REGULATORY AND ENHANCED WATER QUALITY PILOT STUDIES

KALAELOA SEAWATER DESALINATION FACILITY

HAWAIʻI WATER WORKS ASSOCIATION CONFERENCE

October 15, 2025

HONOLULU BOARD OF WATER SUPPLY

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AGENDA

- Team Introductions
- Pilot Test Overview
  - Considerations
  - Timeline
- Regulatory Pilot Test & Enhanced Water Quality Pilot Test
  - Approach
  - Equipment
  - Results
- Summary
- Questions & Answers

PROJECT TEAM MEMBERS - *Introductions*

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Owner

carollo

Owner's Engineer

wsp

Owner's Engineer

KALAELOA
DESALCO

DBOM Contractor

PACE
Advanced Water Engineering

Engineer of Record

Duranceau

Duranceau Consulting
Post Treatment Specialist

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PILOT TEST OVERVIEW

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KSDF KEY PILOT TESTS CONSIDERATION

- Regulatory Pilot Test
  - Demonstrate compliance with Hawai'i Department of Health's (DOH) requirements including Ground Water Rule, New and Modified Public Water Systems, DOH's Guidance for Use of Alternative Filtration Technologies (AFT) and EPA Safe Drinking Water Act requirements
- Enhanced Water Quality Pilot Test
  - Assist BWS in assessing the potential for any impacts due to the introduction and use of the proposed Product Water as a new source of drinking water.

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PILOT TEST WITHIN PROJECT TIMELINE

PILOT TEST PHASE I Start-up & Commissioning	PILOT TEST PHASE II 2 Silica Concentrations	NO DETRIMENTAL IMPACT DETERMINATION	CONSTRUCTION COMMENCEMENT	FINAL COMPLETION	OPERATIONS PERIOD
Feb - Aug 2024	Sept – Jan 2025	May 2025	Spring 2026	2028	

Operations Period Commences After Acceptance

20 Years with Two Additional 5-year Renewal Terms at BWS's Discretion

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REGULATORY PILOT TEST

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REGULATORY - OVERALL PILOT APPROACH

- RO System Performance Monitoring
- Sampling & Analysis
  - Source Seawater
  - Permeate Water
  - Product Water
  - Pilot System Waste Streams

REGULATORY - OVERALL PILOT APPROACH

Source Seawater Sampling & Analysis

- General Water Chemistry
- MPA Analysis
- Bacteriological Analysis
- Radionuclides
- Petroleum Organics (gas, oil & diesel)
- UCMR5 (40 PFAS compounds/ Method 1633)
- Volatile Organic Compounds (89 compounds /Method 624.2)
- Semi Volatile Compounds (84 compounds /Method 625.1)
- Organochlorine Pesticides & PCBs (29 constituents / Method 608.3)
- Herbicides (10 constituents /Method 8151A)
- Lithium
- Particle Count and Size Distribution

Total of Approximately 360 Constituents

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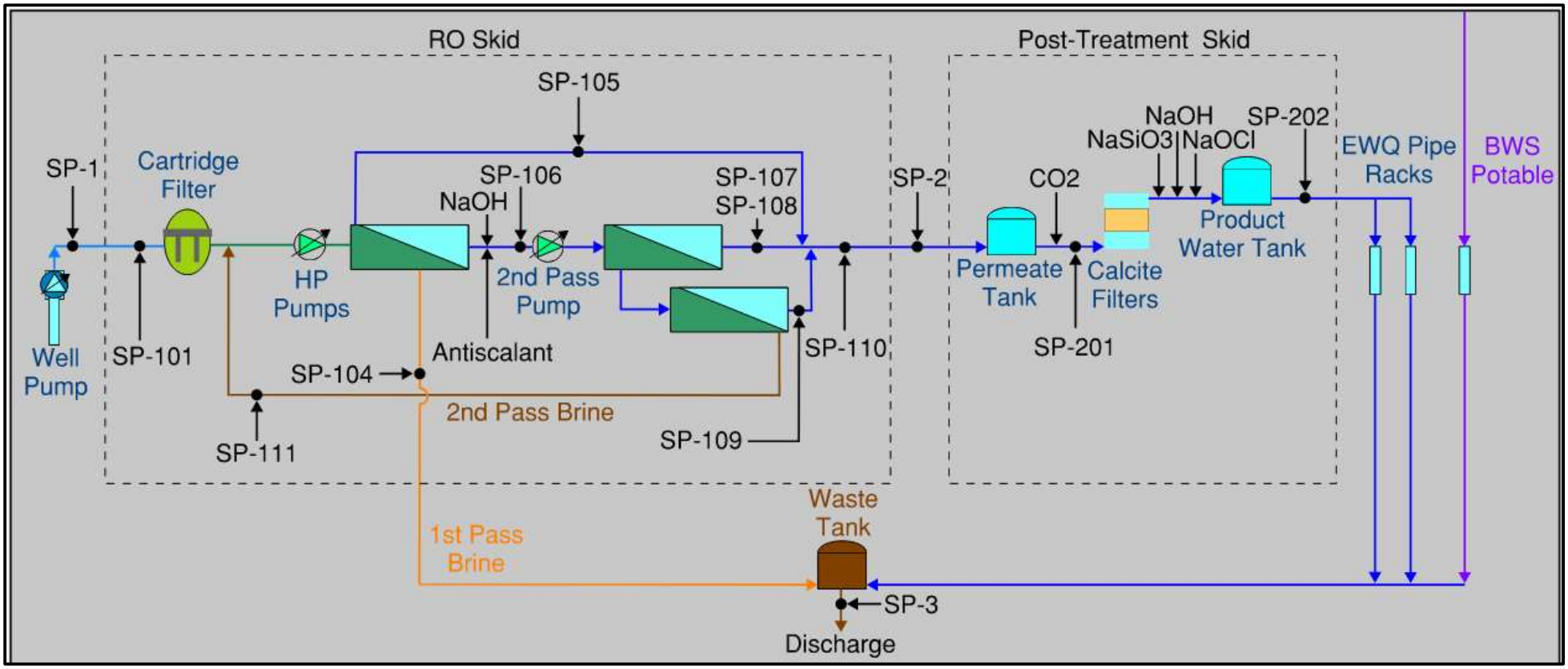
PILOT TEST EQUIPMENT FLOW DIAGRAM



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REGULATORY PILOT TEST EQUIPMENT

- Partial 2 Pass RO System
  - 5 micron Prefilter
  - 1st Pass - SWRO Membranes
    - 1 - 8”vessel - 7 elements in series
  - 2nd Pass - BWRO Membranes
    - 3:1 2.5” vessel array – 7 elements in series
  - Chemical Injection

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REGULATORY PILOT TEST RESULTS

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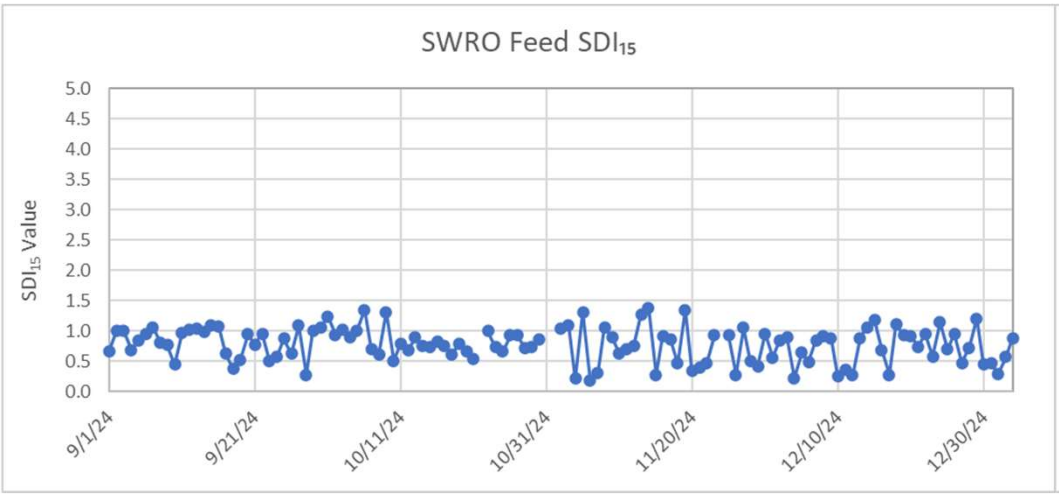
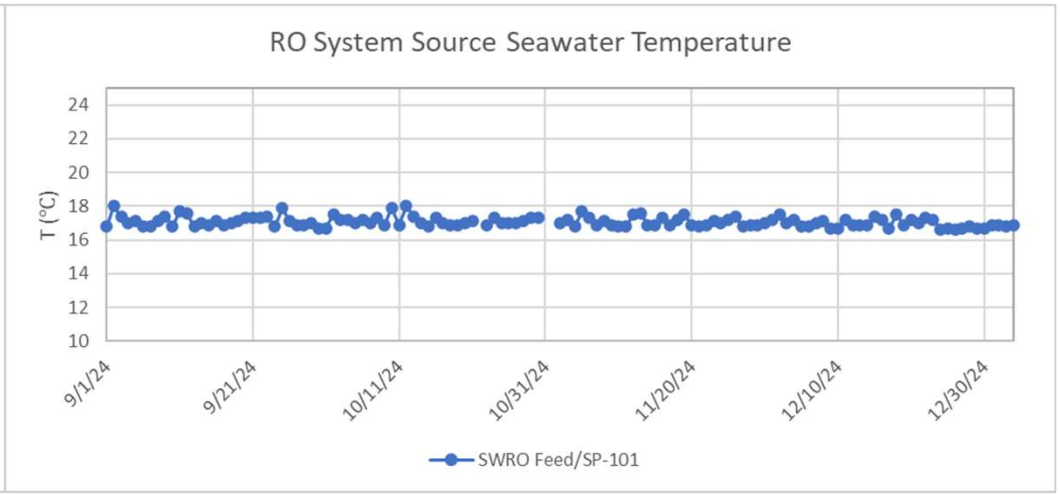
REGULATORY PILOT TEST RESULTS

Source Seawater Feed





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REGULATORY PILOT TEST RESULTS

Source Seawater Feed

- High Quality Feed Water
- No Groundwater Influence Observed
- SDI Values All Well Below Membrane Mfr. Recommended Limits
- All Sampled Volatile Organics, Pesticides, and Other Constituents tested Showed ND Results

REGULATORY PILOT TEST RESULTS

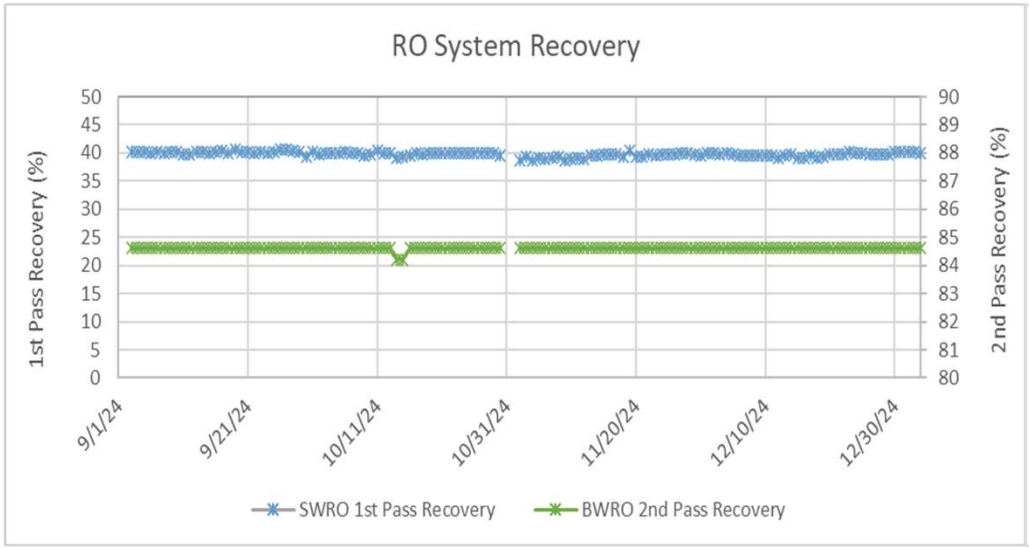
Product Water

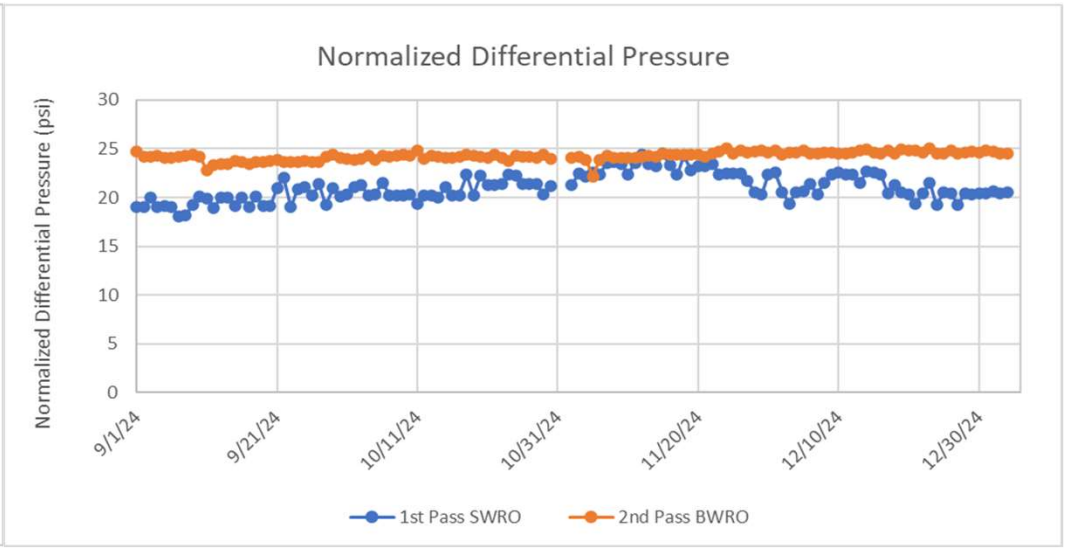
- Very High-Quality Stable Drinking Water
- Meets all US EPA and DOH Drinking Water Standards
- Confirmed Constituents for Sampling & Analysis were ND or below EPA MCL for Drinking Water

REGULATORY PILOT TEST RESULTS

RO System Performance

- Confirmed & Optimized Facility Post Treatment Design
- Stable Operation





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ENHANCED WATER QUALITY PILOT TEST

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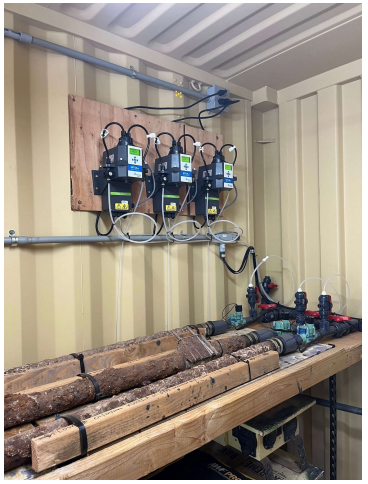
EWQ - OVERALL PILOT APPROACH

- Customer Outreach
- BWS Pipe Harvesting
  - Corrosion Mechanism Assessment of BWS Pipes
  - Corrosion Studies and Assessment of BWS Pipes



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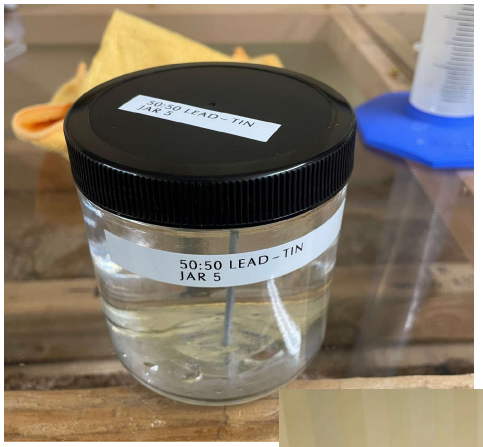
EWQ - OVERALL PILOT APPROACH

- Treatment Processes Sampling & Analysis
  - Optimization of Silica Concentration
- Coupon Immersion Jar Testing
- Disinfection Stability Desktop Study
- Campbell Industrial Park Sampling & Analysis



EWQ - PILOT TEST EQUIPMENT

- Post Treatment
  - CO2 Injection
  - Calcite Reactor
  - Chemical Injection (SiO2, NaOH)
  - Disinfection (NaOCl)

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ENHANCED WATER QUALITY PILOT TEST RESULTS

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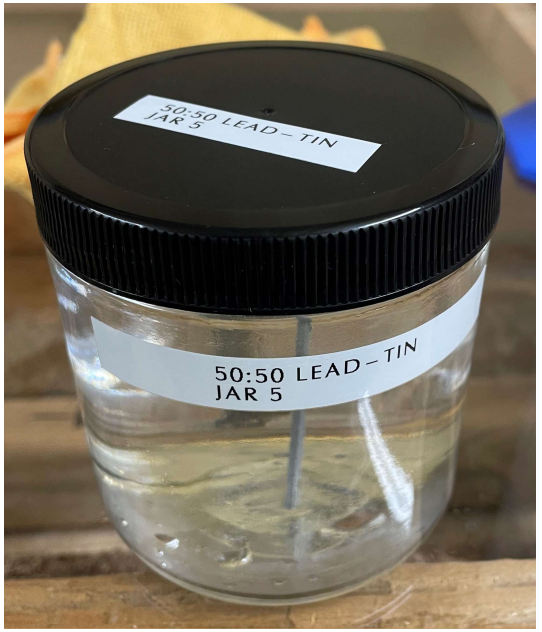
EWQ PILOT RESULTS | COUPON JAR TESTING



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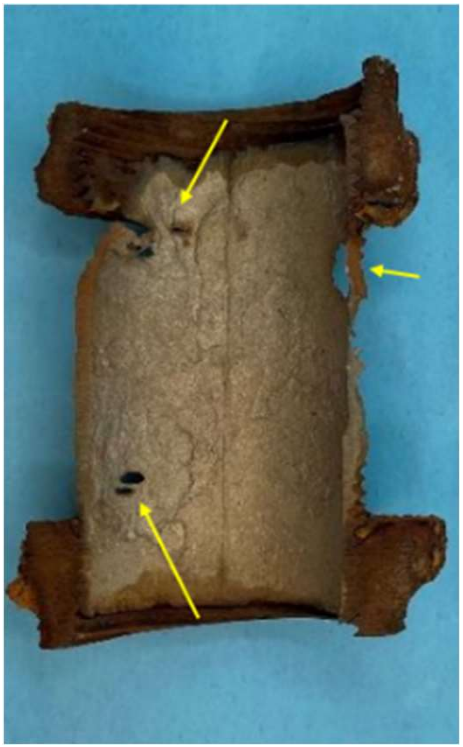
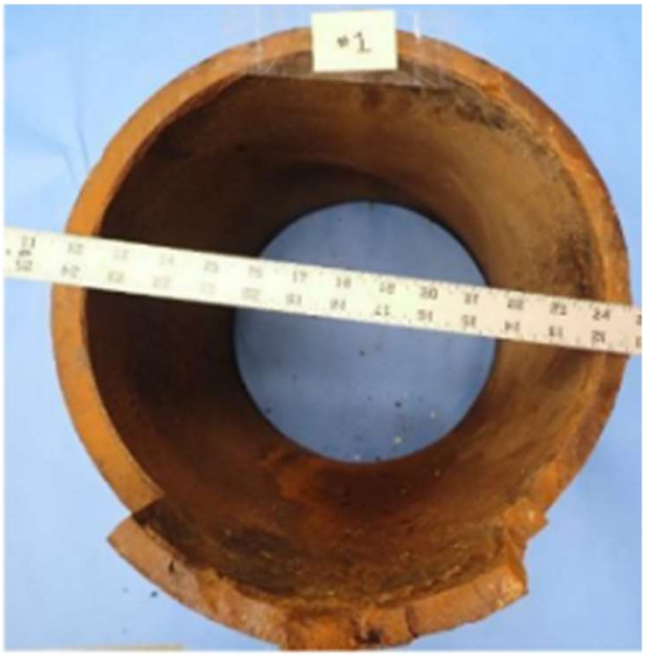
EWQ PILOT RESULTS | BWS PIPE CORROSION MECHANISM RESULTS



4C – 1.5” Galvanized Steel



12” Cast Iron

3C – 2” Galvanized Steel

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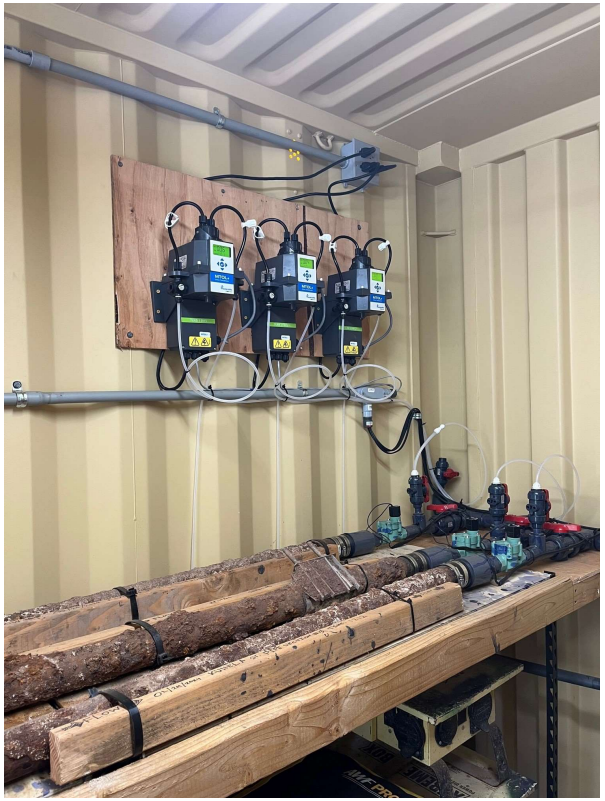
EWQ PILOT RESULTS | PIPE RACK FLOW THROUGH TEST



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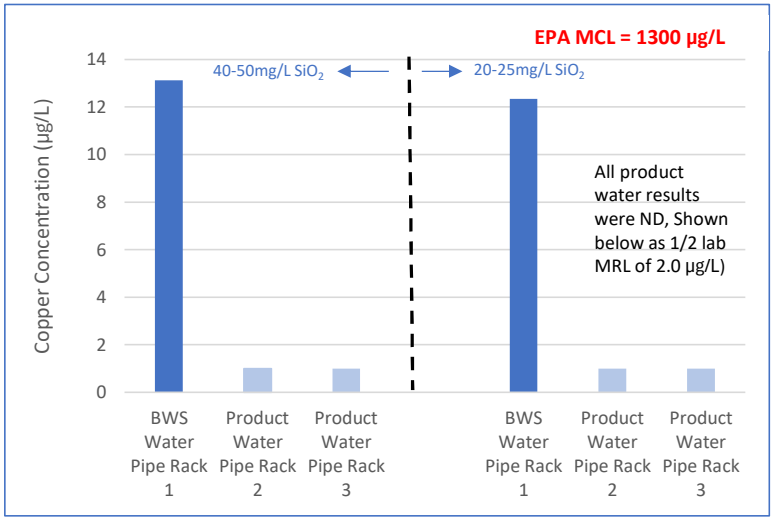
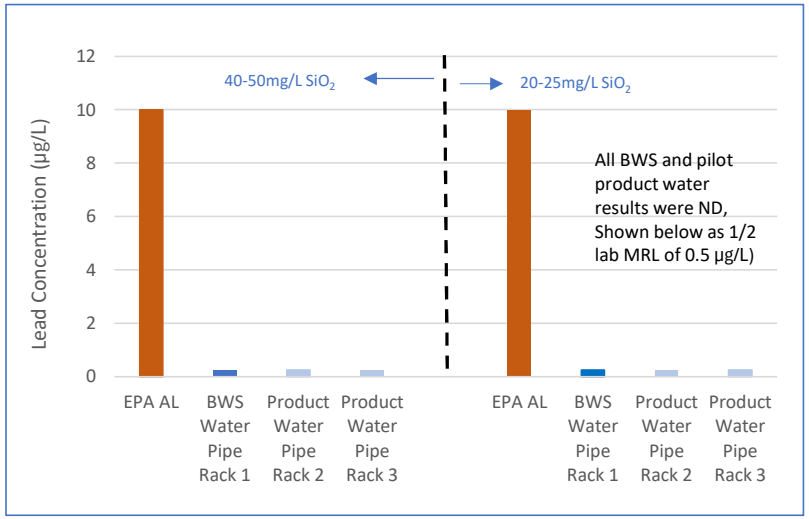
EWQ PILOT RESULTS | PIPE RACK **FLOW THROUGH** TEST RESULTS

Copper



- There should not have been copper in pipe rack effluents from galvanized lines, as shown in the graph above.
- Copper in BWS pipe rack effluent from naturally occurring copper concentrations in groundwater source.

Lead



- There should not have been lead in pipe rack effluents from galvanized lines, as shown in the graph above.
- Note the EPA AL for lead is changing to 10 µg/L in 2027 but is currently 15 µg/L .

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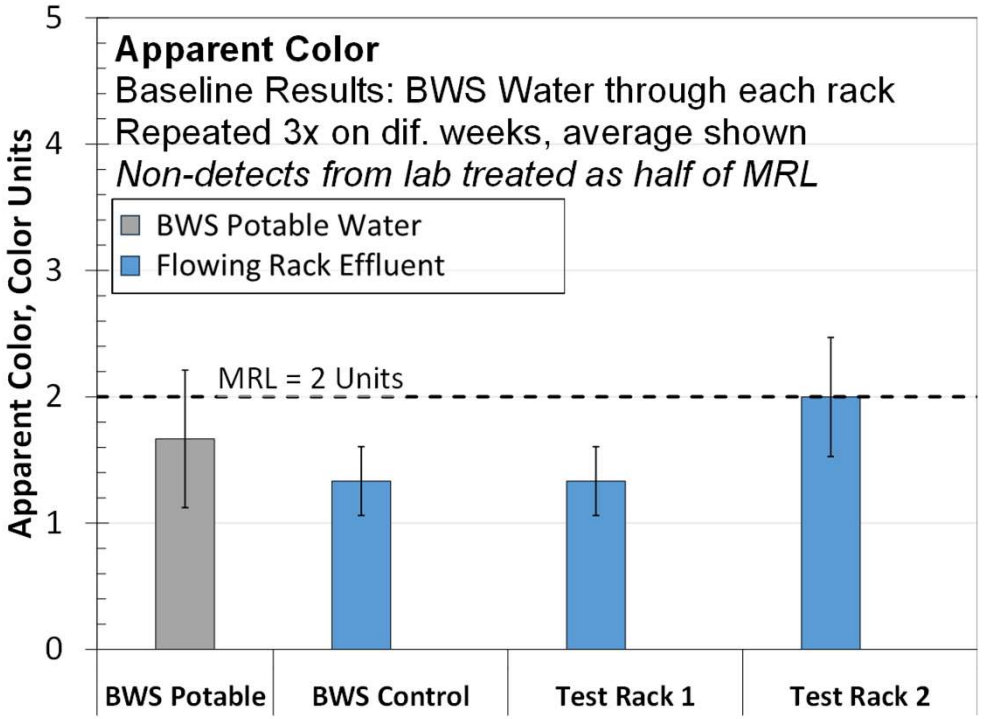
EWQ PILOT RESULTS | PIPE RACK **FLOW THROUGH** TEST RESULTS

SILICA

- BWS Silica concentrations: 65-85 mg/L
- Phase II Silica Concentrations:
  - Phase II.a – 40-50 mg/L
  - Phase II.b – 20-25 mg/L

RESULTS:

- Turbidity – None Detected
- Color – Very little detected



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KSDF PILOT TESTING SUMMARY

- REGULATORY PILOT
  - The RO configuration and process design was validated and optimized.
  - The proposed treatment process demonstrated the capacity to meet all applicable US EPA and HI DOH groundwater drinking water regulatory requirements for the product water
  - The extensive sampling and analysis verified:
    - The seawater source is high quality and amenable to treatment by the RO process
    - The permeate water meets the goals dictating the partial 2-pass RO design (specifically boron)
    - The concentrate and waste streams are acceptable for UIC discharge

KSDF PILOT TESTING SUMMARY

- ENHANCED WATER QUALITY PILOT
  - Customer Outreach allowed the team to identify the types of customers in the Campbell Industrial Park and understand their needs while also informing the customer base of the project details
  - Confirmed stable product water was able to be achieved by the post treatment processes and chemical additions
  - Coupon jar testing showed that reduced silica concentrations in the product water did not have adverse effects on metal leaching from conditioned lead or copper coupons.
  - BWS pipe rack flow through test results indicate that pilot product water pipe rack effluents were of stable water quality at a silica dose as low as 20-25 mg/L SiO_2 with no detrimental impact to the BWS pipes
  - Campbell Industrial Park Sampling verified BWS water quality for baseline characterization to compare after KSDF operation

Mahalo!

Questions?

Presenter Contact Information:
Dawn Halpern
dhalpern@Percwater.com

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