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Round Tank in a Square Door

How to fit an OSHG System into an Existing WTP



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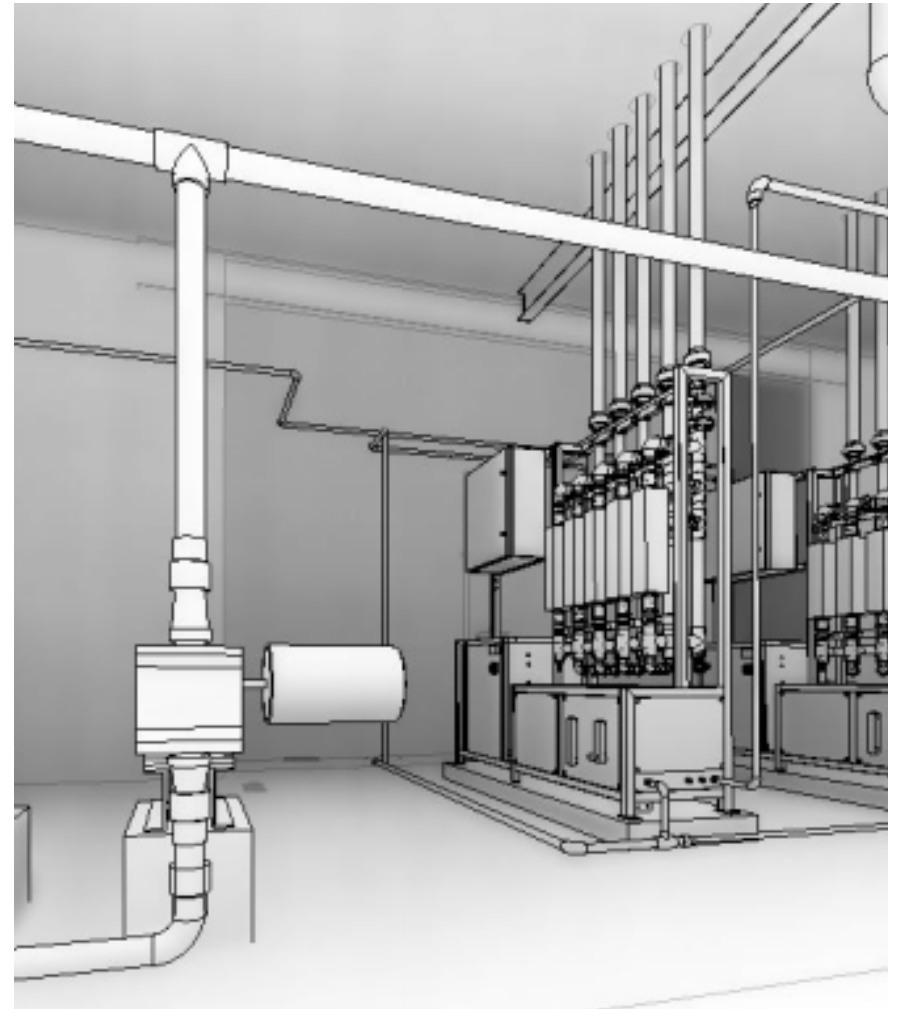
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Outline

- Project Background
- On-site Hypochlorite Generation System Process
- Key design elements and solutions
 - Leveraging the existing space
 - Tank access limitations
 - Silica in groundwater
- Design Takeaways

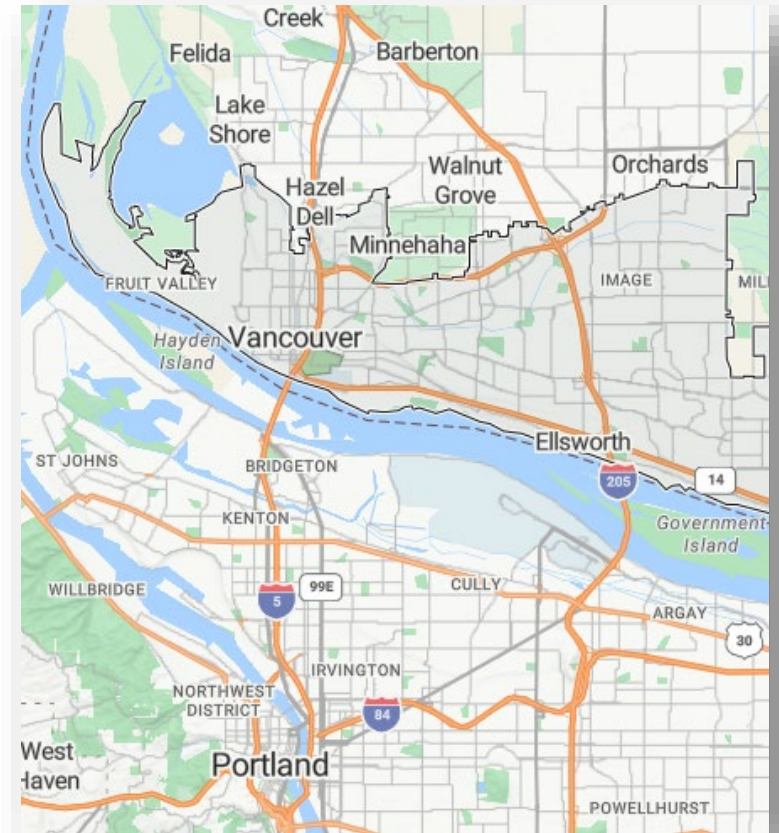




Project Background

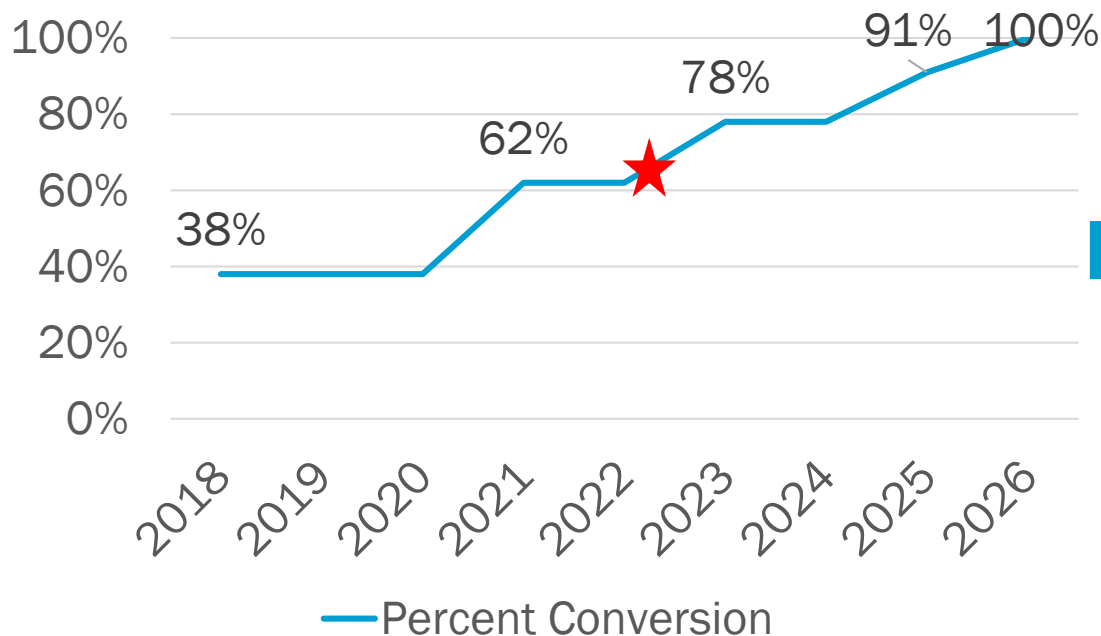
Site Background: Vancouver, WA

- Oldest Washington community
- Third largest water utility
- 100% groundwater supply



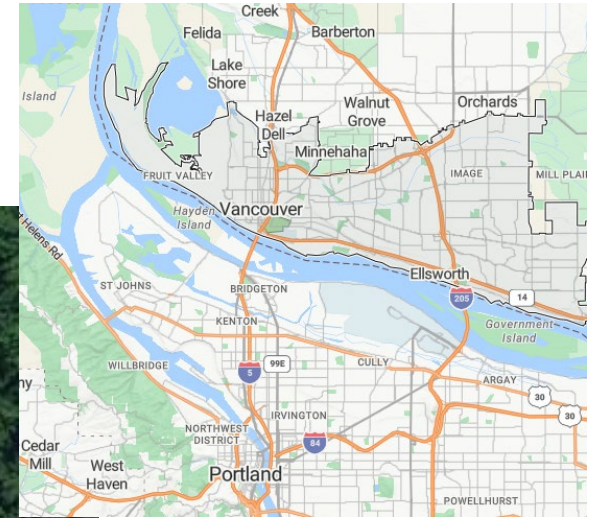
City Wide Chlorine Gas Conversion Program

- System-wide program starting in 2015 to phase out gas by 2025
 - Convert to safer alternative from gas
 - Supply concerns with chlorine gas, Salt delivery more reliable
 - City preferred to not be subject to bulk NaOCl deliveries



Ellsworth WTF
jumps the
reduction by **16%**

Ellsworth WTP



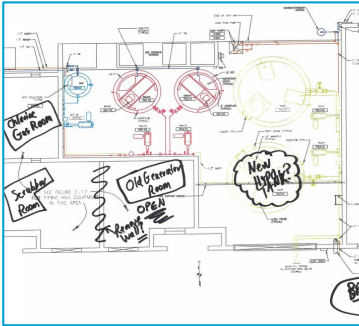
- 6,000 gpm
- Greensand filtration plant

Design Objectives

- Retrofit existing WTP with 200 ppd OSHG system
- Limited construction window; WTP Operational June 1 – September 30
- Maintain chlorine gas system
- Replace existing caustic tanks and piping



Design Elements



Evaluate layout to fit new hypochlorite storage tank in existing space

- Caustic usage evaluation and caustic tank removal and replacement



Retrofit of scrubber and generator room for OSHG system while planning for temporary move of scrubber

- Wall removal and new door access from generator room
- Special considerations for Two-skid to One Tank system



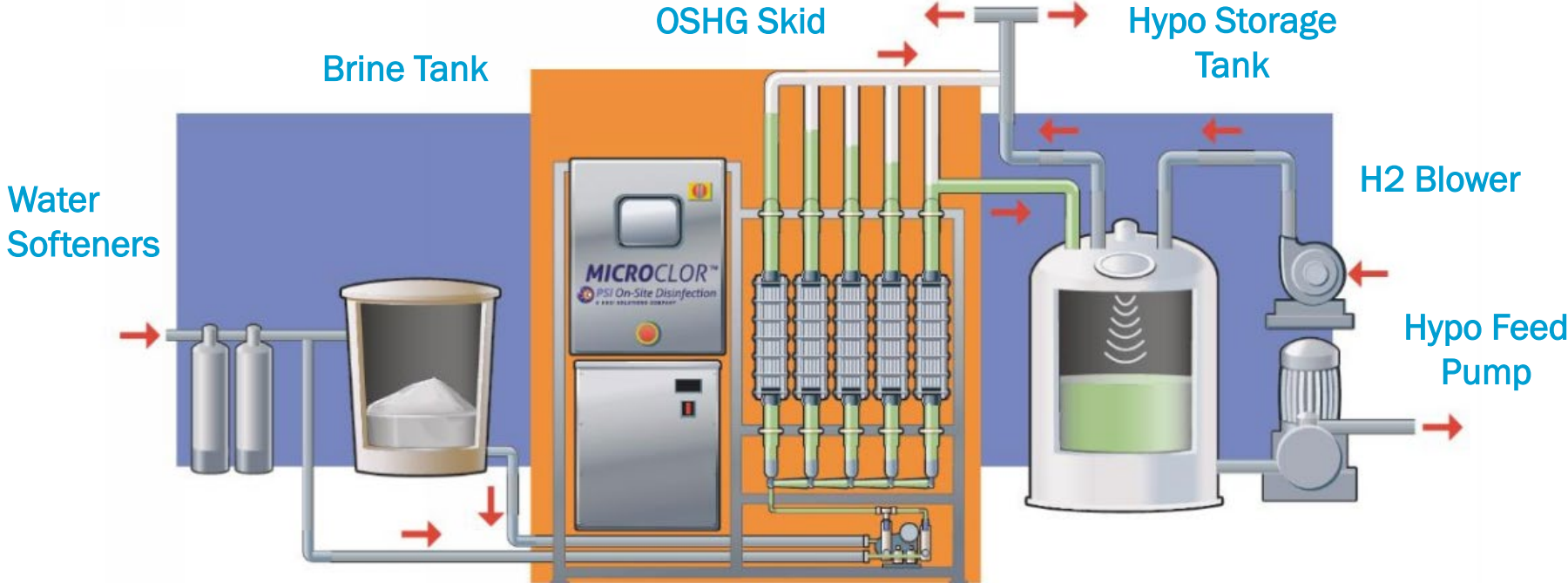
RO pre-treatment system design

- Integration with OSHG system



On-site Hypochlorite Generation System Process

OSHG Process Overview

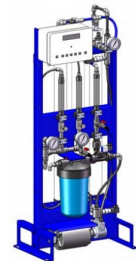
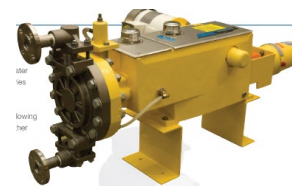


Source: Microclor Technical Information

Brine Solution + Charge (DC) → 0.8% Sodium Hypochlorite + Hydrogen Gas

OSHG System Components

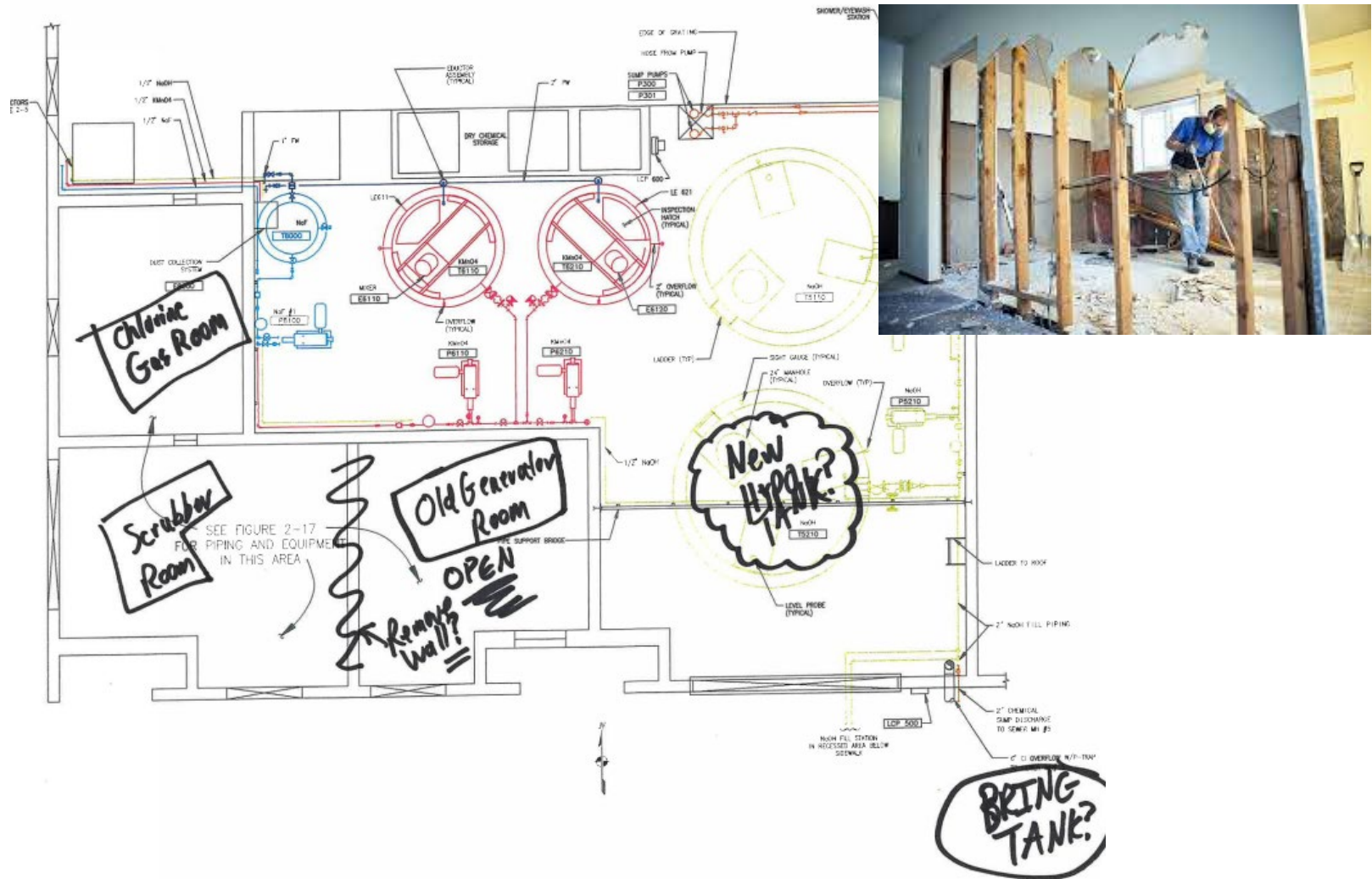
Component	Value
System Capacity	6,000 gpm
Brine Tank	30-ton, FRP (25-ton deliveries)
Microclor OSHG Skids	Two 100-ppd skids, parallel
Sodium Hypochlorite Tank	6,500 gallons, FRP
Hypo Metering Pumps	Two duty/standby diaphragm pumps
Hydrogen dilution blowers	Four (one per skid, 2 duty/standby for Tank)
RO Pretreatment System	Skid, bladder tank, and GAC prefilter





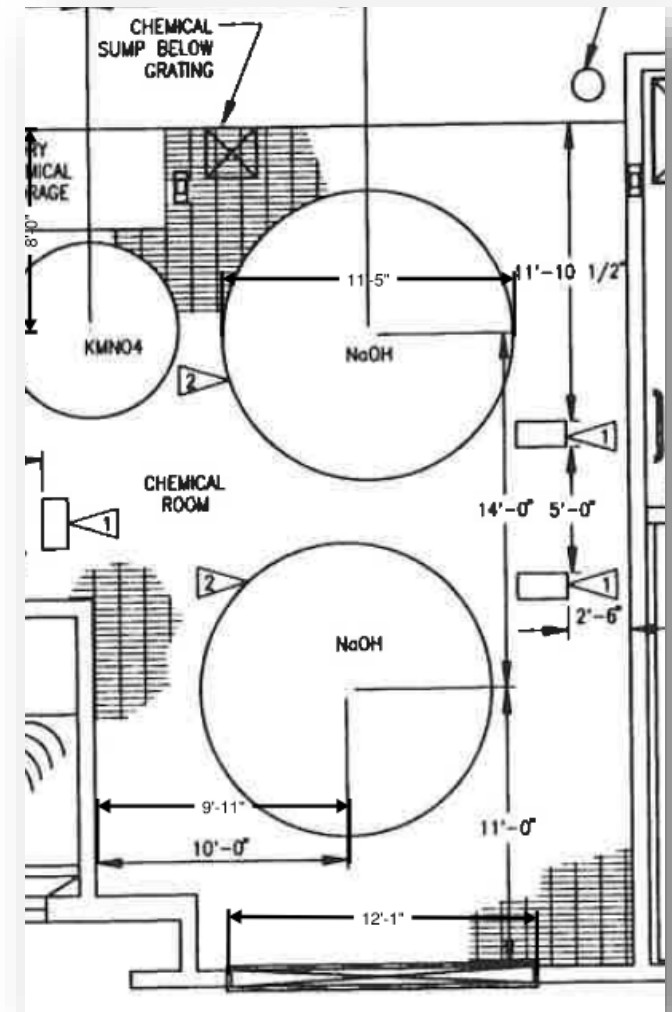
Key Design Elements and Solutions

Adopting the open floor concept



Caustic Tank sizing confirmation for replacement

- Original design criteria:
 - Two 4,200 gallon tanks
 - 4,000 delivery volume of 50% caustic
 - WTP Design Rate: 6,000 gpm
 - Redundancy to take one tank offline for maintenance
 - 10' diameter, 9'8" tall



Reviewed usage to understand options

- Reviewed fill frequencies from past 12 months (June 2020 – June 2021)
- Calculated running total 30-day usage
- Estimated storage for peak conditions and reserve volume

Assume 6,000 gallons

- Tank fill volume: 4,500 gallons
- Reserve: 1,500 gallons

Assuming reserve needed at peak demand

- Peak usage: 160 gpd
- Reserve 9 days



Tank Layout Options

- One tank
- One larger tank, one smaller reserve tank
- Two half size tanks

Selected:
One 6,000 gallon tank with same diameter as existing



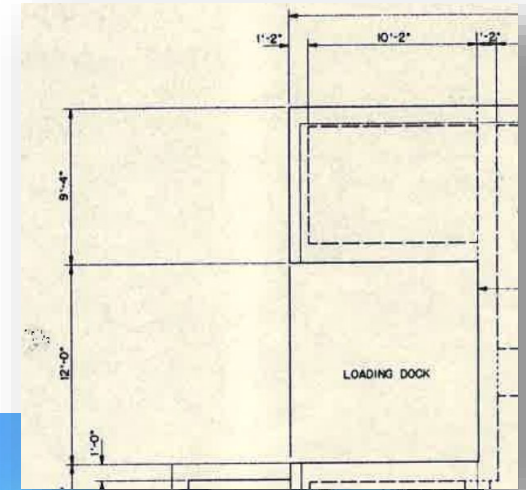
Access limitations



Front/South Side Overhead Door:
11'Wx10'H



West Side Overhead Door:
11'Wx12'H



Field assembly considerations

- Hypochlorite tank height (app. 12'-3") just above door clearance
- Specified field assembly of Hypochlorite tank
- Set cut at anticipated maximum full height



CM team determined tank will fit as full-tank

- “Utilize the corners”



Water Station 1 tank installation example

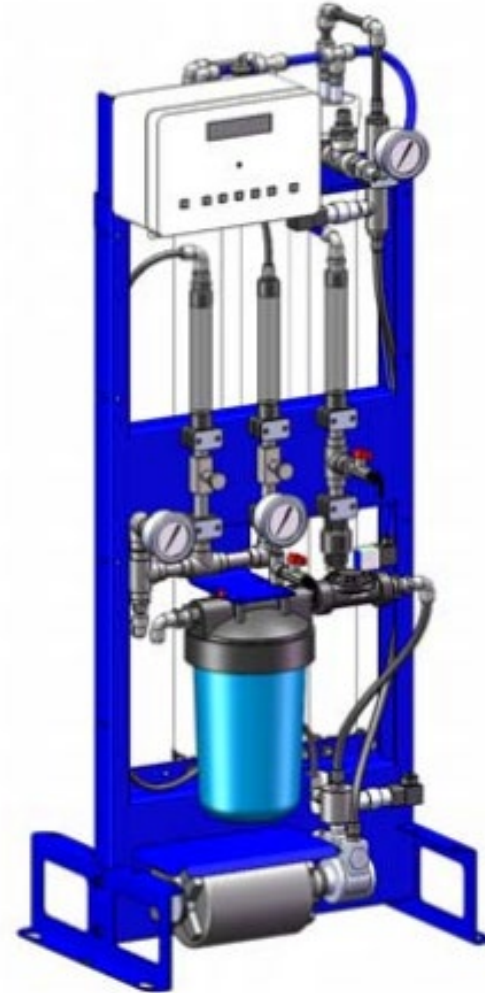
Silica in groundwater

- High silica in groundwater (50 – 60 mg/L as SiO_2)
- Not removed from WTP process
- Causes scaling on electrolytic cells and have observed increased O&M at other water stations
 - Decision to add reverse osmosis pretreatment to evaluate performance



RO design considerations

- Finished water supply feed with chlorine
 - GAC pre-treatment to remove chlorine residual
- Operational flexibility with bypass
- Anti-scalant if reduced performance of RO is observed after startup





Design Takeaways

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- Retrofits require thinking outside the box when you don't have a blank slate



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Design Takeaways

- Consider future expansions when laying out facility – it may come back around for future benefit



Thank you. Questions?

For additional questions:

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Brown AND **Caldwell** :





