

Cherry Picking Pump Stations

Consolidating Assets for Operational Flexibility

Presented by:

Doug Lane, PE, WDM4 | City of Bellevue

Nathan Rostad, PE, PMP | Murraysmith



murraysmith





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Three Efficiencies



- 01 Colocation
- 02 Energy
- 03 Public Buy-in

Introduction & Overview

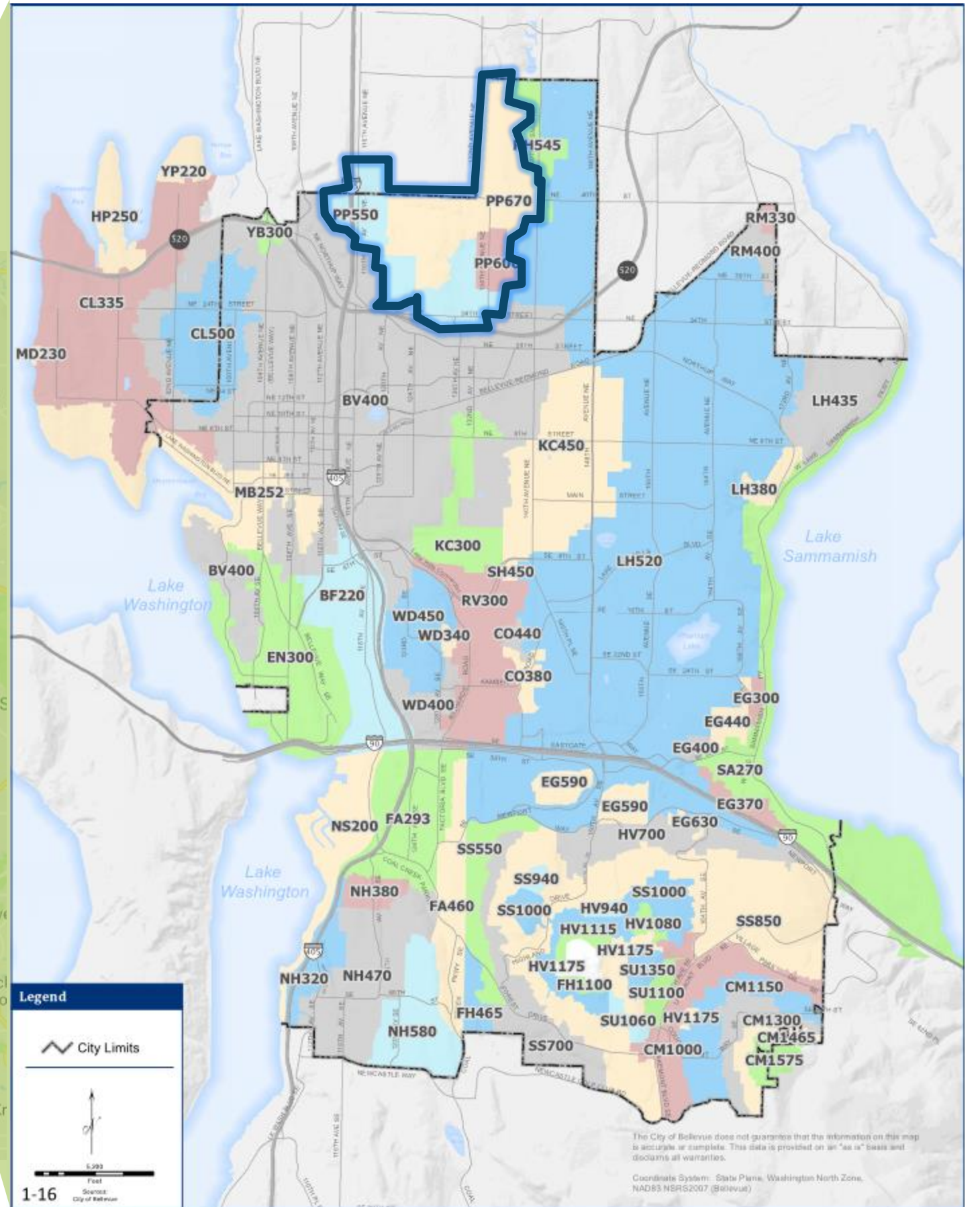
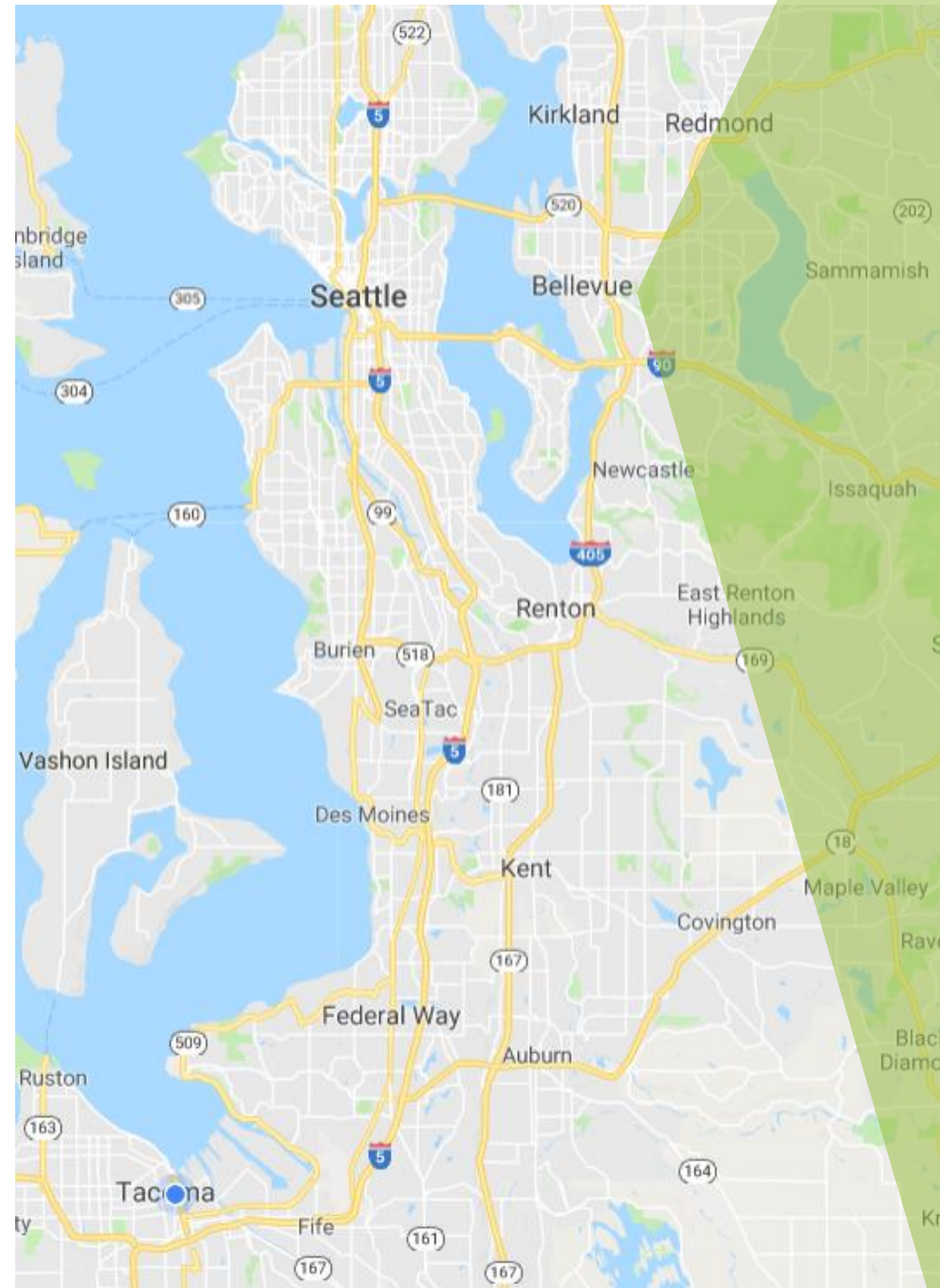
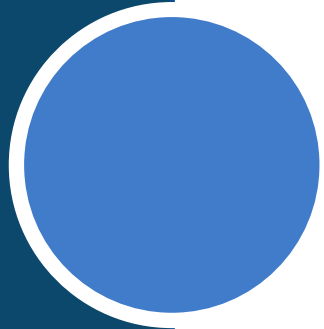


Project Team

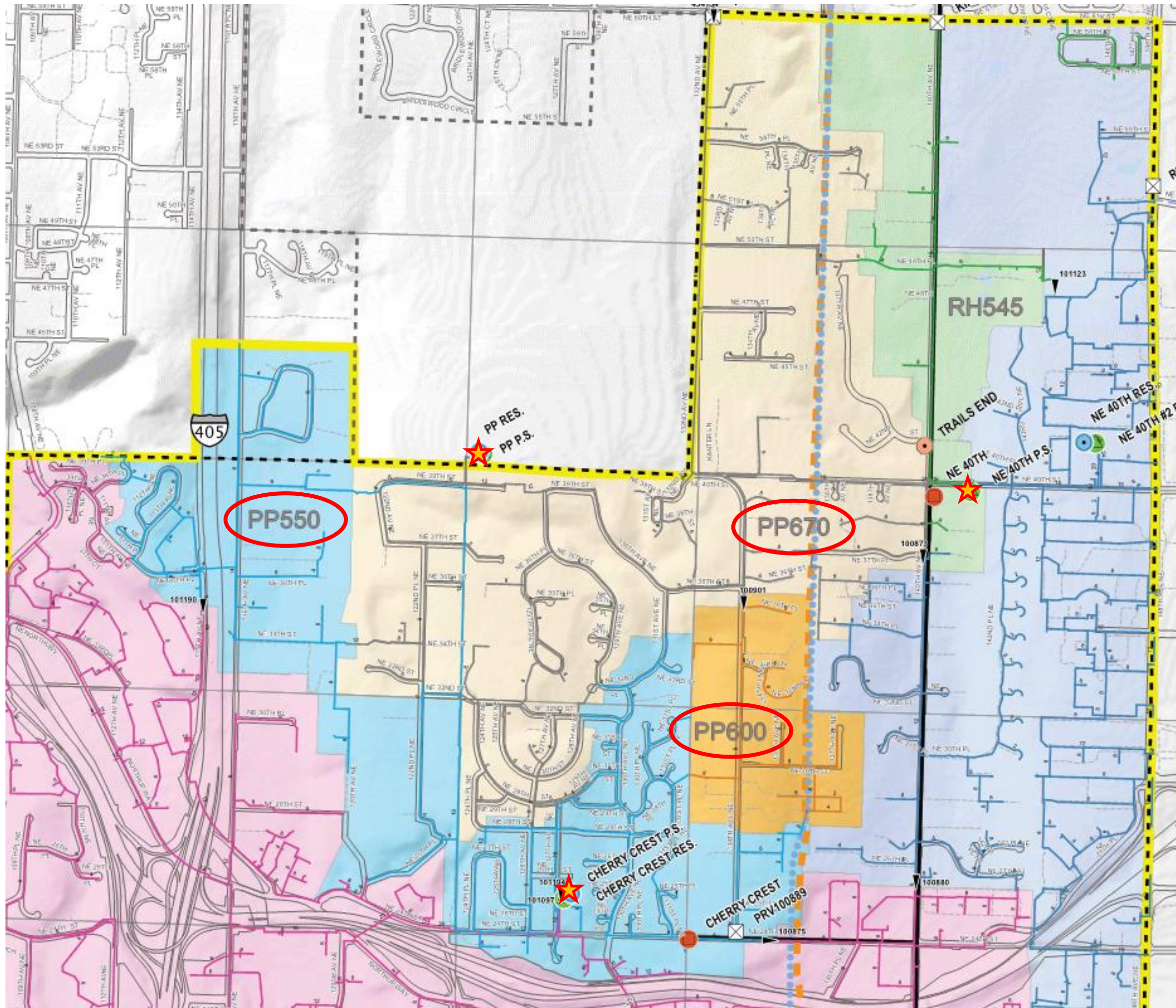
Owner	City of Bellevue
Prime Consultant	Murraysmith, Inc.
Structural Engineer	Peterson Structural Engineers, Inc.
Electrical Engineer	R&W Engineering, Inc.
Instrumentation & Controls	S&B, Inc.
Geotechnical Engineer	HWA Geosciences, Inc.
Landscape Design	RVLA, Inc.
Acoustic Engineer	JGL Acoustics, Inc.
Public Outreach	Envirolssues



City Overview

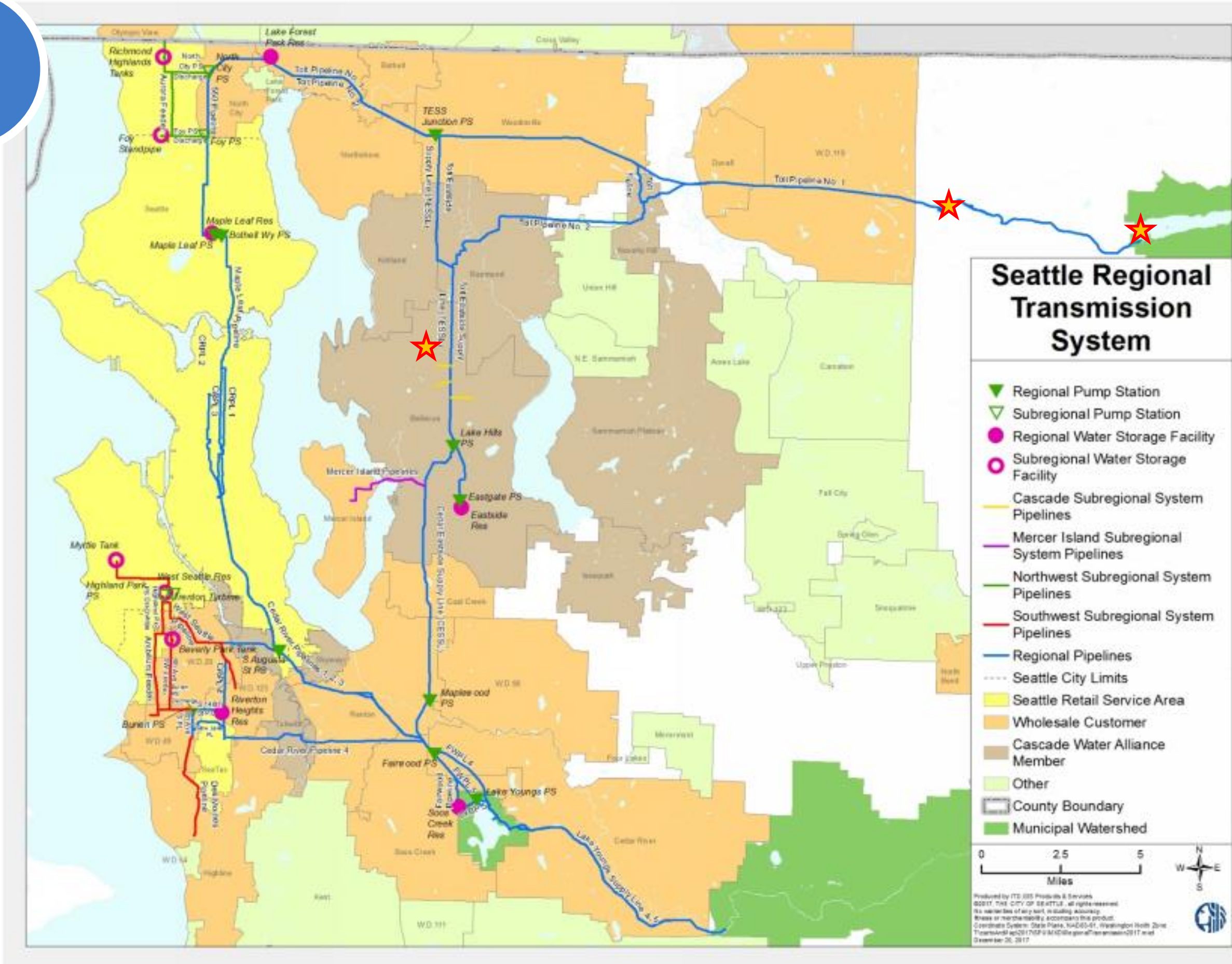


Pikes Peak Area



- Three Pressure Zones
 - PP550
 - PP600
 - PP670
- ~1,700 Connections
- One Reservoir
- Three Pump Stations
- Two PRV Stations from SPU
- Three Sites

Tolt Eastside Supply Line (TESSL)

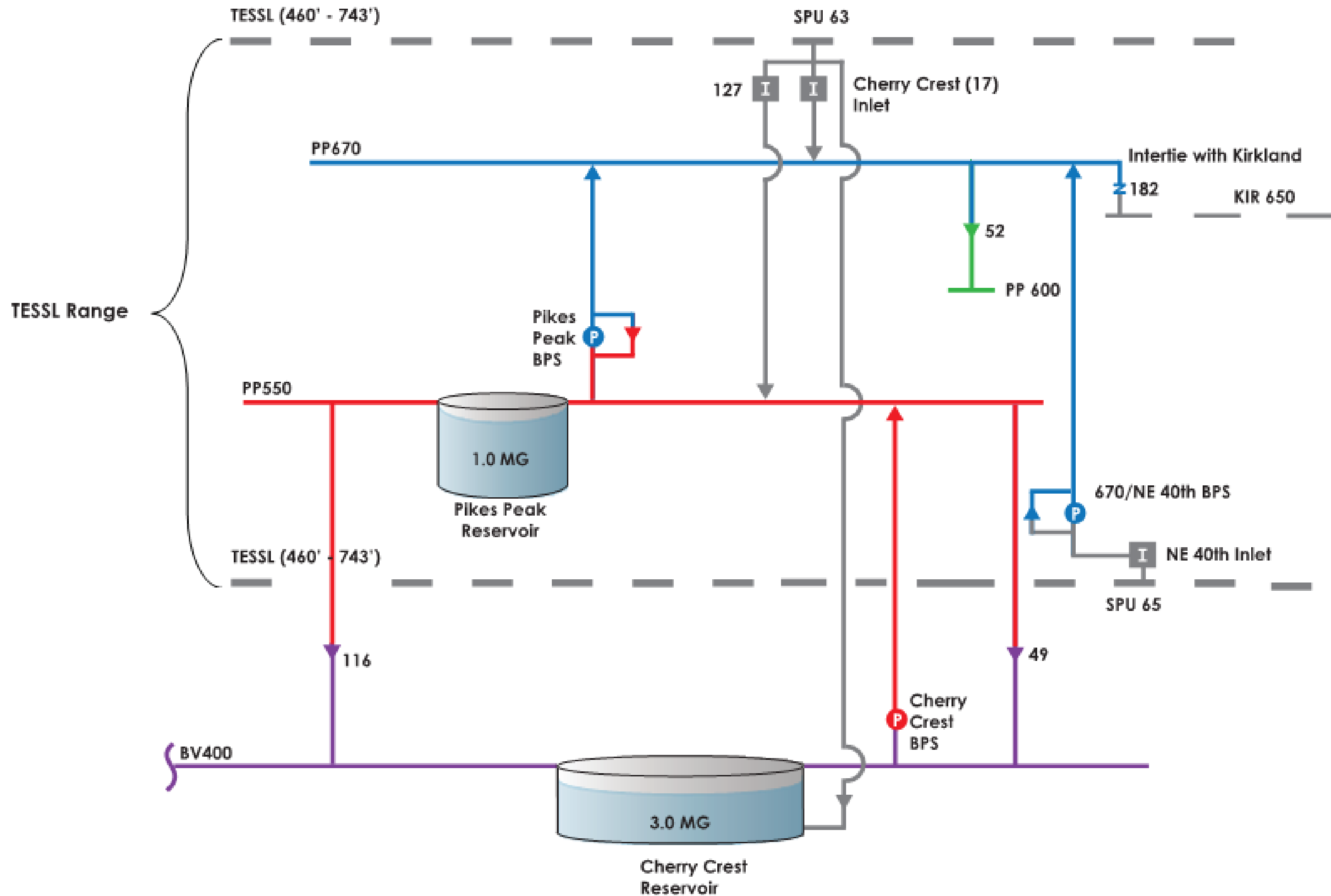


- Tolt Reservoir to Pikes Peak Area
- Reservoir to filtration plant: approximately 7 mi
- Filtration plant to Pikes Peak area: ~22 miles
- Variable hydraulic elevation
 - 460' – 743'
 - Demand / maintenance

Existing System Operation



Existing Pikes Peak Area Hydraulic Profile





Existing Facilities – Pikes Peak Site

- 550 Zone Reservoir
 - 1.0 MG Welded Steel
 - Constructed 1968
 - Seismic Deficiencies
- 670 Zone Pump Station
 - Three Pumps: 1,000 gpm & 1,300 gpm (x2)
- Located in Bridle Trails State Park
- Significant Site Constraints
- More Information: Discovery D Room - Friday at 2:45 pm

Existing Facilities – NE 40th Site

- 670 Zone Pump Station
- Three Pumps
 - 200 gpm
 - 300 gpm
 - 1300 gpm
- Suction from TESSL



Existing Facilities – Cherry Crest Site

- 400 Zone Reservoir
 - 3.0 MG concrete tank
 - Constructed 1999
- 550 Zone Pump Station
 - Two pumps: 500 gpm (x2)
 - Vacuum priming system
 - Constructed 1984
 - Rarely operates
- City Park

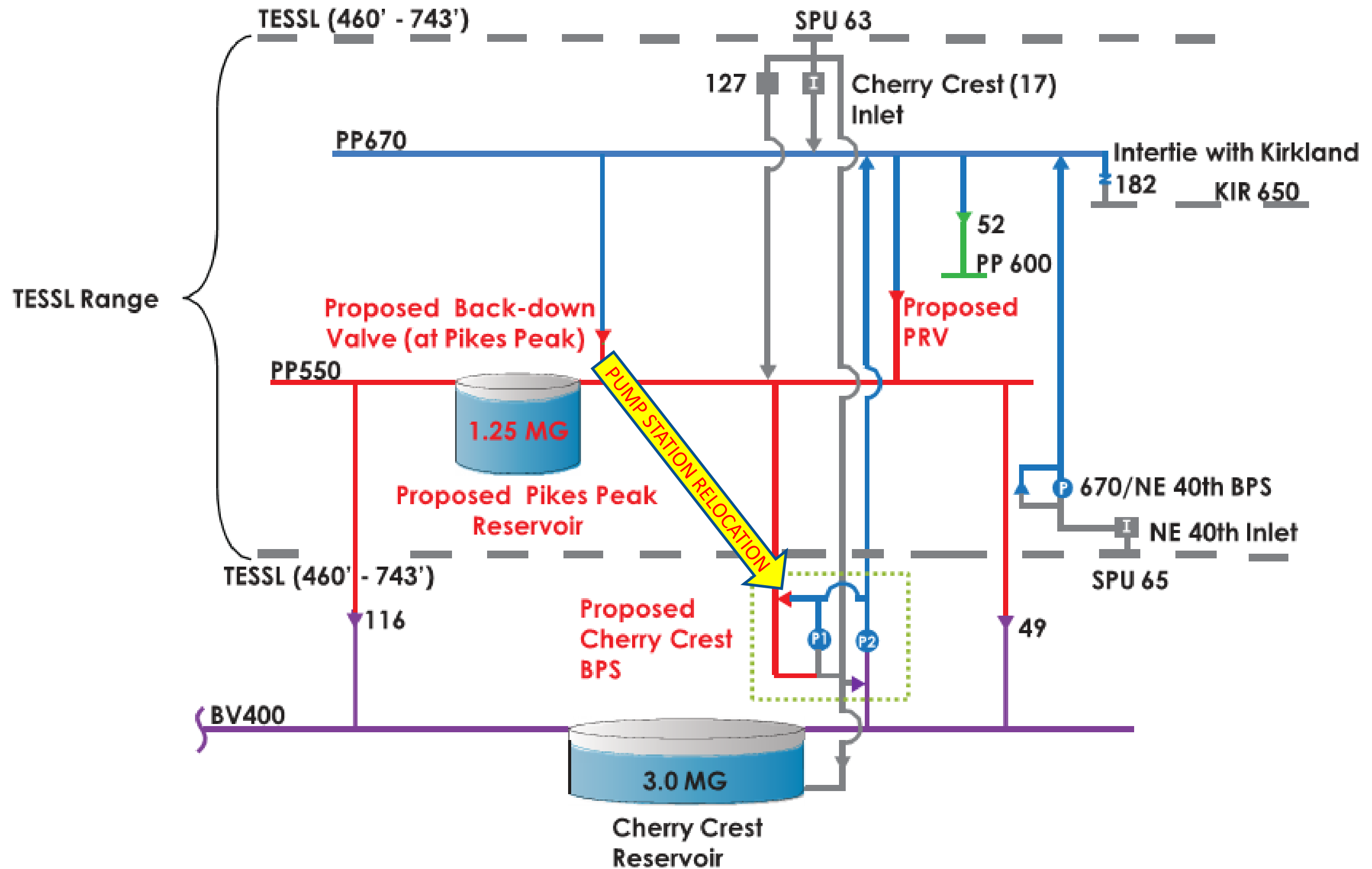


Existing Facilities – Cherry Crest Site

- Two PRV Stations
 - TESSL / 550
 - TESSL / 670
- Piping at Four Pressures
 - TESSL
 - 400
 - 550
 - 670
- Opportunity!



Proposed Pikes Peak Area Hydraulic Profile



- Proposed Cherry Crest PS Pump Configuration
 - P1 = TESSL (or 550) to 670 Zone Domestic Supply Pumps (3 total)
 - P2 = 400 to 670 Zone Domestic + Fire Flow Pumps (3 total, including 1 redundant)

Asset Consolidation Feasibility



Proposed Pump Station Consolidation



Proposed Solution:

- Single New Station Replacing Two Existing Stations
- Located at the Cherry Crest Site

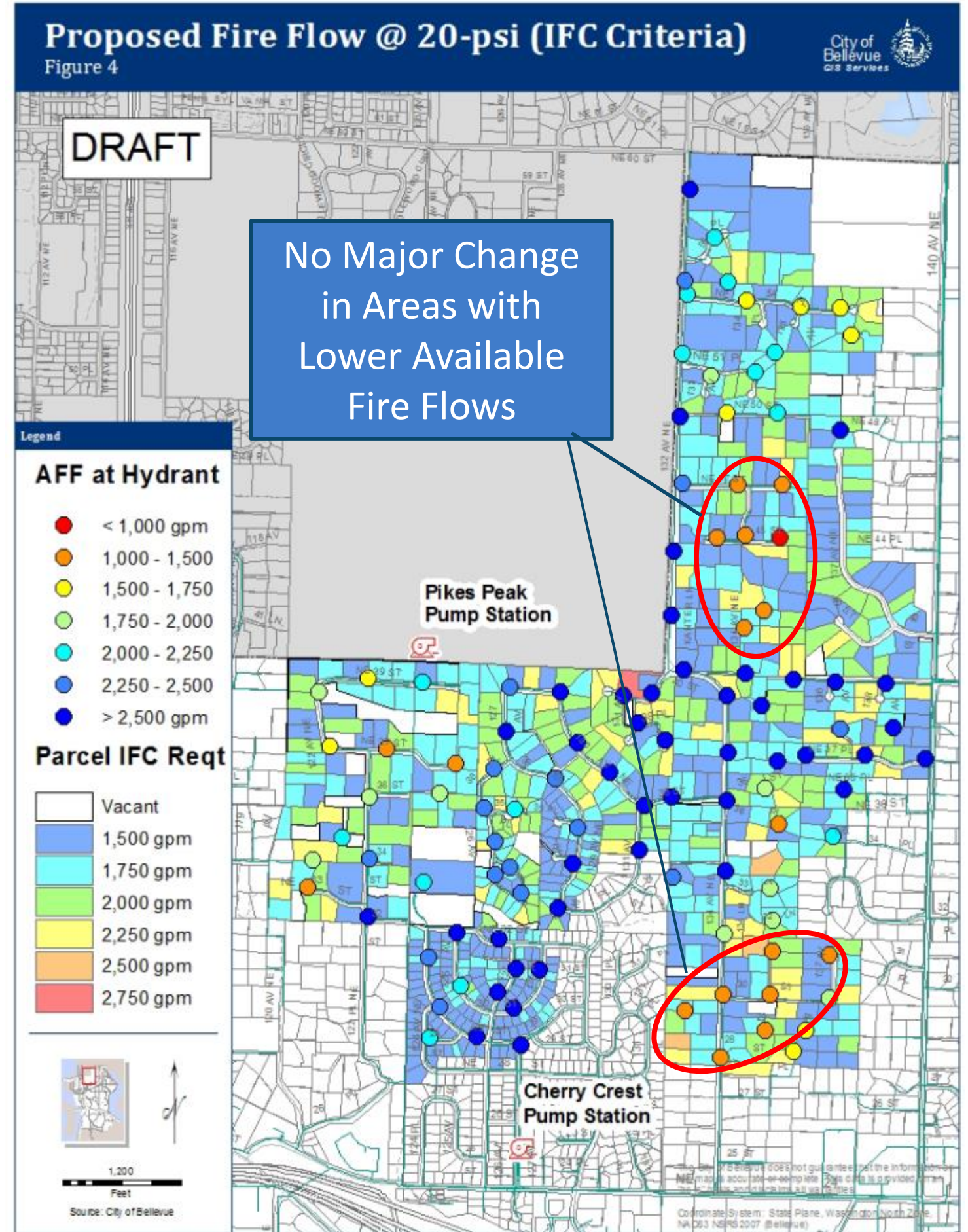
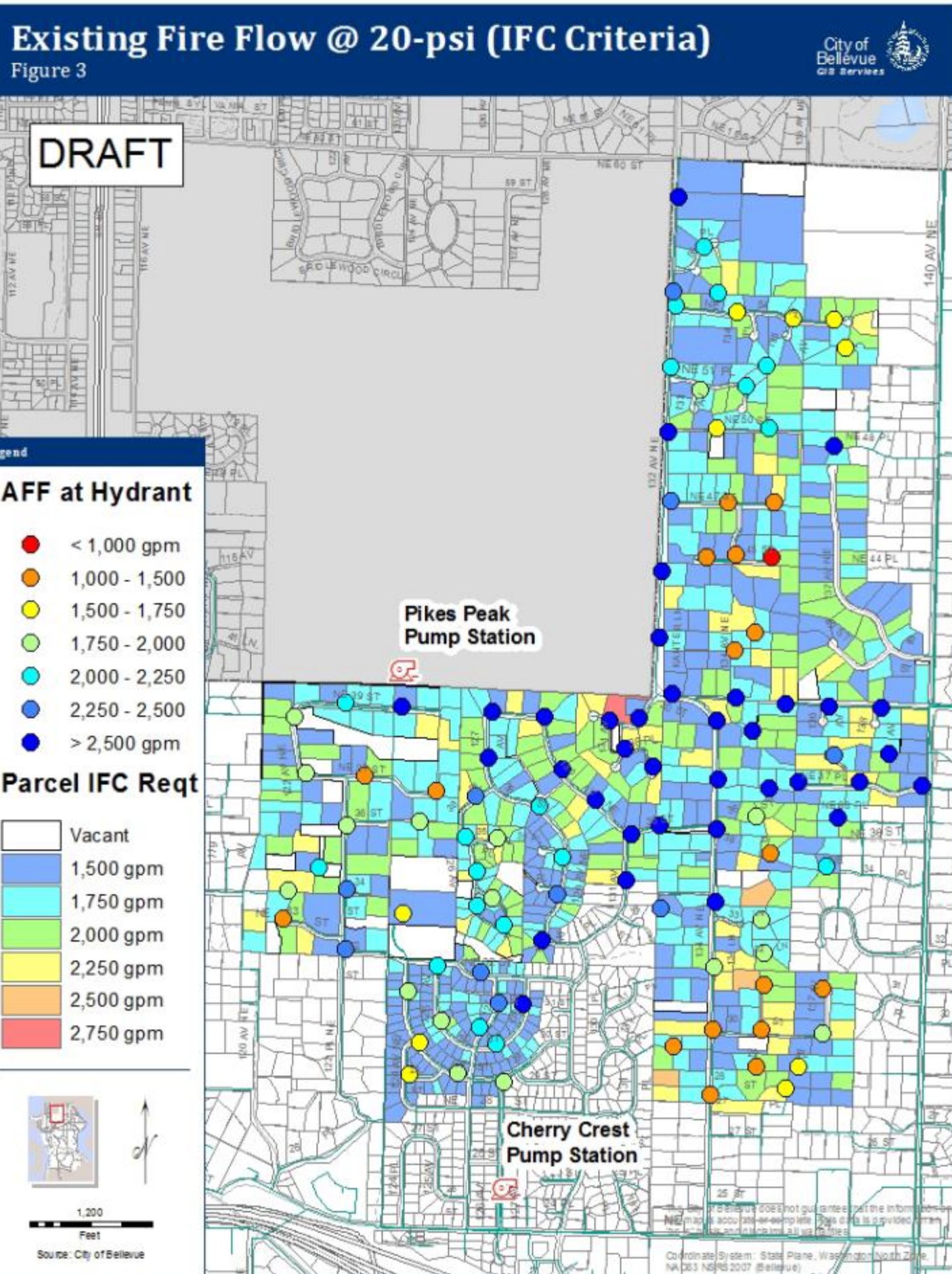
Question:

- Hydraulically Feasible?

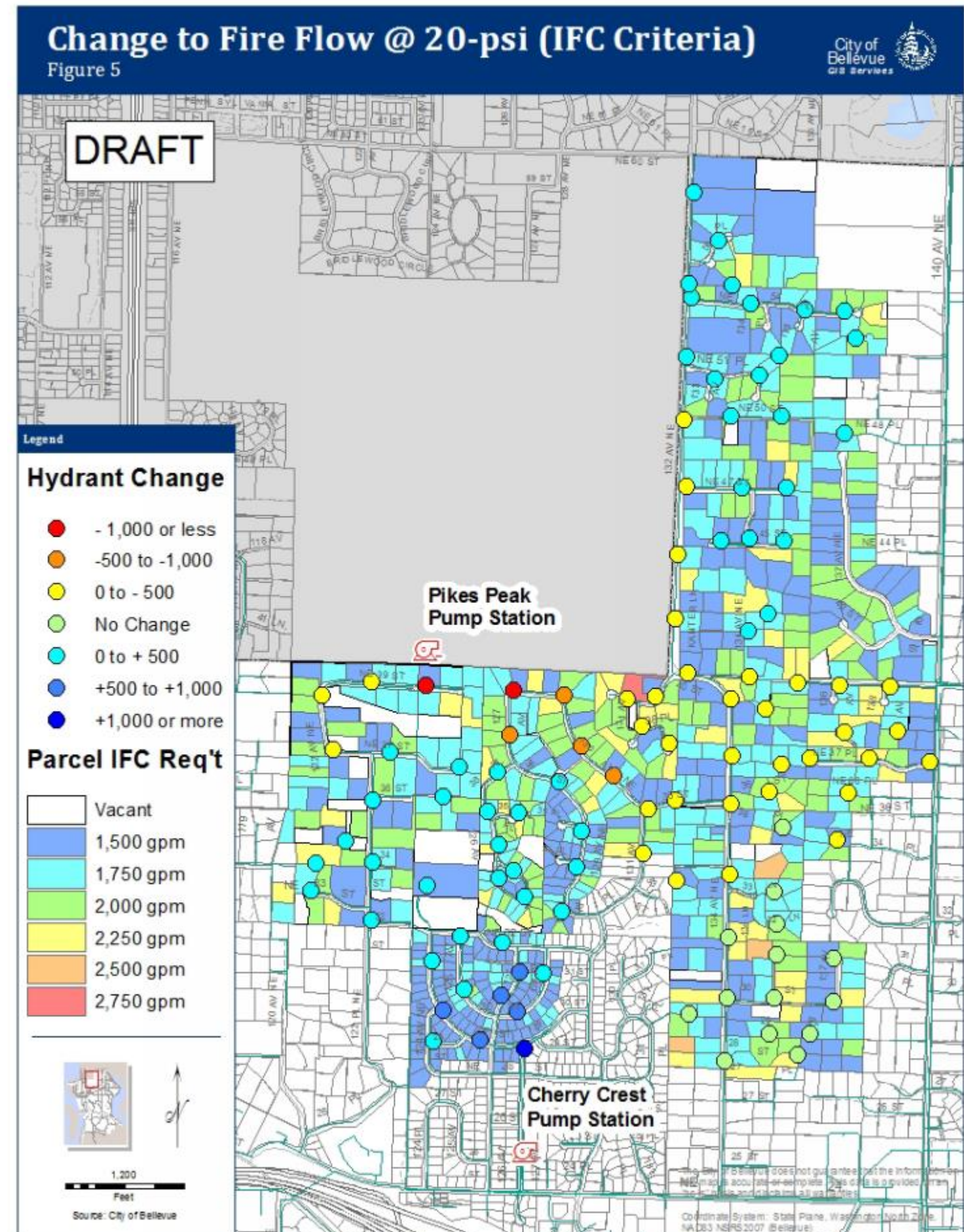


- Pump station moving approximately one mile
- Acceptable impacts to system hydraulics?
- Feasibility test: fire flow impacts



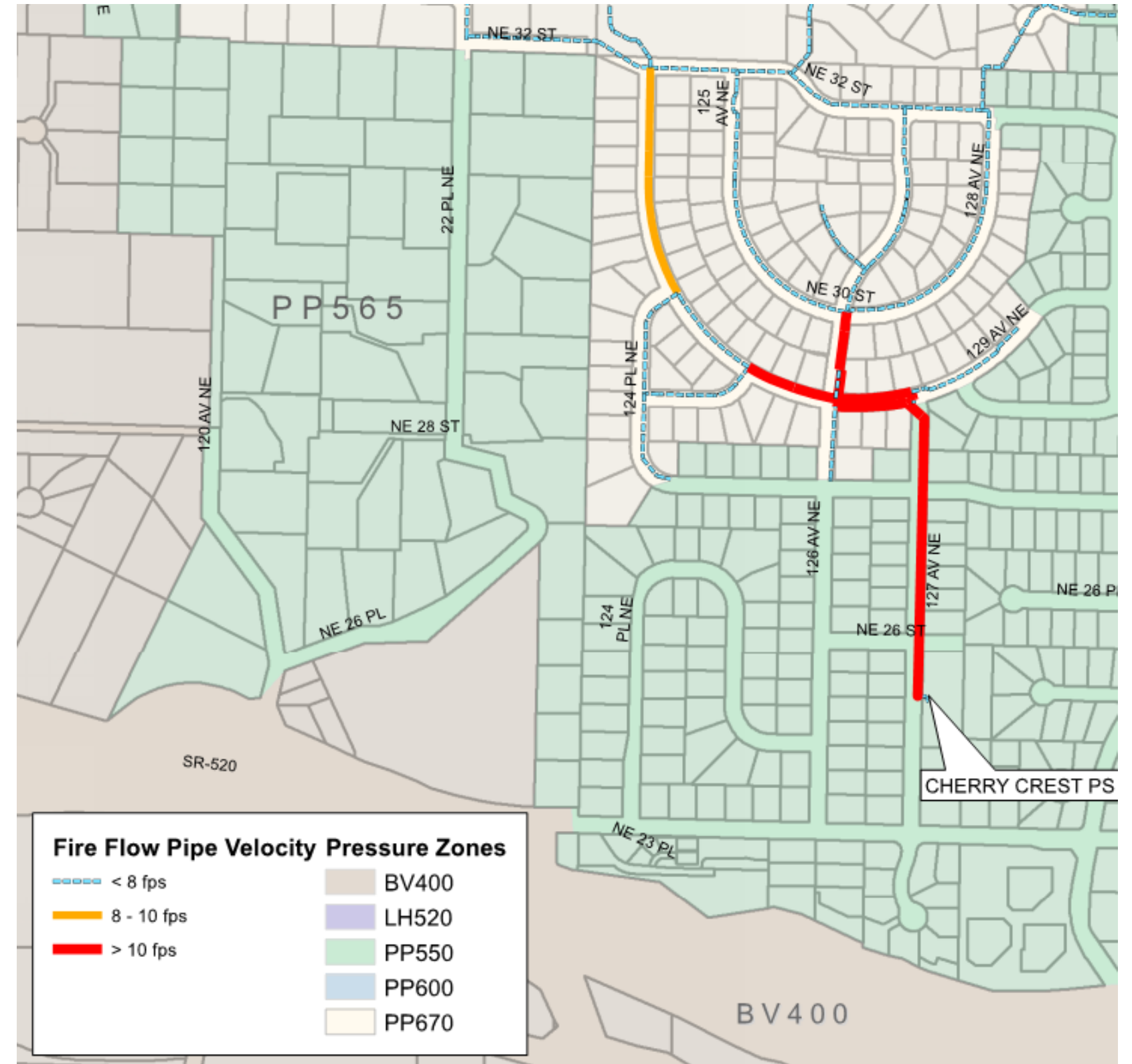


- Generally acceptable impacts
 - areas with reduction in available flow still above City standard
- Analysis did not include water main improvements



Transmission Main Needs

- Single 670 Zone pipe for 1,300 feet from PS discharge
- Off site main upgrades to maximize flow delivery potential from new PS



Design Highlights



Cherry Crest PS Design Highlights

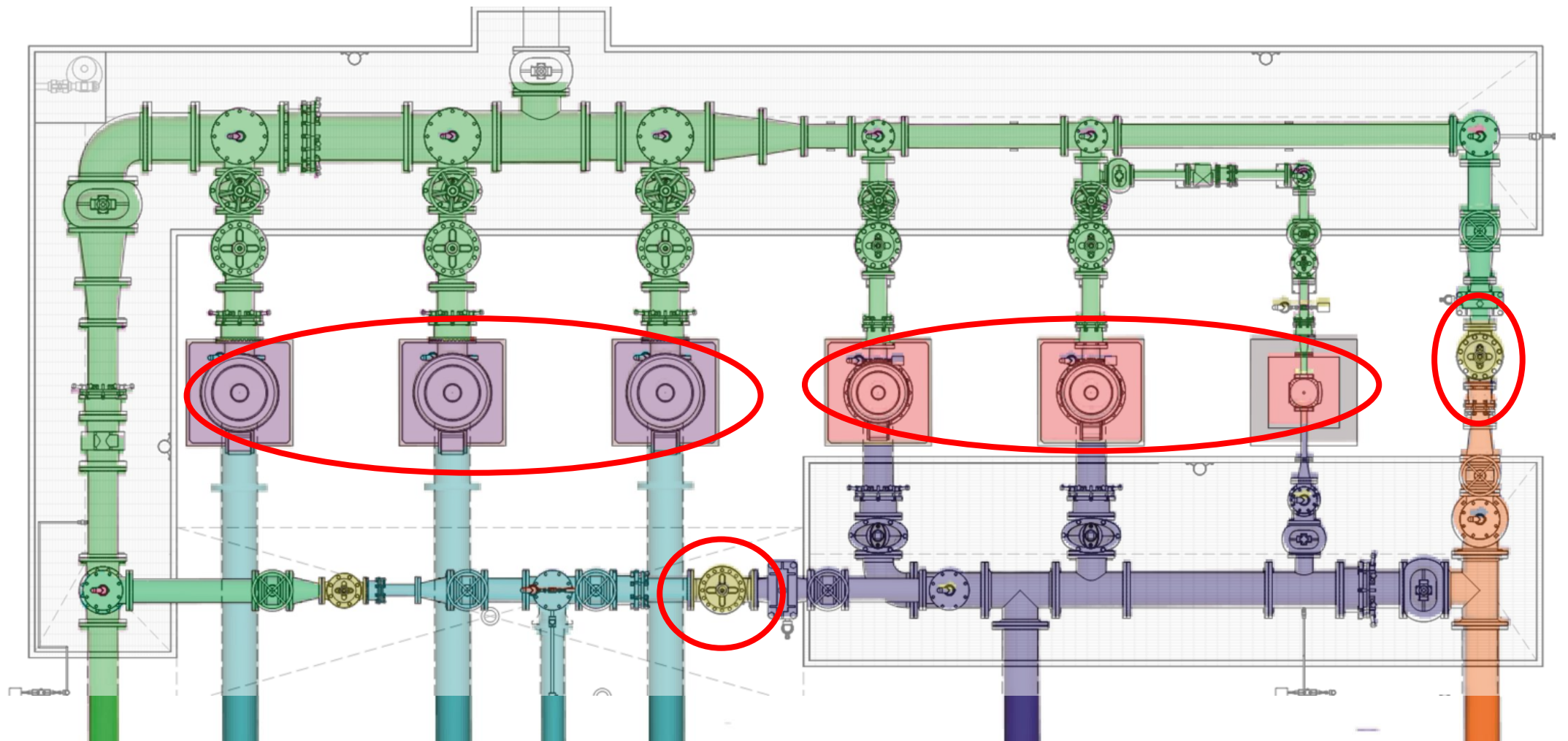
- Multi functional pump station providing supply to 550, 600, and 670 Zones
- Variable suction head for domestic demand pumps
- 670 Zone service resiliency
- Community outreach and public site influences – acoustic and aesthetic design considerations

Efficiency 1 - Colocation



Station (Multi)-Functionality

- Domestic flow: TESSL to 670
 - 550 suction available as backup
 - Capacity: ~30 – 1,100 gpm
 - Three pumps: two identical pumps, plus low flow pump
- Domestic & fire flows: 400 to 670
 - Capacity: ~300 – 1300 gpm per pump (2,600 gpm firm capacity)
 - Three identical pumps
- Backdown valves:
 - TESSL to 400
 - 670 to 550
 - Operational flexibility and redundancy

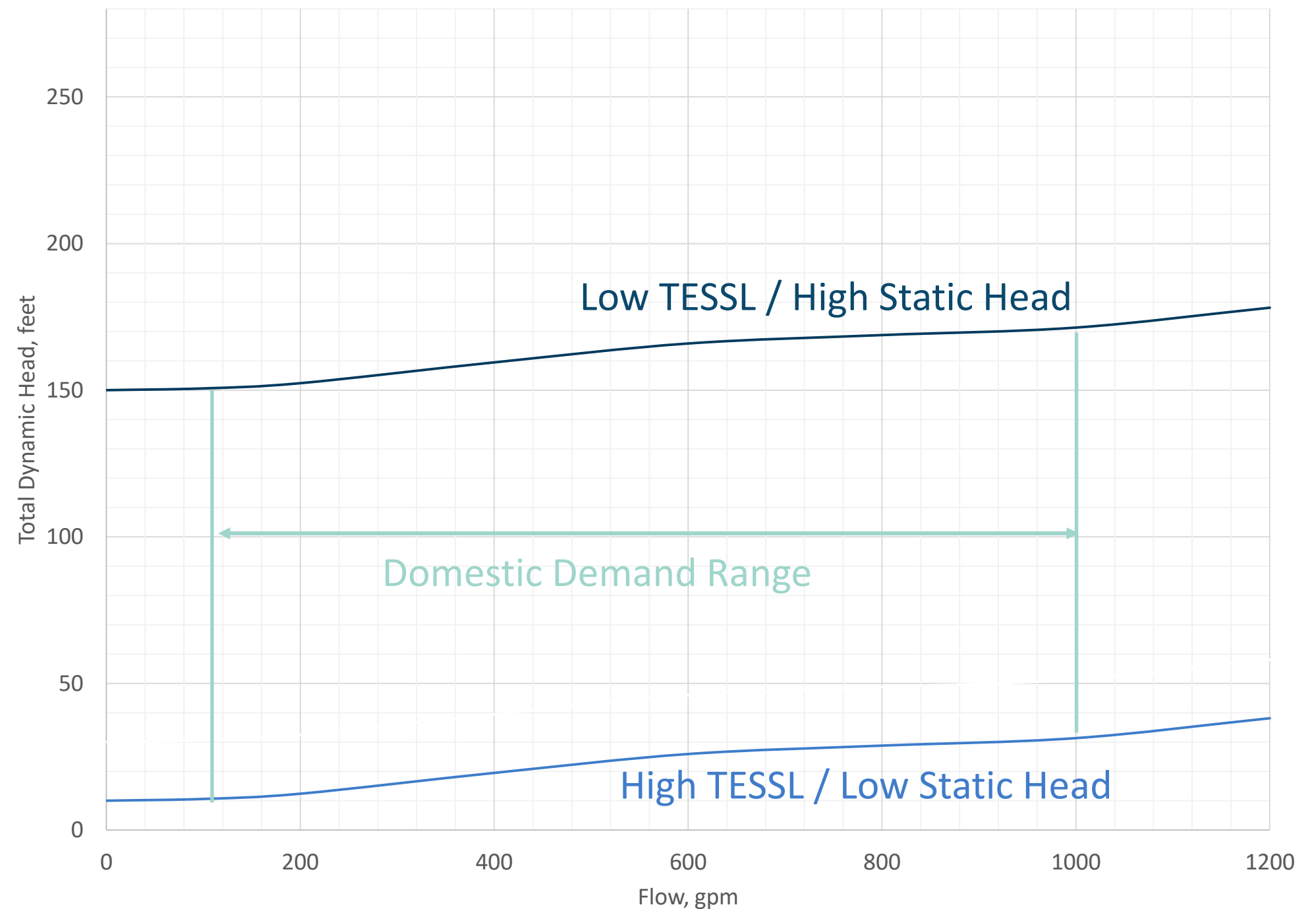


Efficiency 2 - Energy



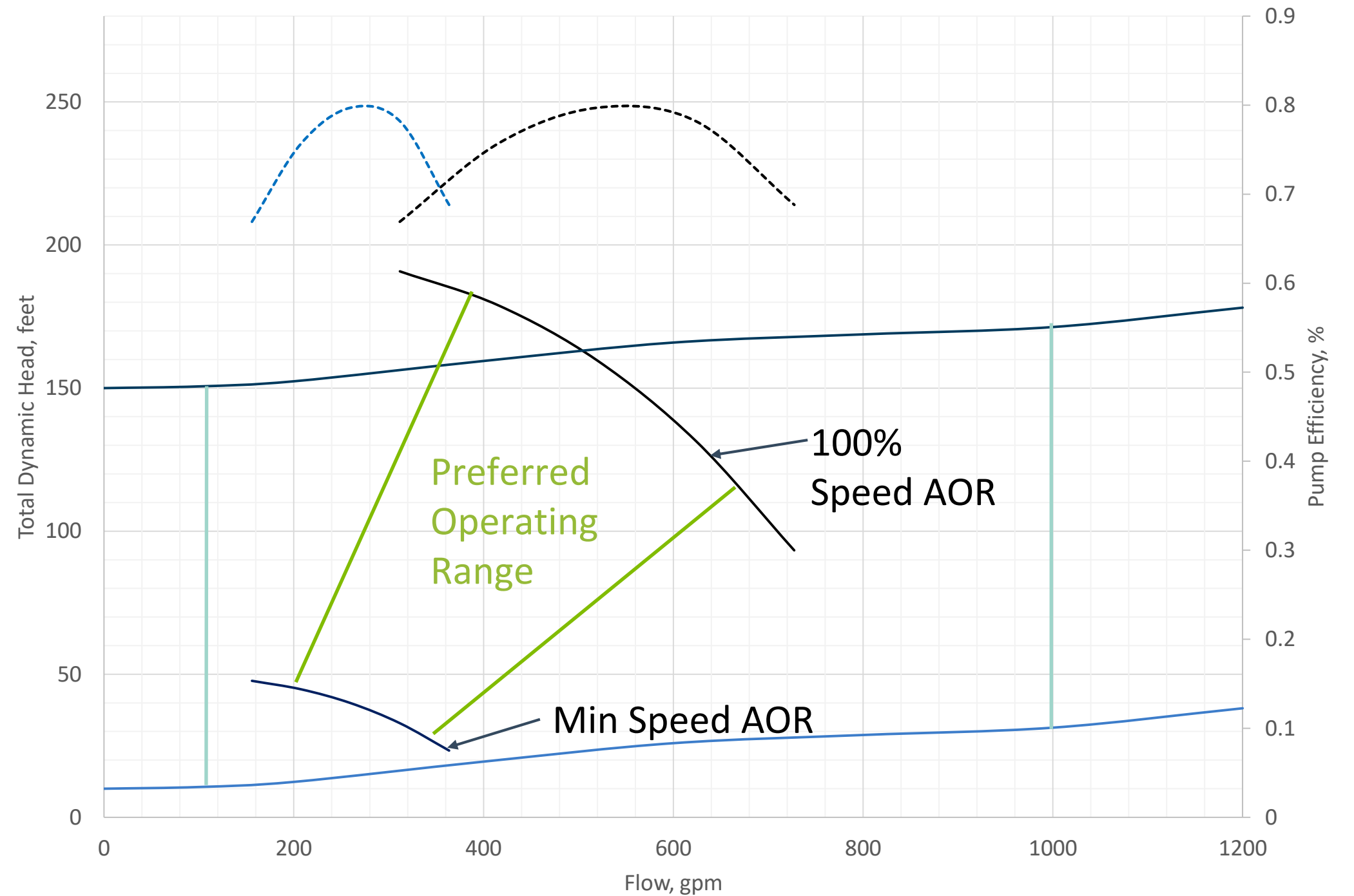
Variable Suction Head – Challenge

- TESSL could range from ~520-660' when pumping
- Demands Range from ~100 – 1,000 gpm



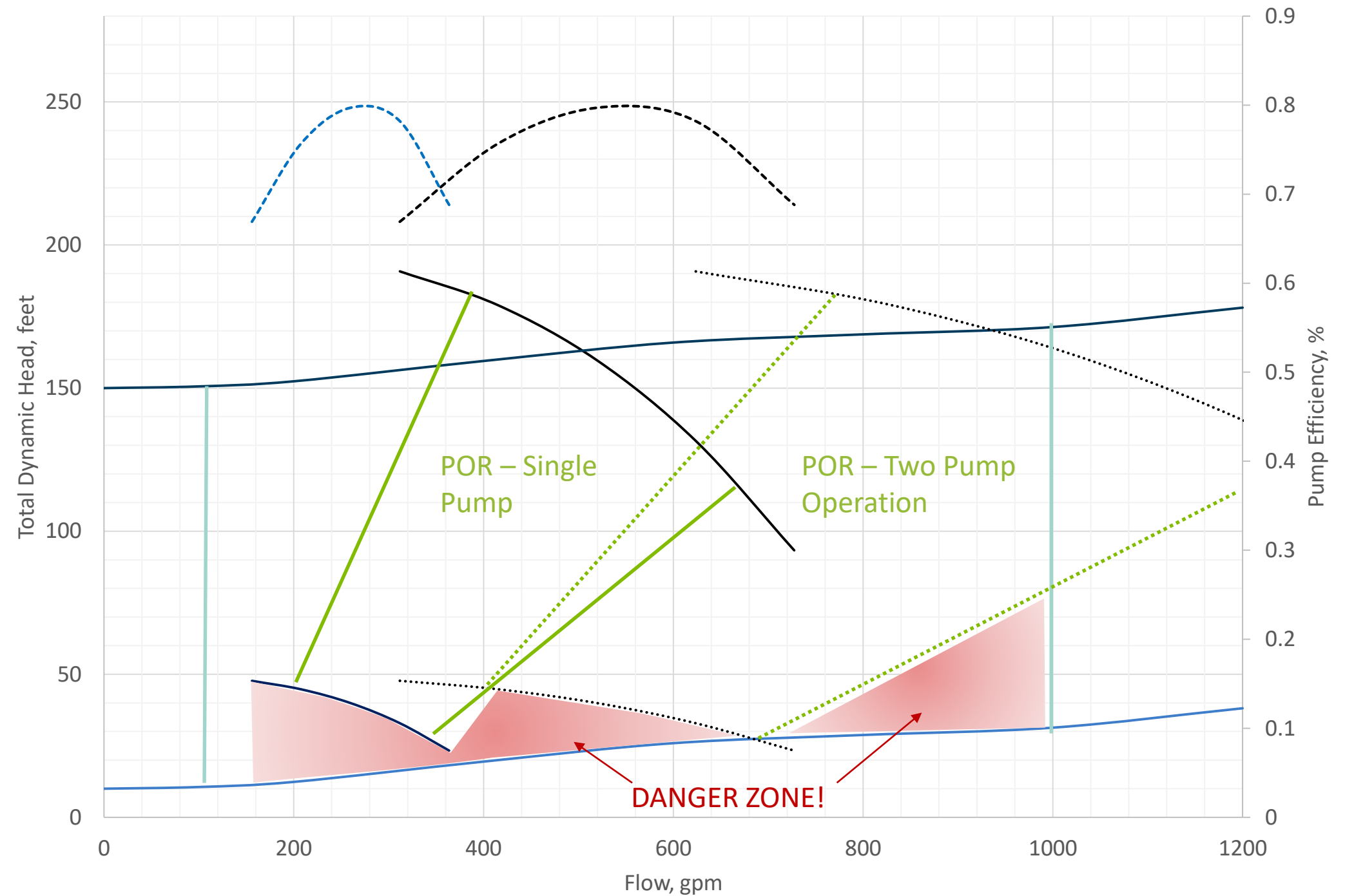
Variable Suction Head – Challenge

- Need to maintain pumping conditions within POR / AOR
 - Cavitation risk
 - Lower efficiency
 - Increased wear



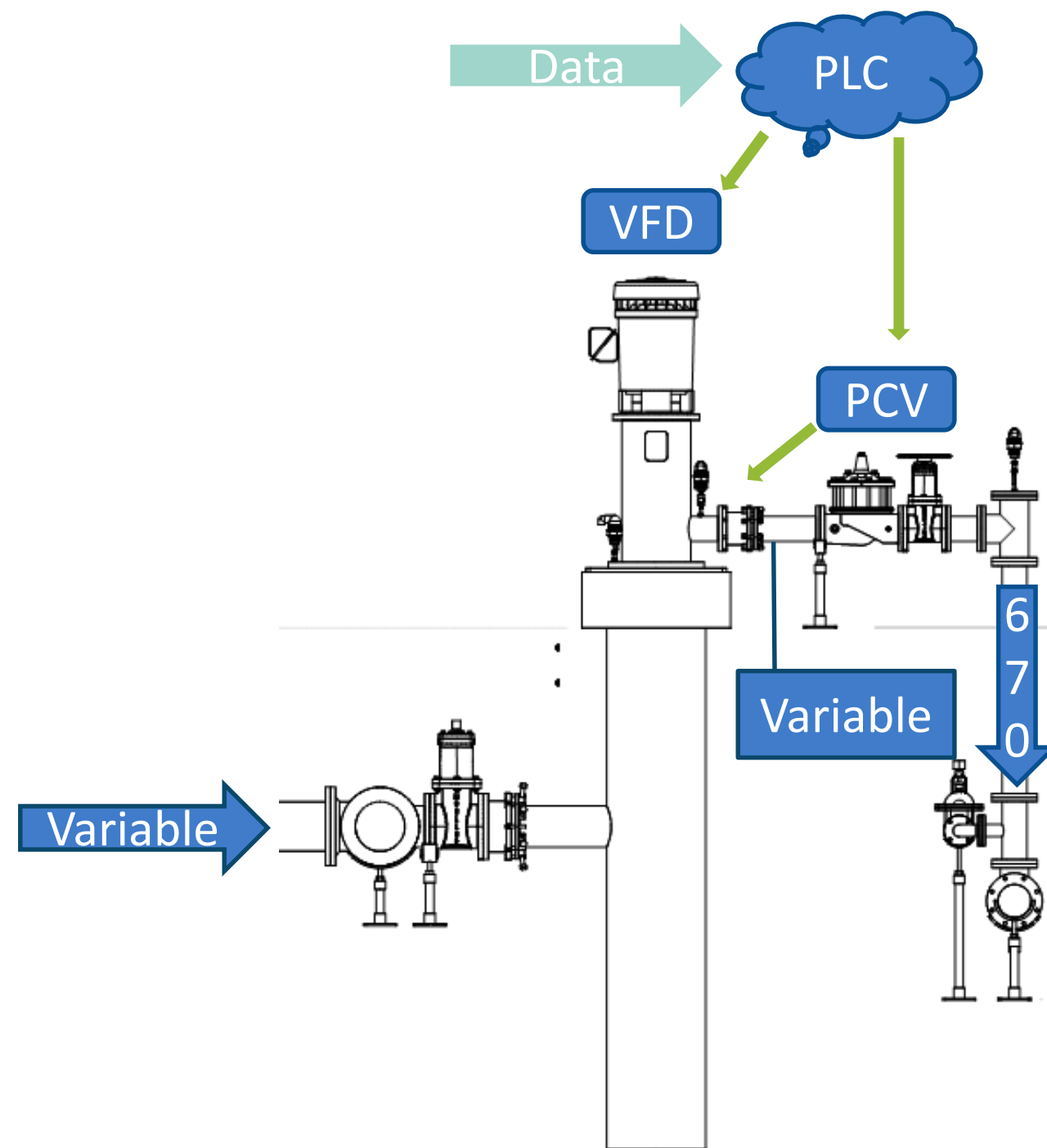
Variable Suction Head – Challenge

- Need to maintain pumping conditions within POR / AOR
- How to handle high amount of time in the danger zone
 - High TESSL head
 - MDD / PHD



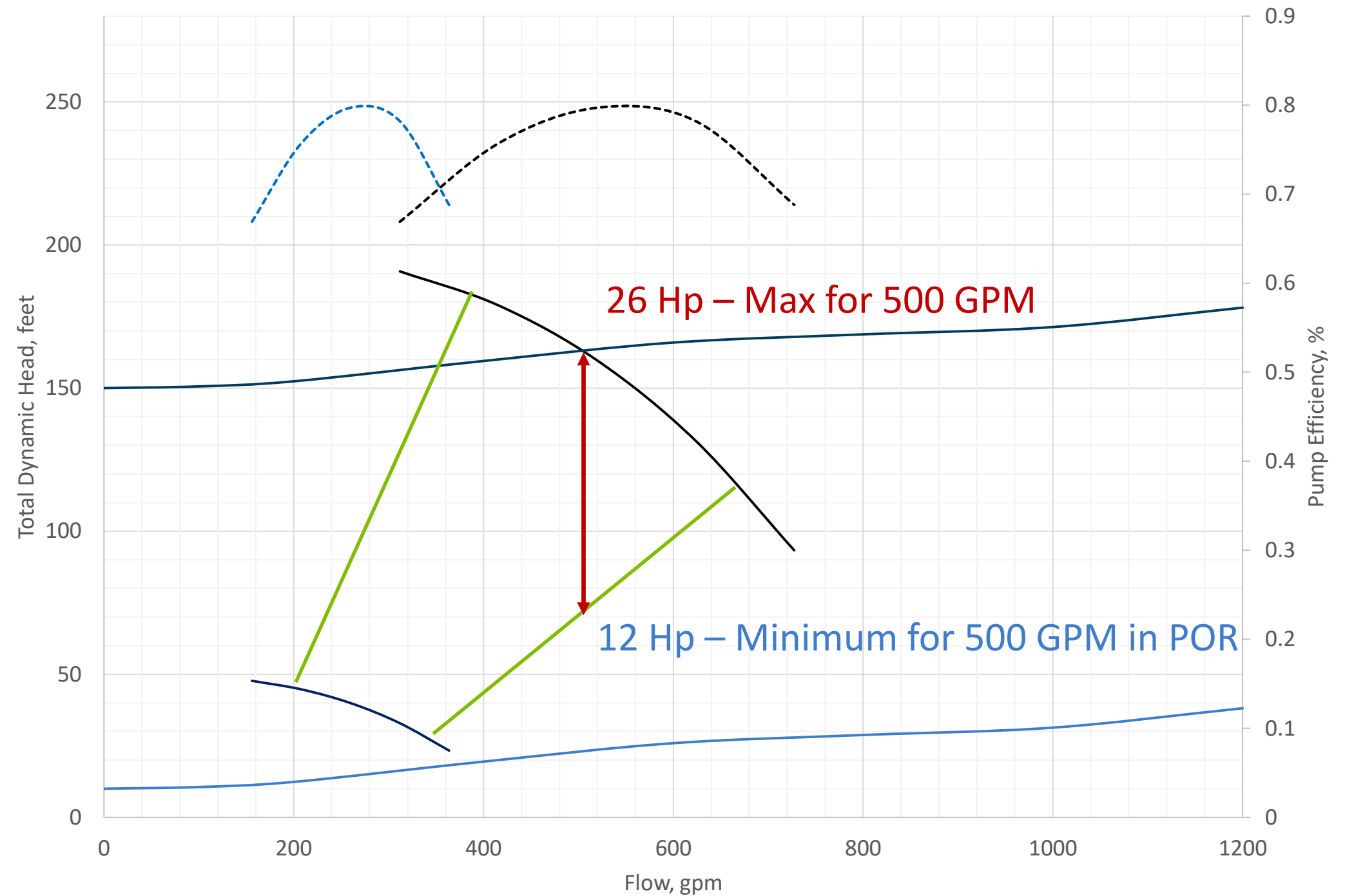
Variable Suction Head – Solution

- Active controls to adjust TDH
 - Pump control valves
- VFDs to match demand



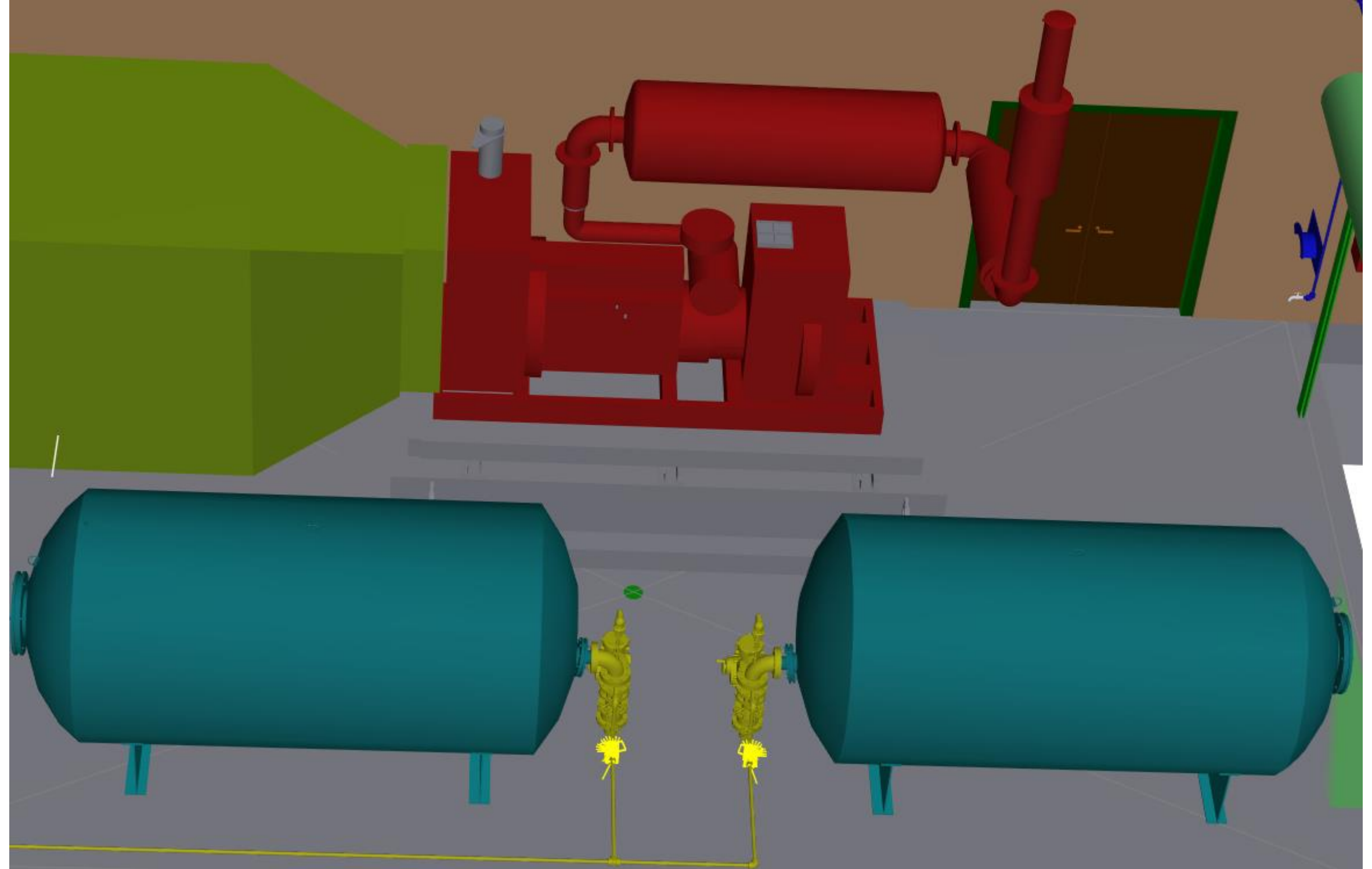
Variable Suction Head – Opportunity

- TESSL rarely below 600 ft,
 - Averages 645' when below 670'
- Reduced power consumption
 - 25 kW-h per 1 MG per Hp reduced



670 Zone Service Resiliency

- Providing resiliency for closed zone
 - Standby generator
 - Pressure tanks to support service pressures

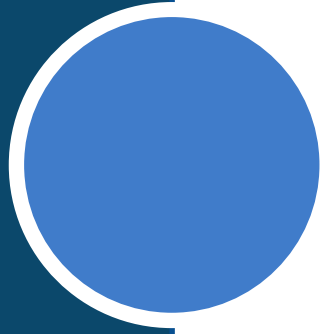


Efficiency 3 – Public Buy-in

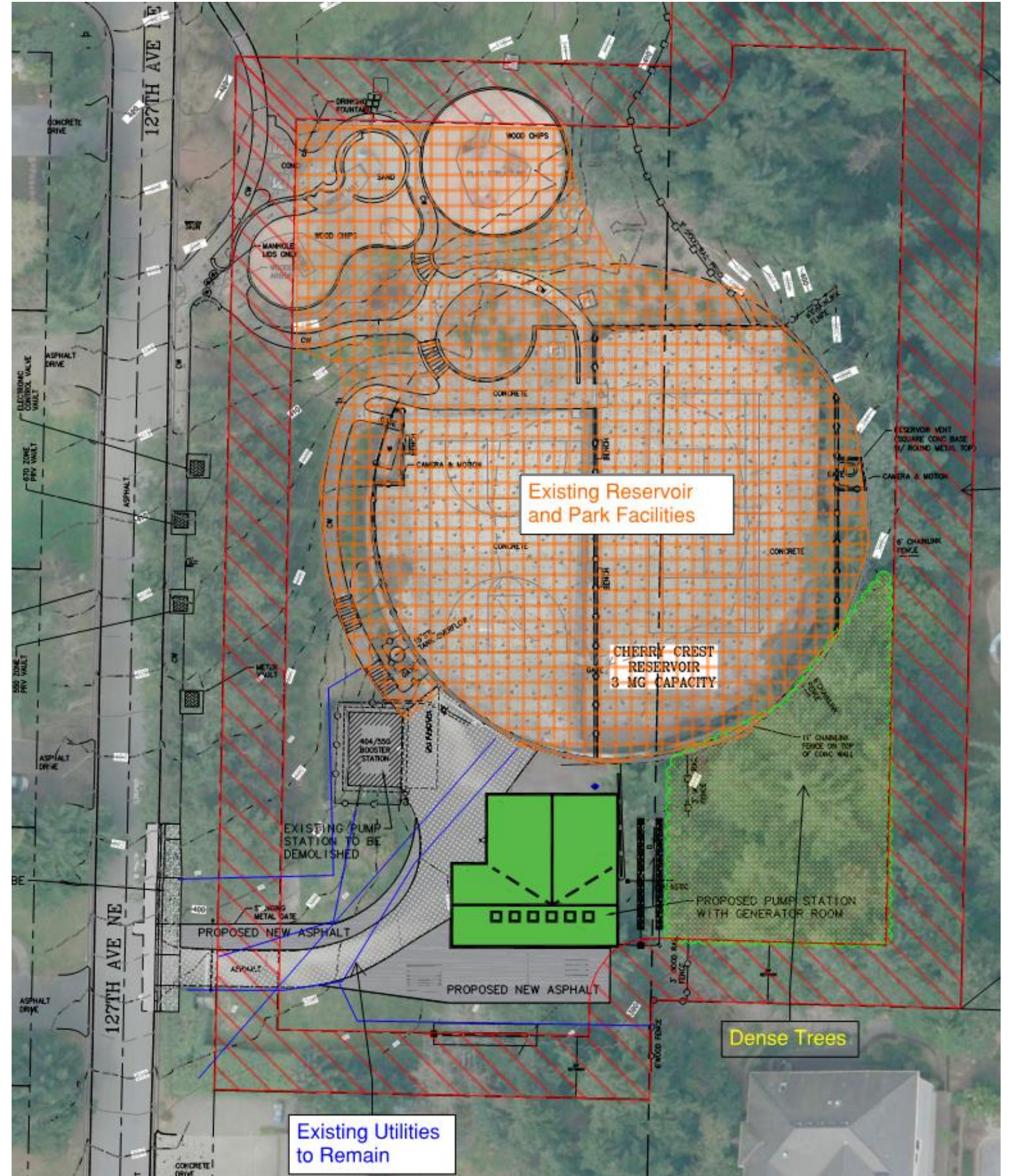




- Community Advisory Group
- Meetings to explain project and hear concerns
- Major Concern: Noise
- Site tour to existing facilities



- Existing park and reservoir
- Utilities to remain
- Dense trees
- Required building setbacks



Can You Hear Me Now?

- Acoustic engineering to address noise concerns
 - Ambient measurements
 - Modeling
 - Mitigation recommendations



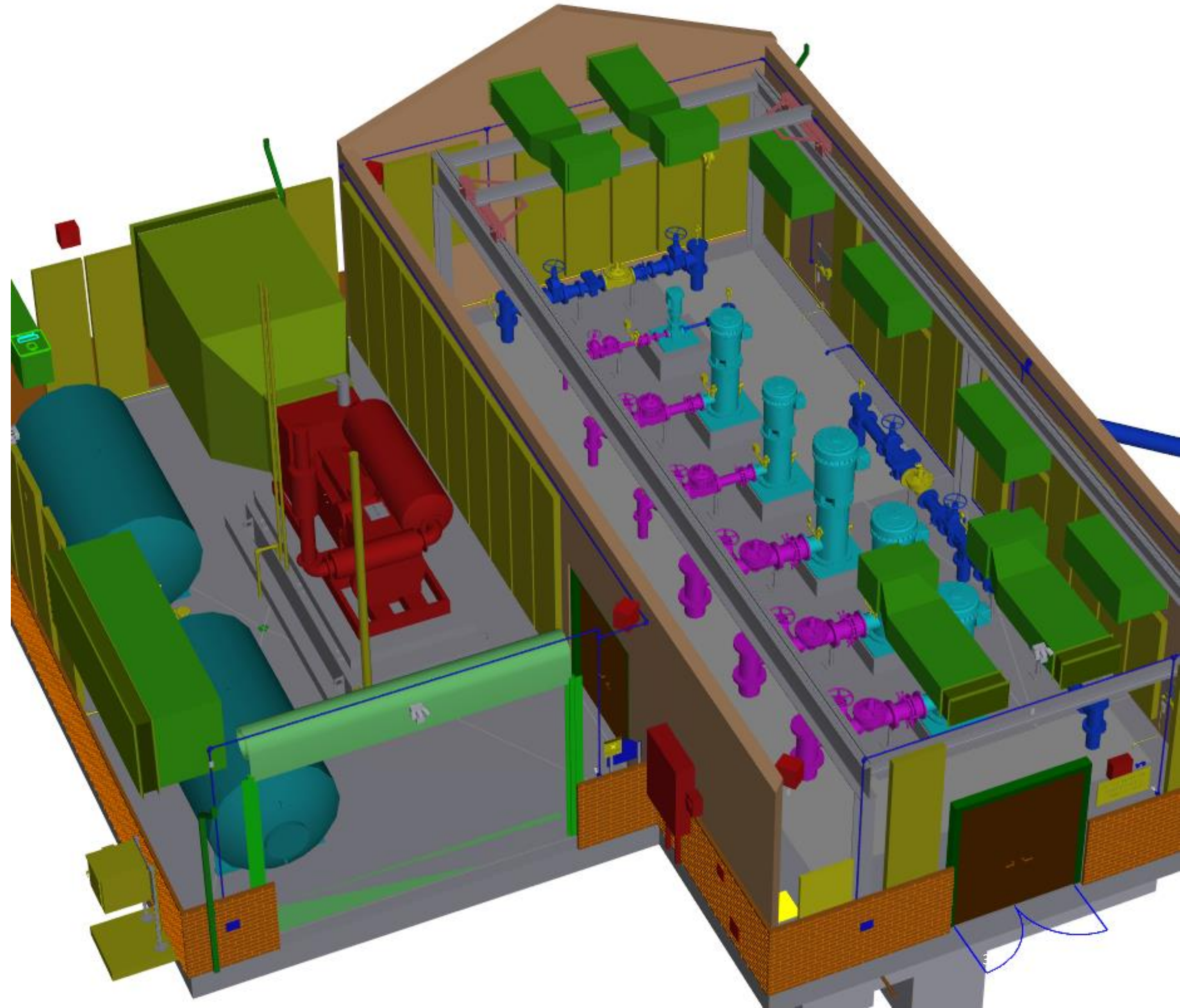
Acoustic Mitigation Design

- Designed Mitigation Measures

- HVAC / Duct Silencers
- Acoustic paneling
- Acoustic detailing

- Results

- 40- 50 dBA with generator on
- 30 – 40 dBA with generator off





- Match residential character of neighborhood
- Provide screening





Q&A

Nathan Rostad: nathan.rostad@murraysmith.us

Doug Lane: Dlane@bellevuewa.gov





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Thank you!