245	410,752	424,717	439,158
Percentage Inflation Rate		3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%
Water Production[2] (acre-ft/yr)	488	488	488	488	488	488	488	488	488	488	488	488
Potable Water Cost[3] ($/acre-ft)	640	659	676	694	712	736	761	787	814	841	870	900
Recycled Water Usage[4] (acre-ft/yr)	647	647	647	647	647	647	647	647	647	647	647	647
Recycled Water Benefits ($)	413,813	426,124	437,224	448,703	460,571	476,230	492,422	509,164	526,476	544,376	562,885	582,023 (BENEFITS)

[1]Variable expenses consist of office repairs and maintenance, professional services, operations, utilities, water purchase fees, and SLWD assessments

[2]Raw surface water and groundwater production in 2018

[3]Cost of Potable Water is equal to variable water expenses ($) divided by the water production (acre-ft)

[4]Recycled Water Average Day Demand

4.1 Identify and Quantify Benefits

Alternative: **Alternat**
Project Participant: **Project Part**

User input

Rate: 3.40% (from water rate study)

Table 4A: Identification and Quantification of Benefits

Item	Benefit	Comments	Quantifiable	F Expected Value	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
1	Avoided costs of water supply development/purchase (potable water)		YES																																										
			High Estimate																																											
			Best Estimate								$582,023	$601,812	$622,273	$643,431	$665,307	$687,928	$711,317	$735,502	$760,509	$786,367	$813,103	$840,749	$869,334	$898,891	$929,454	$961,055	$993,731	$1,027,518	$1,062,453	$1,098,577	$1,135,928	$1,174,550	$1,214,485	$1,255,777	$1,298,474	$1,342,622	$1,388,271	$1,435,472	$1,484,278	$1,534,744	$1,586,925	$1,640,880	$1,696,670	$1,754,357	$1,814,005	$1,875,681	$1,939,455
			Low Estimate																																										
			Expected Value								**$582,023**	**$601,812**	**$622,273**	**$643,431**	**$665,307**	**$687,928**	**$711,317**	**$735,502**	**$760,509**	**$786,367**	**$813,103**	**$840,749**	**$869,334**	**$898,891**	**$929,454**	**$961,055**	**$993,731**	**$1,027,518**	**$1,062,453**	**$1,098,577**	**$1,135,928**	**$1,174,550**	**$1,214,485**	**$1,255,777**	**$1,298,474**	**$1,342,622**	**$1,388,271**	**$1,435,472**	**$1,484,278**	**$1,534,744**	**$1,586,925**	**$1,640,880**	**$1,696,670**	**$1,754,357**	**$1,814,005**	**$1,875,681**	**$1,939,455**
2	Reclaimed water sales revenues		YES																																										
			High Estimate																																											
			Best Estimate								$407,052	$420,892	$435,202	$449,999	$465,299	$481,119	$497,477	$514,391	$531,880	$549,964	$568,663	$587,998	$607,990	$628,661	$650,036	$672,137	$694,990	$718,619	$743,052	$768,316	$794,439	$821,450	$849,379	$878,258	$908,119	$938,995	$970,921	$1,003,932	$1,038,065	$1,073,360	$1,109,854	$1,147,589	$1,186,607	$1,226,952	$1,268,668	$1,311,803	$1,356,404
			Low Estimate																																										
			Expected Value								**$407,052**	**$420,892**	**$435,202**	**$449,999**	**$465,299**	**$481,119**	**$497,477**	**$514,391**	**$531,880**	**$549,964**	**$568,663**	**$587,998**	**$607,990**	**$628,661**	**$650,036**	**$672,137**	**$694,990**	**$718,619**	**$743,052**	**$768,316**	**$794,439**	**$821,450**	**$849,379**	**$878,258**	**$908,119**	**$938,995**	**$970,921**	**$1,003,932**	**$1,038,065**	**$1,073,360**	**$1,109,854**	**$1,147,589**	**$1,186,607**	**$1,226,952**	**$1,268,668**	**$1,311,803**	**$1,356,404**
3	Avoided increased groundwater pumping costs with declining groundwater levels Reduces groundwater pumping and overdraft conditions in the groundwater basin.		NO																																										
4	Increased supply reliability (customer perspective) Improves reliability of existing water supply system by making the system less sensitive to drought conditions.		NO																																										
5	Local control over water resources (not relying on imported water) Increases degree of local control on water supply, by reducing water demand, a portion of which is dependent on water allocations from the CVP.		NO																																										
6	Source water protection Reduces surface water demand; consistent with State policies for restoring and protecting fish and wildlife.		NO																																										
7	Aesthetic values Provides aesthetic benefits for the community by supporting irrigation of areas, even during drought conditions.		NO																																										
8	Other (specify): Reduces need for future water system improvements and expansion.		NO																																										
			Annual Total		$0	$0	$0	$0	$0	$0	$989,075	$1,022,703	$1,057,475	$1,093,430	$1,130,606	$1,169,047	$1,208,794	$1,249,893	$1,292,390	$1,336,331	$1,381,766	$1,428,746	$1,477,324	$1,527,553	$1,579,489	$1,633,192	$1,688,721	$1,746,137	$1,805,506	$1,866,893	$1,930,367	$1,996,000	$2,063,864	$2,134,035	$2,206,592	$2,281,616	$2,359,191	$2,439,404	$2,522,344	$2,608,103	$2,696,779	$2,788,469	$2,883,277	$2,981,309	$3,082,673	$3,187,484	$3,295,859

4.2 Identify and Quantify Costs

Alternative: **Alternative**
Project Participant: **Project Partic**

User Input

Rate 3.40% (from water rate study)

Table 4B: Identification and Quantification of Costs

Item	Cost	Comments		Quantifiable	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
					Expected Value																																									
1	Capital costs for recycled water distribution			YES																																								
				High Estimate																																									
				Best Estimate			$2,392,774																																							
				Low Estimate																																									
				Exected Value			**$2,392,774**																																							
2	Capital costs for storage			YES																																									
				High Estimate																																									
				Best Estimate			$648,542																																							
				Low Estimate																																									
				Exected Value			**$648,542**																																							
3	Capital costs for reclamation treatment			YES																																								
				High Estimate																																									
				Best Estimate			$1,050,000																																							
				Low Estimate																																									
				Exected Value			**$1,050,000**																																							
4	Other (specify):			YES																																								
	Capital costs for trenchless crossing			High Estimate																																									
				Best Estimate			$1,361,818																																							
				Low Estimate																																									
				Exected Value			**$1,361,818**																																							
5	Other (specify):			YES																																								
	Capital costs for pump station			High Estimate																																									
				Best Estimate			$525,000																																							
				Low Estimate																																									
				Exected Value			**$525,000**																																							
6	Other (specify):			YES																																								
	Capital costs for site work			High Estimate																																									
				Best Estimate			$200,000																																							
				Low Estimate																																									
				Exected Value			**$200,000**																																							
7	Other (specify):			YES																																								
	Capital costs for building			High Estimate																																									
				Best Estimate			$300,000																																							
				Low Estimate																																									
				Exected Value			**$300,000**																																							
8	Other (specify):			YES																																								
	Capital costs for recycled water hydrants			High Estimate																																								
				Best Estimate			$20,000																																							
				Low Estimate																																									
				Exected Value			**$20,000**																																							
9	O&M costs for recycled water distribution			YES																																								
				High Estimate																																									
				Best Estimate							$118,652	$122,686	$126,857	$131,170	$135,630	$140,242	$145,010	$149,940	$155,038	$160,310	$165,760	$171,396	$177,223	$183,249	$189,479	$195,922	$202,583	$209,471	$216,593	$223,957	$231,572	$239,445	$247,586	$256,004	$264,708	$273,708	$283,014	$292,637	$302,586	$312,874	$323,512	$334,512	$345,885	$357,645	$369,805	$382,378	$395,379
				Low Estimate																																									
				Exected Value							**$118,652**	**$122,686**	**$126,857**	**$131,170**	**$135,630**	**$140,242**	**$145,010**	**$149,940**	**$155,038**	**$160,310**	**$165,760**	**$171,396**	**$177,223**	**$183,249**	**$189,479**	**$195,922**	**$202,583**	**$209,471**	**$216,593**	**$223,957**	**$231,572**	**$239,445**	**$247,586**	**$256,004**	**$264,708**	**$273,708**	**$283,014**	**$292,637**	**$302,586**	**$312,874**	**$323,512**	**$334,512**	**$345,885**	**$357,645**	**$369,805**	**$382,378**	**$395,379**
10	O&M costs for storage			YES																																								
				High Estimate																																									
				Best Estimate							$70,496	$72,893	$75,371	$77,934	$80,583	$83,323	$86,156	$89,086	$92,114	$95,246	$98,485	$101,833	$105,296	$108,876	$112,577	$116,405	$120,363	$124,455	$128,687	$133,062	$137,586	$142,264	$147,101	$152,102	$157,274	$162,621	$168,150	$173,867	$179,779	$185,891	$192,212	$198,747	$205,504	$212,491	$219,716	$227,186	$234,911
				Low Estimate																																									
				Exected Value							**$70,496**	**$72,893**	**$75,371**	**$77,934**	**$80,583**	**$83,323**	**$86,156**	**$89,086**	**$92,114**	**$95,246**	**$98,485**	**$101,833**	**$105,296**	**$108,876**	**$112,577**	**$116,405**	**$120,363**	**$124,455**	**$128,687**	**$133,062**	**$137,586**	**$142,264**	**$147,101**	**$152,102**	**$157,274**	**$162,621**	**$168,150**	**$173,867**	**$179,779**	**$185,891**	**$192,212**	**$198,747**	**$205,504**	**$212,491**	**$219,716**	**$227,186**	**$234,911**
11	O&M costs for reclamation treatment			YES																																								
				High Estimate																																									
				Best Estimate							$105,000	$108,570	$112,261	$116,078	$120,025	$124,106	$128,325	$132,688	$137,200	$141,865	$146,688	$151,675	$156,832	$162,165	$167,678	$173,379	$179,274	$185,370	$191,672	$198,189	$204,927	$211,895	$219,099	$226,549	$234,251	$242,216	$250,451	$258,967	$267,772	$276,876	$286,290	$296,023	$306,088	$316,495	$327,256	$338,383	$349,888
				Low Estimate																																									
				Exected Value							**$105,000**	**$108,570**	**$112,261**	**$116,078**	**$120,025**	**$124,106**	**$128,325**	**$132,688**	**$137,200**	**$141,865**	**$146,688**	**$151,675**	**$156,832**	**$162,165**	**$167,678**	**$173,379**	**$179,274**	**$185,370**	**$191,672**	**$198,189**	**$204,927**	**$211,895**	**$219,099**	**$226,549**	**$234,251**	**$242,216**	**$250,451**	**$258,967**	**$267,772**	**$276,876**	**$286,290**	**$296,023**	**$306,088**	**$316,495**	**$327,256**	**$338,383**	**$349,888**
12	Other (specify):			YES																																								
	O&M costs for pump station			High Estimate																																									
				Best Estimate							$26,250	$27,143	$28,065	$29,020	$30,006	$31,026	$32,081	$33,172	$34,300	$35,466	$36,672	$37,919	$39,208	$40,541	$41,920	$43,345	$44,819	$46,342	$47,918	$49,547	$51,232	$52,974	$54,775	$56,637	$58,563	$60,554	$62,613	$64,742	$66,943	$69,219	$71,572	$74,006	$76,522	$79,124	$81,814	$84,596	$87,472
				Low Estimate																																									
				Exected Value							**$26,250**	**$27,143**	**$28,065**	**$29,020**	**$30,006**	**$31,026**	**$32,081**	**$33,172**	**$34,300**	**$35,466**	**$36,672**	**$37,919**	**$39,208**	**$40,541**	**$41,920**	**$43,345**	**$44,819**	**$46,342**	**$47,918**	**$49,547**	**$51,232**	**$52,974**	**$54,775**	**$56,637**	**$58,563**	**$60,554**	**$62,613**	**$64,742**	**$66,943**	**$69,219**	**$71,572**	**$74,006**	**$76,522**	**$79,124**	**$81,814**	**$84,596**	**$87,472**
13	Other (specify):			YES																																								
	O&M costs for energy			High Estimate																																									
				Best Estimate							$19,643	$20,311	$21,001	$21,715	$22,453	$23,217	$24,006	$24,822	$25,666	$26,539	$27,441	$28,374	$29,339	$30,337	$31,368	$32,435	$33,537	$34,678	$35,857	$37,076	$38,336	$39,640	$40,988	$42,381	$43,822	$45,312	$46,853	$48,446	$50,093	$51,796	$53,557	$55,378	$57,261	$59,208	$61,221	$63,302	$65,455
				Low Estimate																																									
				Exected Value							**$19,643**	**$20,311**	**$21,001**	**$21,715**	**$22,453**	**$23,217**	**$24,006**	**$24,822**	**$25,666**	**$26,539**	**$27,441**	**$28,374**	**$29,339**	**$30,337**	**$31,368**	**$32,435**	**$33,537**	**$34,678**	**$35,857**	**$37,076**	**$38,336**	**$39,640**	**$40,988**	**$42,381**	**$43,822**	**$45,312**	**$46,853**	**$48,446**	**$50,093**	**$51,796**	**$53,557**	**$55,378**	**$57,261**	**$59,208**	**$61,221**	**$63,302**	**$65,455**
14	Other (specify):			YES																																								
	O&M costs for labor			High Estimate																																									
				Best Estimate							$90,000	$93,060	$96,224	$99,496	$102,879	$106,376	$109,993	$113,733	$117,600	$121,598	$125,733	$130,008	$134,428	$138,998	$143,724	$148,611	$153,664	$158,888	$164,290	$169,876	$175,652	$181,624	$187,799	$194,185	$200,787	$207,614	$214,673	$221,971	$229,518	$237,322	$245,391	$253,734	$262,361	$271,282	$280,505	$290,042	$299,904
				Low Estimate																																									
				Exected Value							**$90,000**	**$93,060**	**$96,224**	**$99,496**	**$102,879**	**$106,376**	**$109,993**	**$113,733**	**$117,600**	**$121,598**	**$125,733**	**$130,008**	**$134,428**	**$138,998**	**$143,724**	**$148,611**	**$153,664**	**$158,888**	**$164,290**	**$169,876**	**$175,652**	**$181,624**	**$187,799**	**$194,185**	**$200,787**	**$207,614**	**$214,673**	**$221,971**	**$229,518**	**$237,322**	**$245,391**	**$253,734**	**$262,361**	**$271,282**	**$280,505**	**$290,042**	**$299,904**
15	Other (specify):			YES																																								
	Contingencies			High Estimate																																									
				Best Estimate	$542,752																																									
				Low Estimate																																									
				Exected Value	**$542,752**																																								
16	Other (specify):			YES																																								
	Engineering, Construction Management, Administration, and Design			High Estimate																																								
				Best Estimate	$542,752																																								
				Low Estimate																																									
				Exected Value	**$542,752**																																								
17	Other (specify):			YES																																								
	Disinfection Process			High Estimate																																									
				Best Estimate			$732,677																																							
				Low Estimate																																									
				Exected Value			**$732,677**																																							
18	Other (specify):			YES																																								
	Diesel Energy			High Estimate																																									
				Best Estimate			$92,698																																							
				Low Estimate																																									
				Exected Value			**$92,698**																																							
19	Other (specify):			YES																																								
	2% Loan Interest			High Estimate																																									
				Best Estimate							$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484	$99,484
				Low Estimate																																									
				Exected Value							**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**	**$99,484**
				Annual Total	$1,085,504	$0	$7,523,508	$0	$0	$0	$529,524	$544,145	$559,264	$574,896	$591,060	$607,774	$625,056	$642,925	$661,402	$680,508	$700,262	$720,689	$741,810	$763,649	$786,231	$809,580	$833,723	$858,687	$884,500	$911,191	$938,789	$967,325	$996,832	$1,027,342	$1,058,889	$1,091,509	$1,125,238	$1,160,113	$1,196,175	$1,233,462	$1,272,017	$1,311,884	$1,353,105	$1,395,728	$1,439,801	$1,485,371	$1,532,492

4.3 Evaluate Project

Alternative: **Name Of Alternative**
Project Participant: **Project Users**

User Input

Discount Rate 6.00%

Table 4C: Project Evaluation

A	B	C	D	E	F
Year	Annual Benefits	Discounted Benefits	Annual Costs	Discounted Costs	Net Benefits (discounted)
2024	$0	$0	$1,085,504	$1,219,672	-$1,219,672
2025	$0	$0	$0	$0	$0
2026	$0	$0	$7,523,508	$7,523,508	-$7,523,508
2027	$0	$0	$0	$0	$0
2028	$0	$0	$0	$0	$0
2029	$0	$0	$0	$0	$0
2030	$989,075	$783,440	$529,524	$419,433	$364,007
2031	$1,022,703	$764,223	$544,145	$406,617	$357,606
2032	$1,057,475	$745,478	$559,264	$394,259	$351,219
2033	$1,093,430	$727,193	$574,896	$382,339	$344,854
2034	$1,130,606	$709,356	$591,060	$370,839	$338,518
2035	$1,169,047	$691,957	$607,774	$359,740	$332,216
2036	$1,208,794	$674,984	$625,056	$349,028	$325,956
2037	$1,249,893	$658,428	$642,925	$338,685	$319,743
2038	$1,292,390	$642,278	$661,402	$328,697	$313,581
2039	$1,336,331	$626,524	$680,508	$319,049	$307,476
2040	$1,381,766	$611,157	$700,262	$309,727	$301,430
2041	$1,428,746	$596,166	$720,689	$300,718	$295,448
2042	$1,477,324	$581,543	$741,810	$292,011	$289,532
2043	$1,527,553	$567,279	$763,649	$283,592	$283,687
2044	$1,579,489	$553,364	$786,231	$275,451	$277,913
2045	$1,633,192	$539,791	$809,580	$267,577	$272,215
2046	$1,688,721	$526,551	$833,723	$259,959	$266,592
2047	$1,746,137	$513,636	$858,687	$252,588	$261,048
2048	$1,805,506	$501,037	$884,500	$245,453	$255,584
2049	$1,866,893	$488,747	$911,191	$238,547	$250,200
2050	$1,930,367	$476,759	$938,789	$231,861	$244,899
2051	$1,996,000	$465,065	$967,325	$225,385	$239,680
2052	$2,063,864	$453,658	$996,832	$219,114	$234,544
2053	$2,134,035	$442,530	$1,027,342	$213,038	$229,493
2054	$2,206,592	$431,676	$1,058,889	$207,151	$224,525
2055	$2,281,616	$421,088	$1,091,509	$201,445	$219,642
2056	$2,359,191	$410,759	$1,125,238	$195,915	$214,844
2057	$2,439,404	$400,684	$1,160,113	$190,554	$210,130
2058	$2,522,344	$390,856	$1,196,175	$185,356	$205,500
2059	$2,608,103	$381,269	$1,233,462	$180,315	$200,954
2060	$2,696,779	$371,917	$1,272,017	$175,426	$196,491
2061	$2,788,469	$362,794	$1,311,884	$170,683	$192,112
2062	$2,883,277	$353,896	$1,353,105	$166,081	$187,815
2063	$2,981,309	$345,215	$1,395,728	$161,616	$183,599
2064	$3,082,673	$336,748	$1,439,801	$157,282	$179,466
2065	$3,187,484	$328,488	$1,485,371	$153,076	$175,412
2066	$3,295,859	$320,431	$1,532,492	$148,992	$171,438
	$71,142,438	**$19,196,966**	**$43,221,961**	**$18,320,778**	**$876,188**

Supplementary Table for Project Evaluation

	Volume (AF)	Net Benefit/AF
Total RW Delivered	**25,883**	**$34**
Total Fresh Water Alternative	**33,648**	**$26**

4.4 Sensitivity Analysis

Alternative	**Alternative**	*User Input*
Project Participant	**Project Participant**	

Table 4D: Summary of Sensitivity Analysis

A	B	C	D
Variable 1 - Discount Rate			
Discount Rate Values	Total Monetized Benefit Discounted	Total Monetized Cost Discounted	Total Monetized Net Benefit Discounted
3.00%	$34,894,219	$25,864,934	$9,029,285
4.00%	$28,242,005	$22,669,925	$5,572,080
5.00%	$23,145,004	$20,219,633	$2,925,371
6.00%	$19,196,966	$18,320,778	$876,188
7.00%	$16,105,491	$16,834,026	-$728,535
8.00%	$13,658,476	$15,658,140	-$1,999,664
9.00%	$11,700,847	$14,718,971	-$3,018,124

*Note: Please see guidance for assessment of values

Discount Rate Incremental Change

1.00 %

Table 4D: Economic Assessment

ECONOMIC ASSESSMENT

RECYCLED WATER

annual cost/acre-ft	**$1,669.90**	/acre-ft
Expected Net Present Value (NPV)	**$876,188.34**	
Expected Net Present Value (NPV)/acre-ft	**$26.04**	/acre-ft

Water Recycling is economically cost-effective

Cost Effective:
Water recycling is economically cost-effective because the expected net present value per acre-ft for the recycled water project is positive. Therefore the proposed recycled water project is recommended.

Project Information	*User Input*
Name of Agency	Santa Nella County Water District
Name of person conducting analsysis	Bao Cha
Phone number	(209) 694-4766
email:	bao@blackwater-eng.com
Reuse project information	
Project name	Recycled Water Feasibility Study
Project location	Santa Nella, California
Indirect potable, or non-potable water production	Non-potable water production
Does the project operate year-round or seasonally	Seasonally
Phases of operation (with years)	40
Accounting Perspective	Statewide
Name Of Alternative	Alternative 4: Upgrade of the existing WWTP treatment process to produce tertiary treated effluent for disposal via landscape irrigation within the public right-of-way, at the Forebay Golf Course, and at future developments, via a purple pipe recycled water system.
Project Users	Commercial Landscape Irrigation Parkway Community Park Truck Fill Station Golf Course Future Development

2. Standard Assumptions

User Input

Table 2A: Time and Interest

Description	Amount	Unit
Useful Life of Project	40	years
Installed Capacity (final project)	939	AF per year
Recycled Water Market Price	$1,119	per AF
Potable Water Replacement Factor (for RW)	24.3	
Project Design Year	2024	
Reference Cost Year (Ref Yr)	2020	
First Year of Project Construction	2026	APPROVED
Project First Year of Operation (Last Year of Construction)	2030	APPROVED
Project Last Year of Operation	2066	
Financing Period	40	years
Annual Interest Rate	2.00%	
Discount Rate	6.00%	

Notes:

'Project Last Year of Operation' is equal to 'Project First Year of Operation' and 'Period of Analysis'
'Project Reference Year' is set by 'Project First Year of Operation'
Maximum analysis is 100 years + 2 years for design & construction

3.1 Fresh Water Supply Alternative *User Input*

Table 3A: Annual Fresh Water Alternative Cost	Costs (2020 $)	Comments
Office R&M		
Repairs & Maintenance	$500	
Professional Services		
Engineering Fees	$20,000	
Contract Services	$500	
Operations/R&M		
Chemicals	$24,000	
Fuel	$5,000	
Vehicle Maintenance	$2,500	
Plant Supplies	$18,100	
Plant Equipment Rental	$1,000	
Repair/Maint Plants	$16,990	
R&M Manhole Pumping Wendy's	$0	
Inspection Fees	$4,482	
Utilities		
Utilities-Solid Waste	$354	
Utilities-Well Meter	$15,500	
Utilities-Plant	$36,500	
Water Purchase/Fees		
Standby Charges	$7,860	
Delivery Charges	$25,000	
Water Purchase M&I SLC WC0004	$49,000	
Water Purcase M&I DMC WC0003	$0	
Water Purchase AG DMC WC0001	$0	
Water Purchase AG SLC WC0002	$0	
Total	**$227,286**	

Notes:
Costs represented as present worth values
Without Project assumes future unmet water demand will incur a shortage cost

3.2 Baseline - Total Volume For Entire Project

Table 3B: Total Volume For Entire Project

User Input

	Total Volume (af)
Total Lifetime Recycled Water Produced	**37,572**
Total Lifetime Fresh Water Alternative Produced	**48,843**

*Note: Total lifetime fresh water alternative must be equal to or greater than the total lifetime recycled water produced in order to demonstrate that there is fresh water supply throughout the project

4.0 BENEFITS OF RECYCLED WATER PROGRAM FOR ALTERNATIVE 4

Table 1 - Projected Commercial Water Rates

Parameters	Current	From 2020 Water Rate Study ($/hcf)				Projected Water Rates ($/hcf)						
Fiscal Year	2019	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Rate ($/hcf)	1.25	1.33	1.37	1.42	1.47	1.51	1.56	1.60	1.65	1.70	1.75	1.81
Percent Increase		6%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%

Recycled water rates should be less than potable water rates

For this feasibility study, the cost of the recycled water is 20% less than potable water

Estimated Potable Water Rate in FY 2030-31 ($/hcf) 1.81

Estimated Recycled Water Rate in FY 2030-31 ($/hcf) 1.44

ADD (ac-ft/yr) 939

Estimated revenue of recycled water by FY 2030-31 ($) 590,919 (BENEFITS)

ADDITIONAL FEES FROM ALL CUSTOMERS WHO WILL BENEFIT FROM THE RECYCLED WATER PROGRAM

Table 2 - Benefits of Recycled Water Program

Parameters	Current	From 2020 Water Rate Study				Projected Water Costs						
Fiscal Year	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Variable Water Expenses[1] ($)	312,237	321,526	329,902	338,562	347,517	359,333	371,550	384,183	397,245	410,752	424,717	439,158
Percentage Inflation Rate		3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%	3.4%
Water Production[2] (acre-ft/yr)	488	488	488	488	488	488	488	488	488	488	488	488
Potable Water Cost[3] ($/acre-ft)	640	659	676	694	712	736	761	787	814	841	870	900
Recycled Water Usage[4] (acre-ft/yr)	939	939	939	939	939	939	939	939	939	939	939	939
Recycled Water Benefits ($)	600,734	618,605	634,720	651,383	668,612	691,345	714,851	739,156	764,287	790,273	817,142	844,925 (BENEFITS)

[1]Variable expenses consist of office repairs and maintenance, professional services, operations, utilities, water purchase fees, and SLWD assessments

[2]Raw surface water and groundwater production in 2018

[3]Cost of Potable Water is equal to variable water expenses ($) divided by the water production (acre-ft)

[4]Recycled Water Average Day Demand

4.1 Identify and Quantify Benefits

Alternative: **Alternat**
Project Participant: **Project Par**

User input

Rate: 3.40% (from water rate study)

Table 4A: Identification and Quantification of Benefits

A	B	C	D	F
				Expected Value
Item	**Benefit**	**Comments**	**Quantifiable**	**2024**
1	Avoided costs of water supply development/purchase (potable water)		YES	
			High Estimate	
			Best Estimate	
			Low Estimate	
			Expected Value	**$844,925**
2	Reclaimed water sales revenues		YES	
			High Estimate	
			Best Estimate	$590,919
			Low Estimate	
			Expected Value	**$590,919**
3	Avoided increased groundwater pumping costs with declining groundwater levels Reduces groundwater pumping and overdraft conditions in the groundwater basin.		NO	
4	Increased supply reliability (customer perspective) Improves reliability of existing water supply system by making the system less sensitive to drought conditions.		NO	
5	Local control over water resources (not relying on imported water) Increases degree of local control on water supply, by reducing water demand, a portion of which is dependent on water allocations from the CVP.		NO	
6	Source water protection Reduces surface water demand; consistent with State policies for restoring and protecting fish and wildlife.		NO	
7	Aesthetic values Provides aesthetic benefits for the community by supporting irrigation of areas, even during drought conditions.		NO	
8	Other (specify): Reduces need for future water system improvements and expansion.		NO	
			Annual Total	$0

2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
					$844,925	$873,652	$903,357	$934,071	$965,829	$998,667	$1,032,622	$1,067,731	$1,104,034	$1,141,571	$1,180,385	$1,220,518	$1,262,015	$1,304,924	$1,349,291	$1,395,167	$1,442,603	$1,491,651	$1,542,367	$1,594,808	$1,649,031	$1,705,098	$1,763,072	$1,823,016	$1,884,999	$1,949,089	$2,015,358	$2,083,880	$2,154,732	$2,227,993	$2,303,744	$2,382,072	$2,463,062	$2,546,806	$2,633,398	$2,722,933	$2,815,513
					$844,925	**$873,652**	**$903,357**	**$934,071**	**$965,829**	**$998,667**	**$1,032,622**	**$1,067,731**	**$1,104,034**	**$1,141,571**	**$1,180,385**	**$1,220,518**	**$1,262,015**	**$1,304,924**	**$1,349,291**	**$1,395,167**	**$1,442,603**	**$1,491,651**	**$1,542,367**	**$1,594,808**	**$1,649,031**	**$1,705,098**	**$1,763,072**	**$1,823,016**	**$1,884,999**	**$1,949,089**	**$2,015,358**	**$2,083,880**	**$2,154,732**	**$2,227,993**	**$2,303,744**	**$2,382,072**	**$2,463,062**	**$2,546,806**	**$2,633,398**	**$2,722,933**	**$2,815,513**
					$590,919	$611,010	$631,784	$653,265	$675,476	$698,442	$722,189	$746,743	$772,133	$798,385	$825,530	$853,598	$882,621	$912,630	$943,659	$975,744	$1,008,919	$1,043,222	$1,078,692	$1,115,367	$1,153,290	$1,192,501	$1,233,046	$1,274,970	$1,318,319	$1,363,142	$1,409,489	$1,457,411	$1,506,963	$1,558,200	$1,611,179	$1,665,959	$1,722,602	$1,781,170	$1,841,730	$1,904,349	$1,969,096
					$590,919	**$611,010**	**$631,784**	**$653,265**	**$675,476**	**$698,442**	**$722,189**	**$746,743**	**$772,133**	**$798,385**	**$825,530**	**$853,598**	**$882,621**	**$912,630**	**$943,659**	**$975,744**	**$1,008,919**	**$1,043,222**	**$1,078,692**	**$1,115,367**	**$1,153,290**	**$1,192,501**	**$1,233,046**	**$1,274,970**	**$1,318,319**	**$1,363,142**	**$1,409,489**	**$1,457,411**	**$1,506,963**	**$1,558,200**	**$1,611,179**	**$1,665,959**	**$1,722,602**	**$1,781,170**	**$1,841,730**	**$1,904,349**	**$1,969,096**
$0	$0	$0	$0	$0	$1,435,843	$1,484,662	$1,535,141	$1,587,335	$1,641,305	$1,697,109	$1,754,811	$1,814,474	$1,876,167	$1,939,956	$2,005,915	$2,074,116	$2,144,636	$2,217,553	$2,292,950	$2,370,911	$2,451,522	$2,534,873	$2,621,059	$2,710,175	$2,802,321	$2,897,600	$2,996,118	$3,097,986	$3,203,318	$3,312,231	$3,424,846	$3,541,291	$3,661,695	$3,786,193	$3,914,923	$4,048,031	$4,185,664	$4,327,976	$4,475,128	$4,627,282	$4,784,609

4.2 Identify and Quantify Costs

Alternative / Project Participant: **Alternative / Project Participant**

User input

Rate: 3.40% (from water rate study)

Table 4B: Identification and Quantification of Costs

Item	Cost	Comments		Quantifiable	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066
					Expected Value																																									
1	Capital costs for recycled water distribution			YES																																								
				High Estimate																																									
				Best Estimate			$3,526,722																																							
				Low Estimate																																									
				Expected Value			**$3,526,722**																																							
2	Capital costs for storage			YES																																									
				High Estimate																																									
				Best Estimate			$4,276,361																																							
				Low Estimate																																									
				Expected Value			**$4,276,361**																																							
3	Capital costs for reclamation treatment			YES																																								
				High Estimate																																									
				Best Estimate			$1,395,000																																							
				Low Estimate																																									
				Expected Value			**$1,395,000**																																							
4	Other (specify):			YES																																								
	Capital costs for trenchless crossing			High Estimate																																									
				Best Estimate			$1,361,818																																							
				Low Estimate																																									
				Expected Value			**$1,361,818**																																							
5	Other (specify):			YES																																								
	Capital costs for pump station			High Estimate																																									
				Best Estimate			$715,000																																							
				Low Estimate																																									
				Expected Value			**$715,000**																																							
6	Other (specify):			YES																																								
	Capital costs for site work			High Estimate																																									
				Best Estimate			$200,000																																							
				Low Estimate																																									
				Expected Value			**$200,000**																																							
7	Other (specify):			YES																																								
	Capital costs for building			High Estimate																																									
				Best Estimate			$300,000																																							
				Low Estimate																																									
				Expected Value			**$300,000**																																							
8	Other (specify):			YES																																								
	Capital costs for recycled water hydrants			High Estimate																																								
				Best Estimate			$20,000																																							
				Low Estimate																																									
				Expected Value			**$20,000**																																							
9	O&M costs for recycled water distribution			YES																																								
				High Estimate																																									
				Best Estimate							$169,137	$174,888	$180,834	$186,983	$193,340	$199,914	$206,711	$213,739	$221,006	$228,520	$236,290	$244,324	$252,631	$261,220	$270,102	$279,285	$288,781	$298,599	$308,752	$319,249	$330,104	$341,327	$352,933	$364,932	$377,340	$390,169	$403,435	$417,152	$431,335	$446,001	$461,165	$476,844	$493,057	$509,821	$527,155	$545,078	$563,611
				Low Estimate																																									
				Expected Value							**$169,137**	**$174,888**	**$180,834**	**$186,983**	**$193,340**	**$199,914**	**$206,711**	**$213,739**	**$221,006**	**$228,520**	**$236,290**	**$244,324**	**$252,631**	**$261,220**	**$270,102**	**$279,285**	**$288,781**	**$298,599**	**$308,752**	**$319,249**	**$330,104**	**$341,327**	**$352,933**	**$364,932**	**$377,340**	**$390,169**	**$403,435**	**$417,152**	**$431,335**	**$446,001**	**$461,165**	**$476,844**	**$493,057**	**$509,821**	**$527,155**	**$545,078**	**$563,611**
10	O&M costs for storage			YES																																									
				High Estimate																																									
				Best Estimate							$85,527	$88,435	$91,442	$94,551	$97,766	$101,090	$104,527	$108,081	$111,755	$115,555	$119,484	$123,546	$127,747	$132,090	$136,582	$141,225	$146,027	$150,992	$156,126	$161,434	$166,923	$172,598	$178,466	$184,534	$190,808	$197,296	$204,004	$210,940	$218,112	$225,528	$233,196	$241,124	$249,323	$257,800	$266,565	$275,628	$284,999
				Low Estimate																																									
				Expected Value							**$85,527**	**$88,435**	**$91,442**	**$94,551**	**$97,766**	**$101,090**	**$104,527**	**$108,081**	**$111,755**	**$115,555**	**$119,484**	**$123,546**	**$127,747**	**$132,090**	**$136,582**	**$141,225**	**$146,027**	**$150,992**	**$156,126**	**$161,434**	**$166,923**	**$172,598**	**$178,466**	**$184,534**	**$190,808**	**$197,296**	**$204,004**	**$210,940**	**$218,112**	**$225,528**	**$233,196**	**$241,124**	**$249,323**	**$257,800**	**$266,565**	**$275,628**	**$284,999**
11	O&M costs for reclamation treatment			YES																																									
				High Estimate																																									
				Best Estimate							$139,500	$144,243	$149,147	$154,218	$159,462	$164,883	$170,489	$176,286	$182,280	$188,477	$194,886	$201,512	$208,363	$215,447	$222,773	$230,347	$238,179	$246,277	$254,650	$263,308	$272,261	$281,518	$291,089	$300,986	$311,220	$321,801	$332,742	$344,056	$355,754	$367,849	$380,356	$393,288	$406,660	$420,486	$434,783	$449,566	$464,851
				Low Estimate																																									
				Expected Value							**$139,500**	**$144,243**	**$149,147**	**$154,218**	**$159,462**	**$164,883**	**$170,489**	**$176,286**	**$182,280**	**$188,477**	**$194,886**	**$201,512**	**$208,363**	**$215,447**	**$222,773**	**$230,347**	**$238,179**	**$246,277**	**$254,650**	**$263,308**	**$272,261**	**$281,518**	**$291,089**	**$300,986**	**$311,220**	**$321,801**	**$332,742**	**$344,056**	**$355,754**	**$367,849**	**$380,356**	**$393,288**	**$406,660**	**$420,486**	**$434,783**	**$449,566**	**$464,851**
12	Other (specify):			YES																																									
	O&M costs for pump station			High Estimate																																									
				Best Estimate							$35,750	$36,966	$38,222	$39,522	$40,866	$42,255	$43,692	$45,177	$46,713	$48,302	$49,944	$51,642	$53,398	$55,213	$57,090	$59,032	$61,039	$63,114	$65,260	$67,479	$69,773	$72,145	$74,598	$77,134	$79,757	$82,469	$85,273	$88,172	$91,170	$94,270	$97,475	$100,789	$104,216	$107,759	$111,423	$115,211	$119,128
				Low Estimate																																									
				Expected Value							**$35,750**	**$36,966**	**$38,222**	**$39,522**	**$40,866**	**$42,255**	**$43,692**	**$45,177**	**$46,713**	**$48,302**	**$49,944**	**$51,642**	**$53,398**	**$55,213**	**$57,090**	**$59,032**	**$61,039**	**$63,114**	**$65,260**	**$67,479**	**$69,773**	**$72,145**	**$74,598**	**$77,134**	**$79,757**	**$82,469**	**$85,273**	**$88,172**	**$91,170**	**$94,270**	**$97,475**	**$100,789**	**$104,216**	**$107,759**	**$111,423**	**$115,211**	**$119,128**
13	Other (specify):			YES																																									
	O&M costs for energy			High Estimate																																									
				Best Estimate							$27,306	$28,234	$29,194	$30,187	$31,213	$32,275	$33,372	$34,507	$35,680	$36,893	$38,147	$39,444	$40,785	$42,172	$43,606	$45,088	$46,621	$48,207	$49,846	$51,540	$53,293	$55,105	$56,978	$58,916	$60,919	$62,990	$65,132	$67,346	$69,636	$72,003	$74,452	$76,983	$79,600	$82,307	$85,105	$87,999	$90,991
				Low Estimate																																									
				Expected Value							**$27,306**	**$28,234**	**$29,194**	**$30,187**	**$31,213**	**$32,275**	**$33,372**	**$34,507**	**$35,680**	**$36,893**	**$38,147**	**$39,444**	**$40,785**	**$42,172**	**$43,606**	**$45,088**	**$46,621**	**$48,207**	**$49,846**	**$51,540**	**$53,293**	**$55,105**	**$56,978**	**$58,916**	**$60,919**	**$62,990**	**$65,132**	**$67,346**	**$69,636**	**$72,003**	**$74,452**	**$76,983**	**$79,600**	**$82,307**	**$85,105**	**$87,999**	**$90,991**
14	Other (specify):			YES																																									
	O&M costs for labor			High Estimate																																									
				Best Estimate							$90,000	$93,060	$96,224	$99,496	$102,879	$106,376	$109,993	$113,733	$117,600	$121,598	$125,733	$130,008	$134,428	$138,998	$143,724	$148,611	$153,664	$158,888	$164,290	$169,876	$175,652	$181,624	$187,799	$194,185	$200,787	$207,614	$214,673	$221,971	$229,518	$237,322	$245,391	$253,734	$262,361	$271,282	$280,505	$290,042	$299,904
				Low Estimate																																									
				Expected Value							**$90,000**	**$93,060**	**$96,224**	**$99,496**	**$102,879**	**$106,376**	**$109,993**	**$113,733**	**$117,600**	**$121,598**	**$125,733**	**$130,008**	**$134,428**	**$138,998**	**$143,724**	**$148,611**	**$153,664**	**$158,888**	**$164,290**	**$169,876**	**$175,652**	**$181,624**	**$187,799**	**$194,185**	**$200,787**	**$207,614**	**$214,673**	**$221,971**	**$229,518**	**$237,322**	**$245,391**	**$253,734**	**$262,361**	**$271,282**	**$280,505**	**$290,042**	**$299,904**
15	Other (specify):			YES																																									
	Contingencies			High Estimate																																									
				Best Estimate	$510,513																																									
				Low Estimate																																									
				Expected Value	**$510,513**																																									
16	Other (specify):			YES																																									
	Engineering, Construction Management, Administration, and Design			High Estimate																																									
				Best Estimate	$510,513																																									
				Low Estimate																																									
				Expected Value	**$510,513**																																									
17	Other (specify):			YES																																									
	Disinfection Process			High Estimate																																									
				Best Estimate			$850,297																																							
				Low Estimate																																									
				Expected Value			**$850,297**																																							
18	Other (specify):			YES																																									
	Diesel Energy			High Estimate																																									
				Best Estimate			$101,856																																							
				Low Estimate																																									
				Expected Value			**$101,856**																																							
19	Other (specify):			YES																																									
	2% Loan Interest			High Estimate																																									
				Best Estimate							$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100	$159,100
				Low Estimate																																									
				Expected Value							**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**	**$159,100**
				Annual Total	$1,021,027	$0	$12,747,054	$0	$0	$0	$706,321	$724,927	$744,165	$764,057	$784,625	$805,893	$827,884	$850,623	$874,135	$898,446	$923,584	$949,576	$976,452	$1,004,242	$1,032,977	$1,062,689	$1,093,411	$1,125,177	$1,158,024	$1,191,987	$1,227,105	$1,263,418	$1,300,964	$1,339,788	$1,379,931	$1,421,439	$1,464,359	$1,508,738	$1,554,625	$1,602,073	$1,651,134	$1,701,863	$1,754,317	$1,808,555	$1,864,636	$1,922,624	$1,982,584

4.3 Evaluate Project

Alternative: **Name Of Alternative**
Project Participant: **Project Users**

User Input

Discount Rate 6.00%

Table 4C: Project Evaluation

A	B	C	D	E	F
Year	Annual Benefits	Discounted Benefits	Annual Costs	Discounted Costs	Net Benefits (discounted)
2024	$0	$0	$1,021,027	$1,147,226	-$1,147,226
2025	$0	$0	$0	$0	$0
2026	$0	$0	$12,747,054	$12,747,054	-$12,747,054
2027	$0	$0	$0	$0	$0
2028	$0	$0	$0	$0	$0
2029	$0	$0	$0	$0	$0
2030	$1,435,843	$1,137,323	$706,321	$559,472	$577,850
2031	$1,484,662	$1,109,426	$724,927	$541,707	$567,719
2032	$1,535,141	$1,082,214	$744,165	$524,607	$557,607
2033	$1,587,335	$1,055,669	$764,057	$508,141	$547,527
2034	$1,641,305	$1,029,775	$784,625	$492,284	$537,491
2035	$1,697,109	$1,004,516	$805,893	$477,007	$527,509
2036	$1,754,811	$979,877	$827,884	$462,286	$517,591
2037	$1,814,474	$955,843	$850,623	$448,098	$507,745
2038	$1,876,167	$932,397	$874,135	$434,418	$497,979
2039	$1,939,956	$909,527	$898,446	$421,226	$488,301
2040	$2,005,915	$887,218	$923,584	$408,502	$478,716
2041	$2,074,116	$865,456	$949,576	$396,225	$469,231
2042	$2,144,636	$844,228	$976,452	$384,377	$459,851
2043	$2,217,553	$823,520	$1,004,242	$372,940	$450,581
2044	$2,292,950	$803,321	$1,032,977	$361,897	$441,424
2045	$2,370,911	$783,617	$1,062,689	$351,232	$432,384
2046	$2,451,522	$764,396	$1,093,411	$340,931	$423,465
2047	$2,534,873	$745,647	$1,125,177	$330,977	$414,670
2048	$2,621,059	$727,357	$1,158,024	$321,358	$406,000
2049	$2,710,175	$709,516	$1,191,987	$312,059	$397,457
2050	$2,802,321	$692,113	$1,227,105	$303,069	$389,044
2051	$2,897,600	$675,137	$1,263,418	$294,375	$380,762
2052	$2,996,118	$658,577	$1,300,964	$285,965	$372,612
2053	$3,097,986	$642,423	$1,339,788	$277,829	$364,594
2054	$3,203,318	$626,666	$1,379,931	$269,956	$356,709
2055	$3,312,231	$611,294	$1,421,439	$262,336	$348,958
2056	$3,424,846	$596,300	$1,464,359	$254,960	$341,341
2057	$3,541,291	$581,674	$1,508,738	$247,817	$333,857
2058	$3,661,695	$567,407	$1,554,625	$240,901	$326,506
2059	$3,786,193	$553,489	$1,602,073	$234,201	$319,288
2060	$3,914,923	$539,913	$1,651,134	$227,710	$312,203
2061	$4,048,031	$526,670	$1,701,863	$221,421	$305,249
2062	$4,185,664	$513,752	$1,754,317	$215,326	$298,425
2063	$4,327,976	$501,150	$1,808,555	$209,418	$291,732
2064	$4,475,128	$488,858	$1,864,636	$203,691	$285,167
2065	$4,627,282	$476,867	$1,922,624	$198,137	$278,730
2066	$4,784,609	$465,170	$1,982,584	$192,751	$272,419
	$103,277,726	**$27,868,303**	**$59,015,427**	**$26,483,887**	**$1,384,416**

Supplementary Table for Project Evaluation

	Volume (AF)	Net Benefit/AF
Total RW Delivered	**37,572**	**$37**
Total Fresh Water Alternative	**48,843**	**$28**

4.4 Sensitivity Analysis

Alternative	**Alternative**	*User Input*
Project Participant	**Project Participant**	

Table 4D: Summary of Sensitivity Analysis

A	B	C	D
Variable 1 - Discount Rate			
Discount Rate Values	Total Monetized Benefit Discounted	Total Monetized Cost Discounted	Total Monetized Net Benefit Discounted
3.00%	$50,656,060	$36,363,553	$14,292,507
4.00%	$40,999,018	$32,184,234	$8,814,784
5.00%	$33,599,684	$28,974,808	$4,624,875
6.00%	$27,868,303	$26,483,887	$1,384,416
7.00%	$23,380,398	$24,530,185	-$1,149,787
8.00%	$19,828,057	$22,981,932	-$3,153,875
9.00%	$16,986,160	$21,742,577	-$4,756,417

*Note: Please see guidance for assessment of values

Discount Rate Incremental Change

1.00 %

Table 4D: Economic Assessment

ECONOMIC ASSESSMENT

RECYCLED WATER

annual cost/acre-ft	**$1,570.75**	/acre-ft
Expected Net Present Value (NPV)	**$1,384,416.17**	
Expected Net Present Value (NPV)/acre-ft	**$28.34**	/acre-ft

Water Recycling is economically cost-effective

Cost Effective:
Water recycling is economically cost-effective because the expected net present value per acre-ft for the recycled water project is positive. Therefore the proposed recycled water project is recommended.

APPENDIX D

Energy Analysis

Table E1: Construction of Plant - Energy Consumption for Alternative 2

Task	Type of Equipment	Number of Days	Hours per Day	Usage (hrs)	Horse Power (HP)	Diesel Energy Consumption[1] (gal)
Site work						
Clearing and Grubbing	Front End Loader	10	8	80	500	815
Rough Grading	Front End Loader	10	8	80	500	815
Rough Grading	Excavator	10	8	80	500	815
Installation of site drainage facilities	Excavator	15	8	120	175	428
Installation of site drainage facilities	Vibratory rollers	10	8	80	175	285
Installation of site drainage facilities	Backhoe	15	8	120	120	293
Install site piping	Excavator	10	8	80	175	285
Install site piping	Vibratory rollers	10	8	80	175	285
Install site piping	Backhoe	10	8	80	120	196
Install site electrical conduits	Excavator	10	8	80	175	285
Install site electrical conduits	Vibratory rollers	10	8	80	175	285
Install site electrical conduits	Backhoe	10	8	80	120	196
Finish grading	Front End Loader	20	8	160	500	1,629
Finish grading	Vibratory rollers	5	8	40	250	204
Paving	Paving Machine	5	8	40	175	143
Paving	Front End Loader	5	8	40	500	407
Paving	Vibratory rollers	5	8	40	250	204
Building						
Construct foundation	Front End Loader	20	8	160	250	815
Construct foundation	Vibratory rollers	10	8	80	175	285
Construct foundation	Concrete Truck	15	8	120	200	489
Delivery of equipment	Crane	8	8	64	250	326
Construct walls	Crane	25	8	200	250	1,018
Install roof trussess	Crane	25	8	200	250	1,018
Install roofing	Crane	15	8	120	250	611
Pre-Treatment						
Pour concrete	Concrete Truck	5	8	40	200	163
Delivery of equipment	Crane	2	8	16	250	81
Install pre-treatment and above ground piping	Crane	10	8	80	250	407
Tertiary Filter						
Pour concrete	Concrete Truck	5	8	40	200	163
Delivery of equipment	Crane	2	8	16	250	81
Install filter and above ground piping	Crane	10	8	80	250	407
Disinfection						
Delivery of equipment	Crane	2	6	12	250	61
Install disinfection	Front End Loader	5	8	40	250	204
Storage Tank						
Construct foundation	Front End Loader	15	8	120	250	611
Construct foundation	Vibratory rollers	5	8	40	175	143
Construct foundation	Concrete Truck	8	8	64	200	261
Delivery of equipment	Crane	3	8	24	250	122
Install storage tank	Front End Loader	10	8	80	250	407
Pump Station						
Pour concrete pad	Concrete Truck	5	8	40	200	163
Delivery of equipment	Crane	2	8	16	250	81
Install pumps	Front End Loader	8	8	64	250	326
Install above ground piping	Front End Loader	8	8	64	250	326
					TOTAL	**16,138**

[1] 49.1 Horsepower-hours = 1 gallon of diesel oil

Table E2: Construction of Distribution - Energy Consumption for Alternative 2

Task	Type of Equipment	Pipeline Length (ft)	Number of Days	Hours per Day	Usage (hrs)	Horse Power (HP)	Diesel Energy Consumption[1] (gal)
Bore and Jack (Highway Trenchless Crossing)							
Sawcut Asphalt Concrete	Concrete Power Saw	X	5	8	40	25	20
Excavate and Shore Bore Pits	Excavator	X	6	8	48	175	171
Grade and Place Rock Bottoms - Bore Pits	Front End Loader	X	4	8	32	250	163
Grade and Place Rock Bottoms - Bore Pits	Vibratory Rollers	X	4	8	4	175	14
Set Up / Bore and Jack 16" Steel Casting	Air Compressor	960	6	6	36	78	57
Set Up / Bore and Jack 16" Steel Casting	Crane	960	20	8	160	250	815
Set Up / Bore and Jack 16" Steel Casting	Welding Unit	960	15	8	120	50	122
Install 8" Carrier Pipe and End Seals / Tie In	Air Compressor	960	6	6	36	78	57
Install 8" Carrier Pipe and End Seals / Tie In	Crane	960	20	8	160	250	815
Install 8" Carrier Pipe and End Seals / Tie In	Welding Unit	960	15	8	120	50	122
Backfill Bore Pits	Backhoe	X	5	8	40	120	98
Patch Pave Bore Pits	Backhoe	X	5	8	40	120	98
Patch Pave Bore Pits	Vibratory Rollers	X	4	8	32	175	114
Patch Pave Bore Pits	Paving Machine	X	4	8	32	175	114
HDD (Canal Trenchless Crossing)							
Install Conductor Casing on South End of Alignment	Air Compressor	X	1	8	8	78	13
Install Conductor Casing on South End of Alignment	Crane	X	2	8	16	231	75
Install Conductor Casing on South End of Alignment	Welder	X	1	8	8	46	7
Install Conductor Casing on South End of Alignment	HDD Rig	X	1	8	8	221	36
Install Conductor Casing on North End of Alignment	Air Compressor	X	2	8	16	78	25
Install Conductor Casing on North End of Alignment	Crane	X	2	8	16	231	75
Install Conductor Casing on North End of Alignment	Welder	X	2	8	16	46	15
Install Conductor Casing on North End of Alignment	HDD Rig	X	2	8	16	221	72
Tail String Management during Reaming and Pipe Fusion	Fusion Machine	X	5	8	40	250	204
Tail String Management during Reaming and Pipe Fusion	Excavator	X	5	8	40	158	129
Tail String Management during Reaming and Pipe Fusion	Forklift	X	5	8	40	89	73
Tail String Management during Reaming and Pipe Fusion	Vac Truck	X	5	8	40	220	179
Mobilization, Swab, Pullback, and Demobilization	Drill Rig	1,246	5	8	40	221	180
Mobilization, Swab, Pullback, and Demobilization	Generator	1,246	5	8	40	84	68
Mobilization, Swab, Pullback, and Demobilization	Separation Plant	1,246	5	8	40	100	81
Mobilization, Swab, Pullback, and Demobilization	Excavator, Medium	1,246	5	8	40	175	143
Mobilization, Swab, Pullback, and Demobilization	Excavator, Small	1,246	5	8	40	158	129
Mobilization, Swab, Pullback, and Demobilization	Pump	1,246	5	8	40	84	68
Mobilization, Swab, Pullback, and Demobilization	Vac Truck	1,246	3	8	24	220	108
Construct Siphon Structure - Excavate and Shoring	Excavator	X	20	8	160	158	515
Construct Siphon Structure - Place Rebar and Forms	Backhoe	X	15	8	120	97	237
Construct Siphon Structure - Pour Concrete	Concrete Mix Truck	X	3	6	18	9	3
Construct Siphon Structue - Remove Forms	Backhoe	X	1	8	8	97	16
Construct Siphon Structure - Install Equipment	Backhoe	X	2	6	12	97	24
Upstream and Downstream Piping Tie-Ins and Modification	Excavator	X	7	8	56	158	180
Upstream and Downstream Piping Tie-Ins and Modification	Backhoe	X	7	8	56	97	111
Upstream and Downstream Piping Tie-Ins and Modification	Pump	X	6	8	48	84	82
Downstream Open Cut Piping, Installation of Vaults	Excavator	X	15	8	120	158	386
Downstream Open Cut Piping, Installation of Vaults	Backhoe	X	15	8	120	97	237
Downstream Open Cut Piping, Installation of Vaults	Paving Equipment	X	2	8	16	132	43
Install Pipeline							
Trench and Install 8-inch Recycled Water	Excavators	20,717	41	8	330	175	1,177
Trench and Install 8-inch Recycled Water	Trenchers	20,717	41	8	330	78	525
Trench and Install 8-inch Recycled Water	Backhoe	20,717	41	8	330	120	807
Trench and Install 8-inch Recycled Water	Crane	20,717	41	8	330	250	1,682
Buy and Haul Backfill Materials	Backhoe	X	10	8	80	120	196
Buy and Haul Backfill Materials	Vibratory Rollers	X	10	8	80	175	285
Trench and Install hydrants	Excavators	X	2	6	12	175	43
Trench and Install hydrants	Trenchers	X	2	6	12	78	19
Trench and Install hydrants	Backhoe	X	2	6	12	120	29
Trench and Install hydrants	Crane	X	2	6	12	250	61
Trench and Install 10-inch Recycled Water	Excavators	1,354	3	8	22	175	77
Trench and Install 10-inch Recycled Water	Trenchers	1,354	3	8	22	78	34
Trench and Install 10-inch Recycled Water	Backhoe	1,354	3	8	22	120	53
Trench and Install 10-inch Recycled Water	Crane	1,354	3	8	22	250	110
Buy and Haul Backfill Materials	Backhoe	X	1	8	8	120	20
Buy and Haul Backfill Materials	Vibratory Rollers	X	1	8	8	175	29
						TOTAL	**11,441**

[1]49.1 Horsepower-hours = 1 gallon of diesel oil

Table E3: Construction of Plant - Energy Consumption for Alternative 3

Task	Type of Equipment	Number of Days	Hours per Day	Usage (hrs)	Horse Power (HP)	Diesel Energy Consumption[1] (gal)
Site work						
Clearing and Grubbing	Front End Loader	10	8	80	500	815
Rough Grading	Front End Loader	10	8	80	500	815
Rough Grading	Excavator	10	8	80	500	815
Installation of site drainage facilities	Excavator	15	8	120	175	428
Installation of site drainage facilities	Vibratory rollers	10	8	80	175	285
Installation of site drainage facilities	Backhoe	15	8	120	120	293
Install site piping	Excavator	10	8	80	175	285
Install site piping	Vibratory rollers	10	8	80	175	285
Install site piping	Backhoe	10	8	80	120	196
Install site electrical conduits	Excavator	10	8	80	175	285
Install site electrical conduits	Vibratory rollers	10	8	80	175	285
Install site electrical conduits	Backhoe	10	8	80	120	196
Finish grading	Front End Loader	20	8	160	500	1,629
Finish grading	Vibratory rollers	5	8	40	250	204
Paving	Paving Machine	5	8	40	175	143
Paving	Front End Loader	5	8	40	500	407
Paving	Vibratory rollers	5	8	40	250	204
Building						
Construct foundation	Front End Loader	20	8	160	250	815
Construct foundation	Vibratory rollers	10	8	80	175	285
Construct foundation	Concrete Truck	15	8	120	200	489
Delivery of equipment	Crane	8	8	64	250	326
Construct walls	Crane	25	8	200	250	1,018
Install roof trussess	Crane	25	8	200	250	1,018
Install roofing	Crane	15	8	120	250	611
Pre-Treatment						
Pour concrete	Concrete Truck	8	8	64	200	261
Delivery of equipment	Crane	2	8	16	250	81
Install pre-treatment and above ground piping	Crane	15	8	120	250	611
Tertiary Filter						
Pour concrete	Concrete Truck	8	8	64	200	261
Delivery of equipment	Crane	2	8	16	250	81
Install filter and above ground piping	Crane	15	8	120	250	611
Disinfection						
Delivery of equipment	Crane	2	6	12	250	61
Install disinfection	Front End Loader	8	8	64	250	326
Storage Tank						
Construct foundation	Front End Loader	20	8	160	250	815
Construct foundation	Vibratory rollers	10	8	80	175	285
Construct foundation	Concrete Truck	15	8	120	200	489
Delivery of equipment	Crane	5	8	40	250	204
Install storage tank	Front End Loader	15	8	120	250	611
Pump Station						
Pour concrete pad	Concrete Truck	10	8	80	200	326
Delivery of equipment	Crane	3	8	24	250	122
Install pumps	Front End Loader	15	8	120	250	611
Install above ground piping	Front End Loader	15	8	120	250	611
					TOTAL	**18,497**

[1] 49.1 Horsepower-hours = 1 gallon of diesel oil

Table E4: Construction of Distribution - Energy Consumption for Alternative 3

Task	Type of Equipment	Pipeline Length (ft)	Number of Days	Hours per Day	Usage (hrs)	Horse Power (HP)	Diesel Energy Consumption[1] (gal)
Bore and Jack (Highway Trenchless Crossing)							
Sawcut Asphalt Concrete	Concrete Power Saw	X	5	8	40	25	20
Excavate and Shore Bore Pits	Excavator	X	6	8	48	175	171
Grade and Place Rock Bottoms - Bore Pits	Front End Loader	X	4	8	32	250	163
Grade and Place Rock Bottoms - Bore Pits	Vibratory Rollers	X	4	8	4	175	14
Set Up / Bore and Jack 16" Steel Casting	Air Compressor	960	6	6	36	78	57
Set Up / Bore and Jack 16" Steel Casting	Crane	960	20	8	160	175	570
Set Up / Bore and Jack 16" Steel Casting	Welding Unit	960	15	8	120	50	122
Install 8" Carrier Pipe and End Seals / Tie In	Air Compressor	960	6	6	36	78	57
Install 8" Carrier Pipe and End Seals / Tie In	Crane	960	20	8	160	175	570
Install 8" Carrier Pipe and End Seals / Tie In	Welding Unit	960	15	8	120	50	122
Backfill Bore Pits	Backhoe	X	5	8	40	120	98
Patch Pave Bore Pits	Backhoe	X	5	8	40	120	98
Patch Pave Bore Pits	Vibratory Rollers	X	4	8	32	175	114
Patch Pave Bore Pits	Paving Machine	X	4	8	32	175	114
HDD (Canal Trenchless Crossing)							
Install Conductor Casing on South End of Alignment	Air Compressor	X	1	8	8	78	13
Install Conductor Casing on South End of Alignment	Crane	X	2	8	16	231	75
Install Conductor Casing on South End of Alignment	Welder	X	1	8	8	46	7
Install Conductor Casing on South End of Alignment	HDD Rig	X	1	8	8	221	36
Install Conductor Casing on North End of Alignment	Air Compressor	X	2	8	16	78	25
Install Conductor Casing on North End of Alignment	Crane	X	2	8	16	231	75
Install Conductor Casing on North End of Alignment	Welder	X	2	8	16	46	15
Install Conductor Casing on North End of Alignment	HDD Rig	X	2	8	16	221	72
Tail String Management during Reaming and Pipe Fusion	Fusion Machine	X	5	8	40	250	204
Tail String Management during Reaming and Pipe Fusion	Excavator	X	5	8	40	158	129
Tail String Management during Reaming and Pipe Fusion	Forklift	X	5	8	40	89	73
Tail String Management during Reaming and Pipe Fusion	Vac Truck	X	5	8	40	220	179
Mobilization, Swab, Pullback, and Demobilization	Drill Rig	1,246	5	8	40	221	180
Mobilization, Swab, Pullback, and Demobilization	Generator	1,246	5	8	40	84	68
Mobilization, Swab, Pullback, and Demobilization	Separation Plant	1,246	5	8	40	100	81
Mobilization, Swab, Pullback, and Demobilization	Excavator, Medium	1,246	5	8	40	175	143
Mobilization, Swab, Pullback, and Demobilization	Excavator, Small	1,246	5	8	40	158	129
Mobilization, Swab, Pullback, and Demobilization	Pump	1,246	5	8	40	84	68
Mobilization, Swab, Pullback, and Demobilization	Vac Truck	1,246	3	8	24	220	108
Construct Siphon Structure - Excavate and Shoring	Excavator	X	20	8	160	158	515
Construct Siphon Structure - Place Rebar and Forms	Backhoe	X	15	8	120	97	237
Construct Siphon Structure - Pour Concrete	Concrete Mix Truck	X	3	6	18	9	3
Construct Siphon Structue - Remove Forms	Backhoe	X	1	8	8	97	16
Construct Siphon Structure - Install Equipment	Backhoe	X	2	6	12	97	24
Upstream and Downstream Piping Tie-Ins and Modification	Excavator	X	7	8	56	158	180
Upstream and Downstream Piping Tie-Ins and Modification	Backhoe	X	7	8	56	97	111
Upstream and Downstream Piping Tie-Ins and Modification	Pump	X	6	8	48	84	82
Downstream Open Cut Piping, Installation of Vaults	Excavator	X	15	8	120	158	386
Downstream Open Cut Piping, Installation of Vaults	Backhoe	X	15	8	120	97	237
Downstream Open Cut Piping, Installation of Vaults	Paving Equipment	X	2	8	16	132	43
Install Pipeline							
Trench and Install 8-inch Recycled Water	Excavators	20,717	41	8	330	175	1,177
Trench and Install 8-inch Recycled Water	Trenchers	20,717	41	8	330	78	525
Trench and Install 8-inch Recycled Water	Backhoe	20,717	41	8	330	120	807
Trench and Install 8-inch Recycled Water	Crane	20,717	41	8	330	175	1,177
Buy and Haul Backfill Materials	Backhoe	X	10	8	80	120	196
Buy and Haul Backfill Materials	Vibratory Rollers	X	10	8	80	175	285
Trench and Install hydrants	Excavators	X	2	6	12	175	43
Trench and Install hydrants	Trenchers	X	2	6	12	78	19
Trench and Install hydrants	Backhoe	X	2	6	12	120	29
Trench and Install hydrants	Crane	X	2	6	12	175	43
Trench and Install 10-inch Recycled Water	Excavators	1,354	3	8	22	175	77
Trench and Install 10-inch Recycled Water	Trenchers	1,354	3	8	22	78	34
Trench and Install 10-inch Recycled Water	Backhoe	1,354	3	8	22	120	53
Trench and Install 10-inch Recycled Water	Crane	1,354	3	8	22	175	77
Buy and Haul Backfill Materials	Backhoe	X	1	8	8	120	20
Buy and Haul Backfill Materials	Vibratory Rollers	X	1	8	8	175	29
Trench and Install 16-inch Recycled Water	Excavators	2,002	4	8	32	175	114
Trench and Install 16-inch Recycled Water	Trenchers	2,002	4	8	32	78	51
Trench and Install 16-inch Recycled Water	Backhoe	2,002	4	8	32	120	78
Trench and Install 16-inch Recycled Water	Crane	2,002	4	8	32	175	114
Buy and Haul Backfill Materials	Backhoe	X	1	8	8	120	20
Buy and Haul Backfill Materials	Vibratory Rollers	X	1	8	8	175	29
						TOTAL	**10,801**

[1] 49.1 Horsepower-hours = 1 gallon of diesel oil

Table E5: Construction of Plant - Energy Consumption for Alternative 4

Task	Type of Equipment	Number of Days	Hours per Day	Usage (hrs)	Horse Power (HP)	Diesel Energy Consumption[1] (gal)
Site work						
Clearing and Grubbing	Front End Loader	10	8	80	500	815
Rough Grading	Front End Loader	10	8	80	500	815
Rough Grading	Excavator	10	8	80	500	815
Installation of site drainage facilities	Excavator	15	8	120	175	428
Installation of site drainage facilities	Vibratory rollers	10	8	80	175	285
Installation of site drainage facilities	Backhoe	15	8	120	120	293
Install site piping	Excavator	10	8	80	175	285
Install site piping	Vibratory rollers	10	8	80	175	285
Install site piping	Backhoe	10	8	80	120	196
Install site electrical conduits	Excavator	10	8	80	175	285
Install site electrical conduits	Vibratory rollers	10	8	80	175	285
Install site electrical conduits	Backhoe	10	8	80	120	196
Finish grading	Front End Loader	20	8	160	500	1,629
Finish grading	Vibratory rollers	5	8	40	250	204
Paving	Paving Machine	5	8	40	175	143
Paving	Front End Loader	5	8	40	500	407
Paving	Vibratory rollers	5	8	40	250	204
Building						
Construct foundation	Front End Loader	20	8	160	250	815
Construct foundation	Vibratory rollers	10	8	80	175	285
Construct foundation	Concrete Truck	15	8	120	200	489
Delivery of equipment	Crane	8	8	64	250	326
Construct walls	Crane	25	8	200	250	1,018
Install roof trussess	Crane	25	8	200	250	1,018
Install roofing	Crane	15	8	120	250	611
Pre-Treatment						
Pour concrete	Concrete Truck	10	8	80	200	326
Delivery of equipment	Crane	5	8	40	250	204
Install pre-treatment and above ground piping	Crane	20	8	160	250	815
Tertiary Filter						
Pour concrete	Concrete Truck	10	8	80	200	326
Delivery of equipment	Crane	5	8	40	250	204
Install filter and above ground piping	Crane	20	8	160	250	815
Disinfection						
Delivery of equipment	Crane	3	6	18	250	92
Install disinfection	Front End Loader	10	8	80	250	407
Storage Tank						
Construct foundation	Front End Loader	25	8	200	250	1,018
Construct foundation	Vibratory rollers	15	8	120	175	428
Construct foundation	Concrete Truck	20	8	160	200	652
Delivery of equipment	Crane	10	8	80	250	407
Install storage tank	Front End Loader	20	8	160	250	815
Pump Station						
Pour concrete pad	Concrete Truck	15	8	120	200	489
Delivery of equipment	Crane	5	8	40	250	204
Install pumps	Front End Loader	20	8	160	250	815
Install above ground piping	Front End Loader	20	8	160	250	815
					TOTAL	**20,959**

[1] 49.1 Horsepower-hours = 1 gallon of diesel oil

Table E6: Construction of Distribution - Energy Consumption for Alternative 4

Task	Type of Equipment	Pipeline Length (ft)	Number of Days	Hours per Day	Usage (hrs)	Horse Power (HP)	Diesel Energy Consumption[1] (gal)
Bore and Jack (Highway Trenchless Crossing)							
Sawcut Asphalt Concrete	Concrete Power Saw	X	5	8	40	25	20
Excavate and Shore Bore Pits	Excavator	X	6	8	48	175	171
Grade and Place Rock Bottoms - Bore Pits	Front End Loader	X	4	8	32	250	163
Grade and Place Rock Bottoms - Bore Pits	Vibratory Rollers	X	4	8	4	175	14
Set Up / Bore and Jack 16" Steel Casting	Air Compressor	960	6	6	36	78	57
Set Up / Bore and Jack 16" Steel Casting	Crane	960	20	8	160	175	570
Set Up / Bore and Jack 16" Steel Casting	Welding Unit	960	15	8	120	50	122
Install 8" Carrier Pipe and End Seals / Tie In	Air Compressor	960	6	6	36	78	57
Install 8" Carrier Pipe and End Seals / Tie In	Crane	960	20	8	160	175	570
Install 8" Carrier Pipe and End Seals / Tie In	Welding Unit	960	15	8	120	50	122
Backfill Bore Pits	Backhoe	X	5	8	40	120	98
Patch Pave Bore Pits	Backhoe	X	5	8	40	120	98
Patch Pave Bore Pits	Vibratory Rollers	X	4	8	32	175	114
Patch Pave Bore Pits	Paving Machine	X	4	8	32	175	114
HDD (Canal Trenchless Crossing)							
Install Conductor Casing on South End of Alignment	Air Compressor	X	1	8	8	78	13
Install Conductor Casing on South End of Alignment	Crane	X	2	8	16	231	75
Install Conductor Casing on South End of Alignment	Welder	X	1	8	8	46	7
Install Conductor Casing on South End of Alignment	HDD Rig	X	1	8	8	221	36
Install Conductor Casing on North End of Alignment	Air Compressor	X	2	8	16	78	25
Install Conductor Casing on North End of Alignment	Crane	X	2	8	16	231	75
Install Conductor Casing on North End of Alignment	Welder	X	2	8	16	46	15
Install Conductor Casing on North End of Alignment	HDD Rig	X	2	8	16	221	72
Tail String Management during Reaming and Pipe Fusion	Fusion Machine	X	5	8	40	250	204
Tail String Management during Reaming and Pipe Fusion	Excavator	X	5	8	40	158	129
Tail String Management during Reaming and Pipe Fusion	Forklift	X	5	8	40	89	73
Tail String Management during Reaming and Pipe Fusion	Vac Truck	X	5	8	40	220	179
Mobilization, Swab, Pullback, and Demobilization	Drill Rig	1,246	5	8	40	221	180
Mobilization, Swab, Pullback, and Demobilization	Generator	1,246	5	8	40	84	68
Mobilization, Swab, Pullback, and Demobilization	Separation Plant	1,246	5	8	40	100	81
Mobilization, Swab, Pullback, and Demobilization	Excavator, Medium	1,246	5	8	40	175	143
Mobilization, Swab, Pullback, and Demobilization	Excavator, Small	1,246	5	8	40	158	129
Mobilization, Swab, Pullback, and Demobilization	Pump	1,246	5	8	40	84	68
Mobilization, Swab, Pullback, and Demobilization	Vac Truck	1,246	3	8	24	220	108
Construct Siphon Structure - Excavate and Shoring	Excavator	X	20	8	160	158	515
Construct Siphon Structure - Place Rebar and Forms	Backhoe	X	15	8	120	97	237
Construct Siphon Structure - Pour Concrete	Concrete Mix Truck	X	3	6	18	9	3
Construct Siphon Structue - Remove Forms	Backhoe	X	1	8	8	97	16
Construct Siphon Structure - Install Equipment	Backhoe	X	2	6	12	97	24
Upstream and Downstream Piping Tie-Ins and Modification	Excavator	X	7	8	56	158	180
Upstream and Downstream Piping Tie-Ins and Modification	Backhoe	X	7	8	56	97	111
Upstream and Downstream Piping Tie-Ins and Modification	Pump	X	6	8	48	84	82
Downstream Open Cut Piping, Installation of Vaults	Excavator	X	15	8	120	158	386
Downstream Open Cut Piping, Installation of Vaults	Backhoe	X	15	8	120	97	237
Downstream Open Cut Piping, Installation of Vaults	Paving Equipment	X	2	8	16	132	43
Install Pipeline							
Trench and Install 12-inch Recycled Water	Excavators	23,416	47	8	373	175	1,331
Trench and Install 12-inch Recycled Water	Trenchers	23,416	47	8	373	78	593
Trench and Install 12-inch Recycled Water	Backhoe	23,416	47	8	373	120	912
Trench and Install 12-inch Recycled Water	Crane	23,416	47	8	373	175	1,331
Buy and Haul Backfill Materials	Backhoe	X	10	8	80	120	196
Buy and Haul Backfill Materials	Vibratory Rollers	X	10	8	80	175	285
Trench and Install hydrants	Excavators	X	2	6	12	175	43
Trench and Install hydrants	Trenchers	X	2	6	12	78	19
Trench and Install hydrants	Backhoe	X	2	6	12	120	29
Trench and Install hydrants	Crane	X	2	6	12	175	43
Trench and Install 16-inch Recycled Water	Excavators	3,356	7	8	54	175	191
Trench and Install 16-inch Recycled Water	Trenchers	3,356	7	8	54	78	85
Trench and Install 16-inch Recycled Water	Backhoe	3,356	7	8	54	120	131
Trench and Install 16-inch Recycled Water	Crane	3,356	7	8	54	175	191
Buy and Haul Backfill Materials	Backhoe	X	1	8	8	120	20
Buy and Haul Backfill Materials	Vibratory Rollers	X	1	8	8	175	29
						TOTAL	**11,233**

[1]49.1 Horsepower-hours = 1 gallon of diesel oil

Table E7: Estimated Electrical Loads for Alternatives

		Alternative 1					Alternative 2					Alternative 3					Alternative 4				
Item	Description	# of units	Hp	Total HP	Annual Usage, hours	kWh/yr	# of units	Hp	Total HP	Annual Usage, hours	kWh/yr	# of units	Hp	Total HP	Annual Usage, hours	kWh/yr	# of units	Hp	Total HP	Annual Usage, hours	kWh/yr
1	**Pre-treatment**																				
	Backwash	X	X	X	X	X	2	7.5	15	274	3,063	3	7.5	23	274	4,595	4	7.5	30	274	6,127
2	**Tertiary Filtration**																				
	Rotating Mechanism	X	X	X	X	X	1	0.5	0.5	2,190	817	1	0.5	0.5	8,760	3,267	1	0.5	0.5	17,520	6,535
	Backwash Pumps	X	X	X	X	X	2	7.5	15	274	3,063	2	7.5	15	730	8,169	2	7.5	15	1,460	16,337
3	**Disinfection System**																				
	Ultraviolet	X	X	X	X	X	X	X	X	X	13,333	X	X	X	X	22,000	X	X	X	X	22,000
4	**Pump Station**																				
	Pumping	X	X	X	X	X	1	20	20	1,460	21,783	1	75	75	1,460	81,687	1	110	110	1,460	119,808
5	**Building**																				
	Lights and outlets	X	X	X	X	X	X	X	X	X	6,240	X	X	X	X	6,240	X	X	X	X	6,240
6	**Lights and Miscellaneous Power**																				
	Outdoor Lights	X	X	X	X	X	X	X	X	X	4,993	X	X	X	X	4,993	X	X	X	X	4,993
	TOTAL					0.0					53,293					130,951					182,040

APPENDIX E

Operations Plan

Surface Water Treatment Plant Operations Plan

Santa Nella County Water District

APRIL 2019

Prepared by:
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Santa Nella County Water District™

BLACKWATER CONSULTING ENGINEERS, INC.

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APPENDICES

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1 Surface Water Treatment Plant Operations Personnel

- Pablo Rodriguez, Chief Plant Operator, Grade T3 #25928
  Plant Operator responsible for daily plant operation and monitoring; responsible for supervision of plant operations staff and reporting.
  (209) 826-0920 Administration Office / Main Number
  (209) 829-0439 After-hours Emergency
  (209) 209-9890 Cell phone

- Amy Montgomery, General Manager, Grade T2 #35014
  Chief Executive Officer responsible for oversight and staff support.

- Jeff Black, P.E., District Engineer
  Provides technical support.

The surface water treatment plant is staffed Monday through Friday from 8:00 am to 4:00 pm. The plant is checked on weekends and holidays between the hours of 9:00 am and 12:00 pm for proper operation. The plant has an alarm system that is monitored 24/7 by Protection One Alarm Company and has recently installed an Allen Bradley SCADA System that is still being integrated. During normal work hours alarms are routed to the District office and during off duty hours, weekends, and holidays alarms are routed to the Chief Operator and General Manager via phone call by Protection One and an auto dialer on the SCADA System. After-hours Emergency calls from customers are routed via a message in English and Spanish on the main number that instructs callers to call the After-Hours Emergency number in the event of an emergency. The After-hours emergency number is forwarded to the Chief Operator during outside normal working hours.

2 Surface Water Treatment Plant Description

The Santa Nella County Water District (SNCWD) Surface Water Treatment Plant (SWTP) consists of a conventional treatment system with coagulation, flocculation, sedimentation, multimedia filtration, disinfection by chlorination, and a treated water storage tank. The plant is designed for an average daily flow of 1.2 million gallons per day (mgd) with a peak capacity of 1.8 mgd. The plant is equipped with a generator in the event of power failures. Continuous monitoring equipment at the SWTP records raw water flow, raw water turbidity, treated water pH, treated water turbidity, storage tank level, booster pump station wet well chlorine residual, and treated water from storage tank chlorine residual.

There are two pump stations at the SWTP: a raw water pump station and a booster pump station that pumps treated water to the storage tank. When the plant runs in automatic mode and the water level in the treated water storage tank reaches a predetermined level, raw water pumps are called to run one at a time and pump raw water to one or both of the treatment modules. Water then flows through the treatment modules by gravity to the booster pump station. Disinfection of the treated water is provided by sodium hypochlorite injection after filtration in the pipelines that flow to the booster pump station. When the water level reaches a predetermined setpoint in the booster pump station wet well, the booster pumps are called on to pump treated chlorinated water to the storage tank. Treated water flows from the storage tank to the main water distribution site by gravity.

Detailed equipment information is included in Appendix A.

3 Monitoring Locations and Sampling Frequencies

- Flow is measured at the raw water pump station from the Department of Water Resources DWR venturi meter through a Rosemount Model 1151 transmitter. The raw water flow rate is monitored continuously on a chart recorder. The treated water flow meter at the outlet of the storage tank is currently out of service.

- Turbidity is measured at the raw water pump station and from the treated water entering the storage tank. Both turbidity readings are monitored continuously on a chart recorder. An alarm system automatically deactivates the SWTP and notifies an operator (via telephone/SCADA) when the combined filter effluent turbidity exceeds 0.2 NTU.

- Disinfectant chlorine residuals are monitored at the treated water booster pump station wet well and at the outlet of the treated water storage tank. The chlorine residuals are continuously monitored on a chart recorder. An alarm system automatically deactivates the SWTP and notifies an operator (via telephone/SCADA) if the free chlorine concentration at the outlet of the treated water storage tank falls below 0.3 mg/L.

- Testing for raw water total and fecal coliform and treated water total coliform is performed monthly by an outside lab, currently, J&L Analytical Laboratory in Modesto.

- Treated water from the storage tank is tested for pH and continuously monitored on a chart recorder.

- A sample tap is located in the sink of the operations control building for daily grab sampling for treated water turbidity, pH, and chlorine residual testing.

- Online metering equipment is calibrated quarterly and annually by Cooper Controls.

- All required water testing is summarized in Appendix B.

4 CT Calculations

At least once per day, a spreadsheet is used to calculate actual and required CT values for the following two disinfectant contact units: 1) the treated water storage tank; and, 2) the transmission pipeline from the treated water storage tank to the main distribution station. Under non-emergency conditions, SNCWD is required to achieve 0.5-$\log_{10}$ *Giardia* inactivation through disinfection. During emergencies, the *Giardia* inactivation requirement (and the required chlorine dose) may be increased, and rapid implementation of the Emergency Disinfection Plan (included in Appendix C) may be necessary. Additional inactivation of pathogens via higher CT values > 300 is achieved through the SWTP storage tank, 10 inch by 2.5-mile transmission line.

A LOW DAILY CT RATIO MAY BE A TIER 1 VIOLATION OF CALIFORNIA SURFACE WATER TREATMENT REGULATIONS, REQUIRING IMMEDIATE PUBLIC NOTIFICATION AND A BOIL WATER ORDER. OPERATORS SHOULD CONTACT THE STATE WATER RESOURCES CONTROL BOARD, DIVISION OF DRINKING WATER (SWRCB-DDW), MERCED DISTRICT OFFICE IMMEDIATELY (559-447-3300) IF ANY DAILY CT RATIO IS LESS THAN 1.00.

The following parameters are utilized in the CT calculations: 1) peak hour flow rate leaving the treated water storage tank; 2) minimum water level within the treated water storage tank; 3) minimum free chlorine concentration at the treated water storage tank outlet; 4) minimum free chlorine concentration at the main distribution station; 5) minimum treated water temperature; and, 6) maximum treated water pH. For process monitoring locations, refer to the Treatment Process Schematic included in Appendix D. SWTP disinfection benchmark and profile information (included in Appendix E) suggests that the most challenging temperature and pH conditions occur in December.

Because the treated water flow meter is currently out of service, the peak hour flow rate is calculated based upon operation of filtered water pumps (located between the filters and the treated water storage tank) and water level fluctuations within the treated water storage tank. The following scenarios exist:

a) One Pump in Operation – If only one filtered water pump operates during the peak demand hour of a given day, then the peak hour flow rate is the flow from one filtered water pump (420 gpm) plus the drain rate of the treated water storage tank.

b) Two Pumps in Operation – If two filtered water pumps operate during the peak demand hour of a given day, then the peak hour flow rate is the flow from two filtered water pumps (840 gpm) plus the drain rate of the treated water storage tank.

The treated water storage tank capacity is 330,000 gallons. The total volume of the transmission pipeline is approximately 100,000 gallons. (According to SNCWD records, the transmission pipeline is 24 inches in diameter from the California Aqueduct to the Delta-Mendota Canal, and 10 inches in diameter from the Delta-Mendota Canal to the main distribution station. Therefore, the transmission pipeline includes more than 3,200 feet of 24-inch diameter pipe and more than 6,300 feet of 10-inch pipe.) The accepted baffling factors (or T10/T values) for the treated water storage tank and the transmission pipeline are 0.1 and 1.0, respectively.

As an example, assume the following are observed during a day: 1) the minimum free chlorine concentration at the treated water storage tank outlet is 1.0 mg/L; 2) the minimum free chlorine concentration at the main distribution station is 0.5 mg/L; 3) the maximum treated water pH is 7.5; 4) the minimum treated water temperature is 5 °C; 5) one filtered water pump operates during the peak demand hour; 6) based upon water level data, the drain rate from the treated water storage tank is approximately 280 gpm during the peak demand hour; and, 7) the minimum water level within the treated water tank is 24.0 feet. CT would be calculated as follows:

$CT_{tank,\ actual}$ = (1.0 mg/L) x (330,000 gallons / 700 gpm) x (24 feet / 30 feet) x (0.1) = 37.7 mg-min/L

$CT_{pipeline,\ actual}$ = (0.5 mg/L) x (100,000 gallons / 700 gpm) x (1.0) = 71.4 mg-min/L

According to the August 1999 USEPA *Disinfection Profiling and Benchmarking Guidance Manual*, the following CT values would be required:

$CT_{tank, required}$ = 30 mg-min/L

$CT_{pipeline, required}$ = 29 mg-min/L

And, the CT ratio would be calculated as follows:

CT ratio = [(37.7 mg-min/L) / (30 mg-min/L)] + [(71.4 mg-min/L) / (29 mg-min/L)] = 3.7

5 Standardization Procedures and Frequencies for All Monitoring Equipment

- The bench model turbidity meter is a Hach portable model 2100Q and is calibrated monthly in accordance with manufacturer's manual.

- Continuous turbidity analyzers are Hach 1720 C and Hach 1720E models and are calibrated monthly per the following procedures:
  1. Pour 1 liter of low turbidity water into clean, dry cylinder.
  2. Place clean, dry turbidimeter head on cylinder and gently swirl.
  3. Press SYSTEM RESET.
  4. Enter 6 SIG AVG and let measurement stabilize. Enter 0.0 STD.
  5. Shake bottle of Formazin and dispense 5 mL of Formazin into cylinder using the TenSette Pipette and mix with stir rod. Replace head, gently swirl cylinder, and allow measurement to stabilize. Enter 20.0 STD.

- Calibration with StablCal®:
  1. From the Main Menu, select SENSOR SETUP and confirm.
  2. Select the appropriate sensor if more than one is connected and confirm.
  3. Select CALIBRATE and confirm.
  4. Select STABLCAL CAL and confirm. Select the available Output Mode (Active, Hold or Transfer) from the list and confirm.
  5. Enter the standard turbidity value of the user prepared standard solution and confirm.
  6. Drain/clean/rinse the turbidimeter body or cal cylinder. Pour the 20 NTU standard into the cylinder body. Replace the head and confirm.
  7. The measured reading (based on a gain of 1.0) is displayed. Confirm.
  8. The display will read GOOD CAL! GAIN:X.XX ENTER TO CONT. Confirm. (if the calibration was unsuccessful, the display will read BAD CAL! Confirm to redo or exit).
  9. The display will read VERIFY CAL? Confirm to verify or exit without verification.
  10. Select the VERIFICATION type or enter initials to complete calibration.
  11. Return the sensor to measure mode and confirm.

- Continuous chlorine residual analyzers consist of a Hach CL17 that measures chlorine residual at the booster pump station clear well and a Hach CL17 that measures chlorine residual in the effluent of the treated water storage tank. The chlorine analyzers are checked for calibration

weekly using manufacturer's instruction manual. Both units are checked daily by comparative chlorine residuals analysis using a portable Hach pocket colorimeter II chlorine residual meter.

- The continuous monitoring pH meter is a Great Lakes International model and measures treated water from the effluent of the treated water storage tank.

- The portable pH meter is a Thermo Scientific and is used to measure raw water pH daily. The meter is calibrated daily using standard buffer solution.

6 Methods for Determining Appropriate Chemicals, Dosages, and Application Points to Achieve Optimal Plant Performance

- Utilizing past plant experience, initial jar tests for polymer dosages are performed twice a year, spring and fall, to determine polymer dosage. Additional jar tests are performed as needed if turbidity performance goals are not met. The coagulants used are PRAESTOL K2001C and PRAESTOL 186K manufactured by Solenis Chemical Company. The chemical feed rates range from 10 to 45 mg/L or 1 to 5 gpd.

- Once polymer dosages are calculated, feed pumps are set to pump chemical at desired dosage using a 4-20 mA signal from the raw water flow meter which doses in a flow paced mode. The stroke rate of the chemical feed pumps can be adjusted using the control knob with settings of 0 to 100 percent to fine tune chemical feed rates. The minimum recommended stroke adjustment is 10 percent. Volumetric calibration, chemical usage in gallons per day is conducted to assure accurate dosage is met. The full procedure for chemical feed pump calibration can be found in the SWTP Operations & Maintenance (O&M) Manual Chapter 6, Pages 6-6 & 6-7.

- Chlorine dosages are calculated and adjusted using a flow proportional setpoint control to achieve desired residual through the PLC controller located on the control panel in the operations building. Residuals are checked at the Hach CL 17 online chlorine analyzer and cross checked with portable Hach pocket colorimeter II chlorine residual meter. Due to chemical degradation of sodium hypochlorite during seasonally low flows that result in longer storage times, it may sometimes be necessary to increase proportional setpoint to maintain desired residuals. Chlorine dosage range is 1.5 to 2.0 mg/L.

7 Performance Goals

Performance goals for the coagulation, flocculation, sedimentation and disinfection processes include the following:

- Achieve NTU of 1 or less in settled water turbidity
- Achieve NTU of < 0.3 in treated water turbidity
- Chlorine residual @ booster pump station – 2.0 mg/L
- Chlorine residual of treated water from Storage Tank – 0.9 to 1.1 mg/L

8 Plant Startup and Shutdown Operation Procedures

Plant startup and shutdown operation procedures are detailed in SWTP O&M manual in chapters # 2 thru 5, pg. 2-1 to 5-3.

9 Filter Runs

Criteria to determine length of filter runs is based on experience and head loss rates. The filters are backwashed every fourth day or when head loss reaches 4 psi or greater. There is no recycle operation from backwash recovery pond water at this time.

10 Sludge Handling

Sludge is removed from sedimentation tanks utilizing the traveling suction collection system known as the Trac Vac system. The sludge is allowed to thicken in the sedimentation tanks and is removed once every 2 weeks and pumped to the sludge lagoons. The operation of the Trac Vac system and sludge handling is outlined in the SWTP O & M Manual Chapter 3, Pages 3-2 to 3-4 and is included in Appendix F. The sludge lagoons are checked quarterly for sludge depth and as needed, sludge is allowed to dry and hauled to sanitary landfill.

11 Distribution and Blending with Well 1

The District has one alternative water supply source that is currently online to supplement the District's water supply. A well (Well 1) located on Henry Miller Rd just west of the Central California Irrigation District (CCID) currently supplies approximately 250 gpm of supplement water. The well pumps water to a 10,000-gallon holding tank located behind the treated water distribution booster pump building. A booster pump in the well blending station pulls water out the tank which is then pumped through a flow meter and chlorinated with a Pulsafeeder chemical metering pump in a flow paced mode. Control of the well pump is based upon the water level within the 10,000-gallon tank. If desired, the well pump can also be activated manually. Water from Well 1 enters the distribution system in a pipeline located on the northwesterly side of the distribution building.

Water from the SWTP enters the distribution system through the distribution room. The treated water booster pumps at the distribution site, located behind the District Office, is equipped with a variable frequency drive and is controlled by: 1) a timer; and, 2) distribution system pressure.

Blending of the well water and treated water occurs within the distribution system. The existing piping configuration does not allow implementation of a uniform blending ratio. SNCWD utilizes Well 1 to accomplish the following: 1) offset the use of California Aqueduct water outside of the San Luis Water District boundary; and, 2) reduce trihalomethane concentrations within the distribution system by introducing water with a relatively low concentration of disinfection byproduct precursors. Simultaneously, operation of Well 1 must be limited to accomplish the following: 1) prevent excessive water age within the transmission pipeline and maintain an adequate free chlorine concentration at the end of the transmission pipeline; and, 2) avoid unacceptable total dissolved solids (TDS) concentrations within the distribution system.

12 System Pressure

- The normal operational pressure range within the distribution line is approximately 42 to 55 psi. If the distribution line pressure drops to 42 psi, then one booster pump located in the main distribution station is automatically activated to maintain system pressure. If the distribution line pressure continues to drop and reaches 40 psi, then a second booster pump in the main distribution station is automatically activated to maintain system pressure. Booster pumps de-activate when the distribution line pressure rises to 55 psi. The booster pumps are configured in parallel, and the capacity of each booster pump is 1,000 gpm at 150 feet of total dynamic head. The booster pumps operate on a Variable Frequency Drive (VFD) and activate infrequently usually for a short period (usually less than 10 minutes). When the booster pumps activate, the treated water storage tank drain rate (used for CT calculations) increases significantly.

- The main distribution system is equipped with a generator to supply energy for operation in the event of a power outage. The generator is run monthly and serviced annually.

13 Emergency Disinfection Plan

The Emergency Disinfection Plan is included in Appendix C.

14 Daily Log and Equipment Checklist

A daily log equipment checklist (included in Appendix G) is used each day to record the status of the SWTP equipment and to document needed maintenance and repairs. The preventative maintenance program for the SWTP is detailed in the O & M manual Chapter 10, Pages 10-1 to 10-4 and is included in Appendix H. Annual calibration for all metered equipment is conducted by Cooper Controls, Inc. The plant generator shall be run monthly and serviced annually.

15 Cleaning and Inspection

The treated water storage tank and the booster reservoir are cleaned and inspected every two (2) years. The last cleaning and inspection was completed on November 5, 2018.

16 Filter Inspection

The filter media is inspected monthly to quarterly, depending on how frequently the need is to pressure wash the treatment trains. Filter inspection consists of checking media levels: Anthracite - 24 inches, Silica - 10 inches, Garnet - 3 inches. If Anthracite is low, more is added to bring it up to 24 inches. Backwash of the filters to waste removes color and seasons the media. . Anthracite will be replaced depending on formation.

17 Monitoring Records and Reporting

- All water quality monitoring is maintained on daily logs and transferred to monthly reporting spreadsheets. All monthly reporting is recorded by plant staff and reviewed by the General

Manager prior to submitting reports to the State Water Resources Control Division of Drinking Water.

- The quantity of water produced, plant flow rates, filtration rates, backwash rates, chemical usage, dosage data, and hours of operation are recorded on daily logs and reported monthly.

18 Chemical and Equipment Suppliers

The following are the names, addresses, and phone numbers of chemical and equipment suppliers:

- Sodium Hypochlorite for disinfection (NaOCl) @ 12.5%
  Brenntag
  175 N Hughes
  Fresno, CA 93706
  (559) 485-4150

- Praestol K2001C and 186K polymer
  Solenis, LLC
  3 Beaver Valley Road, Suite 500
  Wilmington, DE 19803

- Chemical Pump Distributor & Emergency Service
  Cooper Controls, Inc.
  3233 Lance Drive, Suite B
  Stockton, CA 95205
  (209) 339-4571

19 Supervisory Control and Data Acquisition (SCADA)

- Santa Nella County Water District has installed a SCADA system at the SWTP. The system allows the operator to remotely monitor and control the SWTP production process. The SCADA system gives the operator full control to turn pumps on and/or off, make polymer and chlorine adjustments and alternate pumps at the raw and booster pump stations.

- The SCADA system monitors and allows remote control of the following:

  1. Raw water pump station
  2. Flow meter in MGD
  3. Totalizer raw NTU analyzer
  4. Treatment Trains #1 and #2
  5. Filter 1 and 2 levels
  6. Booster pump station tank level
  7. Booster pump station
  8. Total chlorine analyzer
  9. Storage tank level,
  10. Treated NTU analyzer

11. Free chlorine analyzer
12. pH analyzer
13. Water treatment plant run time.

- The pump controller consists of the raw and booster pump station components. The operator has the ability to remotely alternate pumps, as well as turn them off and/or on.

- Chemical pumps, the operator has the ability to:
    1. Remotely alternate chlorine pumps #1 and #2
    2. Adjust chlorine pump speed (%)
    3. Adjust polymer pump speed (%)
    4. Adjust Chlorine pump off delay (sec)

- Setpoints, the operator has the ability to:
    1. Alternate and adjust the on and/or off levels for the raw and booster pump stations
    2. Adjust the storage and booster tank levels and alarms
    3. Adjust setpoints for the raw water NTU, treated water NTU, chlorine high and low, pH high and low, NTU alarm delay and chlorine alarm delay

- The alarms consist of:
    1. Alarm summary
    2. Alarm message
    3. Activate alarm
    4. De-activate alarm
    5. Total number of alarms
    6. Alarm reset
    7. Clear all alarms

    The alarms should be tested once a week for function.

20 Alarm Monitoring Services

Protection One (P1) provides alarm monitoring services for burglary and SWTP system failures. P1 system failure alarms will be used for 6 to 12 months to ensure the SCADA system is functioning properly. Eventually P1 system failure alarms will be removed, but the burglar alarms will remain.

- A list of all alarms included in Appendix I.

Appendix A

Water Treatment Plant Design Criteria

Santa Nella County Water District
Surface Water Treatment Plant
Design Criteria

Plant Capacity

- Average daily flow – 1.2 MGD
- Peak daily flow – 1.8 MGD

Raw Water Pump Station

- Three (3) pumps @ 5 HP and 420 GPM @ 27 TDH
- Intake pipe: 30 inches in diameter
- Intake bar screen: 9.3 sq. ft. with 2.3-inch bar spacing

Rapid Mixers

- One (1) static mixer, 12 inches in diameter

Modular Treatment Units

- Two (2) @ 0.9 MGD capacity each

Flocculation (2 per module)

- Two (2) flocculators @ 0.5 HP each adjustable speed w/ 5:1 gear reduction
- Detention time @ average daily flow – 22.5 minutes
- Basin dimensions – 12 ft x 11 ft x 10 ft water depth

Sedimentation Tank (1 per module)

- Rectangular type w/ tube settlers and sludge siphon removal system (Trac Vac)
- Surface loading rate @ average daily flow – 1 gpm/sq. ft.
- Detention time per module @ average daily flow – 75 minutes
- Tank dimension – 35 ft x 12 ft x 10 ft water depth

Filtration Tanks (1 per module)

- Multi media type
- Filtration rate per tank @ average daily flow – 3.33 gpm/sq. ft.
- Filtration tank dimensions – 12 ft x 10.5 ft x 10 ft water depth
- Surface area – 126 sq. ft.

Filter Media (per module)

- Anthracite coal – 1.0 to 1.1 mm @ 24 inches deep
- Silica sand – 0.5 to 0.6 mm @ 10 inches deep
- Garnet – 0.25 to 0.32 mm @ 3 inches deep

Booster Pump Station

- Three (3) pumps @ 7.5 HP and 420 GPM @ 40 TDH

Treated Water Storage Tank

- Welded Steel Tank, 32 ft high x 45 ft diameter w/ 350,000 gallon capacity or 12,000 gallons per ft at a depth of 29.4 ft (fire storage = 120,000 gallons)

Plant Water System

- One (1) feed pump @ 5 HP and 90 GPM @ 160 ft TDH
- Hydropneumatic Tank – 1,050 gallon capacity

Backwash System

- Backwash (water from treated water storage tank) – 20 gpm/sq. ft. or 2,520 gpm w/ 20 ft. of head
- Backwash volume used per filtration tank – 32,750 gallons
- Surface wash (from plant water system) – surface sweep of 0.5 gpm/sq. ft. or 63 gpm
- Wash water recovery ponds – 2 @ 85,000 gallons each
- Recovered water pump – 1 @ 1.5 HP and 80 gpm @ 34 TDH
- Sludge lagoons – 2 @ 150,000 gallons each

Chemical Feed Pumps

- Propac 9890 polymer is fed by a LMI 1.0 gph pump
- Propac 9800 polymer is fed by a Premia 75 1.83 gph pump
- Sodium hypochlorite is fed by two (2) Pulsafeeder 1.0 gph pumps
- Spare polymer pump - Premia 75 1.83 gph feed pump

Chemical Feed Systems

Chemicals	Dosage, mg/L	Feed Rate	Storage
Praestol K2001C	10 - 45	0.2 – 10 gpd	4 – 53 gallon drums
Praestol 186K	10 - 45	0.2 – 10 gpd	3 – 53 gallon drums
Sodium hypochlorite*	1.5 - 3.0	5.0 – 20 gpd	4 – 53 gallon drums

PLC setpoint for sodium hypochlorite = 1.5 to 2.5 manual/proportional control

* Sodium Hypochlorite chemical strength is 12.5%

Appendix B

Water Quality Monitoring Schedule

Santa Nella County Water District
Surface Water Treatment Plant
Water Quality Monitoring Schedule

Daily Analysis

- Raw turbidity
- Treated water turbidity
- Treated water chlorine residual
- Distribution system chlorine residual
- Raw water pH
- Treated water pH

Monthly Analysis

- Raw water – MPN total and fecal coliform, alkalinity, and TOC
- Treated water – MFT total coliform, TOC
- Well 1 – MFT, total coliform
- Distribution system – MFT, total coliform, and chlorine residual testing @ 2 sampling locations per month rotating between the following locations: McDonalds, RV Park, Wendy's, Carl's Jr., Denny's, Distribution Room.

Quarterly Analysis

- Disinfection Byproduct compliance – TTHM and HAA5 sampled @ Carl's Jr.

Appendix C

Emergency Disinfection Plan

Santa Nella County Water District
Surface Water Treatment Plant
Emergency Disinfection Plan
March 2019

PLAN OBJECTIVE

This plan provides an outline of the equipment and procedures needed for rapid and continuous chlorination of water entering the SNCWD distribution system during emergencies such as earthquakes, fires, vandalism, broken distribution lines, and other operational problems.

The goals of this plan are: 1) to enable the SNCWD to maintain a minimum chlorine residual of at least 1.0 mg/L during emergency situations at all points in the distribution system; and, 2) to ensure that the CT ratio is greater than or equal to 1.00 during emergency situations. When fires occur and booster pumps within the main distribution station operate for extended periods, implementation of this plan may be necessary to boost the residual chlorine concentration and maintain a CT ratio of greater than or equal to 1.00. Note that the flow rate through the two disinfectant contact units (the storage tank and transmission pipeline) could exceed 1,500 gpm during such events, requiring operators to rapidly increase the rate of chlorination.

When emergency chlorination is performed, the State Water Resources Control Board-Division of Drinking Water (559-447-3300) and the Merced County Health Department (209-381-1200) should be notified immediately and the Emergency Disaster/ Response Plan should be implemented.

Disinfection System Description

The surface water treatment plant disinfection system consists of using liquid sodium hypochlorite that is fed by chemical feed pumps. The sodium hypochlorite is supplied at 12.5% NaOCl in 53-gallon drums that are stored inside the chemical room. There is one primary and one backup pump with a maximum capacity of 24 gallons per pump per day of NaOCl. One pump is capable of supplying enough chemical to achieve proper chlorine dosage at a maximum flow of 1.2 mgd. The current maximum daily flow ranges from 0.3 to 0.8 mgd. In the event of no available chemical feed equipment, chlorine can be hand calculated and manually fed by removing the access cover at the wet well booster station located between the treatment trains and treated water storage tank. Chlorine can be added as a batch process e.g. pumping rate (1 raw water pump) 420 gpm x 60 min = 25,200 or 0.0252 mgd x 4mg/L x 8.34 = 0.84 lbs. chlorine / (12.5% x 8.34) = 0.8 gal/NaOCl added during the 60 minute period.

The backup NaOCl pump is ready to use in the event the primary pump fails or for use to maximize chlorine dosage in the event of an emergency to achieve a chlorine residual in the distribution system of 1.0 mg/L. There are three (3) 53-gallon drums of sodium hypochlorite (NaOCl) on hand for disinfection. At an average daily flow of 0.5 mgd this equates to an inventory supply for 18 days of disinfection.

The SNCWD also has a well and a well blending station that has a 42 gallon per hour NaOCl pump that chlorinates water from the District's well. There is a 30 gallon supply of 12.5% NaOCl maintained at the well blending station. At an average daily flow of well water of 95,000 gallons at a chlorine dosage of 2 mg/L an 18-day inventory supply for disinfection is maintained in the well blending building. The well

water is chlorinated and blended with treated water from the surface water treatment plant at the main distribution station. If the transmission line between the SWTP and the main distribution station fails due to earthquake, breakage or other cause, the well blending station can be used to supply chlorinated well water to the community. The main distribution system can be isolated from the community by closing the valve located between the hydropneumatic tank and the main distribution station building. This would provide reduced flow to the community and would require additional notification of reduced flow/pressure notices to public, schools, and fire department. The public would be notified utilizing the district's Emergency Disaster/Response Plan and Emergency Notification Plan (ENP).

If the well blending station cannot supply backup water to the distribution station due to well pump failure, well contamination or other causes, the station can be shut down and isolated from the main distribution station. The well blending station NaOCl pump can be used at the SWTP plant as a primary or backup feed pump to supply disinfection for increased flows generated due to well out of service or for increased chlorine residuals. The combined inventory supply of sodium hypochlorite for the District under normal operating conditions is > 30 days. The combined inventory supply of sodium hypochlorite for the District under emergency operating conditions is 15 days. Additional chlorine can be purchased from supplier and delivered within three (3) days.

In event of an emergency, when the Emergency Disinfection Plan is activated, all dead ends in the distribution system will be flushed and samples tested at locations listed below in this plan to achieve a chorine residual of 1.0 mg/L.

1. Map of distribution system indicating surface water source, wells, storage tanks, booster stations, chlorination feed points and location of chlorine residual test sample sites are located in the District office along with the Bacteriological siting plan. As a reference the sample test sites are McDonalds, RV Park, Wendy's, Carl Jr., and Denny's.

2. Type and model of chlorinator(s) plus flow data at each point of chlorination:

    - Two (2) Sodium hypochlorite Pulsafeeder 1.0 gph pumps located at the SWTP
    - One (1) Sodium hypochlorite Pulsafeeder 1.75 gph pump located at the well blending station

3. Chlorine residuals will be tested using the HACH colorimeter II chlorine residual tester.

4. Chlorine residual test results are maintained in the District office.

5. Name and grade of certified water treatment plant operators.

    - Pablo Rodriguez Grade 3 WTP operator
    - Amy Montgomery Grade 2 WTP operator

Control and Monitoring

1. When Emergency Disinfection Plan is in use, the chlorination facilities will be inspected daily and records kept.

2. During the duration of the emergency, bacteriological samples will be collected daily at the (6) six distribution sampling sites outlined in the bacteriological siting plan

3. A free chlorine residual of greater than 1.0 mg/L will be maintained, monitored, and recorded during the emergency situation.

4. Monthly reports will be submitted as required by the SWRCB-DDW when the equipment is in use.

Appendix D

Treatment Process Schematic

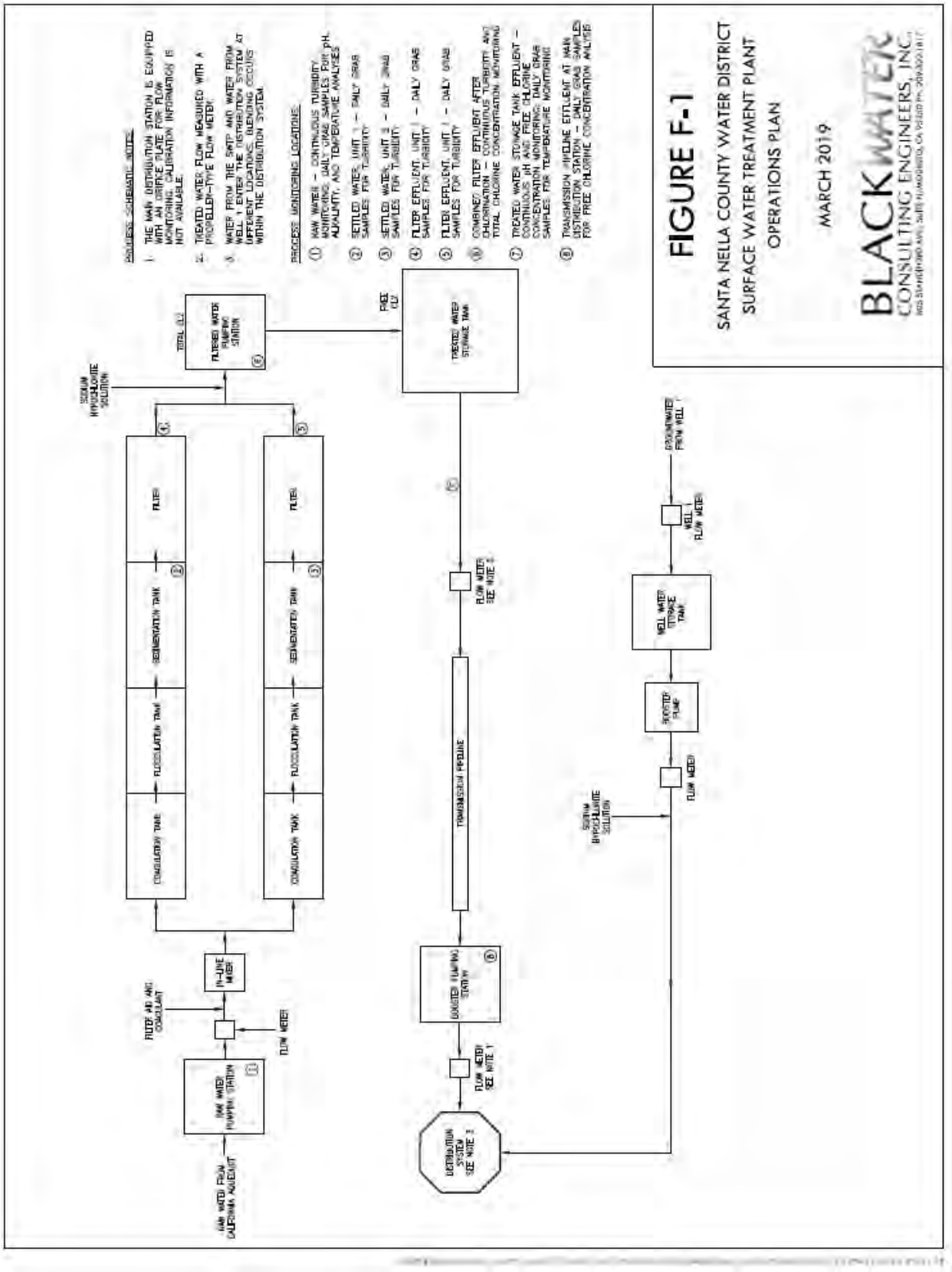
FIGURE F-1
SANTA NELLA COUNTY WATER DISTRICT
SURFACE WATER TREATMENT PLANT
OPERATIONS PLAN
MARCH 2019
BLACKWATER
CONSULTING ENGINEERS, INC.
PROCESS SCHEMATIC NOTES:
1. THE MAIN DISTRIBUTION STATION IS EQUIPPED WITH AN ORIFICE PLATE FOR FLOW MONITORING. CALIBRATION INFORMATION IS NOT AVAILABLE.
2. TREATED WATER FLOW MEASURED WITH A PROPELLER-TYPE FLOW METER.
3. WATER FROM THE SWTP AND WATER FROM WELL 1 ENTER THE DISTRIBUTION SYSTEM AT DIFFERENT LOCATIONS, BLENDING OCCURS WITHIN THE DISTRIBUTION SYSTEM.
PROCESS MONITORING LOCATIONS:
① RAW WATER – CONTINUOUS TURBIDITY MONITORING, DAILY GRAB SAMPLES FOR pH, ALKALINITY, AND TEMPERATURE ANALYSES
② SETTLED WATER, UNIT 1 – DAILY GRAB SAMPLES FOR TURBIDITY
③ SETTLED WATER, UNIT 2 – DAILY GRAB SAMPLES FOR TURBIDITY
④ FILTER EFFLUENT, UNIT 1 – DAILY GRAB SAMPLES FOR TURBIDITY
⑤ FILTER EFFLUENT, UNIT 1 – DAILY GRAB SAMPLES FOR TURBIDITY
⑥ COMBINED FILTER EFFLUENT AFTER CHLORINATION – CONTINUOUS TURBIDITY AND TOTAL CHLORINE CONCENTRATION MONITORING
⑦ TREATED WATER STORAGE TANK EFFLUENT – CONTINUOUS pH AND FREE CHLORINE CONCENTRATION MONITORING, DAILY GRAB SAMPLES FOR TEMPERATURE MONITORING
⑧ TRANSMISSION PIPELINE EFFLUENT AT MAIN DISTRIBUTION STATION – DAILY GRAB SAMPLES FOR FREE CHLORINE CONCENTRATION ANALYSIS
RAW WATER FROM CALIFORNIA AQUEDUCT
RAW WATER PUMPING STATION
FLOW METER
FILTER AID AND COAGULANT
IN-LINE MIXER
CONFLUENCE TANK
FLOCCULATION TANK
SEDIMENTATION TANK
FILTER
SODIUM HYPOCHLORITE SOLUTION
FILTERED WATER PUMPING STATION
TOTAL CL2
FREE CL2
TREATED WATER STORAGE TANK
FLOW METER SEE NOTE 2
TRANSMISSION PIPELINE
BOOSTER PUMPING STATION
FLOW METER SEE NOTE 1
DISTRIBUTION SYSTEM SEE NOTE 3
GROUNDWATER FROM WELL 1
WELL 1 FLOW METER
WELL WATER STORAGE TANK
BOOSTER PUMP
FLOW METER
SODIUM HYPOCHLORITE SOLUTION

Appendix E

Disinfection Benchmark and Profile

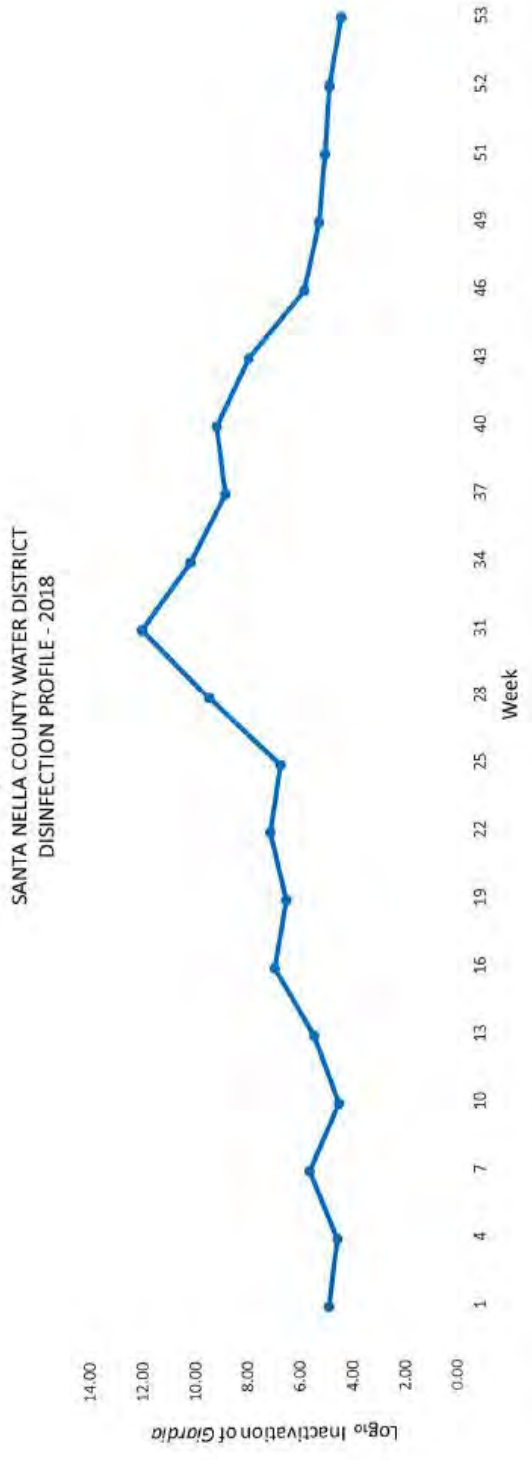

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TABLE 1
SANTA NELLA COUNTY WATER DISTRICT DISINFECTION PROFILE – 2018
WEEKLY CT AND INACTIVATION VALUES

	Daily Min Total CT Ratio							Weekly Min.	Weekly Min Total Log_{10}
Week	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total CT Ratio	*Giardia* Inactivation
1		10.18	10.55	9.84	10.55	10.93	12.14	9.84	4.92
2	11.71	10.93	12.46	13.02	12.58	11.63	12.05	10.93	5.47
3	12.05	10.85	12.05	12.05	12.91	13.83	11.63	10.85	5.43
4	9.13	10.50	11.63	11.23	11.23	10.48	10.93	9.13	4.57
5	11.71	9.78	12.53	11.69	10.58	12.53	11.69	9.78	4.89
6	12.55	18.99	17.10	13.42	11.69	12.10	12.53	11.69	5.85
7	11.69	11.69	11.29	12.53	12.53	11.30	12.55	11.29	5.65
8	11.89	10.91	10.18	11.69	10.91	10.18	10.18	10.18	5.09
9	11.69	11.30	9.84	11.29	11.52	11.29	10.18	9.84	4.92
10	9.84	10.18	10.50	9.17	9.03	9.91	10.93	9.03	4.52
11	9.55	12.97	12.11	11.30	11.38	11.29	11.29	9.55	4.78
12	11.29	10.54	11.29	11.29	12.53	12.10	12.53	10.54	5.27
13	12.11	10.91	11.29	12.10	12.96	15.41	15.96	10.91	5.46
14	17.10	14.89	14.89	15.96	14.89	15.96	17.15	14.89	7.45
15	16.54	16.54	20.34	18.37	15.49	15.43	16.58	15.43	7.72
16	20.40	14.89	14.89	13.90	13.90	13.90	16.54	13.90	6.95
17	18.99	15.41	16.51	17.69	15.41	14.38	15.96	14.38	7.19
18	15.41	12.96	12.10	11.29	12.53	13.90	15.41	11.29	5.65
19	12.97	17.08	17.10	14.90	14.38	15.41	17.10	12.97	6.49
20	13.89	13.42	13.90	13.45	12.53	12.97	13.89	12.53	6.27
21	14.89	13.42	12.53	12.53	13.42	13.42	13.89	12.53	6.27
22	16.51	18.95	21.03	16.51	14.29	18.21	18.84	14.29	7.15
23	27.55	20.31	25.71	20.26	12.55	15.96	14.34	12.55	6.28
24	14.90	15.41	19.61	20.31	20.31	17.69	12.97	12.97	6.49
25	13.42	17.69	19.61	24.03	22.43	22.38	24.83	13.42	6.71
26	20.89	15.95	24.13	15.96	13.42	19.61	21.03	13.42	6.71
27	19.61	23.31	14.88	14.38	18.31	18.95	23.31	14.38	7.19
28	24.98	21.76	25.85	18.95	27.70	27.70	21.76	18.95	9.48
29	23.31	23.31	23.31	23.31	23.99	26.76	23.31	23.31	11.66
30	25.87	24.98	25.85	25.85	24.98	22.52	22.52	22.52	11.26
31	24.98	27.70	26.76	26.76	23.98	28.41	30.87	23.98	11.99
32	30.10	31.93	27.81	22.61	27.12	30.10	28.35	22.61	11.31
33	31.19	30.38	29.85	26.81	27.59	25.87	32.06	25.87	12.94
34	30.78	35.67	22.70	27.06	25.99	20.34	23.35	20.34	10.17
35	21.80	19.68	21.09	18.85	24.03	23.35	23.35	18.85	9.43
36	25.02	21.80	25.02	44.74	49.56	25.31	27.59	21.80	10.90
37	26.22	27.72	30.56	24.15	17.69	19.63	19.63	17.69	8.85
38	18.95	18.32	19.63	17.69	19.63	20.31	21.03	17.69	8.85
39	23.19	23.31	20.31	20.31	22.54	23.19	19.63	19.63	9.82
40	20.31	22.54	20.31	22.54	20.76	18.32	21.03	18.32	9.16
41	20.76	19.37	22.54	16.99	17.46	17.46	18.70	16.99	8.50
42	18.70	19.37	16.29	16.51	18.95	15.41	25.22	15.41	7.71
43	21.54	16.51	17.67	18.93	15.96	16.51	17.10	15.96	7.98
44	17.10	15.41	17.58	17.58	17.58	17.58	17.58	15.41	7.71
45	18.74	19.51	18.21	16.41	16.44	13.81	14.29	13.81	6.91
46	12.53	13.82	13.34	12.53	12.96	11.69	12.69	11.69	5.85
47	11.94	11.44	12.26	11.62	12.53	12.10	12.53	11.44	5.72
48	12.10	11.69	12.53	11.69	13.82	12.53	13.34	11.69	5.85
49	13.34	12.45	14.32	14.32	10.91	10.54	11.62	10.54	5.27
50	10.91	11.44	10.18	10.18	10.18	11.54	10.91	10.18	5.09
51	10.18	12.26	10.54	12.96	14.89	11.82	10.54	10.18	5.09
52	12.02	11.62	11.14	11.54	10.54	10.18	9.84	9.84	4.92
53	9.18	8.87						8.87	4.44

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TABLE 2
SANTA NELLA COUNTY WATER DISTRICT
DISINFECTION PROFILE – 2018
MONTLY AVERAGE INACTIVATION VALUES AND OPERATIONAL PARAMETERS

Month	Treated Water Production, millions of gallons	Average Raw Water Temperature, °C	Average Treated Water pH	Total Log_{10} *Giardia* Inactivation, Average of Daily Minimum Values
Jan	7.99	13	7.6	5.05
Feb	8.61	14	7.7	5.38
Mar	8.74	15	7.9	5.00
Apr	8.43	18	7.6	7.33
May	11.59	17	7.9	6.36
Jun	12.18	20	7.9	6.55
Jul	13.01	23	7.8	9.90
Aug	15.59	24	7.5	11.17
Sep	12.73	23	7.6	9.60
Oct	10.95	20	7.7	8.21
Nov	9.51	16	7.7	6.08
Dec	7.31	13	7.8	4.96
Benchmark [a]				4.96

[a] According to the *LTIESWTR Disinfection Profiling and Benchmarking Technical Guidance Manual* (USEPA, May 2003), a disinfection benchmark is the "lowest monthly average microbial inactivation during the disinfection profile time period."

Appendix F

Sludge Handling

Santa Nella County Water District
Surface Water Treatment Plant
Sludge Handling

Sludge accumulates by gravity, aided by the tank's tube settling modules, in the sludge thickening zone at the bottom of the sedimentation tank. A traveling suction collection system is provided on each unit for withdrawal by suction of up to 90 gpm of sludge at approximately 1% concentration. Maintenance of the sludge level is vital to the proper operation of the sedimentation tank. A recommended practice for sludge drawoff intervals is to frequently draw off small amounts of sludge rather than draw off large amounts of sludge all at once. If the sludge level is allowed to build up to a high, the volume for settling will be reduced accordingly and floc may tend to carry over into the effluent launders. This carryover can be seen by observing the water as it flows into the launders. A sudden increase in turbidity of the settled water would indicate that sludge is being carried over into the launders.

The sludge collection system is driven by a pneumatically motivated tractor which is designed to move underwater along a rail that has been mounted on the bottom of the sedimentation tank. Travel speed is adjustable from a microprocessor from 0 to 2 feet per minute and the length of travel adjustable from 1/3 to 100 percent of the basin length.

Refer to the modular treatment units' O&M manual for more Trac-Vac sludge collector system information. The length of travel of the sludge scraper and the frequency will again depend on the quantity of sludge being formed and how it is affecting the treatment process and water quality. See figure 7 for a diagram of the Trac-Vac System.

Automatic sludge blow off controls for the modular treatment units are contained in the Trac-Vac system control pane. Initiation of the sludge blowoff is based upon elapsed flow quantity, or manual selection. Elapsed time and elapsed flow quantity are adjustable in the programmable controller in the Trac-Vac control panel. A timer relay is also provided to adjust the duration of the blowoff (0 to 20 minutes). Elapsed flow is measured from the raw water flow meter (FE-50) and transmitted to the sludge blowoff controls.

Two hand-off-auto hand selector switches are provided on the Trac-Vac control panel, one for each module's sludge blowoff system. A run light is also mounted on the panel, one for each module's sludge blowoff system. A run light is also mounted on the panel to indicate if sludge removal cycle is in progress.

Accumulated sludge is transferred via the Trac-Vac from the sedimentation tank into one of two sludge lagoons at approximately 1% solids. In the sludge lagoons, the 1% sludge is allowed to further settle and thicken itself to approximately 10% solids by gravity. After the thickened sludge has settled to the lower area of the sludge lagoons, "clarified" water can be decanted back to the washwater recovery ponds through the 4-inch drain overflow. The sludge lagoons should be operated so that the sludge in one lagoon is drying while new sludge is flowing to the second lagoon. Once the sludge in the first lagoon is completely dried and the desired amount of sludge is in the second lagoon, the sludge flow should be re-diverted to the first bed.

Generally, once the bottom of the sludge lagoon becomes completely covered with sludge, the flow should be diverted to the second lagoon.

However, because not only the thickness of the sludge, but its drying characteristics and the weather are all factors in how fast the sludge will dry, the plant personnel must experiment with the amount of sludge that is allowed to build up in one lagoon before it is diverted to the second lagoon. The important point to remember is that the old sludge should be completely dry before new sludge is put on top of it if the lagoons are to function properly.

At 840 gpm raw water inflow rate and 15 NTU raw water quality (average), and 15 mg/L average alum dose, sludge can be expected to accumulate in the sedimentation tanks at a rate of 400 pounds per day (or 40 mg/L). Enough storage volume is available in one sludge lagoon for about 20-30 days of sludge accumulation and thickening to 4-5% solids before it must be redirected to the other lagoon.

Appendix G

Compliance Reporting Forms, Daily Log Forms, and Daily Operational Procedures

Santa Nella County Water District

Surface Water Treatment Plant

Daily Log

Date _____

Operator _____

Raw Water Pump Station	Auto	Manual	Off	Comments / hour meter readings
Pump #1				
Pump #2				
Pump #3				

Treatment Trains	Auto	Manual	Off	
Floccuator Mixer #1				
Floccuator Mixer #2				
Trac Vac #1				
Trac Vac #2				
Clarifier #1				
Clarifier #2				
Filter #1				
Filter #2				

Chemical Feed Systems	Auto	Manual	Off	
Polymer Pump 186K				
Polymer Pump K2001				
Chlorine Pump #1				
Chlorine Pump #2				

Clear Well	Auto	Manual	Off	
Pump #1				
Pump #2				
Pump #3				

Backwash Ponds	Auto	Manual	Off	
Recovered Water Pump				

Plant Water system	Auto	Manual	Off	
Pump				
Tank				
Generator				
Diesel Tank				

	Auto	Manual	Off	
Plant Air Compressor #1				
Plant Air Compressor #2				

Meters	On	Off	
Raw Water Turbidity			
Raw Water Flow Meter			
Treated Water pH			
Treated Water Turbidity			
Chlorine Analyzer #1 CW			
Chlorine Analyzer #2 TW			

	AM	PM	
Storage Tank Level			

T:\Treatment Plants\WTP\SWTP Operations Plan\2019\appendix H1 - Daily Log

Santa Nella County Water District
Jar Test Procedures

1. Using a 1,000 ml graduated cylinder, add 1,000 ml of raw water to each of the jar test breakers.
2. Record the temperature, pH, NTU, and alkalinity of raw water before beginning.
3. Dose each breaker

Jar No.	Dosage, mg/L
1	10.0
2	15.0
3	20.0
4	25.0
5	30.0
6	35.0

4. After dosing, turn on stirrers. Procedure should reflect actual plant conditions as closely as possible.
5. Operate the stirrers at a high RPM for one (1) minute to stimulate the static mixer.
6. Reduce speed of stirrers to match the plant flocculator speed. Operate for 30 minutes.
7. Observe the floc formation after 30 minutes.
8. Shut off the stirrers. Let beakers settle and look to see which one has the best results.
9. Take samples and run a NTU sample.

Santa Nella County Water District
Operator Procedures

When pumps at Distribution Room are activated due to pressure level drop, operator should obtain CL 2 residuals.

Record on the CT Excel sheet to see how much to increase CL 2 to meet a CT ratio above 1.0.

If a CT ratio of 1.0 cannot be met, operator should shut down water plant if possible.

Follow instructions on Emergency Chlorination Plan and contact SWRCB-DDW.

Appendix H

Plant Maintenance

Santa Nella County Water District
Surface Water Treatment Plant
Plant Maintenance

Maintenance on all items should follow manufacturer's recommendations whenever possible. The maintenance schedule below is given as a general reference in lieu of manufacturer's instructions.

A. Maintenance Log - TABLE 10-1

Item		Daily	Wk	3 Mo	6 Mo	Yr	As Necessary
Pumps & Motors							
1.	Check pumps for operation	X					
2.	Lubricate pump bearings		X				
3.	Check pump bearings temperature						X
4.	Drain pump bearings, wash with kerosene and relubricate			X			
5.	Check pump bearings for wear			X			
6.	Check alignment of pump and motor flange with straight edge				X		
7.	Check motor for heating	X					
8.	Check pump shaft sleeve			X			
9.	Replace pump shaft sleeve						X
10.	Examine pump wear rings (manufacturer should specify what is excessive)					X	
Flocculation Tanks							
1.	Check flocculators for operator	X					
2.	Flocculator speed check			X			
3.	Mechanical fastener check				X		
4.	Lubricator check				X		
5.	Regrease bearings					X	
6.	Drain and fill reducer					X	

Item		Daily	Wk	3 Mo	6 Mo	Yr	As Necessary
Sedimentation Tank							
1.	Inspect and clean tub settlers	X					
2.	Check low radius	X					
3.	Sludge collector-Trac-Vacs						
	a. Drain sed. Bouls-air filters	X					
	b. Check Air Pressure	X					
	c. Check oil in compressor	X					
	d. Observe color on sludge discharge	X					
	e. Observe Trac-Vac sequence		X				
	f. Inspect electrical and air connections at Basin			X			
	g. Check wear on brakes, rail, sludge hose, and air-line umbicals				X		
Filters							
1.	Water level	X					
2.	Inspect control valves for smooth operation		X				
3.	Adjust, if necessary, back-wash flow rate			X			
4.	Inspect backwash waste storage	X		X			
5.	Flow Meters	X					
6.	Media in interior			X			
Water Storage Tank							
1.	Inspect for leaks		X				
2.	Drain and inspect inside of tank				X		
Washwater Recovery Pond							
1.	Water level	X					
2.	Drain and remove sludge			X			
3.	Exercise valves		X				

Item	Daily	Wk	3 Mo	6 Mo	Yr	As Necessary
Sludge Lagoons						
1. Water level	X					
2. Exercise Valves		X				
3. Dry and remove sludge					X	
Air Compressors						
1. Observe operations	X					
2. Check pressure switch adjustment and observe pressure gauge		X				
3. Drain condensate	X					
Hydropneumatic Tank						
1. Inspect operation of pressure switches and settings			X			
Chemical Feed Systems						
1. Inspect and makeup stock solutions	X					
2. Inspect feed piping for clogging		X				
3. Calibrate feed pumps			X			
4. Wash out mixing tanks and thoroughly clean				X		
5. Check polyelectrolyte dilution water rotameter setting			X			
6. Inspect pumps as per manufacturer's instructions			X			
7. Measure chemical tank levels	X					
8. Operate valves		X				
Chlorinators						
1. Inspect for leaks	X					
2. Operate valves		X				
3. Check water system		X				
4. Check gas system		X				
5. Clean cabinet and working parts			X			

Appendix I

Alarm List

SCADA System Alarms
Water Treatment Plant
Treated High NTU
Treated Low NTU
Treated High CL 2
Treated Low CL 2
Storage Tank Low Level
Stoarage Tank High Level
Booster Pump Station High Tank Level
Booster Pump Station Low Tank Level
Treated pH High
Treated pH Low
Raw High NTU
Raw Low NTU

Auto Dialer
Water Treatment Plant
Power Failure

P1 Zone	Location Description	Alarm Type	Status
Water Treatment Plant			
1	Entry Motion Detector	Burglar	Online
2	Control Room Motion Detector	Burglar	Online
3	Chemical Room Motion Detector	Burglar	Online
4	Chlorine Room Motion Detector	Burglar	Online
5	Tank Motion Tamper	System	Online
6	Tank Motion Detector - Treatment Trains	System	Off line
7	Storage Tank Low	System	Online
8	Storage Tank high	System	Online
9	Entry Door	Burglar	Online
10	Chemical Room Front	Burglar	Online
11	Chemical Room Side	Burglar	Online
17	High Chlorine Alert	System	Online
18	Low Chlorine Alert	System	Online
19	Phone Alarm #1	Burglar	Online
20	Phone Alarm #2	Burglar	Online
21	Turbidity High	System	Online
22	Turbidity Low	System	Online
Distribution Room			
1	Entry Front Door	Burglar	Online
2	Entry Side Door	Burglar	Online
3	Motion Detector	Burglar	Online
Blending Room			
1	Entry Front Door	Burglar	Online
2	Motion Detector	Burglar	Online

Santa Nella County Water District

Certificate Requirements

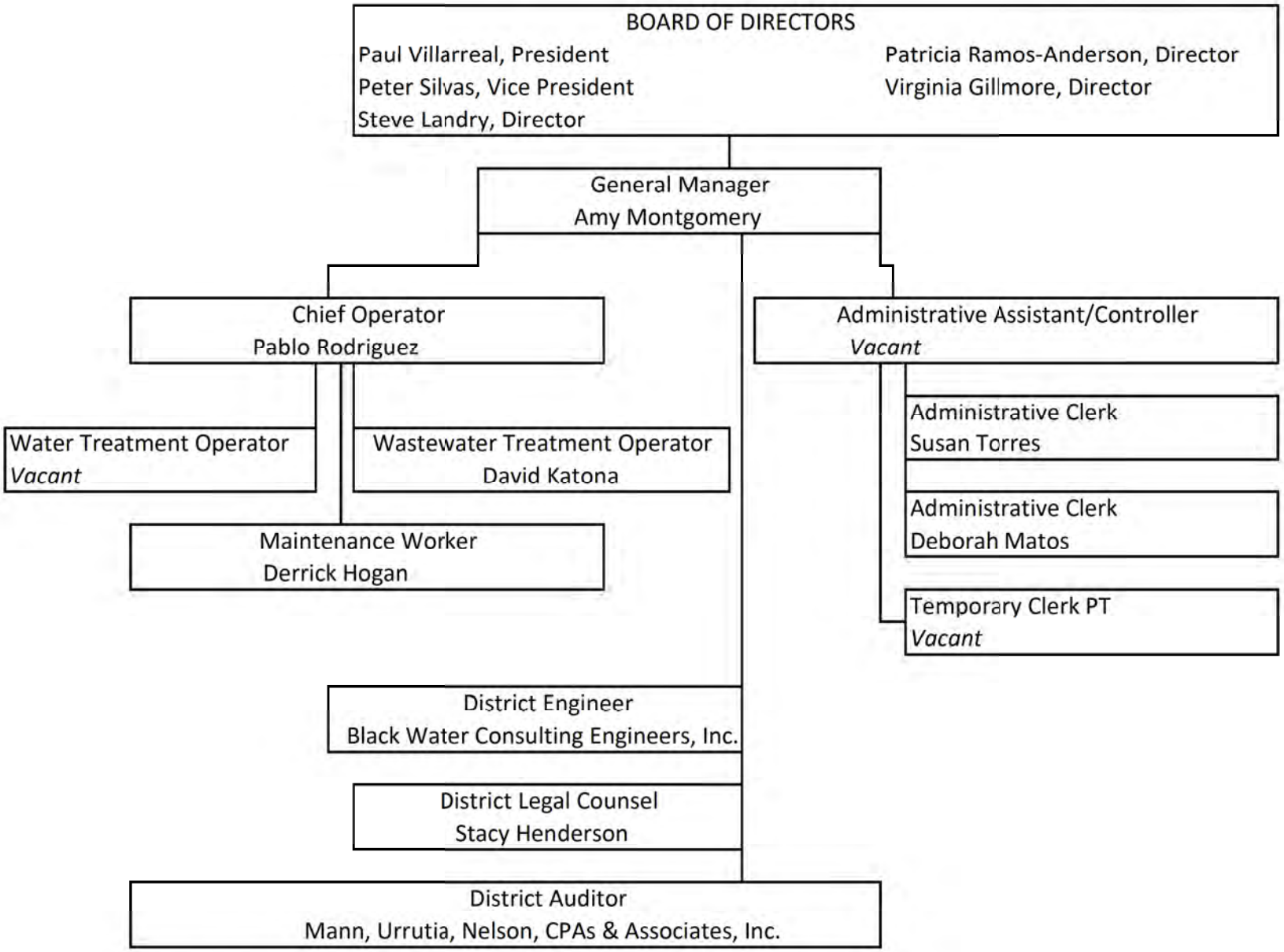
Table 1: Certificate Requirements for Water Recycling Treatment Plants

Wastewater Treatment Plant Classification	Wastewater Treatment Process	Wastewater Treatment Plant Design Flow (mgd)	Wastewater Treatment Plant Operator Certificate	Water Treatment Plant Operator Certificate	Santa Nella County Water District Wastewater Treatment Plant
I	Primary Conventional Treatment Pond	1.0 or less All	Grade I	T1	Undisinfected Secondary Existing Aeration Pond System Design Capacity = 0.34 mgd
II	Primary Biofiltration Modified Treatment Pond	Greater than 1.0 through 5.0 1.0 or less All	Grade II	T2	
III	Primary Biofiltration Activated Sludge Sequencing Batch Reactor Tertiary	Greater than 5.0 through 20.0 Greater than 1.0 through 10.0 5.0 or less 1.0 or less 1.0 or less	Grade III	T3	Disinfected Tertiary Proposed Filter Plant Design Capacity = 0.37 mgd
IV	Primary Biofiltration Activated Sludge Sequencing Batch Reactor Tertiary	Greater than 20.0 Greater than 10.0 through 30.0 Greater than 5.0 through 20.0 Greater than 1.0 through 10.0 Greater than 1.0 through 10.0	Grade IV	T4	
V	Biofiltration Activated Sludge Sequencing Batch Reactor Tertiary	Greater than 30.0 Greater than 20.0 Greater than 10.0 Greater than 10.0	Grade V	T5	

Table 2: Santa Nella County Water District Certification (Year 2020)

Employee	Water No.	Grade	Wastewater No.	Grade	PAC	Effective date	Renewal date	Expiration date
Montgomery, Amy	35014	T-2				1/2013	9/1/2021	1/1/2022
	42869	D-2				11/2013	7/1/2022	11/1/2022
					PA2402:0028	12/27/2019	12/1/2022	12/31/2022
Rodriguez, Pablo	25928	T-3				11/2007	7/1/2022	11/1/2022
	26754	D-3				12/2007	8/1/2020	12/1/2022
Orig Issue: 11/13/2003			10511	Grade 1		11/13/2003		12/31/2020

Santa Nella County Water District



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