



Local Advanced Water Purification System

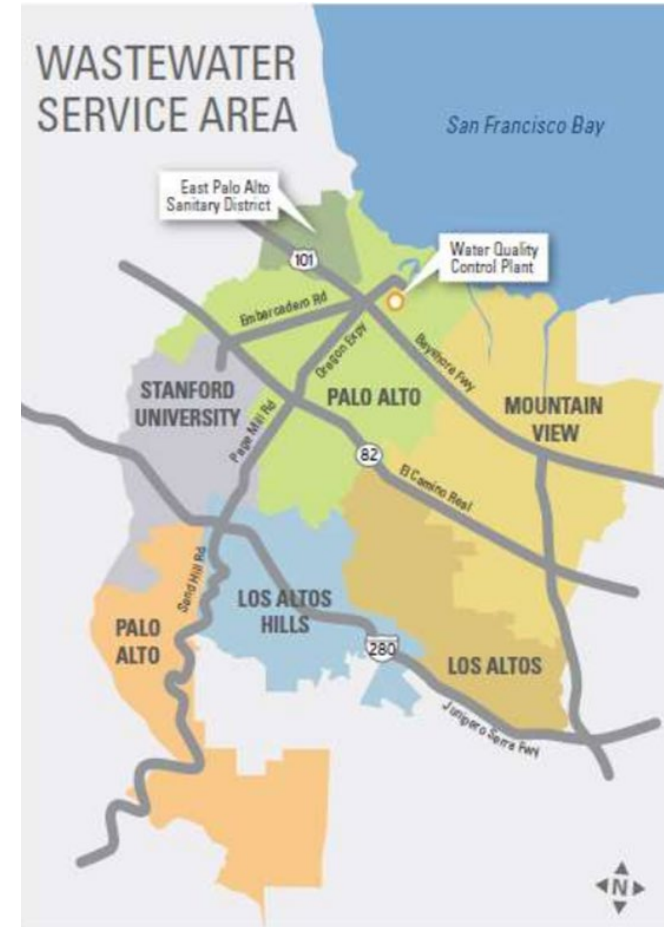
Project Overview

October 15, 2024

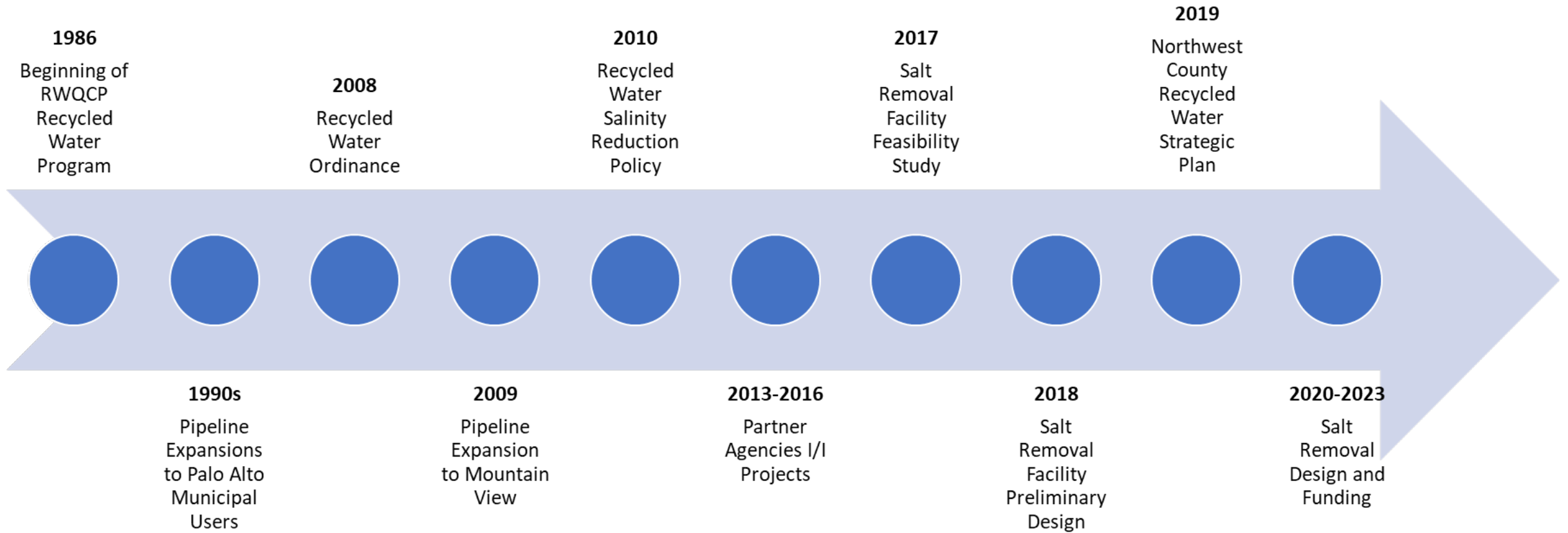
www.cityofpaloalto.org

Palo Alto RWQCP Partners & Service Area

Agency	2020 Population
Mountain View	87,000
Los Altos	34,000
Lost Altos Hills	9,100
Stanford University	7,500
Palo Alto	81,000
East Palo Alto	31,000
TOTAL	250,000

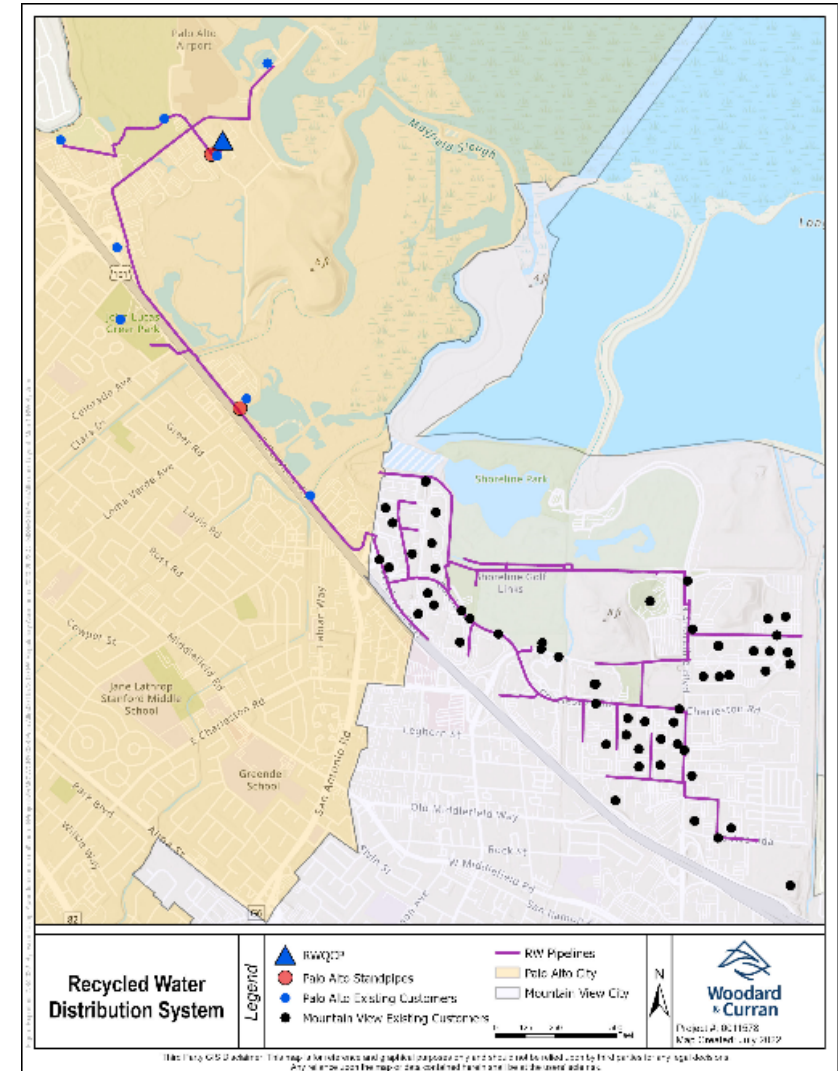


Recycled Water History

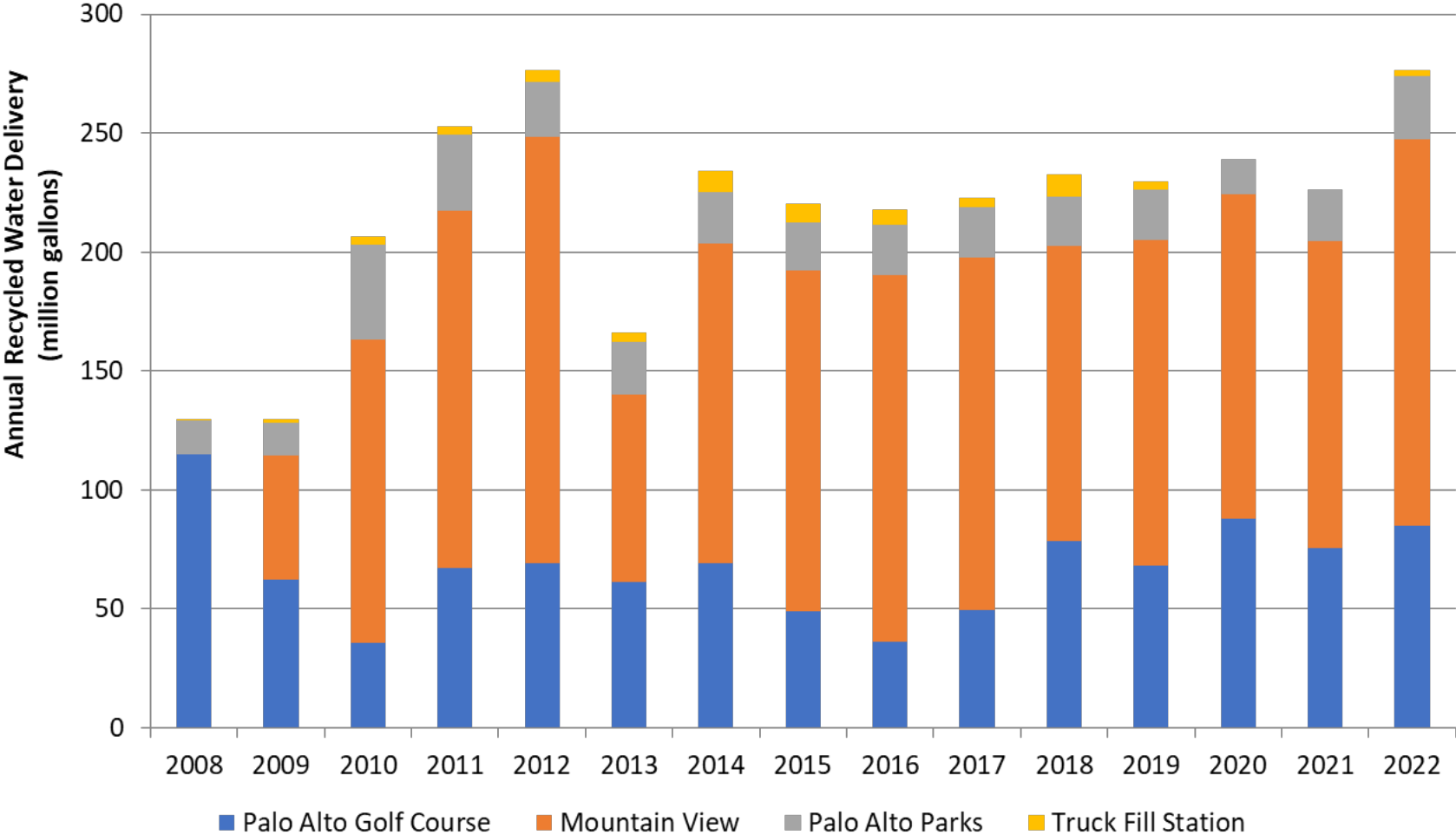


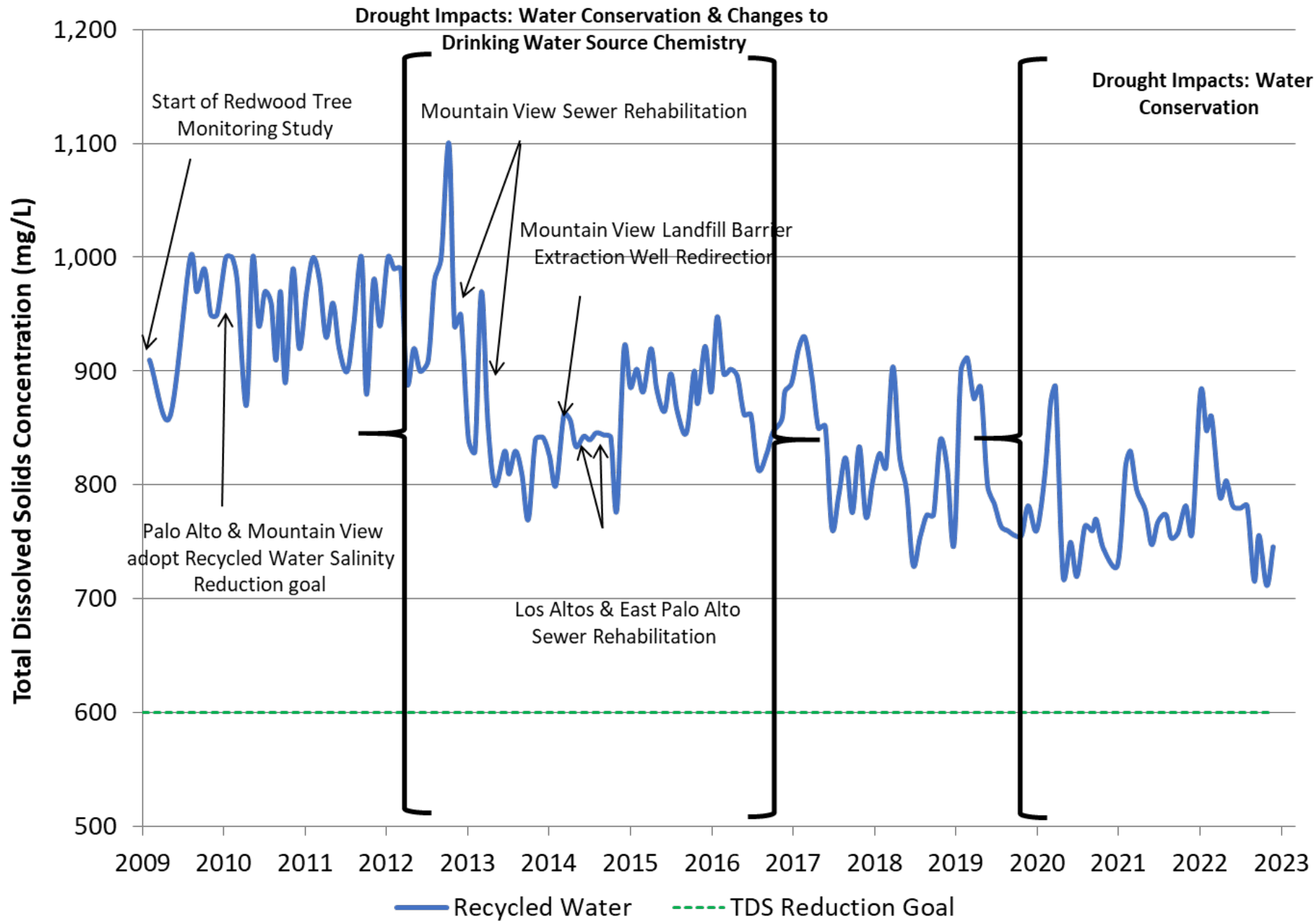
Palo Alto Recycled Water Program

- 230 million gallons per year (5% of final effluent)
 - 130 MG to Mountain View
 - 76 MG to PA Golf Course
 - 22 MG to other users
 - 3 MG to Truckfill users

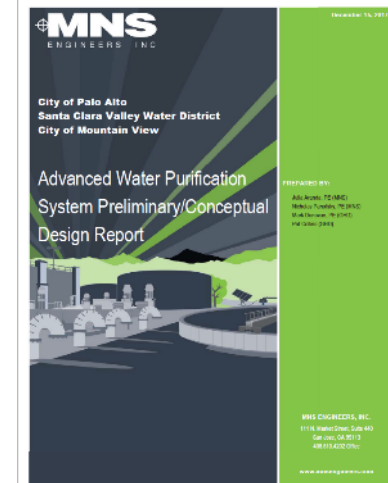
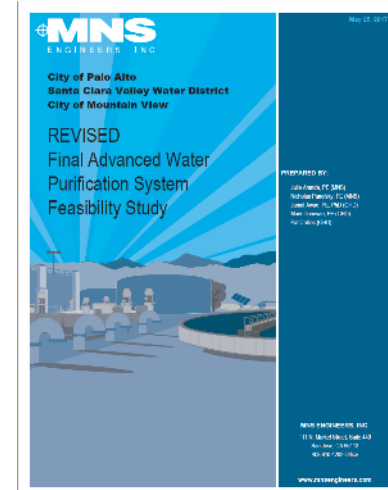
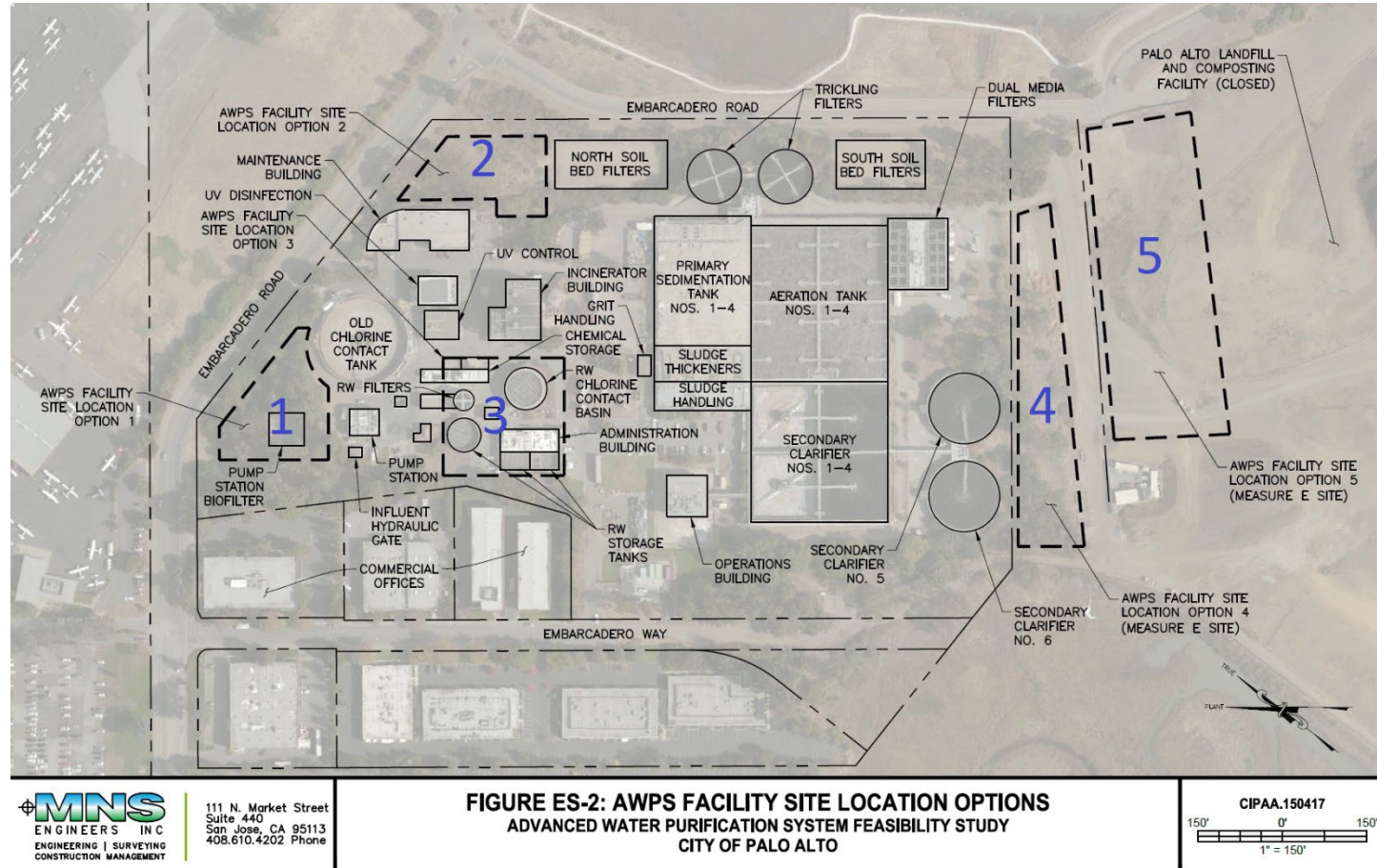


ANNUAL RECYCLED WATER USE





Feasibility Study/Preliminary Design



Local Salt Removal Facility Project Overview



- Project purpose:

- To improve the recycled water quality from the RWQCP by lowering salt content
- Higher quality recycled water decreases potable water demand for irrigation uses
- Phase I – 1.125 MGD permeate production
- Phase II – 2.25 MGD permeate production

Benefits to Palo Alto

- Higher quality water used at Golf Course and Greer Park
- Supports salinity reduction goals
- Reduces conversion of marsh near outfall
- Increases use of recycled water to reduce discharge to the Bay
- One stage within a potential future Direct Potable Reuse project
- Continues collaborative relationship with treatment plant partners
- Sets up potential for future recycled water customers within Palo Alto

AWPS Design Capacity

Table 4-1 AWPS Design Capacity

	Phase 1	Phase 2
Net Production from AWPS	1.125 MGD	2.25 MGD
Internal Consumption	3%	3%
Gross Production from AWPS	1.16 MGD	2.32 MGD



Project Overview

Project includes:

- Replacement of existing soil filter
- New permeate storage tank
- Microfiltration/reverse osmosis process under canopy structure
- Blending station
- Landscaping, paving and site work (perimeter sound wall and fencing)
- New electrical building near wall

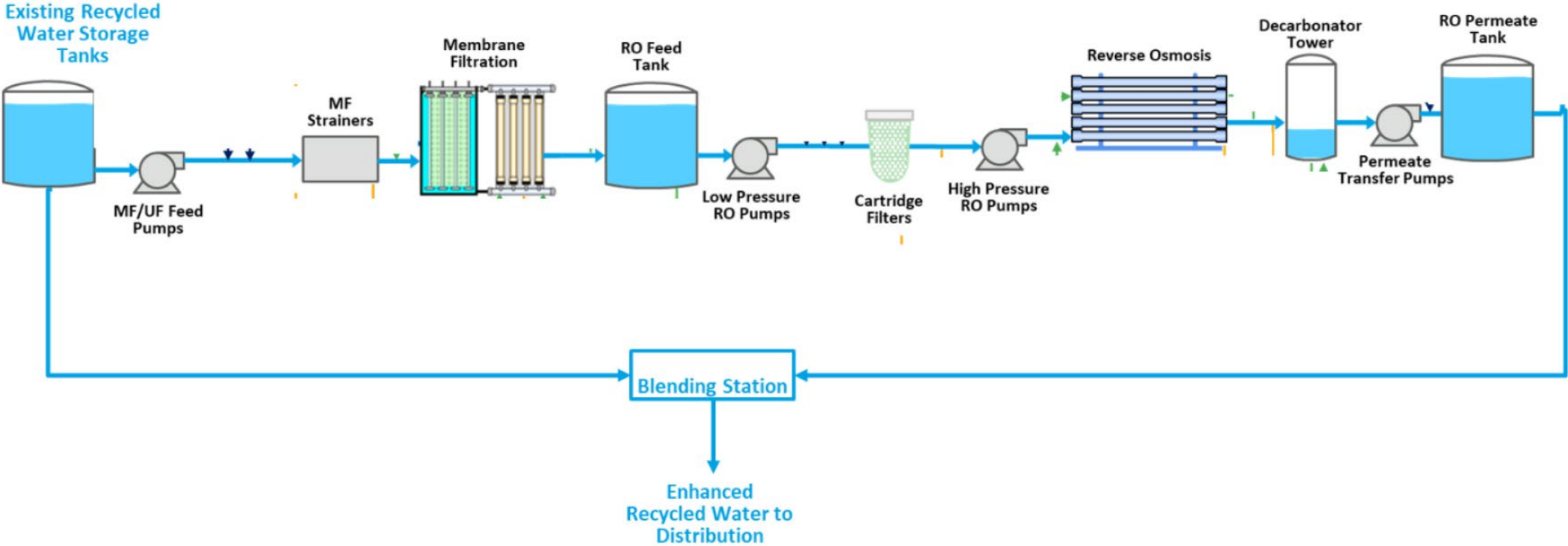


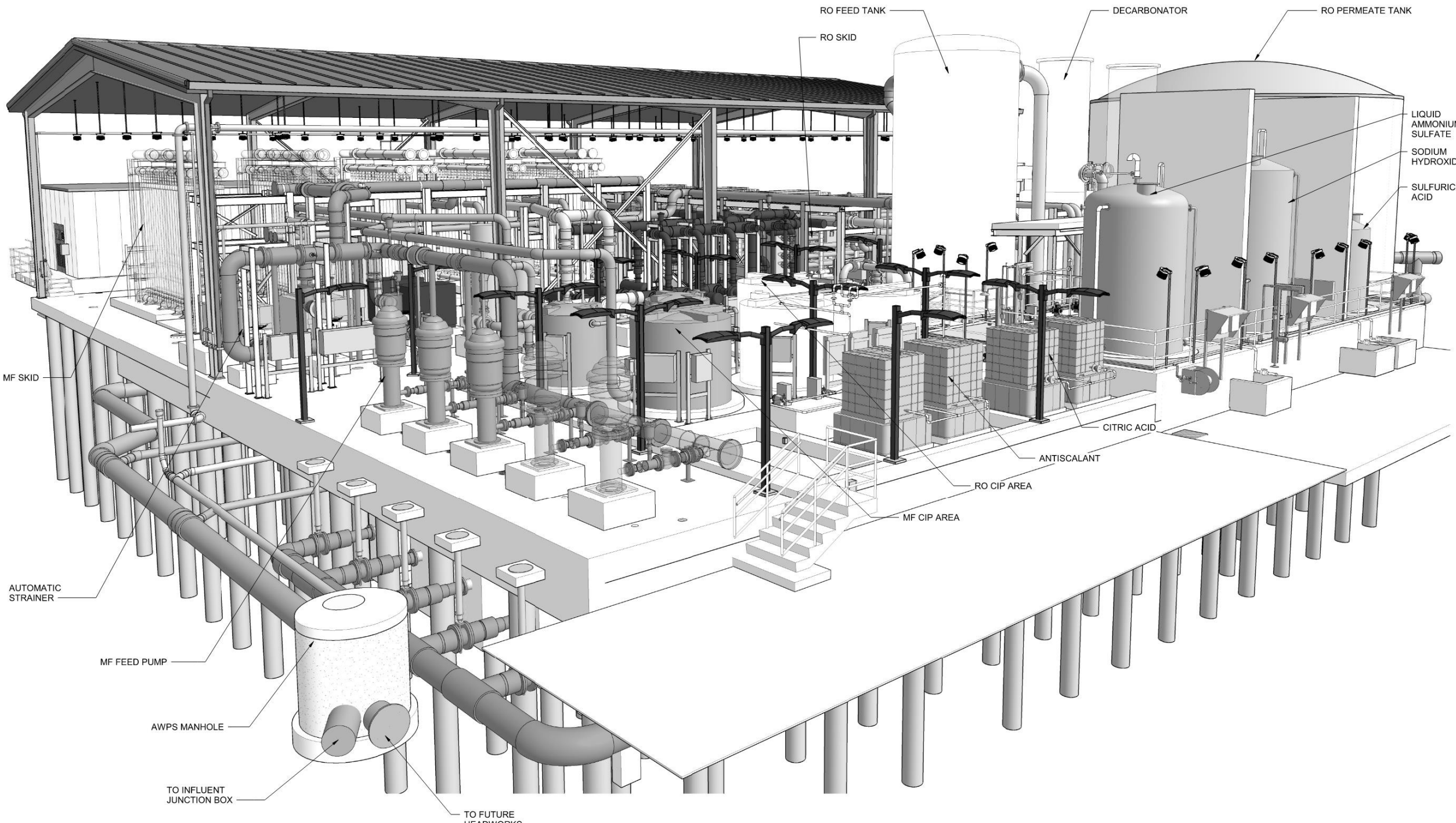
Exterior Site / New Landscaping Modifications

- Facility Tree & Shrub Screening
- Naturalized Planting along Pathway
- Modifications to existing Irrigation
- Informational Board Opportunity



Flow Diagram





RO FEED TANK

DECARBONATOR

RO PERMEATE TANK

RO SKID

LIQUID AMMONIUM SULFATE

SODIUM HYDROXIDE

SULFURIC ACID

MF SKID

CITRIC ACID

ANTISCALANT

RO CIP AREA

MF CIP AREA

AUTOMATIC STRAINER

MF FEED PUMP

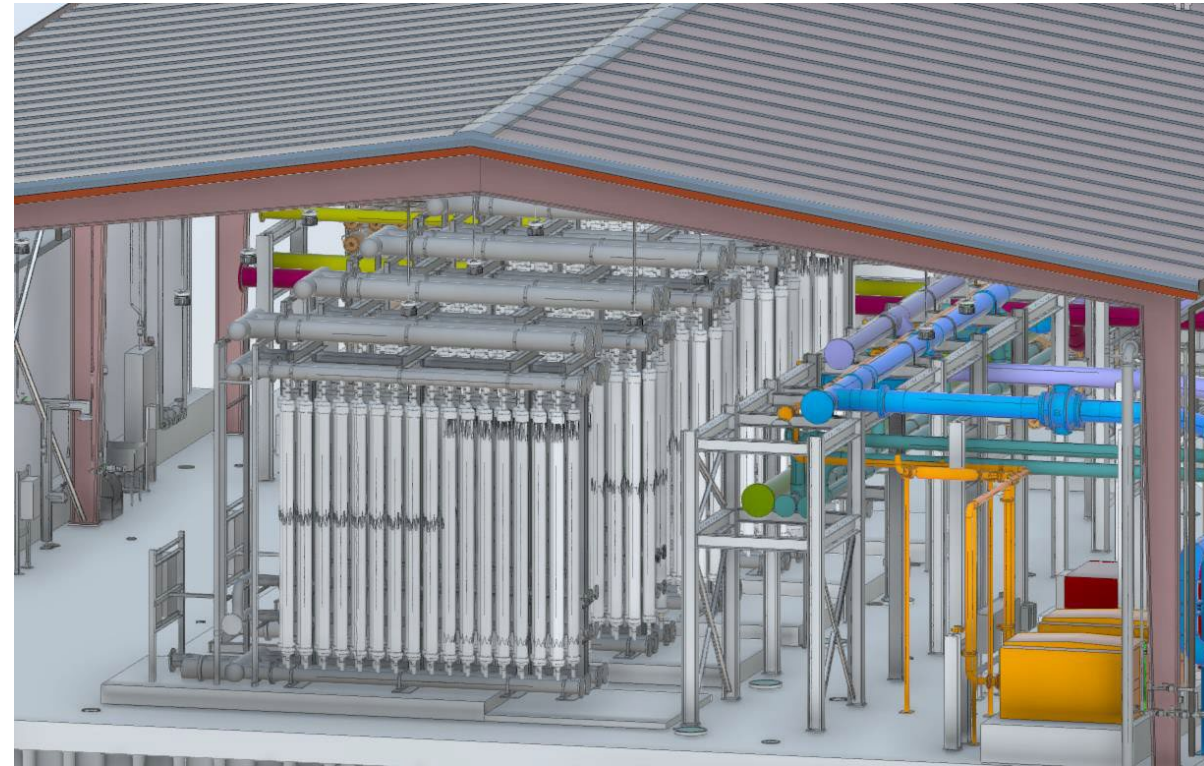
AWPS MANHOLE

TO INFLUENT JUNCTION BOX

TO FUTURE HEADWORKS

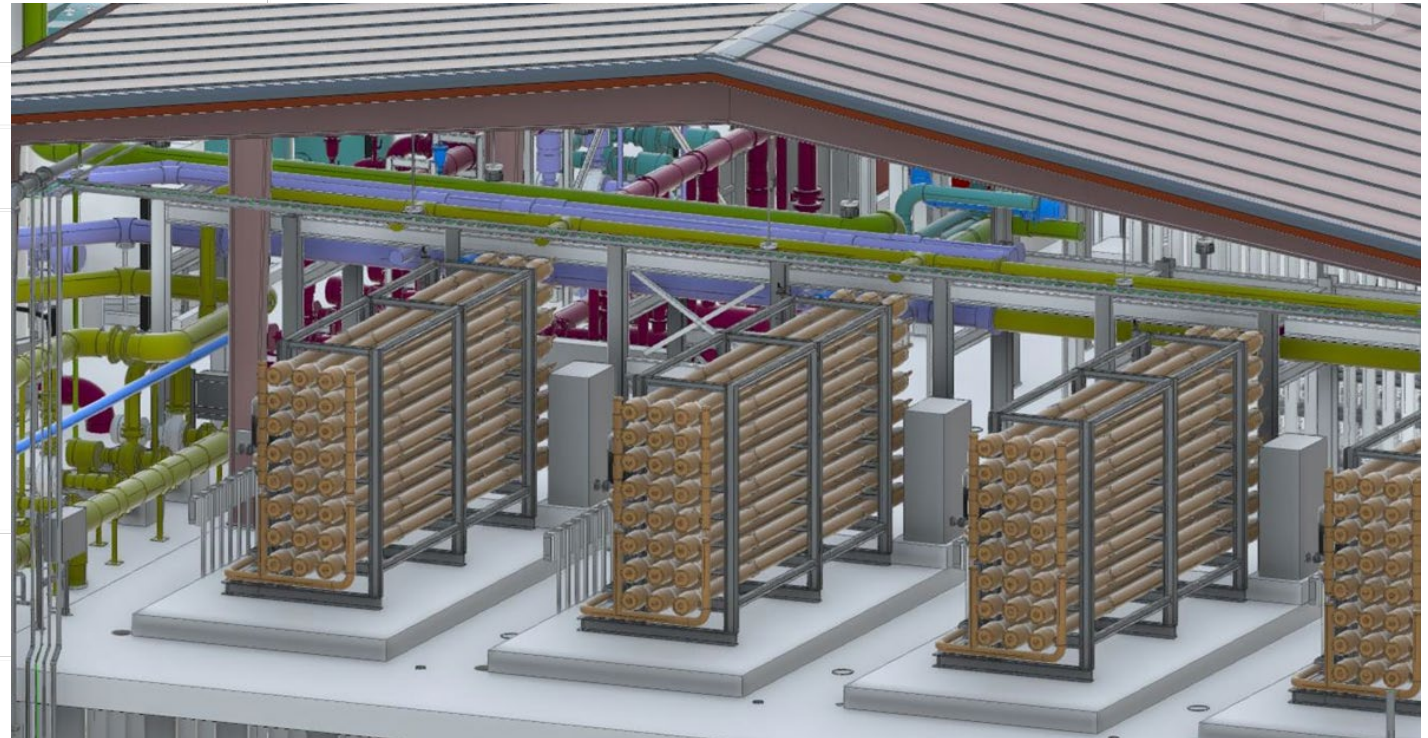
MF System Summary

Design	Proprietary system or Universal Rack capable of housing a membrane module from a minimum of three different membrane manufactures.
Number of MF Units (Phase 1)	Duty, Typical: 3 Duty, Design with 1 Unit Offline for Maintenance: 2 Total MF Units: 3
Number of MF Units (Phase 2)	Duty, Typical: 5 Duty, Design with 1 Unit Offline for Maintenance: 4 Total MF Units: 5
Net Daily Filtrate Production Capacity, All Trains (Phase 1) ¹	1.36 mgd
Maximum Instantaneous Flux for Duty Operation, Not Temperature Corrected	A value to be proposed by MFSS but shall not exceed 30 gfd.
Additional membrane module requirements	Each MF unit shall be configured to accept the installation of additional membrane modules so that a total of no less than percent additional membrane active surface area can be added to the unit in the future without requiring any additional modifications (including piping modifications).

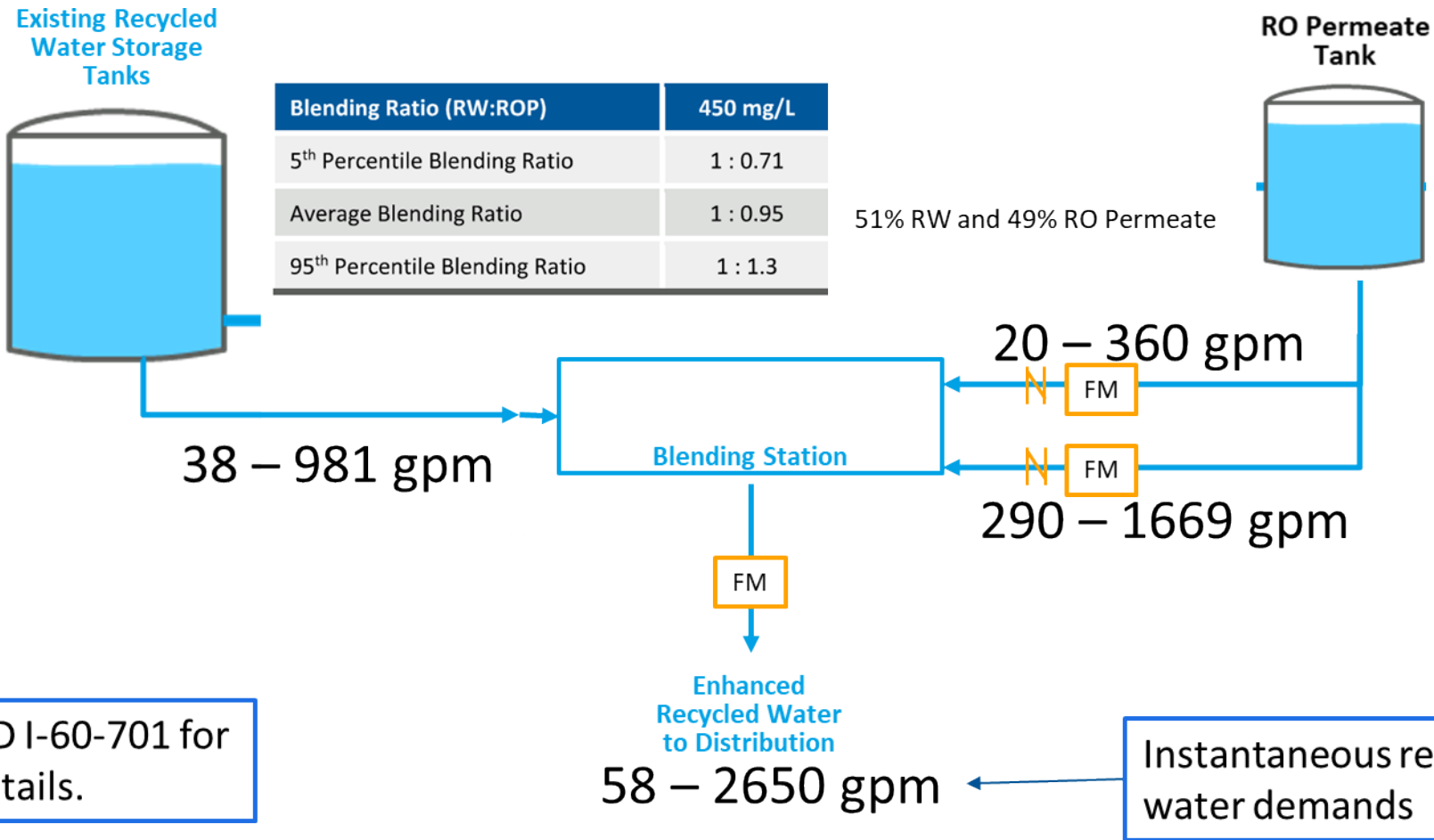


RO System Summary

Design Permeate Flow Range Per RO Unit	403 gpm @ 85% design recovery 355 gpm @ 75% minimum recovery
Design Feedwater Flow Rate Per Unit	474 gpm
Min. Permeate Turndown (% of Design Permeate Flow Rate)	80%
Number of Stages Per Unit	3
Number of RO Elements Per Pressure Vessel (All Stages)	7
Minimum Number of Pressure Vessel Per Stage, Per Unit	
Stage 1	11
Stage 2	5
Stage 3	3
Minimum Installed Pressure Vessel Spare Capacity	4%
Design Permeate Pressure in Combined Permeate Header of Each Unit	20 psig



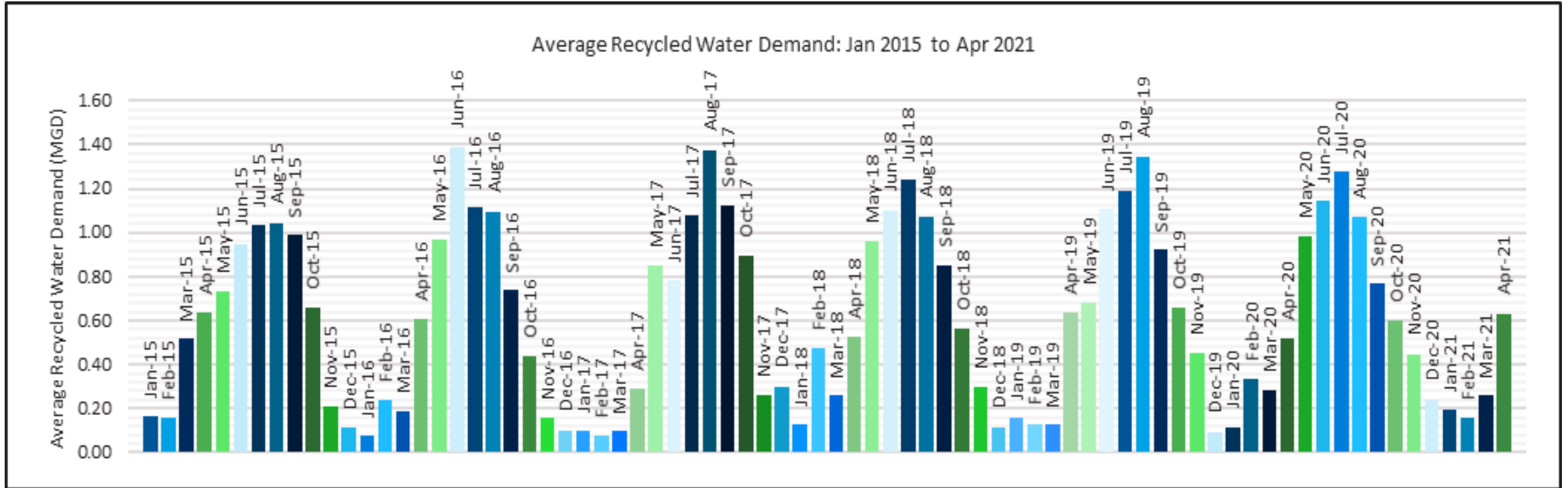
Key Challenges – Blending Ratios and Recycled Water Streams



See P&ID I-60-701 for more details.



Key Challenges – AWPS Turndown Capabilities



Operating Scenarios

6.1 Three MF Skids at 50% and One RO Train at 80%

This scenario illustrates the daily operation of three MF skids at 50% capacity for 1.5 hours and one RO Train at 80% capacity for 1.5 hours to meet lowest observed Enhanced Recycled Water demand of 58 gallons per minute (gpm) meaning 20 gallons per minute of RO Permeate. In this scenario, each day you can alternate an RO Train to minimize RO shutdown procedures. See Figure 3.

6.2 Full MF and RO Operation at Low Demands

This scenario illustrates the operation of the AWPS every other day for approximately 1.5 hours with an Enhanced Recycled Water demand of 58 gpm, blending 20 gpm of RO Permeate and 38 gpm of Recycled Water, allowing the system to run for very short time periods at full capacity. Storage and maintenance procedures for MF and RO should follow Table 2 and Table 4.



Key Challenges – AWPS Turndown Capabilities

Shutdown Timeline	Shutdown Procedure
Less than 4 days	Store in MF Filtrate.
4 days to Less than 8 Days	Perform chemical enhanced backwash Store in MF Filtrate
8 Days and Longer	Perform chemical enhanced backwash Fill the modules with sodium bisulfite Monitor pH

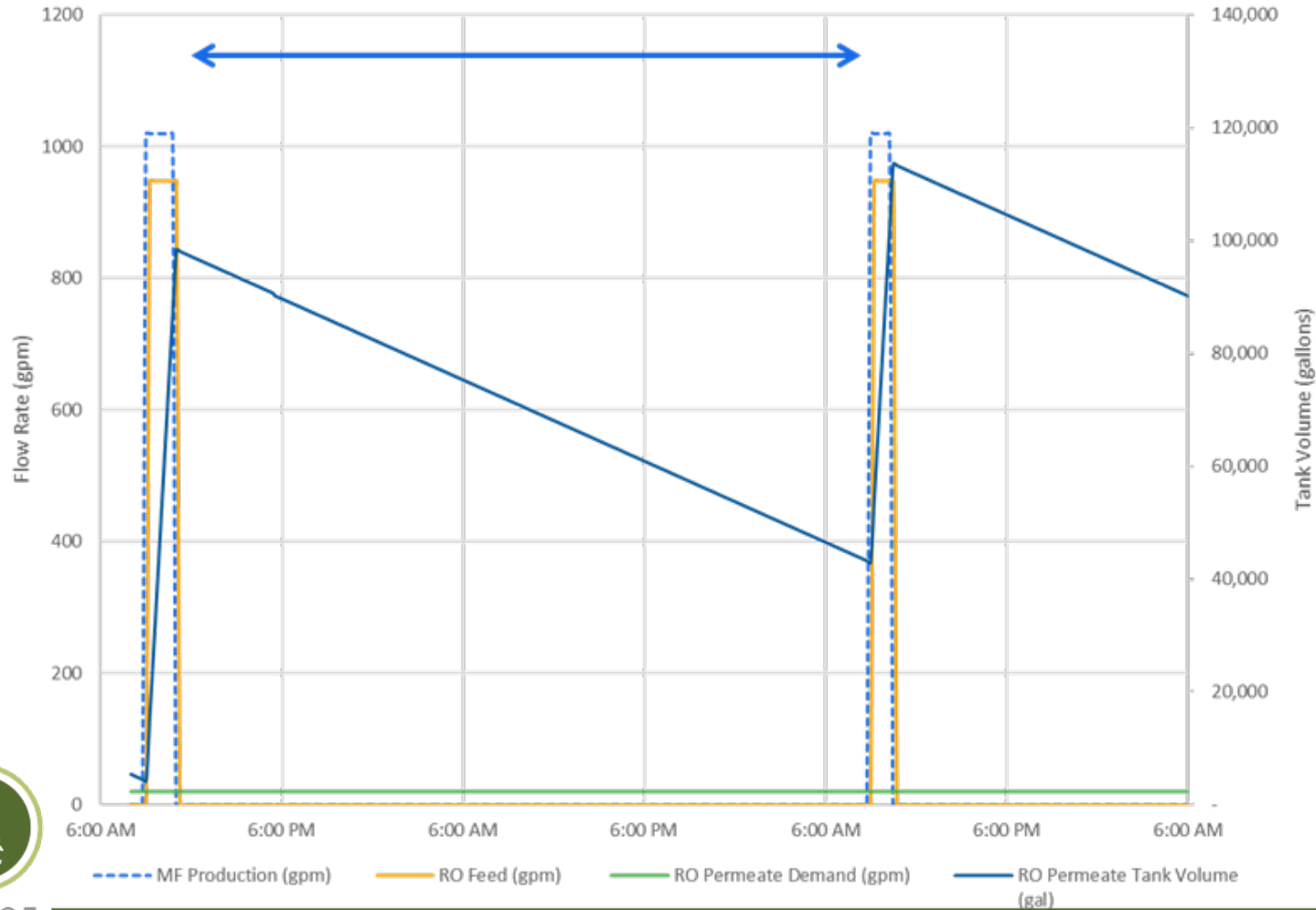
Shutdown Timeline	Shutdown Procedure
Less than 48 hours	RO Flush
48 hours and longer	RO Flush RO Membrane Preservation Monitor pH

Entire AWPS cannot be offline for more than 48 hours without preserving RO membranes



AWPS Turndown Capabilities - Operations

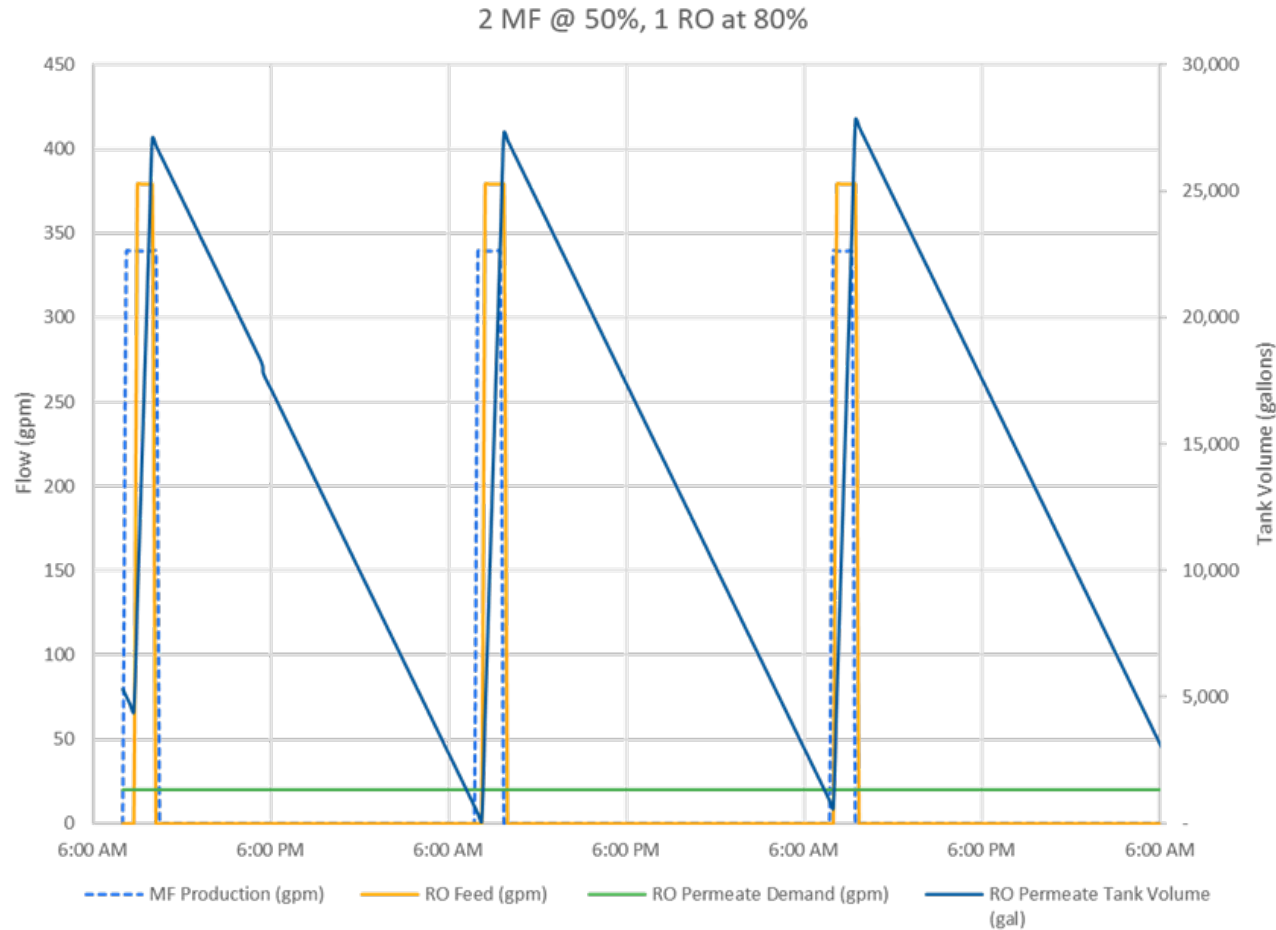
3 MF @ 100%, 2 RO at 100%



- ROP Demand at 20 gpm (lowest observed demand)
- Operate <2 hours every other day at full capacity
- Both RO skids run full capacity



AWPS Turndown Capabilities - Operations



- ROP Demand at 20 gpm (lowest observed demand)
- Operate ~2 hours a day at reduced capacity
- Alternate RO skids every other day



AWPS Turndown Adjustments

- Adjust the RO Permeate to Recycled Water ratios through SCADA to optimize the system and storage. This will be accomplished through trial and error to find the best balance amongst the Recycled Water Storage Tanks and the RO Permeate Tank. Due to the ease of shutting the existing Recycled Water System on and off, it may be better to have a slightly higher AWPS production (i.e. higher RO Permeate ratio).
- Fully preserve one RO Train for the winter.
- Fully preserve one MF Skid for the winter.
- Minimize sodium hypochlorite deliveries to avoid degradation of the chemical. Note that no other chemicals for the AWPS have degradation issues.



Schedule

- Q2 2024 – Planning Entitlement
- Q3 2024 – SRF Loan Installment Sale Agreement (ISA) and USBR Loan
- Q4 2024 – Project to bid
- Q2 2025 – Project NTP
- Q4 2027 – Lower TDS Recycled Water





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**PALO
ALTO**

THANK YOU

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