Reusing Old Facilities for New Treatment Systems – Water Quality Issues

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Today's Topics

- Treatment of Tacoma's in-town South Tacoma Wellfield groundwater
- Emphasis on the water quality issues and the decision making for treatment
- Engineering design discussion was earlier today

Acknowledgements

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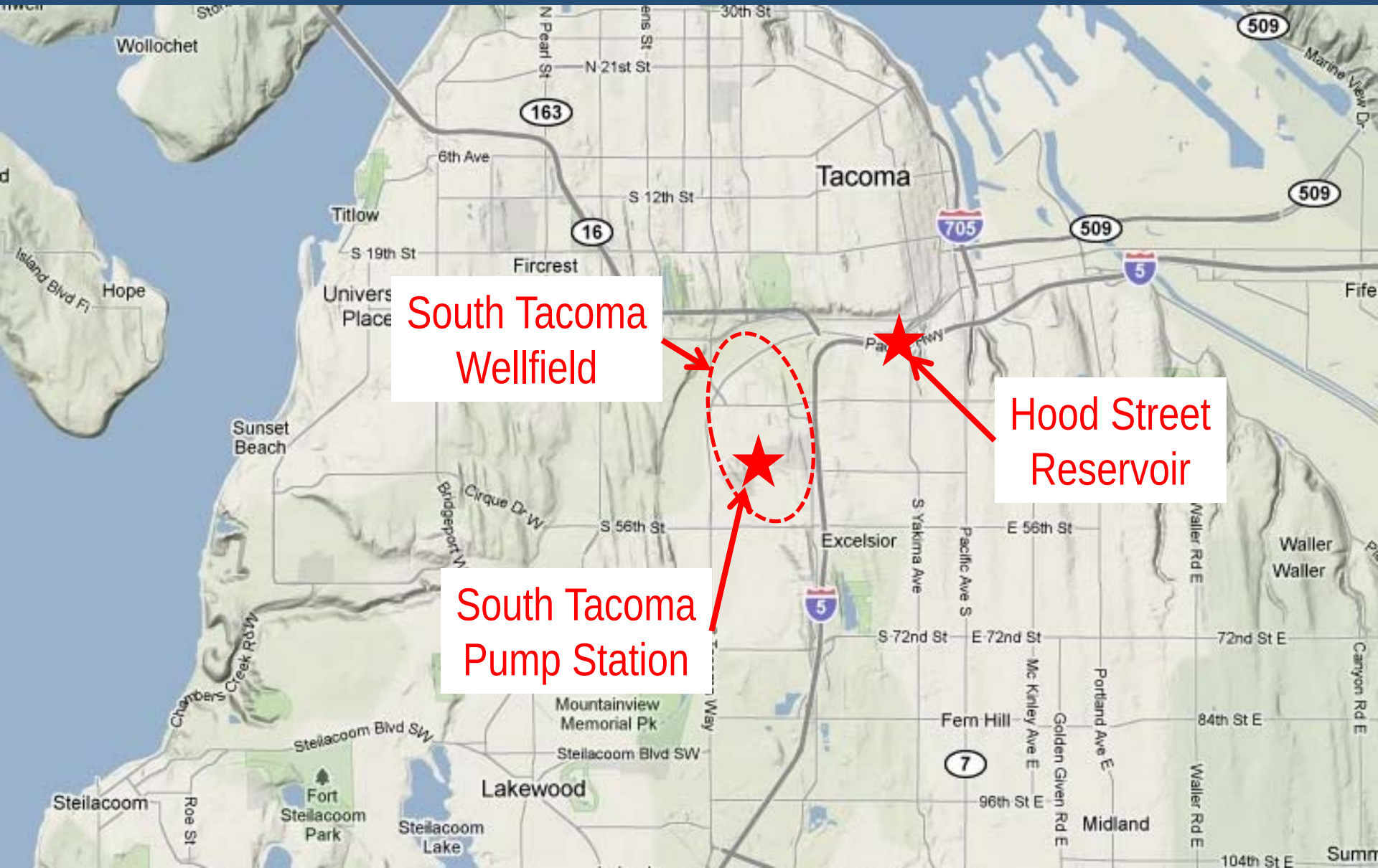
South Tacoma Wellfield Background

- 13 wells along South Tacoma Way in the middle of town
- Wells range in capacity from 0.8 MGD to 11.5 MGD
- Wells discharge to the Wells Pipeline
  - All wells goes to the Hood Street Reservoir
  - Some wells can also go to the South Tacoma Pump Station
- Historical well operation has been primarily focused on meeting system demand

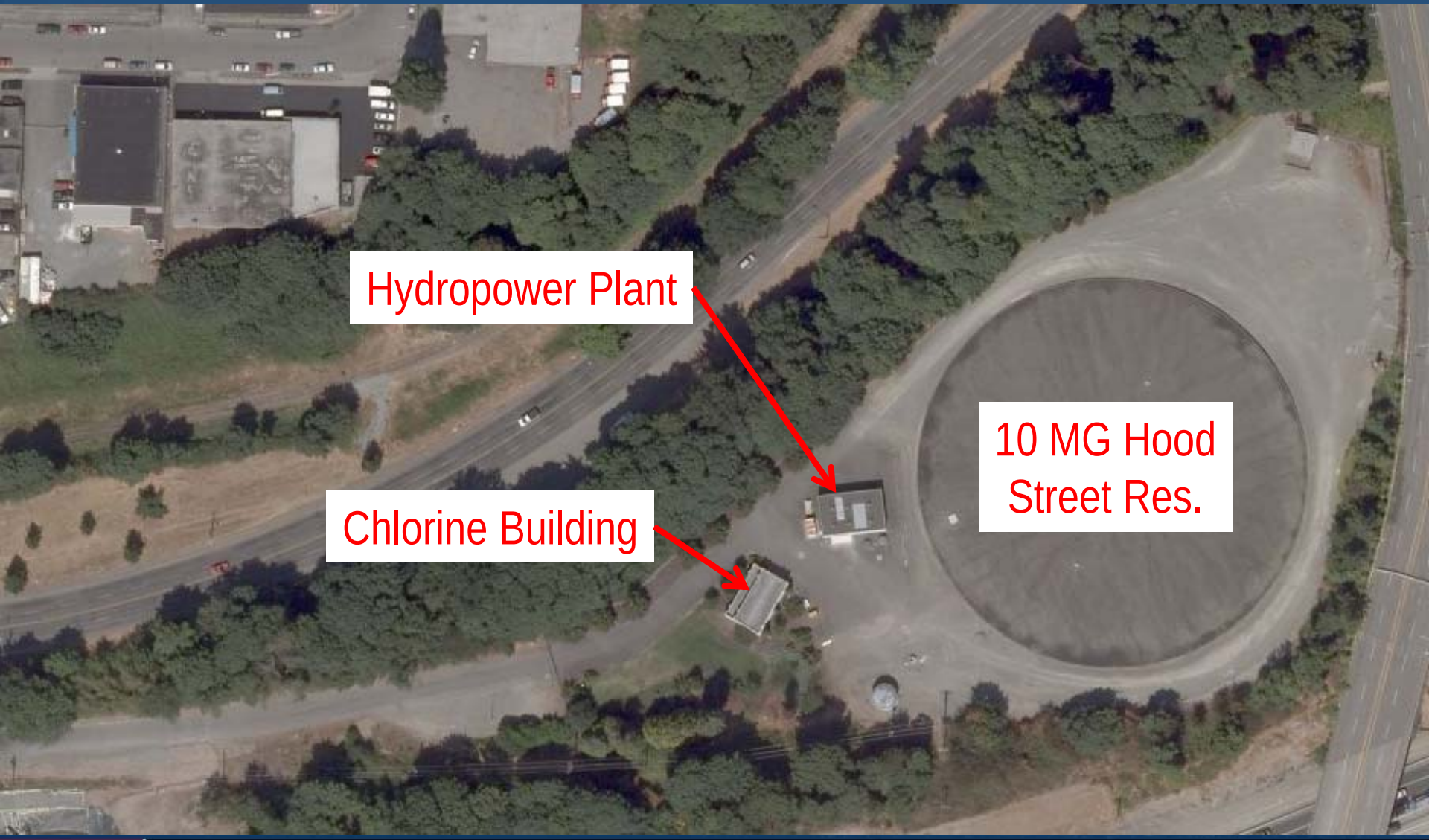
Project Location



Treatment Areas

- Hood Street Reservoir
  - 10 MG buried reservoir
  - Groundwater can blend with treated Green River surface water in varying ratios
- South Tacoma Pump Station
  - 16.7 MGD facility with 0.5 MG clearwell
  - Pumps groundwater directly into distribution system

Hood Street Reservoir



South Tacoma Pump Station

Current Treatment

- Wellheads
  - One has aeration towers for VOC removal
  - All others have no treatment
- Hood Street Reservoir
  - Onsite hypochlorite generation
- South Tacoma Pump Station
  - Tablet chlorinator

Water Quality Part 1 – The important issues

- Low pH
  - Groundwater pH is between 6.9 and 7.3
  - Conducive for home plumbing corrosion
- Fluoride
  - Groundwater is currently not fluoridated while treated Green River water is fluoridated
  - Some customers can experience varying benefits of fluoridation when wells are on

Water Quality Issues Part 2 – not as important

- Volatile Organic Compounds
  - 10 wells have detected one or more VOCs
  - Tacoma Water is in compliance for all compounds
  - Treatment desired for public perception and to maximize public health protection
- Radon
  - No finalized Radon Rule but groundwater is generally above the 300 pCi/L limit in 1999 draft rule
  - Treatment would be proactive in complying with potential future requirements

What is the starting water quality?

- Variable well use and water quality
  - Identified individual well usage and predominant combinations of well usage
  - Modeled blending scenarios based on well usage
  - Assumed no dilution blending with Green River water

Design Water Quality

Parameter	Hood Street Reservoir	South Tacoma Pump Station
pH	7.0	7.1
Alkalinity (mg/L as $CaCO_3$)	78 – 79	75
Radon (pCi/L)	309 – 316	316
TCE (µg/L)	0.00 – 0.58	0.00

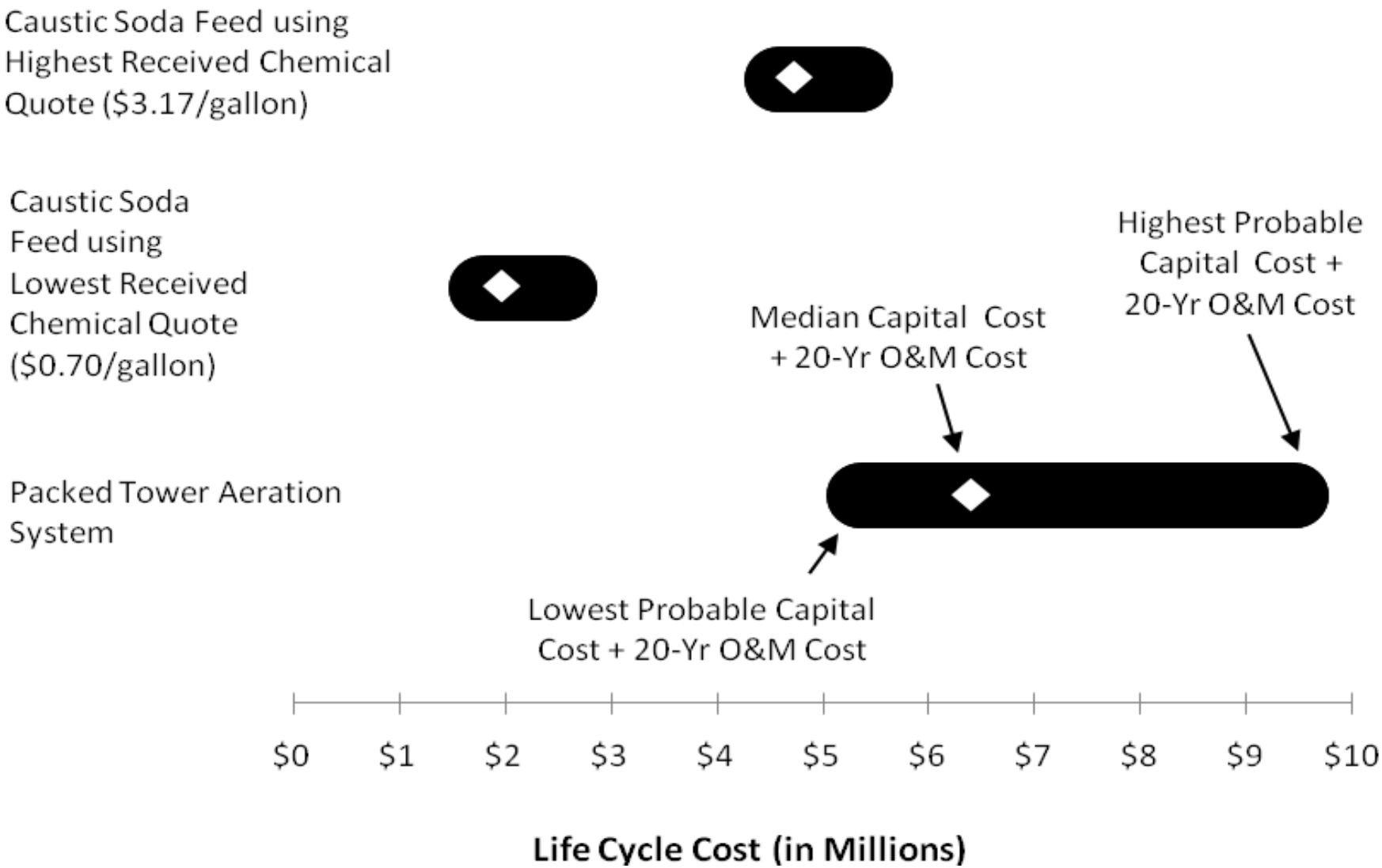
Corrosion Control Options

Options	Advantages	Disadvantages
Aeration	Removes radon and VOCs, no chemicals	Requires repumping, high initial expense
Caustic Soda	Compact system, low initial expense	Hazardous chemical, no radon or VOC removal
Alkalinity Adjustment	Will not work for these waters	
Orthophosphate Addition	Requires caustic soda to work for these waters	

Hood Street Corrosion Control Evaluation

- Aeration
  - Multiple packed towers
  - New clearwell and booster pump station
  - New pipelines
- Caustic soda
  - Reuse existing caustic soda tanks
  - In-pipeline addition
  - Small new chemical feed building

40 MGD Hood Street Reservoir Evaluation



40 MGD Hood Street Corrosion Control

- Both systems were able to meet corrosion control target
- Treatment “premium” for additional radon and VOC removal was $1.7 million to $4.5 million over 20 years
- Caustic soda addition was selected

16.7 MGD South Tacoma Pump Station Corrosion Control

- Retrofit diffused aeration system into bottom of existing clearwell
  - Minimize hazardous chemicals in residential area
  - Minimal disruption to facility operation
  - All new equipment could fit inside existing building

- Initial capital cost estimate = $778,000

Fluoridation Options

- Sodium fluoride saturators
  - Simple passive system, larger footprint
  - Requires handling bags of salt (dust control)
- Sodium fluoride/sodium silicofluoride dry feeders
  - Most mechanically complex system, smaller footprint
  - Requires handling bags of salt (dust control)
- Fluosilicic acid (FSA)
  - Compact liquid feed system
  - Very hazardous chemical

Hood Street Reservoir Fluoridation Decision

- FSA
  - Survey of Pacific NW WTPs found that fluoridating plants >20 MGD only used FSA
  - Compact, no dust control issues
  - Can be stored outdoors

South Tacoma PS Fluoridation Decision

- Sodium fluoride saturators
  - South Tacoma PS has less operational use
  - Saturators can be unattended for long periods
- Fluoride system would be inside an existing room or in a new building

Next Steps

- About to start on final design at Hood Street Reservoir for a caustic soda/FSA chemical feed facility
- Aeration pilot testing for South Tacoma PS
  - Confirm air rates, diffuser spacing, equipment sizes
- Followed by final design for aeration system and fluoride saturators

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