NOTICE OF A SPECIAL MEETING
OF THE BOARD OF DIRECTORS OF THE
OLIVENHAIN MUNICIPAL WATER DISTRICT
1966 Olivenhain Road, Encinitas, CA 92024
Tel: (760) 753-6466 • Fax: (760) 753-5640
VIA TELECONFERENCE AND IN PERSON

Pursuant to AB3035, effective January 1, 2003, any person who requires a disability related modification or accommodation in order to participate in a public meeting shall make such a request in writing to Stephanie Kaufmann, Executive Secretary, for immediate consideration.

DATE: WEDNESDAY, MARCH 30, 2022

TIME: 4:00 P.M.

PLACE: HYBRID REGULAR MEETING VIA TELECONFERENCE AND IN PERSON

Pursuant to the State of California Executive Order, and in the interest of public health, OMWD is temporarily taking actions to mitigate the COVID-19 pandemic by holding Board Meetings electronically or by teleconference. This meeting will be a hybrid of in person and teleconference. Our Boardroom will be open to the public, however, masks must be worn if unvaccinated.

To join this meeting via phone, please dial:
(669) 900-9128 or (346) 248-7799
Meeting ID: 881 0845 6135 and Password: 994423

Public Participation/Comment: Members of the public can participate in the meeting by emailing your comments on an agenda item to the Board Secretary at skaufmann@olivenhain.com or address the board directly in real-time under either of the public comment sections. If you do not receive a confirmation email that your comment has been received, please call (760) 632-4648 or address the board under either of the public comment sections to ensure that your comments are heard in real-time. The subject line of your email should clearly state the item number you are commenting on and should include your name and phone number. All comments will be emailed to the Board of Directors.

NOTE: ITEMS ON THE AGENDA MAY BE TAKEN OUT OF SEQUENTIAL ORDER AS THEIR PRIORITY IS DETERMINED BY THE BOARD OF DIRECTORS

1. CALL TO ORDER

2. PLEDGE OF ALLEGIANCE

3. ROLL CALL

4. DETERMINATION OF A QUORUM

5. ADOPTION OF AGENDA

6. PERSONAL APPEARANCES AND PUBLIC COMMENTS

7. CONSIDER A PRESENTATION ON THE RESULTS OF RECENT INVESTIGATIONS FOR THE SAN DIEGUITO VALLEY BRACKISH GROUNDWATER DESALINATION PROJECT AND PROVIDING STAFF WITH INPUT ON FUTURE STEPS (INFORMATIONAL ITEM)

8. CONSIDER PUBLIC COMMENTS

9. CLOSED SESSION

   A) PENDING LITIGATION – ONE POTENTIAL CASE [PURSUANT TO GOVERNMENT CODE SECTION 54956.9 (d)(2)]

10. OPEN SESSION

11. ADJOURNMENT

Agenda Item 7

Municipal Water District

Memo

Date: March 30, 2022

To: Olivenhain Municipal Water District Board of Directors

From: Joey Randall, Assistant General Manager

Via: Kimberly A. Thorner, General Manager

Subject: **CONSIDER A PRESENTATION ON THE RESULTS OF RECENT INVESTIGATIONS FOR THE SAN DIEGUITO VALLEY BRACKISH GROUNDWATER DESALINATION PROJECT AND PROVIDING STAFF WITH INPUT ON FUTURE STEPS**

Purpose

The purpose of this agenda item is to brief the Board on the results of recent investigations into regulatory and environmental considerations, project economics, and sustainability with regard to the San Dieguito Brackish Groundwater Desalination Project. The workshop will provide an opportunity for Board questions, discussion, and input related to the project.

Recommendation

Staff recommends the Board consider information presented by staff, ask questions, discuss the project, and provide staff with input on future work on the project.

Alternative(s)

None, this is an opportunity for Board input.

Background

OMWD receives 100 percent of its potable water supply from the San Diego County Water Authority (SDCWA). The main sources are the San Joaquin – Sacramento Bay Delta, and the Colorado River. These sources are distant from OMWD and face regulatory, drought, and climate-change challenges. For these reasons, OMWD has been investigating opportunities to diversify its water supply portfolio by developing supplies that are locally controlled, reliable, and cost-competitive. Currently, the local potable supply opportunities include desalinated seawater and brackish groundwater desalination.

In 2008, the Board directed staff to investigate brackish groundwater desalination opportunities, instead of purchasing potable water directly from the Carlsbad Seawater Desalination Plant. The direction at that time was to seek brackish desalination opportunities within OMWD's control at cost equal to or less than the cost of Carlsbad desalinated water, which OMWD had been a partner in and could have elected to receive.

A 2010 opportunities and constraints report identified brackish groundwater desalination opportunities in both the San Elijo and San Dieguito Groundwater basins.

OMWD received United States Bureau of Reclamation funding and in 2016 finalized a feasibility report that concluded the San Elijo Basin was potentially feasible, pending additional hydrogeologic and environmental investigations.

OMWD was awarded State of California grant funding and in 2017 completed a feasibility study of the San Dieguito Basin. The study concluded that the project was technically feasible and that potable water could be produced at a cost that was less than desalinated seawater, and competitive with imported water.

OMWD was awarded additional State of California and Metropolitan Water District of Southern California grant funding and in 2020 completed a 12-month pump test in the San Dieguito Basin. The resultant 2021 Hydrogeologic Report confirmed the feasibility study results, identifying only minor impacts to the groundwater basin storage and mitigable impacts to local wells. The results were presented to the Board in April 2020 and to stakeholders and public a week later. At the April 2020 Board Meeting, staff identified several investigations that would be conducted in fiscal year 2022. Preliminary results from these investigations are now available.

Fiscal Impact

The work completed in fiscal year 2021 and planned for fiscal year 2022 was included in the Board-approved budget.

Is this a Multi Fiscal Year Project? **Yes**
In which FY did this capital project first appear in the CIP budget? **2007**
Board Approved Total Project Budget: **$42,837,000**
Total Grant Funding Received: **$1,370,000**
Current Fiscal Year Appropriation: **$327,000**
To-Date Approved Appropriations: **$4,262,000**
Expenditures and Encumbrances as of (March 9, 2022): **$3,966,752.64** Includes Desal Partners/San Elijo Well carryforward expenditures
Is this change order within the appropriation of this fiscal year? **N/A**
If this change order is outside of the appropriation, Source of Fund? **N/A**

Discussion

The San Dieguito Brackish Groundwater Desalination Project is OMWD's largest current potential capital project, currently budgeted at $42,000,000. The project supports OMWD's historical goal of obtaining one-third of its water supply from local sources, when added to recycled water.

At a minimum, the San Dieguito Valley Brackish Groundwater Desalination Project has been envisioned as a 1 million gallon per day (MGD) capacity project. Based on similar projects, smaller capacities were not thought to be cost effective. However, it is known that larger projects would increase benefits and cost effectiveness through efficiencies of scale.

Throughout the course of the economic analysis, the project team started to look into these concepts, and others in more detail. When the economic model was constructed and the team was able to perform "what if" scenarios, a 1.3 MGD project was determined to have significantly better benefits than a 1.0 MGD project with minimal cost increases. Details describing this concept are included in the metrics for a 1.3 MGD project below.

Brackish groundwater desalination plants need to be shut down periodically for equipment maintenance, repair, and replacement. The team set aside 3 weeks a year for this activity and so the plant would be operational 94 percent of the time. The team also included a “System and Operational Certainty” factor of 95 percent, to account for other factors that could limit production. Reverse osmosis membranes typically have an efficiency in the low 80s percent, meaning that for every 100 acre-feet (AF) of raw water supply, 80 AF of potable water is produced. The capacity calculations follow:

- Plant Capacity = 1.3 MGD or 1,450 AFY
- Plant Production = 1,450 x 0.94 x 0.95 = 1,295 (AFY) rounded to 1,300
- Raw Water Required = 1,300/0.8 = 1,625 AFY

For the recently concluded investigations there are not material differences in the 1.0 and 1.3 MGD projects. The hydrogeologic studies for this project concluded that a groundwater extraction of 1,600 AFY project would have a small decrease in groundwater basin storage. Increasing extraction to 1,625 AFY (1.3 MGD product water) represents an insignificant increase relative to the overall extraction. For the regulatory and environmental analysis the conclusions for a 1.0 MGD project hold for a 1.3 MGD project. Similarly, the water rights analysis was based on 1,625 AFY extraction and 1,300 AFY of production.

This workshop provides an opportunity to review recent information that is critical to the project, ask questions, discuss the project, and consider additional investigations or delaying implementation. Specifically, the workshop will include:

- Regulatory and Environmental Investigations
- An Economic Analysis
- A Water Rights and Sustainability Investigation.

<u>Regulatory and Environmental Investigations</u>

This work was completed by Woodard and Curran, from which Ms. Rosalyn Prickett and her team will present during this portion of the workshop. Woodard and Curran (W&C) is well-versed with OMWD and the San Dieguito Basin, having prepared the environmental documents for the test well, the Extension 153A pipeline, and a horizontal directional drill under the San Dieguito River. During the feasibility study and pump test, they provided civil and treatment process engineering, as a subconsultant to Geoscience Support

Services. Dr. Michael Welch, a regulatory and permitting expert, is a key subconsultant on the W&C team. Dr. Welch was instrumental in assisting OMWD with the discharge permit for the pump test. The scope of the Regulatory and Environmental Investigations includes:

- Documentation of regulatory requirements for a groundwater extraction project with and without supplemental recycled water recharge into the groundwater basin.
- Permitting options, schedules, potential fatal flaws, and strategies.
- Environmental constraints analysis, potential regulations, common resources and permitting approval processes.

The key conclusions of these investigations are that there is a path forward for:

- **Environmental compliance and permitting**
- **Regulatory compliance and permitting**

The level of difficulty for the environmental compliance and permitting process depends on the size and location of the project. However, the project team is well aware of the potential sensitivities and how to avoid them. The feasibility of regulatory compliance and permitting for a potential Phase 2 (Indirect Potable Reuse) project would depend on the ability to locate recycled water injection and extraction wells with enough aquifer travel time between injection and extraction locations. Woodard and Curran is recommending a Phase 2 IPR feasibility study be completed in order to better inform and optimize Phase 1 planning.

Economic Analysis

Doug Gillingham, of Gillingham Water Planning and Engineering, Inc, has prepared the economic analysis framework. There are two areas where Gillingham Water provides special expertise that is unique and particularly valuable to OMWD: economic analysis, and clear, well-documented decision support to management and the Board.

Gillingham Water has recently assisted several water agencies with economic analysis and decision support for important water infrastructure including:

- $5B SDCWA Regional Conveyance System
(OMWD Board Presentation August 19, 2020)
- $130 - $150M Vista Flume Replacement for Vista Irrigation District
- $100M+ Water Supply Alternatives for Sweetwater Authority

Gillingham Water has provided assistance to OMWD with several aspects of the studies for both the San Elijo and San Dieguito groundwater basins. Additionally, it prepared a feasibility study of the Mission Valley Brackish Groundwater Desalination Project for the City of San Diego and were the lead author for the San Diego Formation Groundwater Sustainability Plan. The scope of the Economic Analysis Study includes:

- Review of typical OMWD financial planning assumptions
- Construction of a spreadsheet model
- Development of planning scenarios and economic analysis
- Sensitivity testing of input variables
- Feasibility assessment
- Summary memorandum

The key conclusions from the economic analysis are:

1. **Project benefits are derived from comparing the project to continuing to buy water from SDCWA. SDCWA's mid-range rate forecast is a key assumption in the economic model.**
2. **The economic analysis is particularly sensitive to the project production capacity. The hydrogeologic analysis was based on a groundwater production of 1,600 acre-feet per year, which will support 1.3 million gallons per day (MGD) of potable water production. 1.3 MGD is assumed in the economic analysis.**
3. **With reasonable assumptions for the input variables, including an assumption of $12.5 million in grant funding and a conservative amount of receiving only ½ the amount of potential MWD Local Resources Project funding, the project has an estimated $18 million benefit over 30 years, when compared to SDCWA purchases. $12.5 million in grant funding is reasonable and conservative as the Bureau of Reclamation's Title XVI program alone allows for grants up to 25 percent of the total project cost. There are also other funding programs available at both the state and federal levels. With more conservative assumptions, including only $5 million in grant funding, the project has an estimated $10 million benefit over 30 years.**
4. <u>Sensitivity Testing</u>**: The economic analysis has included sensitivity testing of key input variables, to test the robustness of the finding that the project is economically advantageous. Changing any of the key inputs individually to pessimistic settings reduces but does not eliminate the economic advantage of the project; multiple inputs need to be set concurrently to pessimistic levels before the project loses its advantage. Conversely, adjusting inputs to more optimistic levels increases the project's economic advantage.**
5. **Considering more recent supply chain and inflation issues, the project construction cost estimate for 1 MGD has been updated in this model to $47 million. The overall project budget in the model has been increased to $52 million, not including costs to date. Staff will continue to seek project partnerships.**

6. **These results indicate the project has strong potential, and support the continuation of project planning to reduce uncertainties. These studies should focus on water rights and increasing project capacity, as the benefit from a 1.6 MGD project is $29 million.**

Water Rights and Sustainability will be considered separately by the Board.

The conclusions of analysis thus far is that there is a path forward on regulatory/environmental issues and that project economic analysis support advancing the project to final planning and agency coordination.

Staff will receive Board input and incorporate any direction into the FY 2023/FY 2024 budget process.

Supplemental Information:

- *Workshop Presentation - Attachment 1*
- *Draft Woodard & Curran Technical Memorandum(s) - Attachments 2, 3, 4*
- *Draft Gillingham Water Planning and Engineering Economic Analysis Summary - Attachment 5*
- *Draft Updated Cost Estimate - Attachment 6*

SAN DIEGUITO VALLEY GROUNDWATER PROJECT UPDATE

March 30, 2022

OLIVENHAIN
Municipal Water District

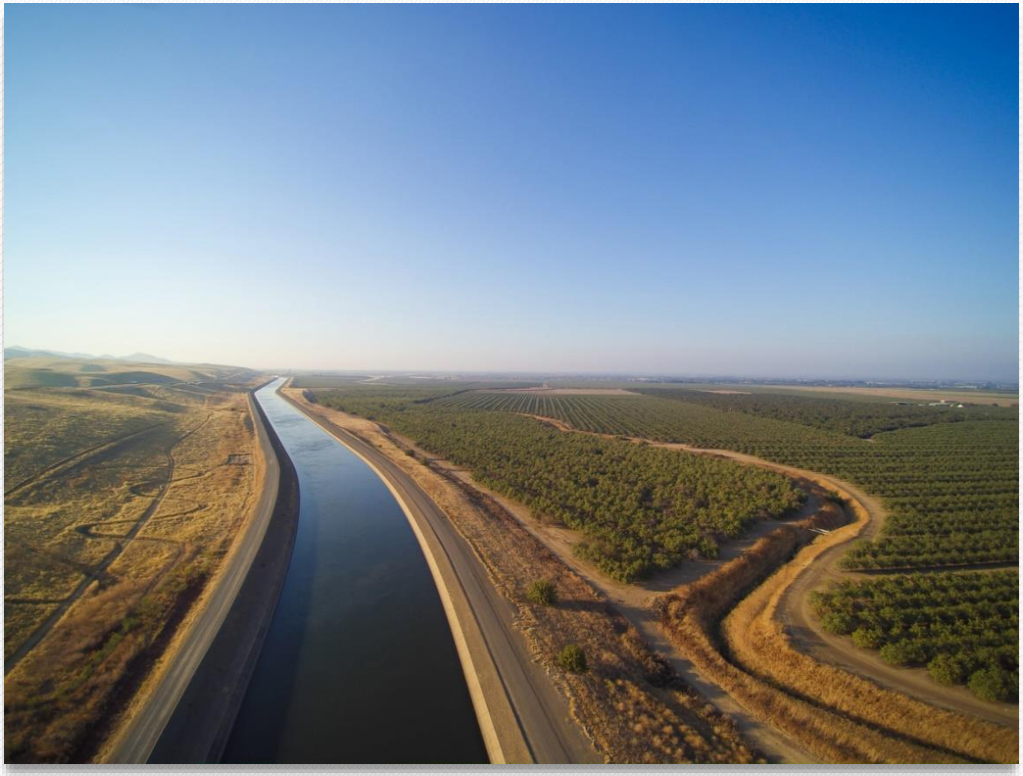
Agenda

- San Dieguito Project Background – OMWD Staff
- Regulatory and Environmental Analysis – Woodard & Curran
  - Board Q & A
- Economic Analysis – Gillingham Water
  - Board Q & A
- Next Steps
  - FY 2023 Investigations, Contracting - OMWD Staff
  - Board Q & A
- Closed Session

OLIVENHAIN
Municipal Water District

Project Background
State of Water in California

- OMWD reliant on imported water
- Imported water increasingly expensive
- Imported water more vulnerable
- OMWD Goal – 1/3 Supply Local
- Groundwater
    - Drought-Proof
    - Reliable
    - Cost-Competitive
    - Local Control
- OMWD 1 of 7 SD water agencies without local potable supplies



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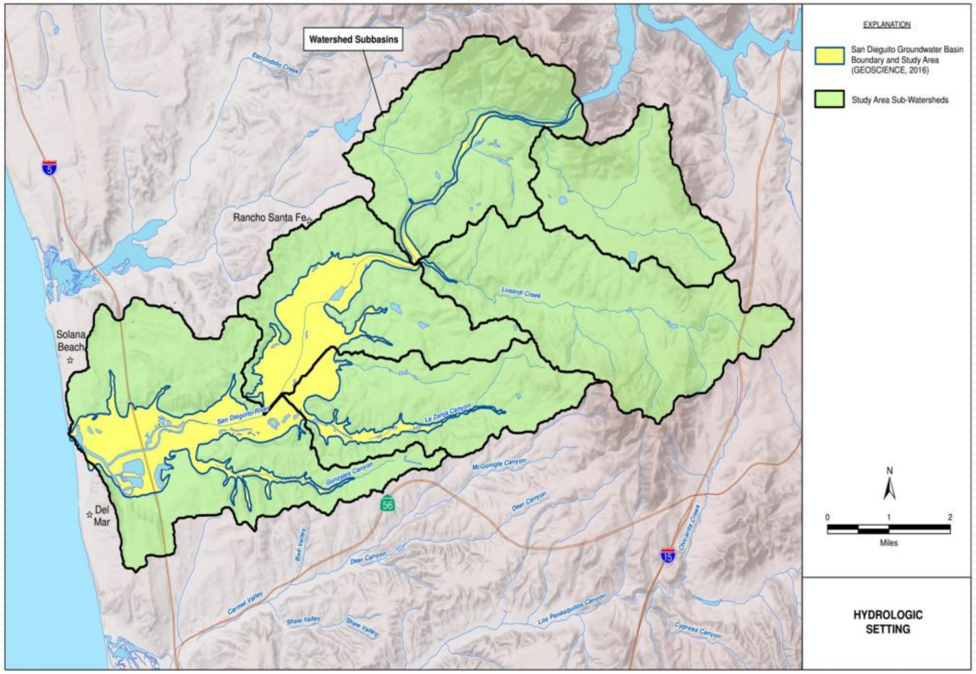
Municipal Water District

Project Background 2008 - 2016

- 2008 Board direction - Brackish groundwater, rather than Carlsbad Desalination
- 2010 Opportunities & Constraints
  - San Elijo GW
  - San Dieguito GW
- 2016 San Elijo - Potentially Feasible (USBR Funding)



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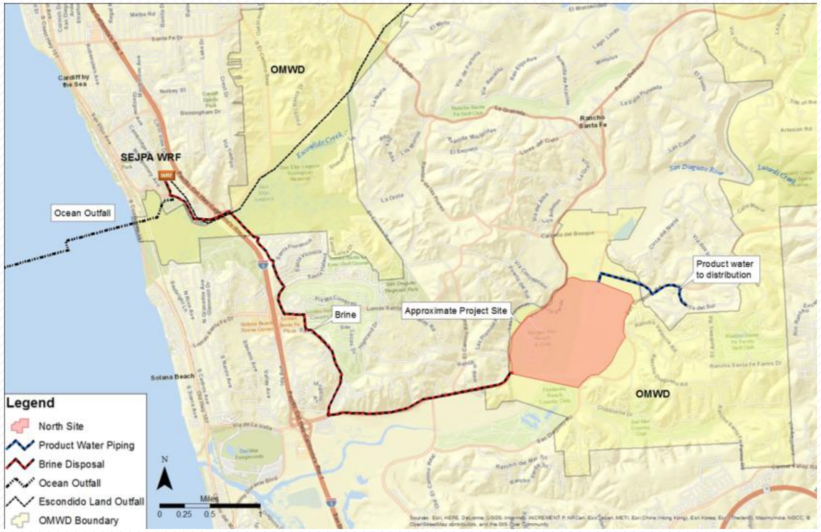
Study Area

2017 DWR San Dieguito Feasibility Study

- Project Feasible and Sustainable at 1 MGD or More
- Cost-Competitive With Imported Water, Less than Desalinated Seawater
- North Valley Wellfield Preferred, Not Influenced by Surface Water
- Meet State and Federal Drinking Water Regulations
- Brine Disposal via SEJPA Ocean Outfall, RWQCB Preference



2021 DWR/ MWD San Dieguito Pump Test

- Briefed Board and Stakeholders April 2021
- Confirmed feasibility study results
- Minor impacts to basin storage
- Impacts to local wells—mitigable

Funding Review

- Feasibility Study
  - $500k
  - $250k Funded by DWR Grant
- Pilot Test Well
  - $1.3M
  - $650k Funded by DWR Grant
  - $175 MWD/SDCWA Iron and Manganese Removal Pilot Testing
- Ultimate Project (if approved)
  - Board approved budget $42M
  - CIP Fund/ Future Grants

Olivenhain Municipal Water District

Two-Year Plan

- <u>FY 2022</u>
- Water Rights Attorney, Peer Review, Sustainability Review
- Independent Cost Est.
- Outreach
- Economic Analysis
- Board Workshop (Today)
- Environmental Scoping

- <u>FY 2023</u>
- Facility Siting Alts
- Long-term Hydrologic Analysis
- Funding Opportunities Research and Identification
- Outreach
- Updated Economic Analysis
- Board Workshop

Two-Year Plan Notes

- Continue Water–Level Monitoring
- Suspended Subsidence Monitoring for Two Years

Board Questions, Discussion, Input

OLIVENHAIN
Municipal Water District
A Public Agency

Agenda

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- Next Steps
  - FY 2023 Investigations, Contracting - OMWD Staff
  - Board Q & A

San Dieguito Valley Brackish Groundwater Desalination Program

Regulatory Strategy and Environmental Constraints

March 2022

PRESENTED BY

Rosalyn Prickett, AICP
Haley Johnson
Susan Brownstein

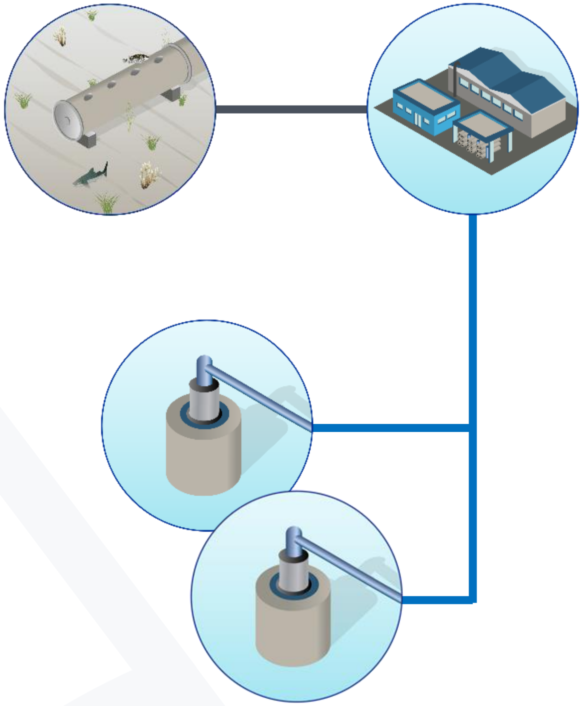
Discussion Overview

- San Dieguito Valley Groundwater Desalination Project
- Regulatory Strategy
- Environmental Constraints

San Dieguito Valley Groundwater Desalination Project – Proposed

Groundwater Extraction and Treatment

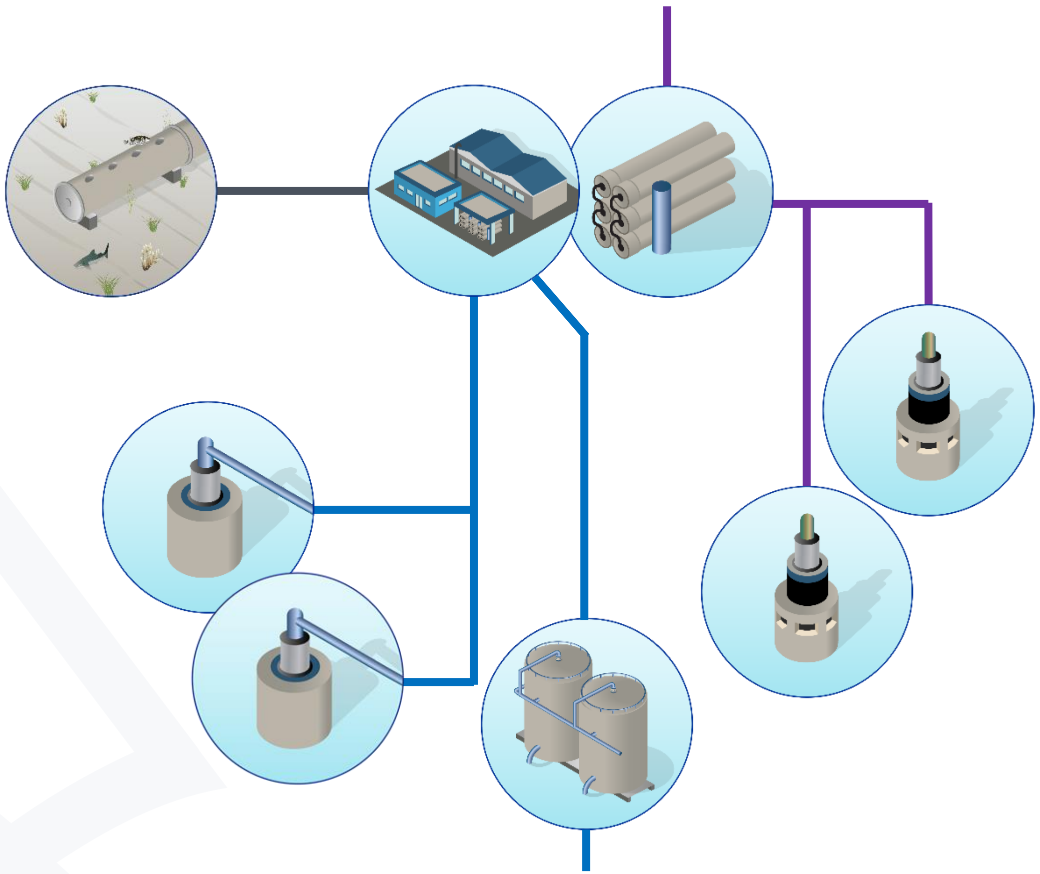
- Extraction wells
- Raw water conveyance from wells to plant
- Desalination treatment plant
- Brine line (or force main) to SEJPA for ocean outfall disposal
- Recycled water conveyance to replace existing groundwater uses

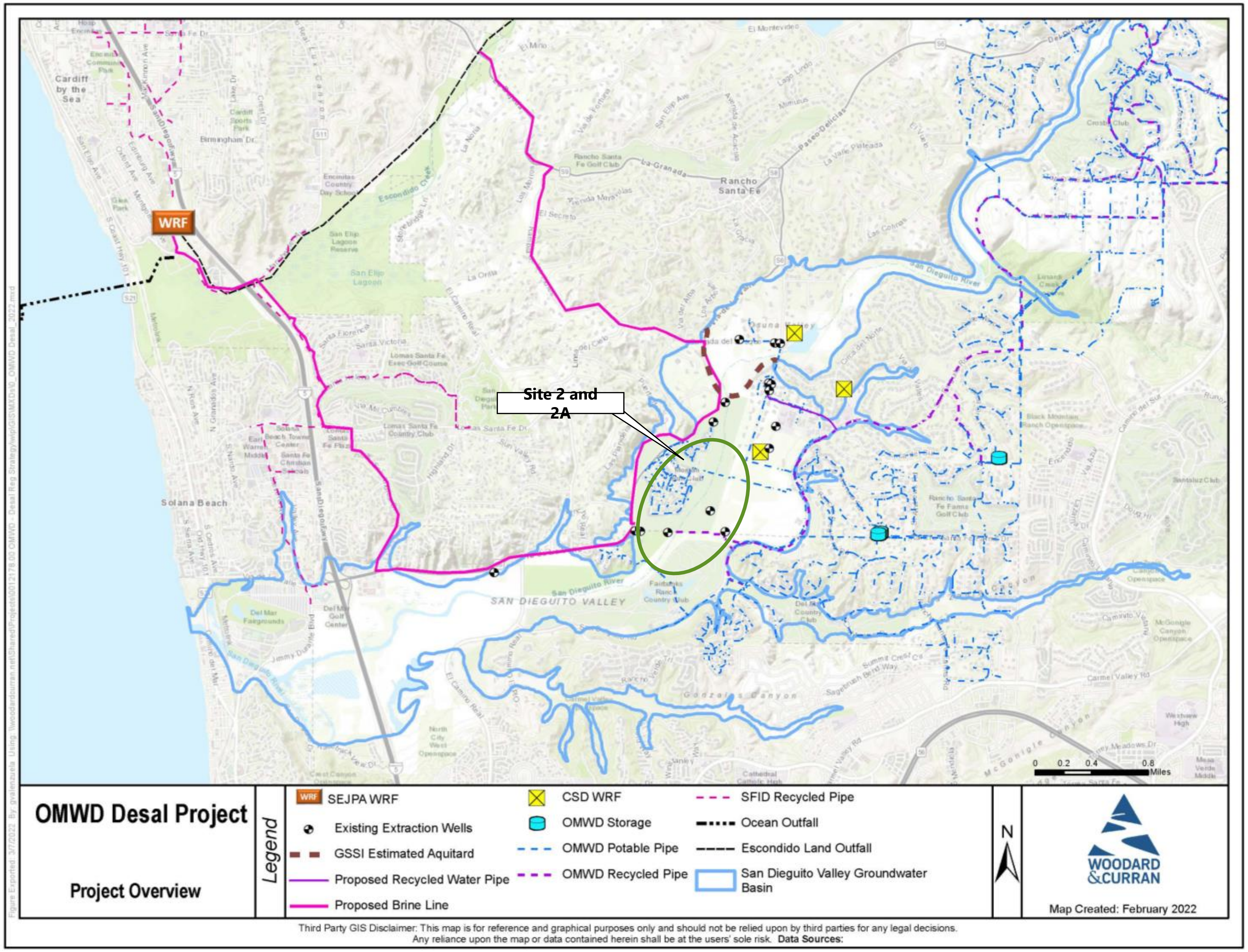


San Dieguito Valley Groundwater Desalination Project – Future Consideration?

Future - Supplemental Recycled Water Injection or Spreading

- Recycled water conveyance to advanced water treatment
- Advanced water treatment facility
- Advanced water conveyance to injection wells
- Injection wells
- Treated water storage
- Potable water conveyance to distribution system

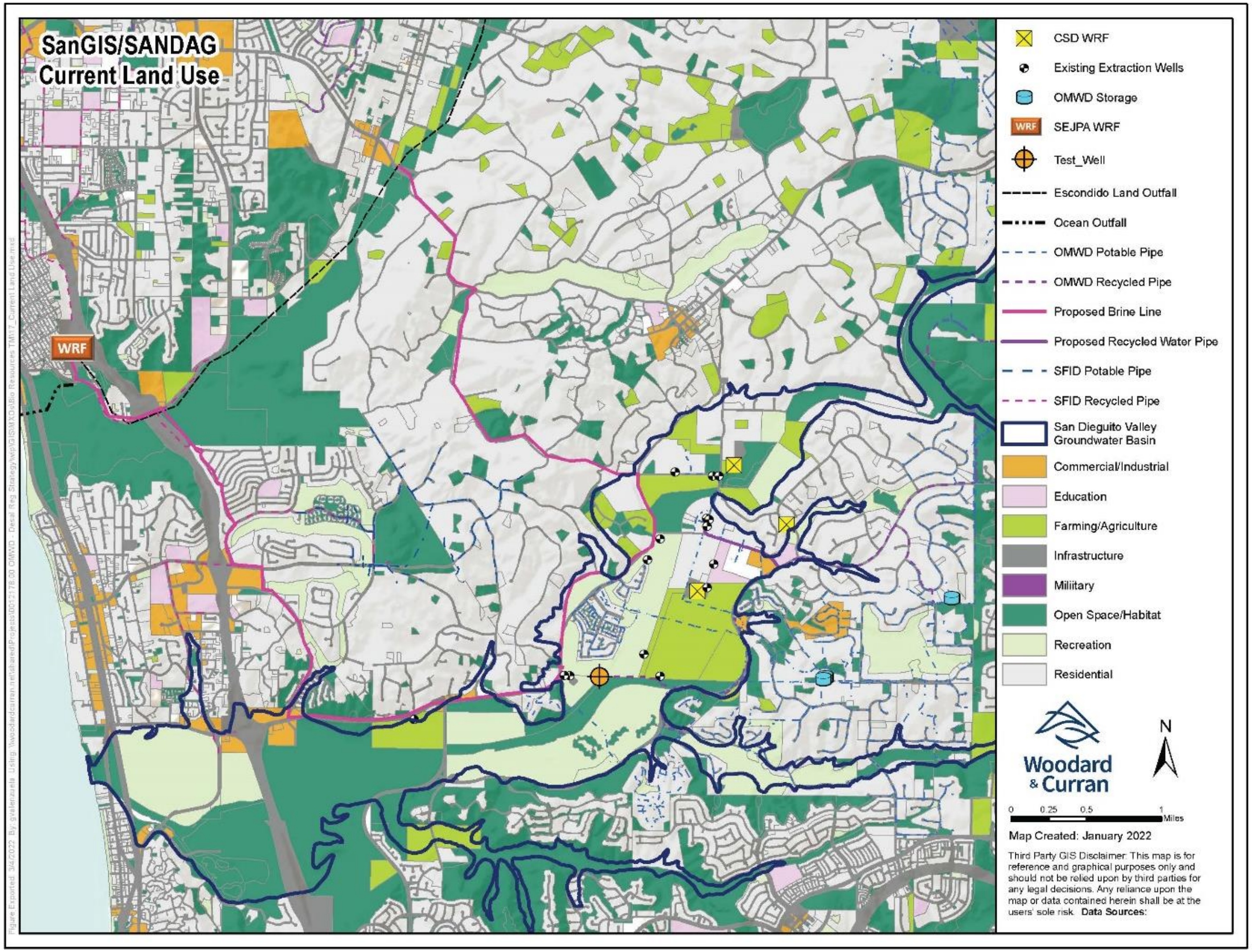




Project Description

- Extraction wells
  - "Site 2 and 2A" area recommended based on pilot test well
- Desalination plant
  - Site alternatives need to be identified
- Brine line
  - Two alignments identified, will finalize based on plant site

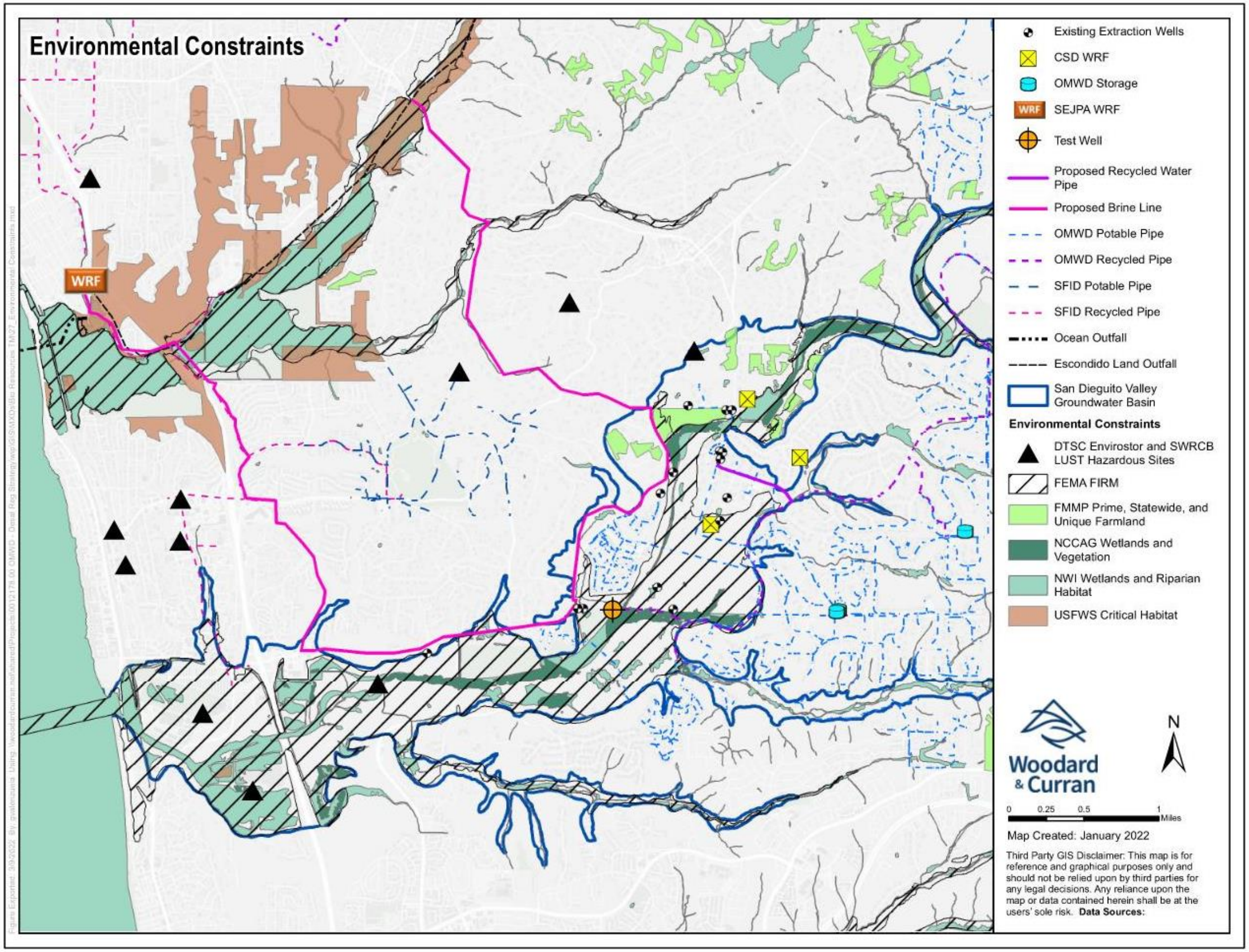
Environmental Constraints



Environmental Setting

→ Land Use
- Residences
- Schools
- Habitat
- Farmed land

→ Expect
- Mitigation
- Public outreach
- Design project around if possible



Environmental Setting

→ Expect to:
- Design project to avoid hazardous cleanup sites
- Letter of Map Revision if treatment plant in floodplain
- Avoid or mitigate for impacts to farmland, wetlands, habitat

California Environmental Quality Act (CEQA)

- Purpose is to:
  - Disclose environmental impacts
  - Identify measures to avoid or reduce impacts
  - Support the agency decision-making process
  - Encourage public participation
  - Enhance interagency coordination

- Technical studies
  - Jurisdictional wetland delineation
  - Biological resources report
  - Cultural and paleontological resources report
  - Geotechnical study
  - Hydrologic study
  - Noise evaluation
  - Air quality, greenhouse gas, and air toxics
- Typically a 12- to 18-month process

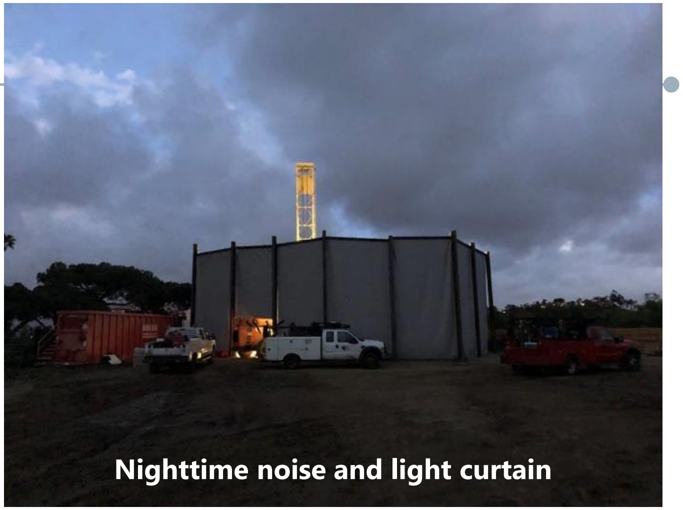
Recent Example:
Pilot Test Well and 153A Recycled Water Pipeline

- Mitigated Negative Declaration (MND)
  - July-December 2018
  - Public hearing, formal responses to comments
- Permits: California Department of Fish & Wildlife Streambed Alteration Agreement; consultation with US Fish & Wildlife; City Noise Permit
- Horizontal directional drilling allowed the project to avoid wetland and other sensitive habitat impacts (Clean Water Act permits avoided)
- Inter-agency coordination necessary to secure easement from San Diego and permits

Temporary Impacts

→ Most environmental impacts would be temporary as a result of construction

→ Expect less than significant with mitigation:
- Outreach and noticing
- Pre-construction surveys and disturbance limits
- Shield from air pollutants, nighttime noise & light
- Traffic control
- Stormwater runoff control
- Construction monitoring

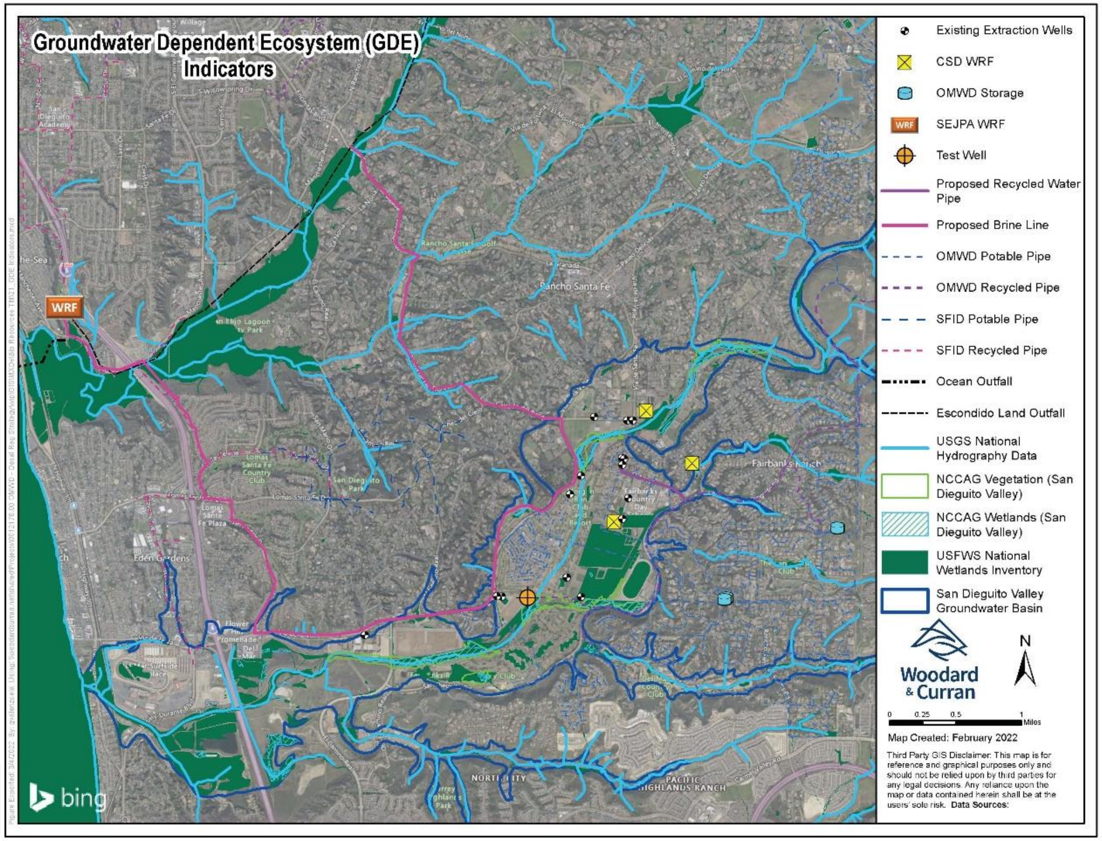


Nighttime noise and light curtain

Construction monitoring and white noise backup signal

Operational Impacts

- Groundwater modeling suggests no impact on surface waters (or associated habitats)
- CEQA analysis should further evaluate impacts to Groundwater Dependent Ecosystems (GDEs)
- Long-term measures may include
  - Ongoing monitoring and reporting
  - Management strategies



Permits and Approvals

	Agency	Permit/Process	Timing
Necessary	Olivenhain Municipal Water District	CEQA process	12-18 months
	San Diego County Department of Environmental Health & Quality	Well/Boring Installation Permit	Approximately 4-6 weeks prior to construction
	State Water Resources Control Board	Drinking Water System Discharge Permit	2-3 months
	State Water Resources Control Board, Division of Drinking Water (DDW)	Water Supply Permit Amendment for use in drinking water system	6-12 months
	Regional Water Quality Control Board, San Diego Region & DDW	Water Recycling Requirements for Injection or Spreading	18-24 months, including public hearing
	Regional Water Quality Control Board, San Diego Region	NPDES Amendment for Brine Discharge to Ocean	12-18 months
	California Coastal Commission	Coastal Development Permit	24-36 months
	Cities, County	Noise permits, Encroachment permits	Approximately 4-6 weeks prior to construction
	State Water Resources Control Board	CWA Section 402 NPDES Stormwater Construction General Permit	SWPPP timeframe: 2-3 months
Potentially avoidable	San Diego Air Pollution Control District	Permit to Operate	6-12 months
	U.S. Army Corps of Engineers, Los Angeles District	Clean Water Act Section 404	6-18 months
	Regional Water Quality Control Board, San Diego Region	Porter-Cologne Water Quality Act CWA Section 401 Certification	12-24 months
	U.S. Fish and Wildlife Service	Endangered Species Act Section 10	Incidental take permit, 12-18 months
	California Dept. of Fish and Wildlife, South Coast Region	Fish and Game Code Section 1600	Streambed Alteration Agreement, 6-8 months
	California Dept. of Fish and Wildlife, South Coast Region	California Endangered Species Act	Incidental take permit, 12-24 months
	San Diego County Flood Control District	Encroachment permit if impact drainage channels	To be avoided through project design
	Caltrans	Encroachment Permit	12-24 months

Summary of Environmental Constraints

- Clear path forward for environmental compliance and permitting
  - Standard suite of environmental studies and permits will be needed
- Difficulty of path depends on size and location of project
  - Proximity to San Dieguito River and its habitats will affect environmental requirements
- Next steps:
  - Siting Study to define site alternatives
  - Begin CEQA compliance
    - Precursor to most permit submittals

Regulatory Strategy

Existing Drinking Water System Permit

State Water Resources Control Board (SWRCB)
Division of Drinking Water (DDW)

Water Supply Permit, with multiple amendments:

- Source
- Treatment
- Distribution
- Utility Management

Typical DDW Permitting Process

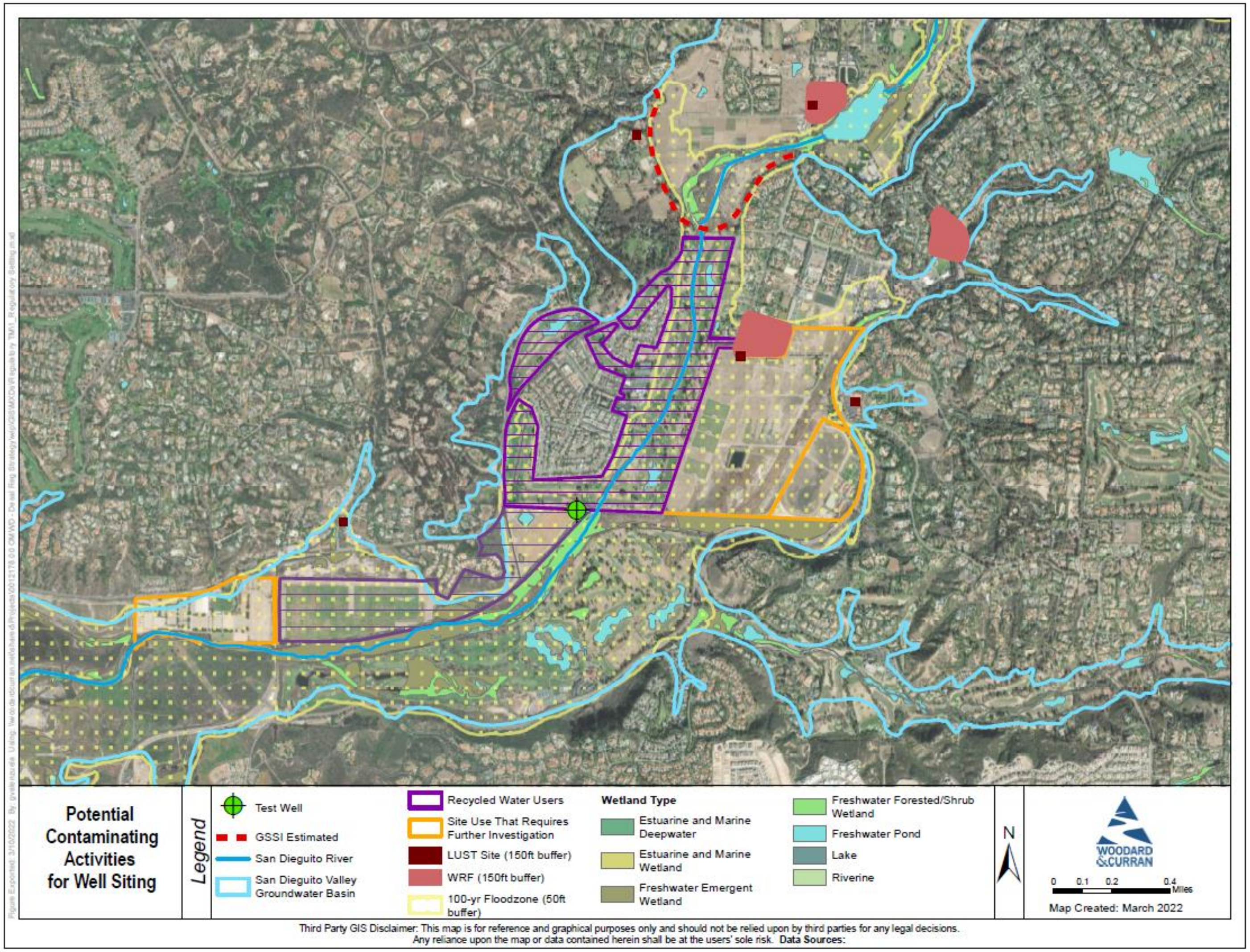
Initial permit amendment application submittals

- Permit amendment application
- **Source water assessment for the well site***
- **Established 50-foot well control zone***
- Design plans and specifications for the well and well coordinates
- California Environmental Quality Act (CEQA) documentation
- Site visit with DDW staff engineer

Orange text: Top three issues, which will be discussed in this presentation
* Indicates item already discussed with DDW during desal test well pilot study

Submittals after construction

- Copy of the well construction permit
- Department of Water Resources well completion report
- **Water quality data**
- Source capacity/pump test results and information per CCR Section 64554
- As-built plans
- DDW well data sheet
- Groundwater Rule compliance plan
- Chlorination equipment specifications and DDW chlorination data sheet
- NSF/ANSI 60/61 certification
- Inspection visit with DDW staff engineer
- Technical report and treatment plant classification

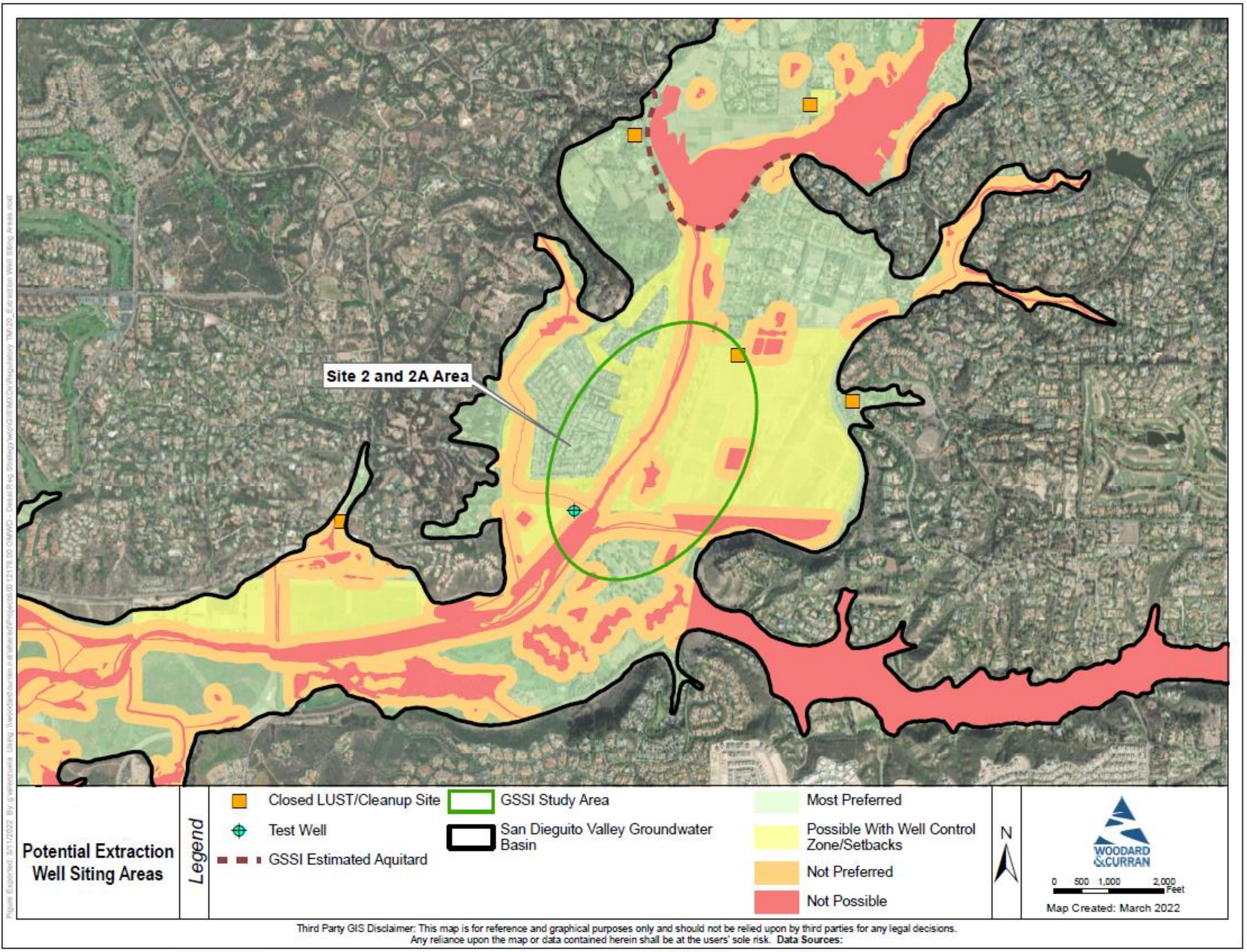


Regulatory Setting

- Potentially contaminating activities (PCAs):
  - Recycled water use
  - Wastewater treatment plants
  - Leaking underground storage tanks (LUSTs)
  - Animal enclosures
- GWUDI: groundwater under the direct influence (of surface water)
- Potential contaminants of concern: iron, manganese, arsenic, PFAS

Mitigation Measures to Address Key Drinking Water Regulatory Issues

Regulatory Concern	Distance	Aquitard	Treatment	Notes
→ Potentially contaminating activities (PCAs):				
‣ Recycled water use sites	X	X		
‣ Wastewater treatment plants	X	X		
‣ Leaking underground storage tanks (LUSTs)	X	X		
‣ Animal enclosures	X	X		
→ GWUDI: groundwater under the direct influence (of surface water)	X	X		Proper siting and well construction will mitigate.
→ Potential contaminants of concern: iron, manganese, arsenic, PFAS			X	All contaminants are removed by proposed treatment train.



Key Regulatory Factors in Extraction Well Siting

- → Productive aquifer
- → Presence of aquitard
- → Distance from surface water and wetlands
- → Distance from potentially contaminating activities (PCAs)
- → Optimize distance and aquifer characteristics to reduce hazards

Regulatory Strategy for Proposed Project

Benefits

- Provides a local, reliable potable water supply for OMWD
- Preferred alternative as a climate change adaptive project
- OMWD operations staff have required certification and experience to operate desalination plant

Constraints

- Water quality constraints will be addressed through siting and/or treatment
- Siting constraints must be considered to avoid GWUDI designation and other PCAs

Summary and Recommendation

- No fatal flaws
- Prioritize extraction well siting and treatment design to ensure long-term project success

Summary of Regulatory Strategy

- → Clear path forward for regulatory compliance and permitting
  - No insurmountable regulatory hurdles – have identified well siting and treatment design considerations
- → Next steps:
  - Siting Study with hydrogeologic evaluation to determine:
    - » *Optimum location of extraction sites.* Should be selected to provide highest well capacity
    - » *Estimate time of travel for effects on shallow aquifer*. Consider distance of well setback from river to avoid classification of wells as GWUDI

Board Questions, Discussion, Input

OLIVENHAIN
Municipal Water District
A Public Agency

Agenda

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- Next Steps
  - FY 2023 Investigations, Contracting - OMWD Staff
  - Board Q & A
- Closed Session

OLIVENHAIN Municipal Water District

Charting Local Waters: San Dieguito Groundwater Study

An OMWD Sustainable Supplies Project

OLIVENHAIN Municipal Water District

Feasibility Assessment (Economics and More)

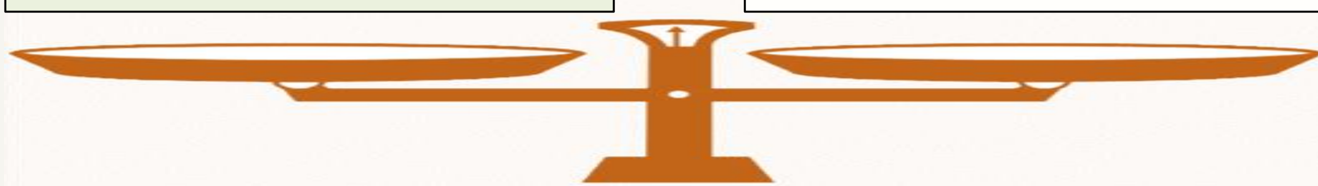
GILLINGHAM WATER

Gillingham Water Planning and Engineering, Inc.

Point of Comparison: Weigh project costs and benefits against those of the No Project alternative

PROJECT vs. NO PROJECT

PROJECT	NO PROJECT



Evaluation Criteria: Consider both cost and non-cost factors

EVALUATION CRITERIA

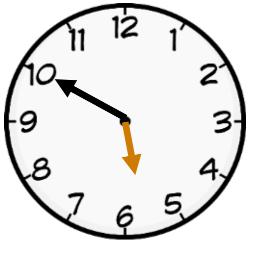
COST FACTORS (COSTS)	NON-COST FACTORS (BENEFITS)
• Water Supply Economy • Ratepayer Economy • Supply Diversification (other than SDCWA)	• Supply Reliability • Water Quality • Environmental Sustainability • Local Control

AGENDA:

1. **Non-Cost Factors:** The project provides improved supply reliability, environmental sustainability, and local control

2. **Cost Factors:** With reasonable assumptions, the project is significantly less costly than the No Project alternative over a 30 period of analysis

3. **Next Steps:** The Non-Cost and Cost findings support advancing the project to final planning and agency coordination (SGMA et. al.)



Non-Cost Factors: The Project fares very well

CRITERIA	Project vs. No Project
• Supply Reliability	↑
• Water Quality	→
• Local Control	↑↑
• Environmental Sustainability	↑
• Reduced Bay-Delta Reliance	↑
• Reduced Colorado River Reliance	↑
• Reduced Energy Footprint / GHG	↑

Legend: Better: ↑ Neutral: → Worse: ↓

Economic Analysis: Costs have escalated. So have Benefits . . . by a bigger margin.

Current Budget (1.0 MGD) (2022 $)	Revised Budget (1.3 MGD) (2022 $)	Increase (%)
$42M	**$52M**	**24%**

Benefits

"All-In" Rate Adjustments

	CY '23	CY '24	CY '25	CY '26	CY '27	CY '28	CY '29	CY '30	CY '31	10 Yr CAGR
2D - High	11.3%	9.7%	10.3%	7.5%	6.4%	5.2%	4.8%	4.4%	4.4%	7.07%
2D - Low	5.9%	3.7%	5.3%	4.5%	3.0%	3.5%	2.6%	2.7%	4.1%	3.91%

Economic Analysis: 30-Year Net Present Value

(1.3 MGD Plant producing 1,300 AF/yr of treated water)

Net Present Value Analysis, in 2022 Dollars

NPV Cost Summary -- Project vs. No Project

NO PROJECT

Cost Component	**NPV**
SDCWA Purchases (raw water)	$78M
Incremental Treatment Costs	$4M
TOTAL (Rounded)	**$81M**

Economic Analysis: 30-Year Net Present Value

(1.3 MGD Plant producing 1,300 AF/yr of treated water)

Net Present Value Analysis, in 2022 Dollars

NPV Cost Summary -- Project vs. No Project

★ PROJECT ★	
Cost Component	**NPV**
Capital Cost	$51M
Grant Funding	-$13M
O&M Cost	$28M
LPP Funding	-$3M
TOTAL (Rounded)	**$64M**

Economic Analysis: 30-Year Net Present Value

(1.3 MGD Plant producing 1,300 AF/yr of treated water)

Net Present Value Analysis, in 2022 Dollars

NPV Cost Summary -- Project vs. No Project

PROJECT

Cost Component	**NPV**
Capital Cost	$51M
Grant Funding	-$13M
O&M Cost	$28M
LPP Funding	-$3M
TOTAL (Rounded)	**$64M**

NO PROJECT

Cost Component	**NPV**
SDCWA Purchases (raw water)	$78M
Incremental Treatment Costs	$4M
TOTAL (Rounded)	**$81M**

Project Cost Advantage = $18M

The Project fares very well

Economic Analysis: Key Assumptions – Yield

User Inputs

Project Sizing and Production Capacity

Production Capacity Plant design capacity	1.3 MGD
Supply and Ops Certainty Risk discount	95%
Discounted Production Inclusive of O&M shutdown allowance	1,300 AF/yr
Groundwater Pumping Pumping level to support production rate	1,625 AF/yr

- Project costs exhibit strong economies of scale. 1.3 MGD fares much better than 1.0 MGD.
- 1.6 MGD would fare even better, but would require pumping of 2,000 AF/yr.

Economic Analysis: Key Assumptions – SDCWA

User Inputs

SDCWA Rate Escalation

Escalation Scenario

(See SDCWA worksheet)

Mid-Range

Rate Cap (Raw) (2022 $)

Current rate = $1523/AF

$2,200/AF

"All-In" Rate Adjustments

	CY '23	CY '24	CY '25	CY '26	CY '27	CY '28	CY '29	CY '30	CY '31	10 Yr CAGR
2D - High	11.3%	9.7%	10.3%	7.5%	6.4%	5.2%	4.8%	4.4%	4.4%	7.07%
2D - Low	5.9%	3.7%	5.3%	4.5%	3.0%	3.5%	2.6%	2.7%	4.1%	3.91%

- Through CY2031 we have used SDCWA Low, Mid, and High forecasts.
- Post 2031 we assume only water system inflation plus 0.0% for Low, 0.5% for Mid-Range, and 1.0% for High escalation scenarios

Economic Analysis: Key Assumptions – Funding

User Inputs

Funding Assistance and Cost Adjustments

Grant Funding	25%	$12.5M
Project is strong candidate		
MWD LPP		Mid-Range
Local Projects Program funding		
Capital Cost Adjustment		0.0%
Adjustable -20% to + 30%		
O&M Cost Adjustment		0.0%
Adjustable -20% to + 30%		
Final Design PAYGO?		PAYGO
or Financed?		

- GRANT FUNDING: Project is very well positioned. Funding at 25 percent of capital is a reasonable mid-range assumption.
- MWD LPP: Our mid-range assumption is the LPP subsidy amount is cut in half.

Economic Analysis: Key Assumptions – Finance

User Inputs	
Finance and NPV Terms	
NPV Term -- Operations Operations period for NPV calcs	30 Yrs
Finance Term Bond or loan term	30 Yrs
District Discount Rate Discounts future cost to P.V.	3.50%
Melded Cost of Funds May include low-interest loans	3.25%
Water Sys. Base Inflation Escalates costs into future	3.50%

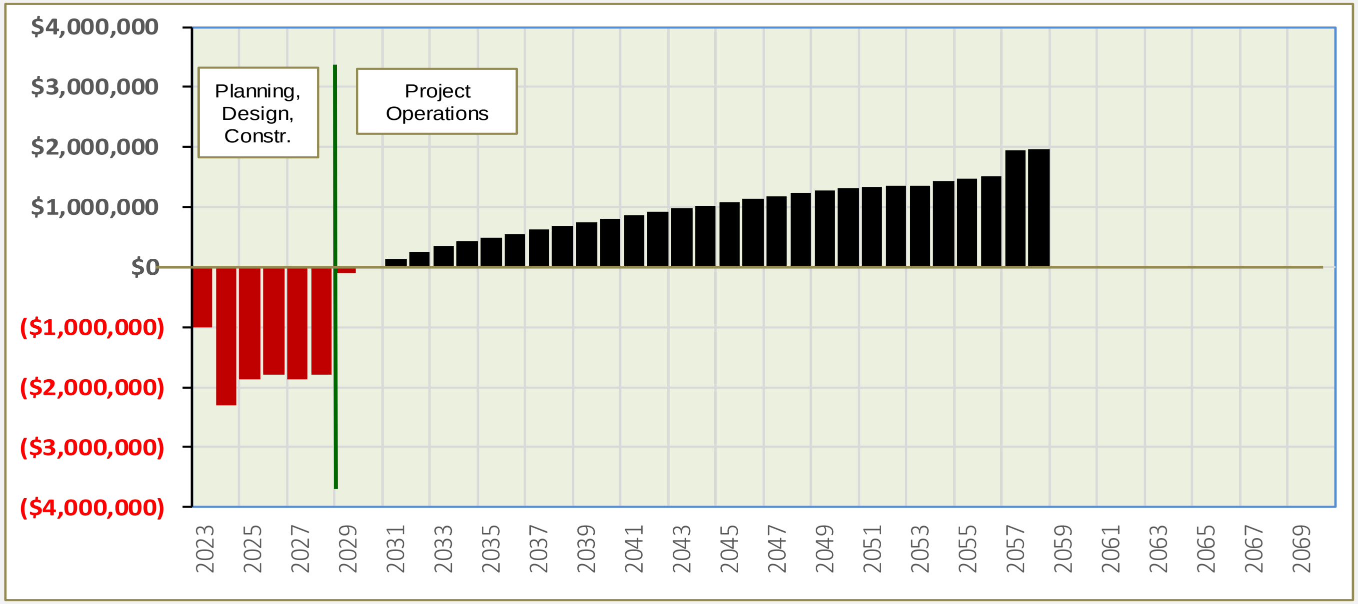
- NPV TERM: 30 years is common but not etched in stone. Longer terms produce greater NPV benefits
- RATE FACTORS: Mostly move in common with inflation. Discount rate is analogous to minimum Rate of Return on investments.

Economic Analysis: Costs and Benefits Over Time

Capacity	SDCWA Rates	Grants	NPV Term	Discount Rate
1.3 MGD	Mid-Range	25%	30 Yrs	3.5%

NPV Annual Cost Differential -- Project vs. No Project

Bond Issue: 2027	Ops. Start: 2029	Cross-over: 2030	Break-even: 2046	Payback pd.: 19 Yrs



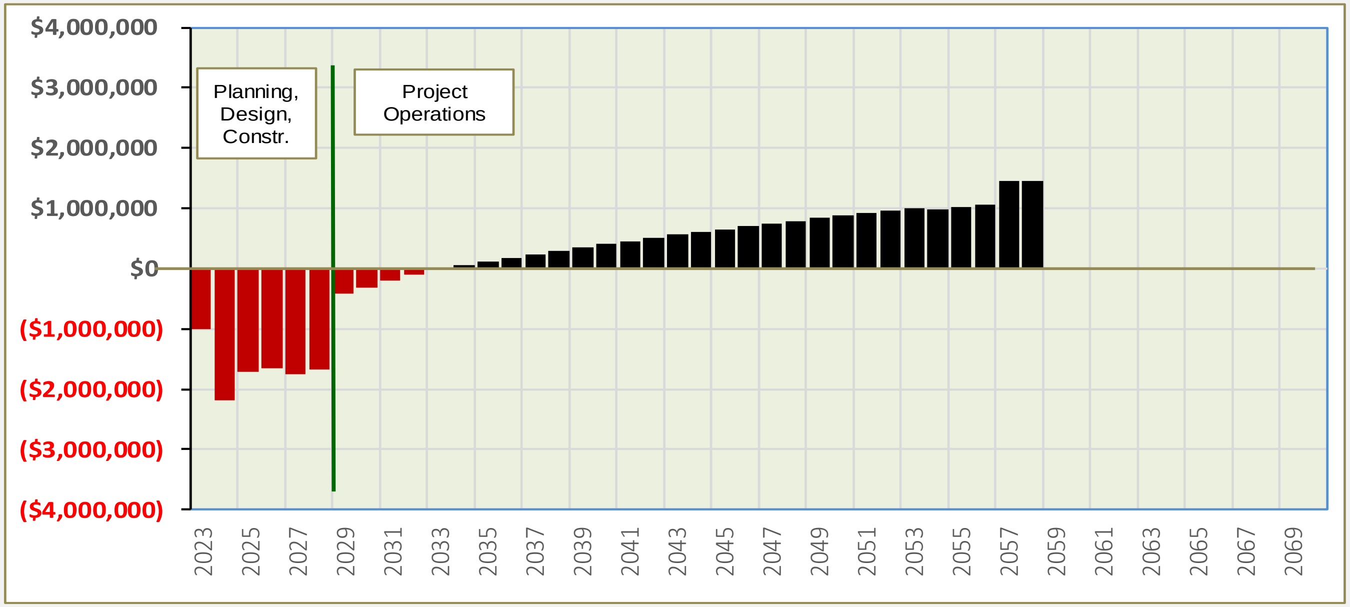
Total Red: $11M	Total Black: $28M	Advantage: $18M

Economic Analysis: Sensitivity Testing

Capacity	SDCWA Rates	Grants	NPV Term	Discount Rate
1.0 MGD	Mid-Range	25%	30 Yrs	3.5%

NPV Annual Cost Differential -- Project vs. No Project

Bond Issue: 2027	Ops. Start: 2029	Cross-over: 2034	Break-even: 2053	Payback pd.: 26 Yrs



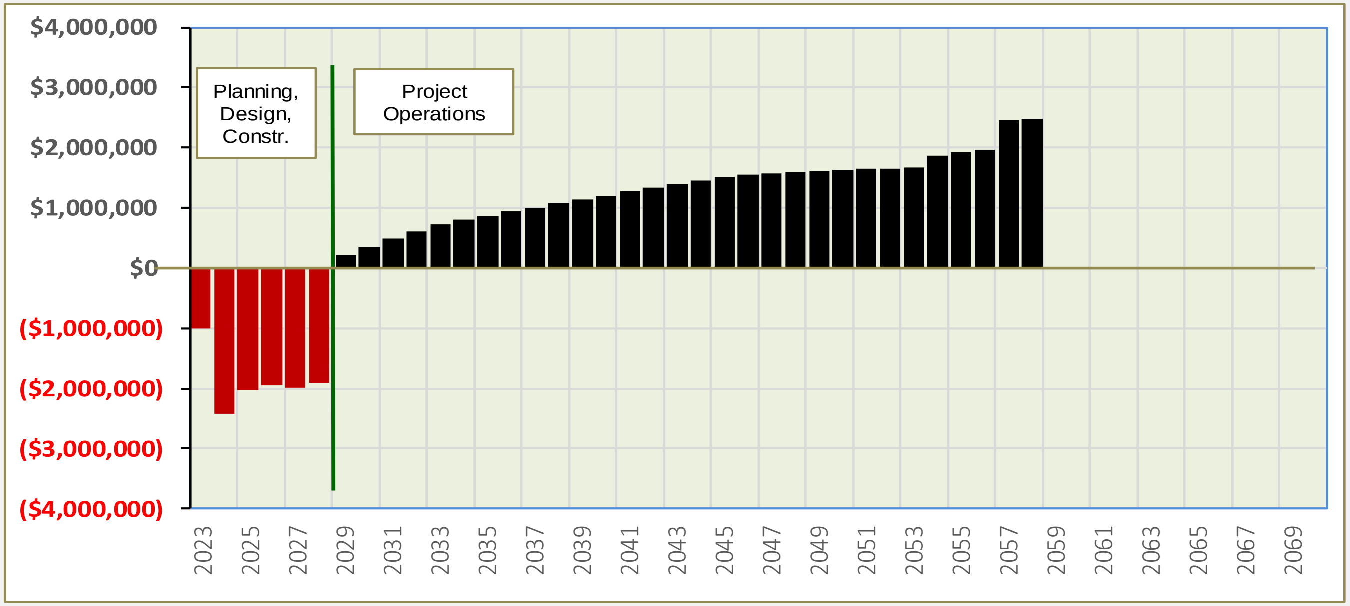
Total Red: $11M	Total Black: $17M	Advantage: $6M

Economic Analysis: Sensitivity Testing

Capacity	SDCWA Rates	Grants	NPV Term	Discount Rate
1.6 MGD	Mid-Range	25%	30 Yrs	3.5%

NPV Annual Cost Differential -- Project vs. No Project

Bond Issue: 2027	Ops. Start: 2029	Cross-over: 2029	Break-even: 2042	Payback pd.: 15 Yrs



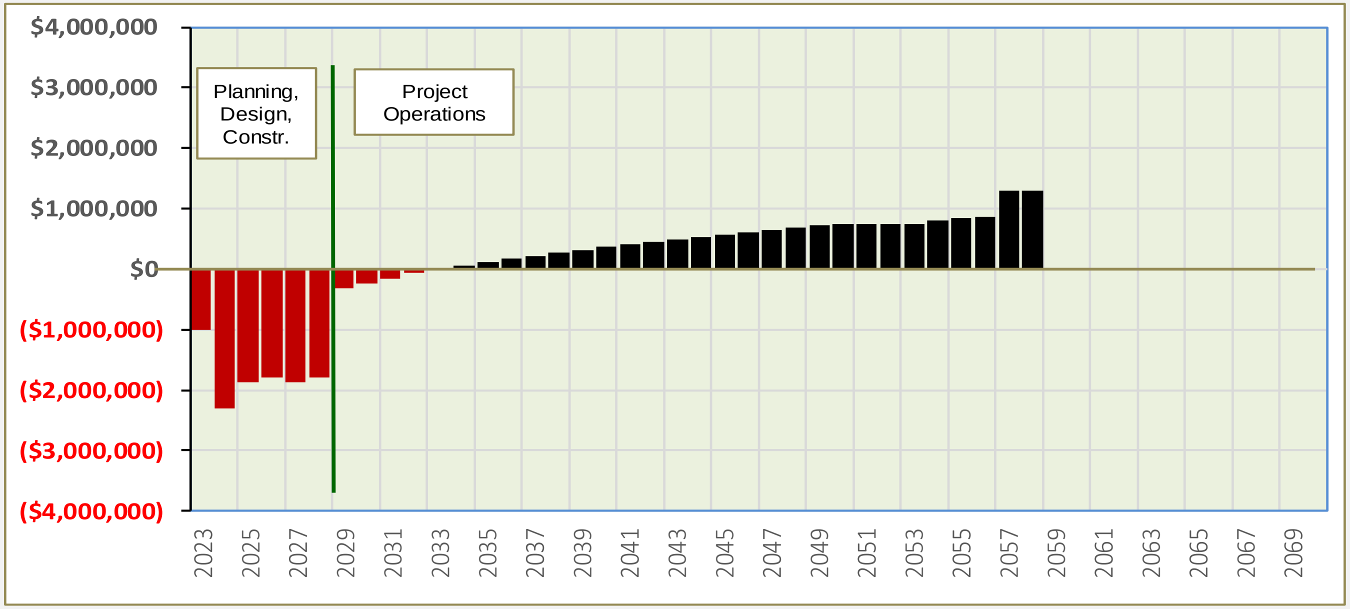
Total Red: $11M	Total Black: $40M	Advantage: $29M

Economic Analysis: Sensitivity Testing

Capacity	SDCWA Rates	Grants	NPV Term	Discount Rate
1.3 MGD	Low	25%	30 Yrs	3.5%

NPV Annual Cost Differential -- Project vs. No Project

Bond Issue: 2027	Ops. Start: 2029	Cross-over: 2034	Break-even: 2056	Payback pd.: 29 Yrs



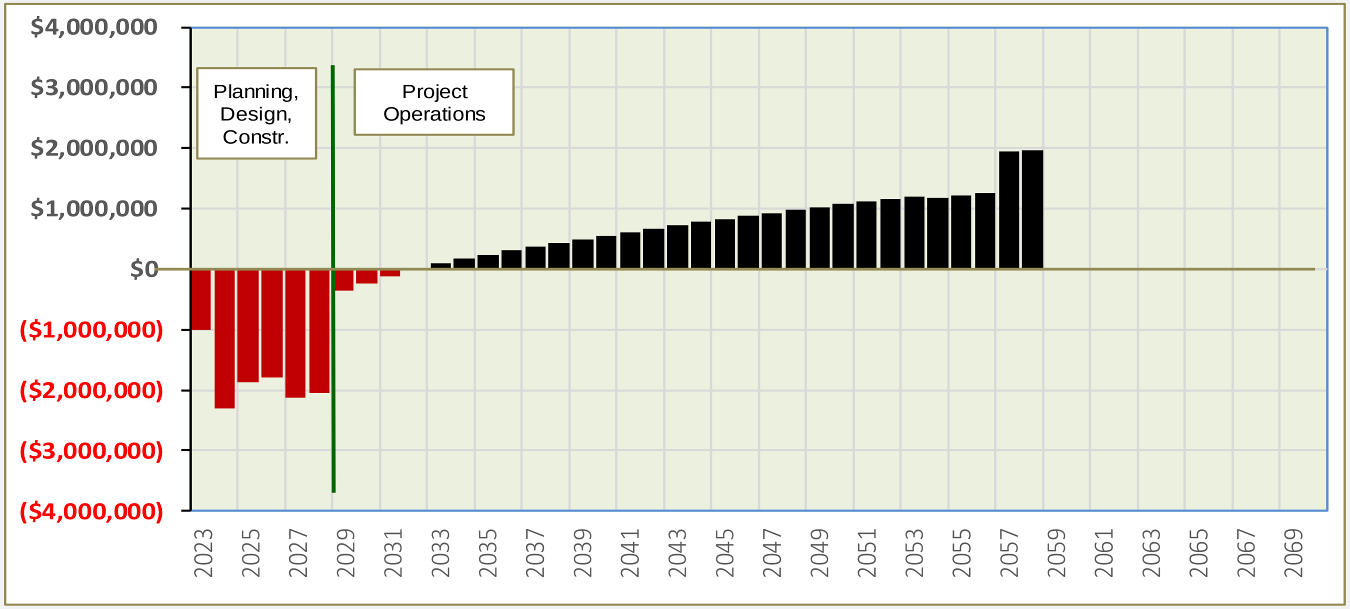
Total Red: $11M	Total Black: $15M	Advantage: $3M

Economic Analysis: Sensitivity Testing

Capacity	SDCWA Rates	Grants	NPV Term	Discount Rate
1.3 MGD	Mid-Range	10%	30 Yrs	3.5%

NPV Annual Cost Differential -- Project vs. No Project

Bond Issue: 2027	Ops. Start: 2029	Cross-over: 2032	Break-even: 2051	Payback pd.: 24 Yrs



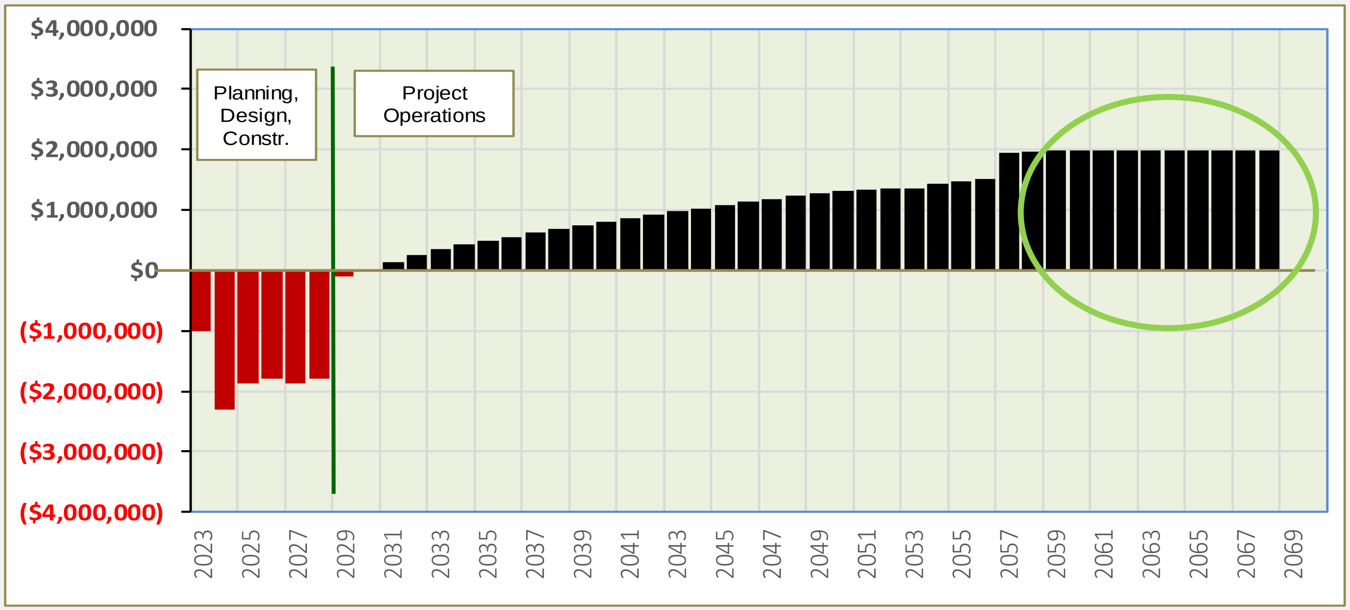
Total Red: $12M	Total Black: $22M	Advantage: $10M

Economic Analysis: Sensitivity Testing

Capacity	SDCWA Rates	Grants	NPV Term	Discount Rate
1.3 MGD	Mid-Range	25%	40 Yrs	3.5%

NPV Annual Cost Differential -- Project vs. No Project

Bond Issue: 2027	Ops. Start: 2029	Cross-over: 2030	Break-even: 2046	Payback pd.: 19 Yrs



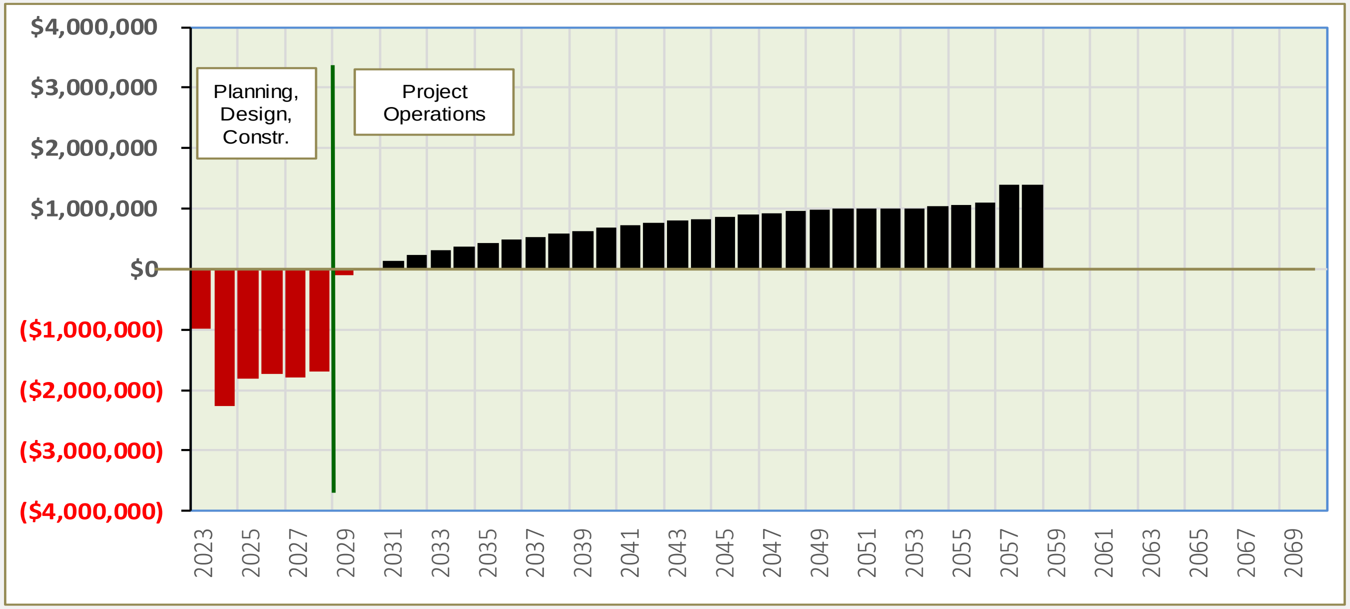
Total Red: $11M	Total Black: $48M	Advantage: $38M

Economic Analysis: Sensitivity Testing

Capacity	SDCWA Rates	Grants	NPV Term	Discount Rate
1.3 MGD	Mid-Range	25%	30 Yrs	4.5%

NPV Annual Cost Differential -- Project vs. No Project

Bond Issue: 2027	Ops. Start: 2029	Cross-over: 2030	Break-even: 2048	Payback pd.: 21 Yrs



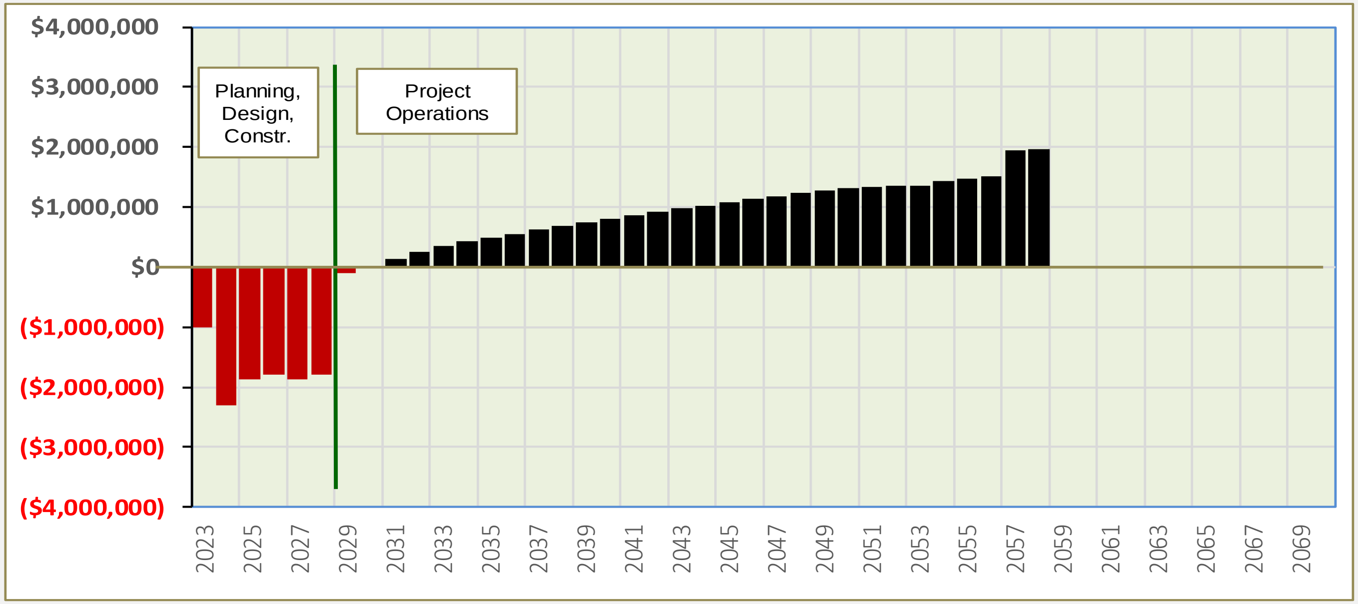
Total Red: $10M	Total Black: $22M	Advantage: $14M

Economic Analysis: The Project fares very well

Capacity	SDCWA Rates	Grants	NPV Term	Discount Rate
1.3 MGD	Mid-Range	25%	30 Yrs	3.5%

NPV Annual Cost Differential -- Project vs. No Project

Bond Issue: 2027	Ops. Start: 2029	Cross-over: 2030	Break-even: 2046	Payback pd.: 19 Yrs



Total Red: $11M	Total Black: $28M	Advantage: $18M

FINDINGS AND RECOMMENDATIONS:

1. **Non-Cost Factors:** The project provides improved supply reliability, environmental sustainability, and local control

2. **Cost Factors:** With reasonable assumptions, the project is significantly less costly than the No Project alternative over a 30 period of analysis

3. **Next Steps:** The Non-Cost and Cost findings support advancing the project to final planning and agency coordination (SGMA et. al.)

Board Questions, Discussion, Input

OLIVENHAIN
Municipal Water District
A Public Agency

FY 2023 Plan – Improve Certainty of Supply, Increase Capacity

- Hydrogeologic Analysis – Capacity Opportunities
- Firm Water Rights, CEQA - SGMA
- Funding – Grants, Low Interest Loans
- Updated Economic Analysis
- Siting Analysis
- Board Workshop – Spring 2023 (Or sooner)
- Outreach

Board Questions, Discussion, Input

Thank you!

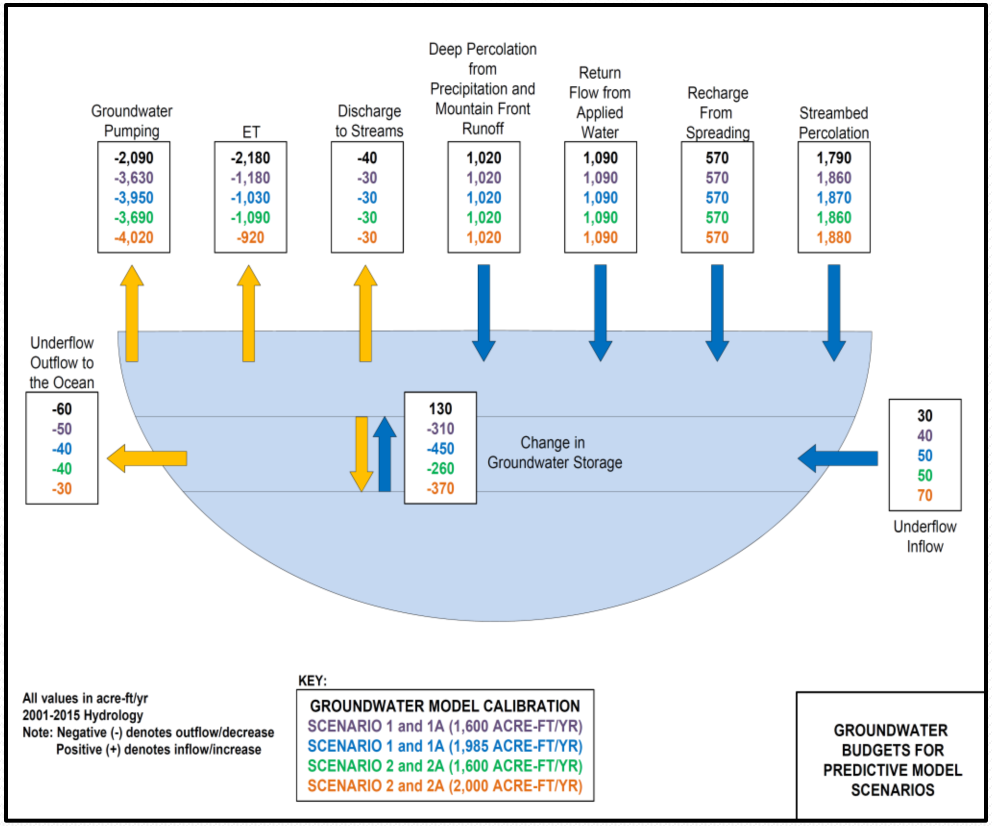
OLIVENHAIN
Municipal Water District
A Public Agency

Supplemental Slides: Detail and Examples

Olivenhain Municipal Water District
A Public Agency

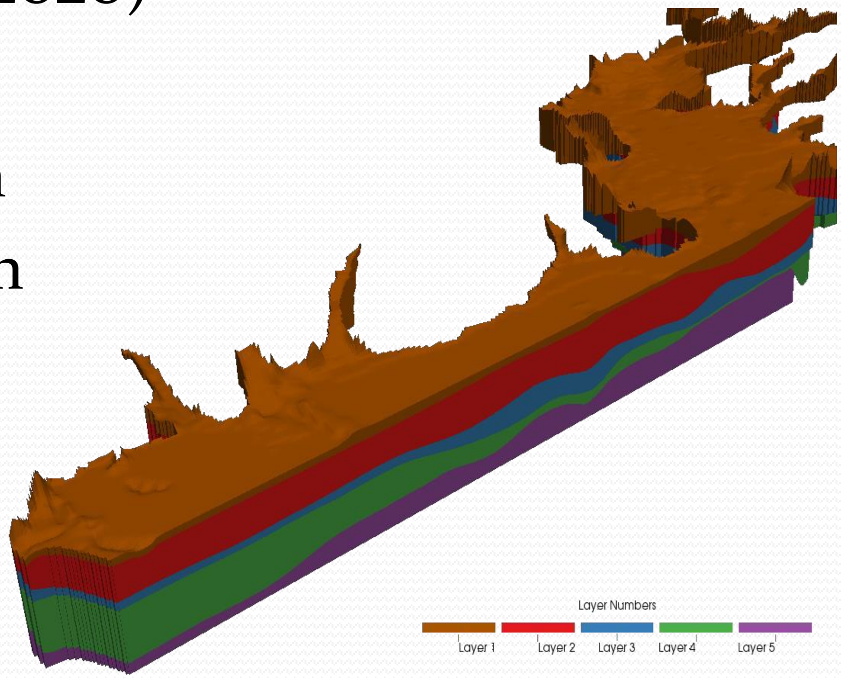
Hydrogeologic Analysis Peer Review

- Highly qualified individual or team
- Independent review
- Confirmation, adjustments, additional work
- Comment on GSP



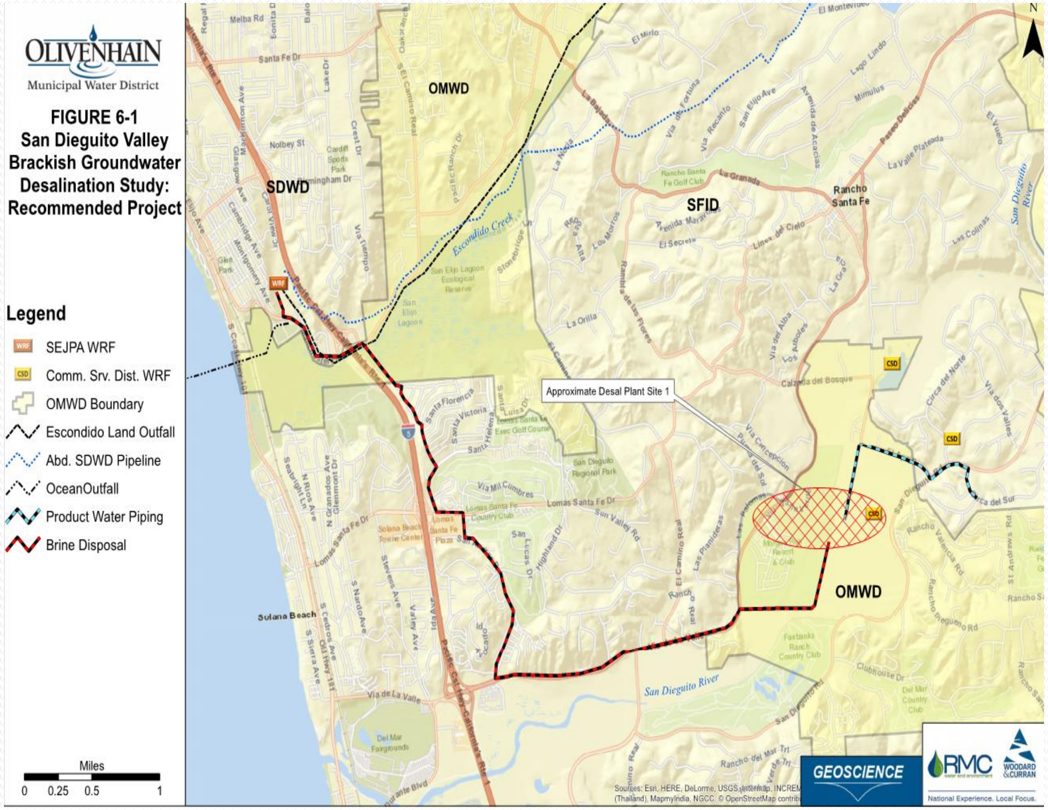
Additional Hydrogeologic Analysis & Modeling

- Long-term analysis (1965-2020)
- Optional Tasks
  - Geophysical Investigation
  - Refine basin configuration
    - Injection Wells
    - Desalination wells



Facility Siting Alternatives

- Wells & WTP, PL, PS
- Long List
- Compatibility, Zoning
- Space
- Availability/Cost
- Added Facility Costs
- Contamination?
- Alternatives for CEQA/NEPA



GSP Scoping

- CEQA, GSP, Both?
- Strategy to win support
  - No impact to users
  - Irrigation return flow
  - Rights to CSD discharges
  - Supplemental recharge
- Pumpers meeting
- Water rights attorney
- Sources of supplemental recharge, costs
- Partnerships, CSDs, SEJPA

Grant Funding, Low-Interest Loans

- *Title XVI*
- *WIIN*
- MWD Local Resources Project
- State Revolving Fund
- Other

Clean Water
State Revolving Fund

Community Outreach

- Community Meeting
  - Explain project and process
  - Collect input
  - ID issues
- “Informed Input”
- Inform the EIR & Board

Phase 2 Slides (potential long term)

Possibility for Indirect Potable Reuse: San Dieguito Valley Groundwater Desalination Project

Groundwater Extraction and Treatment (Phase 1)

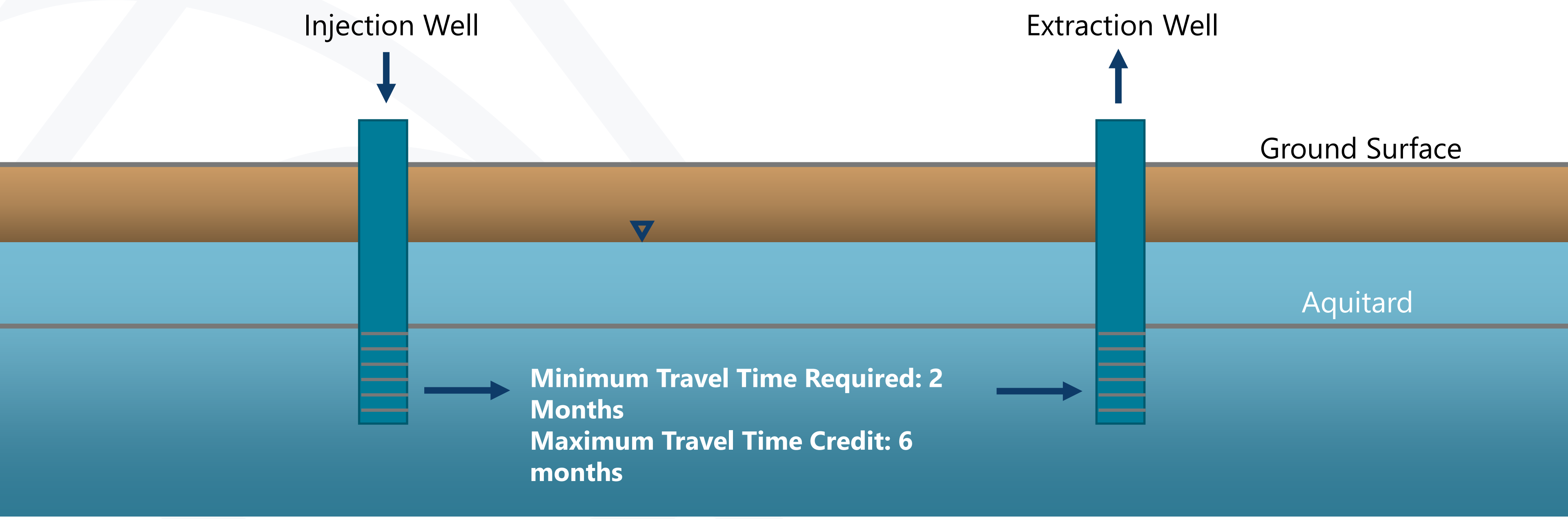
- Extraction wells
- Raw water conveyance from wells to plant
- Desalination treatment plant
- Brine line (or force main) to SEJPA for ocean outfall disposal
- Recycled water conveyance to replace existing groundwater uses

→

Supplemental Recycled Water Injection or Spreading (IPR - Phase 2)

- Recycled water conveyance to advanced water treatment
- Advanced water treatment facility
- Advanced water conveyance to injection wells (eastern basin)
- Injection wells
- Treated water storage
- Potable water conveyance to distribution system
- Alternative – recycled water conveyance to injection wells (western basin)

Conceptual Depiction of Injection Well Siting to Meet Travel Time Requirements Phase 2

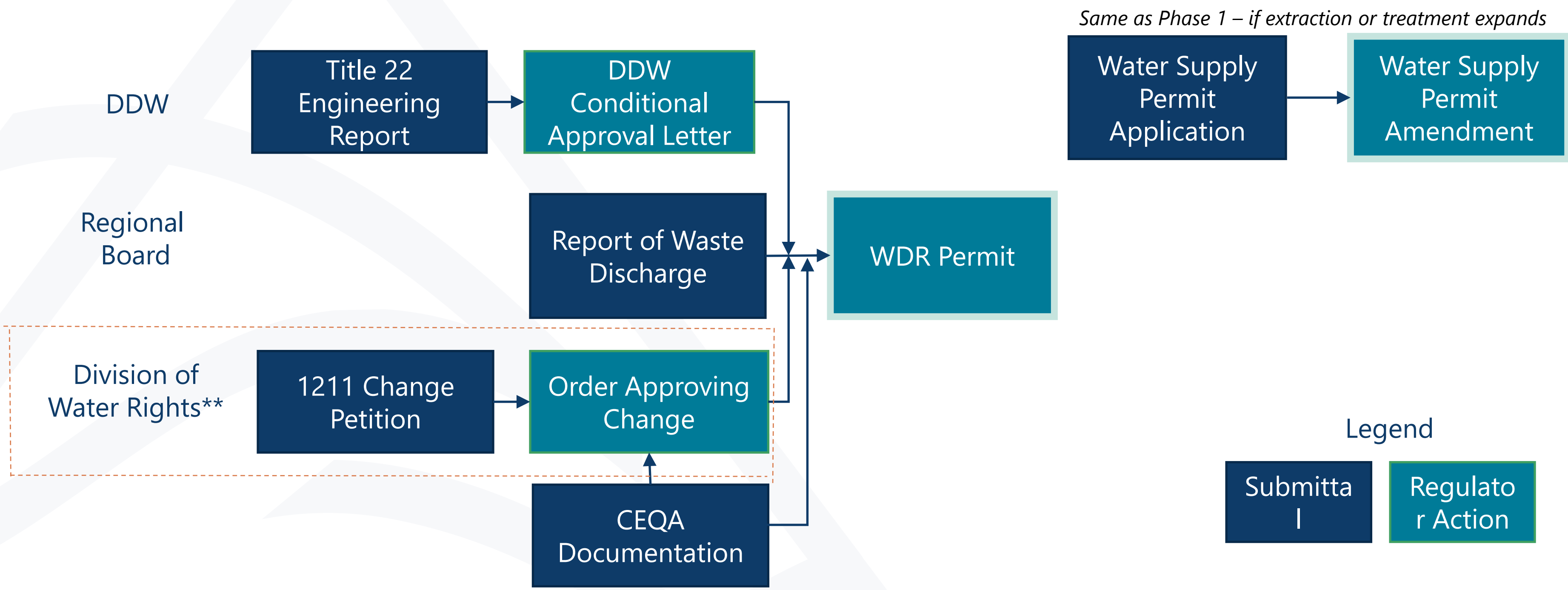


Phase 2 - Not recommended to pursue at this time

- Regulatory feasibility of Phase 2 would depend on ability to separate extraction and injection wells with enough aquifer travel time
  - Other Phase 2 alternatives could be explored to maximize local groundwater supplies and increase resilience
  - Recycled water availability is currently a limiting factor

DDW & RWQCB Indirect Potable Reuse (IPR) Permitting Process

Phase 2: Supplemental Recycled Water Injection or Spreading

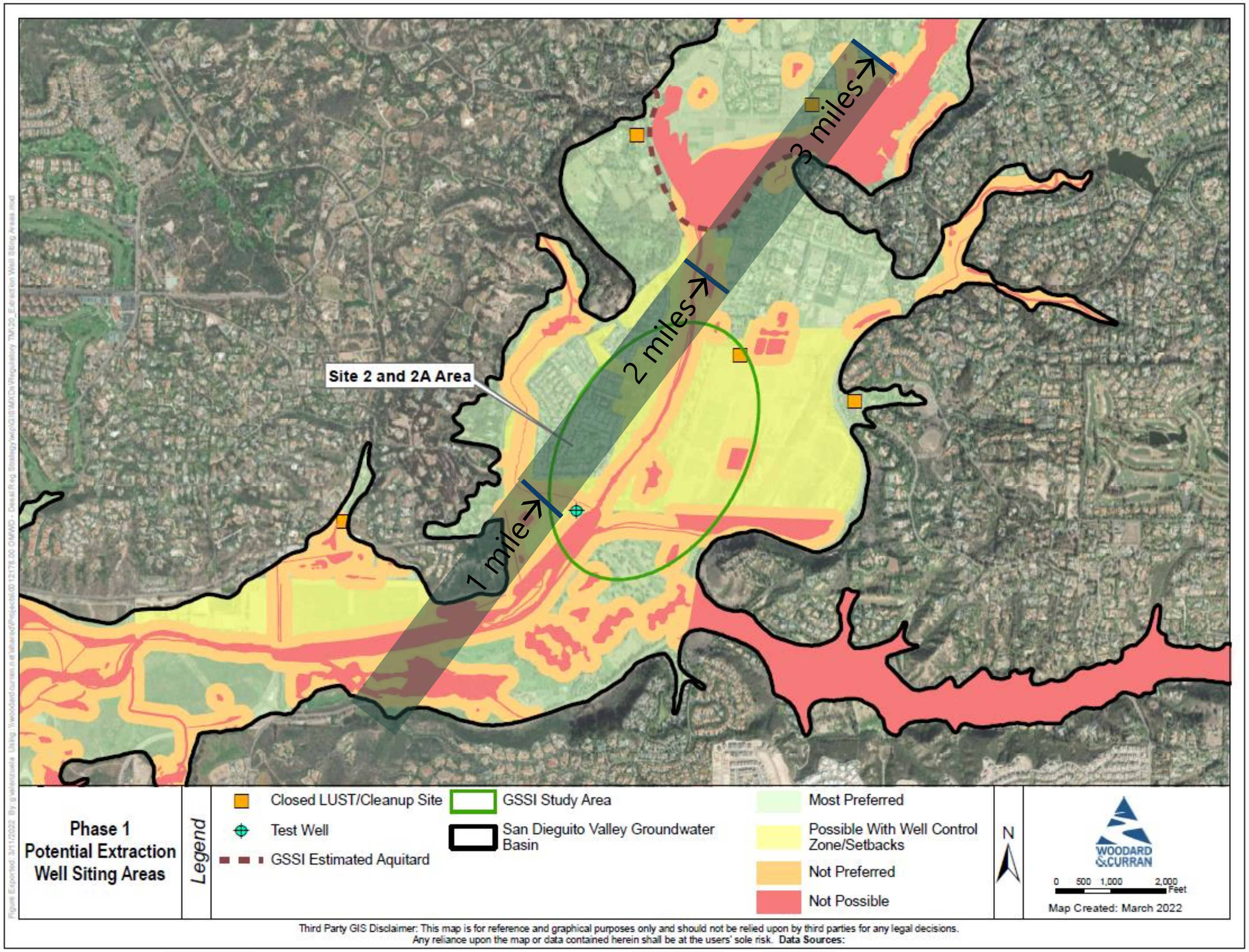


**Only required if WW influences surface water

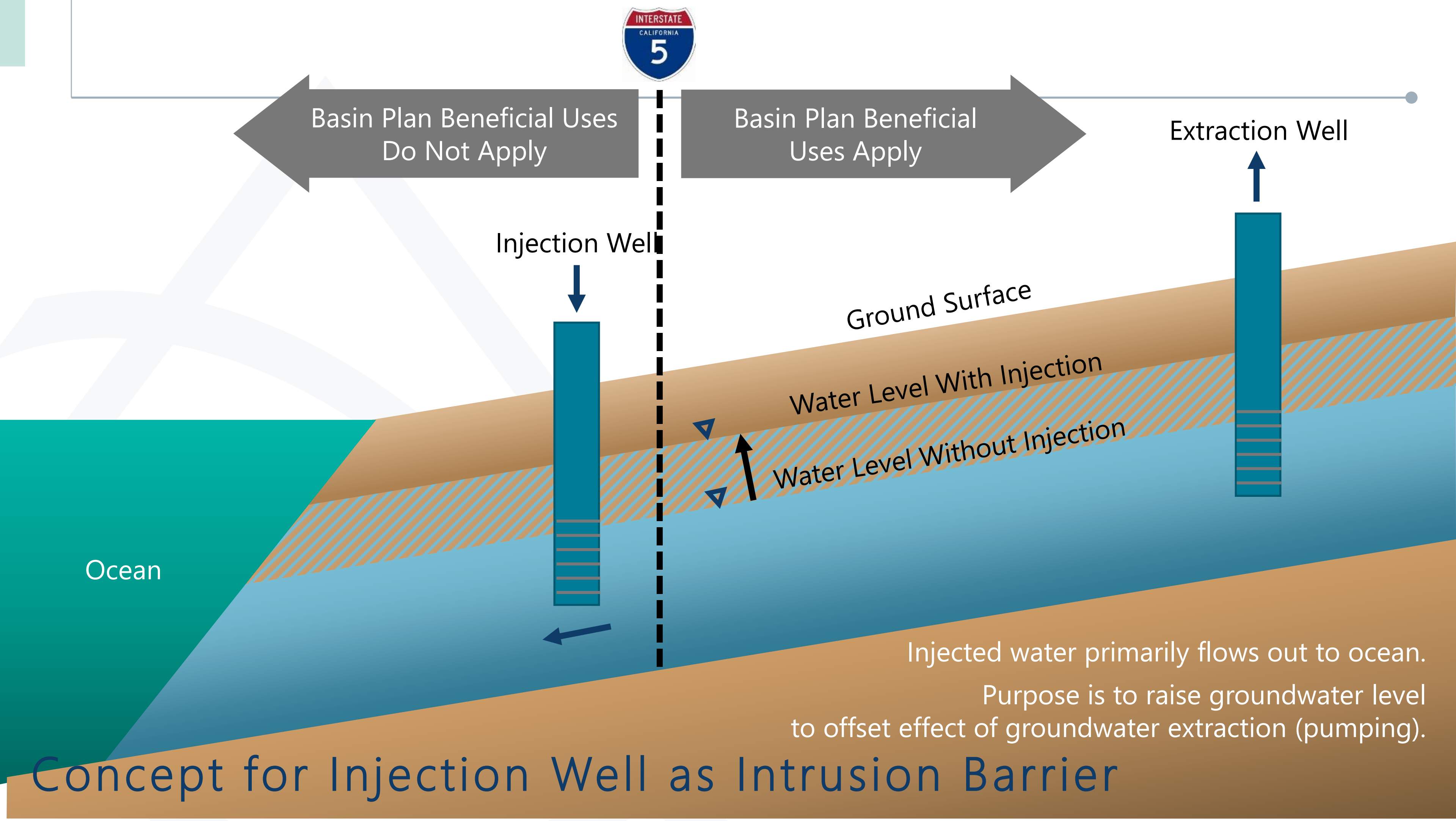
Regulatory Concerns: Indirect Potable Reuse (IPR)
Phase 2: Supplemental Recycled Water Injection/Spreading

Requirement	Surface Spreading	Subsurface Injection
Enhanced Source Control	Pretreatment program with emphasis on constituents that may pass through treatment and could be harmful to human health.	Same as Spreading.
Minimum Treatment Required	• Disinfected tertiary treatment required • Due to emerging contaminants such as PFAS, additional with GAC often needed • Soil aquifer treatment	• **Full advanced treatment (FAT) consisting of reverse osmosis (RO) and ultraviolet (UV) disinfection / advanced oxidation process (AOP)** • Non-RO processes may be considered but have not been approved yet in California.
Pathogen Control and Multiple Barrier Requirements	• At least three treatment barriers • Pathogen removal required: 12/10/10 (V/G/C)	Same as Spreading.
Total Organic Carbon (TOC) Limits	TOC_{max} = 0.5 mg/L ÷ RWC A project with a 20% RWC maximum will have a TOC effluent limit of 2.5 mg/L.	• The plant must produce purified recycled water with a TOC no greater than 0.5 milligrams per liter (mg/L). • Diluent water cannot be used to meet this requirement.
Recycled Municipal Wastewater Contribution (RWC) Limits	• Initial RWC limited to 20%. (Requires 80% diluent water via spreading non-recycled water or use of groundwater underflow) • RWC is limited by effluent TOC (see above). • Diluent water must meet primary drinking water standards	• May be up to 100% • No diluent required
Chemical Standards	• <10 mg/L total nitrogen • Drinking water primary standards • Action levels for lead and copper • Notification Levels and Recycled Water Policy Chemicals of Emerging Concern (CECs) can be met after soil aquifer treatment.	Same as Spreading except: • Notification Levels and Recycled Water Policy CECs must be met in the FAT effluent prior to recharge.
Underground retention time	• **Spreading projects with less than six months retention time have not been successfully permitted**	• Credited with 1-log per month for virus reduction for a maximum of 6-log. • No credit provided underground for Giardia and Cryptosporidium.
Response Retention Time	• Minimum response retention time is two months • Most spreading projects provide at least six months retention to obtain Giardia and Cryptosporidium credits.	• **Minimum response retention time is two months.** • Typically, an additional process beyond standard FAT (eg, free chlorine) is needed for projects with less than 6 months retention time.

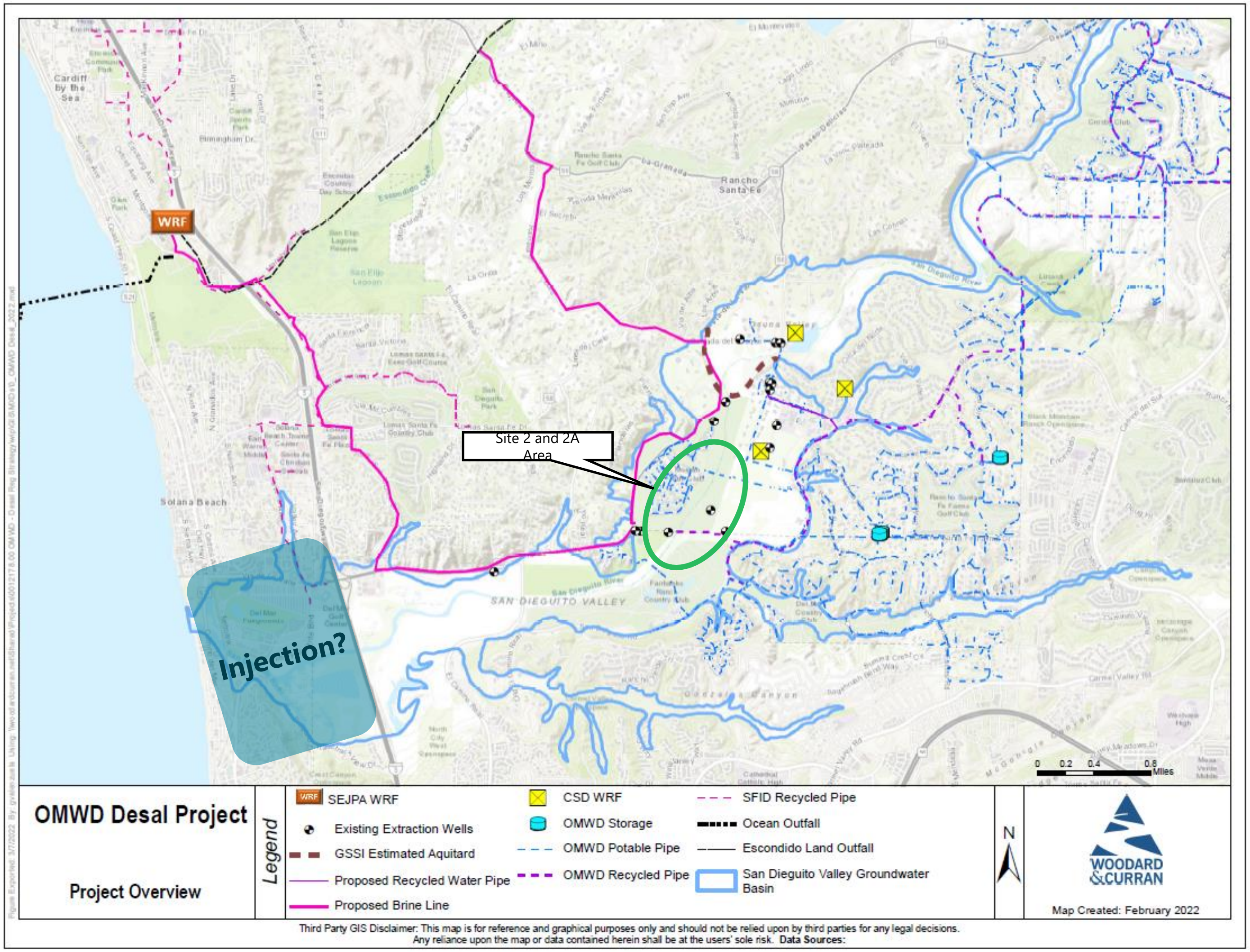
Travel Time Requirements



- 1-5 miles between injection and extraction well fields could be required to meet travel time requirements
- May not be possible to site injection wells in eastern end of basin where aquitard is present and site extraction wells in the Site 2 and 2A area



Concept for Injection Well as Intrusion Barrier



Phase 2 Alternatives

- Injection wells as intrusion barrier west of I-5
  - Uses tertiary treated water
  - Decouples injection and extraction treatment siting
  - Provides more flexibility in extraction well siting to optimize water quality
- Phase 2 alternatives have not been fully explored

Regulatory Summary
Phase 2: Supplemental Recycled Water Injection or Spreading

Benefits

- Additional water source may further enhance project reliability and cost-effectiveness
- Phase 2 alternatives include siting injection wells as an intrusion barrier and/or aquifer storage and recovery project

Constraints

- Travel time requirement for groundwater recharge projects limits extraction well siting options
- Lengthy and complex permitting process compared to Phase 1 extraction and treatment project

Recommendation

- Phase 2 feasibility study should optimize reliability, value, and quality of local water supplies

Woodard & Curran

TECHNICAL MEMORANDUM

TO: Don MacFarlane, Joey Randall
Olivenhain Municipal Water District

PREPARED BY: Susan Brownstein

REVIEWED BY: Rosalyn Prickett, Kraig Erickson, P.E.

DATE: March 23, 2022

RE: San Dieguito Valley Groundwater Desalination Project Description

1. INTRODUCTION

Over the last few decades, Olivenhain Municipal Water District (OMWD) has explored the possibility of developing groundwater in several coastal basins in San Diego County. The San Dieguito Valley basin has been identified as having available groundwater supply for beneficial use by District customers. OMWD currently relies on purchased water for its potable water needs with limited local water supply options available. Faced with rising costs, decreasing availability, and uncertain future reliability of this purchased water supply, OMWD is investigating a local potable water supply through implementation of the San Dieguito Valley Groundwater Desalination Project (Project).

A 2017 *San Dieguito Valley Brackish Groundwater Desalination Feasibility Study* evaluated if 1.0 to 1.3 million gallons per day (mgd) of potable water can be produced from brackish groundwater in the San Dieguito Valley Groundwater Basin. The study evaluated numerous project considerations including production wells, conveyance pipelines, desalination treatment facilities, brine management, as well as project alternatives and costs, environmental and regulatory considerations, and implementation plans.

Following completion of the Feasibility Study, OMWD began pilot borings and test well construction. After the test well was constructed, water quality sampling, pretreatment field testing, and pump tests were conducted to update the groundwater model and verify basin capacities. The 2021 *Report of Design Pilot Testing for the San Dieguito Valley Brackish Groundwater Desalination Project* summarized the results of the pump test. The 1-year pump test was conducted to verify the water balance of the San Dieguito Valley Groundwater Basin, water quality and potential impacts to wells of current basin users, and manganese treatment by piloting pre-treatment technologies. The water balance supports a project producing up to 1.3 mgd.

Overall, the Project appears to be a sustainable solution to creating a reliable drinking water without causing significant impacts to the environment or existing groundwater users. Over the life of the project, the models show improved groundwater basin water quality within the Project area. Implementation of the Project would create a reliable drinking water supply at predictable prices.

1.1 Project Objective

The objective of the Project is to develop available groundwater supplies in the San Dieguito Valley basin for beneficial use, while protecting the existing water rights and environmental resources within the basin.

2. PROJECT OVERVIEW

The San Dieguito Valley Groundwater Desalination Project will produce a local supply of potable water from brackish groundwater in the San Dieguito Valley Groundwater Basin. This project description defines the Project and outlines the physical facilities and water sources.

Groundwater Extraction and Treatment

The goal of the project is to produce 1.0 to 1.3 million gallons per day (mgd) of potable water through brackish groundwater extraction and treatment. This includes construction and operation of the necessary facilities, including groundwater extraction wells, a desalination plant to treat the water to drinking water standards, conveyance pipelines from the extraction wells to the desalination plant and from the desalination plant to the potable water distribution system, and a brine line from the desalination plant to ocean disposal at San Elijo Joint Powers Authority (SEJPA) San Elijo Ocean Outfall (SEOO).

Existing Facilities

2.1 Water Facilities

OMWD water supply is made up of 87 percent purchased or imported water from the San Diego County Water Authority (SDCWA) for potable use and 13 percent recycled water for non-potable irrigation as summarized in **Table 1-1**. With limited local water supplies of its own, OMWD is completely reliant on purchased water for its potable water needs. Faced with rising costs, decreasing availability, and uncertain future reliability of this purchased water supply, OMWD is focusing on developing its own local potable water supply through implementation of the Project.

Table 1-1: Water Supplies FY 2020

Water Supply	Use	Purveyor	Percent	Volume (AF)
Purchased or Imported Water	Potable	SDCWA	87%	17,100
Recycled Water	Non-potable irrigation	OMWD, VWD, City of San Diego, SEJPA, Ranch Santa Fe CSD	13%	2,482
TOTAL			**100%**	**19,582**

Source: OMWD, 2020 UWMP

2.2 Recycled Water Facilities

Recycled water is produced at two of the four water reclamation facilities (WRFs) within OMWD's service area: the 4S Ranch WRF and the Santa Fe Valley WRF, as indicated in **Table 1-2**. All effluent from the 4S Ranch WRF and the Santa Fe Valley WRF is recycled and used for irrigation in the Southeast Quadrant. Supplies are supplemented by two metered connections to the City of San Diego's recycled water system. The Southeast Quadrant Recycled Water Distribution system facilities include a 3 million gallon (MG) recycled water blending reservoir, several pumping stations, a 1 MG water tank, and over 5 miles of recycled water pipeline ranging in size from 8 inches to 20 inches.

The Northwest Quadrant recycled water system is currently supplied through agreements with Vallecitos Water District (VWD) from its Meadowlark WRF and Mahr Reservoir, and San Elijo Joint Powers Authority (SEJPA) from its San Elijo WRF. The Northwest Quadrant includes the Village Park area of the City of Encinitas. OMWD has constructed approximately 2.9 miles of 8- and 12-inch diameter recycled water pipelines within existing streets in the Northwest Quadrant.

Table 1-2: Recycled Water Sources FY 2020

Recycled Water Source	Owner	Treatment	Recycled Water System	Recycled Water Volume (AF)
4S Ranch WRF	OMWD	Tertiary	OMWD Southeast Quadrant Recycled Water System	1,150
Santa Fe Valley WRF	Rancho Santa Fe CSD	Tertiary	OMWD Southeast Quadrant Recycled Water System	182
North City WRF	City of San Diego	Tertiary	OMWD Southeast Quadrant Recycled Water System	377
Meadowlark WRF and San Elijo WRF	VWD and SEJPA	Tertiary	OMWD Northwest Quadrant Recycled Water System	728
TOTAL				**2,482**

Source: OMWD, 2020 UWMP

3. PROPOSED PROJECT

Groundwater extracted from the San Dieguito Valley Groundwater Basin is the source of water being considered for desalination. The groundwater basin is recharged from surface infiltration of storm and base flow in the San Dieguito River, seasonal rainfall, occasional spills from Lake Hodges, underflow from the adjacent hills, and infiltration of treated wastewater from percolation ponds. Extraction wells would be screened in the lower aquifer located below an aquitard, thus eliminating influence from surface water.

Facilities for the project may include the following:

1) Extraction wells
2) Raw water conveyance from wells to plant
3) Desalination treatment plant
4) Brine line (or force main) to SEJPA for ocean outfall disposal
5) Recycled water conveyance to replace existing groundwater uses

3.1 Proposed Facilities – Groundwater Extraction and Treatment

The project facilities would include the infrastructure necessary for brackish groundwater extraction, treatment, and conveyance to OMWD's potable water system.

3.1.1 Extraction Wells

As an outcome of the hydrogeologic investigation, the updated groundwater model reflected general locations where groundwater extraction could occur in the San Dieguito Valley Groundwater Basin. Groundwater production of 1.45 mgd (1,625 AFY) is required to produce 1.3 mgd (1,300 AFY) of desalinated product water, accounting for brine and other process losses of approximately 19 percent, and occasional outages for maintenance. Each well site will require a footprint of approximately 10,000 square feet (sf); assuming two additional wells are required for a total of 20,000 sf. Wells are estimated to be 18-inch diameter and drilled to depths of 150 to 190 feet.

Located along the San Dieguito River west of San Dieguito Road and east of Via de la Valle, Well Sites 2 and 2A were identified in the 2017 *Feasibility Study* and assessed in the 2021 *Report of Design Pilot Testing*. The results of the updated scenario run indicate that the proposed extraction of 1,600 acre-ft/yr at the Desalter Test Well, Sites 2 and 2A will create a minor decrease in storage of 150 acre-ft/yr based on the hydrology of the modeling period and current (2020) groundwater in storage, less than 1 percent of basin storage. Extraction of 1,625 acre-ft/yr would further decrease the storage, but only by an insignificant amount. During above average rainfall periods, it is likely that groundwater storage will be replenished, as is typical for many shallow basins in Southern California.

Based on the hydraulic model, Well Sites 2 and 2A can produce 1,625 AFY with minor localized impacts on surrounding wells in the area. Operation of the Desalter Test Well caused approximately 5 feet of drawdown in the surrounding 4 wells at the end of the long-term pumping test. The 10 additional monitoring wells and piezometers did not show any changes from the Desalter Test Well pumping. Estimated travel time from the river to Well Sites 2 and 2A is 940 days, which indicates that the groundwater at this site is not under the direct influence of surface water. Pumping in the deeper aquifer does not affect surface water in the San Dieguito River, which simplifies treatment and regulatory requirements.

3.1.2 Raw Water Conveyance

Conveyance of groundwater from the well field sites to the groundwater desalter will require approximately 5,300 feet of 12-inch pipe from the well site to the selected plant site. This alignment is unknown and not currently shown on Figure 1-1.

3.1.3 Desalination Treatment Plant

A specific site for the treatment facility has not yet been determined, but it is anticipated to be within the central portion of the San Dieguito Valley Groundwater Basin. Two potential sites for the desalination plant are shown in Figure 1-1. The facility would include two main structures: 1) Process building at approximately 2,600 sf and 2) Chemical building at approximately 1,500 sf. It would also include smaller ancillary structures and equipment around these two main structures. The treatment plant will consist of greensand filters, reverse osmosis treatment, a chemical building, and staff facilities. The required acreage for the groundwater desalter is approximately 1.0 acre. Selection factors for the treatment plant site will include existing land use and compatibility, proximity to the groundwater extraction well locations, elevation above the 100-year floodplain, and access to brine management.

Note, facility should be sized for expansion to treat more than 1.45-mgd of groundwater.

3.1.4 Brine Management

The brine disposal method is anticipated to be via the San Elijo Ocean Outfall (SEOO). The brine flows are estimated to be 0.19 mgd for a 1 mgd project and will require 33,800 feet of 6-inch pipe along San

Andres Road and a pump station to convey the brine from the groundwater desalination facility to the San Elijo Water Reclamation Facility (WRF) for disposal in the SEOO. There are two possible connection points to the SEOO: 1) the Escondido Land Outfall (ELO) and 2) via direct connection to the SEOO at the San Elijo WRF, bypassing the ELO. The 6-inch pipe would also support a 1.3 mgd project.

Five alignment alternatives were evaluated for connecting to the SEOO were considered in the 2017 *Feasibility Study*. The top two alignments as summarized in **Table 3-1.** Connecting to the ELO, which delivers flow to the SEOO, using Rambla de la Flores is the shortest length alignment. For direct connection to San Elijo WRF, the San Andres Drive alignment is the shortest.

Should recycled water be sourced from the San Elijo WRF or the City of Escondido's Hale Avenue Resource Recovery Facility (HARRF) (via the ELO) for future groundwater replenishment, these potential alignments could be used for both brine conveyance (from desalination plant to discharge point) and recycled water conveyance (from reclamation plant to injection wells).

Table 3-1: Alignment Alternatives to San Elijo Ocean Outfall

Brine Connection Alternative	Brine Line Length
Escondido Land Outfall (ELO) (via Rambla de las Flores)	25,500 feet
San Elijo WRF (via San Andres Drive)	33,800 feet

3.1.5 Recycled Water Conveyance

OMWD will also be exploring options to secure existing groundwater wells in the basin that could be offset by recycled water for non-potable uses. To accomplish this, OMWD may extend existing recycled water pipelines that currently serve OMWD customers within the San Dieguito River Valley and install customer connection and meters. The recycled water delivered to existing customers is a blend of three different sources and conveyed through OMWD's Southeast Quadrant. See Section 1.2 above for description of the existing recycled water system.

TECHNICAL MEMORANDUM

TO: Olivenhain Municipal Water District

PREPARED BY: Haley Johnson and George Valenzuela

REVIEWED BY: Rosalyn Prickett

DATE: March 4, 2022

RE: San Dieguito Valley Groundwater Desalination Project Environmental Strategy

TABLE OF CONTENTS

1. INTRODUCTION

Over the last few decades, Olivenhain Municipal Water District (OMWD) has explored the possibility of developing groundwater in several coastal basins in San Diego County. The San Dieguito Valley basin has been identified as having available groundwater supply for beneficial use by District customers. OMWD currently relies on purchased water for its potable water needs with limited local water supply options available. Faced with rising costs, decreasing availability, and uncertain future reliability of this purchased water supply, OMWD is investigating a local potable water supply through implementation of the San Dieguito Valley Groundwater Desalination Project (Project).

A 2017 *San Dieguito Valley Brackish Groundwater Desalination Feasibility Study* evaluated if 1.0 million gallons per day (mgd) of potable water can be produced from brackish groundwater in the San Dieguito Valley Groundwater Basin. The study evaluated numerous project considerations including production wells, conveyance pipelines, desalination treatment facilities, brine management, as well as project alternatives and costs, environmental and regulatory considerations, and implementation plans.

Following completion of the Feasibility Study, OMWD began pilot borings and test well construction. After the test well was constructed, water quality sampling, pretreatment field testing, and pump tests were conducted to update the groundwater model and verify basin capacities. The 2021 *Report of Design Pilot Testing for the San Dieguito Valley Brackish Groundwater Desalination Project* summarized the results of the pump test. The 1-year pump test was conducted to verify the water balance of the San Dieguito Valley Groundwater Basin, water quality and potential impacts to wells of current basin users, and manganese treatment by piloting pre-treatment technologies.

Recent economic feasibility analysis has determined that the Project may be more cost effective as a 1.3 mgd brackish groundwater desalination plant. For this environmental analysis, the conclusions for a 1.0 MGD project hold for a 1.3 MGD project.

Overall, the Project appears to be a sustainable solution to creating a reliable drinking water without causing significant impacts to the environment or existing groundwater users. Over the life of the project, the models show improved groundwater basin water quality within the Project area. Implementation of the Project would create a reliable drinking water supply at predictable prices. . In producing a local source of supply, the Project allows OMWD to adapt to climate change that affects imported supplies

1.1 Project Objective

The objective of the Project is to develop available groundwater supplies in the San Dieguito Valley basin for beneficial use, while protecting the existing water rights and environmental resources within the basin.

1.2 Study Objective

The purpose of this environmental constraints analysis is to determine the level of environmental review that would be required to achieve compliance with the California Environmental Quality Act (CEQA) for the proposed Project. This technical memorandum also identifies the potential State and federal permit requirements for each project phase.

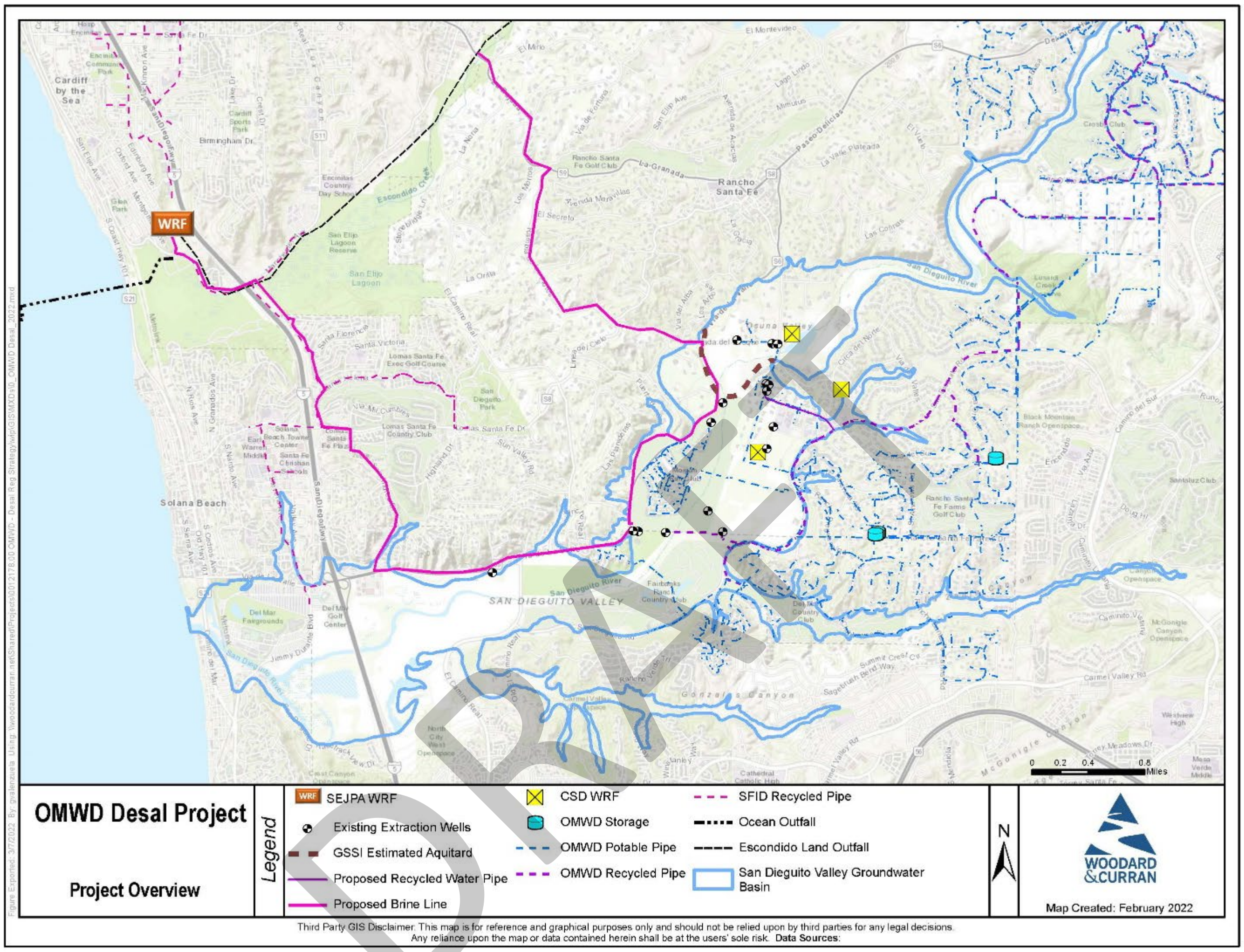
2. PROJECT OVERVIEW

The San Dieguito Valley Groundwater Desalination Project will produce a local supply of potable water from brackish groundwater in the San Dieguito Valley Groundwater Basin

The goal of the Project is to produce 1.0 million gallons per day (mgd) of potable water through brackish groundwater extraction and treatment. The Project includes construction and operation of the necessary facilities, including groundwater extraction wells, a desalination plant to treat the water to drinking water standards, conveyance pipelines from the extraction wells to the desalination plant and from the desalination plant to the potable water distribution system, and a brine line from the desalination plant to ocean disposal at San Elijo Joint Powers Authority (SEJPA) San Elijo Ocean Outfall (SEOO). OMWD is also investigating alignments for additional recycled water conveyance to offset existing groundwater uses.

The Project Area is the San Dieguito Valley Groundwater Basin and vicinity in San Diego County. The Project Area and facilities are shown in **Figure 1**.

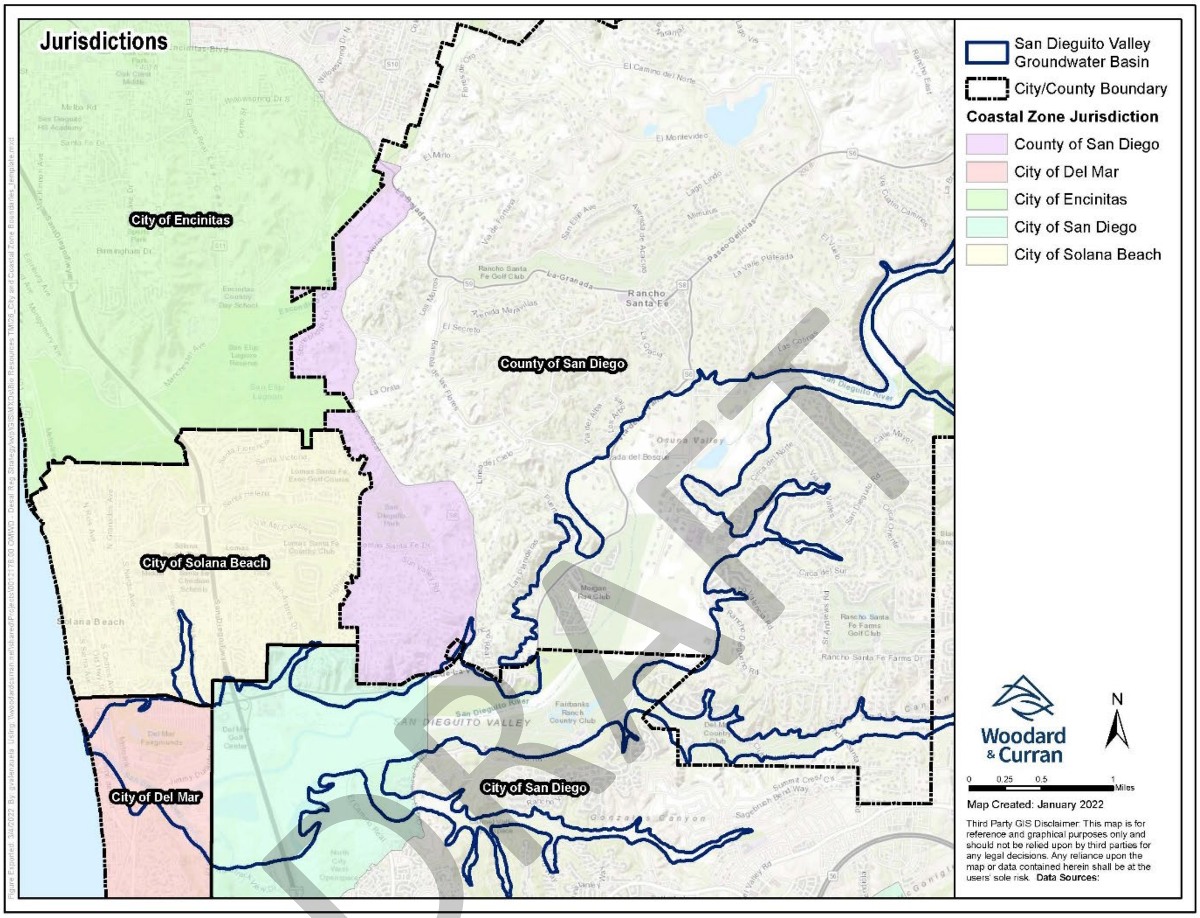
Figure 1 Project Overview



2.1 Setting

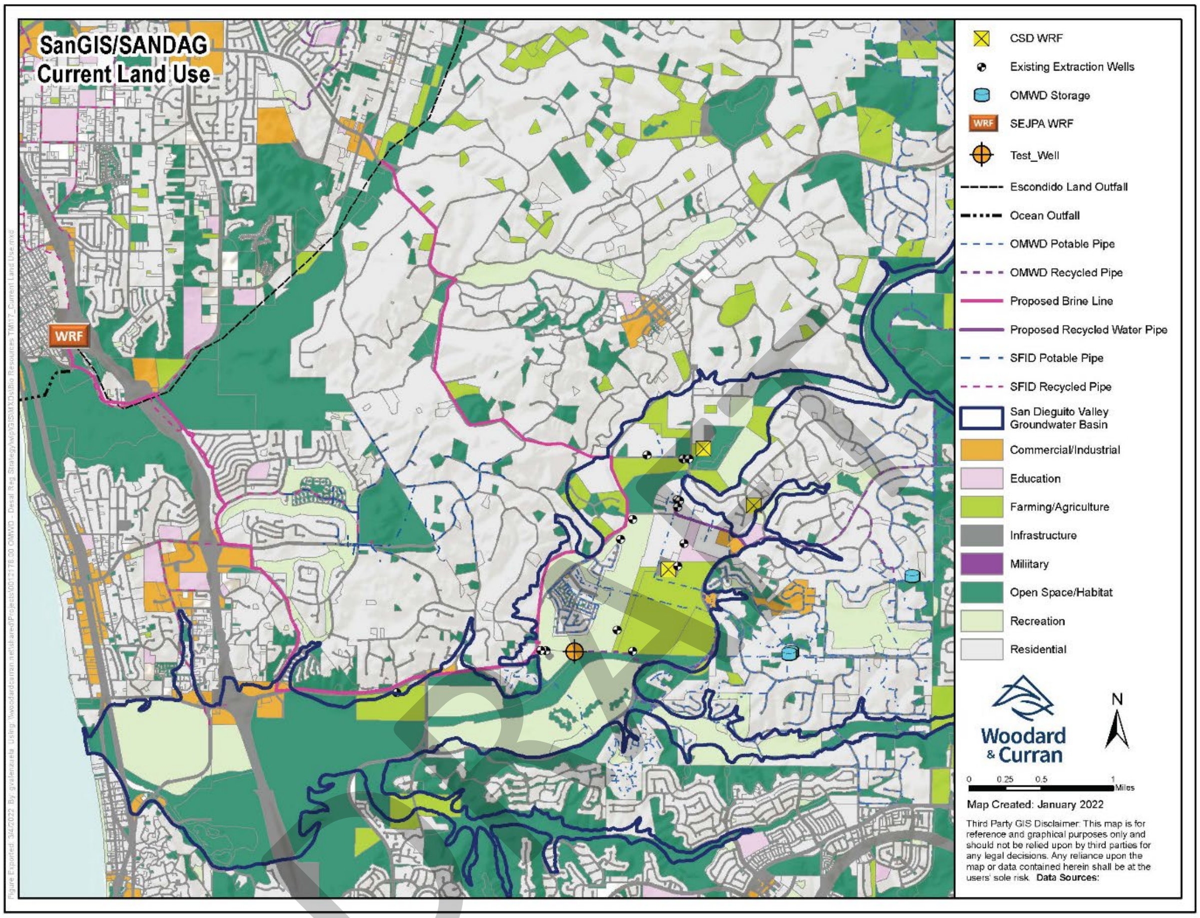
The project area is situated at the boundaries of the City of San Diego, County of San Diego, City of Solana Beach and City of Encinitas. Portions of the project area overlap the coastal zone (SanGIS/SANDAG nd). See **Figure 2**.

Figure 2 City and Coastal Zone Boundaries



Current land use in the project area consists of residential, open space, recreation, and agriculture. See **Figure 3**. Current land use is based on San Diego Association of Governments' (SANDAG's) annual land use and housing unit inventory and is representative of January 1, 2022. SANDAG's annual inventory is verified using aerial photography, the County Assessor Master Property Records file, and other ancillary information (SanGIS/SANDAG nd).

Figure 3 Current Land Use



3. ENVIRONMENTAL RESOURCE CONSIDERATIONS

CEQA requires the evaluation of several different environmental resources to understand and disclose to the public where and how the physical construction and operation of a project may impact those identified resources. The sections below describe potential environmental resources located within the Project area that have the greatest likelihood of being affected and/or requiring permitting. Not all CEQA resource categories are described below. Table 1 presents a summary of the environmental resources present in the Project area and the implications for the Project and Table 2 summarizes the permits that could apply to the Project. Details on the resources and applicable regulations and permits for each can be found in the preliminary constraints analysis that follows. Figure 16 (at end of this study) displays the compiled environmental constraints that must be considered by OMWD for the Project

Table 1: Environmental Constraints Desktop Screening Results Summary

Resource Topic	Summary	Potential Mitigation Requirements and/or Project Design Features
Biological Resources	Construction has the potential to impact the following resources in the project area: protected special-status species, riparian habitat, wetlands, MSCP/MHCP/NCCP	Prior to project approval: • Biological Resources Assessment Report • Jurisdictional Delineation • County review for conformity with MSCP/NCCP planning policies and design guidelines • CDFW Fish and Game Code Section 1600 Lake and Streambed Alteration Agreement • USFWS Endangered Species Act (ESA) Incidental Take Permit • CDFW California ESA Incidental Take Permit Prior to construction: • Compensatory mitigation for impacts to jurisdictional wetlands • Surveys for the presence of special-status species • Worker training • Establish construction disturbance limits • Shield habitat from construction noise and light During construction: • Monitoring by biologist • Best practices (trash removal, cover holes/trenches, equipment mufflers, reduce idling, drip pans) • Potential to stop work if special-status species affected Post-construction: • CNDDB records • Monitoring report
Agriculture	Less than significant impact to mapped farmlands in the project footprint	No mitigation expected to be needed; significant impacts avoided through project design
Water Quality	Construction could contribute to water quality issues	Prior to project approval: • Hydrologic study of potential runoff at treatment plant Prior to construction: • Stormwater Pollution Prevention Plan (SWPPP) (typically prepared by contractor)

Resource Topic	Summary	Potential Mitigation Requirements and/or Project Design Features
Flood Plain	The project area overlaps flood zones, and the treatment plant may need to be built within a flood zone	Prior to project approval: • Letter of Map Revision (LOMR) if treatment plant is constructed within flood zone. May be needed for compliance with San Diego County flood control regulations
GDEs	Operation has the potential to impact groundwater dependent ecosystems	During design: • Locate extraction wells away from GDEs. Prior to project approval: • GDE Study technical report During operation: • Ongoing monitoring of GDEs and regular (e.g., annual) monitoring reports • Implement management strategies, if recommended by GDE monitoring.
Hazards	Fire hazard severity zones and hazardous waste cleanup sites are present in the project area	During design: • Hazardous cleanup sites to be avoided through project design During construction: • Implement fire control measures
Cultural Resources	Construction could impact known and unknown cultural resources or human remains	Prior to project approval: • Cultural Resources Assessment Report During construction • Implement measures for unanticipated discovery of cultural resources or human remains (worker training, notifications, protocols)
Geology	The project has potentially unstable soils.	Prior to project approval: • Geotechnical analysis
Noise	Temporary construction noise could have a potentially significant impact. Operation of the project is not expected to result in a significant impact.	Prior to construction: • Additional noise attenuation (e.g., sound walls during well drilling), may be needed depending on proximity to property lines and noise sensitive receptors • Noise permit required if nighttime construction will occur During construction: • Implement best practices to control daytime noise (e.g., equipment mufflers, white noise backup signal, reduce idling)

Resource Topic	Summary	Potential Mitigation Requirements and/or Project Design Features
Air Quality	Construction and operation would result in emissions of criteria air pollutants, odors, and dust	Prior to project approval: • Air Quality Technical Report During construction: • Construction dust control measures Prior to operation: • SDAPCD permits

Table 2: Summary of Potential Permits and Approvals

Agency	Permit/ Process	Documentation Required	Comments	Timing
FEDERAL				
U.S. Army Corps of Engineers, Los Angeles District	Clean Water Act Section 404	Jurisdictional Delineation, Biological Resources Report, CWA Nationwide Permit	Applicable if construction involves fill or disturbance within bed or bank of jurisdictional waters, as determined by the Jurisdictional Delineation. Can be avoided by siting facilities outside WOTUS (i.e., trenchless pipe installation)	Expected to be avoided through project siting
U.S. Fish and Wildlife Service	Endangered Species Act Section 10	Biological Resources Report, Incidental take permit (ITP)	Applicable if no federal nexus, and if listed species are present according to the Biological Resources Assessment Report and pre-construction surveys	Start when CEQA is approximately 60% done. Timeframe: 12-18 months.
STATE				
California Department of Fish and Wildlife, South Coast Region	Fish and Game Code Section 1600	Streambed Alteration Agreement (SAA)	Required if project disturbs bed, bank, or channel of stream, including under streambed.	Start when CEQA is approximately 60% done. SAA timeframe: 6-8 months.
California Department of Fish and Wildlife, South Coast Region	California Endangered Species Act	Incidental take permit (ITP)	Applicable if State listed species are present according to the Biological Resources Assessment Report and pre-construction surveys with no consistency determination with the federal ESA.	Start when CEQA is approximately 60% done. Timeframe: 12-24 months.

Agency	Permit/ Process	Documentation Required	Comments	Timing
State Water Resources Control Board	Clean Water Act Section 402: NPDES Stormwater Construction General Permit	Stormwater Pollution Prevention Plan (SWPPP)	Applicable if construction soil disturbance totals one acre or greater. Typically prepared by contractor.	SWPPP timeframe: 2-3 months.
State Water Resources Control Board	Drinking Water System Discharge Permit	Amended Notice of Applicability for Statewide Drinking Water System Discharge Permit	If well backflush is discharged to storm drain	2-3 months
State Water Resources Control Board DDW	Water Supply Permit	Water Supply Permit Amendment for use in drinking water system	Amendment to current permit	6-12 months
Regional Water Quality Control Board, San Diego Region	Porter-Cologne Water Quality Act CWA Section 401 Certification	RWQCB reviews Basin Plans in making CWA 401 water quality certification	Triggered by Section 404 Permit. Must be obtained before NWP becomes effective.	Expected to be avoided through project design
Regional Water Quality Control Board, San Diego Region	NPDES Amendment to Waste Discharge Requirements	Amendment to San Elijo WRF Waste Discharge Requirements to add brine discharge to ocean	Obtained by San Elijo JPA to add brine into discharge stream	12-18 months
Caltrans	Encroachment Permit	Permit application and fees	Required for State right-of-way crossings, such as brine line crossing at Highway 5 at Manchester.	12-24 months

Agency	Permit/ Process	Documentation Required	Comments	Timing
California Coastal Commission	California Coastal Act of 1976 Coastal Development Permit	Coastal Development Permit Application and Fees	Applicable if in coastal zone. Project area overlaps four local coastal program areas: City of San Diego, City of Del Mar, City of Solana Beach, and County of San Diego	Start when CEQA is approximately 60% done. Timing: 24-36 months.
LOCAL				
Olivenhain Municipal Water District	CEQA process	CEQA document and supporting studies (Air Quality, Jurisdictional Delineation, Biological Resources, GDEs, Cultural Resources, Geotechnical Study, Hydrologic Study, Paleontological Resources, Noise)	Required. A Program level document is applicable if the project location has not been finalized. An EIR is applicable if there will be significant and unavoidable impacts.	Approximately 12-18 months for preparation of EIR
San Diego Air Pollution Control District	Permit to Operate	Permit application and fees. Review and approval of engineering plans and specifications	Prior to operation of the treatment plant	Start when design approximately 60% done. Approximately 6=12 months
San Diego County Flood Control District	Encroachment Permit	Permit application and fees. Review and approval of engineering plans and specifications	Applicable if impacting drainage channels.	Expected to be avoided through project design
San Diego County Department of Public Health & Quality	Well/Boring Installation Permit	For Extraction and Monitoring Wells	Required	Start when design approximately 60% done. Approximately 4-6 weeks prior to the start of construction

Agency	Permit/ Process	Documentation Required	Comments	Timing
City of San Diego	Noise Permits	Permit application and fees; notify adjacent properties of construction	Noise permit required if daytime construction noise will exceed 75 dBA or there will be nighttime construction noise	Approximately 4-6 weeks prior to the start of construction
County of San Diego, City of San Diego, City of Solana Beach, City of Encinitas	Encroachment Permit(s)	Encroachment Permit. Review and approval of engineering plans and specifications	Required	Start when design approximately 60% done. Approximately 4-6 weeks prior to the start of construction

3.1 Biological Resources

3.1.1 Local Conservation Areas

Figure 4 shows areas within the Project vicinity that are considered conservation areas. The Project area is situated at the borders of three regional habitat conservation plans. To the south, are preservation areas and core biological and sensitive habitat of the San Diego Multiple Species Conservation Program (MSCP) (San Diego County 1998). Development within these areas is subject to general planning policies and design guidelines. The San Diego MSCP covers approximately 900 square miles in southwestern San Diego County and includes the City of San Diego, portions of unincorporated San Diego County, ten additional city jurisdictions, and several independent special districts. The San Diego MSCP's northernmost boundary is the San Dieguito River Valley.

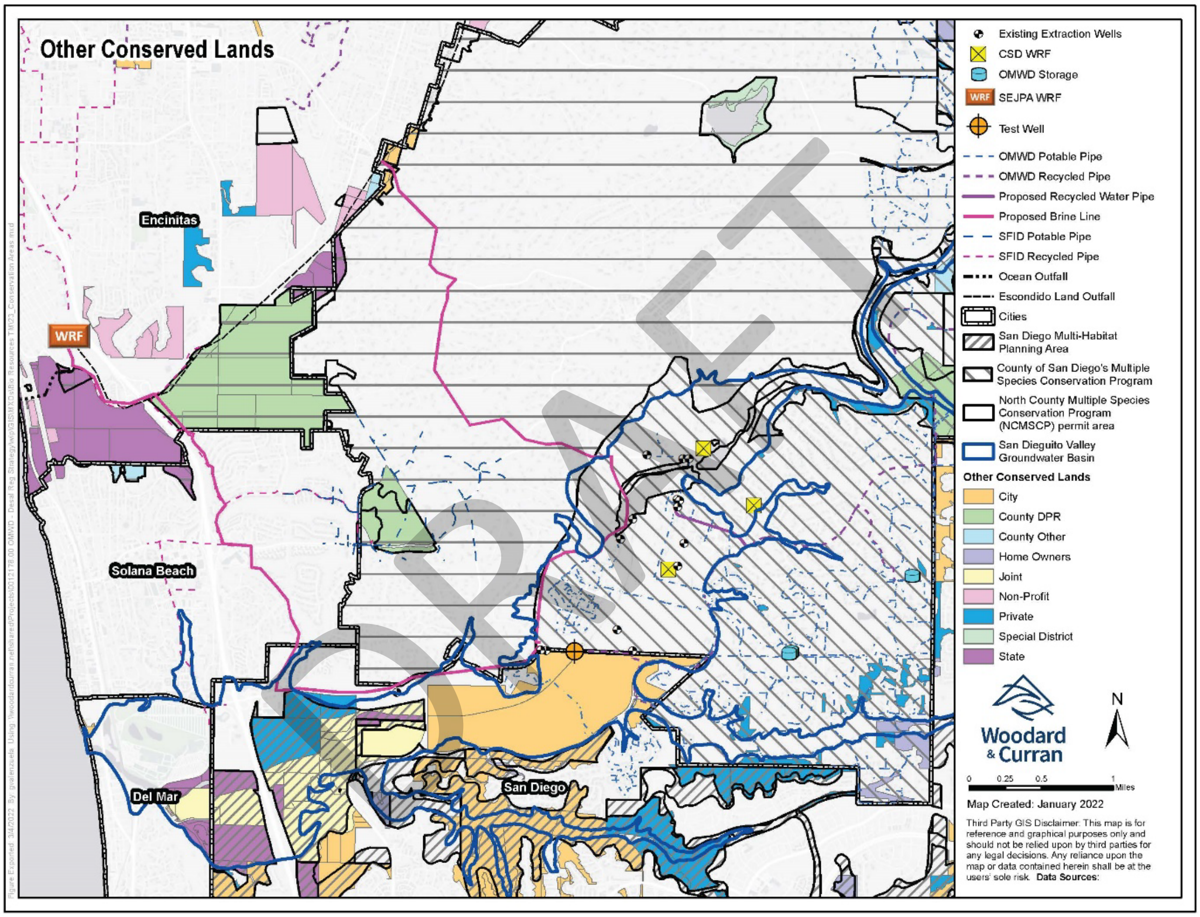
To the east of the Project area, is the South County Subarea Plan of the San Diego MSCP (San Diego County 1997). The San Diego County Board of Supervisors approved the South County Plan on October 22, 1997 and entered into an Implementing Agreement with the Wildlife Agencies for the South County Plan on March 17, 1998. The goal of the South County Plan is to acquire or permanently protect 98,379-acres within the unincorporated area of the county. Development projects are required to conform with the South County Plan through compliance with the Biological Mitigation Ordinance. How a project conforms varies depending on the development type. Some projects meet certain exemption criteria and do not require any modification, while others require revisions and mitigation in order for the project to conform. County staff reviews each project and determines what is necessary for conformance with the South County Plan. The County has negotiated and purchased several properties from willing sellers within the MSCP. Major programs are in place to manage, maintain, and monitor plant and animal life on the lands once they are in the preserve in order to ensure the conservation of their unique resources (San Diego County 1997).

To the north of the Project area, the North County Multiple Species Conservation Plan (NCMSCP) is under development as a joint Habitat Conservation Plan/ Natural Community Conservation Plan (HCP/NCCP). The North County Plan Area encompasses approximately 345,000 acres in and around the unincorporated communities of Bonsall, De Luz, Fallbrook, Harmony Grove, Rancho Santa Fe, Lilac, Pala, Pauma Valley, Rainbow, Ramona, Rincon Springs, Twin Oaks Valley, and Valley Center within the County's jurisdiction. As a joint HCP/NCCP, the North County Plan will provide the basis for the County to receive a federal and state incidental take permit to "cover" specific animal and plant species. This allows the incidental take permit to be extended to future development projects that comply with the MSCP, so these projects do not have to secure their own separate incidental take permit from the U.S. Fish and Wildlife Service and California Department of Fish and Wildlife.

Other conserved lands shown on **Figure 4** are those lands that are legally conserved to protect natural habitats, species, and open space (including agricultural lands that are important components of the regional habitat preserve design); contribute to the existing and planned regional habitat preserve system; and managed to protect the open space or natural resources into the future (SanGIS/SANDAG nd).

Each of the conservation plans, the San Diego MSCP, the South County Subarea Plan of the MSCP, and the North County HCP/NCCP has planning policies and design guidelines to which the Project would be required to conform. However, the North County HCP/NCCP has not yet been finalized and, therefore, may not have implications for the proposed Project. In the CEQA analysis, the Project would need to consider the applicable design guidelines and mitigation may be needed to avoid conflict with the conservation plans.

Figure 4 Local Conservation Areas

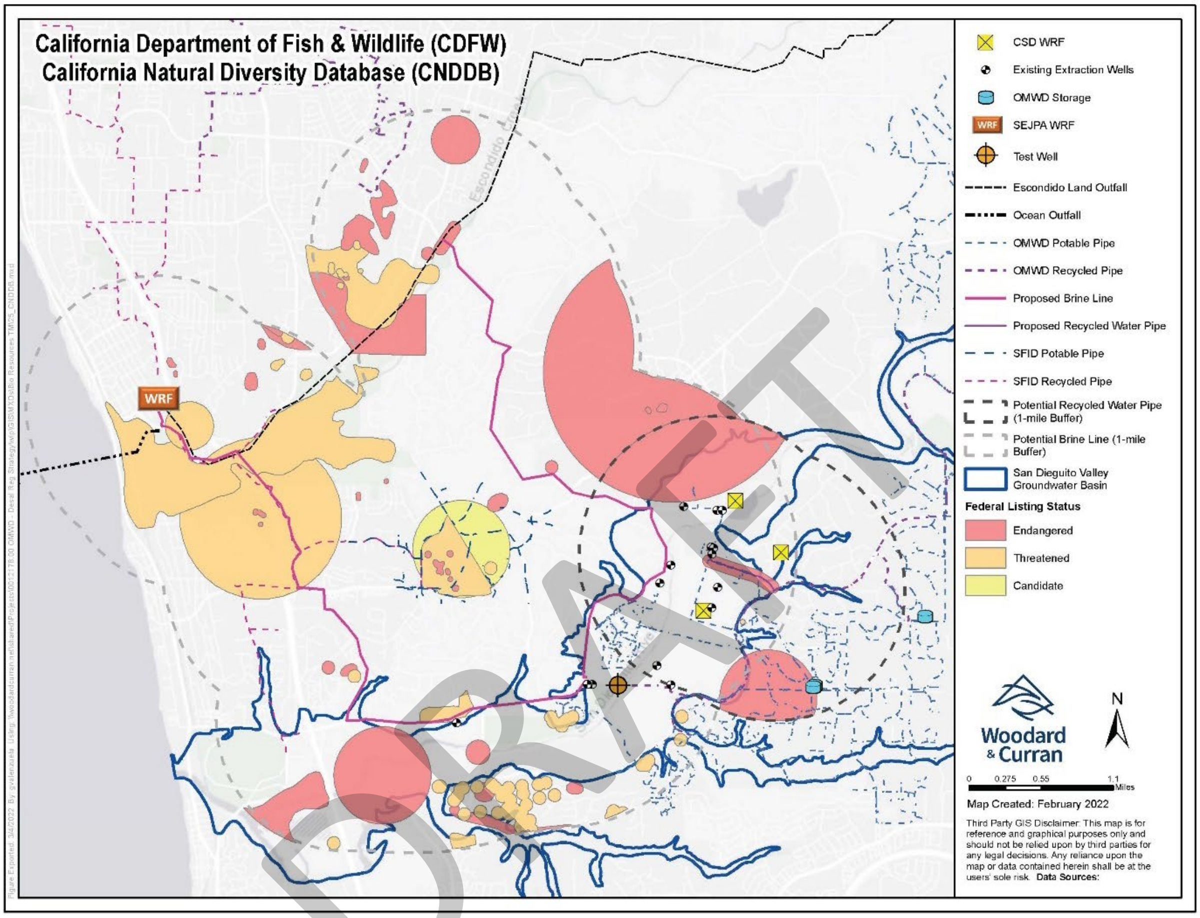


3.1.2 Special-Status Plants, Animals, and Habitats

California Department of Fish and Wildlife's California Natural Diversity Database

The California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB) is an inventory of the status and locations of rare plants and animals in California. According to the CNDDB database results shown **Figure 5**, there are records of 14 listed (federal and State) candidate, threatened, or endangered species in the Project area (CDFW 2022a). The complete list is provided in **Appendix A**.

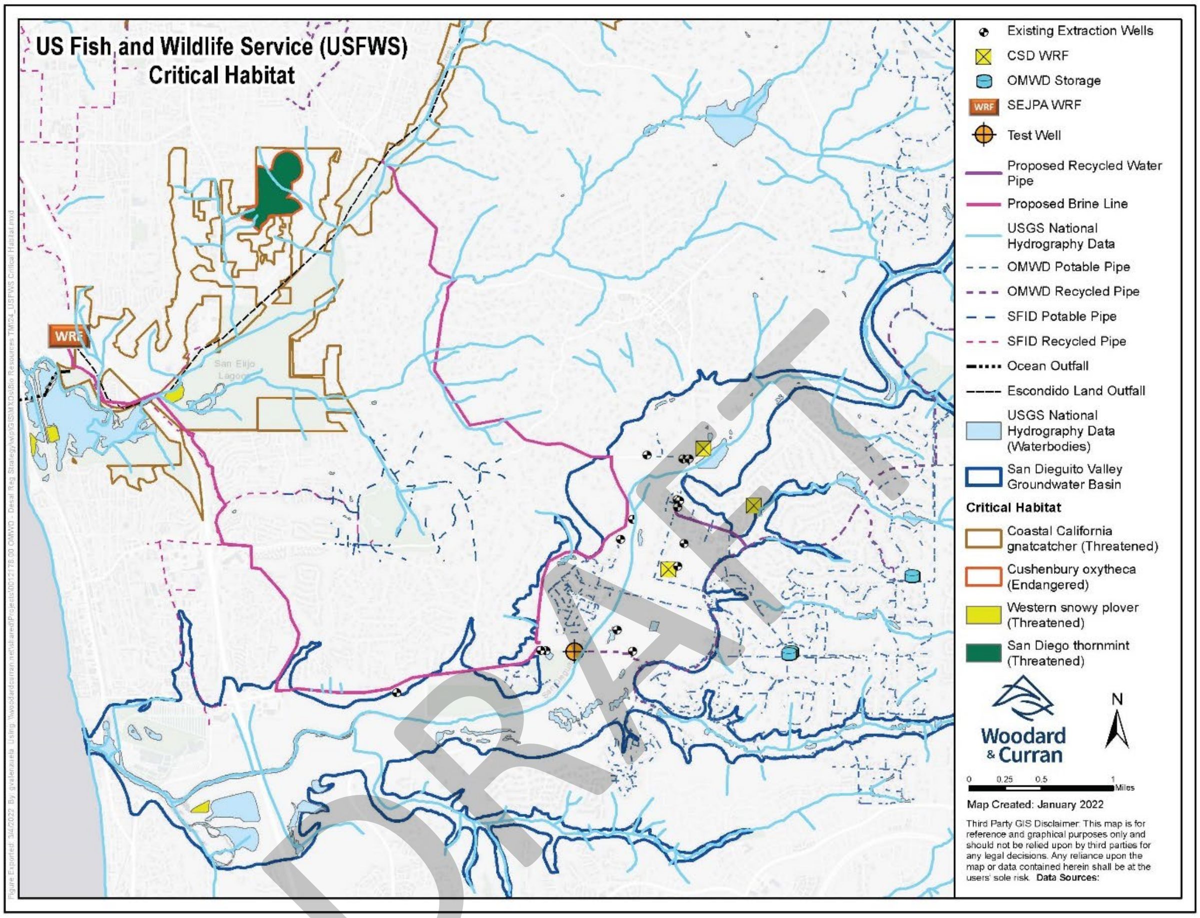
Figure 5 Records of Rare Plants and Animals



U.S. Fish and Wildlife Service Critical Habitat Portal

The US Fish and Wildlife Service (USFWS) Environmental Conservation Online System (ECOS) contains spatial data for active proposed and final critical habitat for USFWS and joint USFWS/National Marine Fisheries Service (NMFS) threatened and endangered species. According to the ECOS database results shown in **Figure 6**, critical habitat areas for coastal California gnatcatcher, western snowy plover, and two plant species are recorded in the Project area (USFW 2022a).

Figure 6 Critical Habitat



U.S. Fish and Wildlife Service Information for Planning and Consultation

The USFWS Information for Planning and Consultation (IPaC) is a project planning tool that shows if any listed species, migratory birds, critical habitat or other natural resources may be present in a given project area. A USFWS IpaC resource list was generated for the Project area. The number of potentially affected species and their federal listing status is summarized below and included in **Appendix B**. In addition to the federally listed species below, the IpaC results included a list of 23 migratory bird species that either occur on the USFWS Birds of Conservation Concern list or warrant special attention in the project location (USFWS 2022b). The complete list of species and their breeding season is included in **Appendix B**.

- Mammals
  - 1 Endangered species: Pacific pocket mouse
- Birds
  - 5 Endangered species: California least tern, least Bell's vireo, light-footed clapper rail, short-tailed albatross, southwestern willow flycatcher
  - 2 Threatened species: coastal California gnatcatcher, western snowy plover

- Insects
    - 1 Candidate species: monarch butterfly
    - 1 Threatened species: Hermes copper butterfly
    - 1 Endangered species: quino checkerspot butterfly
- Crustaceans
    - 2 Endangered species: Riverside fairy shrimp, San Diego fairy shrimp
- Flowering Plants
    - 4 Threatened species: Encinitas baccharis, San Diego thronmint, spreading navarretia, thread-leaved brodiaea
    - 9 Endangered species: California Orcutt grass, coastal dunes milk vetch, Del Mar manzanita, Nevin's barberry, Orcutt's spineflower, San Diego ambrosia, San Diego button-celery, San Diego mesa-mint, willowy monardella

California Native Plant Society's Electronic Inventory of Rare and Endangered Plants

The California Native Plant Society (CNPS) has prepared the Inventory of Rare and Endangered Plants since 1974. The Inventory is a web application used by environmental planners to develop project-specific lists of rare plants that have the potential to occur on project sites prior to conducting on-site surveys. A search of the CNPS Inventory of Rare and Endangered Plants of California for the area containing the potential project included the Encinitas (3311713), Del Mar (3211782), and Rancho Santa Fe (3311712) USGS 7.5' Quadrangles (CNPS 2022). Of the 88 rare and endangered plant species identified, eight are classified as federally endangered and four are classified as federally threatened under the Federal Endangered Species Act (CNPS nd). The complete list can be found in **Appendix C**.

The Project area has numerous special status plant and animal species that have either been recorded or have the potential to occur. The Project area also contains protected critical habitat. Project construction has the potential to impact these special-status species and habitat. Once construction is complete, Project operation is not expected to impact these resources.

During the CEQA analysis, a Biological Resources Assessment Report, including surveys for special-status species, should be prepared to determine the presence of the resources. Due to the potential presence of federally protected species, an incidental take permit may be needed from the USFWS to comply with the Endangered Species Act (ESA). Certain species with the potential to occur are protected under the California ESA, but not the US ESA (e.g., Belding's savannah sparrow, California black rail). Therefore, the Project may need to obtain an incidental take permit from the CDFW to comply with the California ESA. Prior to construction, a biologist would conduct surveys, including protocol surveys for special-status species, and establish construction disturbance limits, as well as barriers to shield habitat from construction activities. A biologist would monitor construction activities, at a frequency that would depend on the species present. For some species, the monitoring could be on a daily basis. The biologist would have the authority to stop work if construction is negatively impacting protected species. Following construction, monitoring activities would be recorded in a technical memo, and the biologist would file any observations with the databases such as the CNDDB, as required. Wetlands and Groundwater Dependent Ecosystems

U.S. Fish and Wildlife Service National Wetland Inventory and United States Geological Survey Topographic Maps

The USFWS National Wetlands Inventory (NWI) is a publicly available resource that provides detailed information on the abundance, characteristics, and distribution of US wetlands. According to the NWI, the proposed project area overlaps the San Dieguito River, Escondido Creek, and the San Elijo Lagoon State Marine Conservation Area. Other areas identified on the NWI in the project area include concrete-lined culverts, natural lined culverts, small creeks, and undeveloped land/floodplain (USFWS 2022c).

The National Hydrography Dataset Plus (NHDPlus) is a publicly available national geospatial surface water framework developed by integrating the National Hydrography Dataset (NHD) with the National Elevation Dataset (NED) and the Watershed Boundary Dataset (WBD). The dataset was developed by the U.S. EPA and U.S. Geological Survey with the goal of estimating flow volume and velocity within surface water reaches throughout the United States, including rivers, streams, canals, ponds, and lakes. NHDPlus is produced from static snapshots of the NHD, NED and WBD; therefore, it includes the features and capabilities of these ingredient datasets. NHDPlus integrates the vector NHD stream network and WBD hydrologic unit boundaries with the NED gridded land surface. This hydrologically-conditioned surface enables the delineation of a catchment (local drainage areas) for each NHD stream segment. The catchments are used to associate precipitation, temperature and runoff data with each stream segment for estimating NHDPlus stream flow. Elevations along each stream are used to compute stream slope for estimating NHDPlus velocities used in time of travel analyses (USEPA 2021).

Potential wetland types within the Project area are summarized in **Table 3** below and shown in **Figure 7**. The potential wetland features are based on publicly available, mapped data from NWI and NHDPlus and may differ from the findings of a project-specific jurisdictional wetland delineation. Other wetland, lagoon and river features, which may be considered jurisdictional, are shown on the USGS Topo map in **Figure 8**.

Table 3 Mapped Wetland Features According to the NWI

Wetland Feature	San Dieguito River	Escondido Creek/ San Elijo Lagoon	Elsewhere in the Project Area
Freshwater Emergent Wetland	X	X	X
Freshwater Forested/Shrub Wetland	X	X	X
Estuarine and Marine Wetland	X	X	
Forested/Shrub Riparian	X		
Freshwater Pond	X		X
Riverine	X		X

Figure 7 Potential Wetlands

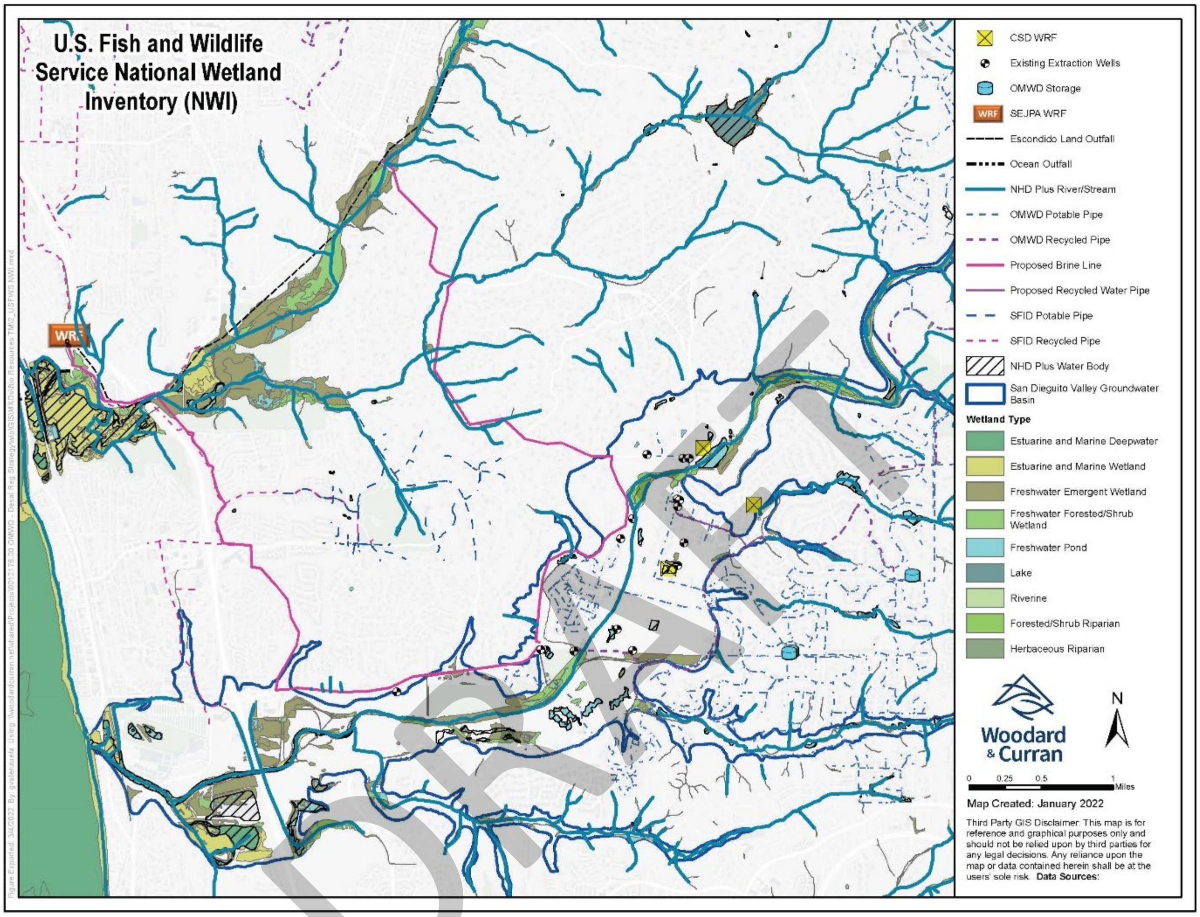
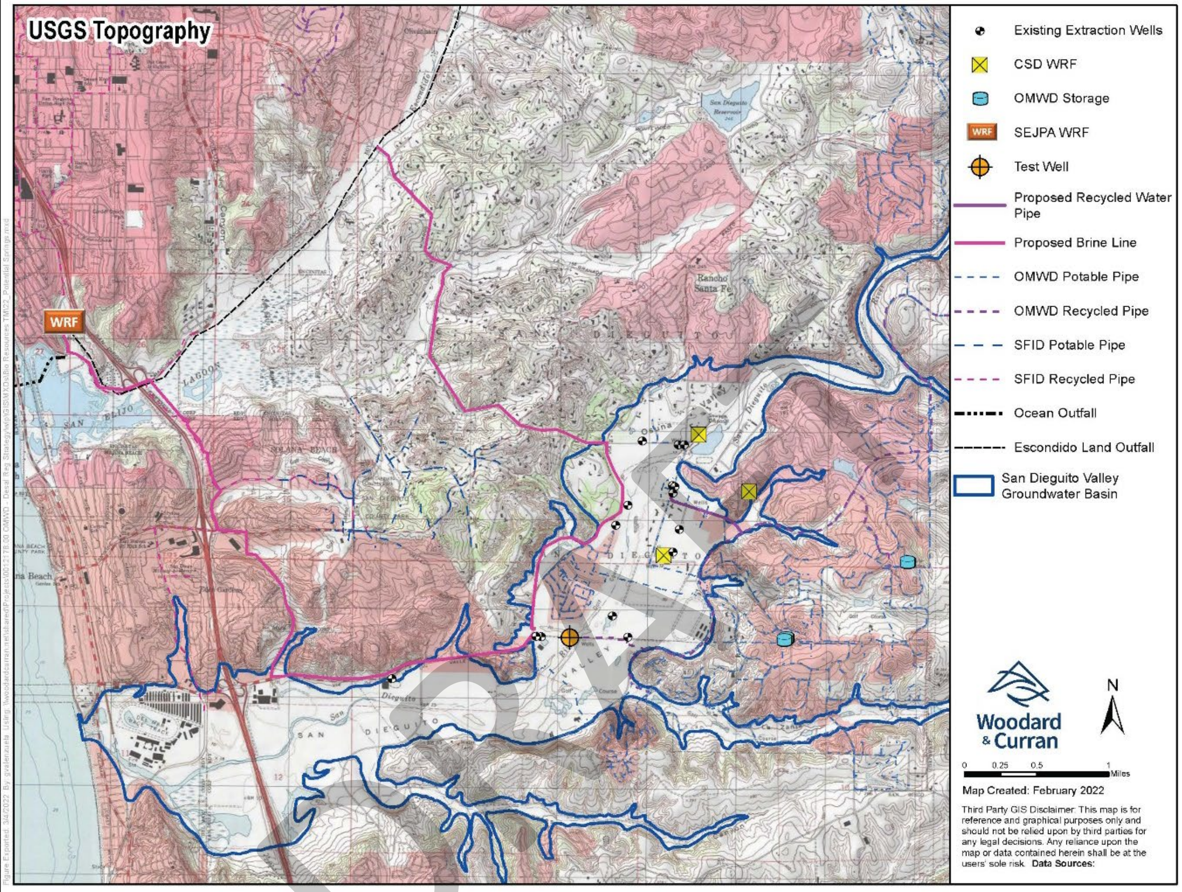


Figure 8 USGS Topo of Project Area



During the environmental planning phase, a Jurisdictional Delineation should be conducted to determine a precise boundary of jurisdictional wetland features. Avoidance of delineated wetland features in Project siting would reduce permitting requirements and compensatory mitigation; impacts to delineated wetland features would require impact reduction and mitigation measures.

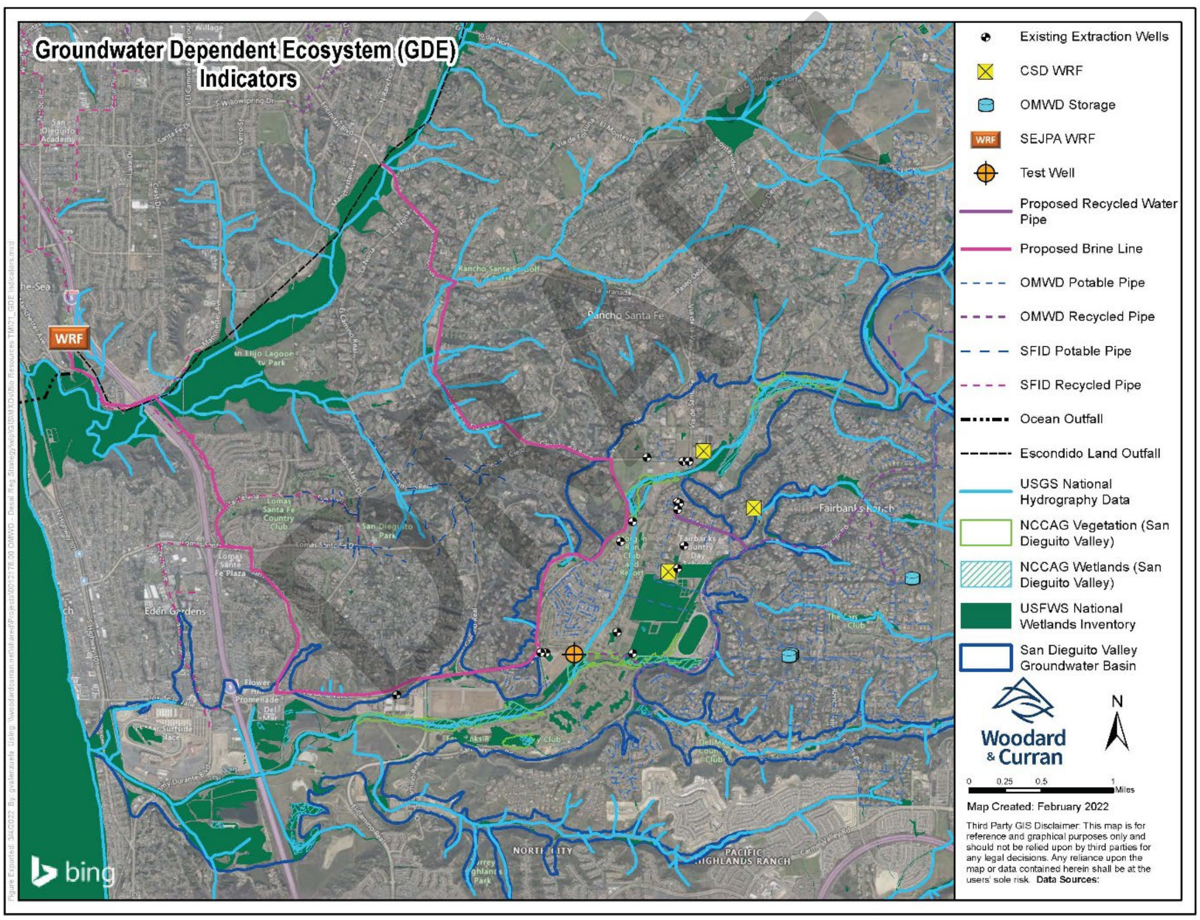
Groundwater Dependent Ecosystems

CEQA requires lead agencies to analyze whether a project would, "substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin." The San Dieguito Valley basin is not currently prioritized by the California Department of Water Resources (DWR) for management under the Sustainable Groundwater Management Act (SGMA). To determine whether the project may affect sustainable groundwater management of the basin, specifically with respect to groundwater dependent ecosystems (GDEs), this analysis refers to The Nature Conservancy (TNC) guidance for considering GDEs under SGMA (TNC 2018).

To identify GDEs, this analysis has relied on TNC's GDE Pulse tool (TNC 2022), which is a web-based interactive map that was developed to monitor the health of GDEs. GDE Pulse incorporates vegetation data in the Natural Communities Commonly Associated with Groundwater Dataset Version 2.0 and groundwater depth data from the DWR Periodic Groundwater Level Measurement dataset.

A TNC database of GDE vegetation plant rooting depth (TNC 2018) indicates that, of the GDE vegetation that may occur in the Project area, the plant rooting depth ranges from one to 35 feet deep (CADWR 2022).

Figure 9 GDE Indicators



According to the *Report of Design Pilot Testing for the San Dieguito Valley Brackish Groundwater Desalination Project* (Geoscience 2021), the one-year pumping test showed current groundwater use does not change the groundwater levels in the shallow aquifer. It also found that pumping in the deeper aquifer does not affect groundwater surface water in the San Dieguito River at pumping rates used for the one-year pumping test. Groundwater levels in the deeper aquifer were locally affected by the groundwater test well and were also affected by operations of production wells in Morgan Run golf course. Water levels declined the most during the dry portion of 2020, but saw complete recovery after the long-term test was completed. The one-year test results suggested that during a single dry year, inflows into the basin can supply current groundwater uses.

However, the Pilot Testing Report found that full scale production will result in a drawdown in both the shallow and deep aquifers. The modelling suggests that the increase in streambed percolation (river loss) is about 120 acre-feet/year and a reduction in evapotranspiration of 1,180 acre-feet/year and surface outflow at the Pacific Ocean of approximately 30 acre-ft/yr. This represents beneficial use of water that would otherwise flow to the ocean. The results of the updated scenario run indicate that the proposed extraction of 1,600 acre-feet/year at the Desalter Test Well, Sites 2 and 2A will create a minor decrease in storage of 150 acre-feet/year based on the hydrology of the modeling period and current (2020) groundwater in storage. The decrease in basin storage of 150 acre-feet/year from pumping 1,600 acre-feet/year over 20 years represents less than 1 percent of basin storage.

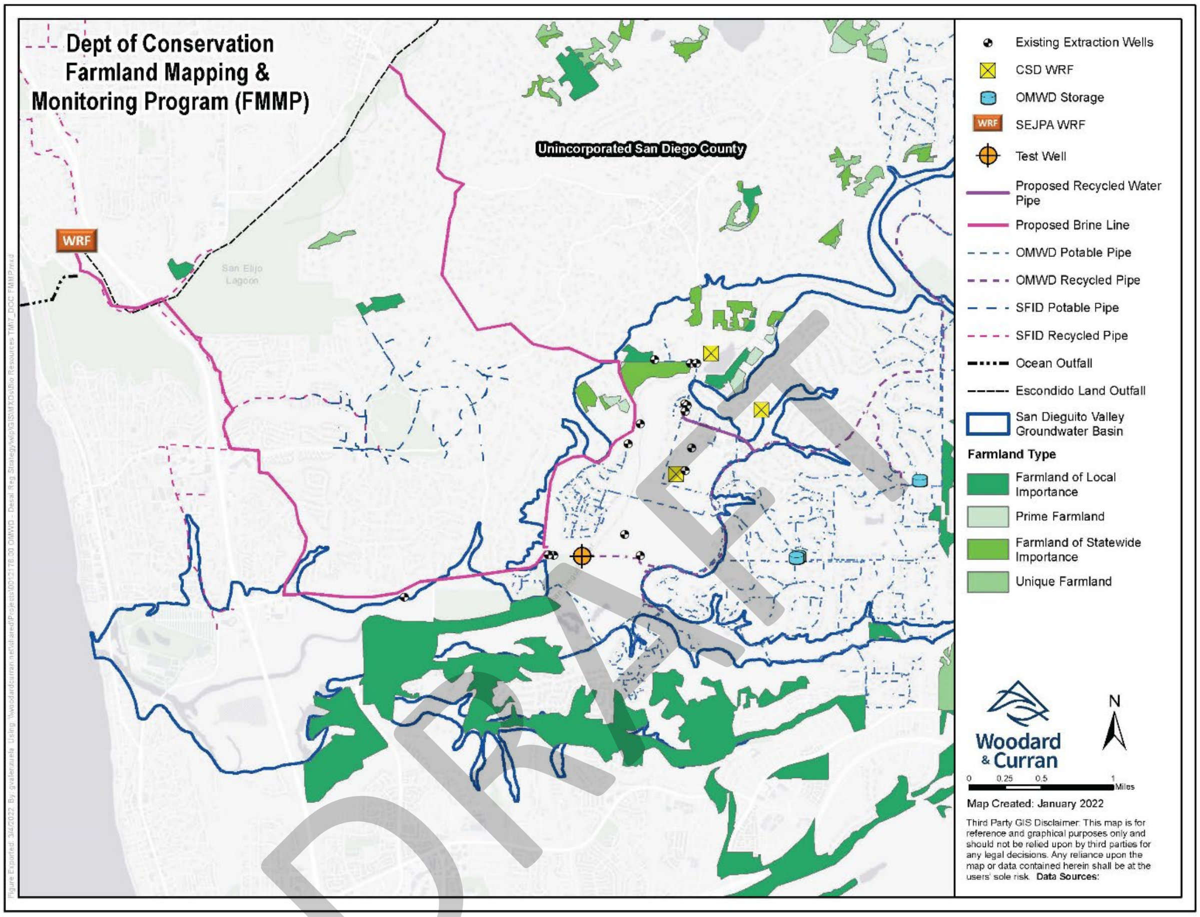
Further study is needed and should be carried out during the CEQA analysis to determine the effects of the potential drawdown in the aquifer on GDEs and their associated habitats and other biological resources. OMWD may be required to identify mitigation actions to maintain and improve GDEs, if recommended in the CEQA document, such as groundwater recharge or removal of non-native plant species.

3.2 Agriculture

CEQA requires projects to determine whether they will convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, as shown on the Farmland Mapping and Monitoring Program (FMMP) maps to non-agricultural use. The California FMMP produces maps and statistical data used for analyzing impacts on California's agricultural resources. Agricultural land is rated according to soil quality and irrigation status; the best quality land is called Prime Farmland. The maps are updated every two years with the use of a computer mapping system, aerial imagery, public review, and field reconnaissance. None of the proposed Project area is located on Prime Farmland, Unique Farmland, or Farmland of Statewide Importance as shown in **Figure 10**. Furthermore, according to the SanGIS/SANDAG GIS Data Warehouse (SanGIS/SANDAG nd), there are no agricultural preserve contract lands located within or adjacent to the proposed project area.

Lands within the San Dieguito riverbed between the Surf Cup soccer fields and Fairbanks Ranch are classified Farmland of Local Importance; however, this is not actively farmed land. Various parcels near the intersection of Calzada Del Bosque and Via De La Valle are classified as Prime Farmland, Farmland of Statewide Importance, and Farmland of Local Importance. Other areas of farmland adjacent to the San Dieguito River and near existing extraction wells and wastewater reclamation facilities include Prime Farmland, Farmland of Statewide Importance, and Farmland of Local Importance (CADOC 2018).

Figure 10 Farmland



During the environmental planning phase, further study including a field visit would be needed to determine the existing extent of farming activity, if any, in the Project area. However, the area is generally characterized by small operations, greenhouses, and container crops. These operations can be avoided through Project design and no mitigation is expected to be needed.

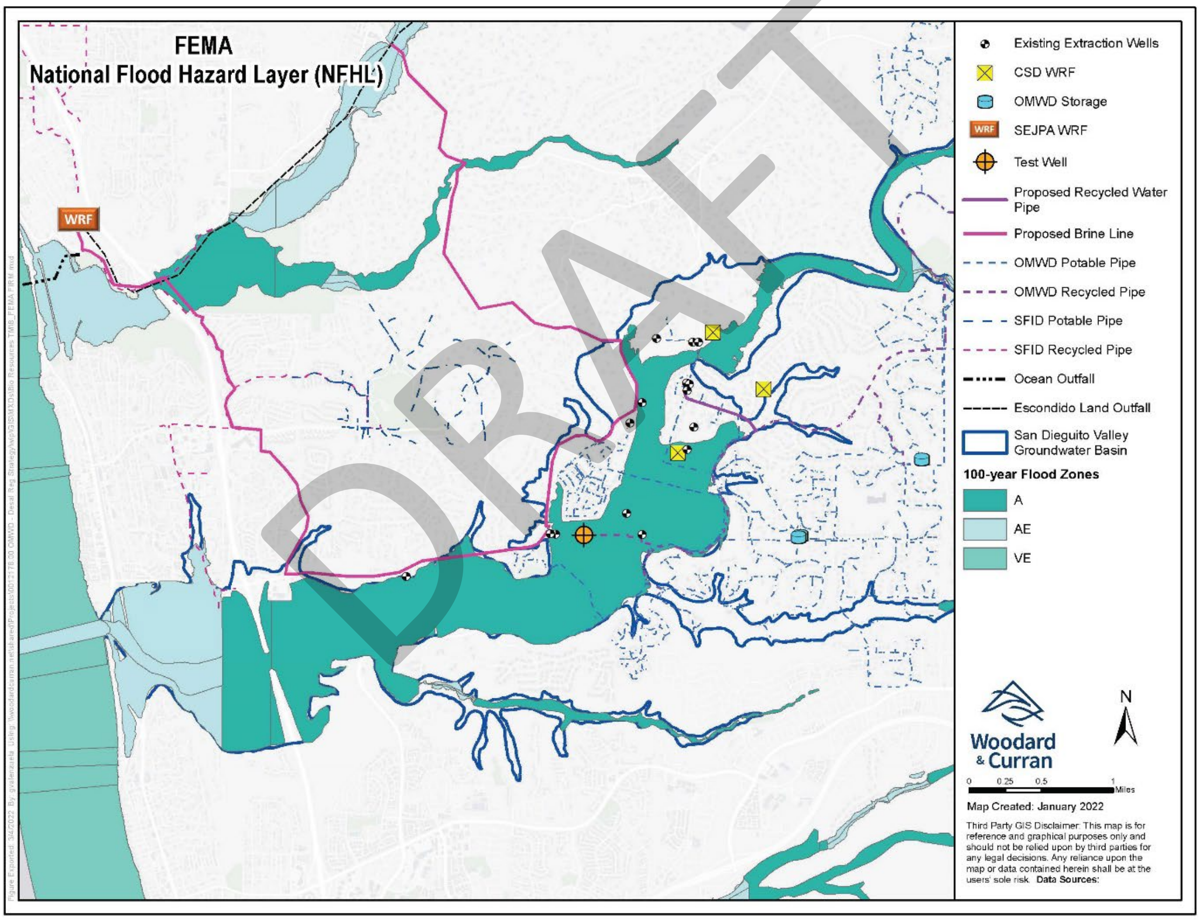
3.3 Hydrology and Water Quality

CEQA requires that projects evaluate whether they would impede or redirect flood flows, risk release of pollutants in a flood area, or degrade the quality of surface water or groundwater. Furthermore, the County has local regulations related to flood damage and hazard prevention (e.g., County of San Diego Code of Regulatory Ordinances Section 91.1.105.10, Flood Damage Prevention Ordinance; County of San Diego Code of Regulatory Ordinances Sections 86.601-86.608, Resource Protection Ordinance (RPO)).

FEMA FIRM Floodplain Mapping

Areas within both the San Elijo Lagoon and the San Dieguito Lagoon are considered 100-year floodplains by FEMA's National Flood Hazard Layer (FEMA 2012). Areas within the San Elijo Lagoon west of the I-5 bridge are classified as flood zone AE (the base floodplain where base flood elevations are provided), while areas to the east of I-5 within the San Elijo Lagoon is classified as flood zone A (areas with a 1% annual chance of flooding). Pipeline alignment along Manchester Avenue and along the I-5 bridge would be adjacent to these 100-year flood zones. Area within the Escondido Creek Tributary and San Dieguito River are classified as flood zone A. See **Figure 11**.

Figure 11 Floodplain Areas



San Diego Regional Water Quality Control Board Basin Plan and Applicable Water Quality Standards

The Water Quality Control Plan for the San Diego Region (Basin Plan; San Diego RWQCB, 1994 and amended through September 1, 2021) identifies water quality objectives for constituents that could potentially cause an adverse effect or impact on the beneficial uses of water in the San Diego region (CA RWQCB 1994). The proposed Project overlaps both the Escondido Creek Hydrologic Area and the Solana

Beach Hydrologic Area of the Basin Plan. Surface water features within the Escondido Creek Hydrologic Area include the San Elijo Lagoon, Escondido Creek, and San Elijo Creek. Surface water features within the Solana Beach Hydrologic Area include the San Dieguito River and San Dieguito Lagoon. Four surface water features within the Project area are listed as impaired waterbodies according to the San Diego RWQCB San Diego Basin Plan Map (San Diego RWQCB 2022). The impairments of the surface water features within the Project area are summarized in Table 4.

Table 4: 303(d) List of Impaired Water Bodies

	Escondido Creek	San Elijo Creek	San Elijo Lagoon	San Dieguito River
Benthic Community Effects	Y			Y
Bifenthrin	Y			
DDT	Y			
Eutrophic			Y	
Indicator Bacteria	Y	Y	Y	Y
Malathion	Y			
Manganese	Y			
Nitrogen	Y			Y
Phosphate	Y			
Phosphorus				Y
Sedimentation/Siltation			Y	
Selenium	Y			
Sulfates	Y			
Total Dissolved Solids	Y			Y
Toxicity	Y		Y	Y

The San Diego RWQCB establishes total daily maximum loads (TMDLs) to address these impairments and help achieve water quality standards. The San Dieguito Watershed Management Area (WMA) has developed and adopted a Water Quality Improvement Plan (WQIP) to establish TMDLs in the water bodies. WQIPs are required for each WMA under regulations adopted by the San Diego Water Board. Major impacts affecting the San Dieguito River WMA include surface water quality degradation, beach closures, sedimentation, habitat degradation and loss, invasive species, and eutrophication. Pollutants of concern for the WMA include bacterial indicators, nitrogen, phosphorus, and TDS. Land use activities, including urban runoff, agricultural runoff, and domestic animals, as well as other natural sources, are the primary sources of water quality impacts in the area. A 2021 WQIP update has been developed and is pending San Diego RWQCB acceptance (Project Clean Water 2021).

Water quality in the Project area is addressed through compliance with the National Pollutant Discharge Elimination System (NPDES) stormwater discharge permits issued to municipalities, construction sites, and industrial facilities to control pollutants in storm water discharges to local surface waters. In February of 2001, under the authority of the Clean Water Act amendments and federal Pollutant Discharge (NPDES) Permit regulations, the Water Board issued the order to the 18 cities within San Diego County, and the Port of San Diego. This order requires that all jurisdictions within the San Diego region prepare

Jurisdictional Urban Runoff Management Plans. Each of these jurisdictional plans must contain a component addressing construction activities and a component addressing existing development. The current regional separate storm sewer system (Regional MS4) permit for is the San Diego Regional Water Quality Control Board (Water Board) Order No. R9-2013-0001, as amended by Order Nos. R9-2015-0001 and R9-2015-0100, NPDES No. CAS0109266 (San Diego RWQCB 2015).

The County of San Diego Code of Regulatory Ordinances Sections 67.801-67.814, Watershed Protection, Stormwater Management, and Discharge Control Ordinance (WPO) was adopted in March of 2008. The stated purposes of this ordinance is to protect the health, safety and general welfare of the County of San Diego residents; to protect water resources and to improve water quality; to cause the use of management practices by the County and its citizens that will reduce the adverse effects of polluted runoff discharges on waters of the State; to secure benefits from the use of stormwater as a resource; and to ensure the County is compliant with applicable state and federal law. The WPO contains discharge prohibitions, and requirements that vary depending on type of land use activity and location in the County. The WPO defines the requirements that are legally enforceable by the County in the unincorporated area (San Diego County. 2011).

In addition, the County has adopted its Standard Urban Stormwater Mitigation Plan (SUSMP) for Land Development and Public Improvement Projects. The SUSMP is focused on project design requirements and related post-construction requirements for land development and capital improvement projects, and addresses WPO requirements for these project types. The WPO also contains Low Impact Development (LID) requirements. LID is a storm water management approach that maintains the natural hydrologic character of a site or region by using design techniques that infiltrate, filter, store, evaporate, and detain runoff on site. A LID Handbook was developed in December 2014 to provide the development community with guidance on implementing LID strategies and practices.

During the environmental planning phase, further study of the Project facilities' relation to flood plains should be included in the CEQA document. The pipelines would be below ground and would not affect flood risks. The wells, if located in a flood zone, would not pose a significant risk related to injury because operation would involve minimal maintenance trips. The wells also would not pose a significant risk related to release of hazardous materials if inundated, because operation would not involve the use of hazardous materials. If a treatment plant is located in a flood zone, a Letter of Map Revision (LOMR) may be needed prior to Project approval for compliance with San Diego County flood control regulations.

During the environmental planning phase, the Project would evaluate the potential for construction and operation to impede flood flows are affect the quality of surface water or groundwater. A hydrologic study may be needed to understand how the new treatment plant(s) could affect the amount and quality of runoff. Recommendations of the study would be incorporated into design. Construction impacts are expected to be addressed through preparation of a Stormwater Pollution Prevention Plan (SWPPP) by the construction contractor.

3.4 Wildfire and Hazardous Sites

CEQA will require that the Project evaluate its potential to conflict with wildfire hazard zones, hazardous was sites, and environmental health, particularly of vulnerable populations.

CalFire Fire Hazard Severity Zones

The California Department of Forestry and Fire Protection publishes maps of Fire Hazard Severity Zones, which are based on data and models of potential fuels over a 30-50 year time horizon and their associated expected fire behavior, and expected burn probabilities to quantify the likelihood and nature of vegetation fire exposure to buildings. The proposed Project area is located within or adjacent to moderate, high, and very high fire hazard severity zones within the City of Encinitas, City of Solana Beach, City of San Diego, and County of San Diego (Cal Fire 2022). Fire severity hazard maps for the County of San Diego and the incorporated cities of Encinitas, Solana Beach, and San Diego can be found in **Appendix D**. The Project is not expected to exacerbate fire risks because it would not introduce new facilities that are typically associated with fire risk (e.g., electrical utility lines). All facilities would be designed for adequate emergency response and evacuation routes. This resource topic would be further evaluated in the CEQA document, but is not expected to require mitigation or result in significant impacts.

CalEnviroScreen

The CalEnviroScreen mapping tool (OEHHA 2021) identifies California communities that are most affected by many sources of pollution, and where people are often especially vulnerable to pollution's effects. It uses environmental, health, and socioeconomic information to produce scores by census tract. An area with a high score is one that experiences a much higher pollution burden than areas with low scores.

The CalEnviroScreen 4.0 Overall Percentile scores for the project area are relatively low. The Project is unlikely to affect environmental justice communities during construction or operation.

State Water Resources Control Board GeoTracker Database

GeoTracker is the State Water Resources Control Boards' (SWRCB) data management system for sites that impact, or have the potential to impact, water quality in California, with emphasis on groundwater. GeoTracker contains records for sites that require cleanup, such as Leaking Underground Storage Tank (LUST) Sites, Department of Defense Sites, and Cleanup Program Sites. GeoTracker also contains records for various unregulated projects as well as permitted facilities including: Irrigated Lands, Oil and Gas production, operating Permitted USTs, and Land Disposal Sites.

There are 45 LUST cleanup sites located within one mile of the project area including the potential brine pipeline and potential recycled water pipeline. Of these 45 sites, 44 are Completed – Case Closed status and 1 is Open – Site Assessment status (SWRCB 2022). The single, open site is located at 820 Birmingham Drive, approximately 4 miles north/northwest of the existing extraction wells. Given its distance, this one open site is unlikely to affect the Project. The complete list of LUST cleanup sites is shown in **Appendix E**.

Figure 12 Community Health Risk

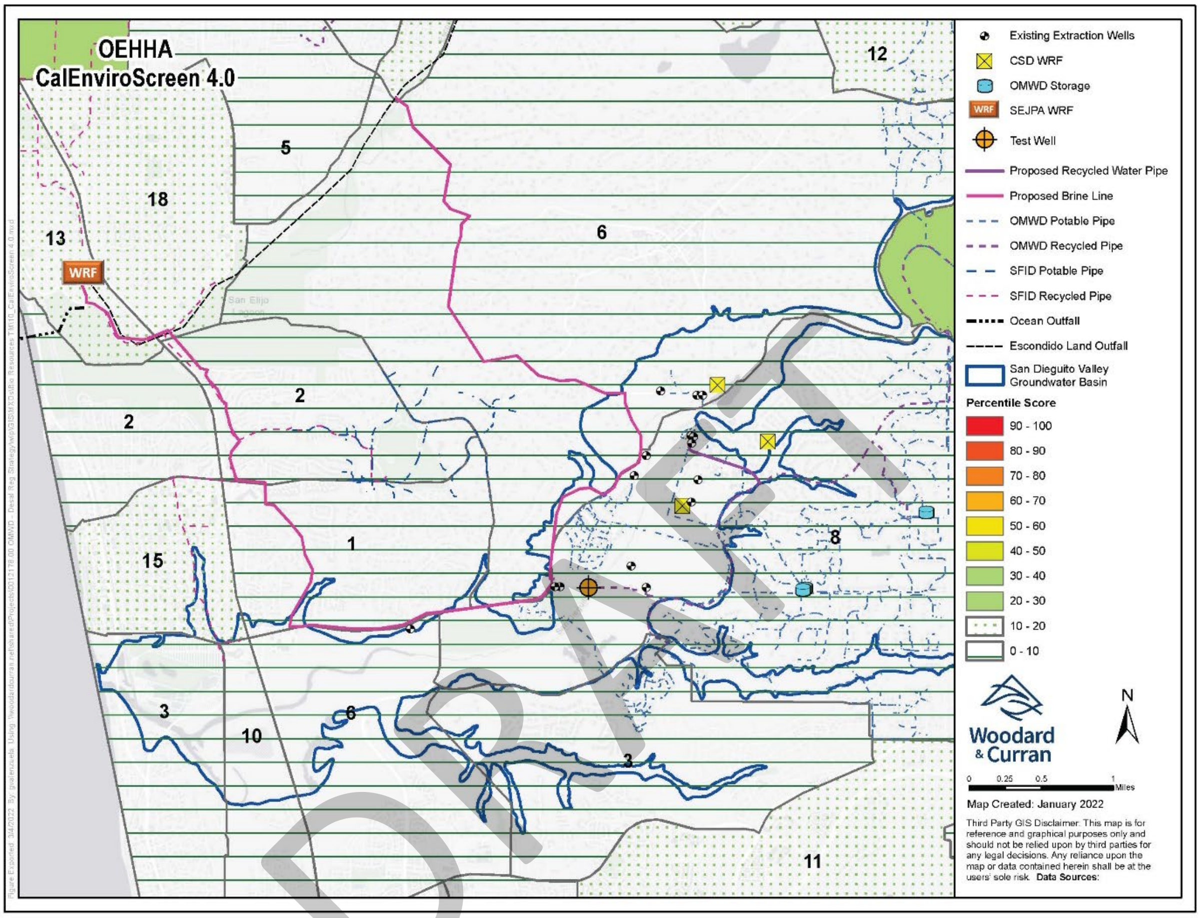
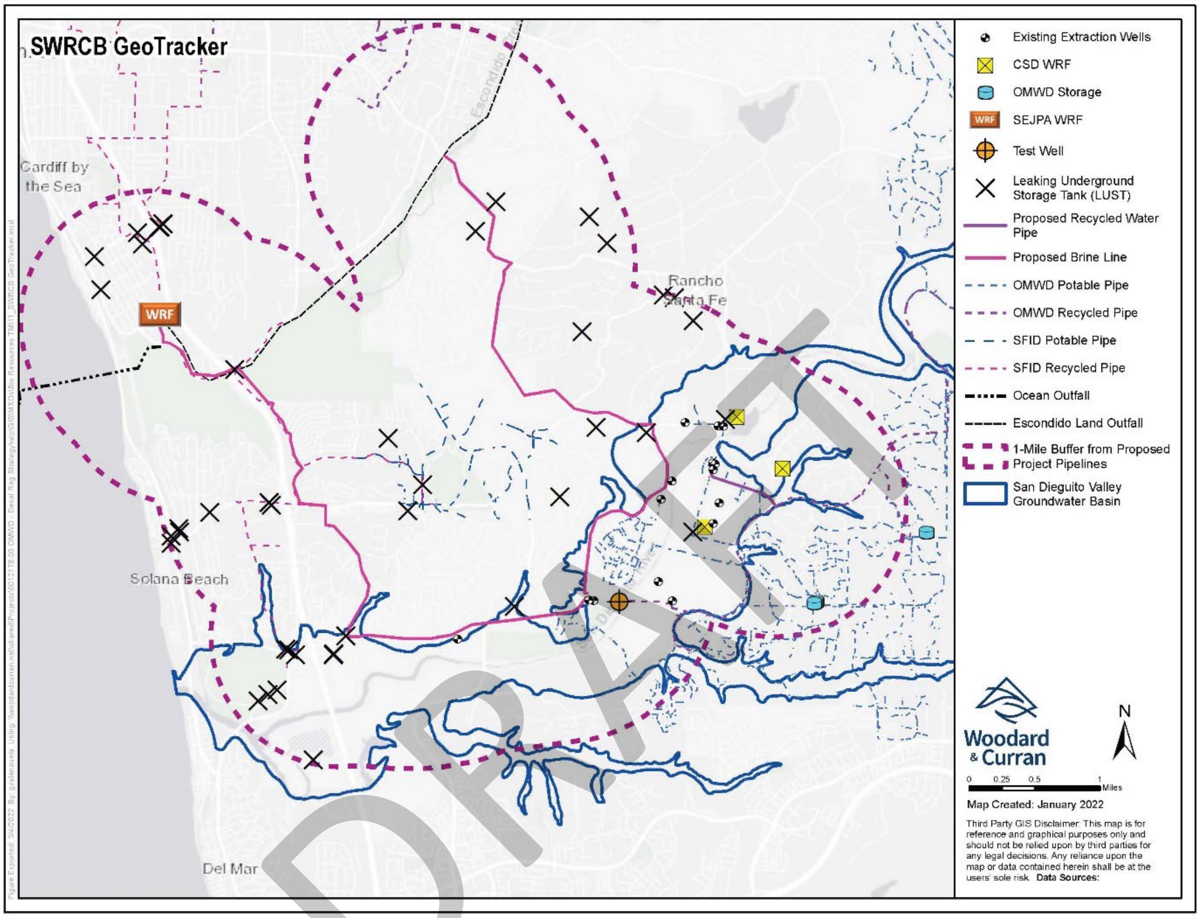


Figure 13 LUST Sites

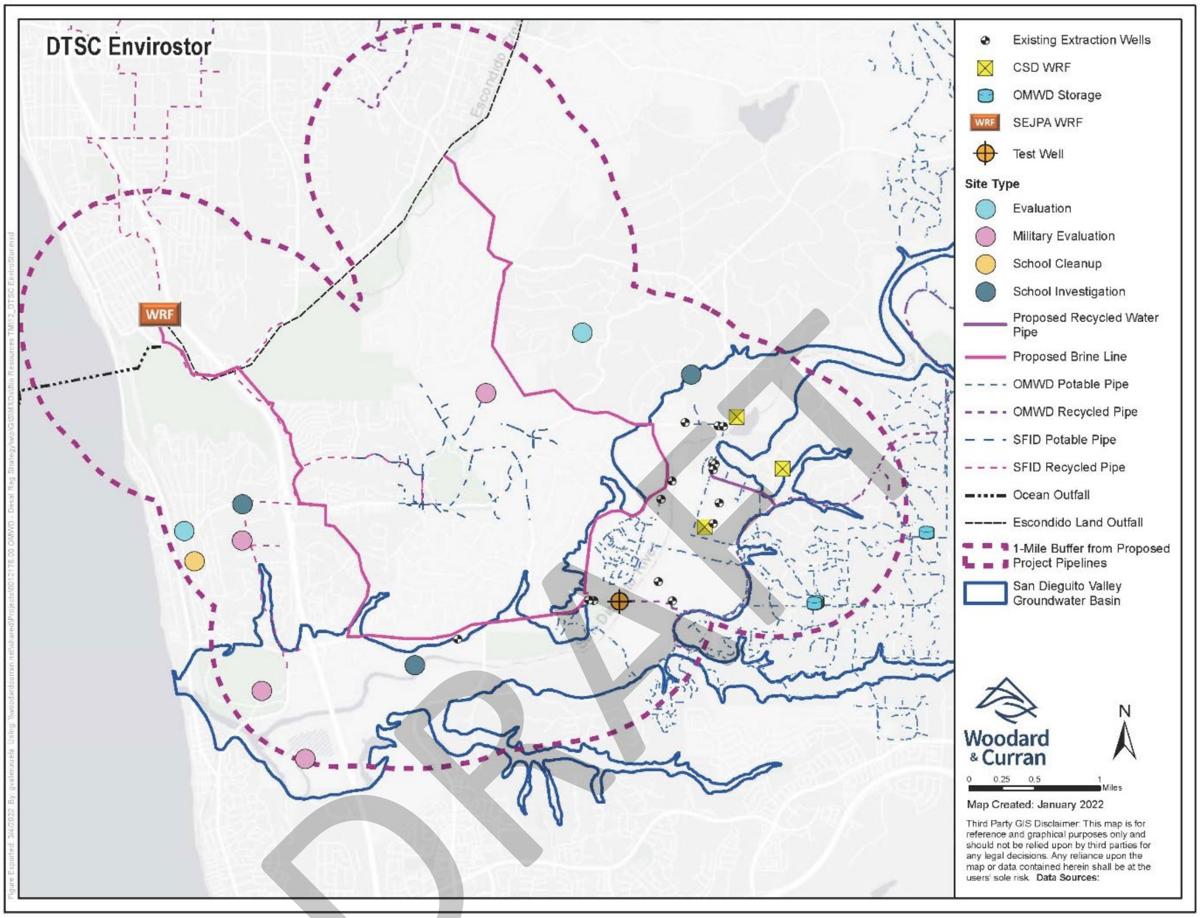


Department of Toxic Substances Control EnviroStor Database

EnviroStor is the California Department of Toxic Substances Control's (DTSC) data management system for tracking cleanup, permitting, enforcement and investigation efforts at hazardous waste facilities and sites with known contamination or sites where there may be reasons to investigate further (DTSC 2022).

There are an estimated 10 cleanup sites within one mile of the proposed Project area, as shown in **Figure 14**. The "military evaluation" sites shown are "inactive – needs evaluation" status, which the DTSC describes as non-active sites where a preliminary level of evaluation is required. The "evaluation" sites shown in **Figure 14** have been referred by DTSC to a local agency to supervise the cleanup of a simple waste release; therefore, they are not expected to affect the Project. The "school cleanup" and "school investigation" sites have a status of "certified," "inactive-withdrawn," or "no further action" and are, therefore, also not expected to affect the Project. These sites are listed in **Appendix F**.

Figure 14 Contamination and Cleanup Sites



3.5 Cultural and Tribal Cultural Resources

In 2018, two cultural resources studies were conducted on behalf of OMWD projects. One for the San Dieguito Valley Groundwater Desalination Pilot Project (ECORP Consulting, Inc. 2018a) and one for the 153a Recycled Water Pipeline Extension Project (ECORP Consulting, Inc. 2018b).

Results of the California Historic Resources Information System (CHRIS) records searches through South Coastal Information Center (SCIC) were received on September 6 and November 8, 2018. The records searches indicated that approximately 100 percent of the San Dieguito Valley Groundwater Desalination Pilot Project area had been previously surveyed for cultural resources at some time in the past. No cultural resources were previously recorded within the Project area itself. However, 97 previously recorded cultural resources were located within one mile of the Project area. Documented resources included 90 pre-contact sites, four historic-era sites, and three multi-component sites. Previously recorded pre-contact sites consisted of habitation sites, lithic scatters, shell middens, a ceramic isolate, and a bedrock mortar, all evidencing the long history of human habitation in the San Dieguito River Valley. The four historic-era sites included three historic trash scatters and the community of Rancho Santa Fe (Rancho San Dieguito) itself which is recognized as a cultural landscape. Multi-component sites included a pre-contact habitation site and historic trash scatter, a pre-contact shell midden and historic trash scatter, and a lithic and ceramic scatter mixed with historic debris. Additionally, six historic addresses were identified within the one-mile records search radius. These properties consisted of private residences in the Rancho Santa Fe area.

A search of the Sacred Lands File was conducted by NAHC in Sacramento, California. The results of this search were received on August 6, 2018. The NAHC Sacred Lands File search failed to indicate the presence of Native American sacred lands in the vicinity of the Project Area.

Two historic-era cultural resources were identified within the project area. However, both resources have been evaluated as not eligible for the California Register of Historic Resources (CRHR) and National Register of Historic Resources (NRHP), and not a Historical Resource as defined by CEQA, or Section 106. No pre-contact archaeological resources were documented within the project area.

The archaeological sensitivity of the project area was considered low, and no testing program was recommended. Although the archaeological sensitivity was low, there always is a potential for ground-disturbing activities to expose previously unrecorded cultural resources. CEQA requires the lead agency to address any unanticipated cultural resources discoveries during project construction. Therefore, mitigation measures were recommended to reduce potential adverse impacts during subsurface excavation associated with the prior projects; similar mitigation actions should be implemented for the proposed Project.

During the environmental planning phase, the proposed Project should conduct a Cultural Resources Assessment Report. It will likely recommend mitigation measures such as worker training, notifications, or protocols to avoid potentially impacting cultural resources during construction.

3.6 Geology, Soils, and Paleontological Resources

USGS Fault Zones Mapping

There are no quaternary faults as defined by the USGS within one mile of the proposed Project area (USGS 2022).

U.S. Department of Agriculture Natural Resources Conservation Service Web Soil Survey

The Project area is primarily underlain by Tujunga, Grangeville, Corralitos, and Huerhuero series soils (Table 3 and Figure 15). These soil types are on alluvial fans and used for urban development (USDA 2022). However, these soils are classified as high sand composition with moderate to high infiltration rates and therefore have the potential to become unstable. A geotechnical analysis should be conducted and incorporated into Project design.

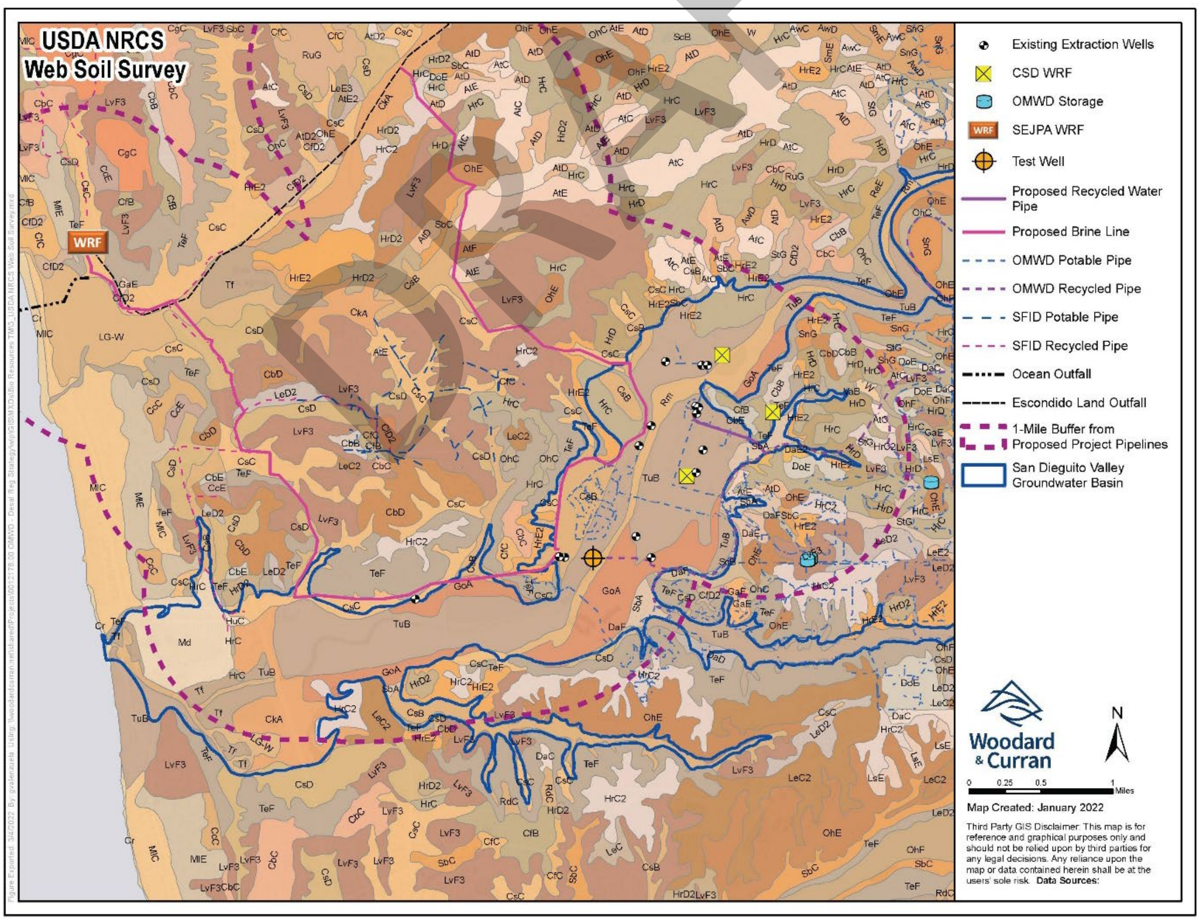
Table 5: USDA Soil Classification

Key	Classification	Drainage class	Hydrologic Soil Group (Rate of Infiltration)
TuB[1]	Tujunga sand, 0 to 5 percent slopes	Somewhat excessively drained	A (High)
GoA[2]	Grangeville fine sandy loam, 0 to 2 percent slopes	Somewhat poorly drained	B (Moderate)
CsC[3]	Corralitos loamy sand	Somewhat excessively drained	A (High)
LvF3[4]	Loamy alluvial land-Huerhuero complex, 9 to 50 percent slopes, severely eroded	Moderately well drained	B (Moderate)

References

1. https://soilseries.sc.egov.usda.gov/OSD_Docs/T/TUJUNGA.html
2. https://soilseries.sc.egov.usda.gov/OSD_Docs/G/GRANGEVILLE.html
3. https://soilseries.sc.egov.usda.gov/OSD_Docs/C/CORRALITOS.html
4. https://soilseries.sc.egov.usda.gov/OSD_Docs/H/HUERHUERO.html

Figure 15 Soils



3.7 Noise

The Project would be subject to noise standards set by the City of San Diego and the other jurisdictions in the Project area. Temporary construction noise which exceeds 75 dB (A) L_{eq} at a sensitive receptor would be considered significant according to the City of San Diego CEQA Guidelines (City of San Diego 2020). Construction noise levels measured at or beyond the property lines of any property zoned residential shall not exceed an average sound level greater than 75- decibels (dB) during the 12-hour period from 7:00 a.m. to 7:00 p.m. In addition, construction activity is prohibited between the hours of 7:00 p.m. of any day and 7:00 a.m. of the following day, or on legal holidays or on Sundays, that would create disturbing, excessive, or offensive noise unless a permit has been applied for and granted beforehand by the Noise Abatement and Control Administrator, in conformance with San Diego Municipal Code Section 59.5.0404.

Where temporary construction noise would substantially interfere with normal business communication, or affect sensitive receptors, such as day care facilities, that may be considered a significant noise impact and would require mitigation such as sounds walls surrounding the well drilling sites.

Impacts to Sensitive Wildlife

Noise mitigation may be required for significant noise impacts to certain avian species during their breeding season, depending upon the location of a project such as in or adjacent to a conservation area, whether or not it is occupied by the California gnatcatcher, least Bell's vireo, southern willow flycatcher, least tern, cactus wren, tricolored blackbird or western snowy plover, and whether or not noise levels from a project, including construction during the breeding season of these species would exceed 60dB(A) or existing ambient noise level if above 60dB(A). In addition, significant noise impacts to the California gnatcatcher are only analyzed if a project is within an Multi Habitat Preservation Area (MHPA); there are no restrictions for the gnatcatcher outside the MHPA any time of year.

Noise from Adjacent Stationary Uses (Noise Generators)

A project which would generate noise levels at the property line which exceed the City's Noise Ordinance Standards is considered potentially significant pursuant to CEQA (such as potentially a carwash or projects operating generators or noisy equipment). If a non-residential use, such as a commercial, industrial or school use, is proposed to abut an existing residential use, the decibel level at the property line should be the arithmetic mean of the decibel levels allowed for each use as set forth in Section 59.5.0401 of the Municipal Code. Although the noise level could be consistent with the City's Noise Ordinance Standards, a noise level above 65 dB (A) CNEL at the residential property line could be considered a significant environmental impact.

Noise/Land Use Compatibility

Noise is one factor to be considered in determining whether a land use is compatible. Construction and operation of a project must consider compatibility with adjacent land uses in designing noise mitigation measures.

Municipal Code §59.5.0401 Sound Level Limits (City of San Diego 2019)

It shall be unlawful for any person to cause noise by any means to the extent that the one–hour average sound level exceeds the applicable limit given in the following table, at any location in the City of San Diego on or beyond the boundaries of the property on which the noise is produced. As with the above noise regulations, construction activities may be subject to noise attenuation measures.

TABLE OF APPLICABLE LIMITS

Land Use	Time of Day	One-Hour Average Sound Level (decibels)
1. Single Family Residential	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m.	50 45 40
2. Multi-Family Residential (Up to a maximum density of 1/2000)	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m.	55 50 45
3. All other Residential	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m.	60 55 50
4. Commercial	7 a.m. to 7 p.m. 7 p.m. to 10 p.m. 10 p.m. to 7 a.m.	65 60 60
5. Industrial or Agricultural	any time	75

Each of the noise regulations summarized above may have bearing on the Project. For example, drilling of the Test Well required installation of sounds walls to attenuate nighttime construction noise for surrounding residents. The treatment plant(s) may be required to install noise attenuation features to minimize operational noise impacts on nearby residences and other noise-sensitive land uses. These impacts would be further analyzed in the CEQA document, but are expected to be less than significant with mitigation incorporated.

3.8 Air Quality

According to the San Diego Air Pollution Control District (SDAPCD), the San Diego Air Basin is designated nonattainment for ozone O_3 (State and federal designation), respirable particulate matter PM_{10} (State and federal), and fine particulate matter $PM_{2.5}$ (State designation). The ambient air quality standards are provided in **Appendix G**.

Table 6 San Diego Air Basin Attainment Status of Criteria Air Pollutant Standards

Criteria Pollutant	Federal Designation	State Designation
Ozone (8-Hour)	Nonattainment	Nonattainment
Ozone (1-Hour)	Attainment *	Nonattainment
Carbon Monoxide	Attainment	Attainment
PM10	Unclassifiable **	Nonattainment
PM2.5	Attainment	Nonattainment
Nitrogen Dioxide	Attainment	Attainment
Sulfur Dioxide	Attainment	Attainment
Lead	Attainment	Attainment
Sulfates	No Federal Standard	Attainment
Hydrogen Sulfide	No Federal Standard	Unclassified
Visibility	No Federal Standard	Unclassified

* The federal 1-hour standard of 12 pphm was in effect from 1979 through June 15, 2005. The revoked standard is referenced here because it was employed for such a long period and because this benchmark is addressed in State Implementation Plans.

** At the time of designation, if the available data does not support a designation of attainment or nonattainment, the area is designated as unclassifiable.

SDAPCD provides criteria in Regulation II, Rule 20.2, Table 20-2-1, “AQIA Trigger Levels.” These thresholds can be applied as screening criteria for potential impact significance for stationary sources. It is unlikely that operation of the proposed Project, given its size, would exceed these screening thresholds. The Project would create a new stationary source which would be subject to applicable permits to operate from the SDAPCD.

Sensitive receptors include people or populations that are particularly susceptible to health effects due to exposure to an air contaminant than is the population at large. Examples include health facilities, residences, schools, playgrounds, childcare facilities, and athletic facilities. Sensitive receptors (and the facilities that house them) in proximity to localized carbon monoxide (CO) sources, toxic air contaminants such as diesel particulates, or odors are of particular concern. (City of San Diego 2020). As shown in **Figure 3**, the Project area includes potential sensitive receptors such as residential land use, schools, and athletic facilities. The CEQA document should include a project-specific air quality analysis that estimates emissions of CO and diesel particulates from Project construction and operation, and considers the potential for objectional odors.

Project construction would emit particulate matter, including dust and diesel particulates. Dust control measures will likely need to be implemented during construction. However, these emissions would be temporary.

Table A-2 SAN DIEGO AIR POLLUTION CONTROL DISTRICT POLLUTANT THRESHOLDS FOR STATIONARY SOURCES			
POLLUTANT	EMISSION RATE		
	Lb/hr	lb/day	tons/yr
Carbon Monoxide (CO)	100	550	100
Oxides of Nitrogen (NOx)	25	250	40
Particulate Matter (PM_{10})	--	100	15
Oxides of Sulfur (SOx) [b]	25	250	40
Lead and Lead Compounds ©	--	3.2	0,6
Particulate Matter, 2.5 microns ($PM_{2.5}$)	--	--	--
Volatile Organic Compounds (VOC)Reactive Organic Gases (ROG)	--	137[e]	15

d. Source: SDAPCD Rule 1501, 20.2(d)(2)
e. San Diego Air Basin has been in attainment of SOx standard due to sulfur-free natural gas for electricity generation and lack of heavy industrial/manufacturing uses in the region.
f. Lead emissions have steadily declined due to catalytic converters and increased use of lead-free gasoline. San Diego is no longer required to monitor for lead.

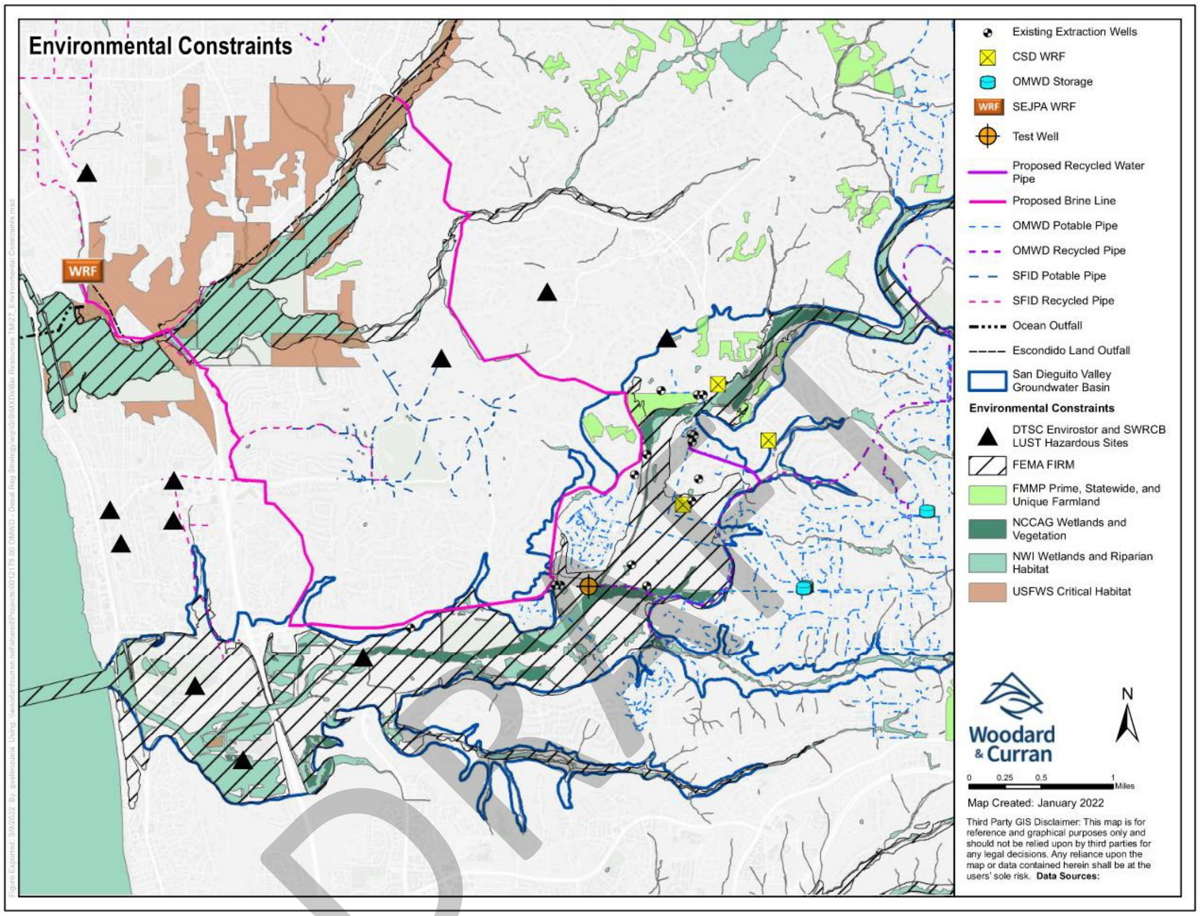
[7] SDAPCD Regulation II, Rule 20.2 (d) (2). http://www.sdapcd.co.san-diego.ca.us/rules/randr.htm For help, contact the SDAPCD at (858) 650-4700 or the California Air Resources Board (CARB) Compliance Assistance Program at 1-800-468-1786.

4. SUMMARY

Figure 16 depicts the location of environmental constraint "hot spots" based on this environmental constraints analysis. Table 1 (above) summarizes the resources that are present in the Project area and lists the possible measures that may be required to mitigate impacts to each environmental resource. Table 2 (above) summarizes the permits that could apply to the Project, based on this desktop environmental constraints analysis, including approximate timeframes and durations associated with permits.

The Project will require development and implementation of a standard suite of special studies on environmental resource topics (e.g., Biological Resources Assessment Report, Hydrologic Study, Cultural Resources Assessment Report, Geotechnical Study, Air Quality Technical Report) as supporting materials for a PEIR. Several permits (e.g., Well/Boring Installation permit, Water Supply Permit Amendment, Coastal Development Permit) will be required to comply with State and federal regulations associated with drinking water systems. The Project's proximity to the San Dieguito River and its habitats will affect environmental requirements. Depending on the site(s) chosen for the Project facilities, several additional environmental permits (e.g., Clean Water Act Section 404, Fish & Game Code 1600, Endangered Species Act) may be necessary. No fatal flaws were identified. Project design shall consider avoidance or mitigation of the environmental resources described herein.

Figure 16 Map of Potential Environmental Constraints



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APPENDIX A. CNDDB RESULTS

APPENDIX B. IPAC RESULTS

APPENDIX C. USFWS SPECIAL STATUS SPECIES

APPENDIX D. FIRE SEVERITY HAZARD MAPS

APPENDIX E. GEOTRACKER RESULTS

APPENDIX F. ENVIROSTOR RESULTS

APPENDIX G. AMBIENT AIR QUALITY STANDARDS

Attachment 4

TECHNICAL MEMORANDUM

TO: Olivenhain Municipal Water District

PREPARED BY: Susan Brownstein, PE

REVIEWED BY: Rosalyn Prickett, Erica Wolski, PE and Michael Welch, PE

DATE: March 3, 2022

RE: San Dieguito Valley Groundwater Desalination Project Regulatory Strategy

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TABLE OF CONTENTS

LIST OF ABBREVIATIONS

1,2,3-TCP	1,2,3-trichloropropane
AF	acre-foot or acre-feet
AFY	acre-feet per year
AOP	advanced oxidation process
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CEC	chemical of emerging concern
CEQA	California Environmental Quality Act
CSD	community services district
CWC	California Water Code
DCMWTP	David C. McCollom Water Treatment Plant
DDW	Division of Drinking Water
DWR	Department of Water Resources
ELO	Escondido Land Outfall
EPA	United States Environmental Protection Agency
FAT	full advanced treatment
GAC	granular activated carbon
gpd	gallons per day
gpd/ft	gallons per day per foot
I-5	Interstate 5
MCL	maximum contaminant level
MG	million gallons
mgd	million gallons per day
mg/L	milligrams per liter
NDMA	n-nitrosodimethylamine
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
OMWD	Olivenhain Municipal Water District
O&M	operation and maintenance
PFAS	per- and polyfluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
Project	San Dieguito Valley Brackish Groundwater Desalination project
PZ	pressure zone
PS	pump station
RO	reverse osmosis
RSFCSD	Ranch Santa Fe Community Services District
RWC	recycled water contribution

RWQCB	Regional Water Quality Control Board
SDCWA	San Diego County Water Authority
SDWD	San Dieguito Water District
SEJPA	San Elijo Joint Power Authority
SEOO	San Elijo Ocean Outfall
SFID	Santa Fe Irrigation District
SGMA	Sustainable Groundwater Management Act
SMCL	secondary maximum contaminant level
SWRCB	State Water Resources Control Board
SWTR	Surface Water Treatment Rule
TDS	total dissolved solids
TOC	total organic carbon
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UV	ultraviolet
WOTUS	Waters of the United States
WRF	water reclamation facility

1. EXECUTIVE SUMMARY

Over the last few decades, Olivenhain Municipal Water District (OMWD) has explored the possibility of developing groundwater in several coastal basins in San Diego County. The San Dieguito Valley basin has been identified as having available groundwater supply for beneficial use by District customers. OMWD currently relies on purchased water for its potable water needs with limited local water supply options available. Faced with rising costs, decreasing availability, and uncertain future reliability of this purchased water supply, OMWD is investigating a local potable water supply through implementation of the San Dieguito Valley Groundwater Desalination Project (Project).

This regulatory strategy evaluates the primary regulatory considerations for a groundwater extraction and treatment project, which consists of producing up to 1.0 million gallons per day (mgd) of potable water from brackish groundwater in the San Dieguito Valley Groundwater Basin and treating it at a desalination plant. The primary regulatory considerations and recommendations are summarized in the table below. No fatal flaws were identified. Project design shall consider the well siting and treatment design considerations described herein.

Table ES-1: Summary of Primary Regulatory Considerations and Recommendations

Groundwater Extraction and Treatment Project
Benefits
Project would provide a local, reliable source of potable water supply for OMWD **(Section 2)**
Preferred alternative as a climate change adaptive project **(Section 2)**
OMWD operations staff have required certification and experience to operate desalination plant **(Section 5.3)**
Constraints
Potentially poor water quality (eg, PFAS, arsenic, GWUDI designation) would necessitate additional treatment capacity or processes **(Section 5.3.1)**
Siting constraints to avoid GWUDI designation and other PCAs further limit possible extraction well locations **(Sections 5.1.1.1** and **5.3.1)**
Ocean Plan compliance for brine discharge could be negatively impacted by PFAS and other emerging contaminants **(Section 5.4)**
Recommendation
Prioritize careful extraction well siting, treatment design, and brine disposal planning (**Section 8**)

2. INTRODUCTION

Over the last few decades, Olivenhain Municipal Water District (OMWD) has explored the possibility of developing groundwater in several coastal basins in San Diego County. The San Dieguito Valley basin has been identified as having available groundwater supply for beneficial use by District customers. OMWD currently relies on purchased water for its potable water needs with limited local water supply options available. Faced with rising costs, decreasing availability, and uncertain future reliability of this purchased water supply, OMWD is investigating a local potable water supply through implementation of the San Dieguito Valley Groundwater Desalination Project (Project).

A 2017 *San Dieguito Valley Brackish Groundwater Desalination Feasibility Study* evaluated if 1.0 million gallons per day (mgd) of potable water can be produced from brackish groundwater in the San Dieguito Valley Groundwater Basin. The study evaluated numerous project considerations including production wells, conveyance pipelines, desalination treatment facilities, brine management, as well as project alternatives and costs, environmental and regulatory considerations, and implementation plans.

Following completion of the Feasibility Study, OMWD began pilot borings and test well construction. After the test well was constructed, water quality sampling, pretreatment field testing, and pump tests were conducted to update the groundwater model and verify basin capacities. The 2021 *Report of Design Pilot Testing for the San Dieguito Valley Brackish Groundwater Desalination Project* summarized the results of the pump test. The 1-year pump test was conducted to verify the water balance of the San Dieguito Valley Groundwater Basin, water quality and potential impacts to wells of current basin users, and manganese treatment by piloting pre-treatment technologies.

Recent economic feasibility analysis has determined that the Project may be more cost effective as a 1.3 mgd brackish groundwater desalination plant. For this regulatory strategy, the conclusions for a 1.0 MGD project hold for a 1.3 MGD project.

Overall, the Project appears to be a sustainable solution to creating a reliable drinking water without causing significant impacts to the environment or existing groundwater users. Over the life of the project, the models show improved groundwater basin water quality within the Project area. Implementation of the Project would create a reliable drinking water supply at predictable prices. In producing a local source of supply, the Project allows OMWD to adapt to climate change that affects imported supplies.

2.1 Project Objective

The objective of the Project is to develop available groundwater supplies in the San Dieguito Valley basin for beneficial use, while protecting the existing water rights and environmental resources within the basin.

2.2 Study Objective

The purpose of this Technical Memorandum is to document the relevant federal, state and local regulatory requirements for implementation of a drinking water extraction and treatment project.

3. PROJECT OVERVIEW

The San Dieguito Valley Groundwater Desalination Project will produce a local supply of potable water from brackish groundwater in the San Dieguito Valley Groundwater Basin. The goal of the Project is to produce 1.0 million gallons per day (mgd) of potable water through brackish groundwater extraction and treatment. The Project includes construction and operation of the necessary facilities, including groundwater extraction wells, a desalination plant to treat the water to drinking water standards, conveyance pipelines from the extraction wells to the desalination plant and from the desalination plant to the potable water distribution system, and a brine line from the desalination plant to ocean disposal at San Elijo Joint Powers Authority (SEJPA) San Elijo Ocean Outfall (SEOO). OMWD is also investigating alignments for additional recycled water conveyance to offset existing groundwater uses.

The Project Area is the San Dieguito Valley Groundwater Basin and vicinity in San Diego County. The Project Area and facilities are shown in **Figure 1**. The oval on **Figure 1** shows the potential area for siting extraction wells along with two potential desalination plant locations. OMWD's potable water distribution system and storage reservoirs are shown to the east of the desalination plant locations. The orange line shows potential brine line routing locations either directly to the San Elijo Joint Powers Authority's (SEJPA) San Elijo Ocean Outfall (SEOO) or via the Escondido Land Outfall to the SEOO. There are three small water reclamation facilities located in the basin that either percolate effluent to the groundwater basin or use the effluent for irrigation.

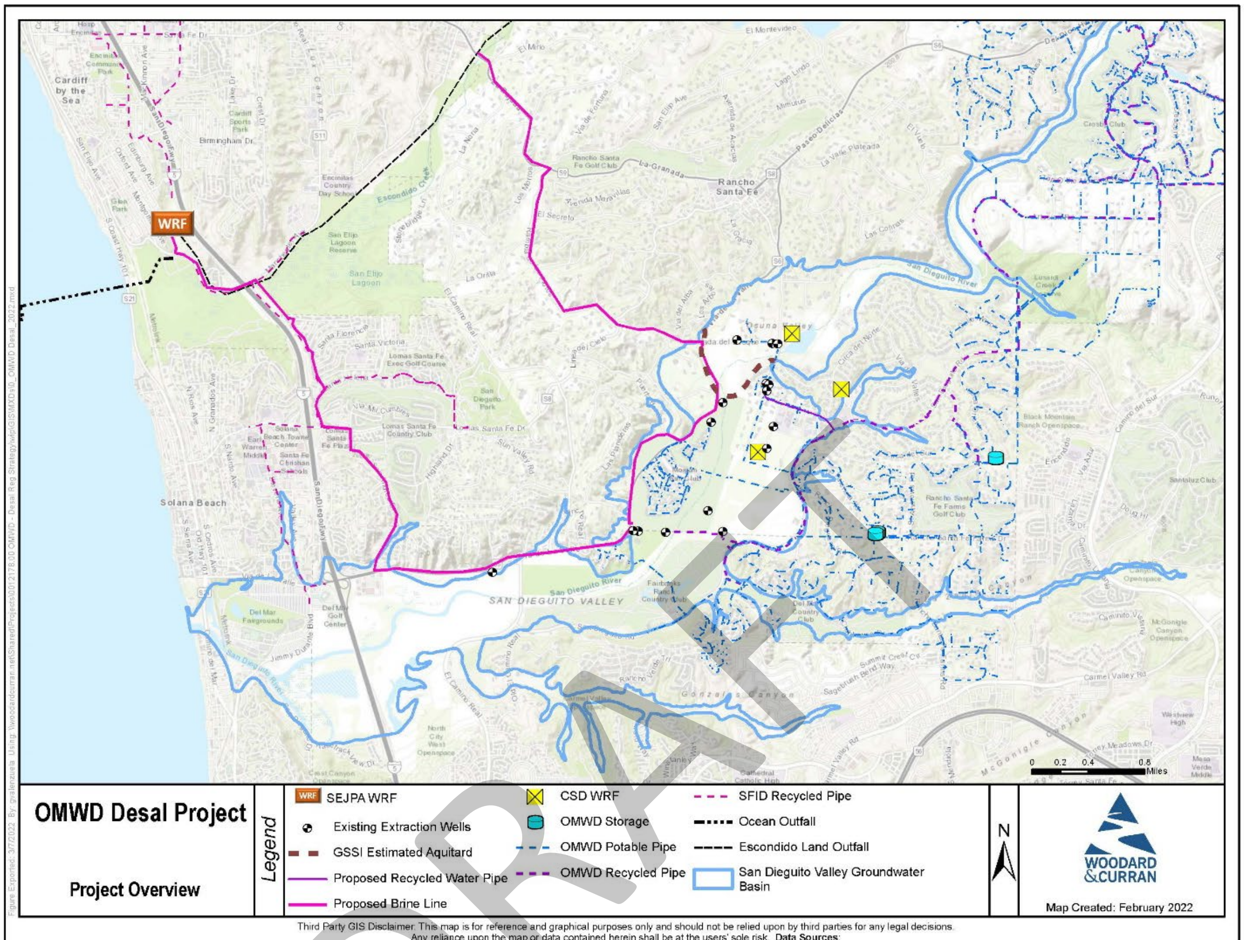

Figure 1. Project Overview

3.1 Roles of Potential Project Participants and Stakeholders

Project participants include Federal, State, and local agencies. To ensure protection of water quality and public health, the use of recycled water is regulated under several State laws, regulations, and policies. Different State regulatory responsibilities are assigned to the State Water Resources Control Board (SWRCB) – Division of Drinking Water (DDW) and the San Diego Regional Water Quality Control Board (RWQCB).

3.1.1 Project Participants

The project will require collaborative efforts between OMWD and several local and State agencies. General and regulatory responsibilities of major agencies are summarized below.

Olivenhain Municipal Water District (OMWD)

OMWD will be the Project Sponsor with roles as identified in State regulation. Responsibilities include:

- Administration, ownership, construction, operation, and maintenance.
- Environmental compliance, permitting, monitoring, and reporting.

California State Water Resources Control Board

Division of Water Rights

- Administers water rights in California.
- Issues permits for diversion of surface water and for water storage.
- Reviews and approves Orders Approving Change in Place of Use and Quantity of Discharge (Wastewater Change Petitions) per California Water Code Sections 1210 through 1212[1].

San Diego Regional Water Quality Control Board (RWQCB)

- Oversees surface water and groundwater quality and establishes water recycling and waste discharge requirements in the San Diego Region (Region 9).
- Incorporates recommendations from the SWRCB DDW into permits for water recycling and groundwater recharge projects.
- Issues and enforces water recycling and waste discharge permits and requirements.

Division of Drinking Water (SWRCB DDW)

- Administers California's Drinking Water Program, which regulates public water systems to ensure compliance with the Safe Drinking Water Act.
- Establishes criteria to protect the public health regarding recycled water production and use.
- Adopts Water Recycling Criteria in the California Code of Regulations, Title 22, including regulations with specific criteria for groundwater recharge projects.
- Holds public hearings on potable reuse projects and makes recommendations to the RWQCB for inclusion into the water recycling requirements, or project permit.

City and County of San Diego

The City of San Diego would have jurisdiction for permits related to facility construction. The County of San Diego would issue well drilling permits, discussed in **Table 6.**

[1] Note: A Wastewater Change Petition per Section 1211 is only triggered when a project would decrease the volume of water in an inland surface by changing the wastewater point of discharge, place of use, or purpose of use.

Adjacent Wastewater Agencies: San Elijo Joint Powers Authority, Rancho Santa Fe CSD, Whispering Palms CSD, Fairbanks Ranch CSD, and City of San Diego

Three community services districts (CSDs) located near the OMWD service area provide wastewater treatment and are potential partners for in lieu recharge, comprised of delivery of recycled water to existing groundwater users: Rancho Santa Fe CSD, Whispering Palms CSD, and Fairbanks Ranch CSD. Rancho Santa Fe CSD operates two water reclamation facilities. In addition, the San Elijo JPA, which consists of members from the City of Solana Beach and City of Encinitas, operates the San Elijo Wastewater Reclamation Facility (WRF) and the San Elijo Ocean Outfall (SEOO). The City of San Diego operates the North City Water Reclamation Plant (NCWRP) which provides recycled water for irrigation in the northern San Diego area, including the San Dieguito River Valley. The major wastewater facilities and their owners are listed in **Table 2.**

Table 2: Major Wastewater Treatment Facilities, Existing Capacities, and Permits

Owner | Facility	Treatment	Capacity	Permit Type and Number
OMWD 4S Ranch WRF	Tertiary for resale	2.0 mgd	WDR No. R9-2019-0005W2 General Order No. 2016-0068-DDW WDR No. R9-2003-0007
Rancho Santa Fe CSD[1] Santa Fe Valley WRF	Tertiary for resale	0.48 mgd	WDR No. R9-2002-0013
Rancho Santa Fe CSD WRF	Secondary treatment, discharge to percolation ponds	0.45 mgd	WDR No. 92-04
Whispering Palms CSD WRF	Secondary treatment, discharge to percolation ponds	0.40 mgd	WDR No. 94-80
Fairbanks Ranch CSD Water Pollution Control Facility	Secondary treatment, discharge to percolation ponds	0.28 mgd	WDR No. 93-05
SEJPA San Elijo WRF	Secondary to ocean outfall, Tertiary for resale	5.25 mgd	Order No. R9-2018-0003 NPDES No. CA0107999
City of San Diego North City Water Reclamation Plant (NCWRP)	Tertiary for resale	30 mgd	Order No. R9-2020-0001 NPDES No. CA0109398

Groundwater Sustainability Agency (GSA)

The San Dieguito Valley Groundwater Basin (No. 9-12) has been designated a very low priority basin by the California Department of Water Resources (DWR). Thus, OMWD is not subject to the provisions of the Sustainable Groundwater Management Act (SGMA), which requires groundwater-dependent regions to form Groundwater Sustainability Agencies (GSAs) to actively manage their groundwater basins and prevent overdraft by balancing levels of pumping and recharge. However, to ensure that the Project is in line with the requirements of SGMA, the Project should ensure sustainable groundwater production as verified by hydrogeologic modeling of the basin and conducting a water balance. Additionally, the groundwater dependent ecosystems (GDEs) – as defined by SGMA – that are located within the basin should be identified and considered in the design of a groundwater development project.

4. REVIEW OF EXISTING PERMITS

4.1 Division of Drinking Water (SWRCB DDW)

DDW regulates potable water produced by public water systems in California, including OMWD. OMWD must meet all applicable regulatory requirements of the California Code of Regulations (CCR), which are primarily found in Title 22, Division 4. Public water systems must obtain a permit from DDW to supply potable water to customers. These permits include specific monitoring and reporting provisions for the water system for approved treatment facilities and the distribution system. Before implementing any change to the water supply or treatment, the public water system must apply for and receive an amended permit from DDW.

4.2 San Diego Regional Water Quality Control Board (RWQCB)

The RWQCBs are empowered to regulate discharges defined by law as "wastewater," which, in part, includes treated municipal wastewater, industrial wastewater, and stormwater. The RWQCBs issue and enforce NPDES permits for discharges to waters that meet criteria for designation as "Waters of the United States" and waste discharge requirements (WDRs) for discharges to state waters, such as groundwater and surface impoundments, that are not designated as waters of the United States. NPDES permits are issued by the San Diego RWQCB through EPA-delegated authority.

The WDRs and NPDES permit numbers for wastewater discharges in the basin and surrounding area are included the facility descriptions in **Table 2**. As shown in Table 1, three regulated secondary treatment percolation operations exist within the basin. Each facility is regulated by WDRs that are more than 25 years old and do not reflect present-day RWQCB implementation policies. These older WDRs establish a 10 mg/L effluent limit for nitrate as nitrogen. All recent RWQCB WDRs for groundwater recharge operations implement the groundwater nitrate objective by establishing a 10 mg/L effluent limitation for total nitrogen (as opposed to regulating only nitrate-nitrogen).

5. REGULATORY REQUIREMENTS

The Project consists of drilling and equipping one or more extraction wells as a potable water supply for OMWD as well as design, construction, and operation of a new groundwater treatment plant to produce water that meets the Federal and State drinking water regulations. The treatment plant will utilize reverse osmosis (RO) to remove salts and other regulated contaminants from the groundwater and will generate a waste concentrate or brine discharge for disposal, and therefore, the regulatory considerations related to this brine are also discussed.

5.1 DDW Regulatory Requirements for Permitting New Production Wells

DDW is a division of the SWRCB, and the EPA has delegated Safe Drinking Water Act primacy for regulation of public drinking water systems to DDW. It is also responsible for establishing uniform criteria for recycled water treatment and use, as well as for protecting potable water systems from cross-connections. These criteria take the form of regulations found in the California Code of Regulations (CCR), Titles 17 and 22.

CCR Title 22 governs the treatment requirements and MCLs for drinking water in California, including at the OMWD's David C. McCollom Water Treatment Plant and any future water treatment facility. OMWD's potable water system is regulated by DDW's San Diego District. District staff perform the following tasks:

- Reviews traditional drinking water projects
- Conducts inspections, and ensures ongoing compliance of drinking water systems
- Issues operating permits to drinking water utilities to treat and serve potable water
- Issues enforcement actions to public water systems that violate regulations or permit conditions

5.1.1 DDW Permit Requirements Before Well Construction

The DDW permitting process for a new production well is discussed in this section and summarized in the checklist in **Appendix 1**. These requirements can be found in CCR Title 22, Section 64560.

5.1.1.1 Drinking Water Source Assessment Requirements (DWSAP)

As of April 1, 1999, all new sources must have an assessment completed as part of the DDW permitting process. This assessment must be conducted in accordance with the DDW Source Assessment and Protection Program (DWSAP). The assessment for groundwater wells must include the following:

1. A ***Delineation*** of protection areas/zones around the well (2 year, 5 year, and 10 year time of travel).
2. An ***Inventory*** of Possible Contaminating Activities (PCAs) within the identified protection areas/zones.
3. A ***Vulnerability Assessment*** to identify the PCAs to which the source is most vulnerable.

The jurisdiction issuing the well drilling permit (i.e., San Diego County) may be required to consult with DDW before issuing a drilling permit to a public water system to ensure that it meets DDW's criteria and can be permitted after construction. The County may also consult with the San Diego RWQCB prior to issuing a well drilling permit to ensure that the proposed well pumping will not contribute to migration of existing contaminant plumes. In addition, to ensure that all potential PCAs have been identified in the DWSAP, the water system should search the following websites, at a minimum:

1) Geotracker (https://geotracker.waterboards.ca.gov/) to determine proximity of the proposed well to underground storage tanks and other cleanup sites, and
2) CalGEM Wellfinder (https://www.conservation.ca.gov/calgem/Pages/Wellfinder.aspx) to determine the proximity of the proposed well to oil and gas wells and related facilities.

5.1.1.2 Well Control Zone Documentation

On March 9, 2008, revisions to the California Waterworks Standards became effective that require water systems to provide documentation demonstrating that a well site control zone with a 50-foot radius around the site can be established for protecting the source from vandalism, tampering, or other threats at the site by water system ownership, easement, zoning, lease, or an alternative approach approved by DDW based on its potential effectiveness in providing protection of the source from contamination. Ideally, OMWD should own and maintain the property at least 50-foot radially around each proposed extraction well to meet this requirement. If the 50-foot well control radius cannot be met at a proposed well location, the DDW permit amendment will require the water system to demonstrate that it will monitor activities within the proximity of the well site.

5.1.1.3 Design Plans and Specifications

Plans and specifications for the proposed extraction well and treatment plant must be submitted to DDW. All new wells are to be drilled and constructed in accordance with the California Department of Water Resources (DWR) Bulletins 74-81 and 74-90 and the American Water Works Association (AWWA) Standard A100-06 for Water Wells. The California Water Well Standards Bulletin 74-90 requires a separation of domestic water supply wells from potential sources of contamination as shown in **Table 3**Error! Reference source not found..

DWR is in the process of updating Bulletin 74: California Well Standards, which was last updated in 1991. The updated bulletin may have requirements or restrictions for new production wells that may affect well siting, drilling, and construction.

Table 3. Minimum Horizontal Separation Requirements for New Well Siting

Potential Pollution or Contamination Source	*Minimum Horizontal Separation Distance Between Well and Known or Potential Source
Any sewer line (sanitary, industrial, or storm main or lateral)	50 feet
Watertight septic tank or subsurface sewage leaching field	100 feet
Cesspool or seepage pit	150 feet
Recycled Water Use Area	50-150 feet depending on level of treatment of recycled water
Animal or fowl enclosure	100 feet

*The above separation distances are for wells with adequate annular seals drilled in dry upper unconsolidated formations that are less permeable than sand. Wells drilled in fractured rock formations need to have much greater separation distances.

Source: DWR, 1991

The AWWA standard specifies a minimum annular seal thickness of 3 inches, which is larger than the two inches currently required by DWR Well Standards. All wells must be plumbed and equipped with proper electrical hookups at the well site to allow for the installation of emergency disinfection equipment in case of a bacteriological water quality failure. In addition, all wells must be equipped with a production meter and flush to waste facilities.

5.1.2 Ground Water Under the Direct Influence (GWUDI) Considerations

If the extraction well location has any potential hydraulic connection with surface water, DDW has the discretion to request an investigation to determine whether the well should be designated "groundwater under the direct influence [of surface water]," or GWUDI. This is defined as "any water beneath the surface of the ground with (i) significant occurrence of insects, or other microorganisms, algae, organic debris, or large diameter pathogens such as *Giardia lamblia*, or (ii) significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity or pH which closely correlate to climate or surface water conditions." An initial investigation typically consists of bacteriological sampling and sampling for turbidity (for example, monthly analysis of *E. coli* and turbidity for one year; see **Appendix 2** for more information). Positive bacteriological samples or high turbidity readings would be followed by additional testing and examination of parameters such as water temperature to confirm the finding. In cases where iron and manganese are present, it can be especially difficult to demonstrate that the groundwater near a surface water is not GWUDI. Therefore, ideally, OMWD should drill a well with sufficient setbacks from the San Dieguito River and other surface waters to avoid the proposed extraction wells falling into this classification. The effect of a GWUDI designation on water treatment requirements is discussed in **Section 5.3.1**.

5.1.2.1 CEQA Documentation

California Environmental Quality Act (CEQA) documentation is required for DDW to issue a permit for the new well, treatment plant, and associated facilities. All environmental documents must be routed through the State Clearinghouse (SCH) and be assigned a SCH Number before DDW will grant permission to put the new source online. A CEQA Notice of Determination must be included with the permit application if the well is for a water system owned by a public agency. Failure to comply with the CEQA requirements will cause a delay in DDW permit issuance.

5.1.2.2 DDW Site Inspection

Once a site has been selected for the proposed well, the DDW staff engineer will perform a site inspection to verify whether the location is suitable to meet DDW regulatory requirements.

5.1.3 DDW Permit Requirements After Well Construction

5.1.3.1 Well Construction Permit and DWR Well Completion Report

Section 13751 of Chapter 10 of Division 7 of the Water Code requires that any person who digs, bores, or drills a water well, cathodic protection well, or a monitoring well, or abandons or destroys any such well, or who deepens or re-perforates any such well shall file a report of completion (Well Completion Report) with DWR within 30 days after its construction or alteration has been completed. The report must be made on forms furnished by DWR. A Well Completion Report is a document completed by the well driller at the time of construction. The Report includes the following information: owner, location, proposed use, equipment employed in the construction of the well, gravel pack, casing material and diameter, perforations, well seal, water levels, well tests, well log, date drilled and the name of the well driller.

A copy of the Well Completion Report must also be submitted to DDW after the well has been drilled.

5.1.3.2 Water Quality Data

Prior to placing a new well into service, it must be determined whether the well water meets the State's drinking water quality standards. To make this determination, water representative of the water quality during sustained pumping must be analyzed for the constituents in **Table 4**.

Table 4. Water Quality Monitoring Requirements for New Production Wells

Constituent Category	Notes
Bacteriological Quality	The well should be disinfected according to AWWA Standard C654 prior to collection of a bacteriological sample.
General Mineral, General Physical, and Inorganic Chemicals	Request the latest monitoring schedule for new wells from DDW. All community water systems must monitor new wells for perchlorate to determine compliance with the perchlorate MCL of 6 ug/L (effective October 18, 2007). To complete initial monitoring for perchlorate, two rounds of sampling, taken five to seven months apart, are needed and one of the two samples must be collected between May and September. Although as of this writing, the hexavalent chromium MCL of 0.010 mg/L has been rescinded, it is prudent to monitor for this constituent, as a new MCL is forthcoming. It is recommended to collect a sample from the well and analyze for hexavalent chromium by EPA method 218.6 or 218.8. If total chromium is to be used as a screening tool for hexavalent chromium (chromium VI), the analytical method used must be capable of detection at the 1 ug/L reporting limit.
Volatile Organic Chemicals	Refer to the DDW district's most recent Water Quality Monitoring Schedule.
Synthetic Organic Chemicals	Refer to the DDW district's most recent Water Quality Monitoring Schedule, including 1,2,3-TCP.
First of four consecutive quarters of radiochemical monitoring	Sample for gross alpha activity. Uranium shall be analyzed for if the gross alpha activity exceeds 5 picoCuries per liter (pCi/L). Community water systems must also conduct four consecutive quarters of monitoring for radium 228. If first two quarters of radium 228 show non-detect (below the detection limit of 1 pCi/L results), monitoring for the remaining two quarters may be waived. DDW staff will complete the latest DDW Radionuclide Worksheet to determine ongoing monitoring requirements.

5.1.3.3 Source Capacity Information

Pump test information must be submitted to DDW that demonstrates the capacity of the source on a sustained basis. Information must also be provided that evaluates any potential impacts to nearby wells and surface water sources as required as part of the CEQA documentation.

5.1.3.4 As-Built Plans and Well Data Sheet

The Well Data Sheet should be provided by DDW staff for OMWD to complete and will include information about the pump and motor, as well as a summary of the Well Completion Report and location of the well.

5.1.3.5 Groundwater Rule Compliance Plan

A plan and sample monthly monitoring report must be submitted to DDW that shows compliance with the Groundwater Rule, either through provision of 4-log removal of viruses or triggered source monitoring in the Total Coliform Rule. Provision of 4-log virus contact time (CT) with chlorine is the most straightforward means of compliance; therefore, the design of the treatment facilities should include a chlorine contact tank and a chlorine analyzer at the outlet of the contactor to ensure and demonstrate regulatory compliance.

5.1.3.6 Treatment (Including Chlorination) Equipment and Chlorination Data Sheet

If treatment (including chlorination) is installed, information about the treatment must also be provided with the permit amendment application for the new well. If chlorination treatment is installed on the well, a completed *Chlorination Data Sheet* must also be submitted. (DDW staff will provide a blank Chlorination Data Sheet for OMWD to complete). Additional permitting requirements for groundwater treatment facilities are discussed in **Section 5.3**.

5.1.3.7 NSF/ANSI Standard 60/61 Certification

In accordance with the California Waterworks Standards, all chemicals and products added to drinking water must be NSF/ANSI 60 certified (CCR Title 22 Section 64590 et seq.), including chemicals used to clean drinking water treatment facility components. The certifying organization must include product testing, facility inspections, QA/QC review, manufacturing practice reviews, and chemical stock inspections; all on an annual basis. Documentation from the certifying organization should be submitted.

In addition, all materials and products that are in contact with drinking water meet the indirect additive requirements (CCR Title 22 Section 64591) of NSF/ANSI 61. Some uncertified direct or indirect additives may be used if specific criteria are met or if a waiver is obtained. Chemicals generated onsite must also meet the NSF/ANSI requirements.

5.1.3.8 Final Well Inspection

After the well has been drilled, the pump and other equipment installed, and before the well is added to the system, DDW staff must complete a field inspection of the well.

A well may not discharge into the water distribution system until the above documents have been submitted to the DDW, a field inspection of the well installation has been made, and a permit amendment has been issued by DDW.

5.2 San Diego DEHQ Regulatory Requirements for Permitting New Production Wells

The San Diego County Department of Environmental Health & Quality (DEHQ), Land and Water Quality Division regulates the design, construction, modification, and destruction of water wells throughout San Diego County to protect San Diego County's groundwater resources. San Diego County Code, Sections 67.401 through 67.424, provide the regulatory authority to the DEHQ to require and issue water well permits and include the standards from DWR Bulletin 74-90 for the construction, repair, reconstruction, or destruction of wells. The installation or modification of wells within San Diego County requires owners to obtain a permit and adhere to well standards.

The well drilling permit will be obtained on behalf of OMWD by the well drilling contractor. The application requires general information about the property owner and well contractor/driller and specific information about the well location and proposed construction details. In addition, the applicant must attach a scaled map of the well location and other items of interest in the vicinity such as property lines, water bodies, roads, septic systems, and other items of interest.

5.3 DDW – Permit Requirements for Drinking Water Treatment Facility

A treatment plant to produce potable water from the extracted groundwater would require extensive review and inspection by DDW throughout the design, construction, and start-up process, culminating in the issuance of an amendment to OMWD's existing drinking water before the treatment plant effluent can be served to the OMWD potable distribution system. In addition to the permitting requirements discussed in **Section 5.1** for the extraction wells, the required documentation includes:

1. Plans and specifications for treatment plant facilities
2. An engineering report describing how the proposed new treatment facilities, including any blending or bypass, will be designed to comply with the treatment, design, performance, and reliability provisions of CCR Title 22
3. An operations, maintenance, and monitoring plan (OMMP)
4. A proposed monthly monitoring report that demonstrates ongoing compliance with CCR Title 22 and the OMMP
5. A list of the OMWD chief and shift treatment operators with the required level of California treatment operator certification

The operator classification of water treatment facilities is discussed in CCR Title 22, Section 64413.1 and is calculated based on the number, concentration, and risk (acute or chronic) of regulated contaminants in the influent water, number and types of disinfection, and overall design flow rate. Based on the treatment train characteristics discussed in the 2017 Feasibility Study (Geoscience, 2017), the treatment plant would likely be classified as a T2 facility if the GWUDI designation were avoided (see worksheet in **Appendix 3** for details). Because the OMWD McCollom Water Treatment Plant is a T5 facility (the highest possible classification), operations and maintenance of the desalter are not expected to pose a regulatory challenge for this Project.

5.3.1 Effect of GWUDI Designation and Other Water Quality Parameters on Water Treatment Design and Operation

As discussed in **Section 5.1**, an extraction well with a hydraulic connection to surface water is considered to be "ground water under the direct influence [of surface water]," or GWUDI. Once a GWUDI determination has been made, the source is regulated under the suite of Surface Water Treatment Rules (SWTR), including requirements for raw water *Giardia* and *Cryptosporidium* monitoring, treatment consisting of 4-log, 3-log, and 2-log removal and/or inactivation of viruses, *Giardia,* and *Cryptosporidium*, respectively, and online monitoring and alarms to demonstrate continuous SWTR compliance. A GWUDI designation would add considerable complexity and cost both to the design and ongoing operation of the potential desalter treatment facility; however, the conceptual design could potentially be modified to provide filtration and disinfection to the entire influent flow. It is important to note that DDW can request a GWUDI investigation for any well that it suspects is hydraulically connected to surface water, even after the well has been permitted and begins operation. Therefore, the potential for a future GWUDI designation should be carefully considered during well siting and treatment design.

The 2021 *Report of Design Pilot Testing for the San Dieguito Valley Brackish Groundwater Desalination Project* (Geoscience, 2021) included water quality data from the test well. Based on the results included in Table 4-5 and Appendix I of the Geoscience report, perfluorooctanesulfonic acid (PFOS) and other per- and polyfluoroalkyl substances (PFAS), iron, and manganese are present in the aquifer, potentially at levels exceeding regulatory limits for drinking water. In addition, arsenic was detected at 5.7 ug/L, which is above half the MCL of 10 ug/L and is commonly found in ground water aquifers where iron and manganese are present. The presence and concentration of these chemicals would affect the treatment design and could limit the amount of treatment bypass that would be acceptable to DDW.

5.4 RWQCB – Waste Discharge Requirements Permit for Brine Discharge

For purposes of this study, it is assumed that the advanced water treatment facility would be co-located with the groundwater desalination facility, both of which would generate brine concentrate requiring disposal. The brine disposal method is anticipated to be via the San Elijo Ocean Outfall (SEOO), which would require the RWQCB to amend the San Elijo WRF NPDES permit.

A Report of Waste Discharge (ROWD) is required to apply for, reissue, amend, or administratively extend a discharge permit. For an existing discharge permit, any changes to the treatment process that may affect water quality, volume of treated wastewater discharged, and discharge point locations should be included in the ROWD for these anticipated changes to be added to the discharge permit. Changes to an ocean outfall discharge require further analysis to determine compliance with the California Ocean Plan (SWRCB, 2019), which establishes receiving water standards (to be achieved upon completion of mixing and initial dilution) for 62 toxic organic and inorganic parameters. Water quality-based concentration standards or performance goals implement receiving water standards established by the SWRCB in Table 3 of the Ocean Plan.

The San Elijo WRF discharge to the SEOO is regulated San Diego RWQCB Order No. R9-2018-0003 (NPDES CA0107999). The existing NPDES discharge permit establishes both (1) water quality-based effluent concentration standards or water quality-based effluent performance goals, and (2) technology-based effluent limitations (TBELs), including technology-based concentration standards for several physical/chemical parameters (e.g., pH, settleable solids, suspended solids, turbidity, grease and oil) which apply individually to the treated effluent from each facility discharging to the ocean (prior to mixing and initial dilution).

In addition to affecting water treatment plant design, the presence of PFOS and other PFAS could affect brine discharge, as these chemicals would be removed by reverse osmosis and would be present in the concentrate. Although PFAS are not currently in the Ocean Plan with recommended limits, it is an area of active regulatory concern and development and could eventually be subject to downstream regulation at the SEOO.

5.5 DDW Requirements for Conveyance Pipelines

The California Code of Regulations, Title 22, Water Works Standards require that new buried non-potable water (e.g., sewer and recycled water) pipelines must be installed with adequate separation from potable water pipelines to minimize potential for contamination of the potable water lines (see **Table 5**). When it is necessary to construct pipelines with less separation distance than required by the regulations, the water utility owner is expected to engage with DDW and may propose an alternative construction method that demonstrates equivalent protection of public health as the prescribed separation criteria and obtain a waiver, pursuant to CCR, Title 22, Section 64551.100. Conveyance pipelines for brine and recycled water with less than tertiary treatment would be considered sewage pipelines in **Table 5**.

DDW will not issue a waiver until 90 percent design or later but may be consulted earlier in the design process to obtain ongoing concurrence with design assumptions and alternative construction methods.

Table 5. Water Main Separation Requirements (Horizontal/Vertical Distance in Feet)

	Potable	Raw Drinking Water Supply[1]	Non-potable[2]	Sewage[3]
Potable		4/1	4/1	10/1
Raw Drinking Water Supply[1]			4/1	10/1

1. Including advanced treated/purified water before augmentation
2. Including disinfected tertiary recycled water and storm water
3. Including untreated sewage, treated sewage, disinfected secondary recycled water, and hazardous fluids

6. MISCELLANEOUS REQUIREMENTS

6.1 DDW Permitting for Potable Water Storage Facilities

Any new distribution reservoir with a capacity equal to or greater than 100,000 gallons must be constructed in accordance with the California Waterworks Standards for distribution reservoirs (CCR Title 22, Section 64585). Plans and specifications must be reviewed by DDW before construction, and the utility must receive a permit amendment from DDW before the reservoir placed into service.

6.2 City of San Diego

The City will be responsible for issuing local permits including a Conditional Use Permit, Building & Safety Plan Check, Traffic Management Plans and Permits, Stormwater Pollution Prevention Plans for Construction, Encroachment Permits, Noise Permits, and others.

6.3 Sustainable Groundwater Management Act (SGMA) Considerations

Because the San Dieguito Basin has been designated a very low priority basin, the provisions of SGMA to form Groundwater Sustainability Agencies (GSAs) do not apply. However, to ensure that the Project is in line with the requirements of SGMA, the Project should include hydrogeologic modeling of the basin and balance levels of pumping and recharge to ensure sustainable groundwater production and protection of groundwater dependent ecosystems (GDEs).

7. SUMMARY

Based on the regulatory requirements discussed in this document, **Table 6** summarizes the primary regulatory considerations to examine further for each project phase.

The Project will require acquisition of an amendment to OMWD's Drinking Water Supply permit. The initial permit amendment application will require several studies (e.g., source water assessment, well control zone) and well design plans, along with a copy of CEQA documentation. Submittals after construction will include water quality data, well completion reports, and equipment specifications. No fatal flaws were identified. Project design shall consider the well siting and treatment design considerations described herein.

Table 6. Summary of Primary Regulatory Considerations

Groundwater Extraction and Treatment Project
Benefits
Project would provide a local, reliable source of potable water supply for OMWD **(Section 2)**
Preferred alternative as a climate change adaptive project **(Section 2)**
OMWD operations staff have required certification and experience to operate desalination plant **(Section 5.3)**
Constraints
Poor water quality (eg, PFAS, arsenic, GWUDI) would necessitate added treatment capacity/processes **(Section 5.3)**
Siting constraints to avoid GWUDI designation and other PCAs limits extraction well locations **(Section 5.3)**
Ocean Plan compliance for brine discharge could be negatively impacted by PFAS and other emerging contaminants **(Section 5.4)**

7.1 Prioritization of Regulatory Siting Constraints for Extraction Wells

A map summarizing the primary regulatory constraints and their impact on extraction well siting is presented in **Figure 2**. A larger version of the figure is provided in **Appendix 4** and additional explanation of the map legend is provided in **Table 7**.

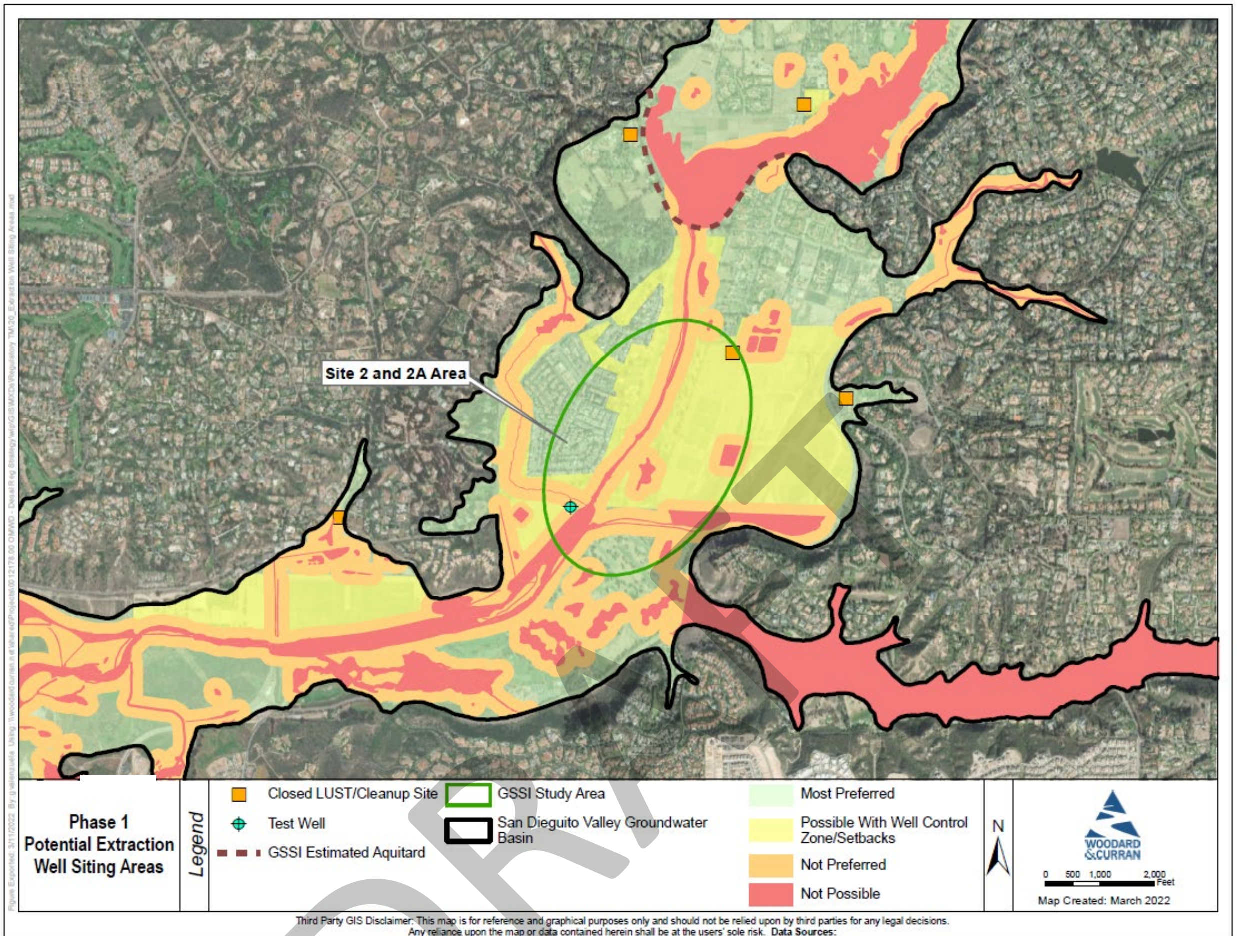

Figure 2. Potential Extraction Well Siting Areas

Table 7. Categorization of Extraction Well Siting Areas in Figure 2

Map Color	Explanation	Site Types	Comment
Red	Not recommended	• Excluded from consideration because of unproductive aquifer • No aquitard and in 100-year flood zone • Within an unlined surface water body (eg, river) • Within an active leaking underground storage tank (LUST) site	Would not meet DWR Well Standards and/or DDW Waterworks Standards.
Orange	May be possible but more site investigation and modeling is needed to determine suitability from a hydrogeological perspective	Aquitard is present AND one or more of the following: • Within a 200' setback from river and unlined surface water bodies • Within 100' from lined surface water bodies or active LUST sites • Within a closed LUST site	If close to surface water, would need to demonstrate to DDW that it is not GWUDI or provide surface water treatment. If close to PCA, would need additional investigation to determine water quality impacts.
Yellow	May be possible but would need to provide adequate well control zone/setback from potentially contaminating activity (PCA)	Aquitard is present AND one or more of the following PCAs: • Recycled water use site • On a wastewater treatment facility site • Other PCA (eg, animal/fowl enclosure)	Would need agreement with landowner to site the well with a 50-foot well control zone and adequate separation from PCA (see **Table 3**).
Green	Most feasible from a regulatory perspective	• Not in the 100-year flood plain • Within 100-yr flood zone but aquitard is present and no current land usage affects DDW permitting	Would need additional investigation to determine site feasibility from a land use/financial perspective and to ascertain aquifer productivity.

The map of the San Dieguito Valley Groundwater Basin in **Figure 2** shows several potential areas for extraction well siting, indicating that the regulatory siting constraints to avoid GWUDI designation and other PCAs can be met. Additional investigation would be required to address the water quality concerns in **Table 6**, however, as well as the potential impact of water quality on brine discharge and Ocean Plan compliance.

8. REFERENCES

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APPENDIX 1. DDW WELL PERMITTING CHECKLIST

APPENDIX 2. DETERMINATION OF GROUNDWATER UNDER THE DIRECT INFLUENCE OF SURFACE WATER (GWUDI)

APPENDIX 3. DDW TREATMENT PLANT CLASSIFICATION WORKSHEET

APPENDIX 4. POTENTIAL EXTRACTION WELL SITING AREAS FOR PROJECT (ENLARGED VERSION OF FIGURE 3)

Attachment 5

San Dieguito Groundwater Desalination Project Planning

ECONOMIC FEASIBILITY ASSESSMENT SUMMARY REPORT

DRAFT March 2022

Prepared by:

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Gillingham Water Planning and Engineering, Inc.

PROJECT TEAM

<u>CONSULTANT TEAM</u>

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Executive Summary

1. The Project: Olivenhain Municipal Water District (OMWD) is investigating the feasibility of developing a San Dieguito Groundwater Desalination project as a new increment of local water supply to serve the long-term needs of its ratepayers.

Previous work by OMWD has evaluated a reasonable range of groundwater project locations and types, and determined the San Dieguito Groundwater Basin (SDGWB) to be the preferred location for more focused studies to assess project feasibility. Engineering and Hydrogeologic investigations have indicated a project is technically feasible, and that OMWD could safely and sustainably pump up to approximately 1,600 acre-feet per year (AF/yr) of surplus groundwater from the basin. Because the groundwater is brackish, desalination via reverse osmosis would be required, and after treatment losses the project would produce approximately **1,300 AF/yr** of new potable supply.

2. Question: How does the Project fare, in terms of cost and non-cost factors, in comparison to the No Project alternative of continued reliance on the San Diego County Water Authority (SDCWA)?

We have structured our analysis as a comparison between the Project and its No Project alternative, the latter being the status quo of continued reliance on purchases of raw water from SDCWA, and treatment of that water at OMWD's David C. McCollom Water Treatment Plant (McCollom plant). Project vs. No Project.

3. Answer: The Project fares very well.

- **Non-Cost Factors:** The project provides improved supply reliability, environmental sustainability, and local control, helping to reduce OMWD's exposure to the uncertainties and escalating costs associated with imported water supplies.
- **Cost Factors:** With reasonable assumptions, the project is significantly less costly than the No Project alternative on a Net Present Value (NPV) basis. Over a 30 year period of plant operations, we estimate present-worth total costs as follows:

30-Year Net Present Value @ 1,300 AF/yr		
PROJECT	NO PROJECT	PROJECT ADVANTAGE
$64M	$81M	**$18M**

Values are rounded and may not sum precisely

4. Recommendations / Next Steps: The findings are sufficient to warrant continued investment by OMWD in project development.

The potential cost and non-cost advantages of the Project support continuing with project development, focusing on measures to plan for management and monitoring of the groundwater basin to ensure the regulatory and legal reliability of OMWD's proposed groundwater pumping.

1. Introduction

1.1. Project Background: Imported supplies are subject to increasing environmental and economic challenges. Evaluating local water supply development opportunities is prudent.

With imported supplies subject to continuing challenges and growing increasingly expensive, it becomes prudent to examine opportunities to develop additional sources of local supply where feasible. OMWD has investigated a reasonable range of groundwater project locations and types, and determined SDGWB to be the preferred location for more focused studies to assess project feasibility.

In 2008, OMWD's Board directed staff to investigate brackish groundwater desalination opportunities, instead of purchasing potable water directly from the Carlsbad Seawater Desalination Plant. The direction at that time was to seek brackish desalination opportunities within OMWD's control at cost equal to or less than the cost of Carlsbad desalinated water, which OMWD had been a partner in and could have elected to receive.

Engineering and Hydrogeologic investigations conducted by OMWD to date have indicated a project is technically feasible, and that OMWD could safely and sustainably pump up to approximately 1,600 acre-feet per year (AF/yr) of surplus groundwater from the basin. Because the groundwater is brackish, desalination via reverse osmosis would be required, and after treatment losses the project would produce approximately 1,300 AF/yr of new potable supply.

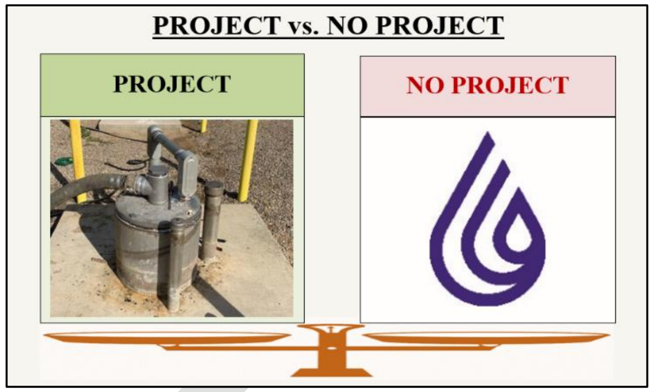
1.2. Economic Feasibility Assessment Purpose: Assess economic feasibility, and provide clear and objective analysis sufficient to support a decision by OMWD on whether to continue investing in project development.

OMWD seeks to manage its ratepayer funds wisely, and to invest those funds only in projects for which probable returns warrant that investment. The costs for project planning and feasibility assessments are by their nature at risk, their potential benefit being contingent on a project advancing to implementation.

With OMWD having already invested funds in studies to date, it is prudent to test each cycle of investment – perhaps each annual budget – against the expectation of return on investment. The economic feasibility assessment presented in this report attempts to meet that challenge.

1.3. Project vs. No Project: The economic point of comparison for the Project is that of the No Project alternative, being the status quo of continued purchases from SDCWA.

Even though previous Board actions have referenced the costs of water from the Carlsbad Seawater Desalination Plant (Carlsbad Desal), the current analysis draws a different point of comparison more apt for OMWD: it's actual marginal source of supply. While it is true that Carlsbad Desal is a component of SDCWA's supply portfolio, and by far the most expensive component, its costs are melded into SDCWA's overall mix, such that the cost to OMWD of buying an extra acre-foot from SDCWA, or the savings of not buying an acre-foot, are those of the melded SDCWA rate structure. Thus the proper economic comparison is between the costs of the Project, and the costs of continuing to purchase the corresponding increment of raw water supply from SDCWA and treating it at OMWD's McCollom water treatment plant.



1.4. Evaluation Criteria: The assessment considers both Cost and Non-Cost factors.

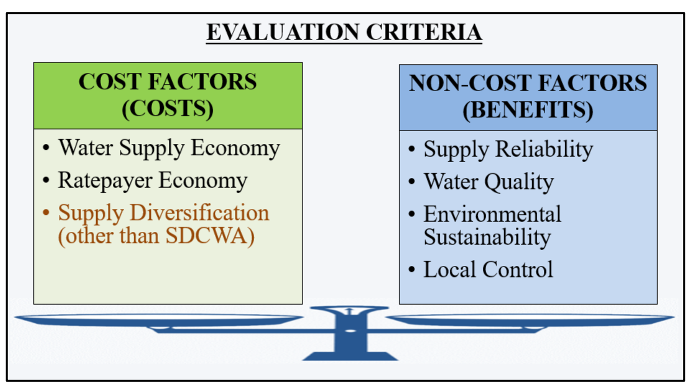
Evaluation criteria begin with the OMWD's mission statement:

> **OMWD MISSION STATEMENT (WATER):** Providing safe, reliable, high-quality drinking water while exceeding all regulatory requirements in a cost-effective and environmentally responsive manner.

This leads to project goals as follows:

1) Economy: Favor projects that improve water supply economy / rate-payer economy in comparison to a No Project alternative
2) Reliability: Favor projects that improve water supply and delivery reliability to OMWD's customers
3) Water Quality: Favor projects that improve water quality for OMWD's customers
4) Environmental Sustainability: Favor projects that are environmentally sustainable
5) Local Control: Although not stated in the mission statement, this criterium appears of interest to OMWD

In the real world, decision bodies make investment decisions by weighing costs and benefits of alternatives. There is a reason we call it cost-benefit analysis: these are two sides of a balance scale.



1.5. Document Outline

The remainder of the briefing document is organized into sections presenting the Fine Screening evaluation and ranking of each of the project alternatives.

Section:

- **SECTION 2:** Evaluation of Non-Cost Factors
- **SECTION 3:** Evaluation of Cost Factors
- **SECTION 4:** Findings and Recommendations

2. Evaluation of Non-Cost Factors

2.1. By almost any measure, the Project fares very well in a comparison of the Non-Cost factors.

Non-cost factor ratings are summarized in Table 2-1 below:

TABLE 2-1: Evaluation of Non-Cost Factors

Criterion	Notes	Rating (Project vs. No Project)
Supply Reliability	Assuming final planning and permitting activities are successful, the project would provide a highly reliable increment of local supply for OMWD's supply portfolio.	↑
Water Quality	Product water quality would be comparable to current treated water.	→
Local Control	The project would provide an increment of supply managed by OMWD and independent of SDCWA and the challenges of imported water supplies.	↑ ↑
Environmental Sustainability	Environmental studies to date indicate the project can be developed without harming existing users or the environment. Removing salt from the basin is an environmental positive.	↑
• **Reduced Bay-Delta Reliance**	The project advances State of California objectives to reduce reliance on the Sacramento – San Joaquin Bay Delta ecosystem.	↑
• **Reduced Colorado River Reliance**	The project reduces OMWD's reliance on supplies from the Colorado River.	↑
• **Reduced Energy Footprint / GHG**	At an average power consumption of approximately 1,600 kWh/AF, the project would have a smaller energy footprint than existing supplies. (Colorado River Aqueduct: approx. 2,000 kWh/AF; State Water Project: approx. 3,000 kWh/AF, Carlsbad Desal: approx. 4,000 kWh/AF)	↑

Legend: Better: ↑ Neutral: → Worse: ↓

3. Evaluation of Cost Factors

3.1. Cost Updates: The project team has prepared an updated estimate of project capital and operating costs.

OMWD commissioned the engineering firm TetraTech to prepare an update of the project's likely construction and operation costs. The update, completed in March of 2022, reflects construction industry inflation that has occurred subsequent to OMWD's previous estimate.

The new estimate covers a range of project sizes, and indicates considerable economy of scale benefits of larger sized projects. Based on OMWD's most recent hydrogeologic investigations, the economic analysis assumes the project would be sized at approximately 1.3 million gallons per day (mgd), up from the previous assumed size of 1.0 mgd. Accounting for plant maintenance and other shutdowns, the project would produce approximately 1,300 AF/yr of new potable water supply.

The updated cost estimates are summarized in **Table 3-1**. For a project sized at 1.3 mgd, the project has a capital cost, exclusive of costs incurred to date, of approximately **$52 million**.

TABLE 3-1: Updated Project Capital and Operating Cost Summary

Project Costs Based on Current Supply Conditions	Design Production Capacity			Selected Capacity
	1.0 MGD	**2.0 MGD**	**3.0 MGD**	**1.3 MGD**
Annual Water Production (af/yr)	1,000 AF/yr	2,000 AF/yr	3,000 AF/yr	1,300 AF/yr
Capital Cost				
Capital Construction	$37,272,930	$44,725,621	$53,382,764	$39,508,737
Wells	*$3,897,618*	*$7,672,400*	*$11,692,853*	*$5,030,053*
Treatment Plant	*$14,788,399*	*$18,050,207*	*$21,087,365*	*$15,766,941*
Pipelines	*$18,586,913*	*$19,003,014*	*$20,602,546*	*$18,711,743*
Brine Line	*$13,754,316*	*$13,754,316*	*$13,754,316*	*$13,754,316*
Supply and Delivery Pipelines	*$4,832,597*	*$5,248,698*	*$6,848,230*	*$4,957,428*
Design, Administration Permitting & CM	$11,164,160	$12,940,160	$14,392,160	$11,696,960
Pre-Design / EIR Support	*$2,676,492*	*$3,248,892*	*$3,902,292*	*$2,848,212*
Final Design and Permitting	*$3,271,268*	*$3,970,868*	*$4,769,468*	*$3,481,148*
Construction Mngt. & Admin.	*$5,216,400*	*$5,720,400*	*$5,720,400*	*$5,367,600*
Property Acquisition	$593,400	$745,200	$897,000	$638,940
Total Capital Cost	**$49,030,490**	**$58,410,981**	**$68,671,924**	**$51,844,637**
O&M Costs ($/yr)				
Sewer Outfall	$56,176	$112,352	$168,529	$73,029
Power	$296,617	$569,669	$842,720	$378,532
Operations Staffing & Testing	$256,244	$322,199	$396,092	$276,031
Membrane & Filter Replacement	$39,500	$79,000	$118,500	$51,350
Chemicals	$76,215	$152,429	$239,559	$99,079
Other O&M and Replacement	$54,572	$99,222	$143,872	$67,967
Total Annual O&M Cost ($/yr)	**$779,324**	**$1,334,871**	**$1,909,273**	**$945,988**

In 2022 dollars. ENR CCI = 12,791
Costs exclusive of costs incurred to date
Costs exclusive of bond issuance costs

3.2. Methodology: Economic feasibility can be assessed in different ways. A First-Year Unit Cost assessment is a standard starting point, but does not account for the differential escalation of costs and benefits over time.

Project planners often begin an economic assessment with a First-Year Unit Cost analysis, a simplified snapshot of a project's unit costs that assumes all project costs and benefits occur in the immediate present. Such an analysis is presented for the project in **Table 3-2.** Be warned, the assessment appears to present the project in an unfavorable light, but this initial take is misleading as explained further below.

TABLE 3-2: First-Year Unit Cost Summary

Production Capacity	1.3 MGD	Discounted Production	1,300 AF/yr	Melded Cost of Funds:	3.25%	Loan Term:	30 Yrs

Cost Component	Capital Costs ($)	Amortized Capital Costs ($/yr)	O&M Costs ($/yr)	Total Equivalent Annual Costs ($/yr)	Unit cost per AF ($/AF)	% of Capital Costs	% of O&M Costs	% of Total Unit Costs
Construction (exlusive of Brine Line)	$25,800,000	$1,320,000		$1,320,000	**$1,020**	50%		**37%**
Design/Admin./Permitting	$11,700,000	$600,000		$600,000	**$460**	23%		**17%**
Property Acquisition	$600,000	$30,000		$30,000	**$20**	1%		**1%**
Brine Line / Concentrate Disposal	$13,800,000	$700,000	$70,000	$770,000	**$590**	27%	7%	**21%**
Power			$380,000	$380,000	**$290**		40%	**10%**
Operator Staffing, Testing			$280,000	$280,000	**$220**		29%	**8%**
Other O&M + Relacement			$220,000	$220,000	**$170**		23%	**6%**
Subotals (rounded)	$51,900,000	$2,650,000	$950,000	$3,600,000	**$2,770**	100%	100%	**100%**

The table presents a projected first-year unit cost of the project of approximately $2,800/AF. This compares unfavorably with the average all-in cost for purchase of raw water from SDCWA and treatment at the McCollom plant, currently approximately $1,800/AF. (The cost is comparable to the SDCWA's CY 2022 unit cost of Carlsbad Desal water of approximately $2,700/AF, but as explained previously this is not our point of comparison.) The table also provides a useful indication of how different capital and operating costs contribute to the overall project cost, most notably showing the significant cost of the project's brine line and concentrate disposal.

However, as an assessment of project economic feasibility, the First-Year Unit Cost methodology in the case of the Project falls considerably short, failing to account for the differential escalation of costs and benefits over time. For that we need to look at an extended period of Net Present Value analysis.

3.3. Net Present Value Analysis: Costs and benefits are distributed over time, and escalate at different rates. NPV analysis captures this important detail.

NPV analysis entails the scheduling of costs and benefits over time, in this case 30 years or more, and then discounting those future costs and benefits to present value, in 2022 dollars. This allows for a more complete comparison of Project and No Project costs than provided by the First-Year Unit Cost analysis.

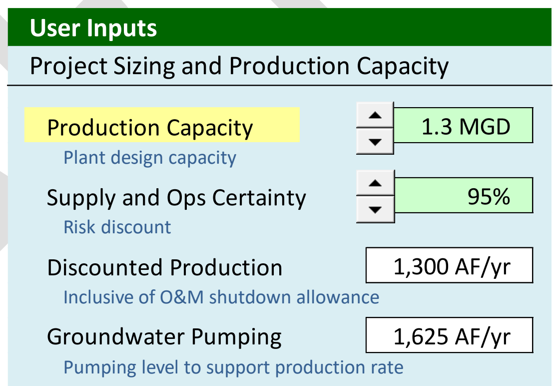
By far the largest direct cost benefit to the Project is that of avoiding purchasing 1,300 AF/yr of raw water from SDCWA over the course of 30 years or longer. Because SDCWA rates are set to escalate at rates greater than inflation for at least the next several years, the cost savings of those avoided purchases will increase. The NPV analysis accounts for this increased benefit.

On the cost side of the ledger, the Project's largest line item is the debt servicing of capital financed via 30-year bonds or other instruments. Assuming level financing, the bond payment remains fixed over time, while all other costs inflate. This means that when discounted to present value in 2022 dollars, the bond payment gradually declines over time, even while project benefits are increasing. The NPV analysis accounts for this important detail. Stay with us and we'll walk you through the inputs and results.

3.4. NPV Inputs: The NPV analysis accounts for four categories of input variables.

The results of the NPV analysis are sensitive to multiple inputs, from interest and discount rates, to SDCWA rate escalation assumptions, to grant funding assumptions, and more. These inputs are described below, with reference to the input screens from our spreadsheet economic model.

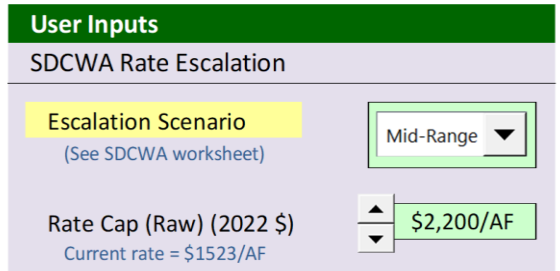
Project Sizing and Production Capacity



- Production Capacity: As noted previously, project costs exhibit very pronounced economies of scale. A project sized at 1.3 mgd is considerably more cost advantageous than one sized at 1.0 mgd, and conversely if the project could be sized even larger, at 1.6 mgd (2,000 AF/yr of groundwater pumping), the Project's advantage would be greater still. The default setting is 1.3 mgd.
- Supply and Operations Certainty: The preliminary engineering and cost assumptions assume the project will approximately 94 percent of the time, allowing for approximately three weeks per year of shutdowns for maintenance and other planned and unplanned events. The NPV analysis allows a further discount of production volume to account for potential unknowns, incorporating an additional measure of conservatism into the economic assessment. Our default setting is 95 percent.
- Discounted Production: This is an information box, not a user input to the NPV model. At the specified production capacity and adjustment factors (see above), the project would produce approximately 1,300 AF/yr of treated water.
- Grooundwater Pumping: This too is an information box, not a user input to the NPV model. At the specified inputs, the project would require a groundwater supply of approximately 1,625 AF/yr. This level of pumping is supported by OMWD's latest hydrogeologic investigations.

SDCWA Rate Escalation

- Escalation Scenario: The model allows selection of SDCWA rate escalation at Low, Mid-Range, and High scenarios. SDCWA's new Long-Range Finance Plan, adopted in November 2021, projects rate increases through CY2031 for Low, Mid-Range, and High scenarios. The Low and High scenarios are presented in SDCWA's graphic below; the Mid-Range scenario is the mid-point between these.



"All-In" Rate Adjustments

	CY '23	CY '24	CY '25	CY '26	CY '27	CY '28	CY '29	CY '30	CY '31	10 Yr CAGR
2D - High	11.3%	9.7%	10.3%	7.5%	6.4%	5.2%	4.8%	4.4%	4.4%	7.07%
2D - Low	5.9%	3.7%	5.3%	4.5%	3.0%	3.5%	2.6%	2.7%	4.1%	3.91%

The NPV model uses the SDCWA projections through CY2031, and subsequently assumes only a modest increase over and above the prevailing rate of water system inflation. The escalation inputs for the three scenarios are listed in **Table 3-3**. The default setting used in the NPV model is Mid-Range.

TABLE 3-3: SDCWA Rate Escalation Assumptions

Scenario	Annual Escalation Rate	
	Initial (through CY31)	**Subsequent** (above inflation)
High	7.1%	1.0%
Mid-Range	5.5%	0.5%
Low	3.9%	0.0%

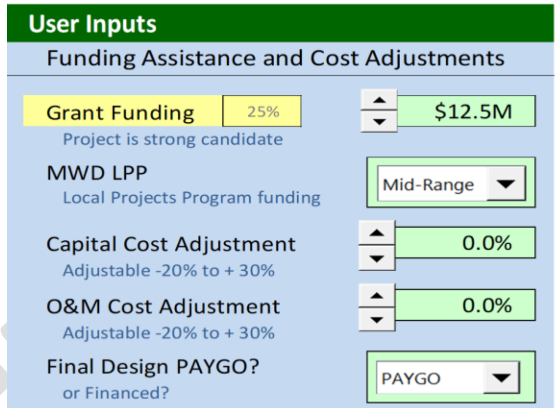
- Rate Cap: The NPV also incorporates an upper limit to SDCWA rate escalation in the form of a rate cap. The rate cap is set in current 2022 dollars, and escalates at the specified rate of water system inflation. The default setting used in the NPV model is $2,200/AF.

  As SDCWA rates continue to increase relative to inflation, member agencies will have additional economic incentive to develop new increments of local water supply, reducing SDCWA demands. At some point SDCWA will have to limit increases to its variable rate by moving some of its cost recovery to unavoidable fixed charges. For the default Mid-Range conditions shown, SDCWA treated All-In rates would escalate **in constant 2022 dollar terms** to approximately $2,700/AF in 2040 and $3,100/AF in 2050. We do not know exactly where the upper limit of variable rates lies, but we judge the projected rates for 2040 are at or approaching the limit. Even though the total All-In SDCWA rate will likely increase beyond these projections, the variable component of those rates -- the amount OMWD would offset through continued access to its local water supply -- would need to be moderated through the implementation by SDCWA of unavoidable fixed charges.

At default settings, the cap has no effect on the Low scenario, and kicks modestly into play for the Mid-Range scenario. The cap has a significant limiting effect on the High scenario.

Project Funding Assistance

- Grant Funding: OMWD assesses the project to be very well positioned to receive substantial grand funding assistance, and that a reasonable mid-range assumption is the project will receive funding equal to 25 percent of project capital costs. Probable sources of grant funding include the U.S. Bureau of Reclamation Title XVI program. The default input to the NPV model is for $12.5 million, which is 25 percent of project capital costs when sized at 1.3 mgd.



- MWD Local Resources Program (LRP):
  The Metropolitan Water District of Southern California (MWD) provides funding assistance for local project development through its LRP. Projects are eligible for LRP funding to the extent they need assistance to remain cost competitive with benchmark rates established by MWD. Under the current terms of the LRP, the project would be eligible for annual funding assistance at the level of $340/AF and lasting for 25 years.

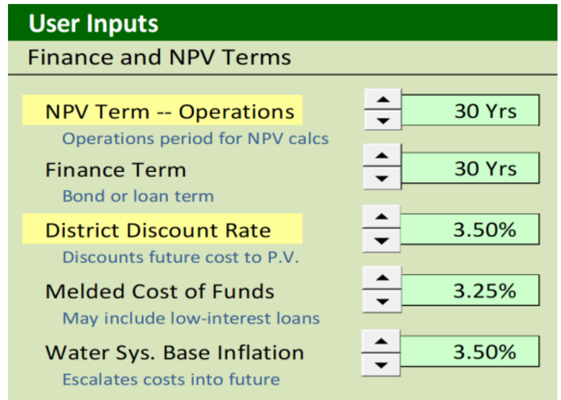
  The NPV model allows LRP funding to be set at three levels: Full, being the funding level described above; Mid-Range, in which the funding about is reduced by half; and None. The default setting used in the NPV model is Mid-Range. This reflects a level of conservatism regarding the ability of MWD to continue funding the LRP given ongoing budget challenges.

- Capital Cost Adjustment: The model allows the capital cost to be adjusted upwards or downwards on a percentage basis. The default setting is no adjustment (0.00%).

- O&M Cost Adjustment: The model allows the annual operations and maintenance costs to be adjusted upwards or downwards on a percentage basis. The default setting is no adjustment (0.00%).

- Final Design PAYGO: The model allows the user to fund the costs for final design of the project as PAYGO or financed. The default setting is PAYGO.

Finance and NPV Terms



- NPV Term: The NPV term by default is set at 30 years of project operations, and is adjustable by the user. Accounting for perhaps six years for project permitting, design, and construction, the total period of the NPV analysis is actually 36 years, beginning FY2023 and continuing through the end of FY2058.

  The use of a 30 year operations term for NPV analysis is common but not etched in stone. The cost estimates for project O&M include sufficient budget for repair and replacement to keep the treatment plant and other project components in good working order well past 30 years. With capital debt then retired, the annual NPV benefits of the project increase, and every year beyond 30 accumulates substantial additional NPV benefit to the project.

- Finance Term: The term of an OMWD bond issue is set by default at 30 years and is adjustable by the user. Adjusting the term has little effect on the NPV comparison of Project vs. No Project costs.

- Discount, Interest, and Inflation Rates: These three inputs are linked, in that the discount and interest (Melded Cost of Funds) rates move up and down in anticipation of inflation.

  - Discount Rate: A capital project involves the upfront investment of funds in the expectation of returns later on. Upfront costs are relatively certain, whereas future benefits are subject to the unknowns of the future. To account for this uncertainty, we discount future benefits at a Discount Rate, as set in the User Inputs. A lower Discount rate reflects optimism about the future and a willingness to "Pay It Forward," whereas a higher Discount rate reflects lower confidence in the future benefits and a desire for a shorter return-on-investment period.

    The Discount Rate is also analogous to the OMWD minimum acceptable Rate of Return on invested capital. If the NPV analysis reports a cost advantage for the project, this means OMWD would be meeting its minimum rate of return, with a bonus benefit on top of that.

  - Melded Cost of Funds: This is the anticipated interest rate of an OMWD borrowing used to fund the capital portion of the project, a mix of an OMWD bond issue and low-interest loans through the State Revolving Fund or the Federal WIFIA program.

  - Water System Base Inflation: This is the anticipated rate of cost escalation for water system capital projects and project operations.

3.5. Results 1: Using reasonable mid-range input assumptions, the project produces approximately $18M in NPV cost advantage in comparison to the No Project Alternative.

Using the inputs described in the previous subsection, the project has a significant NPV cost advantage in comparison to the No Project alternative. The results are summarized in **Table 3-4**.

TABLE 3-4: NPV Cost Summary – Project vs. No Project

(1.3 MGD Plant producing 1,300 AF/yr of treated water)

Net Present Value Analysis, in 2022 Dollars

NPV Cost Summary -- Project vs. No Project

PROJECT		NO PROJECT	
Cost Component	**NPV**	**Cost Component**	**NPV**
Capital Cost	$51M	SDCWA Purchases (raw water)	$78M
Grant Funding	-$13M	Incremental Treatment Costs	$4M
O&M Cost	$28M		
LPP Funding	-$3M		
TOTAL (Rounded)	**$64M**	**TOTAL** (Rounded)	**$81M**

Project Cost Advantage = $18M

A note about those incremental treatment costs:

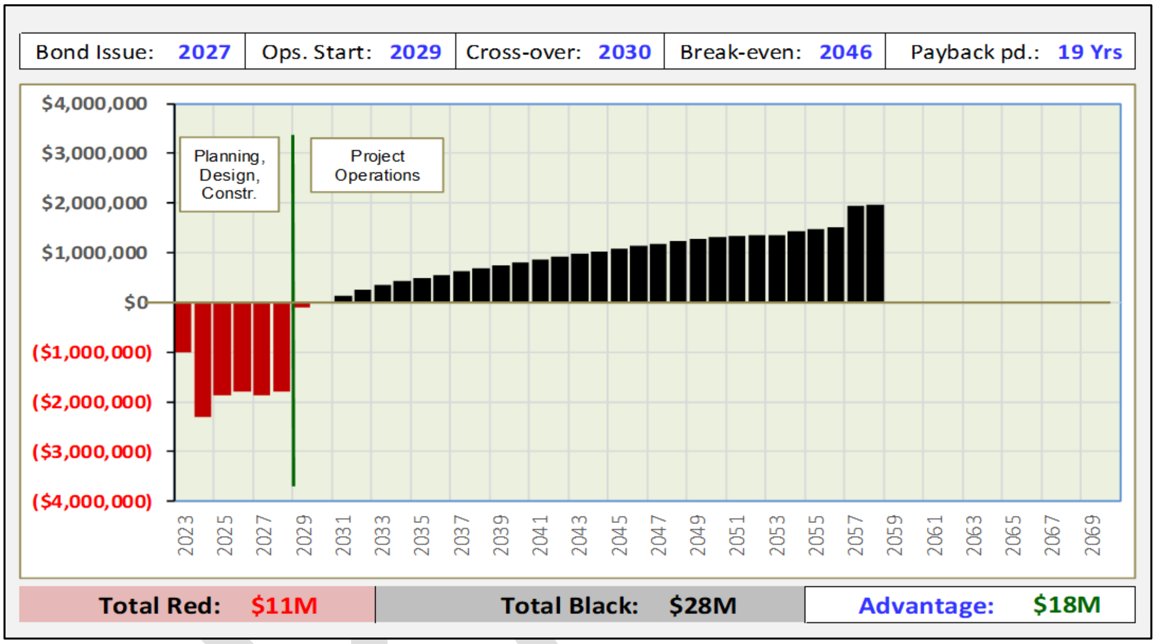
Costs for the No Project alternative arise primarily from the purchase of 1,300 AF/yr of raw water from SDCWA, at escalating prices. The No Project alternative also incurs a modest cost to treat the purchased water at OMWD's McCollom plant. The unit cost applied to this calculation is for only the Variable component of plant costs, covering power, chemicals, and other lesser variable cost components, and excluding debt servicing, most labor, and other fixed cost line items. For FY2022, the variable cost of the plant as estimated by OMWD is approximately $90/AF.

Under the Project alternative, OMWD incurs all the costs for the project, but avoids the costs of the No Project Alternative. At the McCollom plant, OMWD would be treating less water and thereby be incurring lower costs, but with the savings being only for the Variable components of plant costs. The plant would continue to incur the same level of Fixed costs, and these will now be spread out across a smaller production volume, increasing the AVERAGE unit cost ($/AF) of plant operations. It is true then that unit costs per acre-foot would increase, but total costs decrease, and it is total costs that go into the budget.

3.6. Results 2: Costs and benefits are distributed differently over time. Understanding the annual cash flow picture is instructive.

The same NPV results presented in Table 3-4 are presented below in **Figure 3-1**, but now in the form of red/black annual cashflow differential chart. Using the No Project alternative as the baseline of comparison, the figure displays the net annual cost or benefit of the Project alternative in 2022 dollars.

FIGURE 3-1: Annual Cashflow Differential – Project vs. No Project



Costs for Total Red, Total Black, and Advantage are rounded and may not sum precisely.

The notes below describe the different areas of the figure:

- Red Bars: These are the additional costs OMWD would incur over the next four years to permit and design the project, plus payment of capital debt service during two years of project construction and ahead of the plant becoming operational. These costs are at risk, although the risk diminishes as the project advances and certainty of success increases.
- Black Bars: These are the NPV of benefits in excess of costs. The bars jump up the last two years of the 30-year NPV term because the debt service ends two years prior, having begun two years prior to the beginning of operations.
- Total Red / Total Black / Project Advantage: These indicate the cumulative total of the red and black bars, and the resulting NPV advantage of the Project in Comparison to the No Project alternative. As previously noted, capital projects entail the investment of ratepayer funds in anticipation of future benefits. The red bars and black bars together demonstrate how that plays out over time.
- Upper Bar Dates: The upper bar above the graph displays key dates in the NPV analysis. The Crossover date is the year when the annual cost difference of the Project vs. No Project alternative first moves from red to black. The Breakeven date is the year in which

all of the upfront red bar costs have been offset, in present value, by the accumulation of black bars.

Lastly, the Payback Period indicates the number of years between the issuance of bonds and the Breakeven point. If the discount rate used in the analysis accurately reflects OMWD's time preference for money, or in effect its minimum required rate of return on investments, then if it has achieved that return by the end of the payback period, and all of the annual black bar benefits subsequent to that are icing on the cake.

3.7. Results 3: Sensitivity analysis indicates the project retains its NPV cost advantage even if key individual inputs are adjusted to pessimistic levels.

We will report further on sensitivity testing at the March 30 board workshop.

4. Findings and Recommendations

4.1. Findings: The Project provides the opportunity for both cost and non-cost advantage in comparison to the No Project alternative.

As an independent source of new local water supply, the Project provides OMWD with the non-cost advantages of supply reliability, local control, and environmental sustainability. And with reasonable assumptions as to SDCWA rate escalation, grant funding availability, and other inputs, the Project appears capable of providing significant cost advantage as well when compared with the status quo of the No Project alternative.

4.2. Recommendations: The potential project advantages warrant continued investment by OMWD in project development.

The project requires additional planning and development work to confirm the certainty of the groundwater as a source of supply to the project over 30 years or longer, to assess the potential for project sizing in excess of the 1.3 mgd presented in this analysis, and to fine-tune other aspects of the project design. OMWD staff will report on a proposed workplan for consideration as part of the FY2023 budget review process.

Attachment 6

Olivenhain Municipal Water District

Independent Opinion of Probable Construction and Operation & Maintenance Cost for the San Dieguito Valley Brackish Groundwater Desalination Project

TETRA TECH

March 21, 2022

Independent Opinion of Probable Construction and Operation & Maintenance Cost for the San Dieguito Valley Brackish Groundwater Desalination Project

March 21, 2022

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ACRONYMS/ABBREVIATIONS

Acronym or Abbreviation	Definition
AFY	Acre-foot per year
AWWA	American Water Works Association
CEQA	California Environmental Quality Act
DDW	Division of Drinking Water
EA	Each
ft	foot
FRP	Fiberglass Reinforced Plastic
gpd	Gallons per day
gph	Gallons per hour
gpm	Gallons per minute
HP	Horsepower
KW	kilowatt
lbs/day	Pounds per day
LS	Lump sum
MCC	Motor Control Center
MGD	Million Gallons per day
MCL	Maximum Contaminant Level
PLC	Programmable Logic Controller
PSI	Pounds per square inch
PVC	Polyvinyl Chloride
µg/L	Micrograms per liter
mg/L	milligrams per liter
ppm	Parts per million
sf	Square feet
TDH	Total Dynamic Head
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
VFD	Variable Frequency Drives

EXECUTIVE SUMMARY

E.1 PROJECT BACKGROUND

OMWD contracted with Tetra Tech to prepare an independent opinion of probable construction cost for the San Dieguito Valley Brackish Groundwater Desalination Project. The project is planned to be a 1.0 MGD potable water supply from the groundwater basin.

OMWD requested that the costs be broken down into the following categories:

- Construction
- Design, Administration, Permitting and CM
- Property Acquisition (2017 estimate provided by OMWD)
- Sewer/Outfall Capacity and Use (2017 estimate provided by OMWD)
- Power
- Operator Staffing, Testing
- Other O&M and Replacement
- Chemicals

E.2 PROJECT APPROACH

Tetra Tech approached the project by first reviewing the available reports and other data available on the project. Once this initial review was completed a kickoff meeting was held with the District to review a list of desired information and to answer questions on the project. Once this meeting was held the Tetra Tech proceeded with reviewing the project design, developing equipment and materials quotes. A proposed Brackish Water Treatment Plant layout was developed including a site plan, building layouts and a process flow diagram. These were used to prepare a bottoms up independent estimate for the project.

OMWD also requested that an estimate be prepared for an optional 2.0 MGD and 3.0 MGD project. This estimate was prepared using the 1 MGD estimate and determining what additional facilities would be required to construct a functioning treatment plant at 2.0 MGD and 3.0 MGD. Operations and Maintenance costs were then prepared for all three options.

E.3 COST OF WATER

The baseline for all costs on the project is March 2022 when the estimates, materials and vendor quotes were completed. Since the projects will not be started until October 2026 and will have a 2 year construction window, we need to add 5 years of escalation into the overall project costs. The current supply chain issues in the construction industry are significantly increasing construction costs. These supply chain issues were estimated to increase costs of materials / equipment by approximately 30% in the first year and 5% per year to the midpoint of construction. Labor and equipment costs are estimated to increase at 5% per year. The summary of the costs for this current supply change are estimated in Table E-1. OMWD requested that that an alternative analysis be performed assume a normal, non-supply chain situation. This estimate is included in Table E-2.

All our operating costs and our annual acre feet of production are based on an operating factor of 94%. This means that we assume that the Brackish Plant will not be producing product water approximately 6% (22 days) per year. This accounts for membrane cleaning, well rehabilitation, power failures, communication loss, equipment failures and any potential issues with groundwater supply.

Table E-1 Project Costs Based on Current Supply Conditions

	Base Project 1.0 MGD	Expansion to 2.0 MGD	Expansion to 3.0 MGD
Annual Water Production (af/yr)	**1,052**	**2,105**	**3,157**
Capital Cost[1]			
Capital Construction	$34,108,912	$42,125,715	$50,531,380
Design, Administration Permitting & CM	$9164,160	$10,940,160	$12,392,160
Property Acquisition	$593,400	$745,200	$897,000
Total Capital Cost	**$43,866,472**	**$53,811,075**	**$63,820,540**
Amortized Capital Cost, 3.5% for 30 years ($/yr)	**$2,385,078**	**$2,925,780**	**$3,470,008**
O&M Costs ($/yr)			
Sewer Outfall	$59,133	$118,266	$177,399
Power	$321,133	$618,516	$915,899
Operations Staffing & Testing	$258,253	$324,725	$399,197
Chemicals	$76,812	$153,624	$241,437
Other O&M and Replacement	$224,126	$360,379	$507,397
Total Annual O&M Cost ($/yr)	**$939,457**	**$1,575,510**	**$2,241,329**
Total Annual Cost ($/yr)	**$3,224,535**	**$4,501,290**	**$5,711,336**
Unit Capital Cost ($/af)	$2,267	$1,390	$1,099
Unit O&M Cost ($/af)	$893	$749	$710
Total Unit Cost ($/af)	**$3,159**	**$2,139**	**$1,809**

[1] March 2022 ENR CCI = 12,791

Table E-2 Project Costs Based on Normal Supply Conditions

	Base Project 1.0 MGD	Expansion to 2.0 MGD	Expansion to 3.0 MGD
Annual Water Production (af/yr)	**1052**	**2,105**	**3,157**
Capital Cost[1]			
Capital Construction	$30,824,594	$38,087,325	$45,677,251
Design, Administration Permitting & CM	$9164,160	$10,940,160	$12,392,160
Property Acquisition	$593,400	$745,200	$897,000
Total Capital Cost	**$40,582,154**	**$49,772,685**	**$58,966,411**
Amortized Capital Cost, 3.5% for 30 years ($/yr)	**$2,206,506**	**$2,706,207**	**$3,206,082**
O&M Costs ($/yr)			
Sewer Outfall	$59,133	$118,266	$177,399
Power	$321,133	$618,516	$915,899
Operations Staffing & Testing	$258,253	$324,725	$399,197
Chemicals	$76,812	$153,624	$241,437
Other O&M and Replacement	$224,126	$360,379	$507,397
Total Annual O&M Cost ($/yr)	**$939,457**	**$1,575,510**	**$2,2,241,329**
Total Annual Cost ($/yr)	**$3,145,963**	**$4,281,717**	**$5,447,411**
Unit Capital Cost ($/af)	$2,097	$1,286	$1,016
Unit O&M Cost ($/af)	$893	$749	$710
Total Unit Cost ($/af)	**$2,990**	**$2,035**	**$1,726**

[1] March 2022 ENR CCI = 12,791

As shown on Tables E-1 and E-2 the cost estimated for the 1.0 MGD Plant are significantly higher than the current cost of imported water from SDCWA. However, the costs of the 2.0 MGD and 3.0 MGD Plants are within the current SDCWA. Section 3 outlines some of the potential savings that could lower these costs.

1. DESIGN ASSUMPTIONS

Preliminary equipment sizing was prepared and is shown in the sections below based on our review of the two Geosciences Reports provided.

1.1 GROUNDWATER WELLS

The system is designed to treat well water with a composition listed in Table 1-1.

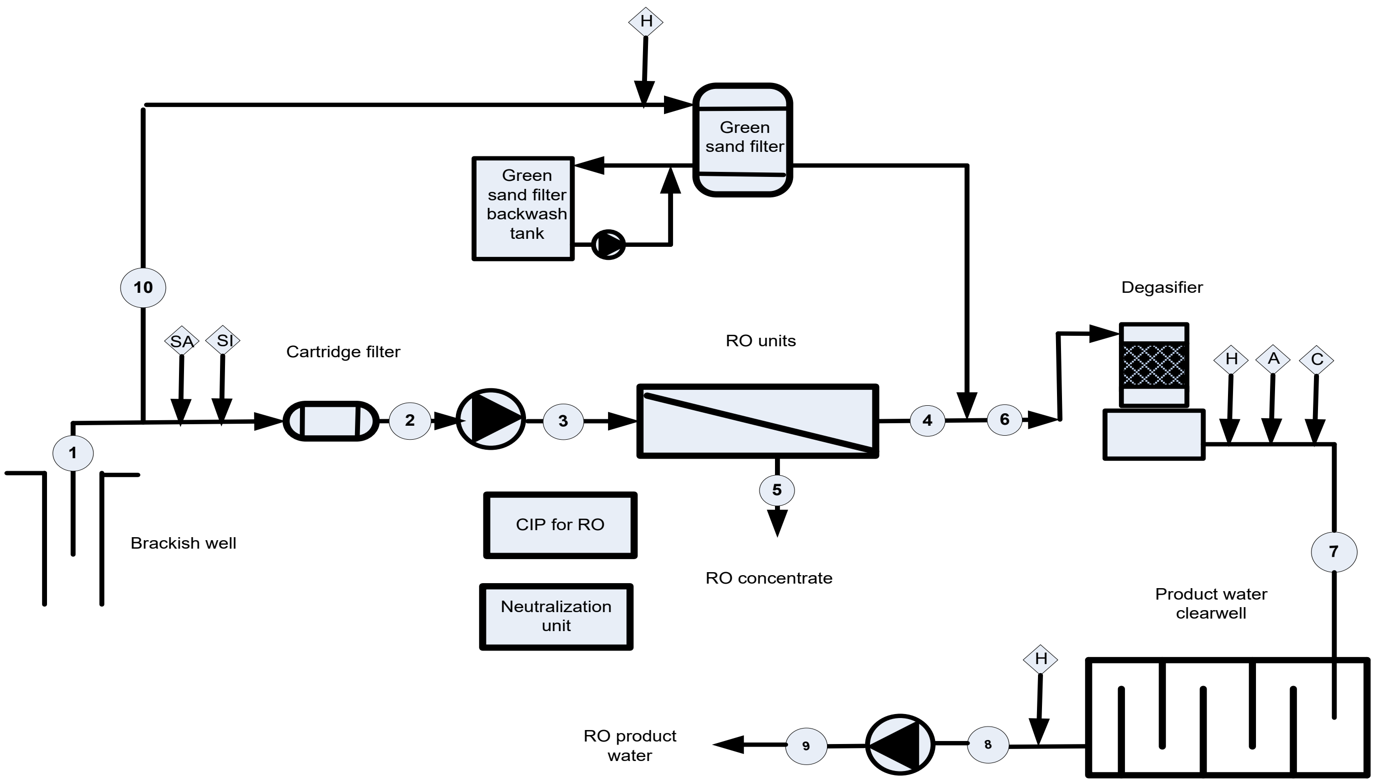
Table 1-1 Well Water Composition

Ca, ppm	400
Mg, ppm	100
Na, ppm	730
K, ppm	39
Ba, ppm	0.13
Sr, ppm	0.48
CO3, ppm	1.54
HCO3, , ppm	561
SO4, ppm	730
Cl, ppm	1300
F, ppm	0.27
NO3, ppm	0
PO4, ppm	0
SiO2	31
Fe, ppm	0.63
Mn, ppm	1.1
TDS, ppm	3895.2
pH	7.8
Temp, C	20.5
CO2 calculated, ppm	14.4

The well water is in a medium range of salinity with reported high concentration of Iron (0.63 ppm) and manganese (1.1 ppm). The well is most likely anaerobic, as documented by reported presence of slight smell of hydrogen sulfide.

1.2 TREATMENT PROCESS, PRODUCT WATER SALINITY TARGET < 700 PPM TDS

An effective treatment process for anaerobic well water with presence of iron and manganese is to pump well water directly to the RO system, without exposing well water to atmospheric oxygen. At the reported well water salinity level, it is beneficial to blend RO permeate water with a fraction of well water. Before blending, well water will pass a green sand filter to remove iron and manganese. Blending allows reduction of RO system size and provides reduction of post treatment chemicals. Schematic flow diagram of the treatment process is provided on Figure 1.



Process location	1	2	3	4	5	6	7	8	9	10
Flows, 1 MGD capacity, gpm	844	750	750	600	150	694	694	694	694	94
Flows, 2 MGD capacity, gpm	1688	1500	1500	1200	300	1388	1388	1388	1388	188
Flows, 3 MGD capacity, gpm	2532	2250	2250	1800	450	2082	2082	2082	2082	282
Pressures, psi	30	15	180	15	30	15	3	3	150	30

SA – Sulfuric acid

SI – Scale inhibitor

H - Hypochlorite

A - Ammonia

C - Caustic

Figure 1 Process Flow Diagram

As shown on Figure 1, the RO process consists of direct pumping of well water to the cartridge filter and to the suction of the high pressure pump. Upstream of cartridge filter, acid and scale inhibitor are added to RO feed water.

The RO membrane unit will operate at recovery rate of 80%. This design for a conservative recovery rate is due to relatively high concentration of silica in the well water. At the outlet of the RO membrane trains, the RO permeate water is combined with the blending stream of well water that passed the green sand filter.

The objective of the green sand filter is to remove iron and manganese. The green sand is being regenerated with solution of hypochlorite. The estimated dosing rate of hypochlorite will be about 4 ppm. The iron and manganese, collected in the green sand filter, is removed during backwash with filtrated water. Backwash of green sand filters will be required every 8 – 24 hours.

The blended product water stream then passes the decarbonator to remove excess CO2. At the outlet of the decarbonator, sodium hydroxide is added to the product water to bring the Langelier Saturation Index to value of positive ~ 0.3. Prior to entry to the product water clear well, ammonia and hypochlorite solution are added to the product water to create chloramines.

The salinity of the final product water will be in the range of 500 – 700 ppm.

Major equipment sizing for alternative 1 is provided in Table 1-2.

The equipment is sized for a base design of product water capacity of 1.0 MGD and two alternatives of expanding system capacity to achieve production capacities of 2.0 and 3.0 MGD. For each expansion alternative, the equipment listed is the additional equipment required to achieve the target product water capacity starting from the initial 1 mgd product water capacity. Each membrane train will be equipped with energy recovery device (Turbocharger) in an interstage position. The energy recovery device boosts the pressure to the feed to the second membrane stage. This will result in some energy saving and better equalization of permeate fluxes between the stages.

Table 1-2 Major Equipment Sizing, Target Product Water Salinity < 700 ppm TDS

	1 MGD	2 MGD	3 MGD
Product water capacity, gpm	694	694	1388
Well water flow, gpm	844	844	1688
RO permeate flow, gpm	600	600	1200
Well water blending flow, gpm	94	94	188
RO system recovery rate, %	80%	80%	80%
RO feed flow, gpm	750	750	1500
Green sand tanks no	1	1	1
Green sand tank diameter, feet	5	5	7
Number of cartridge filter housings	1	1	1
Number of 10" equivalent cartridges	214	214	429
Number of RO units	1	1	1
RO unit array, st	2	2	2

	1 MGD	2 MGD	3 MGD
No of pressure vessels, st 1	14	14	28
No of pressure vessels, st 2	6	6	12
No of elements per vessel	7	7	7
Total number of membrane elements	140	140	280
Number of HP pumps	1	1	1
HP pumps flow rate, gpm	750	750	1500
HP pump suction pressure, psi	15	15	15
HP pump discharge pressure, psi	180	180	180
Number of interstage boosters (ERD)	1	1	2
ERD turbine flow rate, gpm	282	282	564
ERD pump flow, rate, gpm	150	150	300
ERD pump outlet pressure, psi	138	138	138
ERD pump inlet pressure, psi	30	30	30
Number of decarbonators	1	1	1
Decarbonator flow rate, gpm	694	694	1388
Decarbonator diameter, ft	6	6	9
RO power usage			
HP pump differential head, ft	381	381	381
HP pump efficiency	85%	85%	85%
Electric motor efficiency	92%	92%	92%
VFD efficiency	97%	97%	97%
HP pump electric motor power, hp	95	95	190

1.3 TREATMENT PROCESS, PRODUCT WATER SALINITY TARGET < 500 PPM TDS

The treatment process for lower target salinity of 500 ppm TDS will be the same as for the higher limit of product water salinity, as shown on Figure 1. Major equipment sizing for alternative 2 is listed in Table 1-3.

The major difference is somewhat higher permeate capacity of the RO unit and lower blending ratio with well water. Larger capacity of RO system will results in somewhat increased energy usage and pretreatment chemicals. The green sand filters will be smaller due to lower flow rate of blending flow.

Table 1-3 Major Equipment Sizing, Target Product Water Salinity < 500 ppm TDS

	1 MGD	2 MGD	3 MGD
Product water capacity, gpm	694	694	1388
Well water flow, gpm	852.5	852.5	1705
RO permeate flow, gpm	634	634	1268
Well water blending flow, gpm	60	60	120
RO system recovery rate, %	80%	80%	80%
RO feed flow, gpm	792.5	792.5	1585
Green sand tanks no	1	1	1
Green sand tank diameter, feet	4	4	6
Number of cartridge filter housings	1	2	2
Number of 10" equivalent cartridges	214	428	642
Number of RO units	1	2	2
RO unit array, st	2	2	2
No of pressure vessels, st 1	15	15	30
No of pressure vessels, st 2	6	6	12
No of elements per vessel	7	7	7
Total number of membrane elements	140	280	420
Number of HP pumps	1	1	1
HP pumps flow rate, gpm	792.5	792.5	1585
HP pump suction pressure, psi	15	15	15
HP pump discharge pressure, psi	180	180	180
Number of interstage boosters (ERD)	1	1	2
ERD turbine flow rate, gpm	289	289	578
ERD pump flow, rate, gpm	158	158	316
ERD pump outlet pressure, psi	138	138	138
ERD pump inlet pressure, psi	30	30	30
Number of decarbonators	1	1	1
Decarbonator flow rate, gpm	694	694	1388
Decarbonator diameter, ft	6	6	9

	1 MGD	2 MGD	3 MGD
RO power usage			
HP pump differential head, ft	381	381	381
HP pump efficiency	85%	85%	85%
Electric motor efficiency	92%	92%	92%
VFD efficiency	97%	97%	97%
HP pump electric motor power, hp	101	101	201

The cost differences between treating to <500 TDS instead of <700 TDS is not significant, so we have proceeded to perform our Opinion of cost based on the <500 TDS product water option.

2. COST ESTIMATES

Tetra Tech met with OMWD to discuss the approach to the Capital and O&M cost estimating. The following sections provide a breakdown of the costs based on the categories requested by OMWD.

2.1 CONSTRUCTION

Cost for construction were based on vendor quotes and published data on local labor, equipment, and materials. A proposed site plan, equipment layouts and building layouts were also prepared to allow quantities to be prepared. The following factors were also included:

- Taxes on materials 7.75%
- General Conditions 5.0%
- Overhead & Profit 15%
- Contingency 20%
- Material Escalation for Current Supply Condition 30% for first year, 5% for following years
- Material Escalation for Normal Supply Condition Materials 5% per year and Construction 5% per year

Table 2-1 contains a summary of the construction costs from the estimate contained in Appendix A.

Table 2-1 Construction Cost Estimate Current Supply Chain

Construction Package	1.0 MGD	2.0 MGD	3.0 MGD
Brackish Plant	$14,163,427	$17,165,055	$20,297,513
Groundwater Wells	$3,897,618	$7,795,235	$11,692,853
Brackish Disposal Pipeline & Pump Station	$11,473,375	$11,997,580	$12,521,785
Groundwater and Product Water Pipelines	$4,574,493	$5,167,846	$6,019,230
Totals	**$34,108,912**	**$42,125,715**	**$50,531,380**

Table 2-2 contains a summary of the construction costs from the estimate contained in Appendix A.

Table 2-2 Construction Cost Estimate Normal Supply Chain

Construction Package	1.0 MGD	2.0 MGD	3.0 MGD
Brackish Plant	$12,858,527	$15,519,137	$18,286,812
Groundwater Wells	$3,629,320	$7,258,640	$10,887,960
Brackish Disposal Pipeline & Pump Station	$10,290,523	$10,745,771	$11,201,020
Groundwater and Product Water Pipelines	$4,046,225	$4,563,776	$5,301,459
Totals	**$30,824,594**	**$38,087,325**	**$45,677,251**

2.2 DESIGN, ADMINISTRATION, PERMITTING & CM

The costs for design, administration, permitting, and CM were prepared using Tetra Tech costs for previously completed projects. Table 2-3 provides a summary of the costs.

Table 2-3 Design, Administration, Permitting & CM Costs

Item	1.0 MGD	2.0 MGD	3.0 MGD
Design	$3,750,000	$4,810,000	$5,770,000
CM	$2,782,800	$3,202,800	$3,452,800
Administration	$1,014,000	$1,014,000	$1,014,000
Permitting	$540,000	$540,000	$540,000
Contingency 20%	$1,617,360	$1,913,360	$2,155,360
Totals	**$9,164,160**	**$10,940,160**	**$12,392,160**

2.3 PROPERTY ACQUISITION

The costs for property acquisition were based on $690,000 cost per acre of land that was supplied by OMWD. The Brackish Water Plant had a total acreage of 0.64 and we assume an acreage of 0.11 for each well site. Table 2-4 provides a summary of the costs.

Table 2-4 Property Acquisition Costs

Item	1.0 MGD	2.0 MGD	3.0 MGD
Brackish Plant (0.64 acre)	$441,600	$441,600	$441,600
Well Sites (0.11 acre)	$151,800	$303,600	$455,400
Totals	**$593,400**	**$745,200**	**$897,000**

2.4 SEWER OUTFALL COSTS

Sewer Outfall costs were based on were based on $0.0008 cost per gallon of disposal was supplied by OMWD. The flow was based on Figure 1 Process Flow Diagram Table. Table 2-5 provides a summary of the costs.

Table 2-5 Sewer Outfall Costs

Item	1.0 MGD	2.0 MGD	3.0 MGD
Sewer Outfall Cost	$59,133	$118,266	$177,399

2.5 POWER COSTS

Power costs were calculated based on the flow and head of each pump used in the system. A miscellaneous load was also added for items such as blowers, HVAC, lighting, and control systems. A power cost of $019 was provided by OMWD. Table 2-6 provides a summary of the costs.

Table 2-6 Power Costs

Item	1.0 MGD	2.0 MGD	3.0 MGD
Power Cost	$321,133	$618,516	$915,899

2.6 OPERATIONS STAFFING AND TESTING

Costs for operations staffing were developed based on experience with other similar brackish water plants. Hourly rates and overhead for each staff member were provided by OMWD. The costs of testing were based on experience at similar plants. Table 2-7 provides a summary of the costs.

Table 2-7 Operations Staffing & Testing Costs

Item	1.0 MGD	2.0 MGD	3.0 MGD
Average Hours per Week	38	48	58
Labor Costs	$210,252	$264,725	$319,197
Testing & Reporting	$48,000	$60,000	$80,000
Total Costs	**$258,253**	**$324,725**	**$399,197**

2.7 OTHER O&M AND REPLACEMENT

Other O&M and replacement costs consist of Membrane & filter replacements, chemicals, replacement parts and well rehabilitation and repair. These costs were calculated using data from previous similar projects.

The replacement costs for membranes and filters are based on the typical replacement schedule. We calculate the annual cost by dividing the material costs by the estimated life assuming that money will be budgeted each year and held in a replacement account so that when it is time for replacement the money is available. We used the following replacement life for membranes and filters:

- Reverse Osmosis Membranes – 3 Years
- Cartridge Filters – 6 months
- Green Sand Media – 10 years

The chemical costs are based on our calculations of flow and dosage for each chemical as called for in out design section. Major equipment replacement costs are calculated based on the current equipment cost divided by the estimated life of the equipment. We used the following replacement life for equipment:

- Pumps & Motors – 20 years
- Chemical Tanks – 20 years
- Chemical Pumps – 10 years
- Steel Tanks – 30 years
- Electrical Equipment – 20 years
- PLC, SCADA & Solar Equipment – 10 years

We have assumed that since these are shallow wells in a brackish environment with high iron and manganese that well cleaning and rehabilitation would be required every 3 years. Maintenance and spare parts were estimated based on estimates from similar projects.

Our assumption is that each year the estimated annual costs will be used as needed and the remainder will be set aside for future major replacements so that at the end of the 30 year operating period OMWD has a plant that is still operating successfully and a fund available so that it can continue to be operated past the 30 year period.

Table 2-8 provides a summary of the costs.

Table 2-8 Other O&M and Replacement Costs

Item	1.0 MGD	2.0 MGD	3.0 MGD
Membrane & Filter Replacements	$40,235	$80,469	$120,704
Major Equipment Replacement	$98,891	$119,910	$151,693
Well Rehabilitation	$50,000	$100,000	$150,000
Maintenance & Parts	$35,000	$60,000	$85,000
Total Costs	**$224,126**	**$360,379**	**$507,397**

3. PROJECT ADDITIONS AND POTENTIAL SAVINGS

3.1 ADDITIONS TO THE PROJECT

OMWD requested that costs be provided for adding equipment to the project should an unknown contaminate be found in the water that would require treatment with GAC and UVAOP system. Since the watershed does have several WWTPs that use secondary effluent disposal ponds the likely future contaminants could include NDMA, 1,4-Dioxane, and possibly PFAS or VOCs. Table 3-1 includes the costs based on similar sized UVAOP and GAC projects.

Table 3-1 Estimated Cost of Water for GAC and UVAOP Treatment

	1.0 MGD	2.0 MGD	3.0 MGD
Capital Cost			
Capital Construction[1]	$2,200,000	$4,400,000	6,600,000
Design Engineering	$220,000	$440,000	$660,000
Construction Management	$180,000	$350,000	$880,000
Total Capital Cost	**$2,600,000**	**$5,190,000**	**$8,140,000**
O&M Cost ($/AF)			
Power	$30	$49	$61
Chemicals	$24	$38	$48
Labor	$20	$37	$23
Maintenance	$12	$17	$11
Analytical Testing	$4	$4	$4
GAC Media Replacement	$12	$16	$23
Total Annual O&M Cost ($/AF)	**$102**	**$161**	**$170**

[1] March 2022 ENR CCI = 12,791

3.2 POTENTIAL SAVINGS

The base project to provide 1.0 MGD of potable water to the distribution system is currently estimated to be significantly higher than the current SDCWA rates for treated water. The following are some considerations to reduce the project costs:

- The current estimated costs do not include any grant funding. OMWD may want to firm up grant funding and/or low interest loans to reduce the project costs
- The estimated costs for the 2.0 MGD and 3.0 MGD are within the range of the SDCWA current rates. OMWD may want to consider moving to a larger sized project.

- The brine disposal is currently a significant cost to the project. The feasibility study stated that City of San Diego may not accept high TDS brine flows in their sewer because of their proposed Pure Water Project. It may be good idea to reconsider this option since the very small amount of brine from OMWD may not significantly affect a project the size of the City of San Diego's.
- Consider accelerating the project schedule to minimize the escalation charges. Additional grant and low interest funds may be more readily available.

Appendix A. Summary of Construction & O&M Costs

TETRA TECH

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
ESTIMATED COST OF WATER ($ per Acre-Ft) Current Supply Chain Issues

	1 MGD	2 MGD	3 MGD
Annual Water Production (af/yr)	**1,052**	**2,105**	**3,157**
Capital Cost			
Capital Construction	$34,108,912	$42,125,715	$50,531,380
Design, Administration, Permitting & CM	$9,164,160	$10,940,160	$12,392,160
Property Acquistion	$593,400	$745,200	$897,000
Total Capital Cost	**$43,866,472**	**$53,811,075**	**$63,820,540**
Less Grants	$0	$0	$0
Total Net Capital Cost	**$43,866,472**	**$53,811,075**	**$63,820,540**
Amortized Capital Cost ($ /yr)	**$2,385,078**	**$2,925,780**	**$3,470,008**
O&M COSTS ($/YR)			
Sewer Outfall	$59,133	$118,266	$177,399
Power	$321,133	$618,516	$915,899
Operations Staffing & Testing	$258,253	$324,725	$399,197
Chemicals	$76,812	$153,624	$241,437
Other O&M and Replacement	$224,126	$360,379	$507,397
Total Annual O&M Cost ($ /yr)	**$939,457**	**$1,575,510**	**$2,241,329**
Total Annual Cost ($ /yr)	**$3,324,535**	**$4,501,290**	**$5,711,336**
Unit Capital Cost ($/af)	**$2,267**	**$1,390**	**$1,099**
Unit O&M Cost ($/af)	**$893**	**$749**	**$710**
Total Unit Cost ($/af)	**$3,159**	**$2,139**	**$1,809**

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Assumptions

	1 MGD	2 MGD	3 MGD
Extraction & Production			
Well Extraction (gpm)	844	1,688	2,532
Total Well Extraction (gpm)	844	1,688	2,532
RO Recovery (%)	80.0%	80.0%	80.0%
RO Bypass (gpm)	94.0	188.0	282.0
RO Feed (gpm)	750	1,500	2,250
RO Permeate (gpm)	600	1,200	1,800
Treated Bypass	94	188	282
Product Water	694	1,388	2,082
Brine Disposal (gpm)	150	300	450
Annual Operating Time	94.0%	94.0%	94.0%
Annual Well Extration (af)	1,280	2,559	3,839
Annual Production (af)	1,052	2,105	3,157
Annual Concentrate Disposal (af)	227	455	682
Grants			
Proposition 13	$0	$0	$0
Proposition 50	$0	$0	$0
Bureau of Reclamation	$0	$0	$0
Total Grants	$0	$0	$0
Financing Terms			
Interest rate	3.5%	3.5%	3.5%
Period	30	30	30
Energy			
Power Rate ($/kwh)	$0.190	$0.190	$0.190
Brine Disposal Costs			
Outfall Charges ($/AF of Concentrate)	$260.00	$260.00	$260.00
Annual Charges ($/yr)	$59,133	$118,266	$177,399
Membrane & Replacement			
Total RO Membranes	140	280	420
Cost per membrane ($)	$550	$550	$550
Membrane Life (yr)	3	3	3
Cartridge Filter Replacement	$2,143	$4,286	$6,429
Greensand Replacement	12000	24000	36000
Annual Replacement ($/yr)	$39,810	$79,619	$119,429
Maintenance			
Chemical Pump Parts	$10,000	$10,000	$10,000
Pump & Motor Parts	$15,000	$30,000	$45,000
Electrical & Instrumentation Parts	$10,000	$20,000	$30,000
Total Annual Maintenance	$35,000	$60,000	$85,000

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Capital Costs - Brackish Plant

Item No.	Description	1 MGD	2 MGD	3 MGD
1.0 Procurement				
1.1	Membrane Equipment	768,000	986,000	1,250,000
1.2	Membranes	77,000	154,000	231,000
1.3	RO Feed Pumps & Motors	75,000	100,000	150,000
1.4	Stainless & PVC Piping	128,000	220,000	220,000
1.5	Chemical Tanks	44,363	74,976	119,375
1.6	Chemical Feed Pumps	178,232	178,232	178,232
1.7	Greensand Filters	421,000	517,600	634,000
1.8	Decarbonators	200,000	250,000	300,000
1.9	Product and Brine Tanks	78,000	178,000	245,000
1.10	Product Pumps	65,000	95,000	125,000
1.11	MCC/Swithboard, VFDS	595,000	743,750	929,688
1.12	Misc. Electrical	428,000	535,000	668,750
1.13	PLC	90,000	120,000	180,000
1.14	Solar & Tesla Batteries	150,000	200,000	250,000
1.15	Concrete	59,220	59,220	59,220
1.16	Structural Steel	450,000	450,000	450,000
1.17	Mics Building, Roofing, Doors	150,000	150,000	150,000
1.18	Site AC	60,000	60,000	60,000
1.19	Lanscape Materials	20,000	20,000	20,000
	Taxes @ 7.75%	312,853	394,613	482,071
	Subtotal	4,349,668	5,486,391	6,702,336
2.0 Construction				
2.1	Membrane Equipment Install	65,220	119,880	155,560
2.2	Load Membranes	4,860	9,720	14,580
2.3	Install RO Feed Pumps	10,176	20,352	30,528
2.4	Install Interior Piping	34,720	69,720	85,000
2.5	Install Chem Tanks	19,464	24,330	29,196
2.6	Install Chem Pumps	23,880	29,850	35,820
2.7	Install Greensand Filters	168,000	207,040	253,600
2.8	Install Decarbonators	13,800	27,600	34,500
2.9	Install Product & Brine Tanks	7,560	15,120	22,680
2.10	Install MCC/Switchboard & VFDs	250,000	325,000	425,000
2.11	Misc Electrical	285,000	430,000	550,000
2.12	Install PLC & Programming	160,000	210,000	260,000
2.13	Solar & Tesla Batteries	75,000	100,000	150,000
2.14	Treatment Plant Building	832,780	832,780	832,780
2.15	Chemical Building	206,000	206,000	206,000
2.16	Equipment Foundations & Pads	264,773	320,000	376,000
2.17	Fence & Pilasters	676,678	676,678	676,678
2.18	Site Grading & Fill	322,300	322,300	322,300
2.19	Site Paving & Drainage	214,200	214,200	214,200
2.20	Site Landscape & Irrigation	52,500	52,500	52,500
	Subtotal	3,686,911	4,213,070	4,726,922
	Total	**8,036,579**	**9,699,461**	**11,429,258**
	General Conditions @ 5%	**401,829**	**484,973**	**571,463**
	Overhead & Profit @15%	**1,205,487**	**1,454,919**	**1,714,389**
	Contingency @ 20%	**1,607,316**	**1,939,892**	**2,285,852**
	Material Escalation @50%	**2,174,834**	**2,743,195**	**3,351,168**
	Construction Escalation @ 20%	**737,382**	**842,614**	**945,384**
	Construction Total (Current Supply Chain)	**14,163,427**	**17,165,055**	**20,297,513**
	General Conditions @ 5%	**401,829**	**484,973**	**571,463**
	Overhead & Profit @15%	**1,205,487**	**1,454,919**	**1,714,389**
	Contingency @ 20%	**1,607,316**	**1,939,892**	**2,285,852**
	Material Escalation @20%	**869,934**	**1,097,278**	**1,340,467**
	Construction Escalation @ 20%	**737,382**	**842,614**	**945,384**
	Construction Total (Normal Supply Chain)	**12,858,527**	**15,519,137**	**18,286,812**

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Capital Costs - Groundwater Well Drilling & Equiping

Item No.	Description	1 MGD	2 MGD	3 MGD
1.0 Procurement				
1.1	Well Casing & Screens	400,000	800,000	1,200,000
1.2	Well Pumps & Motors	60,000	120,000	180,000
1.3	Electrical Gear	160,000	320,000	480,000
1.4	Well Piping & Site Materials	210,000	420,000	630,000
	Taxes @ 7.75%	64,325	128,650	192,975
	Subtotal	894,325	1,788,650	2,682,975
2.0 Construction				
2.1	Well Drilling & Testing	904,000	1,808,000	2,712,000
2.2	Well Equiping	470,000	940,000	1,410,000
	Subtotal	1,374,000	2,748,000	4,122,000
	Total	**2,268,325**	**4,536,650**	**6,804,975**
	General Conditions @ 5%	**113,416**	**226,833**	**340,249**
	Overhead & Profit @15%	**340,249**	**680,498**	**1,020,746**
	Contingency @ 20%	**453,665**	**907,330**	**1,360,995**
	Material Escalation @50%	**447,163**	**894,325**	**1,341,488**
	Construction Escalation @ 20%	**274,800**	**549,600**	**824,400**
	Construction Total (Current Supply Chain)	**3,897,618**	**7,795,235**	**11,692,853**
	General Conditions @ 5%	**113,416**	**226,833**	**340,249**
	Overhead & Profit @15%	**340,249**	**680,498**	**1,020,746**
	Contingency @ 20%	**453,665**	**907,330**	**1,360,995**
	Material Escalation @20%	**178,865**	**357,730**	**536,595**
	Construction Escalation @ 20%	**274,800**	**549,600**	**824,400**
	Construction Total (Normal Supply Chain)	**3,629,320**	**7,258,640**	**10,887,960**

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Capital Costs - Brine System

Item No.	Description	1 MGD	2 MGD	3 MGD
1.0 Procurement				
1.1	Brine Pipeline Materials	3,445,926	3,445,926	3,445,926
1.2	Brine Pump Materials	213,322	426,644	639,966
	Taxes @ 7.75%	283,592	300,124	316,657
	Subtotal	3,942,840	4,172,694	4,402,549
2.0 Construction				
2.1	Brine Pipeline Labor	790,022	790,022	790,022
2.2	Brine Pipeline Equipment	1,644,039	1,644,039	1,644,039
2.3	Brine Pump Station Labor	18,632	37,264	55,896
2.4	Brine Pump Station Equipment	36,044	72,088	108,132
	Subtotal	2,488,737	2,543,413	2,598,089
	Total	**6,431,577**	**6,716,107**	**7,000,638**
	General Conditions @ 5%	**321,579**	**335,805**	**350,032**
	Overhead & Profit @15%	**964,737**	**1,007,416**	**1,050,096**
	Contingency @ 20%	**1,286,315**	**1,343,221**	**1,400,128**
	Material Escalation @50%	**1,971,420**	**2,086,347**	**2,201,274**
	Construction Escalation @ 20%	**497,747**	**508,683**	**519,618**
	Construction Total (Current Supply Chain)	**11,473,375**	**11,997,580**	**12,521,785**
	General Conditions @ 5%	**321,579**	**335,805**	**350,032**
	Overhead & Profit @15%	**964,737**	**1,007,416**	**1,050,096**
	Contingency @ 20%	**1,286,315**	**1,343,221**	**1,400,128**
	Material Escalation @20%	**788,568**	**834,539**	**880,510**
	Construction Escalation @ 20%	**497,747**	**508,683**	**519,618**
	Construction Total (Normal Supply Chain)	**10,290,523**	**10,745,771**	**11,201,020**

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Capital Costs - Well & Potable Pipelines

Item No.	Description	1 MGD	2 MGD	3 MGD
1.0 Procurement				
1.1	Raw Water Pipeline Materials	468,997	703,496	1,055,243
1.2	Potable Pipeline Materials	1,165,242	1,165,242	1,165,242
	Taxes @ 7.75%	126,654	144,827	172,088
	Subtotal	1,760,893	2,013,565	2,392,573
2.0 Construction				
2.1	Raw Water Labor	44,983	67,474	101,212
2.2	Raw Water Equipment	48,306	96,612	144,918
2.3	Potable Water Labor	348,873	348,873	348,873
2.4	Potable Water Equipment	325,836	325,836	325,836
	Subtotal	767,998	838,795	920,839
	Total	**2,528,891**	**2,852,360**	**3,313,412**
	General Conditions @ 5%	**126,445**	**142,618**	**165,671**
	Overhead & Profit @15%	**379,334**	**427,854**	**497,012**
	Contingency @ 20%	**505,778**	**570,472**	**662,682**
	Material Escalation @50%	**880,446**	**1,006,783**	**1,196,286**
	Construction Escalation @ 20%	**153,600**	**167,759**	**184,168**
	Construction Total (Current Supply Chain)	**4,574,493**	**5,167,846**	**6,019,230**
	General Conditions @ 5%	**126,445**	**142,618**	**165,671**
	Overhead & Profit @15%	**379,334**	**427,854**	**497,012**
	Contingency @ 20%	**505,778**	**570,472**	**662,682**
	Material Escalation @20%	**352,179**	**402,713**	**478,515**
	Construction Escalation @ 20%	**153,600**	**167,759**	**184,168**
	Construction Total (Normal Supply Chain)	**4,046,225**	**4,563,776**	**5,301,459**

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Capital Costs - Design, Admin, Permitting & CM

Item No.	Description	1 MGD	2 MGD	3 MGD
1.0 Design				
1.1	Preliminary Design Report	250,000	250,000	250,000
1.2	Geotechnical Investigations	120,000	120,000	120,000
1.3	Design Survey	80,000	90,000	100,000
1.4	Brackish Plant Design	1,250,000	1,600,000	1,800,000
1.5	Groundwater Well Design	650,000	1,300,000	1,950,000
1.6	Pipeline Design	850,000	900,000	1,000,000
1.7	Engineering During Construction	550,000	550,000	550,000
	Subtotal	3,750,000	4,810,000	5,770,000
2.0 Construction Management				
2.1	Fulltime Construction Manager	728,000	728,000	728,000
2.2	Three Fulltime Inspectors	1,684,800	1,684,800	1,684,800
2.3	Office Assitance	120,000	290,000	290,000
2.4	Hydrogeologist	250,000	500,000	750,000
	Subtotal	2,782,800	3,202,800	3,452,800
3.0 Administration				
3.1	OMWD Project Manager Fulltime	624,000	624,000	624,000
3.2	OMWD Engineer Part Time	270,000	270,000	270,000
3.3	Office Assistance	120,000	120,000	120,000
	Subtotal	1,014,000	1,014,000	1,014,000
4.0 Permitting				
4.1	Permit Fees	200,000	200,000	200,000
4.2	Permit Applications & Engineering	300,000	300,000	300,000
4.3	Office Assistance	40,000	40,000	40,000
	Subtotal	540,000	540,000	540,000
	Contingency 20%	1,617,360	1,913,360	2,155,360
	Total	**9,164,160**	**10,940,160**	**12,392,160**

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Capital Costs - Property Acquisition

Item No.	Description		1 MGD	2 MGD	3 MGD
1.0 Property Acquisition					
1.1	Brackish Plant (0.64 Acre)		441,600	441,600	441,600
1.2	Well Sites (0.11 Acre per Well)		151,800	303,600	455,400
		Total	593,400	745,200	897,000

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Power Costs - 1 MGD Option

	Flow (gpm)	TDH (ft)	Pump Eff. (%)	Motor Eff. (%)	VFD EFF. (%)	HP	Ops %	kwh/yr	Cost ($/kwh)	Annual Costs
Pumping										
Groundwater Wells	844	119	80.0%	92.0%	97.0%	35.53	94.0%	218,231	$0.190	$41,464
RO Feed Pumps	750	381	85.0%	92.0%	97.0%	95.13	94.0%	584,364	$0.190	$111,029
Brine Pumps	150	374	45.5%	92.0%	97.0%	34.89	94.0%	214,322	$0.190	$40,721
Product Water Pumps	694	347	80.0%	92.0%	97.0%	85.18	94.0%	523,257	$0.190	$99,419
Misc. Loads								150,000	$0.190	$28,500
Total Energy Costs										**$321,133**
Energy Rates										
Power Rate ($/kwh)										$0.190

Power Costs - 2 MGD Option

	Flow (gpm)	TDH (ft)	Pump Eff. (%)	Motor Eff. (%)	VFD Eff. (%)	HP	Ops %	kwh/yr	Cost ($/kwh)	Annual Costs
Pumping										
Groundwater Wells	1,688	119	80.0%	92.0%	97.0%	71.05	94.0%	436,461	$0.190	$82,928
RO Feed Pumps	1,500	381	85.0%	92.0%	97.0%	190.26	94.0%	1,168,728	$0.190	$222,058
Brine Pumps	300	374	45.5%	92.0%	97.0%	69.78	94.0%	428,645	$0.190	$81,443
Product Water Pumps	1,388	347	80.0%	92.0%	97.0%	170.36	94.0%	1,046,514	$0.190	$198,838
Misc. Loads								175,000	$0.190	$33,250
Total Energy Costs										**$618,516**
Energy Rates										
Power Rate ($/kwh)										$0.190

Power Costs - 3 MGD Option

	Flow (gpm)	TDH (ft)	Pump Eff. (%)	Motor Eff. (%)		HP	Ops %	kwh/yr	Cost ($/kwh)	Annual Costs
Pumping										
Groundwater Wells	2,532	119	80.0%	92.0%	97.0%	106.58	94.0%	654,692	$0.190	$124,391
RO Feed Pumps	2,250	381	85.0%	92.0%	97.0%	285.39	94.0%	1,753,092	$0.190	$333,087
Brine Pumps	450	374	45.5%	92.0%	97.0%	104.67	94.0%	642,967	$0.190	$122,164
Product Water Pumps	2,082	347	80.0%	92.0%	97.0%	255.54	94.0%	1,569,771	$0.190	$298,256
Misc. Loads								200,000	$0.190	$38,000
Total Energy Costs										**$915,899**
Energy Rates										
Power Rate ($/kwh)										$0.190

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Operations Staffing & Testing - 1 MGD

	Hourly Rate	OH	All-In Rate	Hour/Week	Hours/Year	Annual Costs
Position						
WTP Supervisor	$70.64	2.21	226.75	2.0	104	$16,236
Level III Operator	$47.40	2.21	152.16	20.0	1,040	$108,944
Pump/Motor Tech I	$37.23	2.21	126.00	4.0	208	$17,114
Pump Motor Tech II	$54.98	2.21	176.49	4.0	208	$25,273
Instrument Tech I	$37.88	2.21	121.02	4.0	208	$17,413
Instrument Tech II	$54.98	2.21	161.08	4.0	208	$25,273
Total Hours per Year					1,976	
Average Hours per Day					38.0	
Total Labor Costs						**$210,253**
Testing & Reporting Costs						**$48,000**
Total						**$258,253**

Operations Staffing & Testing - 2 MGD

	Hourly Rate	OH	All-In Rate	Hour/Week	Hours/Year	Annual Costs
Position						
WTP Supervisor	$70.64	2.21	226.75	2.0	104	$16,236
Level III Operator	$47.40	2.21	152.16	30.0	1,560	$163,416
Pump/Motor Tech I	$37.23	2.21	126.00	4.0	208	$17,114
Pump Motor Tech II	$54.98	2.21	176.49	4.0	208	$25,273
Instrument Tech I	$37.88	2.21	121.02	4.0	208	$17,413
Instrument Tech II	$54.98	2.21	161.08	4.0	208	$25,273
Total Hours per Year					2,496	
Average Hours per Day					48.0	
Total Labor Costs						**$264,725**
Testing & Reporting Costs						**$60,000**
Total						**$324,725**

Operations Staffing & Testing - 3 MGD

	Hourly Rate	OH	All-In Rate	Hour/Week	Hours/Year	Annual Costs
Position						
WTP Supervisor	$70.64	2.21	226.75	2.0	104	$16,236
Level III Operator	$47.40	2.21	152.16	40.0	2,080	$217,888
Pump/Motor Tech I	$37.23	2.21	126.00	4.0	208	$17,114
Pump Motor Tech II	$54.98	2.21	176.49	4.0	208	$25,273
Instrument Tech I	$37.88	2.21	121.02	4.0	208	$17,413
Instrument Tech II	$54.98	2.21	161.08	4.0	208	$25,273
Total Hours per Year					3,016	
Average Hours per Day					58.0	
Total Labor Costs						**$319,197**
Testing & Reporting Costs						**$80,000**
Total						**$399,197**

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project

O&M and Replacement - 1 MGD

	Form	Cost ($/gal)	Annual Costs
Chemical			
Sulfuric Acid	Liquid 93.0%	$1.84	$40,584
Scale Inhibitor	Liquid 100%	$1.30	$5,649
Sodium Hypochlorite	Liquid 12.5%	$1.84	$10,512
Ammonium Sulfate	Liquid 40.0%	$1.00	$3,421
Sodium Hydroxide	Liquid 50%	$0.80	$11,349
Citric Acid	Liquid 50.0	$1.30	$1,322
STTP	Powder 100%	$1.68	$3,975
Total Chemical Costs			**$76,812**

O&M and Replacement - 2 MGD

	Form	Cost ($/gal)	Annual Costs
Chemical			
Sulfuric Acid	Liquid 93.0%	$1.84	$81,169
Scale Inhibitor	Liquid 100%	$1.30	$11,299
Sodium Hypochlorite	Liquid 12.5%	$1.84	$21,024
Ammonium Sulfate	Liquid 40.0%	$1.00	$6,842
Sodium Hydroxide	Liquid 50%	$0.80	$22,697
Citric Acid	Liquid 50.0	$1.30	$2,644
STTP	Powder 100%	$1.68	$7,949
Total Chemical Costs			**$153,624**

O&M and Replacement - 3 MGD

	Form	Cost ($/gal)	Annual Costs
Chemical			
Sulfuric Acid	Liquid 93.0%	$1.84	$121,753
Scale Inhibitor	Liquid 100%	$1.30	$16,948
Sodium Hypochlorite	Liquid 12.5%	$1.84	$31,536
Ammonium Sulfate	Liquid 40.0%	$1.00	$10,264
Sodium Hydroxide	Liquid 50%	$0.80	$34,046
Citric Acid	Liquid 50.0	$1.30	$3,966
STTP	Powder 100%	$1.68	$22,924
Total Chemical Costs			**$241,437**

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
O&M and Replacement Costs - 1 MGD

	Cost	Replacement Years	Annual Costs
Membranes (140)	$77,000	3.0	$25,667
Cartridge Filters (214)	$1,284	0.5	$2,568
Greensand Media	$120,000	10.0	$12,000
Pumps & Motors	250,000	20.0	$12,500
Chemical Tanks	44,363	20.0	$2,218
Chemical Pumps	178,232	10.0	$17,823
Steel Tanks	78,000	30.0	$2,600
Decarbonators	200,000	20.0	$10,000
Electrical Equipment	595,000	20.0	$29,750
PLC & Solar	240,000	10.0	$24,000
Well Rehabilitation	150,000	3.0	$50,000
Maintenace & Parts	35,000	1.0	$35,000
Total			**$224,126**

O&M and Replacement Costs - 2 MGD

	Cost	Replacement Years	Annual Costs
Membranes (280)	$154,000	3.0	$51,333
Cartridge Filters (428)	$2,568	0.5	$5,136
Greensand Media	$240,000	10.0	$24,000
Pumps & Motors	415,000	20.0	$20,750
Chemical Tanks	74,976	20.0	$3,749
Chemical Pumps	178,232	10.0	$17,823
Steel Tanks	117,000	30.0	$3,900
Decarbonators	250,000	20.0	$12,500
Electrical Equipment	743,756	20.0	$37,188
PLC & Solar	240,000	10.0	$24,000
Well Rehabilitation	300,000	3.0	$100,000
Maintenace & Parts	60,000	1.0	$60,000
Total			**$360,379**

O&M and Replacement Costs - 3 MGD

	Cost	Replacement Years	Annual Costs
Membranes (420)	$231,000	3.0	$77,000
Cartridge Filters (642)	$3,852	0.5	$7,704
Greensand Media	$360,000	10.0	$36,000
Pumps & Motors	605,000	20.0	$30,250
Chemical Tanks	119,375	20.0	$5,969
Chemical Pumps	178,232	10.0	$17,823
Steel Tanks	245,000	30.0	$8,167
Decarbonators	300,000	20.0	$15,000
Electrical Equipment	929,687	20.0	$46,484
PLC & Solar	280,000	10.0	$28,000
Well Rehabilitation	450,000	3.0	$150,000

TETRA TECH

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
ESTIMATED COST OF WATER ($ per Acre-Ft) Normal Supply Chain Issues

	1 MGD	2 MGD	3 MGD
Annual Water Production (af/yr)	**1,052**	**2,105**	**3,157**
Capital Cost			
Capital Construction	$30,824,594	$38,087,325	$45,677,251
Design, Administration, Permitting & CM	$9,164,160	$10,940,160	$12,392,160
Property Acquistion	$593,400	$745,200	$897,000
Total Capital Cost	**$40,582,154**	**$49,772,685**	**$58,966,411**
Less Grants	$0	$0	$0
Total Net Capital Cost	**$40,582,154**	**$49,772,685**	**$58,966,411**
Amortized Capital Cost ($ /yr)	**$2,206,506**	**$2,706,207**	**$3,206,082**
O&M COSTS ($/YR)			
Sewer Outfall	$59,133	$118,266	$177,399
Power	$321,133	$618,516	$915,899
Operations Staffing & Testing	$258,253	$324,725	$399,197
Chemicals	$76,812	$153,624	$241,437
Other O&M and Replacement	$224,126	$360,379	$507,397
Total Annual O&M Cost ($ /yr)	**$939,457**	**$1,575,510**	**$2,241,329**
Total Annual Cost ($ /yr)	**$3,145,963**	**$4,281,717**	**$5,447,411**
Unit Capital Cost ($/af)	**$2,097**	**$1,286**	**$1,016**
Unit O&M Cost ($/af)	**$893**	**$749**	**$710**
Total Unit Cost ($/af)	**$2,990**	**$2,035**	**$1,726**

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Assumptions

	1 MGD	2 MGD	3 MGD
Extraction & Production			
Well Extraction (gpm)	844	1,688	2,532
Total Well Extraction (gpm)	844	1,688	2,532
RO Recovery (%)	80.0%	80.0%	80.0%
RO Bypass (gpm)	94.0	188.0	282.0
RO Feed (gpm)	750	1,500	2,250
RO Permeate (gpm)	600	1,200	1,800
Treated Bypass	94	188	282
Product Water	694	1,388	2,082
Brine Disposal (gpm)	150	300	450
Annual Operating Time	94.0%	94.0%	94.0%
Annual Well Extration (af)	1,280	2,559	3,839
Annual Production (af)	1,052	2,105	3,157
Annual Concentrate Disposal (af)	227	455	682
Grants			
Proposition 13	$0	$0	$0
Proposition 50	$0	$0	$0
Bureau of Reclamation	$0	$0	$0
Total Grants	$0	$0	$0
Financing Terms			
Interest rate	3.5%	3.5%	3.5%
Period	30	30	30
Energy			
Power Rate ($/kwh)	$0.190	$0.190	$0.190
Brine Disposal Costs			
Outfall Charges ($/AF of Concentrate)	$260.00	$260.00	$260.00
Annual Charges ($/yr)	$59,133	$118,266	$177,399
Membrane & Replacement			
Total RO Membranes	140	280	420
Cost per membrane ($)	$550	$550	$550
Membrane Life (yr)	3	3	3
Cartridge Filter Replacement	$2,143	$4,286	$6,429
Greensand Replacement	12000	24000	36000
Annual Replacement ($/yr)	$39,810	$79,619	$119,429
Maintenance			
Chemical Pump Parts	$10,000	$10,000	$10,000
Pump & Motor Parts	$15,000	$30,000	$45,000
Electrical & Instrumentation Parts	$10,000	$20,000	$30,000
Total Annual Maintenance	$35,000	$60,000	$85,000

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Capital Costs - Brackish Plant

Item No.	Description	1 MGD	2 MGD	3 MGD
1.0 Procurement				
1.1	Membrane Equipment	768,000	986,000	1,250,000
1.2	Membranes	77,000	154,000	231,000
1.3	RO Feed Pumps & Motors	75,000	100,000	150,000
1.4	Stainless & PVC Piping	128,000	220,000	220,000
1.5	Chemical Tanks	44,363	74,976	119,375
1.6	Chemical Feed Pumps	178,232	178,232	178,232
1.7	Greensand Filters	421,000	517,600	634,000
1.8	Decarbonators	200,000	250,000	300,000
1.9	Product and Brine Tanks	78,000	178,000	245,000
1.10	Product Pumps	65,000	95,000	125,000
1.11	MCC/Swithboard, VFDS	595,000	743,750	929,688
1.12	Misc. Electrical	428,000	535,000	668,750
1.13	PLC	90,000	120,000	180,000
1.14	Solar & Tesla Batteries	150,000	200,000	250,000
1.15	Concrete	59,220	59,220	59,220
1.16	Structural Steel	450,000	450,000	450,000
1.17	Mics Building, Roofing, Doors	150,000	150,000	150,000
1.18	Site AC	60,000	60,000	60,000
1.19	Lanscape Materials	20,000	20,000	20,000
	Taxes @ 7.75%	312,853	394,613	482,071
	Subtotal	4,349,668	5,486,391	6,702,336
2.0 Construction				
2.1	Membrane Equipment Install	65,220	119,880	155,560
2.2	Load Membranes	4,860	9,720	14,580
2.3	Install RO Feed Pumps	10,176	20,352	30,528
2.4	Install Interior Piping	34,720	69,720	85,000
2.5	Install Chem Tanks	19,464	24,330	29,196
2.6	Install Chem Pumps	23,880	29,850	35,820
2.7	Install Greensand Filters	168,000	207,040	253,600
2.8	Install Decarbonators	13,800	27,600	34,500
2.9	Install Product & Brine Tanks	7,560	15,120	22,680
2.10	Install MCC/Switchboard & VFDs	250,000	325,000	425,000
2.11	Misc Electrical	285,000	430,000	550,000
2.12	Install PLC & Programming	160,000	210,000	260,000
2.13	Solar & Tesla Batteries	75,000	100,000	150,000
2.14	Treatment Plant Building	832,780	832,780	832,780
2.15	Chemical Building	206,000	206,000	206,000
2.16	Equipment Foundations & Pads	264,773	320,000	376,000
2.17	Fence & Pilasters	676,678	676,678	676,678
2.18	Site Grading & Fill	322,300	322,300	322,300
2.19	Site Paving & Drainage	214,200	214,200	214,200
2.20	Site Landscape & Irrigation	52,500	52,500	52,500
	Subtotal	3,686,911	4,213,070	4,726,922
	Total	**8,036,579**	**9,699,461**	**11,429,258**
	General Conditions @ 5%	**401,829**	**484,973**	**571,463**
	Overhead & Profit @15%	**1,205,487**	**1,454,919**	**1,714,389**
	Contingency @ 20%	**1,607,316**	**1,939,892**	**2,285,852**
	Material Escalation @50%	**2,174,834**	**2,743,195**	**3,351,168**
	Construction Escalation @ 20%	**737,382**	**842,614**	**945,384**
	Construction Total (Current Supply Chain)	**14,163,427**	**17,165,055**	**20,297,513**
	General Conditions @ 5%	**401,829**	**484,973**	**571,463**
	Overhead & Profit @15%	**1,205,487**	**1,454,919**	**1,714,389**
	Contingency @ 20%	**1,607,316**	**1,939,892**	**2,285,852**
	Material Escalation @20%	**869,934**	**1,097,278**	**1,340,467**
	Construction Escalation @ 20%	**737,382**	**842,614**	**945,384**
	Construction Total (Normal Supply Chain)	**12,858,527**	**15,519,137**	**18,286,812**

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Capital Costs - Groundwater Well Drilling & Equiping

Item No.	Description	1 MGD	2 MGD	3 MGD
1.0 Procurement				
1.1	Well Casing & Screens	400,000	800,000	1,200,000
1.2	Well Pumps & Motors	60,000	120,000	180,000
1.3	Electrical Gear	160,000	320,000	480,000
1.4	Well Piping & Site Materials	210,000	420,000	630,000
	Taxes @ 7.75%	64,325	128,650	192,975
	Subtotal	894,325	1,788,650	2,682,975
2.0 Construction				
2.1	Well Drilling & Testing	904,000	1,808,000	2,712,000
2.2	Well Equiping	470,000	940,000	1,410,000
	Subtotal	1,374,000	2,748,000	4,122,000
	Total	**2,268,325**	**4,536,650**	**6,804,975**
	General Conditions @ 5%	**113,416**	**226,833**	**340,249**
	Overhead & Profit @15%	**340,249**	**680,498**	**1,020,746**
	Contingency @ 20%	**453,665**	**907,330**	**1,360,995**
	Material Escalation @50%	**447,163**	**894,325**	**1,341,488**
	Construction Escalation @ 20%	**274,800**	**549,600**	**824,400**
	Construction Total (Current Supply Chain)	**3,897,618**	**7,795,235**	**11,692,853**
	General Conditions @ 5%	**113,416**	**226,833**	**340,249**
	Overhead & Profit @15%	**340,249**	**680,498**	**1,020,746**
	Contingency @ 20%	**453,665**	**907,330**	**1,360,995**
	Material Escalation @20%	**178,865**	**357,730**	**536,595**
	Construction Escalation @ 20%	**274,800**	**549,600**	**824,400**
	Construction Total (Normal Supply Chain)	**3,629,320**	**7,258,640**	**10,887,960**

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Capital Costs - Brine System

Item No.	Description	1 MGD	2 MGD	3 MGD
1.0 Procurement				
1.1	Brine Pipeline Materials	3,445,926	3,445,926	3,445,926
1.2	Brine Pump Materials	213,322	426,644	639,966
	Taxes @ 7.75%	283,592	300,124	316,657
	Subtotal	3,942,840	4,172,694	4,402,549
2.0 Construction				
2.1	Brine Pipeline Labor	790,022	790,022	790,022
2.2	Brine Pipeline Equipment	1,644,039	1,644,039	1,644,039
2.3	Brine Pump Station Labor	18,632	37,264	55,896
2.4	Brine Pump Station Equipment	36,044	72,088	108,132
	Subtotal	2,488,737	2,543,413	2,598,089
	Total	**6,431,577**	**6,716,107**	**7,000,638**
	General Conditions @ 5%	**321,579**	**335,805**	**350,032**
	Overhead & Profit @15%	**964,737**	**1,007,416**	**1,050,096**
	Contingency @ 20%	**1,286,315**	**1,343,221**	**1,400,128**
	Material Escalation @50%	**1,971,420**	**2,086,347**	**2,201,274**
	Construction Escalation @ 20%	**497,747**	**508,683**	**519,618**
	Construction Total (Current Supply Chain)	**11,473,375**	**11,997,580**	**12,521,785**
	General Conditions @ 5%	**321,579**	**335,805**	**350,032**
	Overhead & Profit @15%	**964,737**	**1,007,416**	**1,050,096**
	Contingency @ 20%	**1,286,315**	**1,343,221**	**1,400,128**
	Material Escalation @20%	**788,568**	**834,539**	**880,510**
	Construction Escalation @ 20%	**497,747**	**508,683**	**519,618**
	Construction Total (Normal Supply Chain)	**10,290,523**	**10,745,771**	**11,201,020**

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Capital Costs - Well & Potable Pipelines

Item No.	Description	1 MGD	2 MGD	3 MGD
1.0 Procurement				
1.1	Raw Water Pipeline Materials	468,997	703,496	1,055,243
1.2	Potable Pipeline Materials	1,165,242	1,165,242	1,165,242
	Taxes @ 7.75%	126,654	144,827	172,088
	Subtotal	1,760,893	2,013,565	2,392,573
2.0 Construction				
2.1	Raw Water Labor	44,983	67,474	101,212
2.2	Raw Water Equipment	48,306	96,612	144,918
2.3	Potable Water Labor	348,873	348,873	348,873
2.4	Potable Water Equipment	325,836	325,836	325,836
	Subtotal	767,998	838,795	920,839
	Total	**2,528,891**	**2,852,360**	**3,313,412**
	General Conditions @ 5%	**126,445**	**142,618**	**165,671**
	Overhead & Profit @15%	**379,334**	**427,854**	**497,012**
	Contingency @ 20%	**505,778**	**570,472**	**662,682**
	Material Escalation @50%	**880,446**	**1,006,783**	**1,196,286**
	Construction Escalation @ 20%	**153,600**	**167,759**	**184,168**
	Construction Total (Current Supply Chain)	**4,574,493**	**5,167,846**	**6,019,230**
	General Conditions @ 5%	**126,445**	**142,618**	**165,671**
	Overhead & Profit @15%	**379,334**	**427,854**	**497,012**
	Contingency @ 20%	**505,778**	**570,472**	**662,682**
	Material Escalation @20%	**352,179**	**402,713**	**478,515**
	Construction Escalation @ 20%	**153,600**	**167,759**	**184,168**
	Construction Total (Normal Supply Chain)	**4,046,225**	**4,563,776**	**5,301,459**

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Capital Costs - Design, Admin, Permitting & CM

Item No.	Description	1 MGD	2 MGD	3 MGD
1.0 Design				
1.1	Preliminary Design Report	250,000	250,000	250,000
1.2	Geotechnical Investigations	120,000	120,000	120,000
1.3	Design Survey	80,000	90,000	100,000
1.4	Brackish Plant Design	1,250,000	1,600,000	1,800,000
1.5	Groundwater Well Design	650,000	1,300,000	1,950,000
1.6	Pipeline Design	850,000	900,000	1,000,000
1.7	Engineering During Construction	550,000	550,000	550,000
	Subtotal	3,750,000	4,810,000	5,770,000
2.0 Construction Management				
2.1	Fulltime Construction Manager	728,000	728,000	728,000
2.2	Three Fulltime Inspectors	1,684,800	1,684,800	1,684,800
2.3	Office Assitance	120,000	290,000	290,000
2.4	Hydrogeologist	250,000	500,000	750,000
	Subtotal	2,782,800	3,202,800	3,452,800
3.0 Administration				
3.1	OMWD Project Manager Fulltime	624,000	624,000	624,000
3.2	OMWD Engineer Part Time	270,000	270,000	270,000
3.3	Office Assistance	120,000	120,000	120,000
	Subtotal	1,014,000	1,014,000	1,014,000
4.0 Permitting				
4.1	Permit Fees	200,000	200,000	200,000
4.2	Permit Applications & Engineering	300,000	300,000	300,000
4.3	Office Assistance	40,000	40,000	40,000
	Subtotal	540,000	540,000	540,000
	Contingency 20%	1,617,360	1,913,360	2,155,360
	Total	**9,164,160**	**10,940,160**	**12,392,160**

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Capital Costs - Property Acquisition

Item No.	Description		1 MGD	2 MGD	3 MGD
1.0 Property Acquisition					
1.1	Brackish Plant (0.64 Acre)		441,600	441,600	441,600
1.2	Well Sites (0.11 Acre per Well)		151,800	303,600	455,400
		Total	593,400	745,200	897,000

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Power Costs - 1 MGD Option

	Flow (gpm)	TDH (ft)	Pump Eff. (%)	Motor Eff. (%)	VFD EFF. (%)	HP	Ops %	kwh/yr	Cost ($/kwh)	Annual Costs
Pumping										
Groundwater Wells	844	119	80.0%	92.0%	97.0%	35.53	94.0%	218,231	$0.190	$41,464
RO Feed Pumps	750	381	85.0%	92.0%	97.0%	95.13	94.0%	584,364	$0.190	$111,029
Brine Pumps	150	374	45.5%	92.0%	97.0%	34.89	94.0%	214,322	$0.190	$40,721
Product Water Pumps	694	347	80.0%	92.0%	97.0%	85.18	94.0%	523,257	$0.190	$99,419
Misc. Loads								150,000	$0.190	$28,500
Total Energy Costs										**$321,133**
Energy Rates										
Power Rate ($/kwh)										$0.190

Power Costs - 2 MGD Option

	Flow (gpm)	TDH (ft)	Pump Eff. (%)	Motor Eff. (%)	VFD Eff. (%)	HP	Ops %	kwh/yr	Cost ($/kwh)	Annual Costs
Pumping										
Groundwater Wells	1,688	119	80.0%	92.0%	97.0%	71.05	94.0%	436,461	$0.190	$82,928
RO Feed Pumps	1,500	381	85.0%	92.0%	97.0%	190.26	94.0%	1,168,728	$0.190	$222,058
Brine Pumps	300	374	45.5%	92.0%	97.0%	69.78	94.0%	428,645	$0.190	$81,443
Product Water Pumps	1,388	347	80.0%	92.0%	97.0%	170.36	94.0%	1,046,514	$0.190	$198,838
Misc. Loads								175,000	$0.190	$33,250
Total Energy Costs										**$618,516**
Energy Rates										
Power Rate ($/kwh)										$0.190

Power Costs - 3 MGD Option

	Flow (gpm)	TDH (ft)	Pump Eff. (%)	Motor Eff. (%)		HP	Ops %	kwh/yr	Cost ($/kwh)	Annual Costs
Pumping										
Groundwater Wells	2,532	119	80.0%	92.0%	97.0%	106.58	94.0%	654,692	$0.190	$124,391
RO Feed Pumps	2,250	381	85.0%	92.0%	97.0%	285.39	94.0%	1,753,092	$0.190	$333,087
Brine Pumps	450	374	45.5%	92.0%	97.0%	104.67	94.0%	642,967	$0.190	$122,164
Product Water Pumps	2,082	347	80.0%	92.0%	97.0%	255.54	94.0%	1,569,771	$0.190	$298,256
Misc. Loads								200,000	$0.190	$38,000
Total Energy Costs										**$915,899**
Energy Rates										
Power Rate ($/kwh)										$0.190

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
Operations Staffing & Testing - 1 MGD

	Hourly Rate	OH	All-In Rate	Hour/Week	Hours/Year	Annual Costs
Position						
WTP Supervisor	$70.64	2.21	226.75	2.0	104	$16,236
Level III Operator	$47.40	2.21	152.16	20.0	1,040	$108,944
Pump/Motor Tech I	$37.23	2.21	126.00	4.0	208	$17,114
Pump Motor Tech II	$54.98	2.21	176.49	4.0	208	$25,273
Instrument Tech I	$37.88	2.21	121.02	4.0	208	$17,413
Instrument Tech II	$54.98	2.21	161.08	4.0	208	$25,273
Total Hours per Year					1,976	
Average Hours per Day					38.0	
Total Labor Costs						**$210,253**
Testing & Reporting Costs						**$48,000**
Total						**$258,253**

Operations Staffing & Testing - 2 MGD

	Hourly Rate	OH	All-In Rate	Hour/Week	Hours/Year	Annual Costs
Position						
WTP Supervisor	$70.64	2.21	226.75	2.0	104	$16,236
Level III Operator	$47.40	2.21	152.16	30.0	1,560	$163,416
Pump/Motor Tech I	$37.23	2.21	126.00	4.0	208	$17,114
Pump Motor Tech II	$54.98	2.21	176.49	4.0	208	$25,273
Instrument Tech I	$37.88	2.21	121.02	4.0	208	$17,413
Instrument Tech II	$54.98	2.21	161.08	4.0	208	$25,273
Total Hours per Year					2,496	
Average Hours per Day					48.0	
Total Labor Costs						**$264,725**
Testing & Reporting Costs						**$60,000**
Total						**$324,725**

Operations Staffing & Testing - 3 MGD

	Hourly Rate	OH	All-In Rate	Hour/Week	Hours/Year	Annual Costs
Position						
WTP Supervisor	$70.64	2.21	226.75	2.0	104	$16,236
Level III Operator	$47.40	2.21	152.16	40.0	2,080	$217,888
Pump/Motor Tech I	$37.23	2.21	126.00	4.0	208	$17,114
Pump Motor Tech II	$54.98	2.21	176.49	4.0	208	$25,273
Instrument Tech I	$37.88	2.21	121.02	4.0	208	$17,413
Instrument Tech II	$54.98	2.21	161.08	4.0	208	$25,273
Total Hours per Year					3,016	
Average Hours per Day					58.0	
Total Labor Costs						**$319,197**
Testing & Reporting Costs						**$80,000**
Total						**$399,197**

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project

O&M and Replacement - 1 MGD

	Form	Cost ($/gal)	Annual Costs
Chemical			
Sulfuric Acid	Liquid 93.0%	$1.84	$40,584
Scale Inhibitor	Liquid 100%	$1.30	$5,649
Sodium Hypochlorite	Liquid 12.5%	$1.84	$10,512
Ammonium Sulfate	Liquid 40.0%	$1.00	$3,421
Sodium Hydroxide	Liquid 50%	$0.80	$11,349
Citric Acid	Liquid 50.0	$1.30	$1,322
STTP	Powder 100%	$1.68	$3,975
Total Chemical Costs			**$76,812**

O&M and Replacement - 2 MGD

	Form	Cost ($/gal)	Annual Costs
Chemical			
Sulfuric Acid	Liquid 93.0%	$1.84	$81,169
Scale Inhibitor	Liquid 100%	$1.30	$11,299
Sodium Hypochlorite	Liquid 12.5%	$1.84	$21,024
Ammonium Sulfate	Liquid 40.0%	$1.00	$6,842
Sodium Hydroxide	Liquid 50%	$0.80	$22,697
Citric Acid	Liquid 50.0	$1.30	$2,644
STTP	Powder 100%	$1.68	$7,949
Total Chemical Costs			**$153,624**

O&M and Replacement - 3 MGD

	Form	Cost ($/gal)	Annual Costs
Chemical			
Sulfuric Acid	Liquid 93.0%	$1.84	$121,753
Scale Inhibitor	Liquid 100%	$1.30	$16,948
Sodium Hypochlorite	Liquid 12.5%	$1.84	$31,536
Ammonium Sulfate	Liquid 40.0%	$1.00	$10,264
Sodium Hydroxide	Liquid 50%	$0.80	$34,046
Citric Acid	Liquid 50.0	$1.30	$3,966
STTP	Powder 100%	$1.68	$22,924
Total Chemical Costs			**$241,437**

Olivenhain Municipla Water District (OMWD)
San Dieguito Valley Brackish Groundwater Desalination Project
O&M and Replacement Costs - 1 MGD

	Cost	Replacement Years	Annual Costs
Membranes (140)	$77,000	3.0	$25,667
Cartridge Filters (214)	$1,284	0.5	$2,568
Greensand Media	$120,000	10.0	$12,000
Pumps & Motors	250,000	20.0	$12,500
Chemical Tanks	44,363	20.0	$2,218
Chemical Pumps	178,232	10.0	$17,823
Steel Tanks	78,000	30.0	$2,600
Decarbonators	200,000	20.0	$10,000
Electrical Equipment	595,000	20.0	$29,750
PLC & Solar	240,000	10.0	$24,000
Well Rehabilitation	150,000	3.0	$50,000
Maintenace & Parts	35,000	1.0	$35,000
Total			**$224,126**

O&M and Replacement Costs - 2 MGD

	Cost	Replacement Years	Annual Costs
Membranes (280)	$154,000	3.0	$51,333
Cartridge Filters (428)	$2,568	0.5	$5,136
Greensand Media	$240,000	10.0	$24,000
Pumps & Motors	415,000	20.0	$20,750
Chemical Tanks	74,976	20.0	$3,749
Chemical Pumps	178,232	10.0	$17,823
Steel Tanks	117,000	30.0	$3,900
Decarbonators	250,000	20.0	$12,500
Electrical Equipment	743,756	20.0	$37,188
PLC & Solar	240,000	10.0	$24,000
Well Rehabilitation	300,000	3.0	$100,000
Maintenace & Parts	60,000	1.0	$60,000
Total			**$360,379**

O&M and Replacement Costs - 3 MGD

	Cost	Replacement Years	Annual Costs
Membranes (420)	$231,000	3.0	$77,000
Cartridge Filters (642)	$3,852	0.5	$7,704
Greensand Media	$360,000	10.0	$36,000
Pumps & Motors	605,000	20.0	$30,250
Chemical Tanks	119,375	20.0	$5,969
Chemical Pumps	178,232	10.0	$17,823
Steel Tanks	245,000	30.0	$8,167
Decarbonators	300,000	20.0	$15,000
Electrical Equipment	929,687	20.0	$46,484
PLC & Solar	280,000	10.0	$28,000
Well Rehabilitation	450,000	3.0	$150,000

Appendix B. Brackish Plant Cost Estimate

delcowater
Integrated Solutions

Olivenhain Water District, CA

Tetra Tech

Budgetary Scope of Supply and Pricing

Proposal Number: 4227554
Date: March 4, 2022

3714 Kinnear Place, Saskatoon, SK S7P 0A6
Tel: 306.244.6449 - Fax: 306.665.7500
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1.1 Introduction and Overall Treatment Strategy

Tetra Tech (hereinafter referred to as “the Consultant”) has requested a preliminary budget for two water treatment options of differing capacities for the Olivenhain Water District, CA (hereinafter referred to as “the End User”). The flowrates for each option have been chosen to produce the final net volume of; 3,783 m^3/day for Option 1 and 7,566 m^3/day for Option 2. The final net volume for each option includes permeate flow from a Membrane Treatment Unit combined with a bypass blend flow.

The following chart summarizes the treatment ability of the proposed treatment units:

Constituent	MTU
Hardness	X
Total Dissolved Solids (TDS)	X
Silica	X

Delco Water’s treatment strategy is directed at the water quality issues outlined above and to meet EPA Safe Water Drinking Guidelines. Delco Water has chosen proven technologies that will minimize operating costs and simplify the plant operation.

Delco Water has included interstage instrumentation for membrane health analytics to occur for each stage. An interstage energy recovery device is included, the performance projections will be shared.

Each option also includes a CIP system with integrated neutralization functionality. This will reduce the amount of equipment and space required. For this system, Delco has a supplied cone bottom tank to allow for proper draining between CIP cleaning and neutralization steps to fully remove any precipitate created during neutralization.

Due to the high silica content in the feed water, Delco worked directly with antiscalant providers to achieve the required recovery of 80%. At this high of a recovery, antiscalant precipitation may occur as a calcium/magnesium salt and result in some loss of inhibition. To avoid this, it is recommended to reduce the feed pH to 7.3 utilizing acid dosing. A chemical dosing pump has been included in the scope of supply for this purpose.

1.2 Differentiating Features

The following descriptions are not intended to be inclusive of all features, equipment specifications and strengths of the Delco proposed solution, but rather to highlight some of the features and company strengths that we feel set us apart from our competitors.

1.2.1 Membrane Treatment Unit (MTU) Differentiating Features

1.2.1.1 Flow Control

Flow to each MTU train is controlled by VFD's on the on-skid, high pressure booster pumps, and on-skid magnetic flow meters. VFD's will be provided by others in the MCC. Concentrate control valves control recovery and hydraulic balancing on skid.

1.2.1.2 Low Design Flux Rates

The design flux rate of the RO membrane array is low to ensure that operational sustainability can be achieved during the winter when water temperature approaches 0 degrees Celsius. Delco ensures that the system is designed to meet full system capacity at the coldest water temperature.

1.2.1.3 Chemical Dosing Pump Flow Monitoring

For the chemical system, the Grundfos DDA pumps provide two configurable dry contacts that can be used for pump status. The first dry contact is used as a General Fault alarm. The second dry contact will be a dedicated signal back to our PLC as a digital input for 'Pump Dosing Signal'. This way Delco can initiate a 'No Response' alarm if the input is not active when being requested.

1.2.1.4 Automated Flushes

Automated permeate flushing cycles are programmed into Delco Water's membrane system. Prior to a membrane treatment train going offline, stored permeate water is flushed through the membranes to prevent the possibility of scale forming during downtime. The Clean-in-place tank is sized to be able to flush the membrane vessels with equivalent to three times their volume.

1.2.1.5 Characterized V-Ball Control Valves

Delco's proposed design uses high quality precisely designed characterized v-ball control valves for the concentrate control of the reverse osmosis treatment unit, as well as a v-ball control valve provided loose for installation in the raw water bypass blend line. These valves are provided with modulating, electric actuators. Although these valves come at a premium price, they offer the following advantages over an actuated butterfly valve when used on high pressure systems:

- Precise Flow Control
- Reduced Valve Cavitation
- Quiet Operation
- Avoidance of premature wear

1.2.1.6 Hach sc1000 Analytical Controller

Delco has included Hach's advanced analytical controller for the collection and display of values from all Hach devices on the skid. The sc1000 system simplifies the display of information for the operator and provides one unified device for the connection of probes. This allows for more analytical instruments to be added to the treatment unit, without the need for more controllers.

1.2.1.7 Mag Flow Meters

Magnetic flow meters are included on the feed and concentrate lines of each reverse osmosis membrane train. In addition, a magnetic flow meter is provided loose for installation on the raw water bypass blend line. The mag flow meters provide accurate determination of the Normalized Permeate Flow, Percent Membrane Recovery and Percent Salt Rejection. When compared to paddle wheel flow meters, magnetic flow meters have greater accuracy, especially in a compact skid design where the meters cannot be installed in long sections of straight-run pipe. As well, the paddle wheel meters have moving parts which require more frequent cleaning and maintenance.

1.2.1.8 Epoxy Coated Frames

The MTU and CIP frames will be professionally sandblasted and epoxy coated. Rubber blocking will be provided for installation to allow the skid frame to sit off of the concrete floor, ensuring the bottom of the frame is dry. This prevents premature corrosion and paint failure.

1.2.2 Hydra$_{MAX}$ Control System

1.2.2.1 Membrane Treatment Unit - Advanced Analytics

Delco's proposed equipment ensures that proper analytics are provided at all locations of changing conditions to ensure the system can be operated sustainably and that system health metrics are accurate and representative of how the system is really operating.

Delco's advanced Hydra$_{MAX}$ control system includes KPI's (Key Performance Indicators) that remove the guess work for operators. In real time, %NPF (Percent Normalized Permeate Flow) is indicated for the train as a unit, or stage of each train when inter-stage flow meters are included. This allows the operators to instantly identify if and when a treatment train needs a cleaning. The key to a sustainable operation of a membrane treatment system is to clean before it is too late. This strategy can greatly increase the life expectancy of the membranes. The graphical representation of the membrane array will change color on the operator interface, indicating that a cleaning is needed. The following are system metrics calculated in real time:

- Normalized Permeate Flow (NPF)
- Percent Normalized Flow (%NPF)
- Net Driving Pressure (NDP)
- Percent Recovery
- Salt Rejection
- Differential Pressure

1.2.2.1.1 Red Lion HMI

Delco's proposal includes the use of Red Lion HMI system. Red Lion provides modular process visualization, with a powerful graphical engine. The Red Lion HMI is also uniquely configured for storing and transmitting logged process information.

1.2.2.2 Remote Support and System Access

The Hydra$_{MAX}$ control system can be accessed by a direct internet connection. This facilitates Delco Water staff, at our location in Saskatoon, SK remotely connecting to the equipment. With this built-in capability we can check logs, access alarm history, and see critical process conditions from a remote location. With these remote log-in features, Delco Water can provide timely and situational advice to an operator experiencing problems in the water treatment plant. All access, both local and remote, is logged internally, providing security to the Owner that unauthorized access is not available to users who do not have proper credentials. The remote access is fully featured and provides the ability for Delco Water personnel, or the local operator, to gain control of the system, check alarms, make operational changes, and maintain the operation of the plant without being physically present. This has advantages for the Owner that plant operation can be more versatile and reactive, and not dependent on being present on site.

1.2.2.3 Delco Water Connected Platform – Delco Live

A recent addition to Delco Water’s standard offering is hardware for an optional connected cloud based remote viewing platform. The connected platform will ensure constant monitoring for key performance indicators. There will be no reliance on Delco people to check on these systems, or on operators to let us know when something is going wrong. We can set notification levels outside of what the onsite control system has in place to ensure that we are notified before any issues become serious. With the connected platform – we can log in immediately while on the phone and start helping. This is a game changer for our ability to provide customer support on our product line.

1.3 Equipment

1.3.1 Quality of Proposed Equipment

Delco Water strategically chooses our equipment suppliers based on the following criteria:

- Value and performance track record
- Lifespan costs and reliability
- Technical support
- Proximity of local trouble shooting and technical support
- Global presence and recognition
- Compatibility with other equipment

1.3.2 Design Capacity

Two Membrane Treatment Unit options of differing flows have been considered. Each option includes a bypass blend flow which bypasses the membrane unit and combines with the permeate as the final product.

	Option 1	Option 2	
Maximum Operation Time/Day:	24	24	*hrs*
Days of Operation/Year:	365	365	*days*
MTU Feed Water Flow Rate:	47.3	94.6	*L/s*
Bypass Water Flow Rate:	5.9	11.9	*L/s*
Permeate Water Flow Rate:	37.9	75.7	*L/s*
Total Treated Water Flow Rate:	43.8	87.6	*L/s*
Total Treated Water Capacity:	3,783	7,566	*m^3/day*
	1,380,795	2,761,590	*m^3/year*

1.3.3 Equipment Design

1.3.3.1 Option 1 - Membrane Treatment Unit Equipment

- One (1) Membrane Treatment Unit (MTU) with Blend, 694 USgpm total product
- Approximate skid size: 8,000 mm L x 2,300 mm W x 3,700 mm H
- 15:6, 7 element array
    - Seven (7) 8" membrane elements per vessel, 147 membranes total
    - Stainless-steel pre-filter housing
    - Grundfos PACO KP feed pump
    - Fedco interstage hydraulic pressure booster and pump (energy recovery device)
    - Epoxy coated skid frame
    - On skid sample sink
    - Automatic and manual valves
    - Automated flow control
    - Automated raw purge step
    - Automated permeate flushing
    - Automated recirculation piping
    - Stainless-steel high-pressure piping, PVC low pressure piping
    - Instrumentation included: pressure transmitters and gauges, common feed conductivity, train permeate conductivity, common feed temperature, and feed and concentrate flow
- HYDRA$_{MAX}$ Control System
    - PLC, HMIs, electrical equipment
- One (1) Clean-in-Place System (CIP) skid
    - Approximate skid size: 3,620 mm L, 3,800 mm W, 4,900 mm H
    - Dual function for CIP cleaning and chemical neutralization
    - Polyethylene tank, heater, level switches, circulation pump, valves, epoxy coated frame, and temperature transmitter
- Chemical Dosing System (CHEM)
    - One (1) Dual Panel Antiscalant System
        - Antiscalant day tank, duty/standby dosing pumps, valves, calibration column, pressure regulation, foot valve, control cables, installation kit, panel mounted
    - One (1) Dual Panel Disinfectant System
        - Duty/standby dosing pumps, valves, calibration column, pressure regulation, foot valve, control cables, installation kit, panel mounted
    - One (1) Dual Panel pH Adjustment System
        - Duty/standby dosing pump, valves, calibration column, pressure regulation, foot valve, control cables, installation kit, panel mounted
    - One (1) Dual Panel Feed pH Reduction System
        - Duty/standby dosing pumps, valves, calibration column, pressure regulation, foot valve, control cables, installation kit, panel mounted
    - One (1) Single Panel CIP Acid Dosing System
        - Duty dosing pump, valves, calibration column, pressure regulation, foot valve, control cables, installation kit, panel mounted
    - One (1) Single Panel CIP pH Adjustment System
        - Duty dosing pump, valves, calibration column, pressure regulation, foot valve, control cables, installation kit, panel mounted

1.3.3.2 Option 2 - Membrane Treatment Unit Equipment

- One (1) Membrane Treatment Unit (MTU) with Blend, 1,388 USgpm total product
- Approximate skid size: 8,000 mm L x 3,400 mm W x 4,000 mm H
- 25:15, 7 element array
  - Seven (7) 8” membrane elements per vessel, 280 membranes total
  - Stainless-steel pre-filter housing
  - Grundfos PACO KP feed pump
  - Fedco interstage hydraulic pressure booster and pump (energy recovery device)
  - Epoxy coated skid frame
  - On skid sample sink
  - Automatic and manual valves
  - Automated flow control
  - Automated raw purge step
  - Automated permeate flushing
  - Automated recirculation piping
  - Stainless-steel high-pressure piping, PVC low pressure piping
  - Instrumentation included: pressure transmitters and gauges, common feed conductivity, train permeate conductivity, common feed temperature, and feed and concentrate flow
- $\text{HYDRA}_{\text{MAX}}$ Control System
  - PLC, HMIs, electrical equipment
- One (1) Clean-in-Place System (CIP) skid
  - Approximate skid size: 4,350 mm L, 4,350 mm W, 5,870 mm H
  - Dual function for CIP cleaning and chemical neutralization
  - Polyethylene tank, heater, level switches, circulation pump, valves, epoxy coated frame, and temperature transmitter
- Chemical Dosing System (CHEM)
  - One (1) Dual Panel Antiscalant System
    - Antiscalant day tank, duty/standby dosing pumps, valves, calibration column, pressure regulation, foot valve, control cables, installation kit, panel mounted
  - One (1) Dual Panel Disinfectant System
    - Duty/standby dosing pumps, valves, calibration column, pressure regulation, foot valve, control cables, installation kit, panel mounted
  - One (1) Dual Panel pH Adjustment System
    - Duty/standby dosing pumps, valves, calibration column, pressure regulation, foot valve, control cables, installation kit, panel mounted
  - One (1) Dual Panel Feed pH Reduction System
    - Duty/standby dosing pumps, valves, calibration column, pressure regulation, foot valve, control cables, installation kit, panel mounted
  - One (1) Single Panel CIP Acid Dosing System
    - Duty dosing pump, valves, calibration column, pressure regulation, foot valve, control cables, installation kit, panel mounted
  - One (1) Single Panel CIP pH Adjustment System
    - Duty dosing pump, valves, calibration column, pressure regulation, foot valve, control cables, installation kit, panel mounted

1.3.4 Start-up Chemical Supply

- One barrel (210 L) of antiscalant has been provided for start-up chemical for the MTU.
- Disinfectant, pH adjustment, pH reduction, and reducing agent supply by others

1.4 Field Installation Information

1.4.1 Membrane Treatment Unit

1.4.1.1 Pre-Assembled and Skid Mounted Equipment

- One (1) skid complete unit consisting of one (1) membrane train
  - Dimensions
    - Option 1: 8,000 mm L x 2,300 mm W x 3,700 mm H
    - Option 2: 8,000 mm L x 3,400 mm W x 4,000 mm H
- One (1) complete Clean in Place unit
  - Dimensions
    - Option 1: 3,620 mm L, 3,800 mm W, 4,900 mm H
    - Option 2: 4,350 mm L, 4,350 mm W, 5,870 mm H

1.4.1.2 Equipment Shipped Loose for Field Assembly by Others

- Membranes
- Pre-Cartridge Filters
- Analytical Control Network Adapter Cable
- CIP polyethylene tank
- CIP Tank Heater
- CIP Level Switches

1.4.2 Chemical Feed System

1.4.2.1 Pre-Assembled and Panel Mounted Equipment

- Number of panels described in individual process equipment description

1.4.2.2 Equipment Shipped Loose for Field Assembly by Others

- Control Cable Input: 4-20 mA, Pulse, Start/Stop
- Control Cable Relay Output: Tank Level, Stroke Signal
- Control Cable Output: 4-20 mA, Feed Rate, Pressure
- Install Kit:
  - Injection unit w/ spring-loaded non-return valve
  - PE outlet hose, 6 m
  - PVC inlet hose, 2 m
  - PVC deaeration hose, 2 m
  - PE Foot Valve w/ strainer & weight, w/o level indication

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1.5 Commissioning and Training

1.5.1 Proposed Commissioning and Training Trips

- In the estimate, we have allotted for general commissioning and training. Final trip requirements to be detailed at later project stages.

1.5.2 Water Quality Testing

Delco Water will be responsible for one total set of laboratory samples to be collected at system start-up. Note that these samples will be standard lead time and not expedited. If expedited results are desired Delco can provide a cost adder. Delco also has not included water quality testing for bacteriological testing or coliform testing. The testing parameters for the necessary sample locations are seen in the following table:

Source	General Chemical	Metals
Raw Groundwater	X	X
MTU Combined Product	X	X

1.6 Process Drawings

We can supply P&ID's, General Assembly Drawings, and Electrical Field Wiring Schedules in advance or at tender stage to help with tender bidding accuracy.

1.7 Process Design Considerations

Delco Water can review analysis for sizing of all pumps, valves, heaters, tanks, etc. at a later stage.

1.8 Equipment Cutsheets

Delco Water can supply Equipment Cutsheets at a later stage.

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1.9 Delco Water – Automation Engineering Services

1.9.1 Automation Engineering Services

- Functional Requirements Document
- PLC Programming
- HMI and SCADA Programming
- FAT Testing
- CSA Approval
- Drawings
    - Network Diagrams
    - Inter-panel Power Distribution Diagrams
    - PLC IO Card and Field Wiring Diagrams

1.9.2 PLC Control System

Details to be finalized at a later date.

1.9.3 Panels and Controls

MTU PLC Panel c/w HMI (120VAC, On MTU Skid)
NEMA 4X Panel
15” Red Lion HMI
M340 CPU
M340 Ethernet Communications Card (Modbus TCP)
M340 I/O Rack
Power and I/O Terminals
UPS with alarm relay for PLC IO
Power Filter
DC supply
Ethernet switch
Drawings
CSA approval

POWER Requirement
2-15A 120V Circuits brought to the panel

*Final PLC control and panels to be determined during detailed design phase.

1.10 Enhancements and Alternatives

If the consultant is interested, Delco can provide further cost implications for the following features:

1.10.1 Dual Train Operation (System Redundancy)

Delco Water can provide two (2) trains for each option, each rated for 50% of the requested capacity. Delco Water highly recommends dual train operation as it provides equipment redundancy in the event of critical failure of a skid. Dual train operation also allows for one skid to be operational while the other skid is being cleaned or down for maintenance.

1.10.2 Handheld Instrumentation

Handheld equipment specific to operating the water treatment plant equipment is required for piloting as well as in full-scale. We would like to provide the opportunity for the end user to purchase the equipment they do not currently have that will be needed for their plant. The following table shows a list of all items required for the water treatment plant. If individual items are required, Delco can break out pricing as desired.

Handheld Instrument	Part Number
Meters	
DR900 Multiparameter Portable Colorimeter	9385100
MP-6p Portable Meter	HMP6P
Calibrations/Verification Standards	
Stablcal Verification Ampule, 2100Q	2961701-CA
SpecCheck Secondary Gel Standards Set, DPD Chlorine – LR	2635300
DR/Check Absorbance Standard Kit (Set of 4)	2763900
Sample Cells	
Glass sample cell, 25 mm round, 10-20-25 mL marks, pk/6	2401906
Sample cells with caps for 2100 portable turbidimeters, 10 mL, 6 pcs	2434706
Sample Cell: 1" Round Glass 10mL	2427606
Carrying Case	
Monoprice Weatherproof/Shockproof Hard Case	-
Total Cost	**TBD, price is as per Hach website. Delco covers freight costs.**

NOTE: Any applicable taxes (including GST and PST) are extra.

1.10.3 Service and Support – Extended Service Contract

One of Delco's strengths is our service team composed of engineers and technicians located in Saskatoon, Humboldt, and Winnipeg. With this contract Delco will work with the Client on the most suitable service contract for the Client, that will achieve the common goal of continuing to operate a maintenance friendly, trouble free water treatment system. The services below outline some tasks that we feel are required to maintain a properly functioning and safe system. Each service contract can be altered with additions or deletions to suit the Client's needs.

1. Cleaning, calibrating, and verification of system sensors and analyzers
2. Help desk support

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3. Annual plant status reviews, as-built documentation
4. Site Trips
5. Site auditing and quoting on parts requiring replacement or additional

1.10.4 Motor Starter and CIP Tank Heater Requirements

Upon request, Delco can provide pricing for starter panels for the CIP heater, CIP pump, and on-skid booster pumps. If the design intent is for these starters/VFDs to be provided by others (part of a plant MCC or otherwise), the following are Delco's requirements for the skid equipment:

- MTU Booster Pump – VFD required. If the VFD is to be controlled over Ethernet, Modbus TCP is preferred. Ethernet/IP is also possible but would require a more expensive PLC communications card. Any hardwired IO should be connected to the MTU PLC panel.
- CIP Pump – Soft start or VFD required. See above regarding control over Ethernet options. All hardwired IO should be connected to the MTU PLC panel or the CIP PLC panel (if one exists).
- CIP Heater – Includes additional interlocks to protect the heater form running in an empty tank. All hardwired IO should be connected to the MTU PLC panel or the CIP PLC panel (if one exists).

1.11 Budgetary Pricing

Please see the below budgetary pricing for the End User. Delco Water has allowed consideration for commissioning. Material cost, and actual specification details will impact final pricing, we assume the numbers below with a +/- 10% spread at this time.

Option 1

Description	Price
(1) MTU Train with Bypass Blend, (1) Clean-in-Place/Neutralization Skid, Chemical Dosing System, and Automation – net 43.8 L/s total	$920,000

Option 2

Description	Price
(1) MTU Train with Bypass Blend, (1) Clean-in-Place/Neutralization Skid, Chemical Dosing System, and Automation – net 87.6 L/s total	$1,240,000

Notes:

- All applicable taxes (including PST & GST) on the above-mentioned items would be extra.
- The above pricing is in CAD. Final invoicing is dependent on current exchange rates.
- FOB Delco Water, Saskatoon, SK, Canada

1.11.1 Pricing Validity

This proposal is budgetary only. Material pricing and delivery is highly volatile right now. We can work with you on improving cost and lead time estimates as project timelines become clearer.

1.12 General Project Exclusions

The following are to be provided by others:

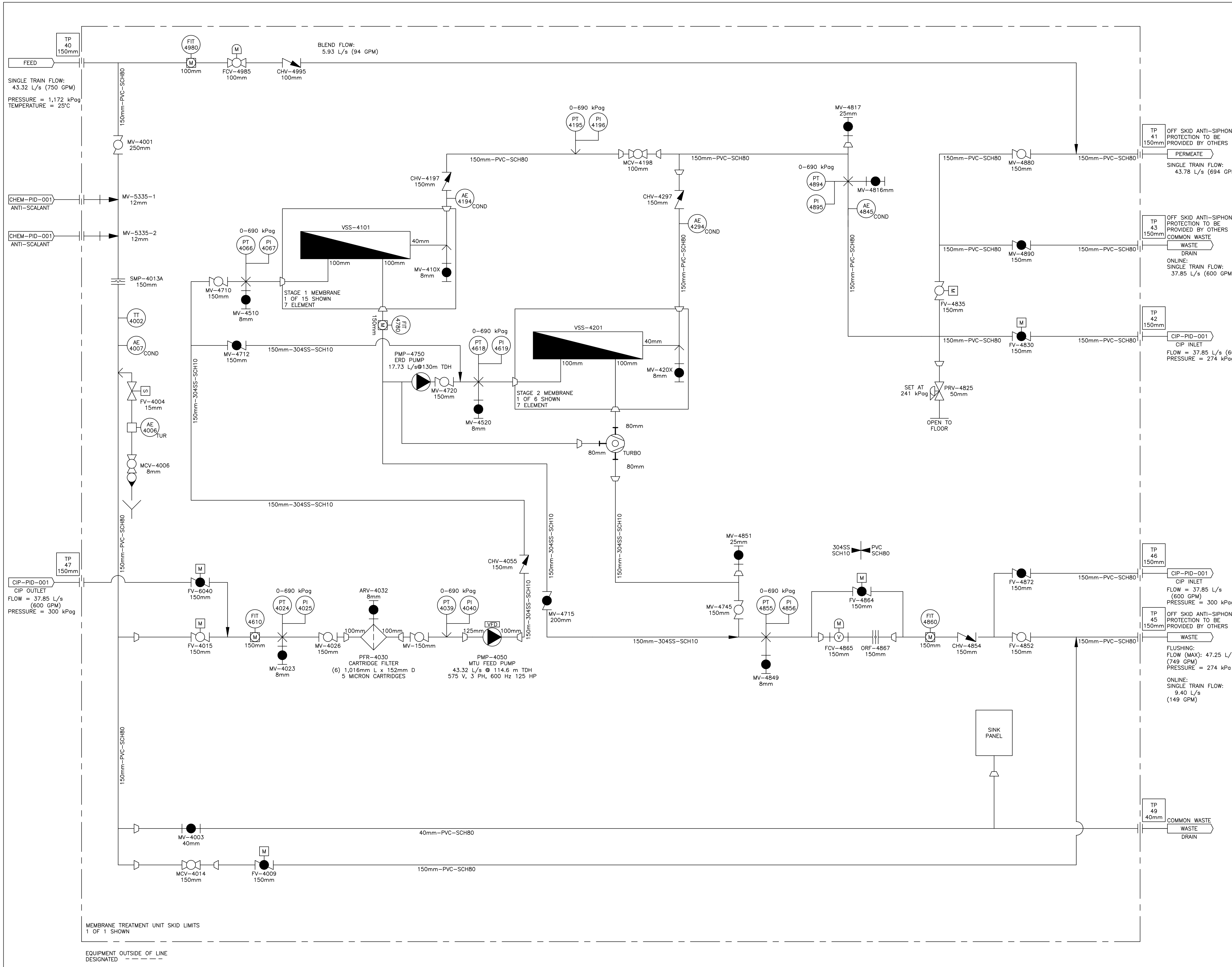
- Floor drains
- See below table for off-skid pumps not indicated in the above scope of supply such as well pumps, transfer pumps, booster pumps

Process Flow	Flow Range	Pressure Range	Notes
MTU Feed	Option 1 – 47.3 L/s Option 2 – 94.6 L/s	30 – 35 psi	VFD recommended*, maintain pressure

**Note: If different well control is desired, please discuss further with Delco.*

- Skid installation
- Equipment access platforms, walkways, stairs etc.
- Unloading, receiving and safe/heated storage of equipment at site until ready for installation
- Equipment anchor bolts
- Raw materials, chemicals, and other consumables required for commissioning and normal operation that aren't listed in this scope
- Cleaning chemicals and chemical containers
- Proprietary cleaners
- Spill containments, injection quills and saddles, chemical transfer pumps
- Discharge chemical feed tubing
- Supply and installation of interconnecting piping routes, vessel face piping, piping and fittings, hangars, supports, pipe racks and fitting.
- All accessories, instruments or other not included in our P&ID's and scope of supply tables to be supplied and installed by others
- Reservoir level switches or other devices used for start/stop signals other than those specified in the scope of supply
- Costs and schedule are subject to escalation based on transport availability of equipment and personnel
- Electrical wiring interconnections (including wiring, conduit and other appurtenances) to and between Delco Water panels/equipment
- Motor control panels. VFDs, motor starters, CIP heater starter provided by others in an MCC
- All motor starters and high voltage contactors (ex. MTU feed pumps, CIP pump, CIP tank heater) installation by others
- Automation full integration of water treatment plant
- Supply of hand-held instrumentation
- Water quality testing for bacteriological testing or coliform testing
- All taxes including but not limited to PST, GST, HST are extra
- Bonding, insurance, and all permitting
- Pricing is in CAD. Final invoicing is dependent on current exchange rates
- FOB Delco Water, Saskatoon, SK, Canada
- Due to the current pandemic and manufacturer lead times, Delco cannot guarantee a specific delivery dates that are out of Delco's control and therefore is excluding from liquidated damages due to schedule delays. Delco will work alongside the Consultant, Client, and General Contractor to optimize schedule and communicate any changes in schedule that will affect the overall project timeline.

- Delco reserves the right to choose alternative manufacturers or vendors to help maintain project cost and schedule implications. These changes will be reviewed with the client prior to moving ahead.
- Any requirement for the removal of the door, wall, roof, any other structural element or other building service or structure that may interfere with transporting the treatment equipment into the existing building.



REVISION HISTORY

REV	DESCRIPTION	DATE
1	ISSUE FOR BUDGET PROPOSAL	2022-02-23

PRELIMINARY NOT FOR CONSTRUCTION

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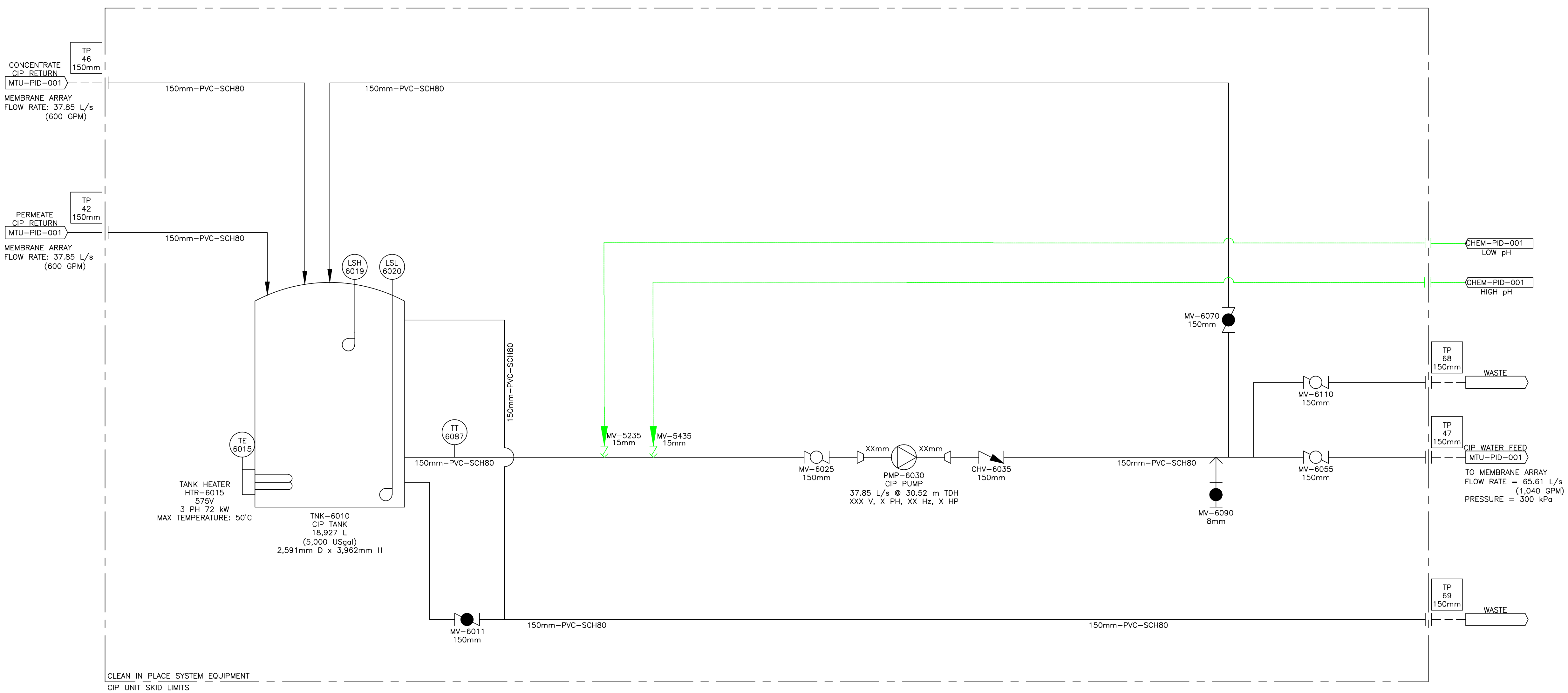
PROJECT NO:	4227554
PROJECT TITLE:	OLIVENHAIN WATER DISTRICT MTU
CONTACT:	
TITLE:	MEMBRANE TREATMENT UNIT
DESCRIPTION:	PROCESS AND INSTRUMENTATION DIAGRAM
DATE:	REV: 1 · SHEET: 1 OF 1 · DRAWN BY: IP
DWG NO: MTU-PID-001	CHECKED BY: TD



REVISION HISTORY

REV	DESCRIPTION	DATE
1	ISSUE FOR BUDGET PROPOSAL	2022-02-24

PRELIMINARY
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PROJECT NO: 4227554

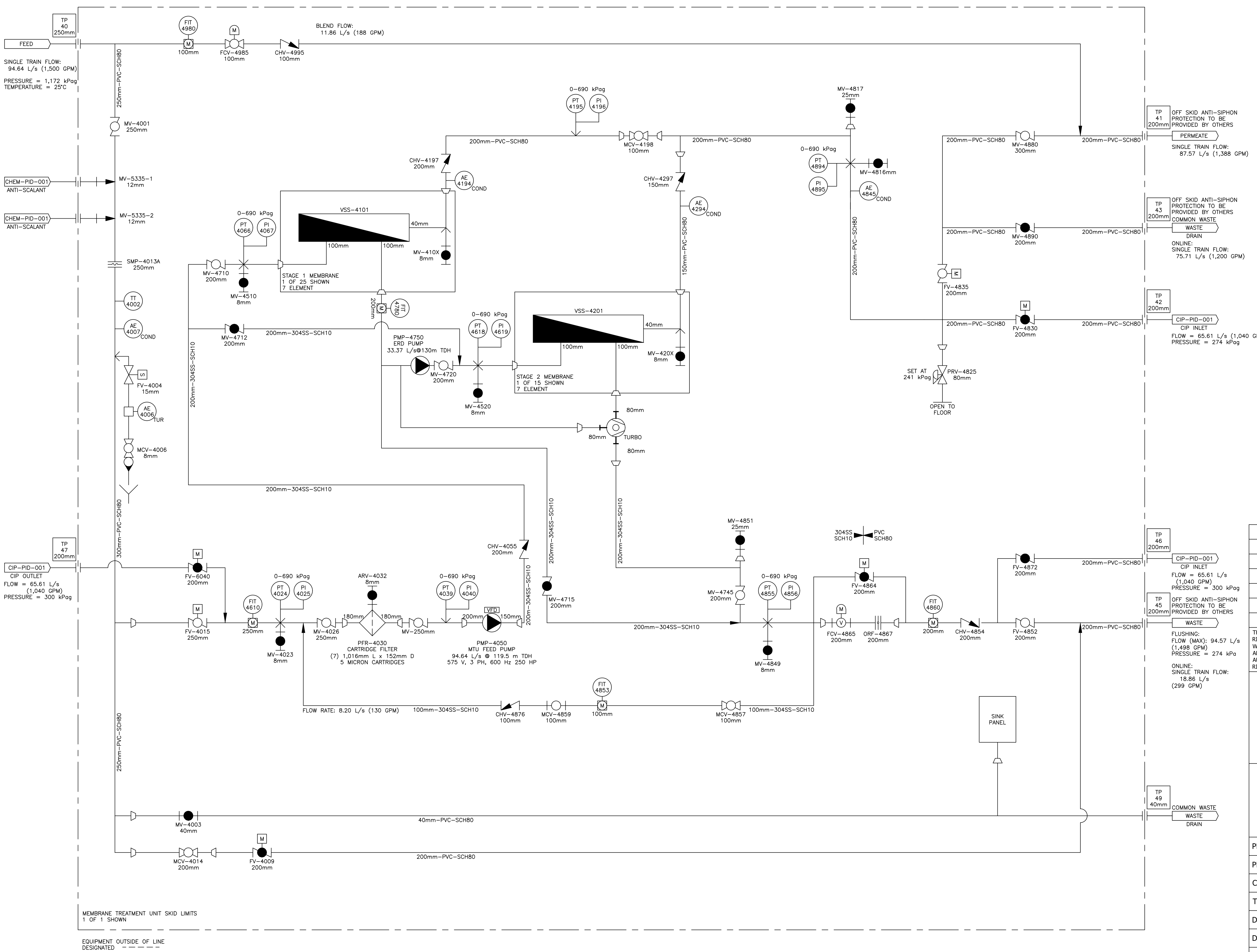
PROJECT TITLE: OLIVENHAIN WATER DISTRICT

CONTACT:

TITLE: CLEAN-IN-PLACE UNIT

DESCRIPTION: PROCESS AND INSTRUMENTATION DIAGRAM

DATE: 2022-02-24	REV: 1	SHEET: 1 OF 1	DRAWN BY: IP
DWG NO: CIP-PID-001			CHECKED BY: TD



REVISION HISTORY

REV	DESCRIPTION	DATE
1	ISSUE FOR BUDGET PROPOSAL	2022-02-23

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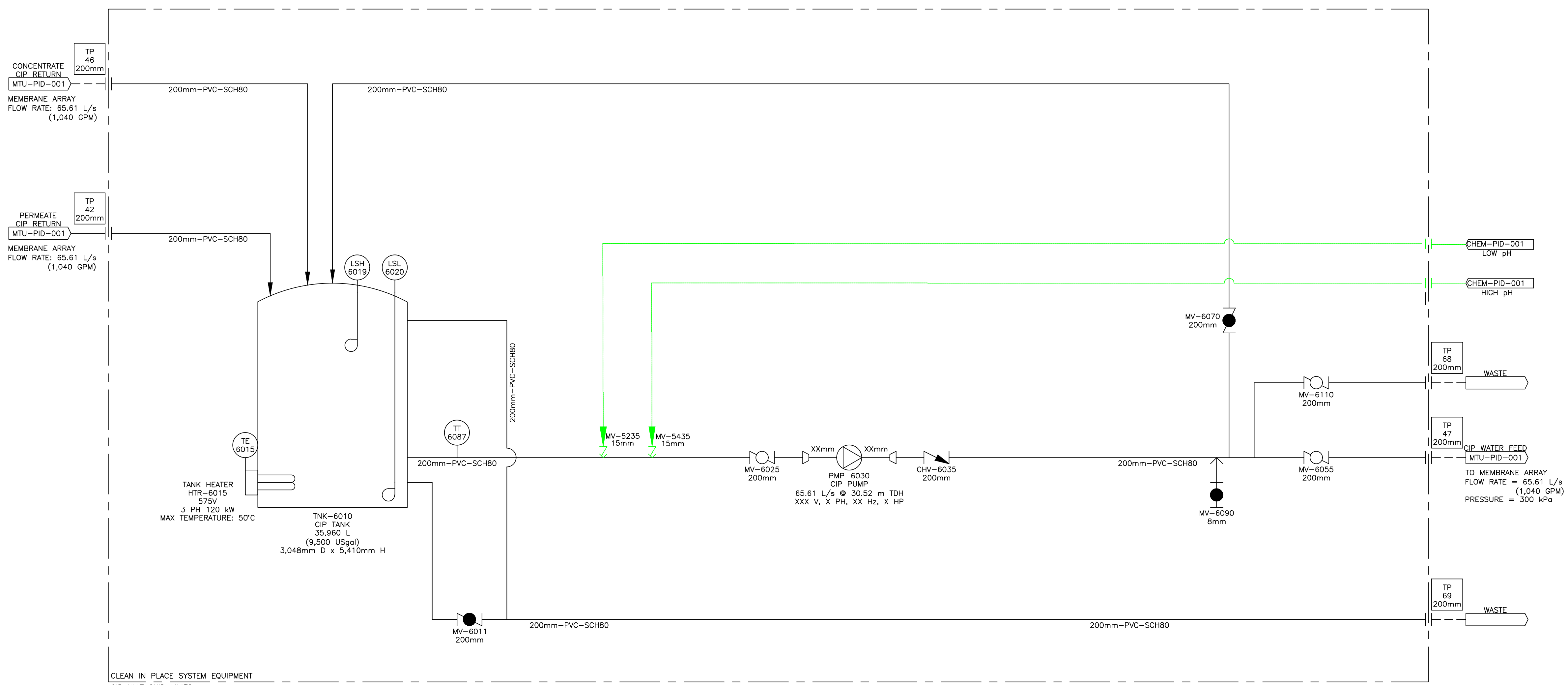
PROJECT NO:	4227554
PROJECT TITLE:	OLIVENHAIN WATER DISTRICT MTU
CONTACT:	
TITLE:	MEMBRANE TREATMENT UNIT
DESCRIPTION:	PROCESS AND INSTRUMENTATION DIAGRAM
DATE:	REV: 1 / SHEET: 1 OF 1 / DRAWN BY: IP
DWG NO: MTU-PID-001	CHECKED BY: TD



REVISION HISTORY

REV	DESCRIPTION	DATE
1	ISSUE FOR BUDGET PROPOSAL	2022-02-24

PRELIMINARY
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PROJECT NO: 4227554

PROJECT TITLE: OLIVENHAIN WATER DISTRICT

CONTACT:

TITLE: CLEAN-IN-PLACE UNIT

DESCRIPTION: PROCESS AND INSTRUMENTATION DIAGRAM

DATE: 2022-02-24 | REV: 1 | SHEET: 1 OF 1 | DRAWN BY: IP

DWG NO: CIP-PID-001 | CHECKED BY: TD

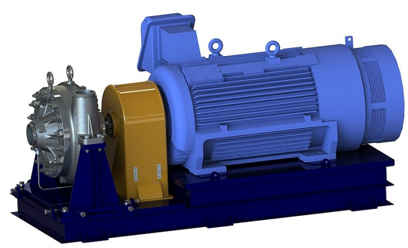
FEDCO Equipment
Sales and Service

Proposal Number
57853.0

Proposal Date:
03/02/2022
Valid for 60 Days

Prepared For:
Igors Ponomarjovs
Delco Water

Prepared by: Jerry Ross
jross@fedco-usa.com
734-731-0909 (mobile)
Microsoft Teams Chat (skype)



NOTES/COMMENTS:

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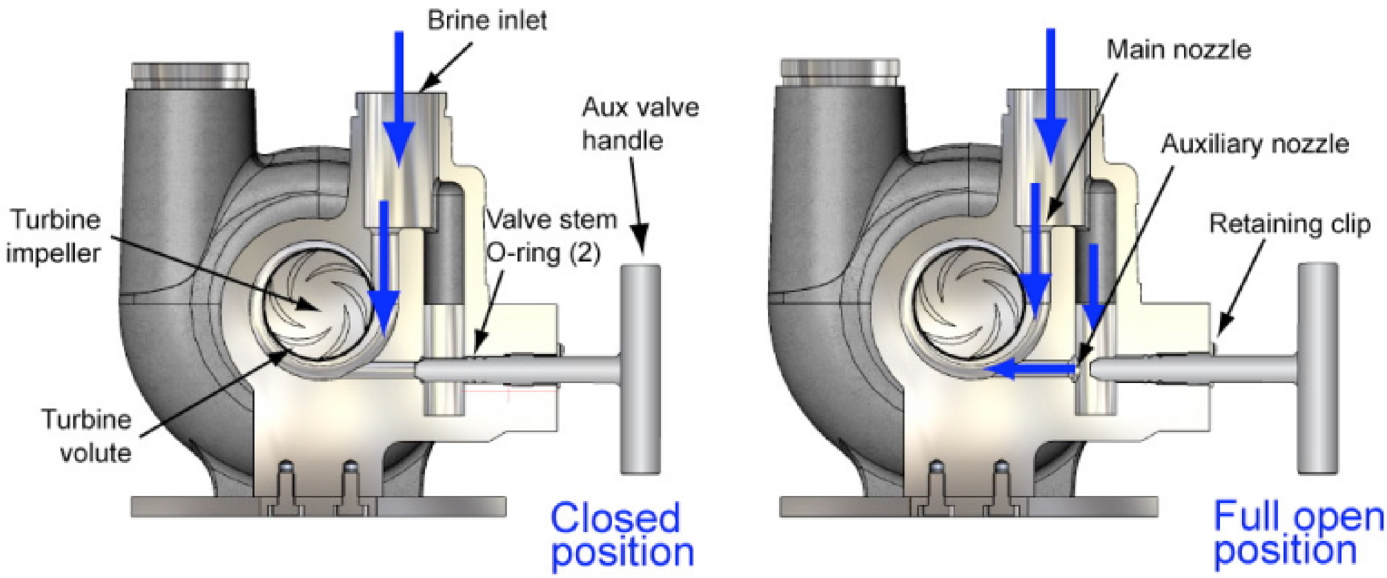


Features

All brine passes through the turbine volute and impeller - no wasted energy
Double o-rings ensure reliable valve stem sealing - standard o-ring sizes
Retaining plate prevents accidental removal of valve stem from the unit
Valve stem in duplex SS 2205
Valve handle in 316 SS
Multi-turn design allows precise brine flow adjustment
May be adjusted by suitable valve actuator - contact FEDCO for details

Operation

Open Aux Valve - increase brine flow / reduce brine pressure
Close Aux Valve - reduce brine flow / increase brine pressure

Installation Considerations

The brine outlet pressure needs to be maintained during operation at the value specified by FEDCO (refer to technical proposal).
Brine flow shall not be bypassed during startup or shutdown - let entire brine flow pass though HPB
Do not allow the membranes to drain after shutdown. This can damage the membranes and result in large amounts of air passing through the HPB turbine section during startup.
If system recovery is more than 50%, contact FEDCO for review.

Booster Data

Model	HPB-130
Feed Flow	281 gpm
Brine Flow	149 gpm
Membrane Pressure	198 psi
Brine Pressure	184 psi
Brine Outlet Pressure	10 psi
Feed Temp	77 °F
Feed TDS	3896
Feed SG (calc)	0.999
Cvo	12.72
Cvc	11.29

*Cv data is approximate

Booster Performance

Feed Boost Pressure	64 psi
Pump Outlet Pressure	134 psi

Booster Options

Standard Pressure Operation
Super Duplex Construction

Material

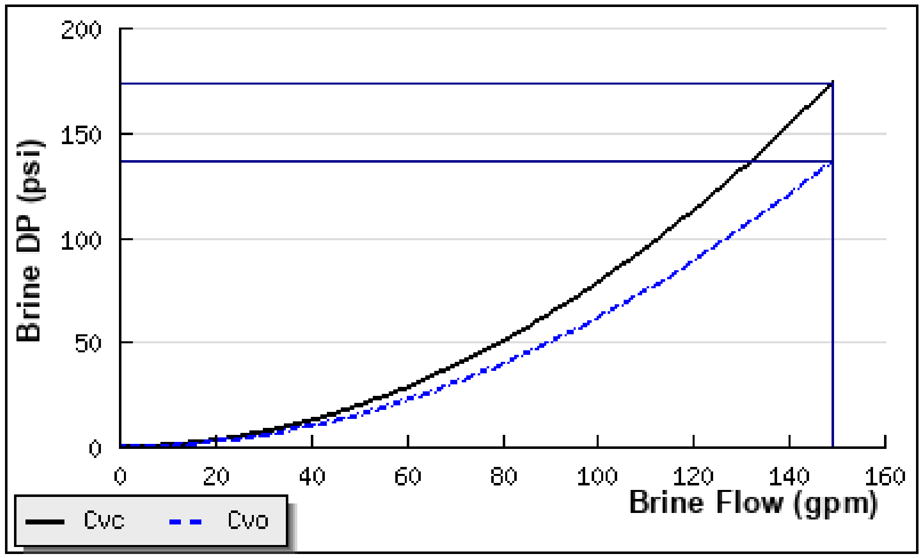
Casing Bolts	316 SS
Bearings	Non-metallic
O-rings	Buna N
Feet	
Casing	Duplex 2507
End Cap	Duplex 2507
Rotor	Duplex 2507 or = (bar stock)
Valve Stem	Duplex 2507

Brine Pressure Control

The HPB replaces the brine control valve normally used to regulate brine flow. The HPB includes an integral brine control valve that can adjust the brine flow and pressure within the approximate range indicated below. Cvo is the lower limit (open) and Cvc is the higher limit (closed). If a centrifugal high pressure feed pump is used, you will also need means to adjust feed flow and pressure such as a feed throttle valve or a variable frequency drive (VFD) on the feed pump or a FEDCO HEMI integrated turbocharger and flow control device. Please contact FEDCO for details.

Pipe Fittings

Pipe fittings between the booster and the process piping will result in loss of boost pressure and such losses need to be included in the system design.



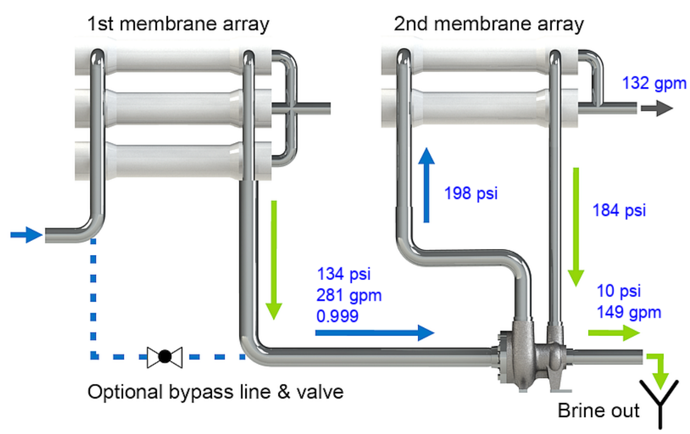
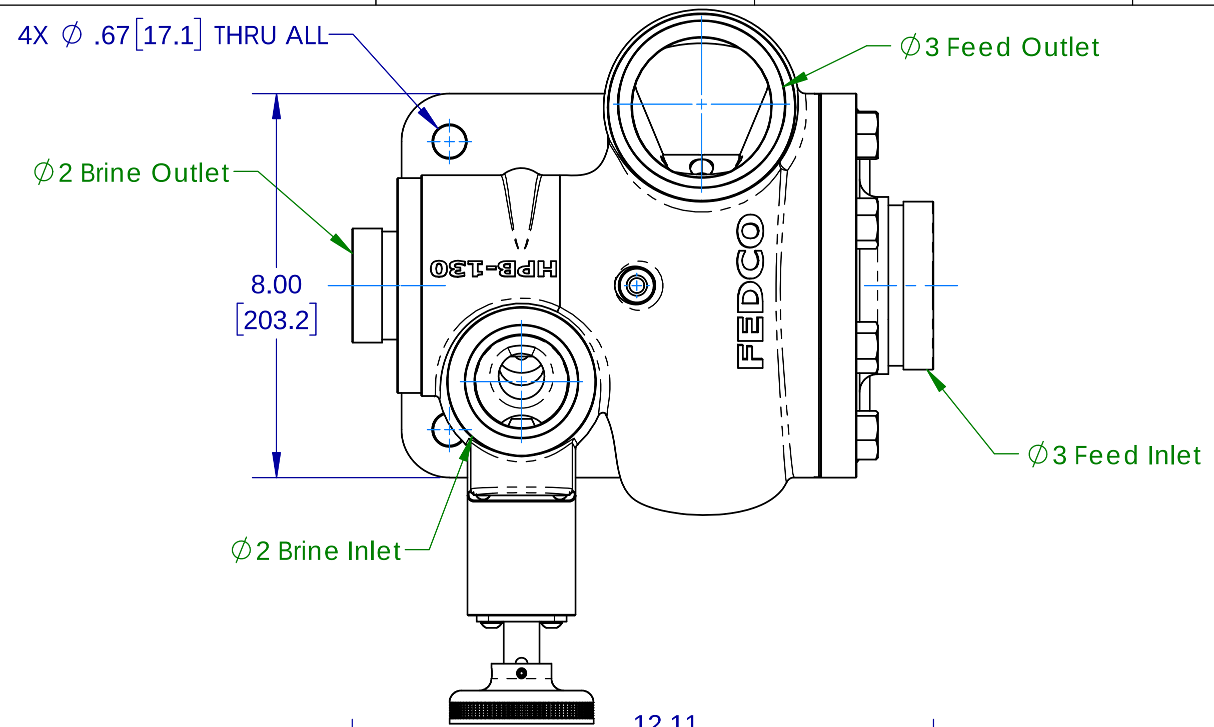
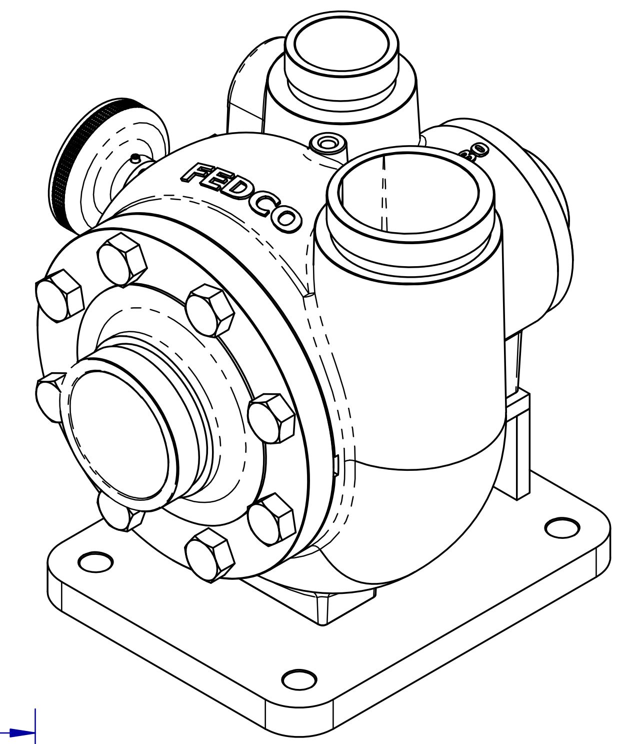
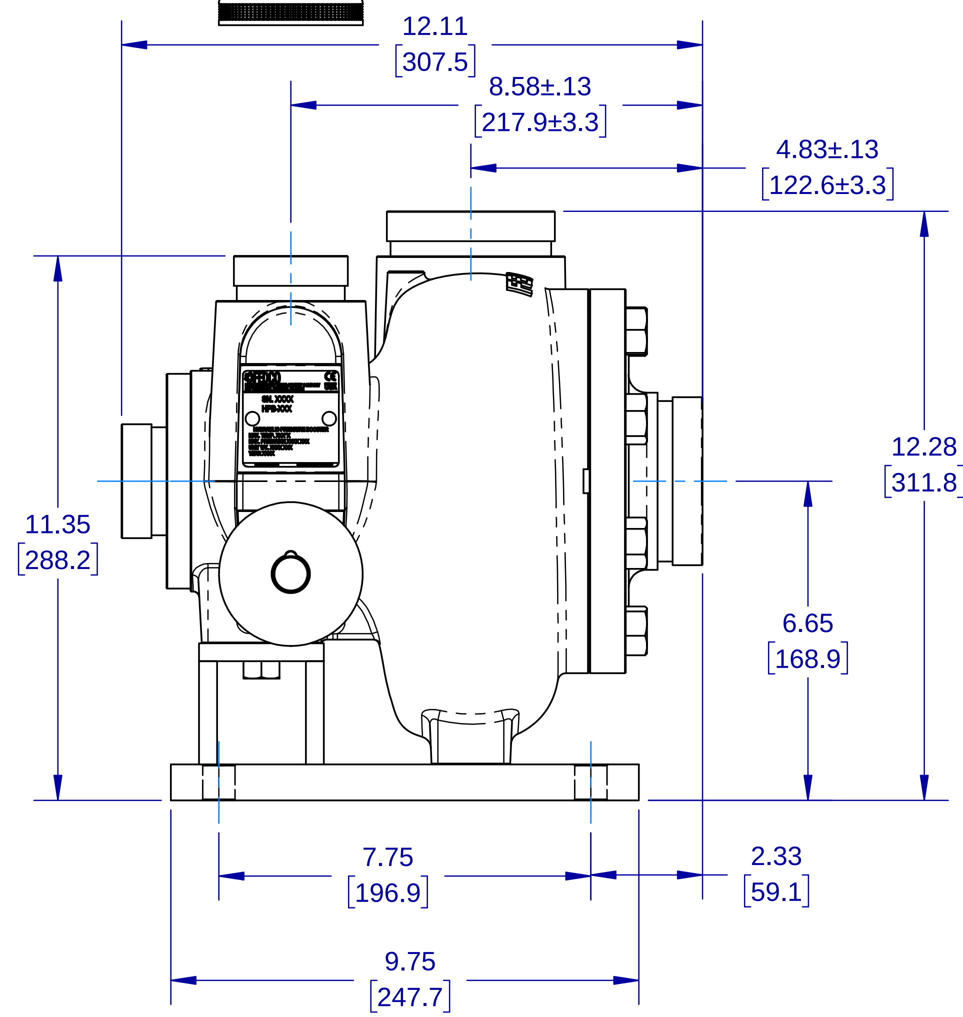
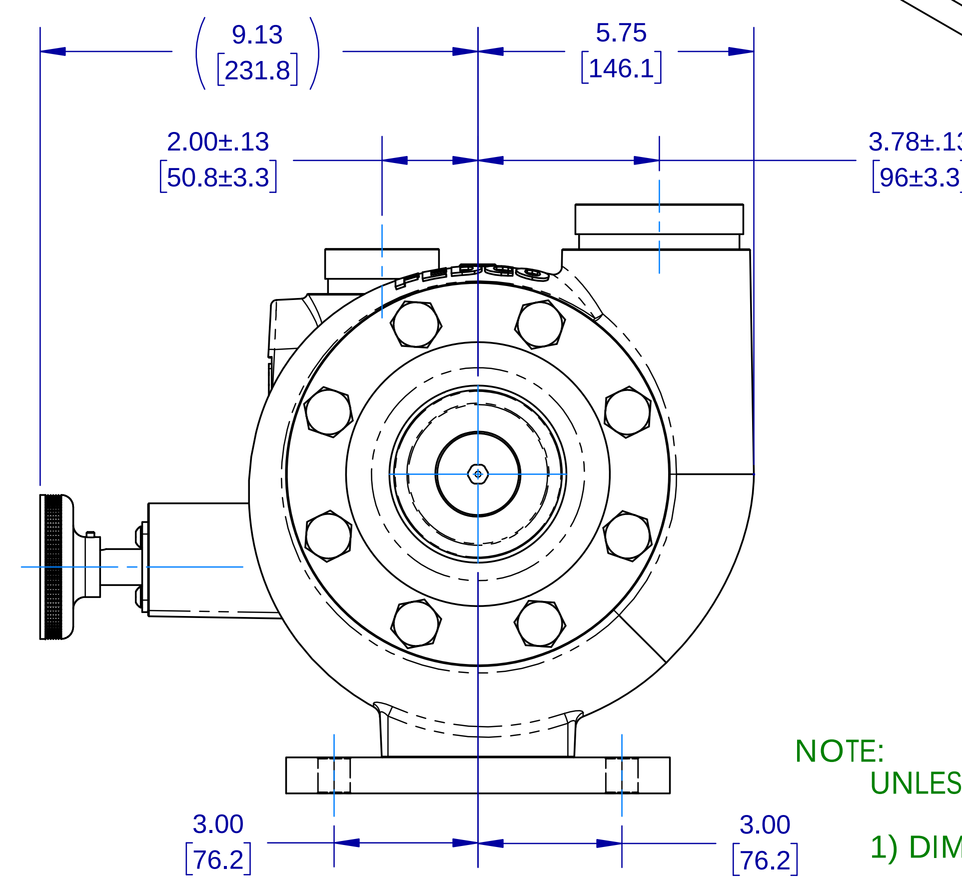


Figure for hydraulic illustration only









NOTE:
UNLESS OTHERWISE SPECIFIED

1) DIMENSIONS IN [ ] ARE IN MILLIMETERS

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL±1/32
ANGULAR: MACH±1 BEND ±
TWO PLACE DECIMAL ±.01
THREE PLACE DECIMAL ±005

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL

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	NAME	DATE
DRAWN		
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

MODEL: **HPB-130**

DESCRIPTION: "OUTLINE"

SIZE	DWG. NO.:	REV:
B		

SCALE: 1:4 | WEIGHT: 117.24lb | SHEET: 1 OF 1

Sign for Nameplate Acceptance: ______________________________

Pump Data	
Model	MSD-16004
Stages	4
Flow	750 gpm
Inlet Pressure	15 psi
Discharge Pressure	178 psi
Feed Temp	77 °F
Feed TDS	3,896
Feed SG (Calc)	0.999
Efficiency	83.5%
RPM	3,281
NPSHR	31 ft
Absorbed Power	85.4 hp
Pump Weight	532 lb

Pump Options
Crating
Standard Inlet Pressure
Motor Junction Box Position F1
Standard Inlet Orientation
Super Duplex Construction

Motor Data	
Manufacturer	Siemens or equivalent
Power Rating (HP)	100.0 - 460/60/3
Service Factor	1.15
Efficiency	94.1%
Full Load Amps	108.0
Frame	405TSC
Enclosure	TEFC
Electric Power	68 kW
Unit Weight	1,097 lb

Drive Data	
Manufacturer	Mitsubishi or equivalent
Type	VFD
Enclosure	- LONG LEAD TIME
Model	FR-F840-01160-3-60
Dimensions (in)	
Electric Power	70 kW
Unit Weight	0

Material	
Shaft	Super Duplex SS 2507
Inlet & Outlet	Super Duplex SS 2507
Stage Bearings	Non-metallic
Motor Adapter	Anodized 713 aluminum
Motor Coupling	Flexible Disc-FNC Treated Carbon Steel
Motor Coupling Guard	316L SS
Pump Leveling Foot	Carbon Steel - A36 Painted
Optional Baseplate	Carbon Steel - A36 Painted
Mechanical Seal Faces	SiC/Graphite
Throttle Nipple & Drain Line	Super Duplex SS 2507
Impellers & Diffusers	Super Duplex SS 2507

Features
Thrust Bearing (water lubricated)
Journal Bearings (water lubricated)
See Outline Drawing for additional information

Feed Pressure Control

Centrifugal pumps require a way to adjust the discharge pressure to match the membrane requirement. There are two ways
- Use a variable frequency drive (VFD) to adjust pump speed
- Use a pressure control valve on the pump discharge

FEDCO can recommend which approach is best for your system
Note: Motors supplied by FEDCO are rated by the supplier for the indicated duty conditions. Contact FEDCO for details.

Discharge Pressure: 178 psi
Feed Flow: 750 gpm
Feed Pressure: 15 psi
Feed TDS: 3,896
Feed SG: 0.999

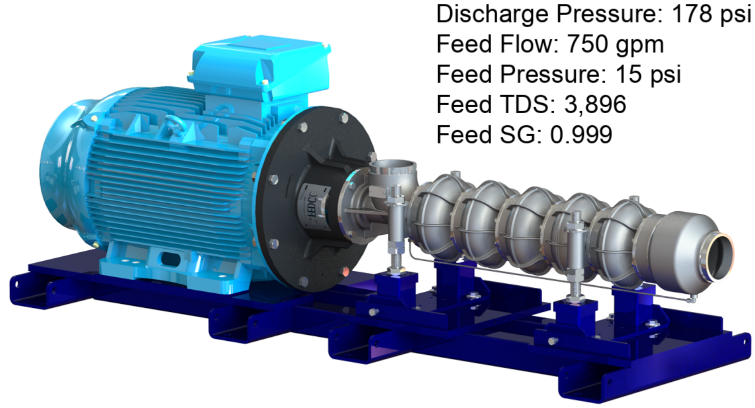
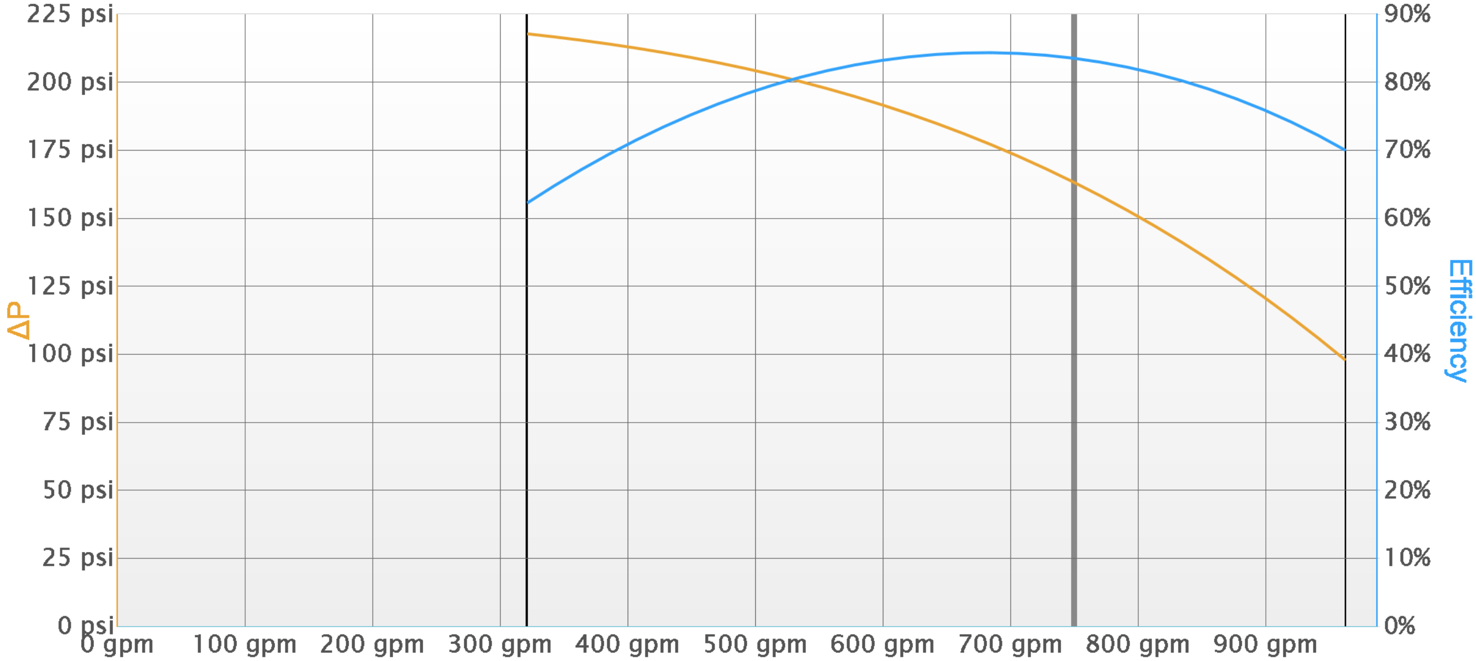
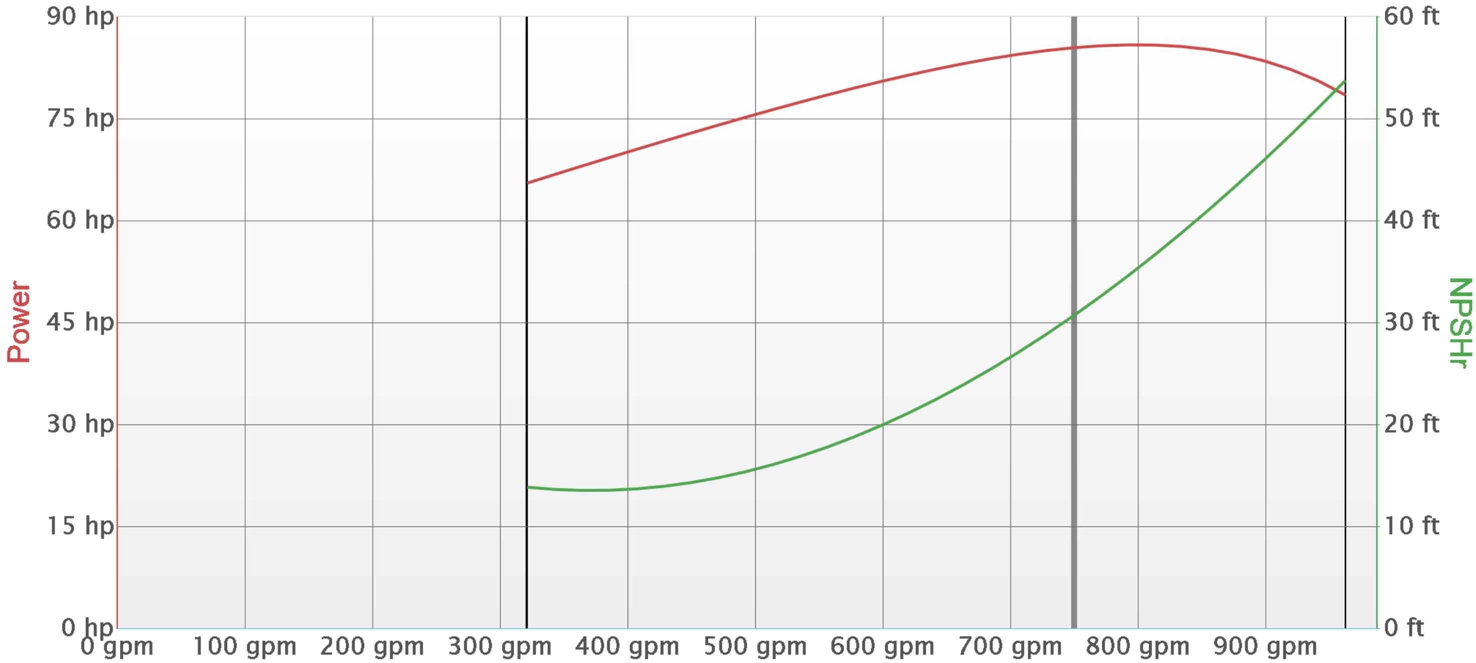


Figure for hydraulic illustration only

MSD-16004 Performance Curves

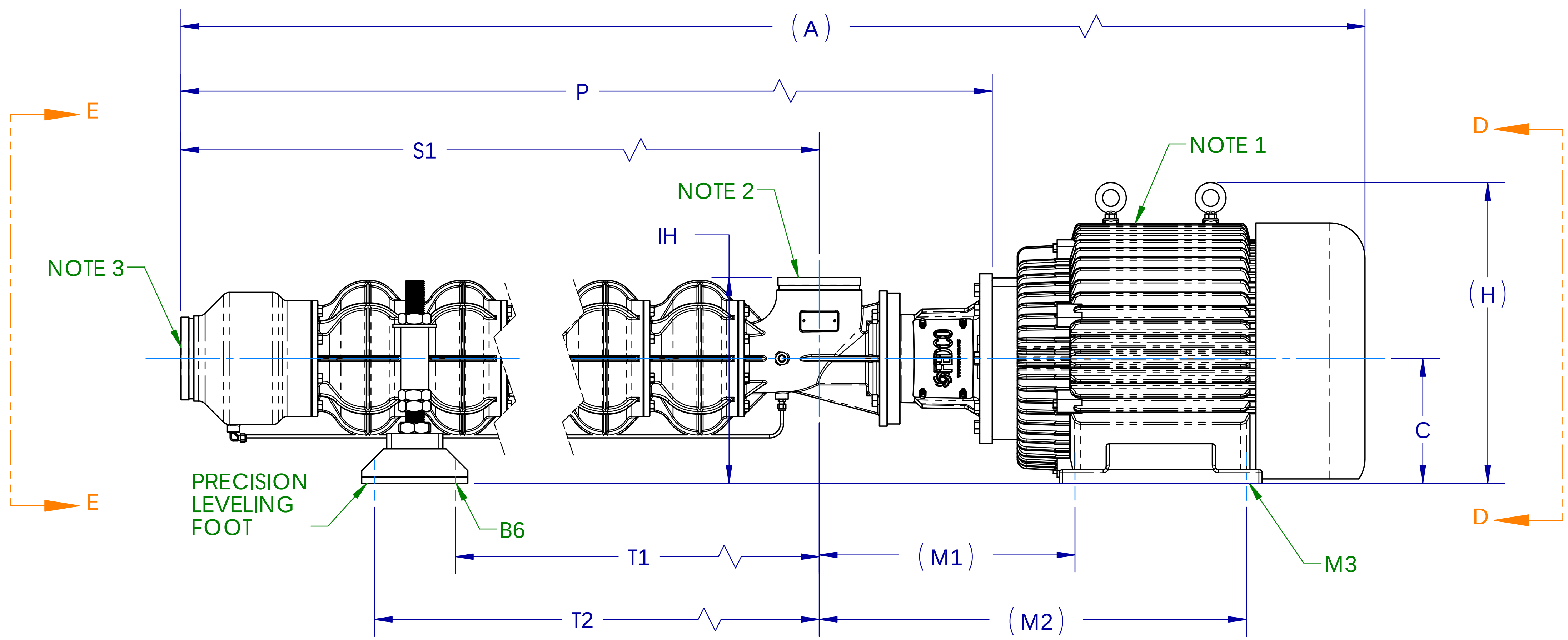


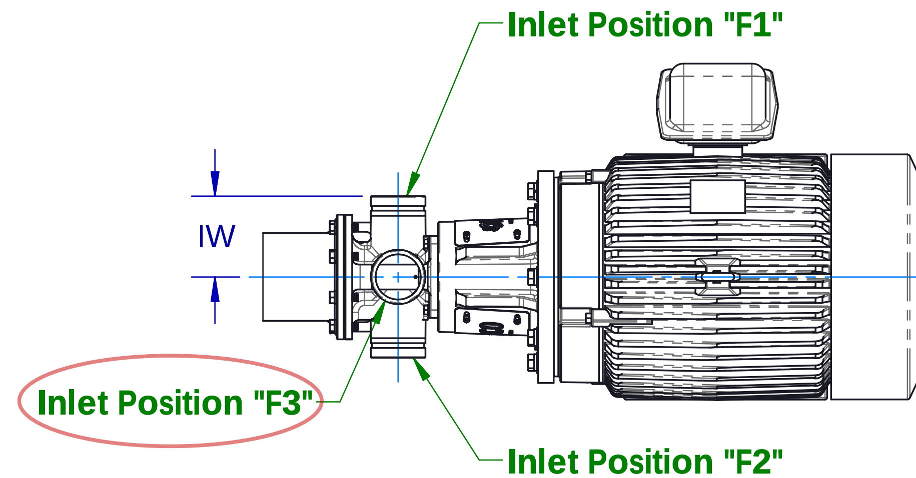


Pump Input		Pump Duty			
Flow	ΔP	RPM	Eff	Power	NPSHR
750 gpm	163 psi	3281	83.5%	85.4 hp	31 ft

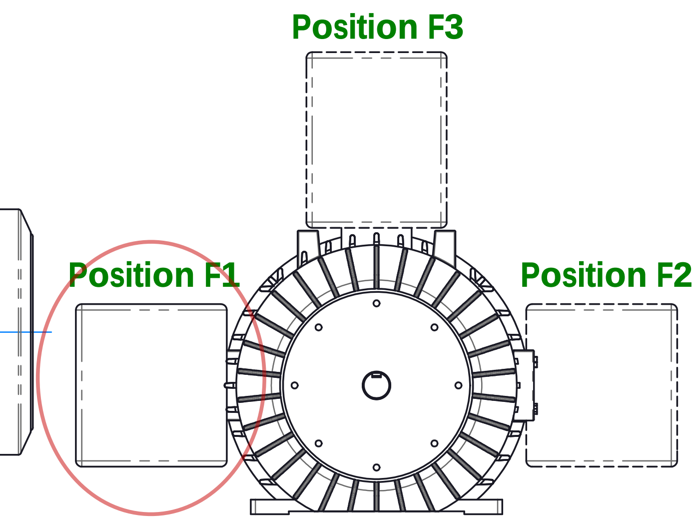
Label	Value
Note 1 - Motor Frame Size	405TSC
Note 2 - Feed Inlet	6" Pipe Coupling
Note 3 - Feed Outlet	6" Pipe Coupling
A	91.07"
B6	4 x Ø0.81" Slotted Holes
B9	2 x 6.50" TYP.
C	10.00" +.00 / -.06
H	24.14"
IH	16.50" ±.06
M1	19.50" ±.06
M2	33.25" ±.06
M3	4 x Ø0.81"
M4	2 x 8.00" TYP.
P	61.19" ±.13
S1	47.32" ±.13
T1	25.33"
T2	31.83"
W1	19.78"
W2	30.66"

Note: Preliminary values are not suitable for construction.

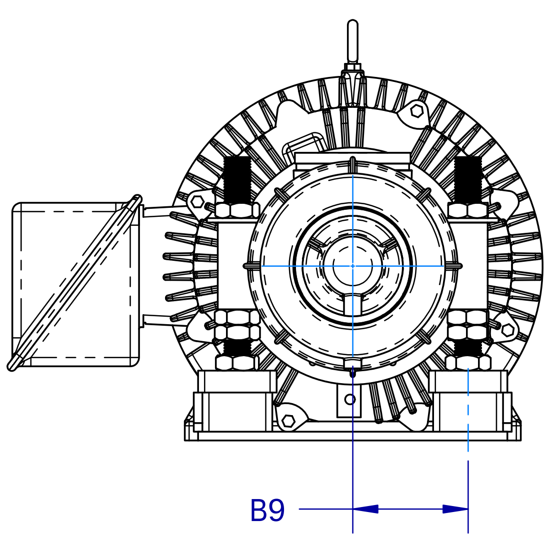




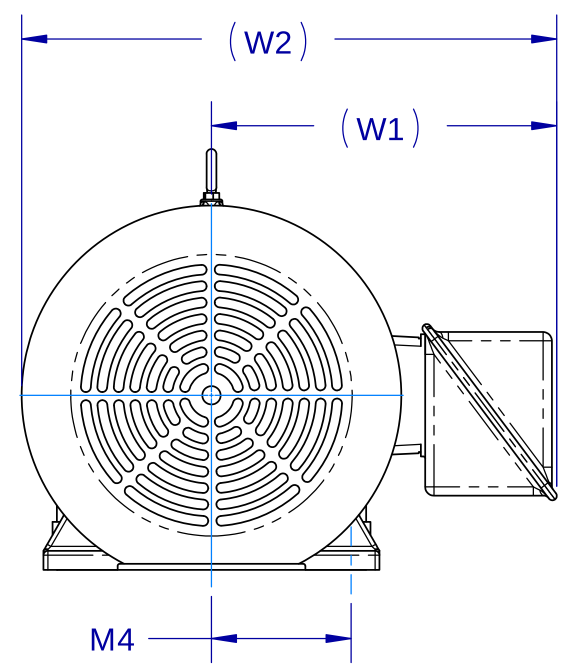
Inlet Position
(Viewed From Top of Pump)



Electrical Box Position
(Viewed from Motor Front)



SECTION E-E



SECTION D-D

NOTE: If Inlet Is Rotated (F1 or F2 Configuration), "IH" Dimension Does Not Apply. Use "IW"

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±1/32
ONE PLACE DECIMAL ±.063 [1.6]
TWO PLACE DECIMAL ±.031 [0.8]
THREE PLACE DECIMAL ±.010 [0.3]
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
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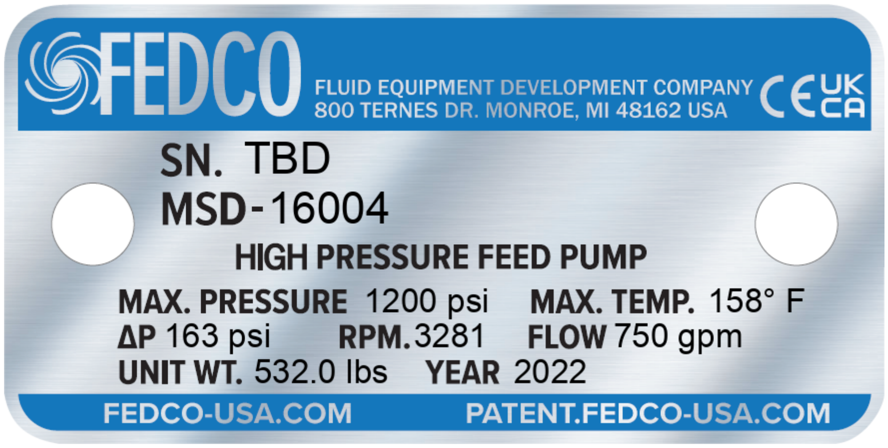
MODEL: MSD-16004

DESCRIPTION: MSD-16004-405TSC
Preliminary Outline
Not Suitable for Construction

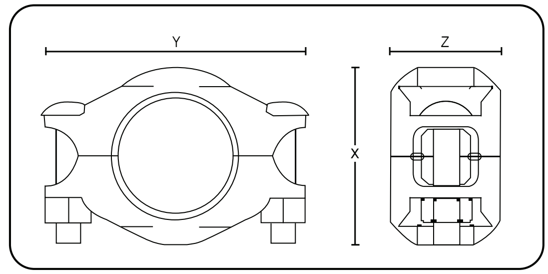
SIZE
DWG. NO.: Inq. 57853.0
REV:
WEIGHT: Pump:532# Motor:1097#
SHEET: 1 OF 1



Sign for Nameplate Acceptance: ______________________________

Piedmont

STYLE D SUPERDUPLEX
HIGH PRESSURE (1200 PSI)



Pressure Rating:
1200 psi (82 bar) with schedule 40s pipe (special alloys) with cut groove only - all sizes.

Housing - SUPERDUPLEX stainless steel type CE8MN, PREN > 40.

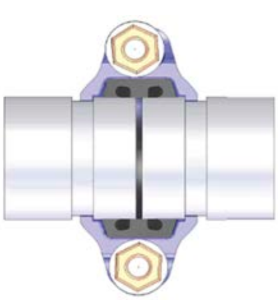
Gaskets - Flush-fit EPDM rubber, suitable for hot and cold water service. NSF/ANSI 61 approved for drinking water system components.
Temperature range:
-20°F to 230°F (-29°C to 110°C)
Not suitable for petroleum service.

Bolts / nuts / washers - Round-head, square-neck, type 316 stainless steel bolts conform to ASTM F-593, group 2, condition CW. For couplings sizes from ¾'' to 3'', use heavy hex type 651 silicon bronze nuts, for couplings of 4'' and up use 316 stainless steel nuts. Washers are heavy pattern 316 stainless steel.

Style D Specifications

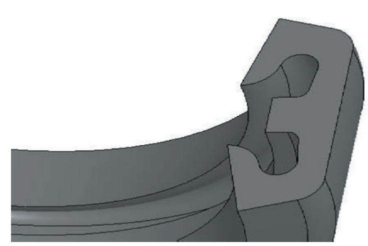
Nominal size	Dimensions			Aprx Weight	Pressure rating when cut grooves and SCH40 pipes are used
	X	Y	Z		
Inches	inches (mm)	inches (mm)	inches (mm)	lbs. (kg)	PSI (BAR)
3/4	2.00 (50.8)	3.20 (81.3)	1.71 (43.4)	1.04 (0.47)	1200 (82)
1	2.29 (58.2)	3.42 (86.9)	1.68 (42.7)	0.97 (0.44)	1200 (82)
1-1/4	2.50 (63.5)	3.65 (92.7)	1.68 (42.7)	1.08 (0.49)	1200 (82)
1-1/2	2.76 (70.1)	4.06 (103.1)	1.71 (43.4)	1.21 (0.55)	1200 (82)
2	3.74 (95.0)	4.46 (113.3)	1.85 (47.0)	1.92 (0.87)	1200 (82)
3	4.48 (113.8)	5.88 (149.3)	1.85 (47.0)	2.64 (1.20)	1200 (82)
4	5.21 (132.3)	6.90 (175.3)	2.02 (51.3)	4.54 (2.06)	1200 (82)
6	8.18 (207.8)	10.25 (260.4)	2.02 (51.3)	9.28 (4.21)	1200 (82)
8	10.90 (276.6)	14.00 (355.6)	2.40 (61.0)	24.50 (11.10)	1200 (82)

Note: Working pressure ratings based upon generally accepted pressure piping design standards and testing in accordance with ASME Section VIII Division 1 pressure vessel test method.



Allowable Pipe End Separation

Assembly Overview



Flush-fit Gasket

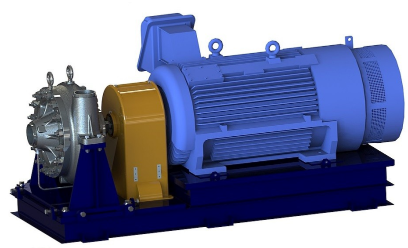
FEDCO Equipment
Sales and Service

Proposal Number 57852.0

Proposal Date:
03/02/2022
Valid for 60 Days

Prepared For:
Igors Ponomarjovs
Delco Water

Prepared by: Jerry Ross
jross@fedco-usa.com
734-731-0909 (mobile)
Microsoft Teams Chat (skype)



NOTES/COMMENTS:

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Email: sales@fedco-usa.com

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FEDCO SINGAPORE
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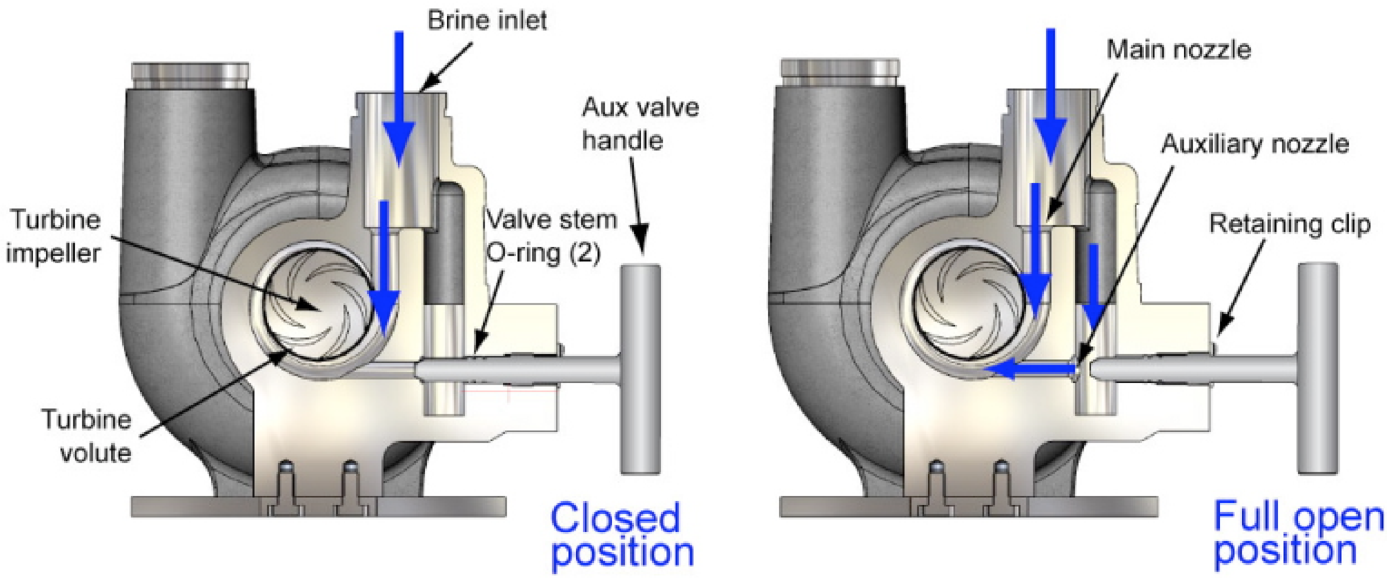
Email: sales@fedco-usa.com



Features

All brine passes through the turbine volute and impeller - no wasted energy
Double o-rings ensure reliable valve stem sealing - standard o-ring sizes
Retaining plate prevents accidental removal of valve stem from the unit
Valve stem in duplex SS 2205
Valve handle in 316 SS
Multi-turn design allows precise brine flow adjustment
May be adjusted by suitable valve actuator - contact FEDCO for details

Operation

Open Aux Valve - increase brine flow / reduce brine pressure
Close Aux Valve - reduce brine flow / increase brine pressure

Installation Considerations

The brine outlet pressure needs to be maintained during operation at the value specified by FEDCO (refer to technical proposal).
Brine flow shall not be bypassed during startup or shutdown - let entire brine flow pass though HPB
Do not allow the membranes to drain after shutdown. This can damage the membranes and result in large amounts of air passing through the HPB turbine section during startup.
If system recovery is more than 50%, contact FEDCO for review.

Booster Data	
Model	HPB-250
Feed Flow	655 gpm
Brine Flow	299 gpm
Membrane Pressure	195 psi
Brine Pressure	183 psi
Brine Outlet Pressure	10 psi
Feed Temp	77 °F
Feed TDS	3896
Feed SG (calc)	0.999
Cvo	24.56
Cvc	22.72
*Cv data is approximate	

Booster Performance	
Feed Boost Pressure	51 psi
Pump Outlet Pressure	144 psi

Booster Options

Standard Pressure Operation
Super Duplex Construction

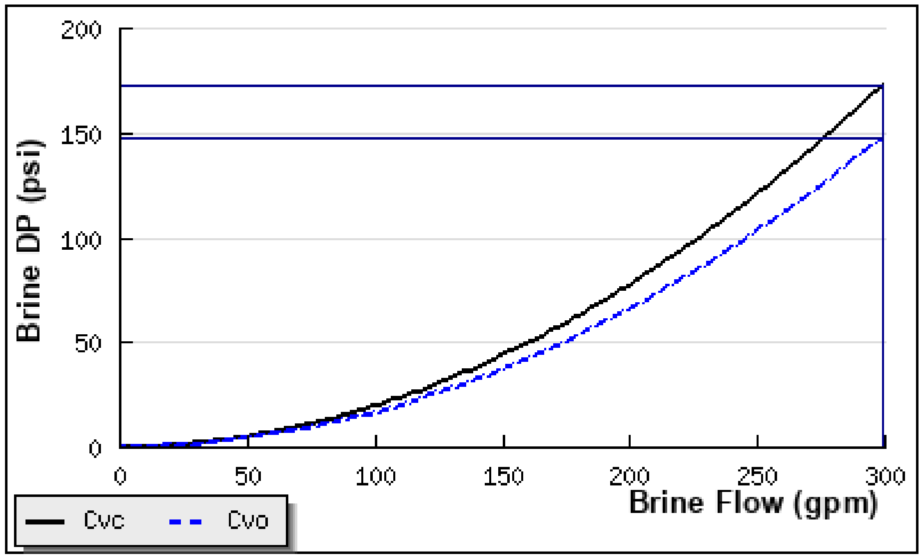
Material	
Casing Bolts	316 SS
Bearings	Non-metallic
O-rings	Buna N
Feet	
Casing	Duplex 2507
End Cap	Duplex 2507
Rotor	Duplex 2507 or = (bar stock)
Valve Stem	Duplex 2507

Brine Pressure Control

The HPB replaces the brine control valve normally used to regulate brine flow. The HPB includes an integral brine control valve that can adjust the brine flow and pressure within the approximate range indicated below. Cvo is the lower limit (open) and Cvc is the higher limit (closed). If a centrifugal high pressure feed pump is used, you will also need means to adjust feed flow and pressure such as a feed throttle valve or a variable frequency drive (VFD) on the feed pump or a FEDCO HEMI integrated turbocharger and flow control device. Please contact FEDCO for details.

Pipe Fittings

Pipe fittings between the booster and the process piping will result in loss of boost pressure and such losses need to be included in the system design.



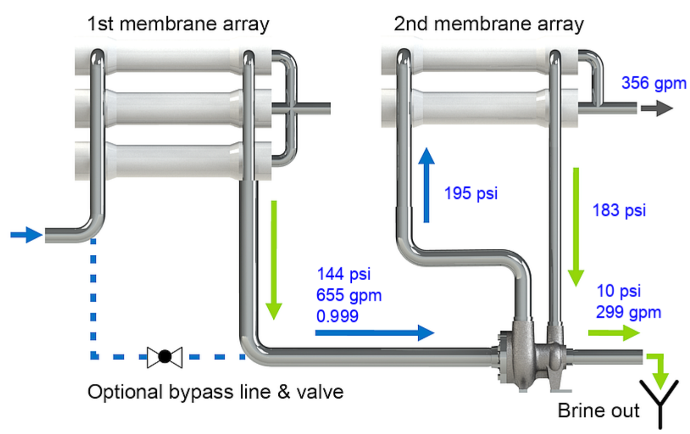
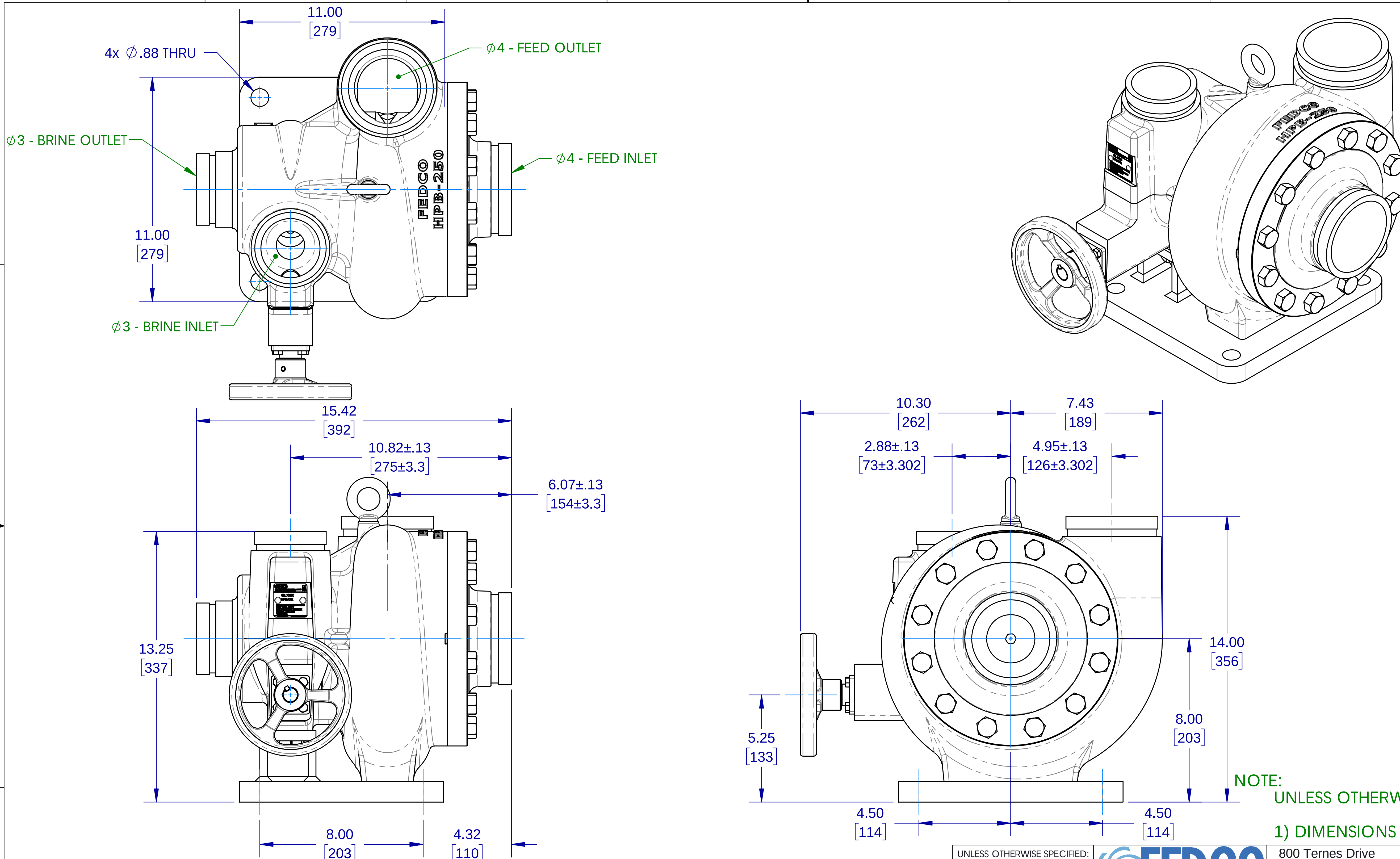


Figure for hydraulic illustration only



NOTE:
UNLESS OTHERWISE SPECIFIED

1) DIMENSIONS IN [ ] ARE IN MILLIMETERS

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL±1/32
ANGULAR: MACH±1 BEND ±
TWO PLACE DECIMAL ±.064
THREE PLACE DECIMAL ±.030

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL
SEE NOTE

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Monroe, MI 48162
USA
Tel: (734) 241-3935
Fax: (734) 241-5173
www.fedco-usa.com

MODEL: **HPB-250**

DESCRIPTION:

"OUTLINE"

SIZE B | DWG. NO.: | REV:

SCALE: 1:5 | WEIGHT: 225.70lb | SHEET: 1 OF 1

Sign for Nameplate Acceptance: ______________________________

Pump Data	
Model	MSD-35002
Stages	2
Flow	1,500 gpm
Inlet Pressure	15 psi
Discharge Pressure	183 psi
Feed Temp	77 °F
Feed TDS	3,896
Feed SG (Calc)	0.999
Efficiency	79.2%
RPM	3,504
NPSHR	44 ft
Absorbed Power	185.6 hp
Pump Weight	551 lb

Pump Options
Crating
Standard Inlet Pressure
Motor Junction Box Position F1
Standard Inlet Orientation
Super Duplex Construction

Motor Data	
Manufacturer	Siemens or equivalent
Power Rating (HP)	200.0 - 460/60/3
Service Factor	1.15
Efficiency	96.2%
Full Load Amps	225.0
Frame	447TSC
Enclosure	TEFC
Electric Power	144 kW
Unit Weight	1,767 lb

Drive Data	
Manufacturer	Yaskawa or equivalent
Type	VFD
Enclosure	IP20 UL,CSA, CE,RCM,RoHS - LONG LEAD TIME
Model	GA8OU4250ABM
Dimensions (in)	27.6x12.3x16.5
Electric Power	148 kW
Unit Weight	174 lb

Material	
Shaft	Super Duplex SS 2507
Inlet & Outlet	Super Duplex SS 2507
Stage Bearings	Non-metallic
Motor Adapter	Anodized 713 aluminum
Motor Coupling	Flexible Disc-FNC Treated Carbon Steel
Motor Coupling Guard	316L SS
Pump Leveling Foot	Carbon Steel - A36 Painted
Optional Baseplate	Carbon Steel - A36 Painted
Mechanical Seal Faces	SiC/Graphite
Throttle Nipple & Drain Line	Super Duplex SS 2507
Impellers & Diffusers	Super Duplex SS 2507

Features
Thrust Bearing (water lubricated)
Journal Bearings (water lubricated)
See Outline Drawing for additional information

Feed Pressure Control

Centrifugal pumps require a way to adjust the discharge pressure to match the membrane requirement. There are two ways
- Use a variable frequency drive (VFD) to adjust pump speed
- Use a pressure control valve on the pump discharge

FEDCO can recommend which approach is best for your system
Note: Motors supplied by FEDCO are rated by the supplier for the indicated duty conditions. Contact FEDCO for details.

Discharge Pressure: 183 psi
Feed Flow: 1,500 gpm
Feed Pressure: 15 psi
Feed TDS: 3,896
Feed SG: 0.999

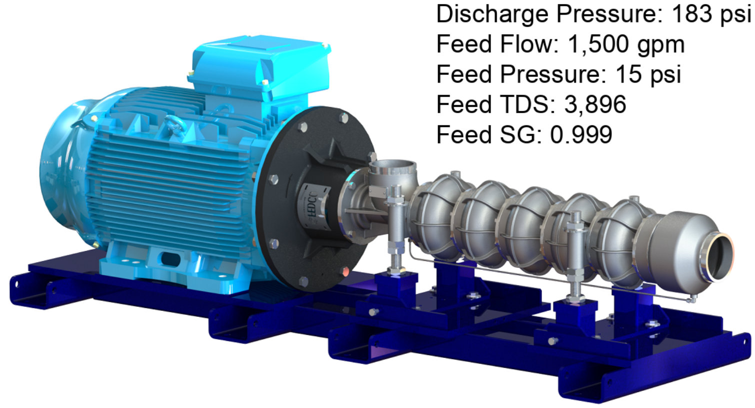
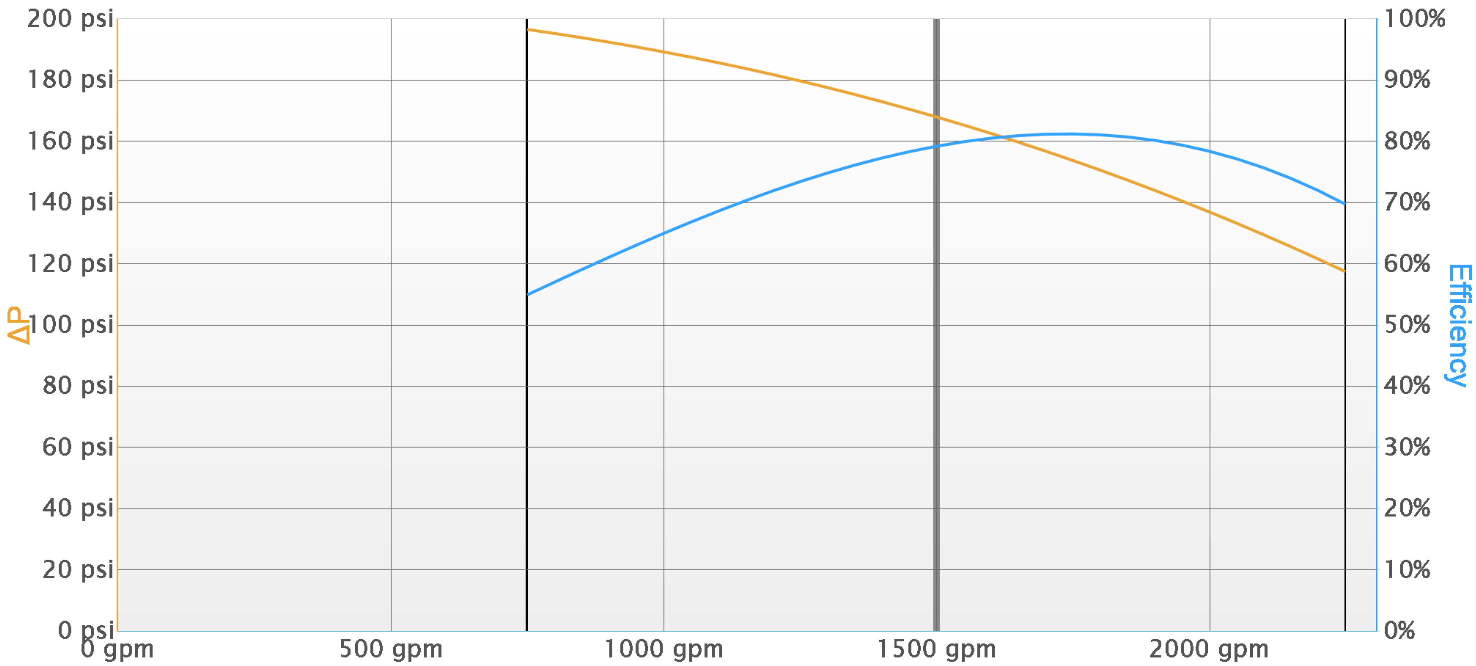
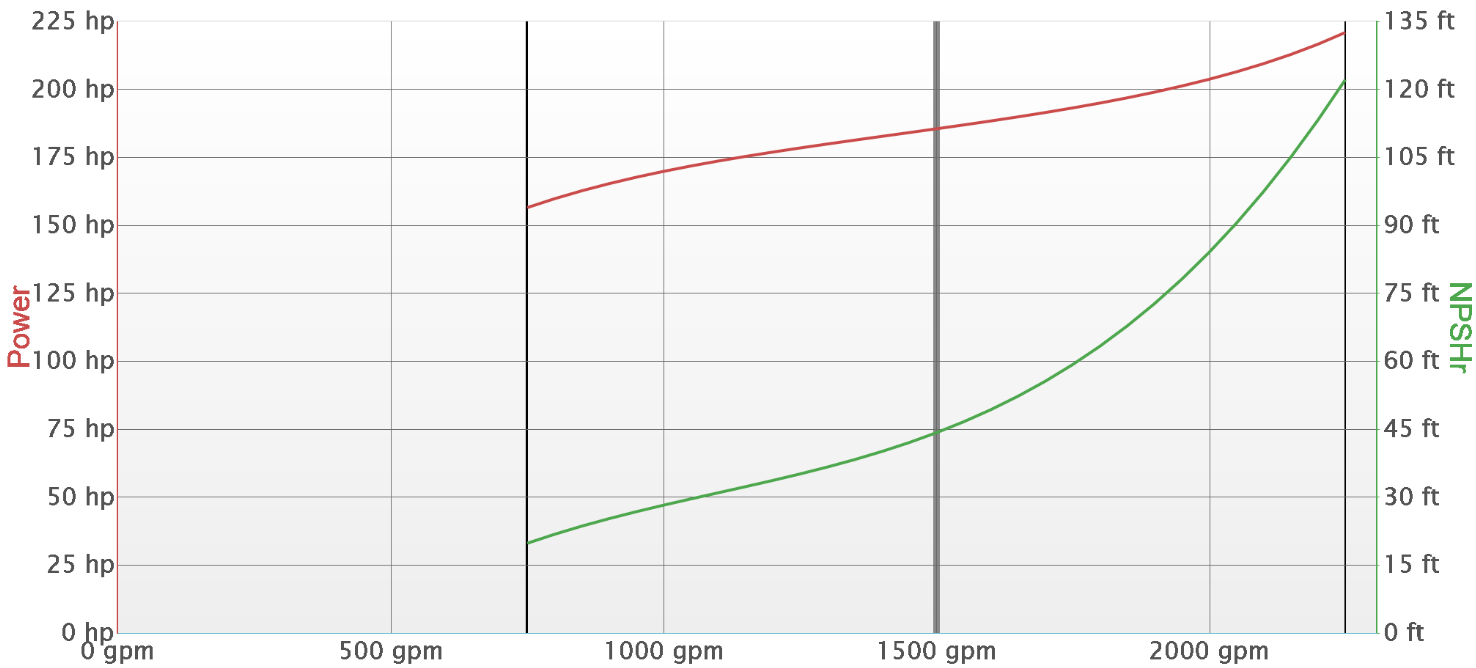


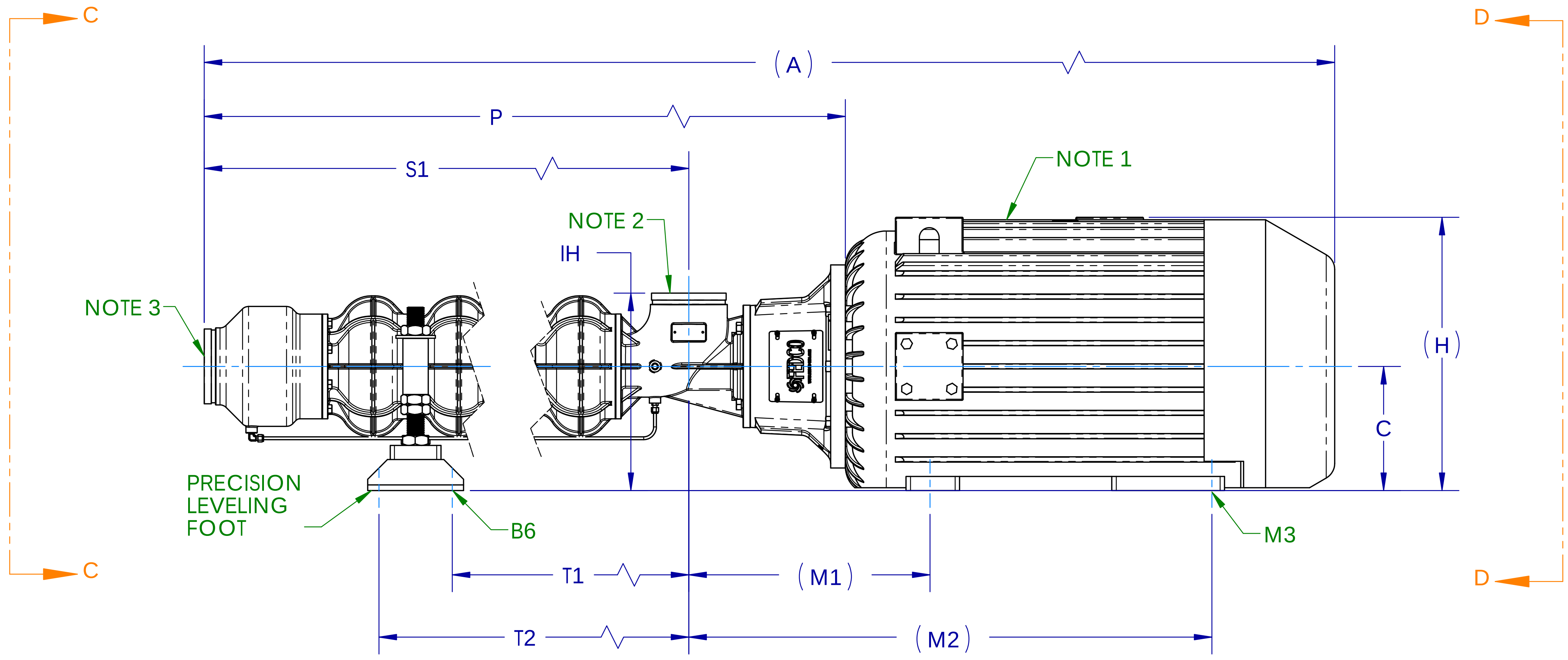
Figure for hydraulic illustration only

MSD-35002 Performance Curves



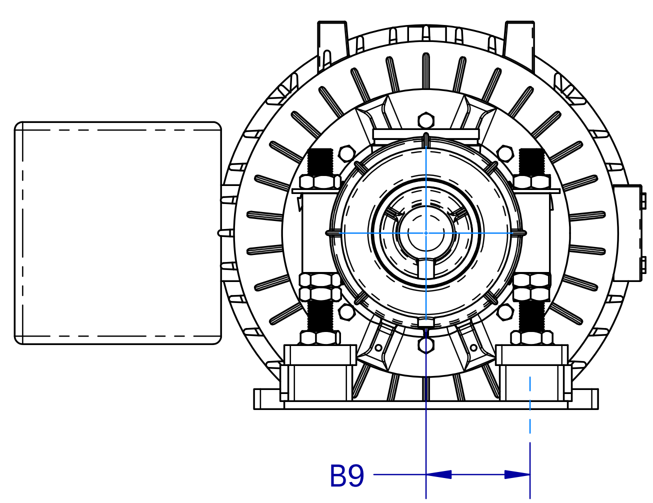


Pump Input		Pump Duty			
Flow	ΔP	RPM	Eff	Power	NPSHR
1,500 gpm	168 psi	3504	79.2%	185.6 hp	44 ft

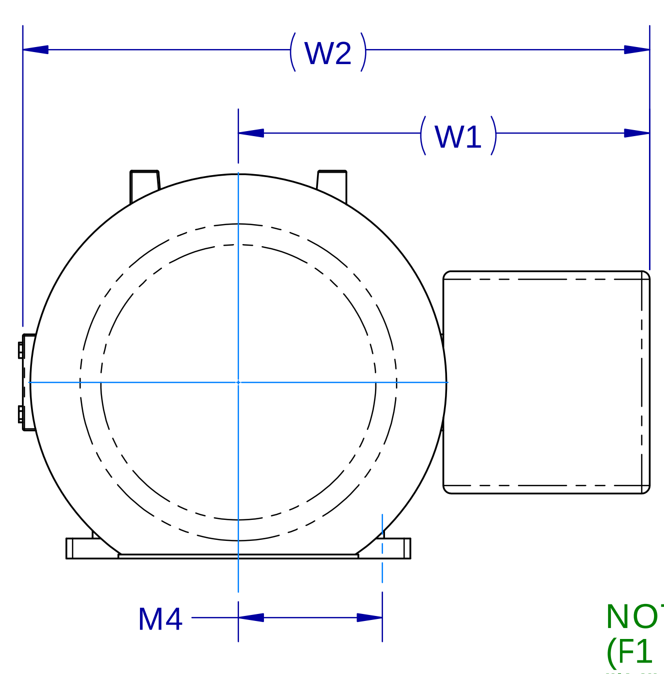


Label	Value
Note 1 - Motor Frame Size	447TSC
Note 2 - Feed Inlet	8" Pipe Coupling
Note 3 - Feed Outlet	8" Pipe Coupling
A	98.51"
B6	4 x Ø0.81" Slotted Holes
B9	2 x 7.36" TYP.
C	11.00" +.00 / -.06
H	24.22"
IH	17.99" ±.06
M1	22.36" ±.06
M2	42.36" ±.06
M3	4 x Ø0.81"
M4	2 x 9.00" TYP.
P	55.31" ±.13
S1	40.46" ±.13
T1	14.50"
T2	21.00"
W1	21.85"
W2	34.13"

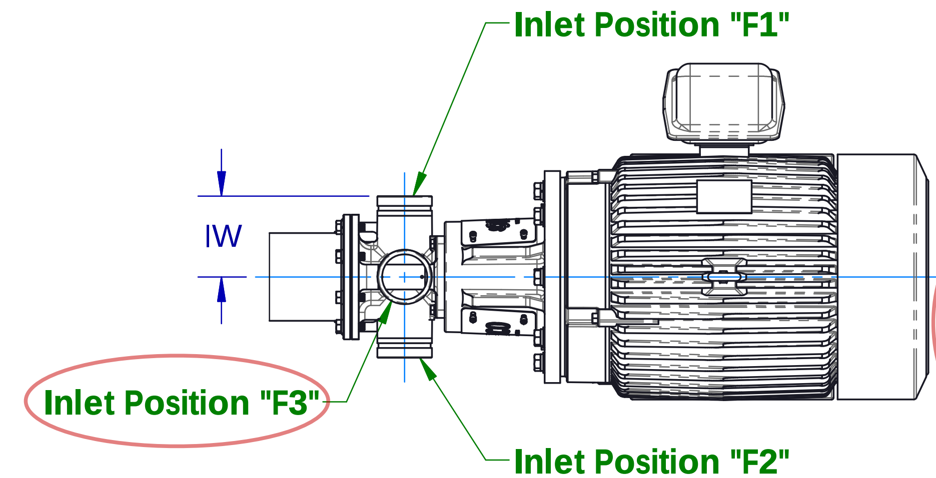
Note: Preliminary values are not suitable for construction.



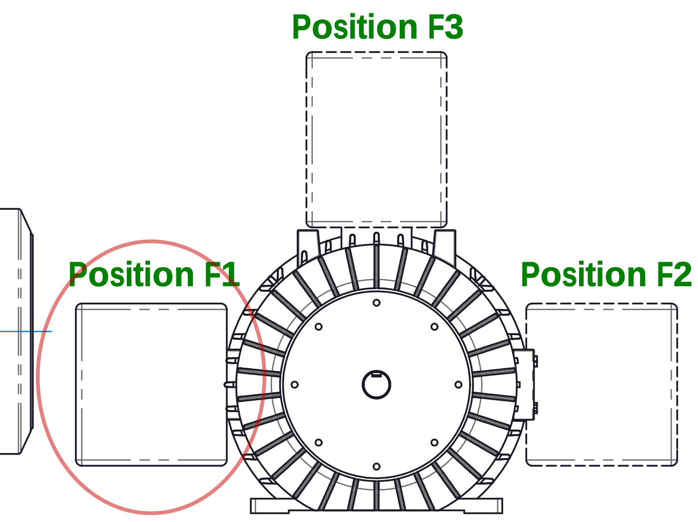
SECTION C-C



SECTION D-D



Inlet Position
(Viewed From Top of Pump)



Electrical Box Position
(Viewed from Motor Front)

NOTE: If Inlet Is Rotated (F1 or F2 Configuration), "IH" Dimension Does Not Apply. Use "IW"

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±1/32
ONE PLACE DECIMAL ±.063 [1.6]
TWO PLACE DECIMAL ±.031 [0.8]
THREE PLACE DECIMAL ±.010 [0.3]

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL

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MFG APPR.		
Q.A.		

800 Ternes Drive
Monroe, MI 48162
USA
Tel: (734) 241-3935
Fax: (734) 241-5173
www.fedco-usa.com

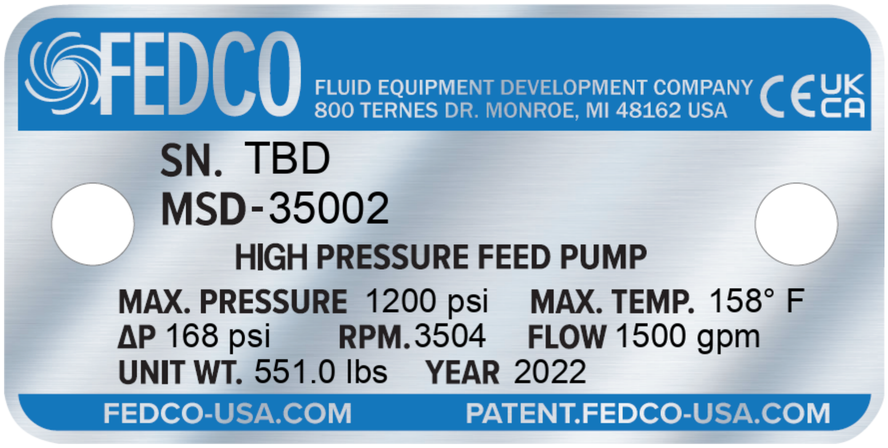
MODEL: MSD-35002

DESCRIPTION: MSD-35002-447TSC
Preliminary Outline
Not Suitable for Construction

SIZE | DWG. NO.: Inq. 57852.0 | REV:

WEIGHT: Pump:551# Motor:1767#

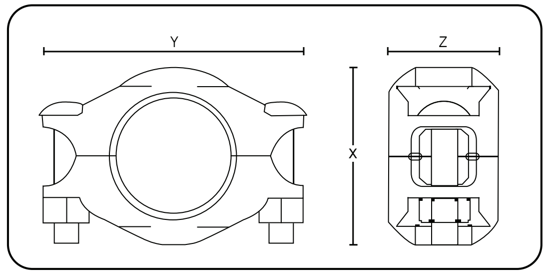
SHEET: 1 OF 1



Sign for Nameplate Acceptance: ______________________________

Piedmont

STYLE D SUPERDUPLEX
HIGH PRESSURE (1200 PSI)



Pressure Rating:
1200 psi (82 bar) with schedule 40s pipe (special alloys) with cut groove only - all sizes.

Housing - SUPERDUPLEX stainless steel type CE8MN, PREN > 40.

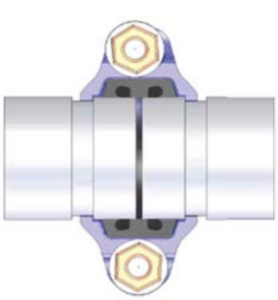
Gaskets - Flush-fit EPDM rubber, suitable for hot and cold water service. NSF/ANSI 61 approved for drinking water system components.
Temperature range:
-20°F to 230°F (-29°C to 110°C)
Not suitable for petroleum service.

Bolts / nuts / washers - Round-head, square-neck, type 316 stainless steel bolts conform to ASTM F-593, group 2, condition CW. For couplings sizes from ¾'' to 3'', use heavy hex type 651 silicon bronze nuts, for couplings of 4'' and up use 316 stainless steel nuts. Washers are heavy pattern 316 stainless steel.

Style D Specifications

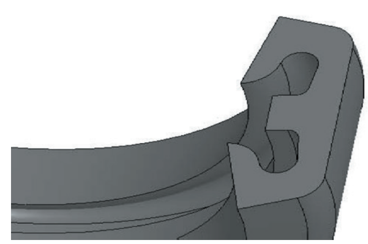
Nominal size	Dimensions			Aprx Weight	Pressure rating when cut grooves and SCH40 pipes are used
	X	Y	Z		
Inches	inches (mm)	inches (mm)	inches (mm)	lbs. (kg)	PSI (BAR)
3/4	2.00 (50.8)	3.20 (81.3)	1.71 (43.4)	1.04 (0.47)	1200 (82)
1	2.29 (58.2)	3.42 (86.9)	1.68 (42.7)	0.97 (0.44)	1200 (82)
1-1/4	2.50 (63.5)	3.65 (92.7)	1.68 (42.7)	1.08 (0.49)	1200 (82)
1-1/2	2.76 (70.1)	4.06 (103.1)	1.71 (43.4)	1.21 (0.55)	1200 (82)
2	3.74 (95.0)	4.46 (113.3)	1.85 (47.0)	1.92 (0.87)	1200 (82)
3	4.48 (113.8)	5.88 (149.3)	1.85 (47.0)	2.64 (1.20)	1200 (82)
4	5.21 (132.3)	6.90 (175.3)	2.02 (51.3)	4.54 (2.06)	1200 (82)
6	8.18 (207.8)	10.25 (260.4)	2.02 (51.3)	9.28 (4.21)	1200 (82)
8	10.90 (276.6)	14.00 (355.6)	2.40 (61.0)	24.50 (11.10)	1200 (82)

Note: Working pressure ratings based upon generally accepted pressure piping design standards and testing in accordance with ASME Section VIII Division 1 pressure vessel test method.



Allowable Pipe End Separation

Assembly Overview



Flush-fit Gasket

February 22, 2022

Attention: Mark Wilf Ph.D.- Tetra Tech

Reference: Two (2) 5’ Diameter Plug and Play Style Filters with Airwash to Treat 60 gpm- H&T Budgetary Proposal BDJ72646

Dear Mark,

In response to your request, Hungerford & Terry, Inc. is pleased to submit the attached Budgetary Proposal BDJ72646 for your consideration. This proposal provides two (2) 5’ diameter GreensandPlus pre-engineered filters with airwash designed to treat 60 gpm while allowing for redundancy.

This proposal is budgetary and is formulated using the available information. The design may be subject to change as more information becomes available. The specifications provided within is intended for securing funding for the project and contains contingency pricing to account for changes that may be necessary as the project progresses. Firm pricing will be available on bid day or upon request per intent to purchase. This proposal is for equipment only and does not offer treatment guarantees at this time.

We very much appreciate the opportunity to submit this proposal and we hope that it meets with your favorable consideration. Should you have any questions or need for additional information, please feel free to contact our local representative at the address and telephone number listed below, or this writer at our home office in Clayton, New Jersey.

Very truly yours,

HUNGERFORD & TERRY, INC.

Christopher Ralph

Christopher Ralph
Sales Representative

Gierlich-Mitchell, Inc.
Angie McDaniel
135 S State College Blvd., Ste 226
Brea, CA 92821
Ph: 714-236-6070 x 1003
Cell: 916-996-1739
Fax: 714-236-6080
amcdaniel@gierlich-mitchell.com

1. SCOPE OF SUPPLY

Two (2) 5' Dia Vertical Filters

- Two (2) 5' diameter Greensand Plus filters.
- 100 PSI design, one (1) 14" x 18" manway, interior unlined exterior prime.
- Sch. 80 PVC inlet distributor/waste collector & Sch. 80 PVC underdrain w/ hub curved radial underdrain
- 12" graded gravel support beds
- 18" Greensand Plus Filter Media
- 18" Anthracite
- Semi Automated Valve nest
  - Bray series 30 valves w/ series 70 electric actuators for the following: Inlet, Outlet, Backwash inlet/slow refill-modulating, Backwash outlet, Rinse, Air inlet, drain down, air pressurizing
  - Bray series 30 butterfly valves with manual operators for the following: Inlet & Outlet isolation, air blower isolating.
  - Filter air release air valve and manual ball valves for air release isolating, drain and backwash telltale.
- Stainless steel gravel retaining screen
- Stainless steel header lateral airwash distributor
- Air blower skid with motor starter and sound enclosure
- Sch. 80 PVC pipe for filter face & filter interconnecting.
- One (1) D/P switch with four (4) pressure gauges w/ supply tubing, isolating valves and sampling valves.
- Three (3) Magnetic bi-directional flow meters. One (1) for each filter located on the inlet header and one (1) on common waste
- To be controlled by NEMA 4X control panel with Allen Bradley PLC.

(includes freight & eight (8) days of start-up supervision)

Notes:
Anchor bolts shall be furnished and installed by the contractor.
Tank internal distributors shall be installed by the contractor.
Concrete shall be furnished and installed by the contractor.
Filter media shall be installed by the contractor.
Finished painting of the filter tank exteriors and piping shall be furnished and applied by the contractor.
All pipe supports shall be furnished and installed by the contractor.
All equipment listed shall be furnished by H&T with installation by the contractor.

2. PRICE SUMMARY

Price: **$421,000**

Four Hundred and Twenty OneThousand Dollars

F.O.B. Shipping Points: With full motor freight included
Payable in US currency, plus any applicable Municipal, State or Federal Taxes.

Payment Terms:

To be determined

Net thirty (30) days. All invoices are due within 30 days. A service or interest charge of 1 ½% per month (18% per annum) will be assessed on all amounts which become past due.

A copy of the payment bond (if applicable) will be required as part of the credit approval process. Purchaser agrees to make pro rata payments for partial shipments and further agrees that if shipment of material is delayed by any act or omission on part of purchaser, payment shall become due within thirty (30) days after the material is ready for shipment

Shipment:

Applicable freight to location is included in the price of the contract. Logistics of shipment will be advised as project proceeds.

Acceptance by Purchaser

____

____

____

Date___________________________
By_______________________________

HUNGERFORD & TERRY, INC.

Christopher Ralph

Christopher Ralph, Sales Representative

This proposal is hereby accepted by:
Hungerford & Terry, Inc._ 2-22-2022

3. FIELD SERVICE CHARGES

8 days 3 trips

"Hungerford & Terry, Inc., will furnish a Field Supervisor at USD-$1,200.00 per weekday of 8 consecutive hours or USD-$150.00 per hour, coinciding with the Purchaser's regular business hours during the normal work week of Monday through Friday including traveling time, plus living and traveling expenses from date of departure from Clayton, NJ, to destination and return. All time in excess of 8 hours shall be charged at 1-1/2 times the daily rate and all traveling and living expenses will be charged at cost. Meal charge is USD-$50.00 per day.

All overtime will be charged at 1-1/2 times the daily rate.

PLEASE NOTE: The Purchaser will be charged for the services of the Field Supervisor at the jobsite when service cannot be rendered because of delay or conditions beyond Hungerford & Terry's control. In cases of undue delay, Hungerford & Terry reserves the right to recall the supervisor.

HUNGERFORD & TERRY, INC.

PER:______________________________
Christopher Ralph, Sales Representative

DATE:______________________________

ACCEPTED: ______________________________

PER: ______________________________

TITLE: ______________________________

DATE: ______________________________

4. CONDITIONS

Prices are based on present day labor and material costs and subject to revision after thirty days from date of quotation. They do not include any Federal, State, Municipal or other tax or Government charge applicable to the sale, shipment or use of equipment quoted on.

Deliveries are contingent upon strikes, accidents, delays in manufacture and other causes beyond our control.

Any typographical or clerical errors in the prices or specifications are subject to correction.

Order shall be made out to Hungerford & Terry, Inc., Clayton, NJ, and shall be subject to acceptance by us at Clayton, NJ. After acceptance, orders may be cancelled only with our written consent and on terms that will indemnify us against loss. Equipment on material cannot be returned except by special permission and when so returned will be subject to discount.

The Company will, free of charge, replace or repair, after receipt f.o.b. its factory promptly and within one year from shipment by it, any part of equipment which, under normal or proper use proves to be defective in workmanship or material. In no event shall the Company be liable for consequential damages.

The Company shall not be liable for failure to perform or delay in performing any obligation if such failure or delay shall be caused directly or indirectly by invasion, insurrection, riot, war, military authority, or by fire, flood, strike, or labor difficulty or by any other cause, whether of the same or different nature from those enumerated, beyond our reasonable control.

From the time said machinery of apparatus or any part thereof arrives on the premises, and until Hungerford & Terry, Inc., for an amount equal to the unpaid portion of the purchase price of the same; such loss or damage to be payable to Hungerford & Terry, Inc., as its interests may appear. All losses by fire or other casualties for which Hungerford & Terry, Inc., is not indemnified and paid under such policies of insurance, shall be borne by the Purchaser on and after the arrival of said machinery or apparatus, or any part thereof on Purchaser's premises.

The title and right of possession of above described articles shall remain vested in Hungerford & Terry, Inc. until Purchaser shall have made full payment thereof in cash and this right shall not be waived by attachment of said articles to the real estate. Upon Purchaser's failure to make above agreed payments or any part thereof, Hungerford & Terry, Inc. is to retain any and all partial payments which may have been made as liquidated damages, and shall be entitled to take immediate possession of said materials.

This proposal, of which the Conditions of Sale are an integral part, shall not become a contract or become binding until it has been approved and signed by a representative of Hungerford & Terry, Inc. at its home office, Clayton, NJ. Persons signing on behalf of purchaser hereby represent that they are legally authorized to enter into this contract.

February 22, 2022

Attention: Mark Wilf Ph.D.- Tetra Tech

Reference: Three (3) 5' Diameter Plug and Play Style Filters with Airwash to Treat 90 gpm- H&T Budgetary Proposal BDJ72647

Dear Mark,

In response to your request, Hungerford & Terry, Inc. is pleased to submit the attached Budgetary Proposal BDJ72647 for your consideration. This proposal provides three (3) 5' diameter GreensandPlus pre-engineered filters with airwash designed to treat 90 gpm while allowing for redundancy.

This proposal is budgetary and is formulated using the available information. The design may be subject to change as more information becomes available. The specifications provided within is intended for securing funding for the project and contains contingency pricing to account for changes that may be necessary as the project progresses. Firm pricing will be available on bid day or upon request per intent to purchase. This proposal is for equipment only and does not offer treatment guarantees at this time.

We very much appreciate the opportunity to submit this proposal and we hope that it meets with your favorable consideration. Should you have any questions or need for additional information, please feel free to contact our local representative at the address and telephone number listed below, or this writer at our home office in Clayton, New Jersey.

Very truly yours,

HUNGERFORD & TERRY, INC.

Christopher Ralph
Sales Representative

Gierlich-Mitchell, Inc.
Angie McDaniel
135 S State College Blvd., Ste 226
Brea, CA 92821
Ph: 714-236-6070 x 1003
Cell: 916-996-1739
Fax: 714-236-6080
amcdaniel@gierlich-mitchell.com

1. SCOPE OF SUPPLY

Three (3) 5' Dia Vertical Filters

- Three (3) 5' diameter Greensand Plus filters.
- 100 PSI design, one (1) 14" x 18" manway, interior unlined exterior prime.
- Sch. 80 PVC inlet distributor/waste collector & Sch. 80 PVC underdrain w/ hub curved radial underdrain
- 12" graded gravel support beds
- 18" Greensand Plus Filter Media
- 18" Anthracite
- Semi Automated Valve nest
  - Bray series 30 valves w/ series 70 electric actuators for the following: Inlet, Outlet, Backwash inlet/slow refill-modulating, Backwash outlet, Rinse, Air inlet, drain down, air pressurizing
  - Bray series 30 butterfly valves with manual operators for the following: Inlet & Outlet isolation, air blower isolating.
  - Filter air release air valve and manual ball valves for air release isolating, drain and backwash telltale.
- Stainless steel gravel retaining screen
- Stainless steel header lateral airwash distributor
- Air blower skid with motor starter and sound enclosure
- Sch. 80 PVC pipe for filter face & filter interconnecting.
- One (1) D/P switch with six (6) pressure gauges w/ supply tubing, isolating valves and sampling valves.
- Four (4) Magnetic bi-directional flow meters. One (1) for each filter located on the inlet header and one (1) on common waste header
- To be controlled by NEMA 4X control panel with Allen Bradley PLC.

(includes freight & eight (8) days of start-up supervision)

Notes:
Anchor bolts shall be furnished and installed by the contractor.
Tank internal distributors shall be installed by the contractor.
Concrete shall be furnished and installed by the contractor.
Filter media shall be installed by the contractor.
Finished painting of the filter tank exteriors and piping shall be furnished and applied by the contractor.
All pipe supports shall be furnished and installed by the contractor.
All equipment listed shall be furnished by H&T with installation by the contractor.

2. PRICE SUMMARY

Price: **$517,600**

Five Hundred and Seventeen Thousand, Six Hundred Dollars

F.O.B. Shipping Points: With full motor freight included
Payable in US currency, plus any applicable Municipal, State or Federal Taxes.

Payment Terms:

To be determined

Net thirty (30) days. All invoices are due within 30 days. A service or interest charge of 1 ½% per month (18% per annum) will be assessed on all amounts which become past due.

A copy of the payment bond (if applicable) will be required as part of the credit approval process. Purchaser agrees to make pro rata payments for partial shipments and further agrees that if shipment of material is delayed by any act or omission on part of purchaser, payment shall become due within thirty (30) days after the material is ready for shipment

Shipment:

Applicable freight to location is included in the price of the contract. Logistics of shipment will be advised as project proceeds.

Acceptance by Purchaser

____

____

____

Date___________________________
By______________________________

HUNGERFORD & TERRY, INC.

Christopher Ralph

Christopher Ralph, Sales Representative

This proposal is hereby accepted by:
Hungerford & Terry, Inc._ 2-22-2022

3. FIELD SERVICE CHARGES

8 days 3 trips

"Hungerford & Terry, Inc., will furnish a Field Supervisor at USD-$1,200.00 per weekday of 8 consecutive hours or USD-$150.00 per hour, coinciding with the Purchaser's regular business hours during the normal work week of Monday through Friday including traveling time, plus living and traveling expenses from date of departure from Clayton, NJ, to destination and return. All time in excess of 8 hours shall be charged at 1-1/2 times the daily rate and all traveling and living expenses will be charged at cost. Meal charge is USD-$50.00 per day.

All overtime will be charged at 1-1/2 times the daily rate.

PLEASE NOTE: The Purchaser will be charged for the services of the Field Supervisor at the jobsite when service cannot be rendered because of delay or conditions beyond Hungerford & Terry's control. In cases of undue delay, Hungerford & Terry reserves the right to recall the supervisor.

HUNGERFORD & TERRY, INC.

PER: ______________________________
Christopher Ralph, Sales Representative

DATE: ______________________________

ACCEPTED: ______________________________

PER: ______________________________

TITLE: ______________________________

DATE: ______________________________

4. CONDITIONS

Prices are based on present day labor and material costs and subject to revision after thirty days from date of quotation. They do not include any Federal, State, Municipal or other tax or Government charge applicable to the sale, shipment or use of equipment quoted on.

Deliveries are contingent upon strikes, accidents, delays in manufacture and other causes beyond our control.

Any typographical or clerical errors in the prices or specifications are subject to correction.

Order shall be made out to Hungerford & Terry, Inc., Clayton, NJ, and shall be subject to acceptance by us at Clayton, NJ. After acceptance, orders may be cancelled only with our written consent and on terms that will indemnify us against loss. Equipment on material cannot be returned except by special permission and when so returned will be subject to discount.

The Company will, free of charge, replace or repair, after receipt f.o.b. its factory promptly and within one year from shipment by it, any part of equipment which, under normal or proper use proves to be defective in workmanship or material. In no event shall the Company be liable for consequential damages.

The Company shall not be liable for failure to perform or delay in performing any obligation if such failure or delay shall be caused directly or indirectly by invasion, insurrection, riot, war, military authority, or by fire, flood, strike, or labor difficulty or by any other cause, whether of the same or different nature from those enumerated, beyond our reasonable control.

From the time said machinery of apparatus or any part thereof arrives on the premises, and until Hungerford & Terry, Inc., for an amount equal to the unpaid portion of the purchase price of the same; such loss or damage to be payable to Hungerford & Terry, Inc., as its interests may appear. All losses by fire or other casualties for which Hungerford & Terry, Inc., is not indemnified and paid under such policies of insurance, shall be borne by the Purchaser on and after the arrival of said machinery or apparatus, or any part thereof on Purchaser's premises.

The title and right of possession of above described articles shall remain vested in Hungerford & Terry, Inc. until Purchaser shall have made full payment thereof in cash and this right shall not be waived by attachment of said articles to the real estate. Upon Purchaser's failure to make above agreed payments or any part thereof, Hungerford & Terry, Inc. is to retain any and all partial payments which may have been made as liquidated damages, and shall be entitled to take immediate possession of said materials.

This proposal, of which the Conditions of Sale are an integral part, shall not become a contract or become binding until it has been approved and signed by a representative of Hungerford & Terry, Inc. at its home office, Clayton, NJ. Persons signing on behalf of purchaser hereby represent that they are legally authorized to enter into this contract.

February 22, 2022

Attention: Mark Wilf Ph.D.- Tetra Tech

Reference: Four (4) 5' Diameter Plug and Play Style Filters with Airwash to Treat 188 gpm- H&T Budgetary Proposal BDJ72648

Dear Mark,

In response to your request, Hungerford & Terry, Inc. is pleased to submit the attached Budgetary Proposal BDJ72648 for your consideration. This proposal provides four (4) 5' diameter GreensandPlus pre-engineered filters with airwash designed to treat 188 gpm while allowing for redundancy.

This proposal is budgetary and is formulated using the available information. The design may be subject to change as more information becomes available. The specifications provided within is intended for securing funding for the project and contains contingency pricing to account for changes that may be necessary as the project progresses. Firm pricing will be available on bid day or upon request per intent to purchase. This proposal is for equipment only and does not offer treatment guarantees at this time.

We very much appreciate the opportunity to submit this proposal and we hope that it meets with your favorable consideration. Should you have any questions or need for additional information, please feel free to contact our local representative at the address and telephone number listed below, or this writer at our home office in Clayton, New Jersey.

Very truly yours,

HUNGERFORD & TERRY, INC.

Christopher Ralph
Sales Representative

Gierlich-Mitchell, Inc.
Angie McDaniel
135 S State College Blvd., Ste 226
Brea, CA 92821
Ph: 714-236-6070 x 1003
Cell: 916-996-1739
Fax: 714-236-6080
amcdaniel@gierlich-mitchell.com

1. SCOPE OF SUPPLY

Four (4) 5' Dia Vertical Filters

- Four (4) 5' diameter Greensand Plus filters.
- 100 PSI design, one (1) 14" x 18" manway, interior unlined exterior prime.
- Sch. 80 PVC inlet distributor/waste collector & Sch. 80 PVC underdrain w/ hub curved radial underdrain
- 12" graded gravel support beds
- 18" Greensand Plus Filter Media
- 18" Anthracite
- Semi Automated Valve nest
    - Bray series 30 valves w/ series 70 electric actuators for the following: Inlet, Outlet, Backwash inlet/slow refill-modulating, Backwash outlet, Rinse, Air inlet, drain down, air pressurizing
    - Bray series 30 butterfly valves with manual operators for the following: Inlet & Outlet isolation, air blower isolating.
    - Filter air release air valve and manual ball valves for air release isolating, drain and backwash telltale.
- Stainless steel gravel retaining screen
- Stainless steel header lateral airwash distributor
- Air blower skid with motor starter and sound enclosure
- Sch. 80 PVC pipe for filter face & filter interconnecting.
- One (1) D/P switch with six (6) pressure gauges w/ supply tubing, isolating valves and sampling valves.
- Five (5) Magnetic bi-directional flow meters. One (1) for each filter located on the inlet header and one (1) on common waste header
- To be controlled by NEMA 4X control panel with Allen Bradley PLC.

(includes freight & eight (8) days of start-up supervision)

Notes:
Anchor bolts shall be furnished and installed by the contractor.
Tank internal distributors shall be installed by the contractor.
Concrete shall be furnished and installed by the contractor.
Filter media shall be installed by the contractor.
Finished painting of the filter tank exteriors and piping shall be furnished and applied by the contractor.
All pipe supports shall be furnished and installed by the contractor.
All equipment listed shall be furnished by H&T with installation by the contractor.

2. PRICE SUMMARY

Price: **$634,000**

Six Hundred and Thirty Four Thousand Dollars

F.O.B. Shipping Points: With full motor freight included
Payable in US currency, plus any applicable Municipal, State or Federal Taxes.

Payment Terms:

To be determined

Net thirty (30) days. All invoices are due within 30 days. A service or interest charge of 1 ½% per month (18% per annum) will be assessed on all amounts which become past due.

A copy of the payment bond (if applicable) will be required as part of the credit approval process. Purchaser agrees to make pro rata payments for partial shipments and further agrees that if shipment of material is delayed by any act or omission on part of purchaser, payment shall become due within thirty (30) days after the material is ready for shipment

Shipment:

Applicable freight to location is included in the price of the contract. Logistics of shipment will be advised as project proceeds.

HUNGERFORD & TERRY, INC.

Christopher Ralph

Christopher Ralph, Sales Representative

This proposal is hereby accepted by:
Hungerford & Terry, Inc._ 2-22-2022

Acceptance by Purchaser

____

____

____

Date___________________________
By______________________________

3. FIELD SERVICE CHARGES

8 days 3 trips

"Hungerford & Terry, Inc., will furnish a Field Supervisor at USD-$1,200.00 per weekday of 8 consecutive hours or USD-$150.00 per hour, coinciding with the Purchaser's regular business hours during the normal work week of Monday through Friday including traveling time, plus living and traveling expenses from date of departure from Clayton, NJ, to destination and return. All time in excess of 8 hours shall be charged at 1-1/2 times the daily rate and all traveling and living expenses will be charged at cost. Meal charge is USD-$50.00 per day.

All overtime will be charged at 1-1/2 times the daily rate.

PLEASE NOTE: The Purchaser will be charged for the services of the Field Supervisor at the jobsite when service cannot be rendered because of delay or conditions beyond Hungerford & Terry's control. In cases of undue delay, Hungerford & Terry reserves the right to recall the supervisor.

HUNGERFORD & TERRY, INC.

PER:______________________________
Christopher Ralph, Sales Representative

DATE:______________________________

ACCEPTED: ______________________________

PER: ______________________________

TITLE: ______________________________

DATE: ______________________________

4. CONDITIONS

Prices are based on present day labor and material costs and subject to revision after thirty days from date of quotation. They do not include any Federal, State, Municipal or other tax or Government charge applicable to the sale, shipment or use of equipment quoted on.

Deliveries are contingent upon strikes, accidents, delays in manufacture and other causes beyond our control.

Any typographical or clerical errors in the prices or specifications are subject to correction.

Order shall be made out to Hungerford & Terry, Inc., Clayton, NJ, and shall be subject to acceptance by us at Clayton, NJ. After acceptance, orders may be cancelled only with our written consent and on terms that will indemnify us against loss. Equipment on material cannot be returned except by special permission and when so returned will be subject to discount.

The Company will, free of charge, replace or repair, after receipt f.o.b. its factory promptly and within one year from shipment by it, any part of equipment which, under normal or proper use proves to be defective in workmanship or material. In no event shall the Company be liable for consequential damages.

The Company shall not be liable for failure to perform or delay in performing any obligation if such failure or delay shall be caused directly or indirectly by invasion, insurrection, riot, war, military authority, or by fire, flood, strike, or labor difficulty or by any other cause, whether of the same or different nature from those enumerated, beyond our reasonable control.

From the time said machinery of apparatus or any part thereof arrives on the premises, and until Hungerford & Terry, Inc., for an amount equal to the unpaid portion of the purchase price of the same; such loss or damage to be payable to Hungerford & Terry, Inc., as its interests may appear. All losses by fire or other casualties for which Hungerford & Terry, Inc., is not indemnified and paid under such policies of insurance, shall be borne by the Purchaser on and after the arrival of said machinery or apparatus, or any part thereof on Purchaser's premises.

The title and right of possession of above described articles shall remain vested in Hungerford & Terry, Inc. until Purchaser shall have made full payment thereof in cash and this right shall not be waived by attachment of said articles to the real estate. Upon Purchaser's failure to make above agreed payments or any part thereof, Hungerford & Terry, Inc. is to retain any and all partial payments which may have been made as liquidated damages, and shall be entitled to take immediate possession of said materials.

This proposal, of which the Conditions of Sale are an integral part, shall not become a contract or become binding until it has been approved and signed by a representative of Hungerford & Terry, Inc. at its home office, Clayton, NJ. Persons signing on behalf of purchaser hereby represent that they are legally authorized to enter into this contract.

SAN DIEGUITO GW PROJECT			
		CONST.	
DESCRIPTION	LABOR COST	EQUIPT COST	TOTAL
MEMBRANES - 140 TOTAL	3,360	1,500	4,860
MEMBRANE SKIDS	42,840	11,820	54,660
CIP TANK	8,400	2,160	10,560
CARTRIDGE FILTERS	6,720	2,040	8,760
RO FEED PUMPS	8,400	1,776	10,176
STAINLESS STEEL AND PVC PIPING IN TRENCHES	27,720	7,000	34,720
CHEMICAL TANKS - 4 EA	11,760	5,196	16,956
CHEMICAL TOTES - 3 EA	1,386	1,122	2,508
CHEMICAL FEED PUMPS	18,480	5,400	23,880
DECARBONATOR	11,760	2,040	13,800
PRODUCT WATER AND BRINE TANKS	5,040	2,520	7,560
PRODUCT AND BRINE PUMPS	9,800	2,960	12,760

Pascal & Ludwig Constructors

From:	Wilf, Mark
To:	Tedesco, Steve
Subject:	Fw: Olivenhain
Date:	Monday, February 28, 2022 3:54:22 PM

Decarbonators

Mark Wilf Ph. D.
Tetra Tech
17885 Von Karman Ave
Irvine, CA 92612
Phone: 858 444 7334

From: Samuel Boswell <sboswell@danielmechanical.com>
Sent: Friday, February 25, 2022 4:34 PM
To: Wilf, Mark <Mark.Wilf@tetratech.com>; Matthew Rebmann <matt@chcwater.com>
Cc: Jack Moser <jmoser@danielmechanical.com>; Dillan Truong <dtruong@danielmechanical.com>
Subject: RE: Olivenhain

Mark,

Please see below budgetary quotes for the equipment you're needing.

694GPM Forced Draft Decarbonator System: $200,000.00

- Qty. (1) 5'Ø Decarbonator
  - NSF rated packing media (6-ft packing depth)
  - Weir trough liquid distribution system
- Qty. (1) Fans rated for 2,000 cfm
- Qty. (1) Fan Inlet Filter
- Qty. (1) Electrical Control Panel
- Interconnecting FRP ductwork, damper, and flex connector between the fan and decarbonator.
- 1-Lot of Instruments
- Startup, training, and testing

1,338GPM Forced Draft Decarbonator System: $250,000.00

- Qty. (1) 7'Ø Decarbonator
  - NSF rated packing media (6-ft packing depth)
  - Weir trough liquid distribution system
- Qty. (1) Fans rated for 4,000 cfm
- Qty. (1) Fan Inlet Filter
- Qty. (1) Electrical Control Panel
- Interconnecting FRP ductwork, damper, and flex connector between the fan and decarbonator.
- 1-Lot of Instruments
- Startup, training, and testing

Excludes freight, tax, installation, NSF certification, exterior piping located outside of the vessel, VFD's, ductwork supports, BNG kits for ductwork, anchor bolts, and anchor/foundation design.

Best Regards,

Sam Boswell, PE
Lead Process Designer
Daniel Company, Inc.
1939 W 11th Street, Suite E
Upland, CA 91786
Ph (909) 982-1555
Fax (909) 982-1855

From: Wilf, Mark <Mark.Wilf@tetratech.com>
Sent: Tuesday, February 22, 2022 9:53 AM
To: Samuel Boswell <sboswell@danielmechanical.com>; Matthew Rebmann <matt@chcwater.com>
Subject: Re: Olivenhain

Hi Matt, Sam

Please let me know if you will be able to provided a proposal for the Olivenhain project, according to process information listed below.

Kind regards,

Mark Wilf Ph. D.
Tetra Tech
17885 Von Karman Ave
Irvine, CA 92612
Phone: 858 444 7334

From: Wilf, Mark <Mark.Wilf@tetratech.com>
Sent: Monday, February 14, 2022 10:07 AM
To: sboswell@danielmechanical.com <sboswell@danielmechanical.com>; Matthew Rebmann <matt@chcwater.com>
Subject: Olivenhain

Sam, Matt,

Tetra Tech is preparing a budgetary evaluation of a new brackish water RO project for the Olivenhain Water District.
Would appreciate very much if you could provide a budgetary quote for Decarbonator.
Please provide quote for two units.
One for flow rate 694 gpm and one for flow rate of 1388 gpm.

Influent water has the following composition:

Decarbonator inlet water	
Temp, C	**20**
Hardness, ppm as CaCO3	193
Ca, ppm as ion	54.82
Mg, ppm as ion	13.70
Na, ppm as ion	136.16
K , ppm as ion	7.53
CO3, ppm as ion	0.57
HCO3, ppm as ion	101.93
SO4, ppm as ion	105.78
Cl, ppm as ion	217.30
F, ppm as ion	0.06
SiO2, ppm as ion	5.19
CO2, ppm as ion	81.00
TDS, ppm	**643.81**
pH	**6.26**

Will highly appreciate your prompt response.

Regards,

Mark Wilf Ph. D.
Tetra Tech
17885 Von Karman Ave
Irvine, CA 92612
Phone: 858 444 7334

From:	Wilf, Mark
To:	Tedesco, Steve
Subject:	Fw: Olivenhain
Date:	Monday, February 28, 2022 10:17:53 PM
Attachments:	image888843.png image753212.png image450881.png image801568.png image931905.png

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RO system quote from Biwater

Mark Wilf Ph. D.
Tetra Tech
17885 Von Karman Ave
Irvine, CA 92612
Phone: 858 444 7334

From: Richard White <richard.white@biwater.com>
Sent: Monday, February 28, 2022 6:59 PM
To: Wilf, Mark <Mark.Wilf@tetratech.com>
Subject: Fwd: Olivenhain

Richard White
Biwater Inc
Tel: +1 909 599 4129
Mobile: +1 626 241 4818
biwater.com

Biwater Inc, 8751 Prestige Ct, Rancho Cucamonga, California, CA 91730, United States.

From: Richard White
Sent: Tuesday, February 22, 2022 11:07:57 AM
To: Wilf, Mark <Mark.Wilf@tetratech.com>
Cc: Aaron O'Donnell <aaron.odonnell@biwater.com>
Subject: RE: Olivenhain

Mark,
The budget pricing is good for all the variety of membrane arrays you have, plus or minus a couple of vessels. If you are going with a single train system I would recommend a permeate storage tank for flushing and for make-up water for CIP, as you won’t have any permeate production when the single train is offline. I would make the permeate storage tank double the size of the CIP tank.

Thanks

From: Richard White
Sent: Tuesday, February 22, 2022 10:46 AM
To: Wilf, Mark <Mark.Wilf@tetratech.com>
Cc: Aaron O'Donnell <aaron.odonnell@biwater.com>
Subject: RE: Olivenhain

Mark,
Sorry for delay.
So are you wanting two separate quotes?

Option 1: RO Train to produce ~600gpm permeate at 80% Rec
Option 2: RO Train to produce ~1200gpm permeate at 80% Rec

I assume you want only one train for each option, or do you want to break it to two trains at 50% capacity each for each option?

Option 1:
For a single train 26:14 7M Array with ERD (Not including HP feed pump), plus CIP Tank, CIP Pump, CIP Neutralization Tank, CIP Instruments = $850k

Option 2:
For a single train 13:7 7M Array with ERD (Not including HP feed pump), plus CIP Tank, CIP Pump, CIP Neutralization Tank, CIP Instruments = $750k

Kind regards,
Richard

From: Wilf, Mark <Mark.Wilf@tetratech.com>
Sent: Monday, February 14, 2022 8:50 AM
To: Richard White <richard.white@biwater.com>
Subject: Olivenhain

Hi Rich,

Hope you and family are well.
Tetra Tech is preparing a budgetary evaluation of a new brackish water RO project for the Olivenhain Water District.
Would appreciate very much if you could provide a budgetary quote for an RO units: 1 & 2 MGD product water capacity (including blending). Each unit should be equipped with interstage ERD. Also please include CIP unit and CIP solution neutralization tank.
The parameters of the RO units are listed in the table below.
A representative computer projections for a 2 MGD unit is attached.

Will highly appreciate your prompt response.

Regards,

Product water capacity, mgd	1.0	2.0	1.0	2.0
Product water capacity, gpm	694	1388	694	1388
Well water flow, gpm	844	1688	852.5	1705
RO permeate flow, gpm	600	1200	634	1268
Well water blending flow, gpm	94	188	60	120
RO system recovery rate, %	80%	80%	80%	80%
RO feed flow, gpm	750	1500	792.5	1585
Number of cartridge filter housings	1	1	1	1
Number of RO units	1	1	1	1
RO unit array, st	2	2	2	2
No of pressure vessels, st 1	14	28	15	30
No of pressure vessels, st 2	6	12	6	12
No of elements per vessel	7	7	7	7
Total number of membrane elements	140	280	147	294
Interstage ERD	1	1	1	1

Mark Wilf Ph. D.
Tetra Tech
17885 Von Karman Ave
Irvine, CA 92612
Phone: 858 444 7334

From:	Wilf, Mark
To:	Tedesco, Steve
Subject:	Fw: PR1235 Olivenhain Water District - RO system
Date:	Monday, February 28, 2022 3:57:11 PM
Attachments:	image001.png

RO units

Mark Wilf Ph. D.
Tetra Tech
17885 Von Karman Ave
Irvine, CA 92612
Phone: 858 444 7334

From: Shayan Yaghoubi <shayan.yaghoubi@h2oinnovation.com>
Sent: Wednesday, February 16, 2022 5:16 PM
To: Wilf, Mark <Mark.Wilf@tetratech.com>
Subject: PR1235 Olivenhain Water District - RO system

Hi Mark,

Please see the budgetary price and preliminary scope below:

1 MGD RO train – budgetary price is $600K EXW, H2OI's Manufacturing facility in accordance with the scope of supply below:

- One (1) Cartridge filter housing with CF elements - skidded
- One (1) RO HP pump with associated instruments and valves– skidded
- one (1) skidded single pass RO trains (14:6-7M array), each skid including pressure vessels, spiral wound membrane elements, and associated instruments, valves and piping - skidded. Interstage ERD unit, and associated valves, instrumentation, and piping will be shipped loose.
- One (1) RO CIP system, including one CIP pump w/ motor, one (1) CIP cartridge filter housing, instruments, one (1) CIP tank with immersed CIP tank heater, and associated instruments, valves – skidded except for CIP tank, immersed heater and some instruments and valves

2 MGD RO train – budgetary price is $880K EXW, H2OI's Manufacturing facility in accordance with the scope of supply below:

- One (1) Cartridge filter housing with CF elements - skidded
- One (1) RO HP pump with associated instruments and valves– skidded
- one (1) skidded single pass RO trains (28:12-7M array), each skid including pressure vessels, spiral wound membrane elements, and associated instruments, valves and piping - skidded. Interstage ERD unit, and associated valves, instrumentation, and piping will be shipped loose.
- One (1) RO CIP system, including one CIP pump w/ motor, one (1) CIP cartridge filter housing, instruments, one (1) CIP tank with immersed CIP tank heater, and associated instruments, valves – skidded except for CIP tank, immersed heater and some instruments and valves

Scope of Supply not included in estimated budgetary price:

- Supply and installation of interconnected piping and wiring between skidded equipment
- Unloading, uncrating, installation and installation supervision
- Supply of consumables including power and chemicals
- Disposal and handling of any and all waste produced
- Any and all costs associated with water quality sampling and analytical work
- Internet connection at the project site
- All ladders, platforms and grating, if required
- Embedded posts and anchor
- Shipping to site
- WTP building, including site civil, concrete, building envelop, building electrical & mechanical systems

Please let me know if you have any questions. Thanks.

Best regards,

Shayan Yaghoubi, M.Eng., P.Eng.
Regional Technical Sales Manager – Capital Equipment
Cell.: +1 619.884.5834
shayan.yaghoubi@h2oinnovation.com | www.h2oinnovation.com
1048 La Mirada Court, Vista, CA 92081, United States

From: Wilf, Mark <Mark.Wilf@tetratech.com>
Sent: Tuesday, February 15, 2022 3:43 PM
To: Shayan Yaghoubi <shayan.yaghoubi@h2oinnovation.com>
Subject: Re: Olivenhain

Hi Shayan,

Thank you for a prompt response.
Please provide quote according to array listed in the table.
In each option there is only one train. No redundant equipment.

Regards,

Mark Wilf Ph. D.
Tetra Tech
17885 Von Karman Ave
Irvine, CA 92612
Phone: 858 444 7334

From: Shayan Yaghoubi <shayan.yaghoubi@h2oinnovation.com>
Sent: Tuesday, February 15, 2022 3:40 PM
To: Wilf, Mark <Mark.Wilf@tetratech.com>

Subject: RE: Olivenhain

Hi Mark,

Thanks for your inquiry.

Can you please confirm if we should use the highlighted flows below (this is inline with the projection)? The projection shows 26:14 array, but the table shows 28:12, which one should we use?

Also, there is only 1 x100% train for each scenario, no redundant train. Can you please confirm?

Thanks.

Best regards,

Shayan Yaghoubi, M.Eng., P.Eng.
Regional Technical Sales Manager – Capital Equipment
Cell.: +1 619.884.5834
shayan.yaghoubi@h2oinnovation.com | www.h2oinnovation.com
1048 La Mirada Court, Vista, CA 92081, United States

From: Wilf, Mark <Mark.Wilf@tetratech.com>
Sent: Tuesday, February 15, 2022 3:17 PM
To: Shayan Yaghoubi <shayan.yaghoubi@h2oinnovation.com>
Subject: Olivenhain

Hi Shayan,

Tetra Tech is preparing a budgetary evaluation of a new brackish water RO project for the Olivenhain Water District.
Would appreciate very much if you could provide a budgetary quote for RO units: 1 & 2 MGD product water capacity (including blending). Each unit should be equipped with interstage ERD. Also please include CIP unit and CIP solution neutralization tank.
The parameters of the RO units are listed in the table below.
A representative computer projections for a 2 MGD unit is attached.

Will highly appreciate your prompt response.

Regards,

Product water capacity, mgd	1.0	2.0	1.0	2.0
Product water capacity, gpm	694	1388	694	1388
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RO permeate flow, gpm	600	1200	634	1268

Well water blending flow, gpm	94	188	60	120
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RO unit array, st	2	2	2	2
No of pressure vessels, st 1	14	28	15	30
No of pressure vessels, st 2	6	12	6	12
No of elements per vessel	7	7	7	7
Total number of membrane elements	140	280	147	294
Interstage ERD	1	1	1	1

Mark Wilf Ph. D.
Tetra Tech
17885 Von Karman Ave
Irvine, CA 92612
Phone: 858 444 7334

1340 N Jefferson St • Anaheim, CA 92807
PHONE 714.309-8141
ulises.martinez@dxpe.com

Tetra Tech
Olivehain Desalination Dosing Stations

Chemical Storage Tanks

(Image not indicative of final product)

1340 N Jefferson St • Anaheim, CA 92807
PHONE 714.309-8141
ulises.martinez@dxpe.com

MUNICIPAL SALES
WATER & WASTEWATER

February 28, 2022

PRICED PROPOSAL

Tetra Tech
17885 Von Karman Ave.#500
Irvine, CA 92614

Attention Mark Wilf PHD
Phone No. 858-444-7334

Confidential Information

All drawings, specifications, and technical information provided to the purchaser shall be treated as confidential and proprietary. In acceptance of this proposal, purchaser agrees not to permit any such drawings, specifications, or other such information to be shown or disclosed to anyone other than Tetra Tech personnel, or their client who need this information in connection with the work involved. Any other disclosure is specifically prohibited unless purchaser receives written permission from DXP Enterprises.

1340 N Jefferson St • Anaheim, CA 92807
PHONE 714.309-8141
ulises.martinez@dxpe.com

MUNICIPAL SALES
WATER & WASTEWATER

Chemical Storage HDPE Tanks 1 MGD $44,363.00

EQUIPMENT SCOPE OF SUPPLY

Service: 93% Sulfuric RO Feed – 4,400 Gallons

Vertical Storage Tanks:

Part No.	Capacity (gal)	Brimful (gal) Capacity	DxH(in)	Cylinder (in)Height	List Price
5210000N	4400	4600	90x182	166	$25,249.00

Service: 100% Scale Inhibitor RO Feed – 110gallons

Vertical Storage Tanks:

Part No.	Capacity (gal)	Brimful (gal) Capacity	DxH(in)	Cylinder Height (in)	List Price
8010000N	110	115	33x41	29	$1,368.00

Service: 12.5% Sodium Hypochlorite – 1600gallons

Vertical Storage Tanks:

Part No.	Capacity (gal)	Brimful (gal) Capacity	DxH(in)	Cylinder Height (in)	List Price
1780200N	1900	1900	72x119	108	$10,958.00

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ulises.martinez@dxpe.com

Service: 40% Ammonium Sulfate – 340 gallon

- Vertical Storage Tanks:

Part No.	Capacity (gal)	Brimful (gal) Capacity	DxH(in)	Cylinder Height (in)	List Price
5760100N	360	373	53x59	50	$2,418.00

Service: 50% Sodium Hydroxide – 800gallon

Vertical Storage Tanks:

Part No.	Capacity (gal)	Brimful (gal) Capacity	DxH(in)	Cylinder Height (in)	List Price
5760100N	850	850	48x117	107	$4,370.00

Chemical Storage HDPE Tanks 2 MGD $74,976.00

<u>EQUIPMENT SCOPE OF SUPPLY</u>

Service: 93% Sulfuric RO Feed – 8,000 Gallons

Vertical Storage Tanks:

Part No.	Capacity (gal)	Brimful (gal) Capacity	DxH(in)	Cylinder (in)Height	List Price
5210000N	8000	8300	120x186	166	$38,088.00

1340 N Jefferson St • Anaheim, CA 92807
PHONE 714.309-8141
ulises.martinez@dxpe.com

MUNICIPAL SALES
WATER & WASTEWATER

Service: 100% Scale Inhibitor RO Feed – 220gallons

Vertical Storage Tanks:

Part No.	Capacity (gal)	Brimful (gal) Capacity	DxH(in)	Cylinder Height (in)	List Price
1008100N	250	250	34x64	58	$1,832.00

Service: 12.5% Sodium Hypochlorite – 3200 gallons

Vertical Storage Tanks:

Part No.	Capacity (gal)	Brimful (gal) Capacity	DxH(in)	Cylinder Height (in)	List Price
8190000N	3650	3986	102x126	109	$19,672.00

Service: 40% Ammonium Sulfate – 680 gallons

Vertical Storage Tanks:

Part No.	Capacity (gal)	Brimful (gal) Capacity	DxH(in)	Cylinder Height (in)	List Price
1700200N	710	710	60x68	58	$4,426.00

1340 N Jefferson St • Anaheim, CA 92807
PHONE 714.309-8141
ulises.martinez@dxpe.com

MUNICIPAL SALES
WATER & WASTEWATER

Service: 50% Sodium Hyrdroxide – 1600 gallons

Vertical Storage Tanks:

Part No.	Capacity (gal)	Brimful (gal) Capacity	DxH(in)	Cylinder Height (in)	List Price
1780200N	1900	1900	72x119	108	$10,958.00

Misc:

Freight: FOB Destination
Shipment: 10 – 12 weeks after release to fabrication

1340 N Jefferson St • Anaheim, CA 92807
PHONE 714.309-8141
ulises.martinez@dxpe.com

MUNICIPAL SALES
WATER & WASTEWATER

Tetra Tech
Olivehain Desalination Dosing Stations

Chemical Transfer/Metering

1340 N Jefferson St • Anaheim, CA 92807
PHONE 714.309-8141
ulises.martinez@dxpe.com

MUNICIPAL SALES
WATER & WASTEWATER

February 28, 2022

PRICED PROPOSAL

Tetra Tech
17885 Von Karman Ave.#500
Irvine, CA 92614

Attention	Mark Wilf PHD
Phone No.	858-444-7334

We are pleased to submit our Proposal to supply pumps:

Chemical Transfer; Chemical Metering

Confidential Information

All drawings, specifications, and technical information provided to the purchaser shall be treated as confidential and proprietary. In acceptance of this proposal, purchaser agrees not to permit any such drawings, specifications, or other such information to be shown or disclosed to anyone other than Tetra Tech personnel, or their client who need this information in connection with the work involved. Any other disclosure is specifically prohibited unless purchaser receives written permission from DXP Enterprises.

1340 N Jefferson St • Anaheim, CA 92807
PHONE 714.309-8141
ulises.martinez@dxpe.com

MUNICIPAL SALES
WATER & WASTEWATER

Diaphragm Pump Skids 1 MGD $178,232.00

EQUIPMENT SCOPE OF SUPPLY

Service: 93% Sulfuric RO Feed – *5.5gph*

(1) Skid-mounted metering system, pre-piped, pre-wired Duplex
- (2) Diaphragm Pump Embedded Controller
- (2) Calibration column
- (1) Pressure Relief Valve
- (1) Pressure indicator w/isolator
- (1) Visual flow indicator
- (lot) Check valves
- (1) Pulsation dampener
- (1) Flow switch low
- (1) Control Panel
- (Lot) Sch.80 PVC piping, fittings, ball valves (PFA tubing for pump connections)
- Skid piping, labor

Service: Scale Inhibitor – 0.2 gph

(1) Skid-mounted metering system, pre-piped, pre-wired Duplex
- (2) Diaphragm Pump Embedded Controller
- (2) Calibration column
- (1) Pressure Relief Valve
- (1) Pressure indicator w/isolator
- (1) Visual flow indicator
- (lot) Check valves
- (1) Pulsation dampener
- (1) Flow switch low
- (1) Control Panel
- (Lot) Sch.80 PVC piping, fittings, ball valves (PFA tubing for pump connections)
- Skid piping, labor

DXP
1340 N Jefferson St • Anaheim, CA 92807
PHONE 714.309-8141
ulises.martinez@dxpe.com

MUNICIPAL SALES
WATER & WASTEWATER

Service: 12.5% Sodium Hypochlorite – 2.2 gph

(1) Skid-mounted metering system, pre-piped, pre-wired Duplex
- (2) Diaphragm Pump Embedded Controller
- (2) Calibration column
- (1) Pressure Relief Valve
- (1) Pressure indicator w/isolator
- (1) Visual flow indicator
- (lot) Check valves
- (1) Pulsation dampener
- (1) Flow switch low
- (1) Control Panel
- (Lot) Sch.80 PVC piping, fittings, ball valves (PFA tubing for pump connections)
- Skid piping, labor

Service: 40% Ammonium Sulfate – 0.5 gph

(1) Skid-mounted metering system, pre-piped, pre-wired Duplex
- (2) Diaphragm Pump Embedded Controller
- (2) Calibration column
- (1) Pressure Relief Valve
- (1) Pressure indicator w/isolator
- (1) Visual flow indicator
- (lot) Check valves
- (1) Pulsation dampener
- (1) Flow switch low
- (1) Control Panel
- (Lot) Sch.80 PVC piping, fittings, ball valves (PFA tubing for pump connections)
- Skid piping, labor

1340 N Jefferson St • Anaheim, CA 92807
PHONE 714.309-8141
ulises.martinez@dxpe.com

Service: 50% Sodium Hydroxide – 1.1 gph

(1) Skid-mounted metering system, pre-piped, pre-wired Duplex

- (2) Diaphragm Pump Embedded Controller
- (2) Calibration column
- (1) Pressure Relief Valve
- (1) Pressure indicator w/isolator
- (1) Visual flow indicator
- (lot) Check valves
- (1) Pulsation dampener
- (1) Flow switch low
- (1) Control Panel
- (Lot) Sch.80 PVC piping, fittings, ball valves (PFA tubing for pump connections)
- Skid piping, labor

Diaphragm Pump Skids 2 MGD $178,232.00

EQUIPMENT SCOPE OF SUPPLY

Service: 93% Sulfuric Acid – 11 gph

(1) Skid-mounted metering system, pre-piped, pre-wired Duplex

- (2) Diaphragm Pump Embedded Controller
- (2) Calibration column
- (1) Pressure Relief Valve
- (1) Pressure indicator w/isolator
- (1) Visual flow indicator
- (lot) Check valves
- (1) Pulsation dampener
- (1) Flow switch low
- (1) Control Panel
- (Lot) Sch.80 PVC piping, fittings, ball valves (PFA tubing for pump connections)
- Skid piping, labor

1340 N Jefferson St • Anaheim, CA 92807
PHONE 714.309-8141
ulises.martinez@dxpe.com

Service: Scale Inhibitor – 0.4 gph

(1) Skid-mounted metering system, pre-piped, pre-wired Duplex
- (2) Diaphragm Pump Embedded Controller
- (2) Calibration column
- (1) Pressure Relief Valve
- (1) Pressure indicator w/isolator
- (1) Visual flow indicator
- (lot) Check valves
- (1) Pulsation dampener
- (1) Flow switch low
- (1) Control Panel
- (Lot) Sch.80 PVC piping, fittings, ball valves (PFA tubing for pump connections)
- Skid piping, labor

Service: 12.5% Sodium Hypochlorite – 4.4 gph

(1) Skid-mounted metering system, pre-piped, pre-wired Duplex
- (2) Diaphragm Pump Embedded Controller
- (2) Calibration column
- (1) Pressure Relief Valve
- (1) Pressure indicator w/isolator
- (1) Visual flow indicator
- (lot) Check valves
- (1) Pulsation dampener
- (1) Flow switch low
- (1) Control Panel
- (Lot) Sch.80 PVC piping, fittings, ball valves (PFA tubing for pump connections)
- Skid piping, labor

Service: 40% Ammonium Sulfate – 1.0 gph

(1) Skid-mounted metering system, pre-piped, pre-wired Duplex
- (2) Diaphragm Pump Embedded Controller
- (2) Calibration column
- (1) Pressure Relief Valve
- (1) Pressure indicator w/isolator
- (1) Visual flow indicator
- (lot) Check valves

1340 N Jefferson St • Anaheim, CA 92807
PHONE 714.309-8141
ulises.martinez@dxpe.com

- (1) Pulsation dampener
- (1) Flow switch low
- (1) Control Panel
- (Lot) Sch.80 PVC piping, fittings, ball valves (PFA tubing for pump connections)
- Skid piping, labor

Service: 50% Sodium Hydroxide – 2.2 gph

(1) Skid-mounted metering system, pre-piped, pre-wired Duplex

- (2) Diaphragm Pump Embedded Controller
- (2) Calibration column
- (1) Pressure Relief Valve
- (1) Pressure indicator w/isolator
- (1) Visual flow indicator
- (lot) Check valves
- (1) Pulsation dampener
- (1) Flow switch low
- (1) Control Panel
- (Lot) Sch.80 PVC piping, fittings, ball valves (PFA tubing for pump connections)
- Skid piping, labor

Misc:

Freight:	FOB Destination
Shipment:	10 – 12 weeks after release to fabrication

- **PFA tubing is suggested throughout the skid for leak-free operation and ease of field workability.**
- **Skid is tested locally prior to delivery.**
- **Skid is fabricated locally in Orange County.**

1340 N. Jefferson Ave • Anaheim , CA 92807
Phone (714)-309-8141 •
Ulises.Martinez@dxpe.com
DXP Enterprises, Inc.

THE INDUSTRIAL DISTRIBUTION EXPERTS

Attn:

Zeshan Punja
Tetra Tech
17885 Von Karma Ave. #500
Irvine, CA 92614

Subject:
OMWD Brackish Water Desalination **3/4/2022**

EQUIPMENT SCOPE OF SUPPLY

5x4x12 SSC Pumps

Qty. 1 Patterson model 5x4x12 SSC single stage horizontal split case pump rated at 848 GPM @ 486 FT TDH at 3575 RPM with the following features:

- Materials of Construction: NSF Compliant Material
- Base/ Coupling/ Guard
- Mechanical Seal: PRG Seal
- Motor: 200 HP, 3600 RPM Motor (TEFC enclosure, 460/3/60)
- Test: unwittnessed Hydro and Test

Unit Price:	$54,990.00
200HP VFD:	$25,000.00
Total:	**$79,990.00**

Control Panels:

Duplex control Panel: $100,000.00
Quadplex control Panel: $200,000.00

1340 N. Jefferson Ave • Anaheim , CA 92807
Phone (714)-309-8141 •
Ulises.Martinez@dxpe.com
DXP Enterprises, Inc.

THE INDUSTRIAL DISTRIBUTION EXPERTS

Notes:

a) Taxes are not included in above pricing.

b) Terms: Net 30 OAC. Quote is valid for 30 days.

c) Price above does not include inbound/outbound freight

*d) Please contact Ulises Martinez **(714) 309-8141** with any questions or concerns*

Thank you for the opportunity to quote!

Olivehain Municipal Water District
San Dieguito Valley Brackish Groundwater Desalination Study
DRAFT - Engineer's Opinion of Probable Construction Cost
TREATMENT SITE
Date: 03/01/2022

			Estimated Quantity	Unit	Unit Cost	Total Cost	Total Adjusted Cost
1.	Treatment Site - Civil Construction Costs						
	a.	Mobilization	1	LS	$50,000	$50,000	$50,000
	b.	Excavation	2000	CY	$8	$16,000	$16,000
	c.	Backfill and Compaction	2000	CY	$10	$20,000	$20,000
	d.	Import and Raise Site (10 ft)	9630	CY	$20	$192,600	$192,600
	e.	Final Grading	26180	SF	$1	$26,200	$26,200
	f.	Drainage System	1	LS	$17,500	$17,500	$17,500
	g.	Landscape	3500	SF	$15	$52,500	$52,500
	h.	Pavement	8000	SF	$20	$160,000	$160,000
	i.	Driveways	2	EA	$5,000	$10,000	$10,000
	j.	Fencing	360	LF	$20	$7,200	$7,200
	k.	Access Gates	2	EA	$15,000	$30,000	$30,000
	l.	Painting, Striping and Signage	1	LS	$7,000	$7,000	$7,000
Subtotal:							$589,000
General Requirements, Bonding, Ins. (5%)							$30,000
Overhead and Profit (15%)							$89,000
Contingency (20%)							$118,000
	GRAND TOTAL:						$826,000

Electrical Cost Estimate

Client: **OMWD**
Project: **OMWD - Brackish Desalter**
Status:

Prepared by: **MK**
Checked by:

Date: **2/28/2022**
Date:

Line Item No.	Description	Qty	Unit	Material Cost Unit	Material Cost Total	Labor Cost Unit	Labor Cost Total	TOTAL
3	MSB	1	LS	$100,000	$100,000	$45,000	$45,000	$145,000
4	MCC	1	LS	$115,000	$115,000	$75,000	$75,000	$190,000
5	VFD	1	LS	$350,000	$350,000	$100,000	$100,000	$450,000
8	Integrated Power system (IPS)	1	LS	$30,000	$30,000	$30,000	$30,000	$60,000
9	Conduits and Wires	1	LS	$300,000	$300,000	$150,000	$150,000	$450,000
10	Trenching	1	LS	$25,000	$25,000	$25,000	$25,000	$50,000
12	Underground Electrical pull boxes	1	LS	$15,000	$15,000	$10,000	$10,000	$25,000
13	Well BLDG and Pump Station BLDG Lighting and Receptacles	1	LS	$30,000	$30,000	$35,000	$35,000	$65,000
14	Site lighting	1	LS	$20,000	$20,000	$25,000	$25,000	$45,000
15	Vessel site lighting	1	LS	$8,000	$8,000	$10,000	$10,000	$18,000
17	PLC Panel	1	LS	$90,000	$90,000	$60,000	$60,000	$150,000
19	Programing and Testing	1	LS	$0	$0	$100,000	$100,000	$100,000
20	Solar with batteries	1	LS	$150,000	$150,000	$75,000	$75,000	$225,000
21	Misc.	1	LS	$30,000	$30,000	$30,000	$30,000	$60,000
	WELL #66 SUBTOTAL				$1,263,000		$770,000	$2,033,000
	SUBTOTAL				$1,263,000		$770,000	$2,033,000

Sales Tax 8.00% of materials =	$101,040.00
SUBTOTAL with sales tax =	$2,134,040
Contingency =	$0
TOTAL	**$2,134,040**

Appendix C. Groundwater Well Construction Estimate

Conduit	Qty	Unit	Material Cost RSMeans 2014	Material Cost +20% Markup	Material Cost TOTAL	Labor Cost RSMeans 2014	Labor Cost +20% Markup	Labor Cost TOTAL	TOTAL
5" PVC schedule 40 conduit		LF	$13.95	$16.74	$0	$12.20	$14.64	$0	$0
4" PVC schedule 40 conduit		LF	$10.70	$12.84	$0	$9.50	$11.40	$0	$0
3-1/2" PVC schedule 40 conduit		LF	$9.25	$11.10	$0	$8.55	$10.26	$0	$0
3" PVC schedule 40 conduit		LF	$7.05	$8.46	$0	$7.75	$9.30	$0	$0
2-1/2" PVC schedule 40 conduit		LF	$6.15	$7.38	$0	$6.55	$7.86	$0	$0
2" PVC schedule 40 conduit		LF	$4.09	$4.91	$0	$4.74	$5.69	$0	$0
1-1/2" PVC schedule 40 conduit		LF	$3.14	$3.77	$0	$4.27	$5.12	$0	$0
1" PVC schedule 40 conduit		LF	$2.09	$2.51	$0	$3.41	$4.09	$0	$0
3/4" PVC schedule 40 conduit		LF	$1.07	$1.28	$0	$2.94	$3.53	$0	$0
5" PVC coated steel conduit		LF	$121.00	$145.20	$0	$28.50	$34.20	$0	$0
4" PVC coated steel conduit		LF	$49.00	$58.80	$0	$23.50	$28.20	$0	$0
3-1/2" PVC coated steel conduit		LF	$47.00	$56.40	$0	$21.50	$25.80	$0	$0
3" PVC coated steel conduit		LF	$35.00	$42.00	$0	$19.40	$23.28	$0	$0
2-1/2" PVC coated steel conduit		LF	$31.00	$37.20	$0	$17.05	$20.46	$0	$0
2" PVC coated steel conduit		LF	$19.00	$22.80	$0	$12.20	$14.64	$0	$0
1-1/2" PVC coated steel conduit		LF	$14.15	$16.98	$0	$9.50	$11.40	$0	$0
1" PVC coated steel conduit		LF	$9.35	$11.22	$0	$7.75	$9.30	$0	$0
3/4" PVC coated steel conduit		LF	$7.55	$9.06	$0	$6.10	$7.32	$0	$0
5" rigid steel conduit		LF	$45.00	$54.00	$0	$28.50	$34.20	$0	$0
4" rigid steel conduit		LF	$23.00	$27.60	$0	$21.50	$25.80	$0	$0
3-1/2" rigid steel conduit		LF	$19.45	$23.34	$0	$19.40	$23.28	$0	$0
3" rigid steel conduit		LF	$15.50	$18.60	$0	$17.05	$20.46	$0	$0
2-1/2" rigid steel conduit		LF	$13.30	$15.96	$0	$12.20	$14.64	$0	$0
2" rigid steel conduit		LF	$7.45	$8.94	$0	$9.50	$11.40	$0	$0
1-1/2" rigid steel conduit		LF	$5.75	$6.90	$0	$7.75	$9.30	$0	$0
1" rigid steel conduit		LF	$3.69	$4.43	$0	$6.55	$7.86	$0	$0
3/4" rigid steel conduit		LF	$2.56	$3.07	$0	$5.35	$6.42	$0	$0
4" liquidtight flexible metallic conduit		LF	$20.00	$24.00	$0	$28.50	$34.20	$0	$0
3" liquidtight flexible metallic conduit		LF	$13.35	$16.02	$0	$17.05	$20.46	$0	$0
2" liquidtight flexible metallic conduit		LF	$5.65	$6.78	$0	$14.25	$17.10	$0	$0
1 1/2" liquidtight flexible metallic conduit		LF	$4.50	$5.40	$0	$10.65	$12.78	$0	$0
1" liquidtight flexible metallic conduit		LF	$2.83	$3.40	$0	$6.10	$7.32	$0	$0
3/4" liquidtight flexible metallic conduit		LF	$1.88	$2.26	$0	$4.27	$5.12	$0	$0
CONDUIT TOTAL					$0			$0	$0

Wire & Cable	Qty	Unit	Material Cost RSMeans 2014	Material Cost +20% Markup	Material Cost TOTAL	Labor Cost RSMeans 2014	Labor Cost +20% Markup	Labor Cost TOTAL	TOTAL
750 kcmil stranded copper conductor, THHN/THWN, 600V		LF	$25.25	$30.30	$0	$3.90	$4.68	$0	$0
500 kcmil stranded copper conductor, THHN/THWN, 600V		LF	$11.75	$14.10	$0	$2.67	$3.20	$0	$0
350 kcmil stranded copper conductor, THHN/THWN, 600V		LF	$8.55	$10.26	$0	$2.37	$2.84	$0	$0
250 kcmil stranded copper conductor, THHN/THWN, 600V		LF	$6.05	$7.26	$0	$2.13	$2.56	$0	$0
#4/0 stranded copper conductor, THHN/THWN, 600V		LF	$5.00	$6.00	$0	$1.94	$2.33	$0	$0
#3/0 stranded copper conductor, THHN/THWN, 600V		LF	$4.00	$4.80	$0	$1.71	$2.05	$0	$0
#2/0 stranded copper conductor, THHN/THWN, 600V		LF	$3.20	$3.84	$0	$1.47	$1.76	$0	$0
#1/0 stranded copper conductor, THHN/THWN, 600V		LF	$2.54	$3.05	$0	$1.29	$1.55	$0	$0
#1 stranded copper conductor, THHN/THWN, 600V		LF	$2.12	$2.54	$0	$1.07	$1.28	$0	$0
#2 stranded copper conductor, THHN/THWN, 600V		LF	$1.61	$1.93	$0	$0.95	$1.14	$0	$0
#3 stranded copper conductor, THHN/THWN, 600V		LF	$1.29	$1.55	$0	$0.86	$1.03	$0	$0
#4 stranded copper conductor, THHN/THWN, 600V		LF	$1.03	$1.24	$0	$0.81	$0.97	$0	$0
#6 stranded copper conductor, THHN/THWN, 600V		LF	$0.65	$0.78	$0	$0.66	$0.79	$0	$0
#8 stranded copper conductor, THHN/THWN, 600V		LF	$0.38	$0.46	$0	$0.54	$0.64	$0	$0
#10 stranded copper conductor, THHN/THWN, 600V		LF	$0.25	$0.29	$0	$0.43	$0.51	$0	$0
#12 stranded copper conductor, THHN/THWN, 600V		LF	$0.16	$0.19	$0	$0.39	$0.47	$0	$0
750 kcmil stranded copper conductor, XHHW, 600V		LF	$23.75	$28.50	$0	$3.90	$4.68	$0	$0
500 kcmil stranded copper conductor, XHHW, 600V		LF	$11.00	$13.20	$0	$2.67	$3.20	$0	$0
350 kcmil stranded copper conductor, XHHW, 600V		LF	$8.00	$9.60	$0	$2.37	$2.84	$0	$0
250 kcmil stranded copper conductor, XHHW, 600V		LF	$6.10	$7.32	$0	$2.13	$2.56	$0	$0
#4/0 stranded copper conductor, XHHW, 600V		LF	$5.90	$7.08	$0	$1.94	$2.33	$0	$0
#3/0 stranded copper conductor, XHHW, 600V		LF	$4.70	$5.64	$0	$1.71	$2.05	$0	$0
#2/0 stranded copper conductor, XHHW, 600V		LF	$3.75	$4.50	$0	$1.47	$1.76	$0	$0
#1/0 stranded copper conductor, XHHW, 600V		LF	$3.00	$3.60	$0	$1.29	$1.55	$0	$0
#1 stranded copper conductor, XHHW, 600V		LF	$2.42	$2.90	$0	$1.07	$1.28	$0	$0
#2 stranded copper conductor, XHHW, 600V		LF	$1.77	$2.12	$0	$0.95	$1.14	$0	$0
#4 stranded copper conductor, XHHW, 600V		LF	$1.13	$1.36	$0	$0.81	$0.97	$0	$0
#6 stranded copper conductor, XHHW, 600V		LF	$0.74	$0.88	$0	$0.66	$0.79	$0	$0
#8 stranded copper conductor, XHHW, 600V		LF	$0.45	$0.53	$0	$0.54	$0.64	$0	$0
#10 stranded copper conductor, XHHW, 600V		LF	$0.29	$0.35	$0	$0.43	$0.51	$0	$0
#12 stranded copper conductor, XHHW, 600V		LF	$0.19	$0.23	$0	$0.39	$0.47	$0	$0
WIRE & CABLE TOTAL					$0			$0	$0

CONDUIT & WIRE TOTAL	Material	Labor
CONDUIT & WIRE TOTAL	$0	$0

Olivehain Municipal Water District
San Dieguito Valley Brackish Groundwater Desalination Study
DRAFT - Engineer's Opinion of Probable Construction Cost
WELL 2
Date: 03/01/2022

				Estimated Quantity	Unit	Unit Cost	Total Cost	Total Adjusted Cost
1.		Well 2 - Well Costs						
	a.	Mobilization/Demobilization Reverse Circulation Drill Rig and Equipment, Permits, Bonds, and NPDES Compliance		1	LS	$100,000	$100,000	$100,000
	b.	Furnish, Install and Maintain Noise Equipment and Noise Attenuation Panels		400	LF	$100	$40,000	$40,000
	c.	Provide for Treatment Sampling, Analysis, and Compliance with NPDES Permit		1	LS	$70,000	$70,000	$70,000
	d.	36-inch OD Steel Conductor Casing in 48-inch Borehole		50	LF	$800	$40,000	$40,000
	e.	Pilot Hole Drilling		200	LF	$250	$50,000	$50,000
	f.	Downhole Geophysical Surveying		1	LS	$7,000	$7,000	$7,000
	g.	Isolated Aquifer Zone Test Construction & Development		1	EA	$25,000	$25,000	$25,000
	h.	Collect, Store and Transport Groundwater Samples to Laboratory		1	EA	$5,500	$5,500	$5,500
	i.	35.25-inch Diameter Upper Pilot Hole Ream		50	LF	$270	$13,500	$13,500
	j.	28-inch Diameter Lower Pilot Hole Ream		110	LF	$240	$26,400	$26,400
	k.	Downhole Caliper Survey		1	LS	$5,000	$5,000	$5,000
	l.	Downhole Deviation (magnetic) Survey		1	LS	$3,000	$3,000	$3,000
	m.	18-inch Super Duplex 2507 Stainless Steel Blank Casing (1/4" thk)		63	LF	$1,000	$62,500	$62,500
	n.	18-inch Super Duplex 2507 Stainless Steel Louvered Casing (1/4" thk)		65	LF	$900	$58,500	$58,500
	o.	18-inch Super Duplex Stainless Steel Cellar Pipe (" thk) with Welded Bottom Cap		20	LF	$900	$18,000	$18,000
	p.	3-inch 316 Stainless Steel Gravel Feed Tube		42	LF	$25	$1,100	$1,100
	q.	2-inch Type 316L Stainless Steel Pressure Transmitter/Sounding Tube		60	LF	$20	$1,200	$1,200
	r.	4-inch Type 316L Stainless Steel Camera Tube		60	LF	$60	$3,600	$3,600
	s.	3-inch Type 316L Stainless Steel Air Vent Tube		4	LF	$100	$400	$400
	t.	Pilot Hole Bottom Seal (optional)		10	LF	$50	$500	$500
	u.	Gravel Pack		120	LF	$150	$18,000	$18,000
	v.	Annular Grout Seal		160	LF	$70	$11,200	$11,200
	w.	Gyroscopic Alignment Test		1	LS	$3,000	$3,000	$3,000
	x.	Mechanical Well, and Chemical Development		1	LS	$20,000	$20,000	$20,000
	y.	Conduct Video Camera Survey		2	EA	$2,000	$4,000	$4,000
	z.	Mobilization and Demobilization of Test Pump		1	LS	$25,000	$25,000	$25,000
	aa.	Pumping Development (Step-Drawdown and Constant Rate Testing)		1	LS	$32,000	$32,000	$32,000
	bb.	Downwell Dynamic Spinner Survey		1	LS	$7,500	$7,500	$7,500
		Subtotal:	$652,000					
2.		Well 2 - Site Costs						
	a.	Well Pump, Pump Base, and Electric Motor		1	LS	$140,000	$140,000	$140,000
	b.	Well Above Ground Piping, Valves and Appurtenances		1	LS	$40,000	$40,000	$40,000
	c.	Site Improvements		1	LS	$70,000	$70,000	$70,000
	d.	Electrical and Instrumentation Equipment Improvements		1	LS	$200,000	$200,000	$200,000
		Subtotal:	$450,000					
Subtotal:								$1,102,000
General Requirements, Bonding, Ins. (5%)								$56,000
Overhead and Profit (15%)								$166,000
Contingency (20%)								$221,000
		GRAND TOTAL:						$1,545,000

Olivehain Municipal Water District
San Dieguito Valley Brackish Groundwater Desalination Study
DRAFT - Engineer's Opinion of Probable Construction Cost
WELL 2A
Date: 03/01/2022

			Estimated Quantity	Unit	Unit Cost	Total Cost	Total Adjusted Cost
1.	Well 2A - Well Costs						
a.	Mobilization/Demobilization Reverse Circulation Drill Rig and Equipment, Permits, Bonds, and NPDES Compliance		1	LS	$100,000	$100,000	$100,000
b.	Furnish, Install and Maintain Noise Equipment and Noise Attenuation Panels		400	LF	$100	$40,000	$40,000
c.	Provide for Treatment Sampling, Analysis, and Compliance with NPDES Permit		1	LS	$70,000	$70,000	$70,000
d.	36-inch OD Steel Conductor Casing in 48-inch Borehole		50	LF	$800	$40,000	$40,000
e.	Pilot Hole Drilling		200	LF	$250	$50,000	$50,000
f.	Downhole Geophysical Surveying		1	LS	$7,000	$7,000	$7,000
g.	Isolated Aquifer Zone Test Construction & Development		1	EA	$25,000	$25,000	$25,000
h.	Collect, Store and Transport Groundwater Samples to Laboratory		1	EA	$5,500	$5,500	$5,500
i.	35.25-inch Diameter Upper Pilot Hole Ream		50	LF	$270	$13,500	$13,500
j.	28-inch Diameter Lower Pilot Hole Ream		110	LF	$240	$26,400	$26,400
k.	Downhole Caliper Survey		1	LS	$5,000	$5,000	$5,000
l.	Downhole Deviation (magnetic) Survey		1	LS	$3,000	$3,000	$3,000
m.	18-inch Super Duplex 2507 Stainless Steel Blank Casing (1/4" thk)		63	LF	$1,000	$62,500	$62,500
n.	18-inch Super Duplex 2507 Stainless Steel Louvered Casing (1/4" thk)		65	LF	$900	$58,500	$58,500
o.	18-inch Super Duplex Stainless Steel Cellar Pipe (" thk) with Welded Bottom Cap		20	LF	$900	$18,000	$18,000
p.	3-inch 316 Stainless Steel Gravel Feed Tube		42	LF	$25	$1,100	$1,100
q.	2-inch Type 316L Stainless Steel Pressure Transmitter/Sounding Tube		60	LF	$20	$1,200	$1,200
r.	4-inch Type 316L Stainless Steel Camera Tube		60	LF	$60	$3,600	$3,600
s.	3-inch Type 316L Stainless Steel Air Vent Tube		4	LF	$100	$400	$400
t.	Pilot Hole Bottom Seal (optional)		10	LF	$50	$500	$500
u.	Gravel Pack		120	LF	$150	$18,000	$18,000
v.	Annular Grout Seal		160	LF	$70	$11,200	$11,200
w.	Gyroscopic Alignment Test		1	LS	$3,000	$3,000	$3,000
x.	Mechanical Well, and Chemical Development		1	LS	$20,000	$20,000	$20,000
y.	Conduct Video Camera Survey		2	EA	$2,000	$4,000	$4,000
z.	Mobilization and Demobilization of Test Pump		1	LS	$25,000	$25,000	$25,000
aa.	Pumping Development (Step-Drawdown and Constant Rate Testing)		1	LS	$32,000	$32,000	$32,000
bb.	Downwell Dynamic Spinner Survey		1	LS	$7,500	$7,500	$7,500
	Subtotal:	$652,000					
2.	Well 2A - Site Costs						
a.	Well Pump, Pump Base, and Electric Motor		1	LS	$140,000	$140,000	$140,000
b.	Well Above Ground Piping, Valves and Appurtenances		1	LS	$40,000	$40,000	$40,000
c.	Site Improvements		1	LS	$70,000	$70,000	$70,000
d.	Electrical and Instrumentation Equipment Improvements		1	LS	$200,000	$200,000	$200,000
	Subtotal:	$450,000					
Subtotal:							$1,102,000
General Requirements, Bonding, Ins. (5%)							$56,000
Overhead and Profit (15%)							$166,000
Contingency (20%)							$221,000
	GRAND TOTAL:						$1,545,000

Appendix D. Pipeline Construction Estimate

TETRA TECH

Prepared By: ZP
Date: 2/28/2022
CHK By:

San Dieguito Valley Brackish Groundwater Desalination Study

Opinion of Probable Construction Costs

Item	Description	Qty	Unit	Unit Cost[10]	Cost	Subtotal
GENERAL						
1	Mobilization/Demobilization			5.0%	$451,186	
2	SWPPP			1.5%	$135,356	
				AGREGATE (ITEMS 1-2)		*$586,541*
BRINE DISCHARGE MAIN						
3	6-inch C-900 DR-18 PVC (Paved Roadway Surfaces)[1]	13300	LF	$ 120	$1,596,000	
4	6-inch C-900 DR-18 PVC (Unpaved Surfaces)[1]	1700	LF	$ 60	$102,000	
5	6-inch Jack & Bore Mobilization/Demobilization[2]	3	LS	$ 36,070	$108,210	
6	6-inch Jack & Bore Trenchless Installation[3]	1500	LF	$ 700	$1,050,000	
7	8-inch C-900 DR-18 PVC (Paved Roadway Surfaces)[1]	15420	LF	$ 130	$2,004,600	
8	8-inch C-900 DR-18 PVC (Unpaved Surfaces)[1]	2930	LF	$ 70	$205,100	
9	8-inch Jack & Bore Mobilization/Demobilization[2]	1	LS	$ 36,040	$36,040	
10	8-inch Jack & Bore Trenchless Installation[3]	500	LF	$ 710	$355,000	
11	6-inch 11.25 Degree Bends[1,4]	13	EA	$ 710	$9,230	
12	6-inch 22.5 Degree Bends[1,4]	11	EA	$ 700	$7,700	
13	6-inch 45 Degree Bends[1,4]	9	EA	$ 720	$6,480	
14	6-inch 90 Degree Bends[1,4]	14	EA	$ 750	$10,500	
15	8-inch 11.25 Degree Bends[1,4]	9	EA	$ 980	$8,820	
16	8-inch 22.5 Degree Bends[1,4]	9	EA	$ 1,000	$9,000	
17	8-inch 45 Degree Bends[1,4]	7	EA	$ 1,000	$7,000	
18	8-inch 90 Degree Bends[1,4]	8	EA	$ 1,080	$8,640	
19	6-inch Solid Wedge Gate Valve[5]	8	EA	$ 15,600	$124,800	
20	8-inch Solid Wedge Gate Valve[5]	10	EA	$ 21,970	$219,700	
21	6-inch Blowoff Assembly[1,5]	6	EA	$ 26,510	$159,060	
22	1-inch ARV Assembly[6]	7	EA	$ 18,450	$129,150	
23	WRF Discharge Connection[7]	1	EA	$ 35,000	$35,000	
BRINE BOOSTER STATION						
23	Booster Pump Skid Unit - Goulds ITT NM3196 (Duplex - 1 MGD WTP	1	LS	$ 50,000	$50,000	
24	Variable Frequency Drive (Duplex - 1 MGD WTP Capacity)	2	EA	$ 10,000	$20,000	
25	Booster Pump - Additional at 2 MGD WTP Capacity	1	EA	$ 20,500	$20,500	
26	Variable Frequency Drive - Additional at 2 MGD WTP Capacity	1	EA	$ 10,000	$10,000	
27	Booster Pump - Additional at 3 MGD WTP Capacity	1	EA	$ 20,500	$20,500	
28	Variable Frequency Drive - Additional at 3 MGD WTP Capacity	1	EA	$ 10,000	$10,000	
	ELECTRICAL IMPROVEMENTS [8]					
29	Expanded Electrical Service	1	LS	$ 20,000	$20,000	
30	I&C / Electrical / SCADA	1	LS	$ 20,000	$20,000	
31	Generator	1	LS	$ 80,000	$80,000	
	STRUCTURAL IMPROVEMENTS					
32	Wetwell Structure (10' x 5' x 5' - 2HR Emergency Storage at 450 gpm)	22	CY	$ 750	$16,500	
33	Booster Pump Skid Unit - Equipment Pad	4	CY	$ 750	$3,000	
BRACKISH WATER DISCHARGE MAIN						
34	12-inch C-900 DR-18 PVC (Paved Roadway Surfaces)[1]	2000	LF	$ 170	$340,000	
35	12-inch C-900 DR-18 PVC (Unpaved Surfaces)[1]	500	LF	$ 100	$50,000	
36	12-inch 11.25 Degree Bends[1,4]	5	EA	$ 1,630	$8,150	
37	12-inch 22.5 Degree Bends[1,4]	5	EA	$ 1,670	$8,350	
38	12-inch 45 Degree Bends[1,4]	5	EA	$ 1,800	$9,000	
39	12-inch 90 Degree Bends[1,4]	7	EA	$ 2,410	$16,870	
40	12-inch Solid Wedge Gate Valve[5]	2	EA	$ 48,230	$96,460	
41	6-inch Blowoff Assembly[1,5]	1	EA	$ 28,380	$28,380	
42	1-inch ARV Assembly[6]	2	EA	$ 19,220	$38,440	
POTABLE WATER DISCHARGE MAIN						
43	12-inch C-900 DR-18 PVC (Paved Roadway Surfaces)[1]	8300	LF	$ 170	$1,411,000	
44	12-inch C-900 DR-18 PVC (Unpaved Surfaces)[1]	0	LF	$ 100	$0	
45	12-inch Jack & Bore Mobilization/Demobilization[2]	2	LS	$ 36,740	$73,480	
46	12-inch Jack & Bore Trenchless Installation[3]	500	LF	$ 740	$370,000	
47	12-inch 11.25 Degree Bends[1,4]	9		$ 950	$8,550	
48	12-inch 22.5 Degree Bends[1,4]	7		$ 970	$6,790	
49	12-inch 45 Degree Bends[1,4]	6		$ 1,050	$6,300	
50	12-inch 90 Degree Bends[1,4]	8		$ 1,190	$9,520	
51	12-inch Resilient Wedge Gate Valve	4		$ 5,950	$23,800	
52	6-inch Blowoff Assembly[1,5]	1		$ 14,000	$14,000	
53	1-inch ARV Assembly[6]	1		$ 5,710	$5,710	
54	12" 402 PZ Connection[9]	1		$ 36,380	$36,380	
				AGREGATE (ITEMS 3-53)		*$9,023,710*
SUBTOTAL (ALL AGREGATE COST)						*$9,610,251*
	Environmental Mitigation			5.0%	$480,513	
					$0	
					$0	
SUBTOTAL (CONTINGENCY + AGREGATE COST)						*$10,090,764*
TOTAL PROJECT COST (ROUNDED)						***$10,091,000***

Notes:

1.) Estimates for excavation, backfilling, and paving (unpaved surfaces excludes paving) are included in the unit cost and were developed using RS Means. Piping and mechanical joint fittings and restraints are included in the unit costs based on vendor budgetary estimates. Please note that ductile iron mechanical joint fittings for brine and brackish water account for Protecto 401 Epoxy Lining, which is recommended by the lining manufacturer for saline solutions with a salt concentration of 28%. Potable ductile iron mechancial joint fittings account for cement mortar lining.
2.) The unit cost for jack & bore mobilization and demobilization are based on RS Means maximum unit cost estimate.
3.) The RS Means unit cost for the trenchless jack and bore installation is for a 24" pipe casing with 1/2" thick walls, which is the smallest size casing noted on RS Means. The estimate, however, is within typical ranges for jack & bore operations, which ranges from $500-$700/LF. Jack & bore installations go a maximum of 600' LF per setup, threfore, that was used to develop the number of mobilization/demobilization setups.
4.) All bends have an additional 5 bends added to account for any vertical bends that can not be ascertained at this time.
5.) Solid wedge gate valves with aluminum bronze material are recommended and have been shown to perform well in industrial applications where brine or brackish service is required. An alternative is a butterfly valve of aluminum and bronze material make. The vendor quoted Tetra Tech solid wedge gate valves with the following specifications: DHC Class 150# Flanged, NRS Solid Wedge Gate Valve, B148 C95800 Nickel Aluminum Bronze Body, Bronze Disc, B150 C6300 Nickel Aluminum Bronze Stem, HW Open Left.
6.) The ARV unit cost for brackish and brine applications accounts for duplex stainless steel ARVs, which are suitable for brine and brackish applications. The cost is noticeably higher than the 1" potable ARV assembly.
7.) No as-builts are available to understand the means to connect to the existing ocen outfall at the San Elijo WRF. Therfore, an assumption on the piping connection is estimated at $15,000 and for bypass operations an additional $20,000 was assumed.
8.) Electrical improvements are approximate estimates and conservative enough for this study phase portion pf the project. During detailed design these numbers will be more refined and with further conversations with OMWD operations and their controls/SCADA group whereby a more detailed estimate can be developed.
9.) The cost of the connection accounts for the piping connections using RS Means and estimates for fittings & restraints from vendors, however, for water that will need to be removed from the existng pressure mains and hauled offsite to make the connection to the existing distribution system an estimated $30,000 was included.
10.) Unit cost where manufacturer equipment and piping costs were received from vendors had multipliers of 1.15 applied twice to the unit cost estimate they provided to Tetra Tech to account for contractor markup/profit and inflationary costs over a two year period. Therfore, the multipliers are as follows: contractor markup/profit = 1.15 & inflationary cost (2 yrs) = 1.15.

Item	RS Means Line Num	Work	RS Means Description	Labor Unit Cost	Equip. Unit Cost	Unit Cost	Unit	QTY	Unit	Cost/LF	Cost/Item	Units	
6" Pipe Trench & Paving Unit Costs													
1		*Excavation*											
	312316131356		4'-6' Deep, 3/4 C.Y. excavator w/trench box - Paved			$8.48	per CY	0.48	CY/ft	$4.10	$4.10	LF	
	312316131356		4'-6' Deep, 3/4 C.Y. excavator w/trench box - Unpaved			$8.48	per CY	0.32	CY/ft	$2.75	$2.75	LF	
	312323200010	Hauling Excavated Material	Hauling										
	312323209702	Existing Trenched Material - Paved	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.63	CY/ft	$8.53	$8.53	LF	
		Existing Trenched Material - Unpaved	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.48	CY/ft	$6.59	$6.59	LF	
2	*312323160010*	*Pipe & Trench Zone Borrow Fill*	*Fill by Borrow & Utility Bedding*										
	312323160200		Sand, dead or bank - Paved			$36.30	per CY	0.37	CY/ft	$13.50	$13.50	LF	
	312323160200		Sand, dead or bank - Unpaved			$36.30	per CY	0.46	CY/ft	$16.67	$16.67	LF	
	312323160500		Compacting bedding in trench - Paved			$6.98	per CY	0.28	CY/ft	$1.93	$1.93	LF	
	312323160500		Compacting bedding in trench - Unpaved			$6.98	per CY	0.36	CY/ft	$2.54	$2.54	LF	
	312323200010	Hauling Borrow Fill Material	Hauling										
	312323209702	Sand - Paved	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.37	CY/ft	$5.06	$5.06	LF	
	312323209702	Sand - Unpaved	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.46	CY/ft	$6.25	$6.25	LF	
3	*321216140010*	*Asphalt Paving*	*Paving Asphaltic Concrete*										
	321216140030		3" binder course, 2" topping			$4.38	per SF	4.58	sf/ft	$20.04	$20.04	LF	
		Bituminous-Stabilized Base Courses	For roadways and large paved areas										
	321126191100		Macadam penetration crushed stone, 6" thick, 3 gal./S.Y.			$23.63	per SY	0.51	sy/ft	$12.01	$12.01	LF	
	321126191100		Macadam penetration crushed stone, 6" thick, 3 gal./S.Y.			$23.63	per SY	0.51	sy/ft	$12.01	$12.01	LF	
	321126191100		Macadam penetration crushed stone, 6" thick, 3 gal./S.Y.			$23.63	per SY	0.51	sy/ft	$12.01	$12.01	LF	
	312323200010	Hauling Asphalt Paving Material	Hauling										
	312323209702	Asphalt Topping	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.042	CY/ft	$0.58	$0.58	LF	
	312323209702	Binder Course	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.06	CY/ft	$0.86	$0.86	LF	
	312323209702	Bituminous-Stabalized Base Course	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.28	CY/ft	$3.85	$3.85	LF	
	312323230010	Compaction											
	312323235020	Asphalt Layers	Riding, vibrating roller, 6" lifts, 3 passes			$0.52	per CY	0.38	CY/ft	$0.20	$0.20	LF	
6" Pipe Trenchless Crossing - Jack & Bore Unit Costs													
4	*330507230010*	*Jack & Bore - Trenchless Pipe Installation*	*Utility Boring & Jacking*										
	330507231100	Mobilization	Prepare jacking pits, incl. mobilization & demobilization, max			$32,104.00	EA			32104.00	$32,104.00	EA	
	330507230100	Casing Install	Casing only, 100' minimum, roadwork, 1/2" thick wall, 24" diameter casing			$600.00	per LF			600.00	$600.00	LF	
		Pipe Install	Pipe pull operation	$12.00		$15.03	per LF			15.03	$15.03	LF	
		Pipe Install - Material	6" DR-18 PVC[1]			$14.10	per LF			14.10	$14.10	LF	
	312323160200		Sand, dead or bank - Unpaved			$36.30	per CY	4.58	CY/ft	$3,326.20	$3,326.20	EA	
	312323160500		Compacting bedding in trench - Unpaved			$6.98	per CY	4.58	CY/ft	$639.58	$639.58	EA	
	312323200010	Hauling Borrow Fill Material	Hauling										
	312323209702	Sand - Unpaved	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	4.58	CY/ft	$62.40	$62.40	LF	
6" DR-18 Pipe Install Unit Cost													
5	*333111250010*	*PVC Pipe Installation*	*Sewage Collection, Polyvinyl Chloride*										
	333111252040	Pipe Install - Labor & Equip.	20' lengths, SDR 35, B&S, 6" diameter	$3.11		$3.89	per LF			3.89	$3.89	LF	
		Pipe Install - Material	6" DR-18 PVC[1]			$14.10	per LF			14.10	$14.10	LF	
6" Pipe Bends Unit Cost													
6	*331413150010*	*Mechanical Joint Fittings/Bends*	*Water Supply, Ductile Iron Pipe*										
	331413158020	11.25 Deg Bend - Labor & Equip.[31]	Piping, fittings, mechanical joint, AWWA C110, 90 < bend, 6" diameter	$85.16		$98.46	EA				$98.46	EA	
	331413158020	22.5 Deg Bend Install - Labor & Equip.	Piping, fittings, mechanical joint, AWWA C110, 90 < bend, 6" diameter	$85.16		$98.46	EA				$98.46	EA	
	331413158020	45 Deg Bend Install - Labor & Equip.	Piping, fittings, mechanical joint, AWWA C110, 90 < bend, 6" diameter	$85.16		$98.46	EA				$98.46	EA	
	331413158020	90 Deg Bend Install - Labor & Equip.	Piping, fittings, mechanical joint, AWWA C110, 90 < bend, 6" diameter	$85.16		$98.46	EA				$98.46	EA	
		Ductile Iron Mechanical Joint Fittings											
		11.25 Deg Bend - Protecto 401 Epoxy Lining				$454.00	EA				$454.00	EA	
		22.5 Deg Bend - Protecto 401 Epoxy Lining				$450.00	EA				$450.00	EA	
		45 Deg Bend - Protecto 401 Epoxy Lining				$464.00	EA				$464.00	EA	
		90 Deg Bend - Protecto 401 Epoxy Lining				$498.00	EA				$498.00	EA	
		11.25 Deg Bend - CML&C				$167.00	EA				$167.00	EA	
		22.5 Deg Bend - CML&C				$159.00	EA				$159.00	EA	
		45 Deg Bend - CML&C				$175.00	EA				$175.00	EA	
		90 Deg Bend - CML&C				$216.00	EA				$216.00	EA	
		Mechanical Joint Restraints											
		6" EBAA Megalug Kit - E2006 PEC				$75.00	EA				$75.00	EA	
6" Valves Unit Cost													
7	*331419100010*	*Gate Valves*	*Valves, Water Distribution*										
	331419103814	6" RSWG Valve Install - Labor & Equip.	Gate valves C.I., 125 psi, mechanical joint, w/ boxes - 6" diameter	194.04	61.16	$286.32	EA				$286.32	EA	
	331417158840	Valve Box	Valve box and large base w/lid			$789.09	EA				$789.09	EA	
		6" Solid Wedge Gate Valve (FL X FL) - Brine				$12,186.00	EA				$12,186.00	EA	
		Wax Tape				$1,000.00	EA				$1,000.00	EA	
		6" Ductile Iron Long Spool - Protecto 401 Epoxy				$475.00	EA				$475.00	EA	
		6" EBAA Flange Adapter w/ Gasket				$50.00	EA				$50.00	EA	
		6" EBAA Megalug Kit F/DI				$65.00	EA				$65.00	EA	
		6" EBAA Megalug Kit - E2006 PEC				$75.00	EA				$75.00	EA	
6" Blowoff Assembly Unit Cost													
8	*331419100010*	*6" Blowoff Assembly*	*Valves, Water Distribution*										
	331419103814	6" RSWG Valve Install - Labor & Equip.	Gate valves C.I., 125 psi, mechanical joint, w/ boxes - 6" diameter	194.04	61.16	$286.32	EA				$286.32	EA	
		6" RSWG (FL X FL) - Brine				$12,186.00	EA				$12,186.00	EA	
		Wax Tape				$1,000.00	EA				$1,000.00	EA	
		6" Ductile Pipe (Protecto 401) MJ X MJ 20 LF - Brine				$5,449.00	EA				$5,449.00	EA	
		6" EBAA Megalug Kit - E2006 PEC				$75.00	EA				$75.00	EA	
		6" X 6" Tee MJ X FL - Protecto 401 Epoxy Lining (Brine)				$759.00	EA				$759.00	EA	
	312316131356		4'-6' Deep, 3/4 C.Y. excavator w/trench box - Paved			$8.48	per CY	7.41	CY		$62.81	EA	
	312323200010	Hauling Excavated Material	Hauling										
	312323209702	Existing Trenched Material	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	7.41	CY		$100.89	EA	
	331417158840	Valve Box	Valve box and large base w/lid			$789.09	EA				$789.09	EA	
		Vault w/ steel cover (3' x 3' x 3')	Vault			$3,800.00	EA				$3,800.00	EA	
		6" MJ Cap				$72.00	EA				$72.00	EA	
1" ARV Assembly Unit Cost													
9	*331419200010*	*ARV Assenbly*	*Valves*										
	331419201110	1" ARV Assembly - Potable	Air release & vacuum valve for water, 1" inlet			$1,164.13	EA				$1,164.13	EA	
	331419201110	1" ARV Assembly - Brackish	Air release & vacuum valve for water, 1" inlet			$4,664.13	EA				$13,992.39	EA	8300
		6" Ductile Iron Long Spool - Protecto 401 Epoxy				$475.00	EA				$475.00	EA	2500
		6" EBAA Megalug Kit - E2006 PEC				$75.00	EA				$75.00	EA	
		6" EBAA Megalug Kit F/DI				$65.00	EA				$65.00	EA	
		Vault w/ steel cover (3' x 3' x 3')	Vault			$3,800.00	EA				$3,800.00	EA	
	312323200010	Hauling Excavated Material	Hauling										
	312323209702	Existing Trenched Material	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	7.41	CY		$100.89	EA	

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6" PVC DR-18 - Brackish Water Discharge Main Unit Cost Summary			
1	*6" DR-18 PVC (Paved)*	***$120.00***	***LF***
2	*6" DR-18 PVC (Unpaved)*	***$60.00***	***LF***
3	*6" DR-18 PVC (Trenchless)*	***$700.00***	***LF***
4	*6" DR-18 PVC (Trenchless - Mobilization)*	***$36,070.00***	***EA***
5	*11.25 Deg Bends*	***$710.00***	***EA***
6	*22.5 Deg Bends*	***$700.00***	***EA***
7	*45 Deg Bends*	***$720.00***	***EA***
8	*90 Deg Bends*	***$750.00***	***EA***
9	*6" RWGV*	***$15,600.00***	***EA***
10	*6" Blowoff Assembly*	***$26,510.00***	***EA***
11	*1" ARV Assembly*	***$18,450.00***	***EA***

Item	RS Means Line Num	Work	RS Means Description	Labor Unit Cost	Equip. Unit Cost	Unit Cost	Unit	QTY	Unit	Cost/LF	Cost/Item	Units
8" Pipe Trench & Paving Unit Costs												
1		*Excavation*										
	312316131356		4'-6' Deep, 3/4 C.Y. excavator w/trench box - Paved			$8.48	per CY	0.54	CY/ft	$4.54	$4.54	LF
	312316131356		4'-6' Deep, 3/4 C.Y. excavator w/trench box - Unpaved			$8.48	per CY	0.34	CY/ft	$2.86	$2.86	LF
	312323200010	Hauling Excavated Material	Hauling									
	312323209702	Existing Trenched Material - Paved	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.68	CY/ft	$9.23	$9.23	LF
		Existing Trenched Material - Unpaved	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.54	CY/ft	$7.30	$7.30	LF
2	*312323160010*	*Pipe & Trench Zone Borrow Fill*	*Fill by Borrow & Utility Bedding*									
	312323160200		Sand, dead or bank - Paved			$36.30	per CY	0.40	CY/ft	$14.41	$14.41	LF
	312323160200		Sand, dead or bank - Unpaved			$36.30	per CY	0.49	CY/ft	$17.80	$17.80	LF
	312323160500		Compacting bedding in trench - Paved			$6.98	per CY	0.29	CY/ft	$2.06	$2.06	LF
	312323160500		Compacting bedding in trench - Unpaved			$6.98	per CY	0.39	CY/ft	$2.71	$2.71	LF
	312323200010	Hauling Borrow Fill Material	Hauling									
	312323209702	Sand - Paved	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.40	CY/ft	$5.41	$5.41	LF
	312323209702	Sand - Unpaved	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.49	CY/ft	$6.68	$6.68	LF
3	*321216140010*	*Asphalt Paving*	*Paving Asphaltic Concrete*									
	321216140030		3" binder course, 2" topping			$4.38	per SF	4.75	sf/ft	$20.82	$20.82	LF
		Bituminous-Stabilized Base Courses	For roadways and large paved areas									
	321126191100		Macadam penetration crushed stone, 6" thick, 3 gal./S.Y.			$23.63	per SY	0.53	sy/ft	$12.48	$12.48	LF
	321126191100		Macadam penetration crushed stone, 6" thick, 3 gal./S.Y.			$23.63	per SY	0.53	sy/ft	$12.48	$12.48	LF
	321126191100		Macadam penetration crushed stone, 6" thick, 3 gal./S.Y.			$23.63	per SY	0.53	sy/ft	$12.48	$12.48	LF
	312323200010	Hauling Asphalt Paving Material	Hauling									
	312323209702	Asphalt Topping	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.044	CY/ft	$0.60	$0.60	LF
	312323209702	Binder Course	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.06	CY/ft	$0.86	$0.86	LF
	312323209702	Bituminous-Stabalized Base Course	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.29	CY/ft	$4.00	$4.00	LF
	312323230010	Compaction										
	312323235020	Asphalt Layers	Riding, vibrating roller, 6" lifts, 3 passes			$0.52	per CY	0.40	CY/ft	$0.21	$0.21	LF
8" Pipe Trenchless Crossing - Jack & Bore Unit Costs												
4	*330507230010*	*Jack & Bore - Trenchless Pipe Installation*	*Utility Boring & Jacking*									
	330507231100	Mobilization	Prepare jacking pits, incl. mobilization & demobilization, max			$32,104.00	EA			32104.00	$32,104.00	EA
	330507230100	Casing Install	Casing only, 100' minimum, roadwork, 1/2" thick wall, 24" diameter casing			$600.00	per LF			600.00	$600.00	LF
		Pipe Install	Pipe pull operation	$12.00		$15.03	per LF			15.03	$15.03	LF
		Pipe Install - Material	8" DR-18 PVC[1]			$24.10	per LF			24.10	$24.10	LF
	312323160200		Sand, dead or bank - Unpaved			$36.30	per CY	4.55	CY/ft	$3,301.05	$3,301.05	EA
	312323160500		Compacting bedding in trench - Unpaved			$6.98	per CY	4.55	CY/ft	$634.75	$634.75	EA
	312323200010	Hauling Borrow Fill Material	Hauling									
	312323209702	Sand - Unpaved	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	4.55	CY/ft	$61.93	$61.93	LF
8" DR-18 Pipe Install Unit Cost												
5	*333111250010*	*PVC Pipe Installation*	*Sewage Collection, Polyvinyl Chloride*									
	333111252040	Pipe Install - Labor & Equip.	20' lengths, SDR 35, B&S, 6" diameter	$3.11		$3.89	per LF			3.89	$3.89	LF
		Pipe Install - Material	8" DR-18 PVC[1]			$24.10	per LF			24.10	$24.10	LF
8" Pipe Bends Unit Cost												
6	*331413150010*	*Mechanical Joint Fittings/Bends*	*Water Supply, Ductile Iron Pipe*									
	331413158020	11.25 Deg Bend - Labor & Equip.[31]	Piping, fittings, mechanical joint, AWWA C110, 90 < bend, 6" diam	$125.64	$18.07	$166.15	EA				$166.15	EA
	331413158020	22.5 Deg Bend Install - Labor & Equip.	Piping, fittings, mechanical joint, AWWA C110, 90 < bend, 6" diam	$125.64	$18.07	$166.15	EA				$166.15	EA
	331413158020	45 Deg Bend Install - Labor & Equip.	Piping, fittings, mechanical joint, AWWA C110, 90 < bend, 6" diam	$125.64	$18.07	$166.15	EA				$166.15	EA
	331413158020	90 Deg Bend Install - Labor & Equip.	Piping, fittings, mechanical joint, AWWA C110, 90 < bend, 6" diam	$125.64	$18.07	$166.15	EA				$166.15	EA
		Ductile Iron Mechanical Joint Fittings										
		11.25 Deg Bend - Protecto 401 Epoxy Lining				$607.00	EA				$607.00	EA
		22.5 Deg Bend - Protecto 401 Epoxy Lining				$626.00	EA				$626.00	EA
		45 Deg Bend - Protecto 401 Epoxy Lining				$631.00	EA				$631.00	EA
		90 Deg Bend - Protecto 401 Epoxy Lining				$706.00	EA				$706.00	EA
		Mechanical Joint Restraints										
		8" EBAA Megalug Kit - E2008 PEC				$100.00	EA				$100.00	EA
8" Valves Unit Cost												
7	*331419100010*	*Gate Valves*	*Valves, Water Distribution*									
	331419103814	8" RSWG Valve Install - Labor & Equip.	Gate valves C.I., 125 psi, mechanical joint, w/ boxes - 6" diameter	194.04	61.16	$286.32	EA				$286.32	EA
	331417158840	Valve Box	Valve box and large base w/lid			$789.09	EA				$789.09	EA
		8" Solid Wedge Gate Valve (FL X FL) - Brine				$18,129.00	EA				$18,129.00	EA
		Wax Tape				$1,000.00	EA				$1,000.00	EA
		8" Ductile Iron Long Spool - Protecto 401 Epoxy				$626.00	EA				$626.00	EA
		8" EBAA Flange Adapter w/ Gasket				$68.00	EA				$68.00	EA
		8" EBAA Megalug Kit F/DI				$87.00	EA				$87.00	EA
		8" EBAA Megalug Kit - E2008 PEC				$100.00	EA				$100.00	EA
6" Blowoff Assembly Unit Cost												
8	*331419100010*	*6" Blowoff Assembly*	*Valves, Water Distribution*									
	331419103814	6" RSWG Valve Install - Labor & Equip.	Gate valves C.I., 125 psi, mechanical joint, w/ boxes - 6" diameter	194.04	61.16	$286.32	EA				$286.32	EA
		6" RSWG (FL X FL) - Brine				$12,186.00	EA				$12,186.00	EA
		Wax Tape				$1,000.00	EA				$1,000.00	EA
		6" Ductile Pipe (Protecto 401) MJ X MJ 20 LF - Brine				$5,449.00	EA				$5,449.00	EA
		6" EBAA Megalug Kit - E2006 PEC				$75.00	EA				$75.00	EA
		6" X 6" Tee MJ X FL - Protecto 401 Epoxy Lining (Brine)				$759.00	EA				$759.00	EA
	312316131356		4'-6' Deep, 3/4 C.Y. excavator w/trench box - Paved			$8.48	per CY	7.41	CY		$62.81	EA
	312323200010	Hauling Excavated Material	Hauling									
	312323209702	Existing Trenched Material	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	7.41	CY		$100.89	EA
	331417158840	Valve Box	Valve box and large base w/lid			$789.09	EA				$789.09	EA
		Vault w/ steel cover (3' x 3' x 3')	Vault			$3,800.00	EA				$3,800.00	EA
		6" MJ Cap				$72.00	EA				$72.00	EA
1" ARV Assembly Unit Cost												
9	*331419200010*	*ARV Assenbly*	*Valves*									
	331419201110	1" ARV Assembly - Potable	Air release & vacuum valve for water, 1" inlet			$1,164.13	EA				$1,164.13	EA
	331419201110	1" ARV Assembly - Brackish	Air release & vacuum valve for water, 1" inlet			$4,664.13	EA				$13,992.39	EA
		6" Ductile Iron Long Spool - Protecto 401 Epoxy				$475.00	EA				$475.00	EA
		6" EBAA Megalug Kit - E2006 PEC				$75.00	EA				$75.00	EA
		6" EBAA Megalug Kit F/DI				$65.00	EA				$65.00	EA
		Vault w/ steel cover (3' x 3' x 3')	Vault			$3,800.00	EA				$3,800.00	EA
	312323200010	Hauling Excavated Material	Hauling									
	312323209702	Existing Trenched Material	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	7.41	CY		$100.89	EA

8300 #REF!
2500 $325,000.00

Data Inputs & Dimensions							
	Dimensions					Multipliers	
	Width (ft	Depth (ft	Length (ft	Dia (ft)	Area (sqft)/L	Equipment	Inflation
Pipe (O.D.)				0.754166667	0.45		
Pipe Cover - Paved		4					
Pipe Cover - Unpaved		3					
Excavation - Paved[1]	2.754167	5.254167			14.47085069		
Asphalt Paving Trenched	4.754167	1.92			9.11		
Excavation - Unpaved	2.754167	4.3					
Asphalt - Topping[2]		0.17					
Asphalt - Binder[2]		0.25					
Asphalt - Base[2]		1.50					
Jack & Bore Pit Trench	5	25.00	20				
Borrow Fill Material - Paved[3]		6.254167					
Borrow Fill Material - Unpaved[3]		5.3					
Asphalt - Topping[4]		0.25					
Asphalt - Binder[4]		0.33					
Asphalt - Base[4]		1.67					
Blowoff Assembly Trench	2.5	4	20				
ARV Assembly Trench	2.5	4	20				
Contractor Overhead & Profit						1	1

1.) The cover overtop of the pipe is 6' and including the 1.1' of pipe O.D. and roughly 0.5' for the pipe bedding the total excavation required will go towards a depth og 7.6'.
2.) Estimated topping, binder, and base courses are 2", 3", & 18" per SDRSD trench detail on DWG G-24A DTL A & G-24B. OMWD's detail does not provided trenching info on utility installations in roadways.
3.) The borrow fill material is greater than the depth of the trench due to compaction and the additional material that will be needed for the blow-offs and ARVs. A foot of additional borrow fill material was added to the depth of the excavation to get
4.) Asphalt topping and base courses were increased by an inch and the asphalt base course was increased by 2" for hauling purposes. Due to compaction and material needed for blow-offs and ARVs in roadways the extra materail was added to account for these items and the reduced volume resulting from compaction.

30" Extension 6368 $ 36.00 1

Valve Box Total #REF!
SIP Industries SIP Code List Price QTY

Asphalt Paving Trenched 5.1 0.17
Placed Material Depth
Asphalt - Topping[1] 0.17

8" PVC DR-18 - Brackish Water Discharge Main Unit Cost Summary			
1	*8" DR-18 PVC (Paved)*	***$130.00***	***LF***
2	*8" DR-18 PVC (Unpaved)*	***$70.00***	***LF***
3	*8" DR-18 PVC (Trenchless)*	***$710.00***	***LF***
4	*8" DR-18 PVC (Trenchless - Mobilizatio*	***$36,040.00***	***EA***
5	*11.25 Deg Bends*	***$980.00***	***EA***
6	*22.5 Deg Bends*	***$1,000.00***	***EA***
7	*45 Deg Bends*	***$1,000.00***	***EA***
8	*90 Deg Bends*	***$1,080.00***	***EA***
9	*8" RWGV*	***$21,970.00***	***EA***
10	*6" Blowoff Assembly*	***$26,510.00***	***EA***
11	*1" ARV Assembly*	***$18,450.00***	***EA***

Item	RS Means Line Num	Work	RS Means Description	Labor Unit Cost	Equip. Unit Cost	Unit Cost	Unit	QTY	Unit	Cost/LF	Daily Output	Cost/Item	Units
12" Pipe Trench & Paving Unit Costs													
1		*Excavation*											
	312316131362		6'-10' Deep, 3/4 C.Y. excavator w/trench box - Paved			$11.31	per CY	0.64	CY/ft	$7.27	235	$7.27	LF
	312316131356		4'-6' Deep, 3/4 C.Y. excavator w/trench box - Unpaved			$8.48	per CY	0.36	CY/ft	$3.07	235	$3.07	LF
	312323200010	Hauling Excavated Material	Hauling										
	312323209702	Existing Trenched Material - Paved	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.78	CY/ft	$10.69	108	$10.69	LF
		Existing Trenched Material - Unpaved	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.64	CY/ft	$8.76	108	$8.76	LF
2	*312323160010*	*Pipe & Trench Zone Borrow Fill*	*Fill by Borrow & Utility Bedding*										
	312323160200		Sand, dead or bank - Paved			$36.30	per CY	0.43	CY/ft	$15.56	150	$15.56	LF
	312323160200		Sand, dead or bank - Unpaved			$36.30	per CY	0.53	CY/ft	$19.38	150	$19.38	LF
	312323160500		Compacting bedding in trench - Paved			$6.98	per CY	0.31	CY/ft	$2.19	90	$2.19	LF
	312323160500		Compacting bedding in trench - Unpaved			$6.98	per CY	0.42	CY/ft	$2.92	90	$2.92	LF
	312323200010	Hauling Borrow Fill Material	Hauling										
	312323209702	Sand - Paved	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.43	CY/ft	$5.84	108	$5.84	LF
	312323209702	Sand - Unpaved	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.53	CY/ft	$7.27	108	$7.27	LF
3	*321216140010*	*Asphalt Paving*	*Paving Asphaltic Concrete*										
	321216140030		3" binder course, 2" topping			$4.38	per SF	5.10	sf/ft	$22.34	9000	$22.34	LF
		Bituminous-Stabilized Base Courses	For roadways and large paved areas										
	321126191100		Macadam penetration crushed stone, 6" thick, 3 gal./S.Y.			$23.63	per SY	0.57	sy/ft	$13.39	15000	$13.39	LF
	321126191100		Macadam penetration crushed stone, 6" thick, 3 gal./S.Y.			$23.63	per SY	0.57	sy/ft	$13.39	15000	$13.39	LF
	321126191100		Macadam penetration crushed stone, 6" thick, 3 gal./S.Y.			$23.63	per SY	0.57	sy/ft	$13.39	15000	$13.39	LF
	312323200010	Hauling Asphalt Paving Material	Hauling										
	312323209702	Asphalt Topping	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.047	CY/ft	$0.64	108	$0.64	LF
	312323209702	Binder Course	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.06	CY/ft	$0.86	108	$0.86	LF
	312323209702	Bituminous-Stabalized Base Course	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	0.31	CY/ft	$4.29	108	$4.29	LF
	312323230010	Compaction											
	312323235020	Asphalt Layers	Riding, vibrating roller, 6" lifts, 3 passes			$0.52	per CY	0.43	CY/ft	$0.22		$0.22	LF
12" Pipe Trenchless Crossing - Jack & Bore Unit Costs													
4	*330507230010*	*Jack & Bore - Trenchless Pipe Installation*	*Utility Boring & Jacking*										
	330507231100	Mobilization	Prepare jacking pits, incl. mobilization & demobilization, max			$32,104.00	EA			32104.00		$32,104.00	EA
	330507230100	Casing Install	Casing only, 100' minimum, roadwork, 1/2" thick wall, 24" diameter casing			$600.00	per LF			600.00		$600.00	LF
		Pipe Install	Pipe pull operation	$12.00		$15.03	per LF			15.03		$15.03	LF
		Pipe Install - Material	8" DR-18 PVC[1]			$50.85	per LF			50.85		$50.85	LF
	312323160200		Sand, dead or bank - Unpaved			$36.30	per CY	5.34	CY/ft	$3,880.01	150	$3,880.01	EA
	312323160500		Compacting bedding in trench - Unpaved			$6.98	per CY	5.34	CY/ft	$746.07	90	$746.07	EA
	312323200010	Hauling Borrow Fill Material	Hauling										
	312323209702	Sand - Unpaved	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	5.34	CY/ft	$72.79	108	$72.79	LF
12" DR-18 Pipe Install Unit Cost													
4	*333111250010*	*PVC Pipe Installation*	*Sewage Collection, Polyvinyl Chloride*										
	333111252160	Pipe Install - Labor & Equip.	13' lengths, SDR 35, B&S, 12" diameter	$4.19	$0.60	$5.57	per LF			5.57		$5.57	LF
		Pipe Install - Material	12" DR-18 PVC[1]			$50.85	per LF			50.85		$50.85	LF
12" Pipe Bends Unit Cost													
5	*333111250010*	*Mechanical Joint Fittings/Bends*	*Sewage Collection, Polyvinyl Chloride*										
		11.25 Deg Bend - Labor & Equip.[3/]	Elbow, 11.25 degree, 12" diameter	$127.04	$18.29	$164.06	EA					$164.06	EA
	333111253885	22.5 Deg Bend Install - Labor & Equip.	Elbow, 22.5 degree, 12" diameter	$127.04	$18.29	$164.06	EA					$164.06	EA
	333111253805	45 Deg Bend Install - Labor & Equip.	Elbow, 45 degree, 12" diameter	$127.04	$18.29	$164.06	EA					$164.06	EA
	333111253755	90 Deg Bend Install - Labor & Equip.	Elbow, 90 degree, 12" diameter	$127.04	$18.29	$164.06	EA					$164.06	EA
		Ductile Iron Mechanical Joint Fittings											
		11.25 Deg Bend - Protecto 401 Epoxy Lining				$1,104.00	EA					$1,104.00	EA
		22.5 Deg Bend - Protecto 401 Epoxy Lining				$1,142.00	EA					$1,142.00	EA
		45 Deg Bend - Protecto 401 Epoxy Lining				$1,274.00	EA					$1,274.00	EA
		90 Deg Bend - Protecto 401 Epoxy Lining				$1,882.00	EA					$1,882.00	EA
		11.25 Deg Bend - CML&C				$421.00	EA					$421.00	EA
		22.5 Deg Bend - CML&C				$444.00	EA					$444.00	EA
		45 Deg Bend - CML&C				$523.00	EA					$523.00	EA
		90 Deg Bend - CML&C				$658.00	EA					$658.00	EA
		Mechanical Joint Restraints											
		12" EBAA Megalug Kit - E2012 PEC				$179.00	EA					$179.00	EA
12" Valves Unit Cost													
6	*331419100010*	*Gate Valves*	*Valves, Water Distribution*										
	331419103340	12" RSWG Valve Install - Labor & Equip.	Gate valves C.I., 125 psi, mechanical joint, w/ boxes - 12" diameter	194.04	61.16	$286.32	EA					$286.32	EA
	331417158840	Valve Box	Valve box and large base w/lid			$789.09	EA					$789.09	EA
		12" Solid Wedge Gate Valve (FL X FL) - Brackish				$42,987.00	EA					$42,987.00	EA
		12" RSWG (MJ X MJ) - Potable				$2,065.00	EA					$2,065.00	EA
		Wax Tape				$1,000.00	EA					$1,000.00	EA
		12" Ductile Iron Long Spool - CML&C				$413.00	EA					$413.00	EA
		12" Ductile Iron Tee - CML&C				$924.00	EA					$924.00	
		12" Ductile Iron Long Spool - Protecto 401 Epoxy				$1,090.00	EA					$1,090.00	EA
		12" EBAA Flange Adapter w/ Gasket				$145.00	EA					$145.00	EA
		12" EBAA Megalug Kit F/DI				$165.00	EA					$165.00	EA
		12" EBAA Megalug Kit - E2012 PEC				$179.00	EA					$179.00	EA
6" Blowoff Assembly Unit Cost													
7	*331419100010*	*6" Blowoff Assembly*	*Valves, Water Distribution*										
	331419103814	6" RSWG Valve Install - Labor & Equip.	Gate valves C.I., 125 psi, mechanical joint, w/ boxes - 6" diameter	194.04	61.16	$286.32	EA					$286.32	EA
		6" RSWG (FL X FL) - Brackish				$12,186.00	EA					$12,186.00	EA
		6" RSWG (FL X FL) - Potable				$581.00	EA					$581.00	EA
		Wax Tape				$1,000.00	EA					$1,000.00	EA
		6" Ductile Pipe (Protecto 401) MJ X MJ 20 LF - Brine				$5,449.00	EA					$5,449.00	EA
		6" Ductile Pipe (CML&C) MJ X MJ 20 LF - Potable				$3,409.00	EA					$3,409.00	EA
		12" EBAA Megalug Kit - E2012 PEC				$179.00	EA					$179.00	EA
		12" X 6" Tee MJ X FL - Protecto 401 Epoxy Lining (Brackish)				$1,411.00	EA					$1,411.00	EA
		12" X 6" Tee MJ x FL -CML&C (Potable)				$674.00	EA					$674.00	EA
	312316131352	Excavation	6'-10' Deep, 3/4 C.Y. excavator w/trench box			$11.31	per CY	11.11	CY		235	$125.67	EA
	312323200010	Hauling Excavated Material	Hauling										
	312323209702	Existing Trenched Material	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	11.11	CY		108	$151.33	EA
	331417158840	Valve Box	Valve box and large base w/lid			$789.09	EA					$789.09	EA
		Vault w/ steel cover (3' x 3' x 3')	Vault			$3,800.00	EA					$3,800.00	EA
		6" MJ Cap				$72.00	EA					$72.00	EA
1" ARV Assembly Unit Cost													
8	*331419200010*	*ARV Assenbly*	*Valves*										
	331419201110	1" ARV Assembly - Potable	Air release & vacuum valve for water, 1" inlet			$1,164.13	EA					$1,164.13	EA
	331419201110	1" ARV Assembly - Brackish	Air release & vacuum valve for water, 1" inlet			$4,664.13	EA					$13,992.39	EA
		12" Ductile Iron Long Spool - CML&C				$413.00	EA					$413.00	EA
		12" Ductile Iron Long Spool - Protecto 401 Epoxy				$1,090.00	EA					$1,090.00	EA
		12" EBAA Megalug Kit - E2012 PEC				$179.00	EA					$179.00	EA
		12" EBAA Megalug Kit F/DI				$165.00	EA					$165.00	EA
		Vault w/ steel cover (3' x 3' x 3')	Vault			$3,800.00	EA					$3,800.00	EA
	312323200010	Hauling Excavated Material	Hauling										
	312323209702	Existing Trenched Material	18 C.Y. truck, 8 wheels, 30 min wait/ld./uld., 45 mph avg., cycle 40 miles			$13.62	per CY	11.11	CY		108	$151.33	EA

Data Inputs & Dimensions

	Dimensions					Multipliers	
	Width (ft	Depth (ft	Length (ft	Dia (ft)	Area (sqft)/L	Equipment	Inflation
Pipe (O.D.)				1.1	0.95		
Pipe Cover - Paved		4					
Pipe Cover - Unpaved		3					
Excavation - Paved[1]	3.1	5.6			17.36		
Asphalt Paving Trenched	5.1	1.92			9.78		
Excavation - Unpaved	3.1	4.6					
Asphalt - Topping[2]		0.17					
Asphalt - Binder[2]		0.25					
Asphalt - Base[2]		1.50					
Jack & Bore Pit Trench	6	25.00	20				
Borrow Fill Material - Paved[3]		6.6					
Borrow Fill Material - Unpaved[3]		5.6					
Asphalt - Topping[4]		0.25					
Asphalt - Binder[4]		0.33					
Asphalt - Base[4]		1.67					
Blowoff Assembly Trench	2.5	6	20				
ARV Assembly Trench	2.5	6	20				
Contractor Overhead & Profit						1	1

1.) The cover overtop of the pipe is 6' and including the 1.1' of pipe O.D. and roughly 0.5' for the pipe bedding the total excavation required will go towards a depth og 7.6'.
2.) Estimated topping, binder, and base courses are 2", 3", & 18" per SDRSD trench detail on DWG G-24A DTL A & G-24B. OMWD's detail does not provided trenching info on utility installations in roadways.
3.) The borrow fill material is greater than the depth of the trench due to compaction and the additional material that will be needed for the blow-offs and ARVs. A foot of additional borrow fill material was added to the depth of the excavation to get
4.) Asphalt topping and base courses were increased by an inch and the asphalt base course was increased by 2" for hauling purposes. Due to compaction and material needed for blow-offs and ARVs in roadways the extra materail was added to account for these items and the reduced volume resulting from compaction.

SIP Industries	SIP Code	List Price	QTY
48" Belled Base Top - Flange VBX w/ Lid	6135	$206.00	1
16" Extension	6366	$ 24.00	2
30" Extension	6368	$ 36.00	1

Valve Box Total $ 290.00

SIP Industries	SIP Code	List Price	QTY

Asphalt Paving Trenched	5.1	0.17
Placed Material Depth		
Asphalt - Topping[1]		0.17

213 LF

12" PVC DR-18 - Product Water Discharge Main Unit Cost Summary			
Item	**Piping & Fittings/Assembly**	**Cost**	**Units**
1	*12" DR-18 PVC (Paved)*	***$170.00***	***LF***
2	*12" DR-18 PVC (Unpaved)*	***$100.00***	***LF***
3	*12" DR-18 PVC (Trenchless)*	***$740.00***	***LF***
4	*12" DR-18 PVC (Trenchless - Mobilizati*	***$36,740.00***	***EA***
3	*11.25 Deg Bends*	***$950.00***	***EA***
4	*22.5 Deg Bends*	***$970.00***	***EA***
5	*45 Deg Bends*	***$1,050.00***	***EA***
6	*90 Deg Bends*	***$1,190.00***	***EA***
7	*12" RWGV*	***$5,950.00***	***EA***
8	*6" Blowoff Assembly*	***$14,000.00***	***EA***
9	*1" ARV Assembly*	***$5,710.00***	***EA***
10	*Poable Water Connection*	***$6,380.00***	***EA***
12" PVC DR-18 - Brackish Water Discharge Main Unit Cost Summary			
1	*12" DR-18 PVC (Paved)*	***$170.00***	***LF***
2	*12" DR-18 PVC (Unpaved)*	***$100.00***	***LF***
3	*11.25 Deg Bends*	***$1,630.00***	***EA***
4	*22.5 Deg Bends*	***$1,670.00***	***EA***
5	*45 Deg Bends*	***$1,800.00***	***EA***
6	*90 Deg Bends*	***$2,410.00***	***EA***
7	*12" RWGV*	***$48,230.00***	***EA***
8	*6" Blowoff Assembly*	***$28,380.00***	***EA***
9	*1" ARV Assembly*	***$19,220.00***	***EA***

Blue Brute | C900

PRESSURE-RATED PVC PIPE

JM Eagle™

DELIVERING GOOD WATER TO YOU

AWWA C900-16, CSA B137.3
ASTM D1784 Cell Class 12454
ANSI/NSF 61/14, UL 1285

Gasket: ASTM F477
Joint: ASTM D3139

MARKETS

Potable | Irrigation | Reclaim | Sewer

DESCRIPTION

Available Pipe Sizes (CIOD)

4", 6", 8", 10", 12", 14", 16", 18", 20", 24", 30", 36", 42", 48"

Nominal Laying length = 20 feet *(Laying length tolerances are in accordance with AWWA and CSA standards)*

Color: Blue | Green | Purple | White

AWWA C900-16	
305 psi	(DR 14)
235 psi	(DR 18)
200 psi	(DR 21)
165 psi	(DR 25)
125 psi	(DR 32.5)
100 psi	(DR 41)
80 psi	(DR 51)

Note: FM Approvals Pressure Class 185 psi for DR18 and 250 psi for DR14.

CSA B137.3	
309 psi	(DR 14)
235 psi	(DR 18)
167 psi	(DR 25)

BENEFITS

Field-cut with a power saw or handsaw; bevel without complicated machinery.

Does not need lining, wrapping, coating, or cathodic protection to prevent galvanic corrosion.

Corrosive resistant, safe, long-lasting, and stable solution for a modern infrastructure.

Consistency in carrying capacity (flow coefficient, C=150), for savings in pumping costs, and size of the pipe.

*50 year warranty only applicable to C900/Eagle Loc 900, C905, C909, AWWA C901/C906. Check www.jmeagle.com/warranty for full details.

Blue Brute | C900

PRESSURE-RATED PVC PIPE

JM Eagle™

DELIVERING GOOD WATER TO YOU

SUBMITTAL AND DATA SHEET

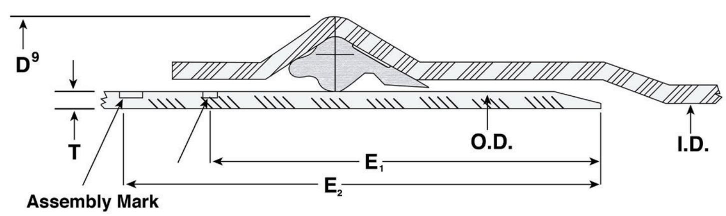
PIPE SIZE (IN)	AVERAGE O.D. (IN)	NOM. I.D. (IN)	MIN. T. (IN)	APPROX. E_1 (IN)	APPROX. E_2 (IN)	APPROX. D^9 (IN)	APPROX. WGT (LBS/FT)
PRESSURE CLASS 305 psi (DR 14)							
PIPE STIFFNESS: 815 psi							
4	4.80	4.07	0.343	4.5	5.5	6.365	3.2
6	6.90	5.86	0.493	5.25	6.25	8.887	6.7
8	9.05	7.68	0.646	6.25	7.25	11.499	11.6
10	11.10	9.42	0.793	7.25	8.25	14.072	17.6
12	13.20	11.20	0.943	8.25	9.25	16.57	25.1
16	17.40	14.85	1.242	7.25	8.75	21.637	43.77
24	25.80	21.89	1.843	9.75	11.25	31.958	98.33
PRESSURE CLASS 235 psi (DR 18)							
PIPE STIFFNESS: 364 psi							
4	4.80	4.23	0.267	4.5	5.5	6.204	2.6
6	6.90	6.09	0.383	5.25	6.25	8.654	5.3
8	9.05	7.98	0.503	6.25	7.25	11.195	9.2
10	11.10	9.79	0.617	7.25	8.25	13.699	13.9
12	13.20	11.65	0.733	8.25	9.25	16.125	19.7
14	15.30	13.50	0.850	6.5	8	18.603	26.75
16	17.40	15.35	0.967	7.25	8.75	21.135	34.86
18	19.50	17.20	1.083	7.75	9.25	23.832	48.95
20	21.60	19.06	1.200	8.75	10.25	26.107	54.22
24	25.80	22.76	1.433	9.75	11.25	31.089	77.97
30	32.00	28.23	1.778	11.5	13.5	38.264	117.82
PRESSURE CLASS 200 psi (DR 21)*							
PIPE STIFFNESS: 224 psi							
14	15.30	13.75	0.729	6.5	8	18.347	23.07
16	17.40	15.64	0.829	7.25	8.75	20.097	30.04
18	19.50	17.53	0.929	7.75	9.25	23.505	37.27
20	21.60	19.42	1.029	8.75	10.25	25.744	46.71
24	25.80	23.19	1.229	9.75	11.25	30.656	67.53
30	32.00	28.77	1.524	11.5	13.5	37.725	103.71
36	38.30	34.43	1.824	13.25	15.25	44.753	152.16
PRESSURE CLASS 165 psi (DR 25)							
PIPE STIFFNESS: 129 psi							
4	4.80	4.39	0.192	4.5	5.5	6.045	1.9
6	6.90	6.31	0.276	5.25	6.25	8.427	3.9
8	9.05	8.28	0.362	6.25	7.25	10.896	6.7
10	11.10	10.16	0.444	7.25	8.25	13.332	10.1
12	13.20	12.08	0.528	8.25	9.25	15.69	14.4
14	15.30	14.00	0.612	6.5	8	18.098	19.48
16	17.40	15.92	0.696	7.25	8.75	20.561	25.38
18	19.50	17.85	0.780	7.75	9.25	23.19	31.99
20	21.60	19.77	0.864	8.75	10.25	25.395	39.46
24	25.80	23.61	1.032	9.75	11.25	30.239	56.98
30	32.00	29.29	1.280	11.5	13.5	37.208	88.49
36	38.30	35.05	1.532	13.25	15.25	44.134	128.41
42	44.50	40.73	1.780	15.5	17.5	51.56	176.02
48*	50.80	46.49	2.032	16.5	18.5	58.393	231.22
PRESSURE CLASS 125 psi (DR 32.5)*							
PIPE STIFFNESS: 57 psi							
14	15.30	14.30	0.471	6.5	8	17.799	15.14
16	17.40	16.27	0.535	7.25	8.75	20.219	19.63
18	19.50	18.23	0.600	7.75	9.25	22.808	24.75
20	21.60	20.19	0.665	8.75	10.25	24.973	30.54
24	25.80	24.12	0.794	9.75	11.25	29.734	44.11
30	32.00	29.91	0.985	11.5	13.5	36.582	68.45
36	38.30	35.80	1.178	13.25	15.25	43.383	99.22
48	50.80	47.49	1.563	16.5	18.5	57.399	178.49

PIPE SIZE (IN)	AVERAGE O.D. (IN)	NOM. I.D. (IN)	MIN. T. (IN)	APPROX. E_1 (IN)	APPROX. E_2 (IN)	APPROX. D^9 (IN)	APPROX. WGT (LBS/FT)
PRESSURE CLASS 100 psi (DR 41)							
PIPE STIFFNESS: 28 psi							
14	15.30	14.52	0.373	6.5	8	17.599	12.01
16	17.40	16.51	0.424	7.25	8.75	19.992	15.63
18	19.50	18.50	0.476	7.75	9.25	22.555	19.72
20	21.60	20.49	0.527	8.75	10.25	24.691	24.31
24	25.80	24.48	0.629	9.75	11.25	29.397	35.10
30	32.00	30.35	0.780	11.5	13.5	36.163	54.65
36	38.30	36.30	0.934	13.25	15.25	42.885	78.97
42	44.50	42.18	1.085	15.5	17.5	50.108	108.19
48	50.80	48.14	1.239	16.5	18.5	56.736	142.10
PRESSURE CLASS 80 psi (DR 51)*							
PIPE STIFFNESS: 14 psi							
30	32.00	30.67	0.627	11.5	13.5	35.836	44.08
36	38.30	36.71	0.751	13.25	15.25	42.478	64.32
42	44.50	42.65	0.872	15.5	17.5	49.652	88.10
48	50.80	49.69	0.996	16.5	18.5	56.217	115.79

Product Standard: ANSI/AWWA C900-16
CSA B137.3* (DR 18, 25, 4"-18"; DR 14, 4"-12")
Pipe Compound: ASTM D1784 Cell Class 12454
Gasket: ASTM F477
Integral Bell Joint: ASTM D3139
Certifications: ANSI/NSF 61, ANSI/NSF 14*
UL 1285 (DR 14, 18, 25, up to 24"), FM 1612* (DR 14 / DR 18; 4-12"), CSA B137.3*
Note: FM Approvals Pressure Class 185 psi for DR 18 and 250 psi for DR 14.
Nominal Laying Length: 20 feet
(Laying length tolerences with AWWA and/or CSA standards)
Installation: JM Eagle™ Blue Brute Installation Guide

Manning Coefficient (n) = 0.009 • Hazen-Williams Coefficient (c) = 150

*Please call regarding availability.



I.D.: Inside Dameter
O.D.: Outside Diameter
T: Wall Thickness
D^9: Bell Outside Diameter

E_1: Distance between 1st Insertion/ Assembly Mark to the end of spigot.
E_2: Distance between 2nd Insertion/ Assembly Mark to the end of spigot.

FM APPROVED · ASTM INTERNATIONAL · NSF pw · UL LISTED · CSA · MEMBER Uni-Bell PVC PIPE ASSOCIATION

From: Virgil Diaz
To: Punja, Zeshan
Cc: Tedesco, Steve
Subject: RE: Pratt Mueller Resilient Seated Wedge Gate Valve (Non-Rising Stem) - Brine Discharge
Date: Wednesday, February 23, 2022 12:12:40 PM
Attachments: image003.jpg
image004.jpg
image005.jpg
Importance: High

Z –

As promised, below are what I consider BEST solution for you but as mentioned via phone, I do have alternatives. Brand below is from DHC (DaeHan Controls) and are a manufacturer we tap for specialty project such as yours.

Scope: DHC Class 150# Flanged, NRS Solid Wedge Gate Valve, B148 C95800 Nickel Aluminum Bronze Body, Bronze Disc, B150 C6300 Nickel Aluminum Bronze Stem, HW Open Left
Budgetary Pricing Below:

4" - $7168/each
8" - $18129/each
12" - $42987/each
6" - $12186/each

Please review and let me know if you have any questions. FYI, second option (if allowed), would be to maybe look at a RUBBER LINED double offset style butterfly valve with EPDM seat.

Regards,

Virgil Diaz Jr.

14081 Yorba Street #109
Tustin, CA 92780
714-832-1090 P
562-818-9855 C
Serving California, Nevada, Arizona and New Mexico since 2001

From: Punja, Zeshan <ZESHAN.PUNJA@tetratech.com>

Sent: Monday, February 21, 2022 9:20 AM
To: Virgil Diaz <V.Diaz@southwestvalve.com>; Kelly Brians <k.brians@southwestvalve.com>
Cc: Bryan Jackson <b.jackson@southwestvalve.com>; Tedesco, Steve <Steve.Tedesco@tetratech.com>
Subject: RE: Pratt Mueller Resilient Seated Wedge Gate Valve (Non-Rising Stem) - Brine Discharge

Hi Virgil,

That is fine, my familiarity is certainly more involved with potable connections for pipeline projects. Thanks for clarifying the norms for industrial applications. Let me know if you need anything else.

Thanks,
Z

From: Virgil Diaz <V.Diaz@southwestvalve.com>
Sent: Monday, February 21, 2022 9:17 AM
To: Punja, Zeshan <ZESHAN.PUNJA@tetratech.com>; Kelly Brians <k.brians@southwestvalve.com>
Cc: Bryan Jackson <b.jackson@southwestvalve.com>; Tedesco, Steve <Steve.Tedesco@tetratech.com>
Subject: RE: Pratt Mueller Resilient Seated Wedge Gate Valve (Non-Rising Stem) - Brine Discharge
Importance: High

Thank you Z –

Now you note both "MJxMJ" end configuration and "150 Flange" in your descriptions below. I will go with FLANGE X FLANGE 150# ends. MJxMJ ends are not available for the most industrial type set ups as this is an end configuration usually associated with AWWA type products and projects.

PRICING AND MODEL NUMBER HAS BEEN INCLUDED BELOW FOR THE 12" POTABLE WATER APPLICATION

Virgil Diaz Jr.

14081 Yorba Street #109
Tustin, CA 92780
714-832-1090 P
562-818-9855 C
Serving California, Nevada, Arizona and New Mexico since 2001

From: Punja, Zeshan <ZESHAN.PUNJA@tetratech.com>
Sent: Monday, February 21, 2022 9:06 AM
To: Virgil Diaz <V.Diaz@southwestvalve.com>; Kelly Brians <k.brians@southwestvalve.com>
Cc: Bryan Jackson <b.jackson@southwestvalve.com>; Tedesco, Steve <Steve.Tedesco@tetratech.com>
Subject: RE: Pratt Mueller Resilient Seated Wedge Gate Valve (Non-Rising Stem) - Brine Discharge

Morning Virgil,

Thank you for your detailed email. To answer your question a bit better I have provided the information below pe the type of service.

Brine Discharge (6" & 8")

-
- Butterfly Valve (Rubber Seated MJ X MJ)
- Pressure Rating: 230 PSI or comparable
- ANSI Class 150 Flange
- NRS w/ 2" Service Nut

Brackish Discharge (12")

-
- Butterfly Valve (Rubber Seated & MJ X MJ)
- Pressure Rating: 230 PSI or comparable
- ANSI Class 150 Flange
- NRS w/ 2" Service Nut

Potable Discharge (12") (MUELLER A2362-23 E381 OL)

- RSWGV (MJ X MJ)
- Pressure Rating: 250 PSI or comparable
- ANSI Class 125 Flange
- NRS w/ 2" Service Nut

NET BUDGETARY PRICE: $2065/EACH

Let me know if you require any additional information. I appreciate your help!

Thanks,
Z

From: Virgil Diaz <V.Diaz@southwestvalve.com>
Sent: Monday, February 21, 2022 8:30 AM
To: Punja, Zeshan <ZESHAN.PUNJA@tetratech.com>; Kelly Brians <k.brians@southwestvalve.com>
Cc: Bryan Jackson <b.jackson@southwestvalve.com>; Tedesco, Steve <Steve.Tedesco@tetratech.com>

Subject: RE: Pratt Mueller Resilient Seated Wedge Gate Valve (Non-Rising Stem) - Brine Discharge
Importance: High

Morning Z –

Message received and thank you for reaching out.

In reviewing your message below, I would tell you that AWWA C509/515 RW Gate Valves of any kind are not really meant for anything outside of POTABLE/RECLAIMED water applications. In my experience, I don't know that any reputable AWWA RWGV manufacturer would recommend using RWGV's for brackish water or even worse, brine service.

I was the Western District Sr. Sales Engineer for Mueller Water Products for just shy of 20 years before joining Southwest Valve & Equipment in July of 2019 and can tell you that we **DID NOT RECOMMEND** using AWWA C509/515 valves for any wastewater or brine type service as we had no real testing data to support that this would be a safe application. Most design concerns for this category of AWWA valve were tied around NSF listings and UL approvals and not so much these specific and highly corrosive environments.

You are correct in assuming that these applications will require special coating consideration or alternate materials all together. We are working with another client looking for options for the same type of application and can tell you that we're looking to supply either metal seated gate valves or butterfly valves both made of aluminum bronze in order to eliminate any concerns tied to Fusion Bonded or liquid epoxies, rubber lining or glass lining. We've also come up with an option for the air valves tied to the brine service lines.

A few questions for you Z:

- **PRESSURE RATING OF VALVE?**
- **150# FLANGED?**
- **NRS w/HW or 2" Service Nut? Or OS&Y set up?**
- **MUST VALVE BE GATE STYLE OR IS BUTTERFLY STYLE VALVE ALLOWED?**

Look forward to the response Z and talk soon.

Regards,

Virgil Diaz Jr.

14081 Yorba Street #109
Tustin, CA 92780
714-832-1090 P
562-818-9855 C
Serving California, Nevada, Arizona and New Mexico since 2001

From: Punja, Zeshan <ZESHAN.PUNJA@tetratech.com>
Sent: Monday, February 21, 2022 6:34 AM
To: Kelly Brians <k.brians@southwestvalve.com>
Cc: Bryan Jackson <b.jackson@southwestvalve.com>; Virgil Diaz <V.Diaz@southwestvalve.com>; Tedesco, Steve <Steve.Tedesco@tetratech.com>
Subject: Pratt Mueller Resilient Seated Wedge Gate Valve (Non-Rising Stem) - Brine Discharge

Good Morning Kelly,

My name is Zeshan Punja, but feel free to call me Z. I am a consultant that works for Tetra Tech in our Irvine office. Currently we are working on getting cost estimates together for a project for Olivenhain Municipal Water District (OMWD). This brackish water treatment plant project has a brackish well water booster station and brine lift station components to it. I am looking to get cost estimates for 6-inch, 8-inch, and 12-inch resilient wedge gate valves. However, the 6” and 8” valves will need to be used on a brine discharge line. I figure this will require additional special coating and likely more stainless internals. The 12-inch will be used on a brackish and potable water line, therefore, even the 12” will have two budgetary estimates to apply for both applications. I am just looking for budgetary cost per size and application. Please feel free to call me at 949-809-5041 for any questions.

Thanks,
Z

S&J Supply Co., Inc.
pipeline materials

S & J SUPPLY COMPANY, INC.
13105 FLORENCE AVE
SANTA FE SPRINGS, CA 90670
562-944-7433
Fax 562-944-7224

Quotation

EXPIRATION DATE	QUOTE NUMBER
03/23/2022	S100188291

S & J SUPPLY COMPANY, INC.
13105 FLORENCE AVE
SANTA FE SPRINGS, CA 90670
562-944-7433
Fax 562-944-7224

QUOTE TO:

TETRA TECH INC
301 E VANDERBILT WAY
SUITE 450
SAN BERNARDINO, CA 92408

SHIP TO:

TETRAT TETRA TECH SHOP ACCT
301 E VANDERBILT WAY
SUITE 450
SAN BERNARDINO, CA 92408

CUSTOMER NUMBER	CUSTOMER PO NUMBER	JOB NAME / REF NUMBER	SALESPERSON
4462	OMWD		RANDALL RIVERA

WRITER	SHIP VIA	TERMS	SHIP DATE	FREIGHT ALLOWED
MATT SCHMIDT	OT OUR TRUCK	Net 30 Days	02/21/2022	No

ORDER QTY	DESCRIPTION	UNIT PRICE	EXT PRICE
15200ft	DR18PB6 6" C900 DR18 CL235 PVC PIPE BLUE ULFM PC 150	14.100/ft	214320.00
18600ft	DR18PB8 8" C900 DR18 CL235 PVC PIPE BLUE ULFM PC 150	24.100/ft	448260.00
1ea	E1006 6" EBAA EZ FLG ADPT W/ GSKT	50.000/ea	50.00
1ea	E1008 8" EBAA EZ FLG ADPT W/ GSKT	68.000/ea	68.00
1ea	E1106DEC 6" EBAA MEGA LUG KIT F/ DI	65.000/ea	65.00
1ea	E1108DEC 8" EBAA MEGA LUG KIT F/ DI	87.000/ea	87.00
1ea	E2006PEC 6" EBAA MEGA LUG KIT F/ PVC	75.000/ea	75.00
1ea	E2008PEC 8" EBAA MEGA LUG KIT F/ PVC	100.000/ea	100.00
	*		
8300ft	DR18PB12 12" C900 DR18 CL235 PVC PIPE BLUE ULFM PC 150	50.850/ft	422055.00
1ea	E1012 12" EBAA EZ FLG ADPT W/ GSKT	145.000/ea	145.00
1ea	E1112DEC 12" EBAA MEGA LUG KIT F/ DI	164.000/ea	164.00

** Continued on Next Page *

Subtotal	
S&H Charges	
Amount Due	

S&J Supply Co., Inc.
pipeline materials

S & J SUPPLY COMPANY, INC.
13105 FLORENCE AVE
SANTA FE SPRINGS, CA 90670
562-944-7433
Fax 562-944-7224

Quotation

EXPIRATION DATE	QUOTE NUMBER
03/23/2022	S100188291

S & J SUPPLY COMPANY, INC.
13105 FLORENCE AVE
SANTA FE SPRINGS, CA 90670
562-944-7433
Fax 562-944-7224

QUOTE TO:

TETRA TECH INC
301 E VANDERBILT WAY
SUITE 450
SAN BERNARDINO, CA 92408

SHIP TO:

TETRAT TETRA TECH SHOP ACCT
301 E VANDERBILT WAY
SUITE 450
SAN BERNARDINO, CA 92408

CUSTOMER NUMBER	CUSTOMER PO NUMBER	JOB NAME / REF NUMBER	SALESPERSON
4462	OMWD		RANDALL RIVERA

WRITER	SHIP VIA	TERMS	SHIP DATE	FREIGHT ALLOWED
MATT SCHMIDT	OT OUR TRUCK	Net 30 Days	02/21/2022	No

ORDER QTY	DESCRIPTION	UNIT PRICE	EXT PRICE
1ea	E2012PEC 12" EBAA MEGA LUG KIT F/ PVC *	179.000/ea	179.00
2500ft	DR25PB12 12" C900 DR25 CL165 PVC PIPE BLUE	36.850/ft	92125.00
1ea	E1012 12" EBAA EZ FLG ADPT W/ GSKT	145.000/ea	145.00
1ea	E1112DEC 12" EBAA MEGA LUG KIT F/ DI	164.000/ea	164.00
1ea	E2012PEC 12" EBAA MEGA LUG KIT F/ PVC	179.000/ea	179.00

THIS IS ONLY S & J SUPPLY COMPANY, INC. INTERPRETATION OF WHAT IS NEEDED TO DO THE JOB. PLEASE VERIFY ALL MATERIALS AND QUANTITIES.
****
QUOTE DOES NOT INCLUDE APPLICABLE SALES TAX UNLESS NOTED

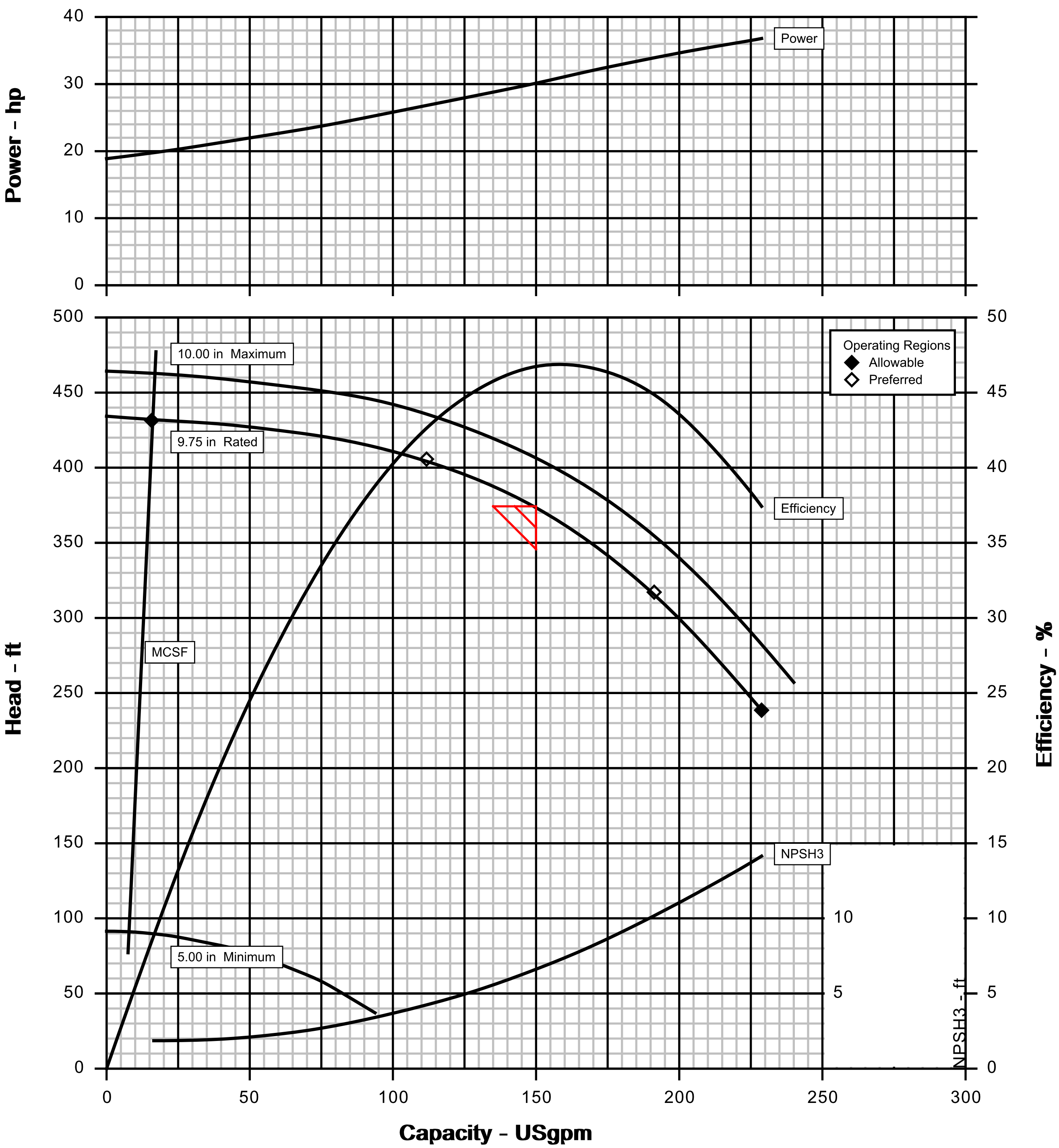
Subtotal	1178181.00
S&H Charges	0.00
Amount Due	1178181.00

Printed By: MATTS on 2/21/2022 2:20:02 PM

Pump size & type / Stages	: 2K2x1-10ARV M3 ST / 1
Based on curve no.	: MIII8390BV
Impeller diameter	: 9.75 in

Customer	: Tetra Tech	Capacity	: 150.0 USgpm
Item number	: RO Backwash brine	Head	: 374.00 ft
Service	: RO recirculation	Density / Specific gravity	: - / 1.000
Flowserve reference	: 3936085428	Pump speed	: 3,500 rpm
Date	: March 2, 2022	Ns / Nss (per eye)	: 513 / 10,040 (US)
		Test tolerance	: ANSI/HI 14.6 Grade 1U

CURVES ARE APPROXIMATE, PUMP IS GUARANTEED FOR ONE SET OF CONDITIONS; CAPACITY, HEAD, AND EFFICIENCY....



FLOWSERVE

Hydraulic Datasheet

Customer	: Tetra Tech	Pump / Stages	: 2K2x1-10ARV M3 ST / 1
Customer reference	: Tetra Tech	Based on curve no.	: MIII8390BV
Item number	: RO Backwash brine	Flowserve reference	: 3936085428
Service	: RO recirculation	Date	: March 2, 2022

Operating Conditions

Capacity (rated/normal)	: 150.0 USgpm / -
Water capacity (CQ=1.00)	: -
Total developed head	: 374.00 ft
Water head (CH=1.00)	: -
NPSHa/NPSHa less margin	: 34.0 ft / -
Maximum suction pressure	: 0.0 psig

Liquid

Liquid type	: Other
Liquid description	: RO recirculation
Temperature	: 60 °F
Density / Specific gravity	: - / 1.000
Solid Size - Actual / Limit	: - / 0.4060 in
Viscosity / Vapor pressure	: 1.00 cSt / -

Materials / Specification

Material column code	: D4
Pump specification	: ASME B73.1

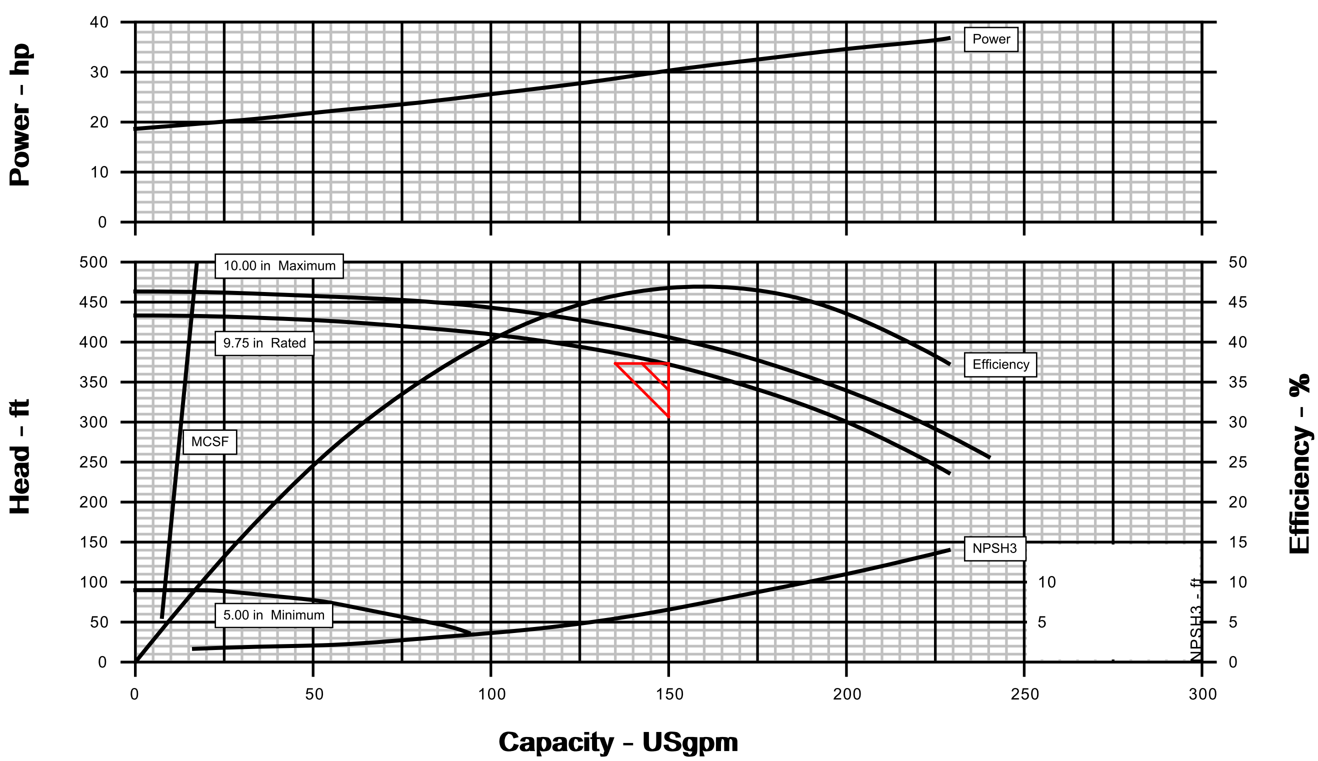
Other Requirements

Hydraulic selection : No specification
Construction : No specification
Test tolerance : ANSI/HI 14.6 Grade 1U
Driver Sizing : Max Power (SO to EOC) not using SF
Seal configuration : Single Seal

Performance

Hydraulic power	: 14.2 hp	Impeller diameter	
Pump speed	: 3,500 rpm	Rated	: 9.75 in
Pump overall efficiency (CE=1.00)	: 46.9 %	Maximum	: 10.00 in
NPSH required (NPSH3)	: 6.6 ft	Minimum	: 5.00 in
Rated brake power	: 30.2 hp	Ns / Nss (per eye)	: 513 / 10,040 (US)
		Minimum continuous flow	: 16.1 USgpm
Maximum brake power	: 36.8 hp	Maximum head at rated diameter	: 434.02 ft
Driver power rating	: 40.0 hp / 29.8 kW	Flow at BEP	: 159.1 USgpm
Casing working pressure	: 187.9 psig	Flow as % of BEP	: 94.3 %
(based on shut off @ cut dia/rated SG)		Efficiency at normal flow	: -
Maximum allowable	: 275.0 psig	Impeller diameter ratio (rated/max)	: 97.5 %
Hydrostatic test pressure	: 413.0 psig	Head rise to shut off	: 16.0 %
Estimated rated seal chamber pressure	: 18.6 psig	Total head ratio (rated / max) / (max / rated)	: 91.8 % / 108.9 %

CURVES ARE APPROXIMATE, PUMP IS GUARANTEED FOR ONE SET OF CONDITIONS; CAPACITY, HEAD, AND EFFICIENCY.
MCSF PROVIDES MECHANICAL PROTECTION ONLY. MINIMUM THERMAL FLOW MUST BE CALCULATED FOR THE SPECIFIC FLUID AND OPERATING CONDITIONS.



FLOWSERVE

Construction Datasheet

Customer	: Tetra Tech	Pump / Stages	: 2K2x1-10ARV M3 ST / 1
Customer reference	: Tetra Tech	Based on curve no.	: MIII8390BV
Item number	: RO Backwash brine	Flowserve reference	: 3936085428
Service	: RO recirculation	Date	: March 2, 2022

Construction

Nozzles	Size	Rating	Face	Position
Suction	2.00	150#	FF	End
Discharge	1.00	150#	FF	Top

Casing mounting	: Foot
Casing split	: Radial
Impeller type	: Reverse Vane
Bearing type (radial)	: Sgl Row
Bearing number (radial)	: 6310-C3
Bearing type (thrust)	: Dbl Row
Bearing number (thrust)	: 5310-AHC3
Bearing lubrication	: Flood
Rotation (view from driver)	: CW per Hyd. Institute

Materials

Casing	: 316SS (D4/CF8M)
Impeller	: 316SS (D4/CF-8M)
Seal chamber	: FML Box / (316SS)
Shaft	: 316 SS
Sleeve	: No Sleeve

Baseplate, Coupling and Guard

Baseplate type	: Type A Foundation
Baseplate material	: 316 SS
Baseplate size	: 264 Baseplate
Coupling manufacturer	: T.B. Woods
Coupling size	: Sure-Flex SC8
Coupling / Shaft guard	: Steel
Shaft / seal guard	: 304 SS Seal Finger Guard

Weights (Approx.)

Bareshaft pump (net)	: 210.0 lb
Baseplate (net)	: 328.0 lb
Driver (net)	: 560.0 lb
Shipping gross weight/volume	: 1,262.7 lb / 19.27 cu.ft

Testing

Hydrostatic test	: Non witnessed
Performance test	: Non witnessed
NPSH test	: Non witnessed

Paint and Package

Pump paint	: FLS St'd PU Topcoat
Base grout surface prep	: N/A
Shipment type	: Domestic

Driver Information

Manufacturer	: Flowserve Choice
Power	: 40.0 hp / 29.8 kW
Service factor (requested / actual)	: 1.15 / 1.15
Synchronous speed	: 3,600 rpm
Orientation / Mounting	: Horizontal / Foot
Driver type	: NEMA
Frame-size / material	: 324TS / Iron
Enclosure	: TEFC-PE
Hazardous area class	: -
Explosion 'T' rating	: -
Volts / Phase / Hz	: 230/460 / 3 / 60 Hz
Amps-full load/locked rotor	: 45.90 A / 360.70 A
Motor starting	: Direct on line (DOL)
Insulation	: F
Temperature rise	: -
Bearings	: Ball
Lubrication	: Grease
Motor mounted by	: Flowserve

Sound Pressure (dBA @ 1.0 m)

Driver, expected	: 77.0 dBA
Pump & driver, estimated	: 83.0 dBA

Seal Information

Arrangement	: Sgl Int O-Ring
Size	: 1.875
Manufacturer / Type	: Flowserve / ISC2 Pusher
Material code (Man'f/API)	: C2CPX----ECXV- / BSTFN
Internal neck bushing	: Not Available

Gland

Gland material	: 316SS
Flush	: .375" NPT
Vent	: .375" NPT
Drain	: .375" NPT
Auxiliary seal device	: Carbon Bushing

Piping

Seal flush plan	: Plan 03
Seal flush construction	: Not supplied
Seal flush material	: Not supplied
Aux seal flush plan	: Plan 61
Aux seal flush construction	: Not supplied
Aux seal flush material	: Not supplied

Notes

-

ANSI 3A w/site, magnetic drain plug

-

-

-

XSD Drawing No. 0000AMK3SXX2KXXFTRVSSMSFM

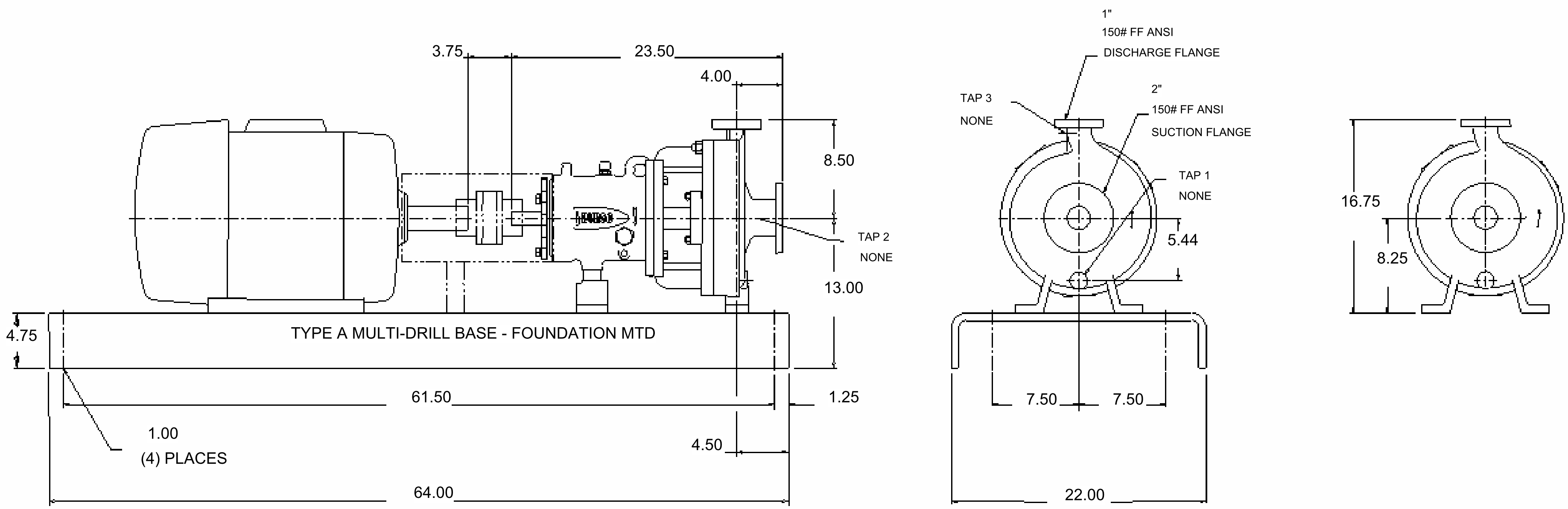
Full Page GA Drawing

Dimensions certified for construction
when properly endorsed below.
Refer to factory for any "*" dimensions.
DO NOT SCALE DRAWING

NOTES:
1. Consult pump I.O.M. before installing the pump.
2. Installation dimensions are +/- .13" (3mm), unless otherwise noted.
3. Foundation bolts and piping should not be set rigidly before receipt of

4. Allow a minimum of .75" (19mm) under baseplate for adjustment and grouting.
5. All holes in flanges are offset from centrelines.
6. Piping, foundations, and systems are the responsibility of others. Flowserve Pump Division data and comments are offered as an aid, but Flowserve Pump Division cannot assume responsibility for the system design or operation. It is recommended that a specialist skilled in this area be consulted to ensure a successful installation.
7. Dimension shown from bottom of base to centerline of pump includes any blocks under pump, as necessary.

ASME size A05
Shaft Dia. at Seal: 1.875"
Shaft Dia.at Cplg: 1.125"



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Customer	: Tetra Tech	Pump size & type	: 2K2x1-10ARV M3 ST	Drawing number	: -
Item number	: RO Backwash brine	Pump speed / Stages	: 3,500 rpm / 1	Date	: March 2, 2022
Service	: RO recirculation	Flow / Head	: 150.0 USgpm / 374.00 ft	Certified by / Date :	: -
Customer PO #	: -	Driver power / Frame	: 40.0 hp / 29.8 kW / 324TS	Seal type	: ISC2 Pusher
Flowserve reference	: 3936085428	Volts / Phase / Hz	: 230/460 / 3 / 60 Hz	Seal flush plan	: Plan 03

FLOWSERVE

Additional Details

Customer	: Tetra Tech	Pump / Stages	: 2K2x1-10ARV M3 ST / 1
Customer reference	: Tetra Tech	Based on curve no.	: MIII8390BV
Item number	: RO Backwash brine	Flowserve reference	: 3936085428
Service	: RO recirculation	Date	: March 2, 2022

Duty Conditions		**Performance**	
Quantity of pumps	: 2	Hydraulic power	: 14.2 hp
Liquid description	: RO recirculation	Pump overall efficiency	: 46.9 %
Liquid type	: Other	NPSH3 @ Impeller eye	: 6.6 ft
Frequency	: 60 Hz	Rated brake power	: 30.2 hp
Flammable	: No	Maximum brake power	: 36.8 hp
Toxic	: No	Motor rating	: 40.0 hp / 29.8 kW
H2S	: No	Ns / Nss (per eye)	: 513 / 10,040 (US)
Rated flow	: 150.0 USgpm	MCSF	: 16.1 USgpm
Rated head	: 374.00 ft	Rated impeller diameter	: 9.75 in
NPSHa	: 34.0 ft	Maximum impeller diameter	: 10.00 in
Viscosity	: 1.00 cSt	Minimum impeller diameter	: 5.00 in
Specific gravity	: 1.000	Maximum head	: 434.02 ft
Maximum suction pressure	: 0.0 psig	Flow at BEP	: 159.1 USgpm
Rated suction pressure	: 0.0 psig	Flow as % of BEP	: 94.3 %
Maximum liquid temperature	: 60 °F	Rated/max diameter	: 97.5 %
Vapor pressure	: -	Head rise to shut off	: 16.0 %
Altitude	: -	Rated/max head	: 91.8 %
Static head	: -	Visc. capacity correction factor (CQ)	: 1.00
Pump length strategy used	: -	Visc. head correction factor (CH)	: 1.00
		Visc. efficiency correction factor (CE)	: 1.00

Selection status

Product line	: Mark 3 & LoFlo ANSI	Business unit	: Chesapeake
Pump speed	: 3,500 rpm	Selection status	: Acceptable

Working Pressure Limits		**Actual Pressure Values**	
Casing assembly MRWP	: 187.9 psig	Casing pressure	: 187.9 psig
Suction region MRWP	: -	(based on shut off @ cut dia/rated SG)	
Discharge region MRWP	: N/A	Allowed discharge	: 275.0 psig
Casing Assembly MAWP	: 275.0 psig	Allowed suction	: 106.0 psig
Suction region MAWP	: 106.0 psig	Seal chamber pressure	: 18.6 psig
Discharge Region MAWP	: 275.0 psig	Maximum discharge pressure	: N/A
Materials		Maximum suction pressure	: 0.0 psig
Requested pump material	: D4	Casing design	: -
Selected pump material	: D4	Discharge flange rating	: N/A
		Suction flange rating	: N/A

Hydrostatic Test Pressures (when purchased)

Casing hydrotest pressure	: 413.0 psig	Suction region hydrotest pressure	: 413.0 psig
Discharge region hydrotest pressure	: 413.0 psig		

Performance Corrections and Factors

Mechanical Seal / Packing	: -	Bearing configuration	: -
Auxiliary seal	: -	Back wear ring supply	: No back rings fitted
Clearances	: -	Solid size	: -
Shaft configuration	: -	Solid size limit	: 0.4060 in
Orifice plate diameter	: -	Torque rating (max power)	: 1.05 hp/100 rpm
Energy density	: 0 hp/min	Torque rating (rated power)	: 0.86 hp/100 rpm
dN (API 7th) / dmN (API 8th)	: -	Torque limit	: 5.00 hp/100 rpm
		Pump WR² at 3,500 rpm	: 0.46 lb-ft²

Additional Details

Customer	: Tetra Tech	Pump / Stages	: 2K2x1-10ARV M3 ST / 1
Customer reference	: Tetra Tech	Based on curve no.	: MIII8390BV
Item number	: RO Backwash brine	Flowserve reference	: 3936085428
Service	: RO recirculation	Date	: March 2, 2022

Shaft Deflection and Bearing Life

Shaft deflection (rated)	: -	Radial bearing life (shut off)	: -
Shaft deflection limit (rated)	: -	Radial bearing life limit (shut off)	: -
Shaft deflection (shut off)	: -	Thrust bearing life (rated)	: -
Shaft deflection limit (shut off)	: -	Thrust bearing life limit (rated)	: -
Radial bearing life (rated)	: -	Thrust bearing life (shut off)	: -
Radial bearing life limit (rated)	: -	Thrust bearing life limit (shut off)	: -

User Messages

Memo

To: Olivenhain Municipal Water District Board of Directors

Subject: CONSIDER PUBLIC COMMENTS

There may be public comments before the Board meeting is adjourned.

Memo

To: Olivenhain Municipal Water District Board of Directors

Subject: CLOSED SESSION

It may be necessary to go into Closed Session.

Memo

To: Olivenhain Municipal Water District Board of Directors

Subject: OPEN SESSION

Memo

To: Olivenhain Municipal Water District Board of Directors

Subject: ADJOURNMENT

We are adjourned.