

Lake Oswego Tigard Water Partnership

# Innovative Solutions in Pump Station Implementation and Design



May | 2014



# Overview

- Overview of LOTWP
- Bonita Pump Station
  - Tigard system overview
  - Dual pumping supply approaches
  - Pump Station siting alternatives
  - Hydraulic integration with LO and Tigard infrastructure
  - Back up power approaches
  - System integration and system piping improvements



# Overview of the Lake Oswego Tigard Water Partnership

# Who is LOTWP?



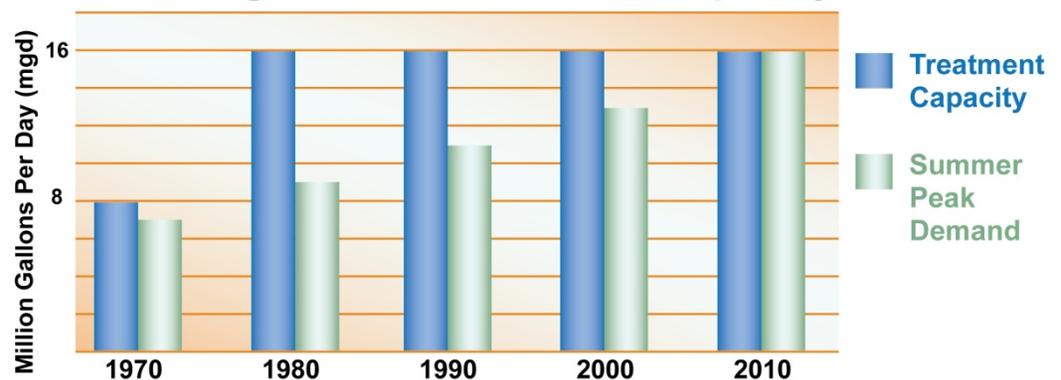
# Who is LOTWP?

- Lake Oswego’s system is near capacity; aging facilities lack reliability.
- Tigard needs secure, dependable water; system ownership.
- Both cities want to keep water affordable for ratepayers.
- Cities began sharing water in the 1970s.

| Facts & Figures      | Lake Oswego     | Tigard                         |
|----------------------|-----------------|--------------------------------|
| Population served    | 34,000          | 57,000                         |
| Peak demand          | 16 mgd*         | 13 mgd                         |
| Current water source | Clackamas River | Portland/Bull Run, Groundwater |
| Future water source  | Clackamas River | Clackamas River, Groundwater   |

\*million gallons per day

### Lake Oswego Water Treatment Capacity

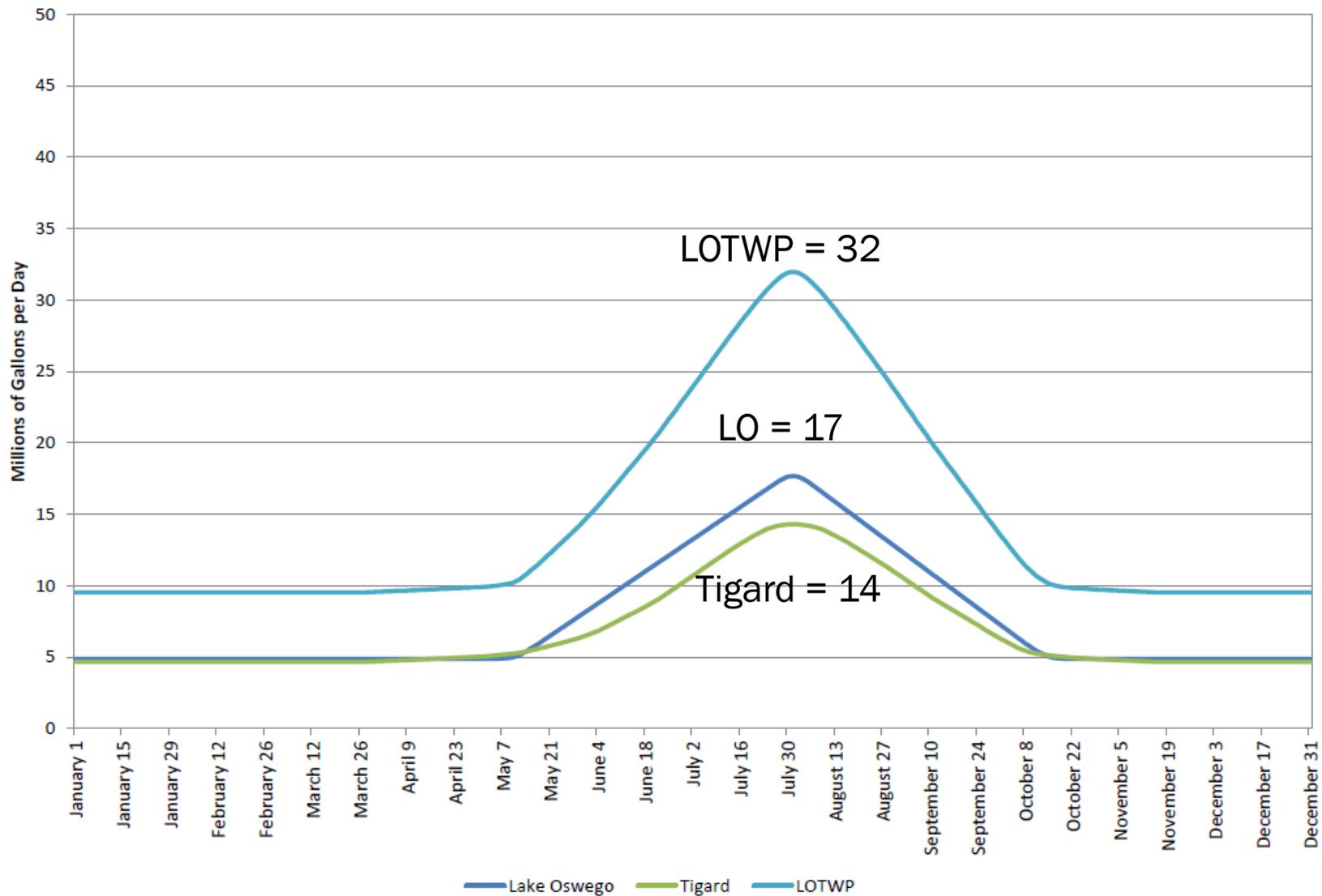


# LO Clackamas River Water Rights and System Supply Capacity

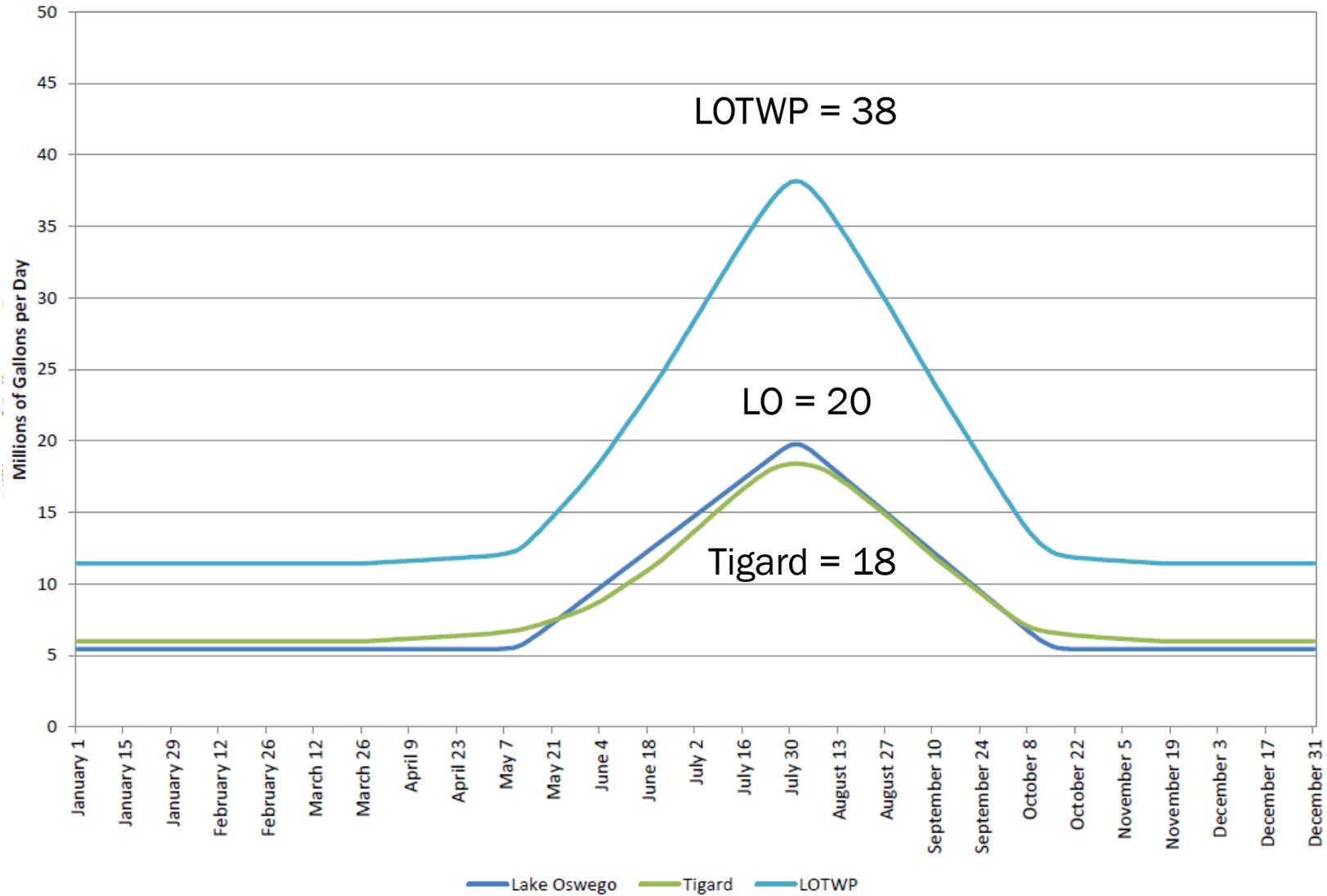


- Current Supply/Capacity
  - Lake Oswego 16 mgd from Clackamas River
  - Tigard wholesale supply from Portland Water Bureau
- Future Demands
  - Lake Oswego 18-24 mgd
  - Tigard 20 mgd
- Clackamas Water Rights
  - 59 cfs = 38 mgd

# 2016 Demands

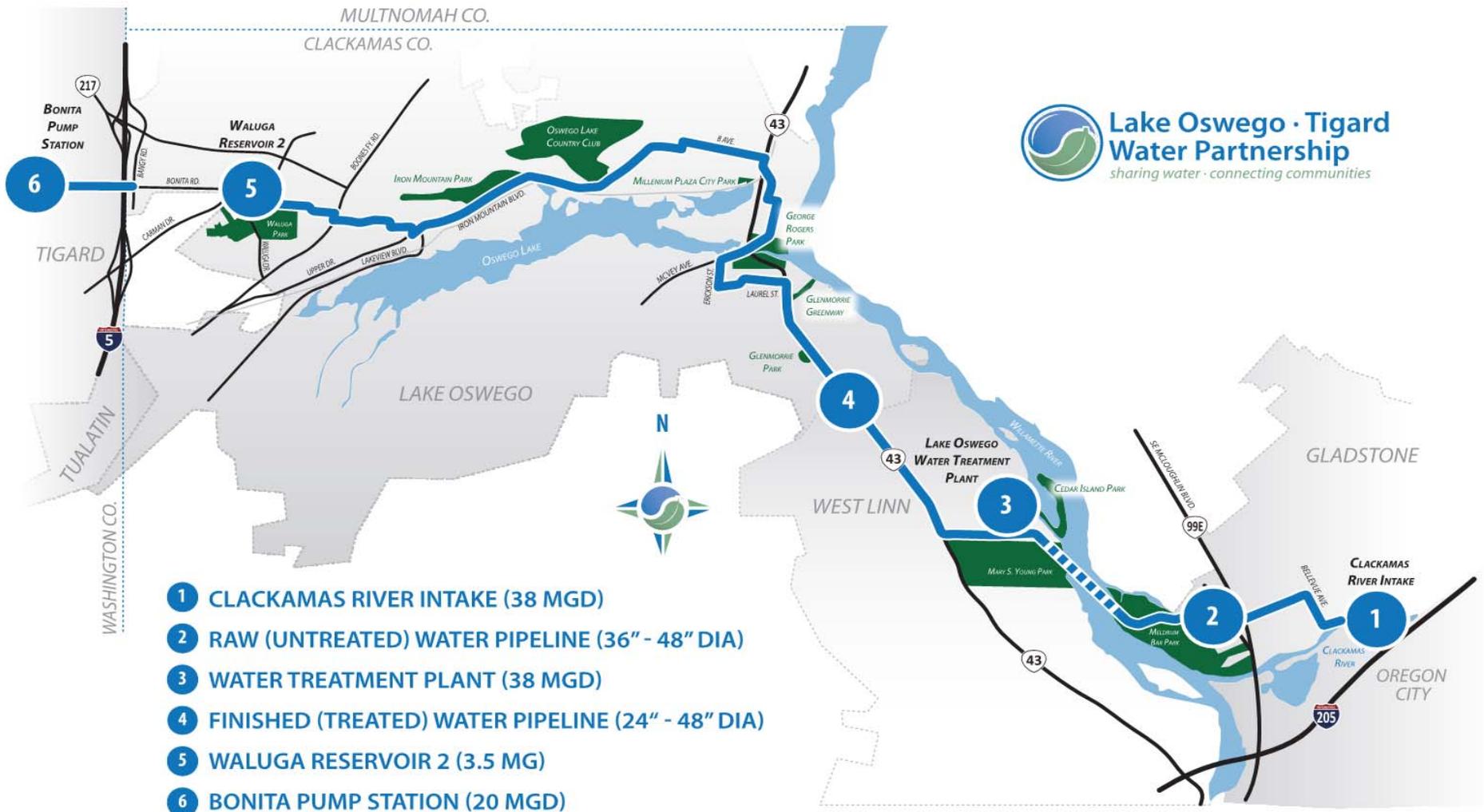


# 2013 Demands



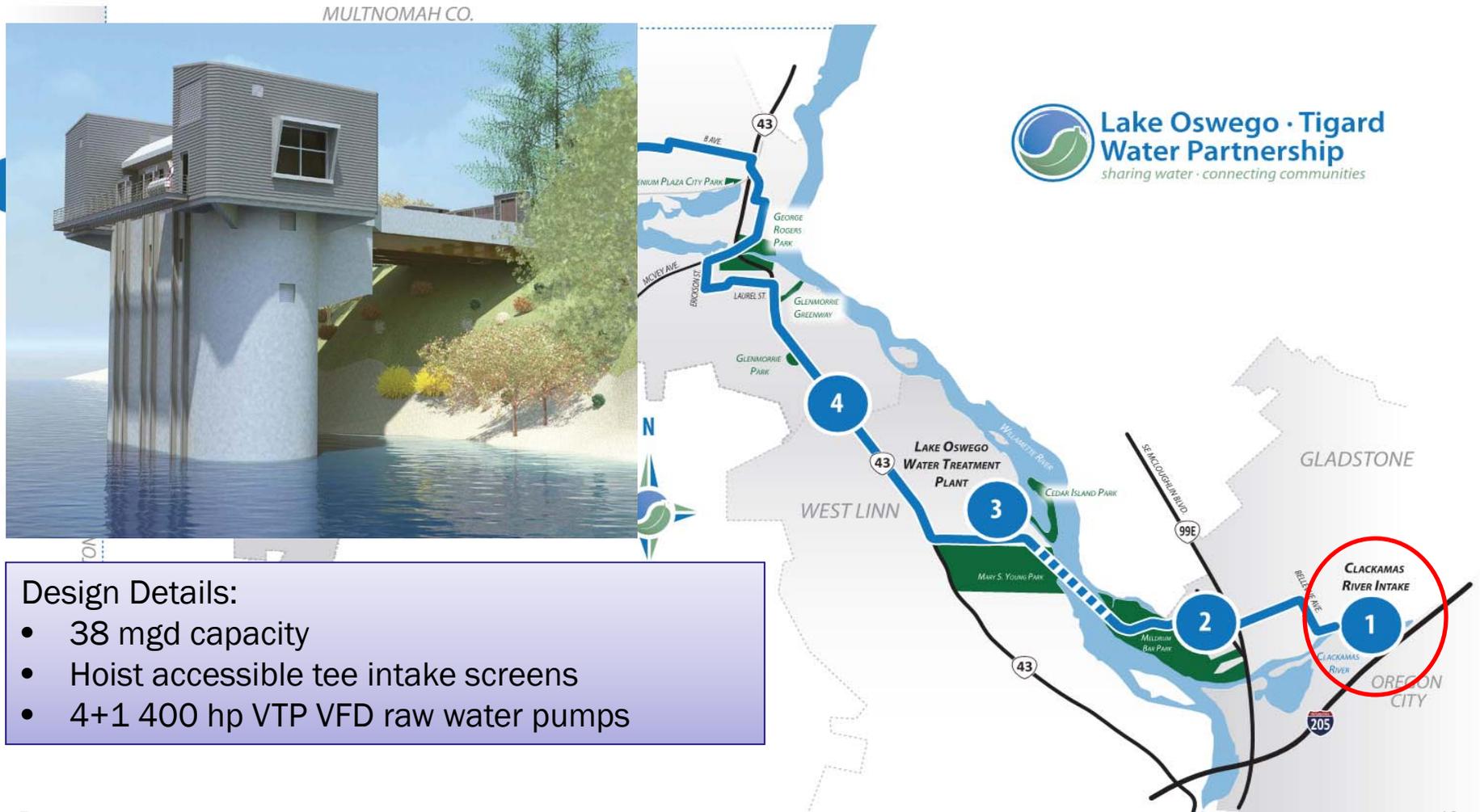
# LOTWP – 1 Program, 7 Projects

All facilities online by July 2016



# 7 Projects – River Intake Pump Station

All facilities online by July 2016



# 7 Projects- Raw Water Pipeline

All facilities online by July 2016

MULTNOMAH CO.



image courtesy of Western Corridor Recycled Water Ltd.  
Photo credit: Chris Lees Photography

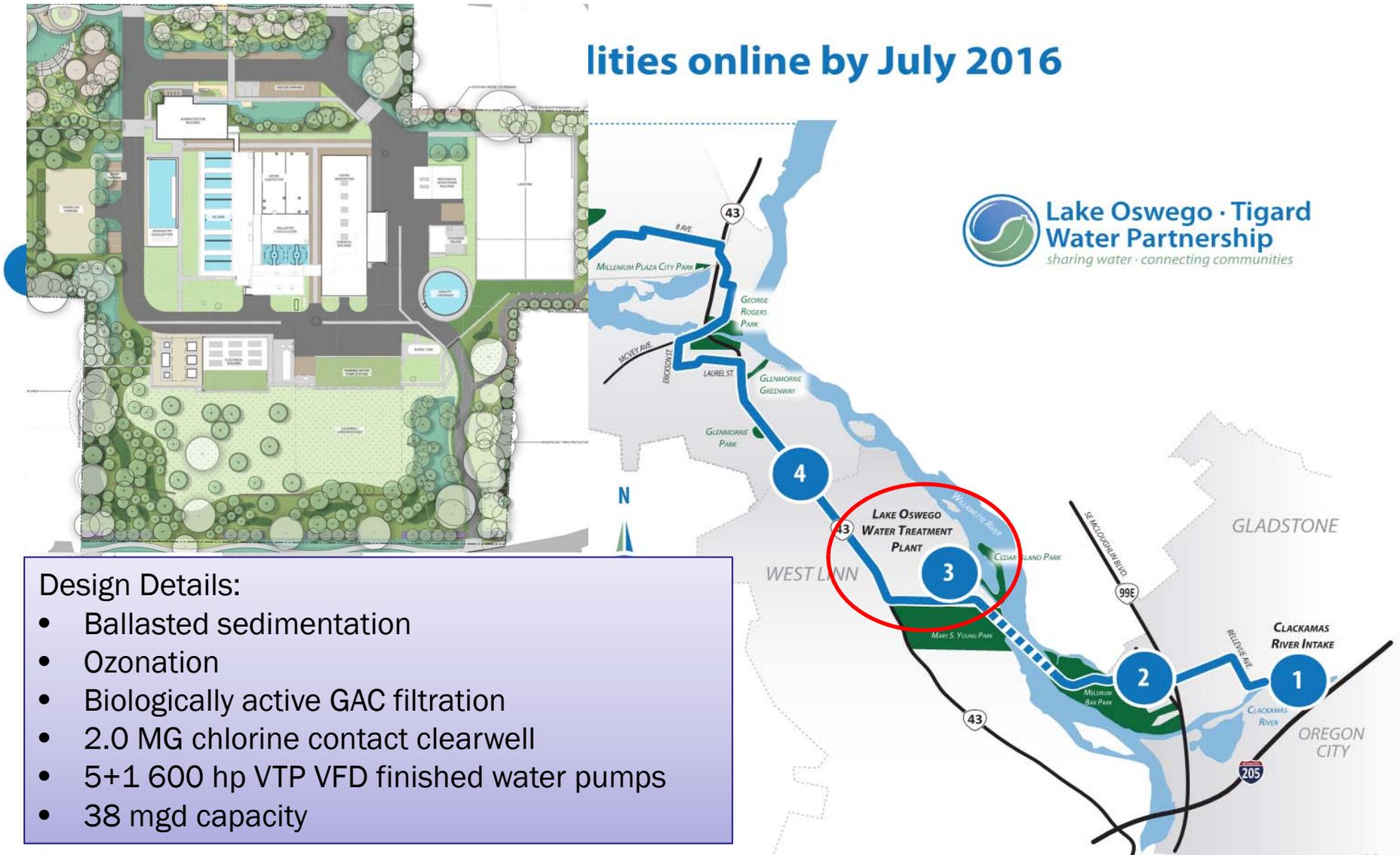


## Design Details:

- 2.6 miles of 36" to 48" diameter steel piping
- Open cut and HDD
- 38 mgd capacity

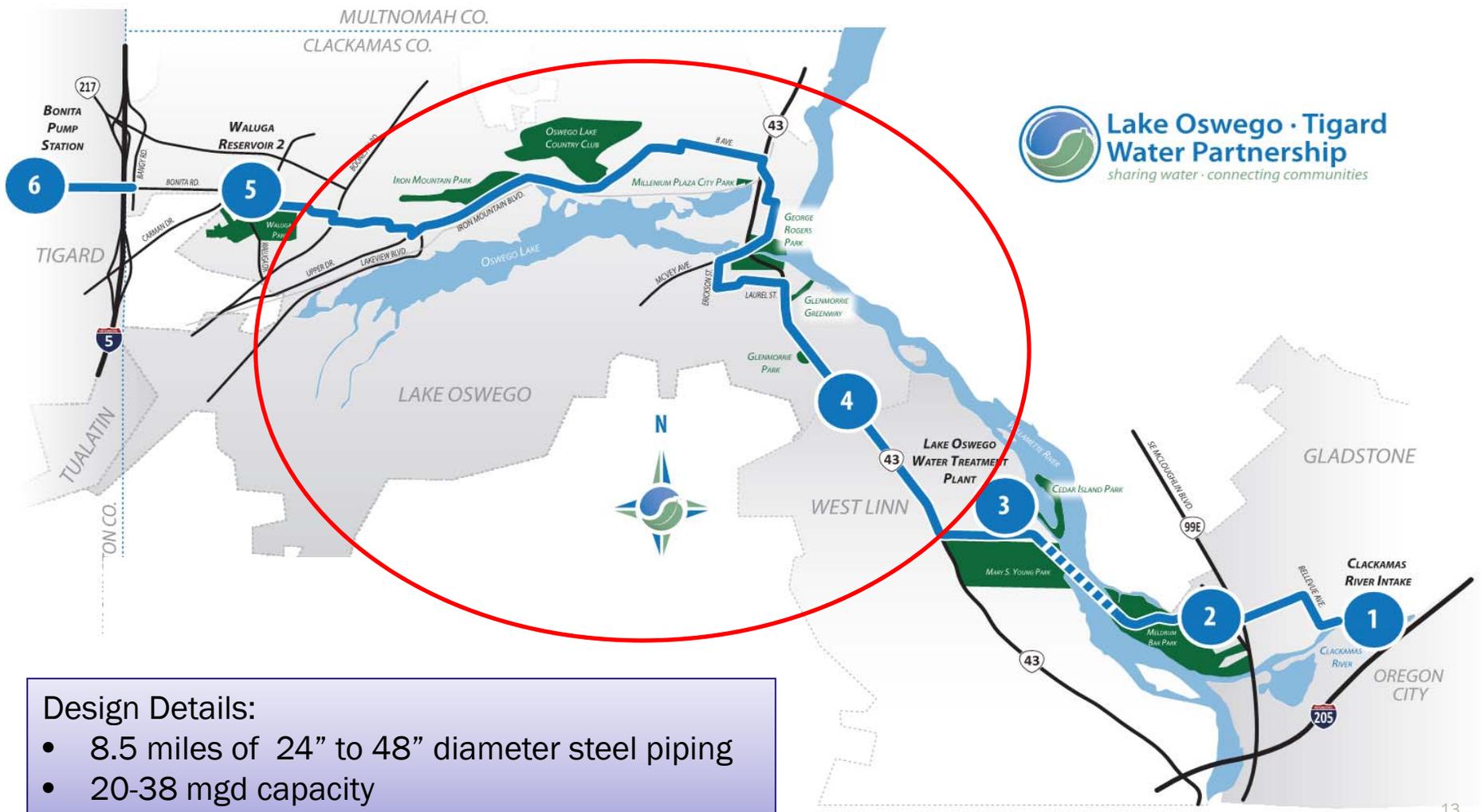
# 7 Projects- Water Treatment Plant

Utilities online by July 2016



# 7 Projects- Finished Water Pipeline

All facilities online by July 2016

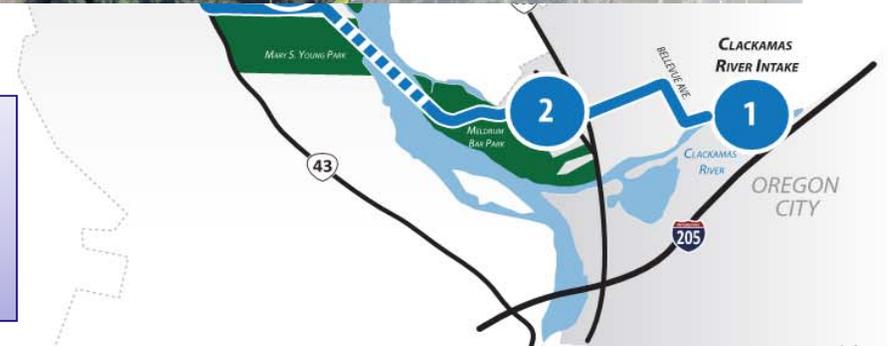
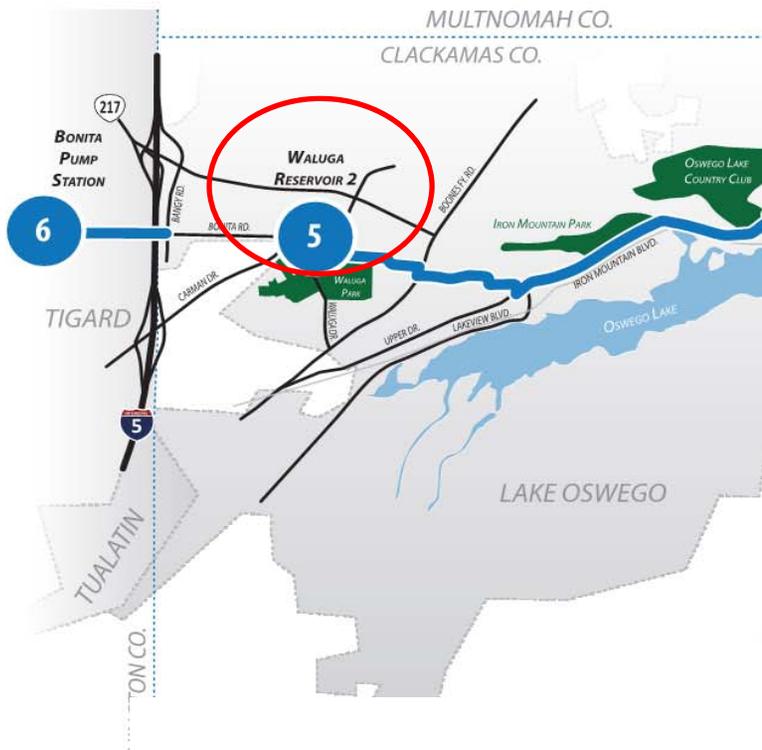


## Design Details:

- 8.5 miles of 24" to 48" diameter steel piping
- 20-38 mgd capacity

# 7 Projects – Waluga Reservoir 2

All facilities online by July 2016

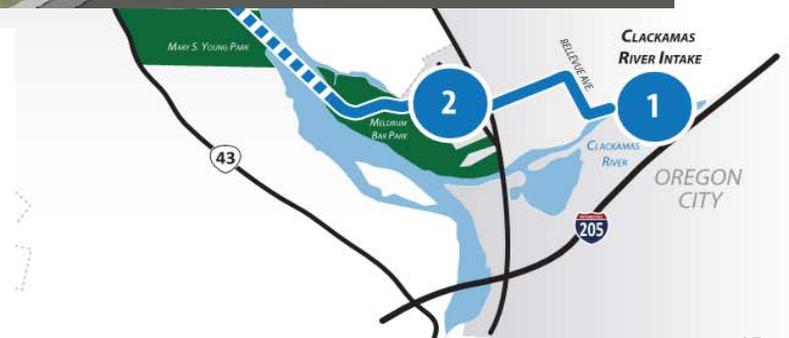
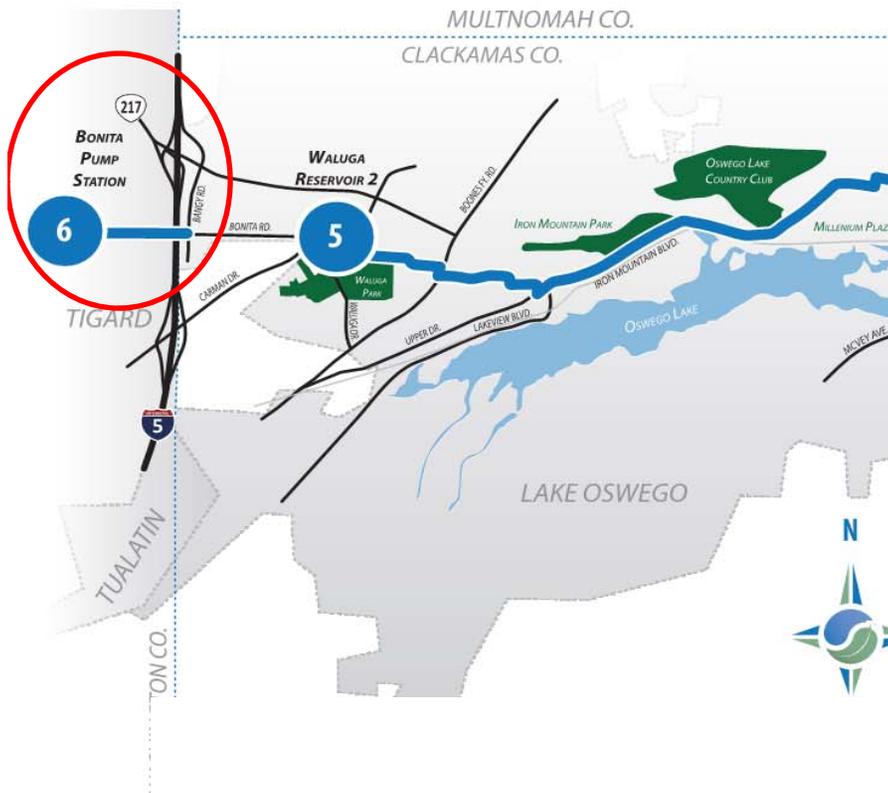


## Design Details:

- 3.5 MG prestressed concrete
- Prestressed, wire wrapped DN Tank
- 49 feet tall with self supporting dome roof

# 7 Projects – Bonita Pump Station

All facilities online by July 2016



## Design Details:

- 5+1 VTP with VFDs - Dual PS
- 16-20 mgd capacity

# Capital Costs

- Lowest cost option for Lake Oswego and Tigard
- Smallest cumulative rate increases over long-term
- Tigard also benefits by system ownership

Total Program Cost: \$250 Million



# Bonita Pump Station Case Study

# Bonita Pump Station Project

- Owner: Lake Oswego-Tigard Water Partnership (LOTWP)
  - City of Lake Oswego, Oregon
  - City of Tigard, Oregon
- Program Manager: Brown and Caldwell
  - Planning and modeling
  - Project definition – siting, permitting, land use
  - Oversight and coordination
- Designer: Black & Veatch
- Structural and Seismic: OBEC
- Architect: MWA

# Tigard System

- 57,500 People Served
- Future demand 14 to 20MGD
- 4 Previous Sources
  - Purchased water from PWB, TWVD, LO, JWC
- Five major pressure zones
  - Supplied by 14 reservoirs and 7 major pump stations
  - Majority of the city is serviced by the 410 zone
- Majority of supply from PWB through 470 and into the 410 zone

# Previous Supply

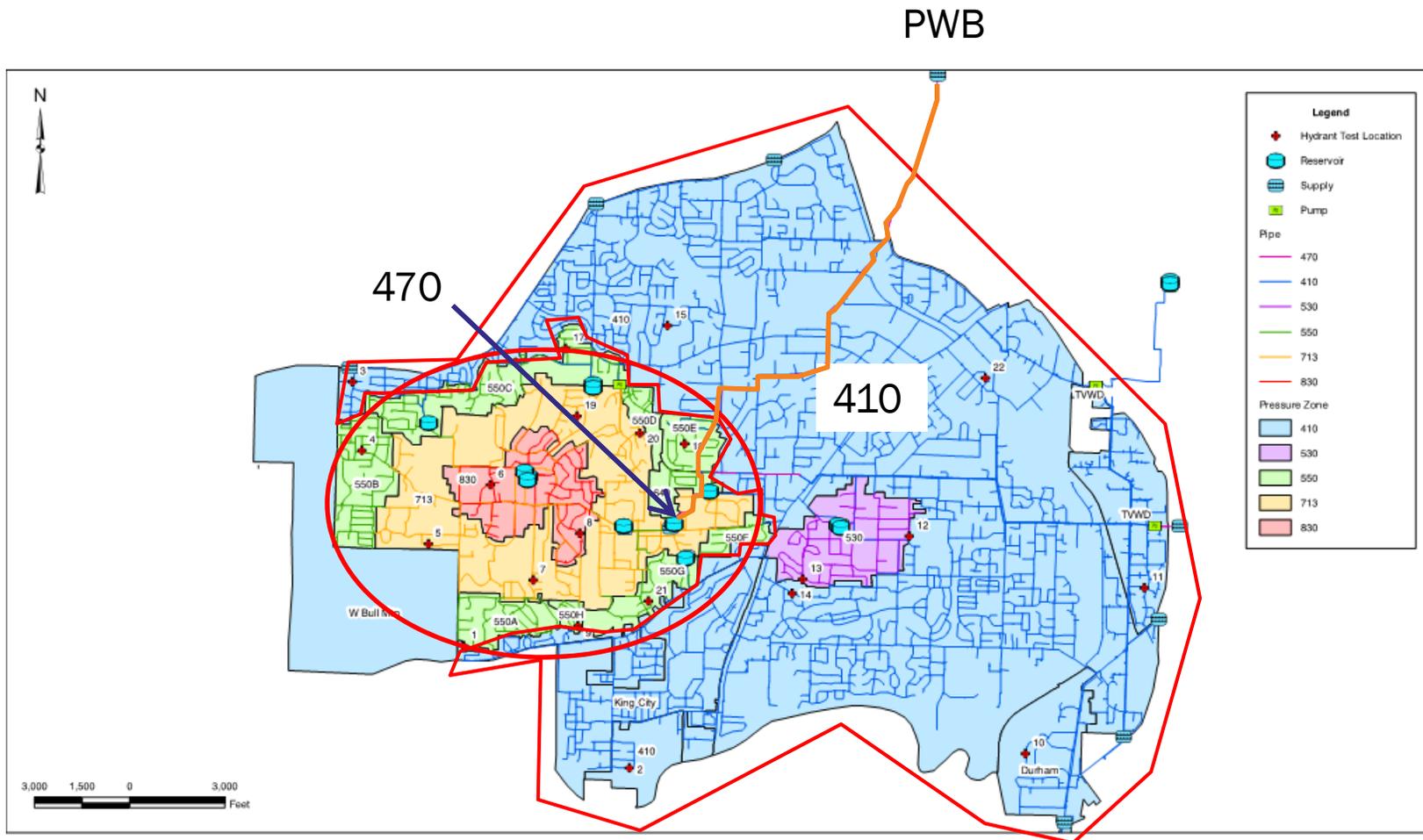


FIGURE 3.2  
HYDRANT TEST LOCATIONS  
WATER SYSTEM MASTER PLAN  
CITY OF TIGARD

# Previous Supply

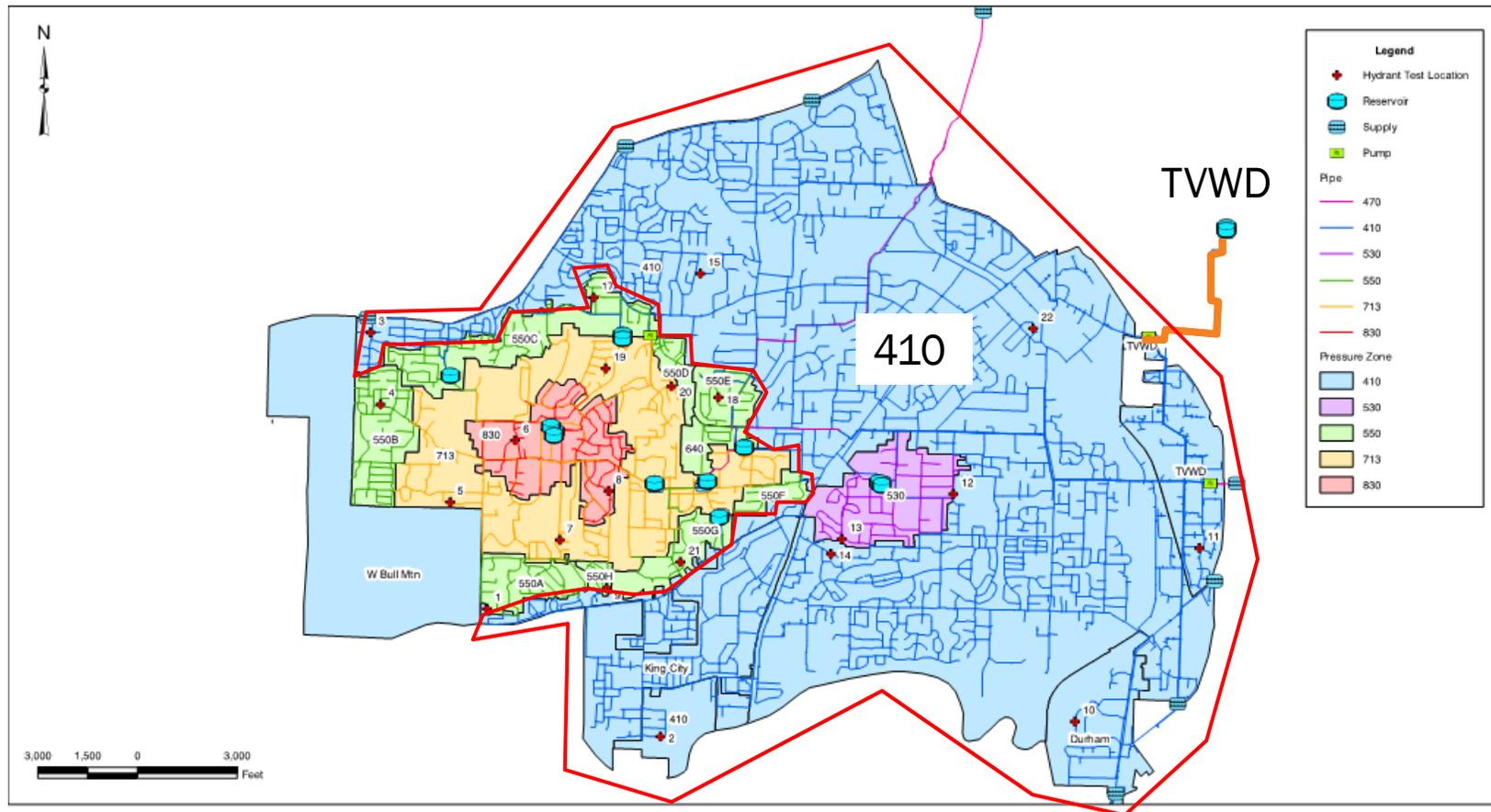


FIGURE 3.2  
HYDRANT TEST LOCATIONS  
WATER SYSTEM MASTER PLAN  
CITY OF TIGARD

# Pump Station Design Alternatives

- Two separate pump station facilities
  - WR to 410 PS
  - 410 to 470 PS
- Combined dual pump station facilities
  - WR to 410 and 470
  - “dual” pumping supply approaches combining two pump stations and increased operational flexibility into one common facility

# New Supply – Two Pump Stations

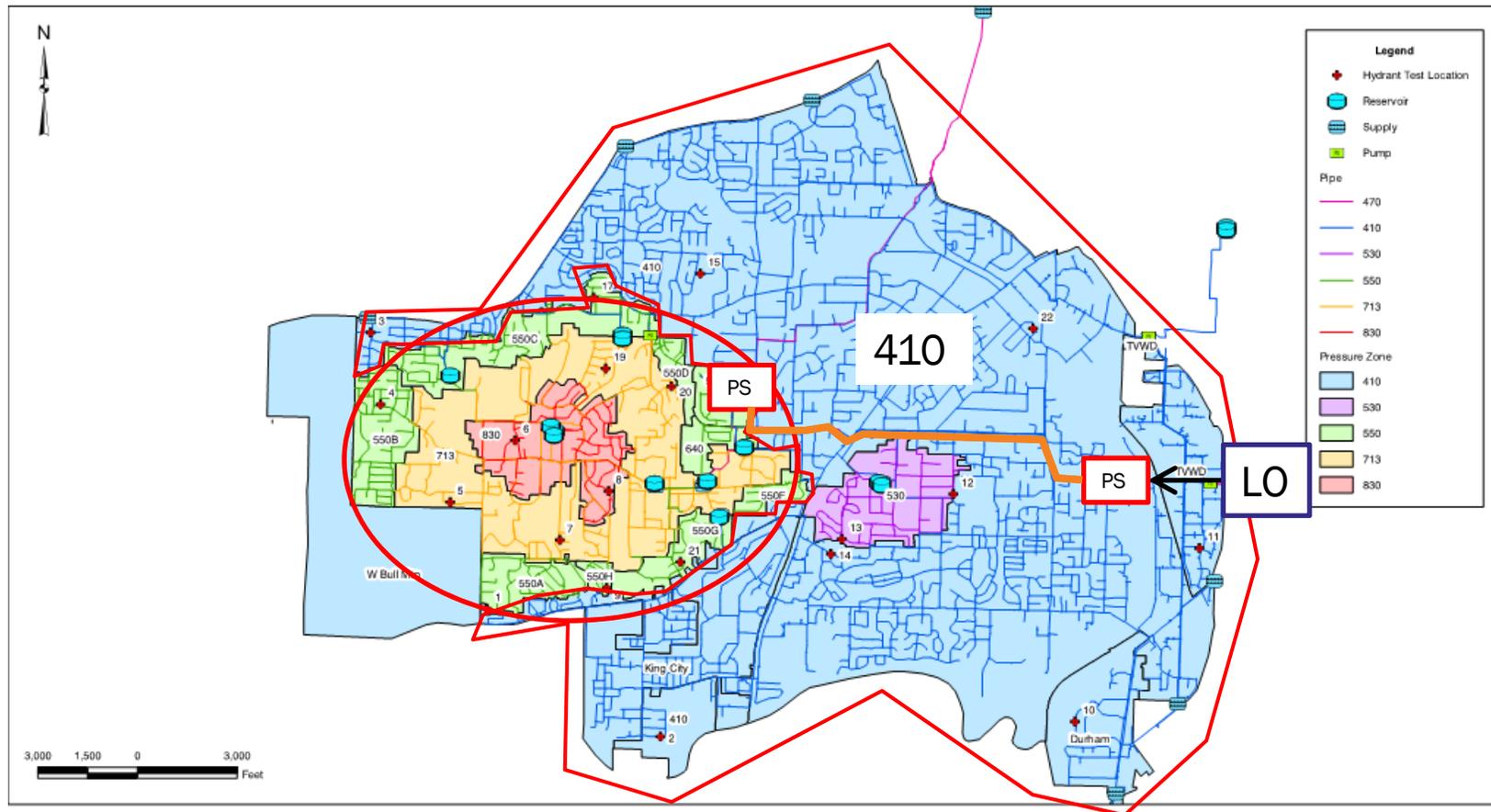


FIGURE 3.2  
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CITY OF TIGARD

# New Supply – One Dual Pump Station

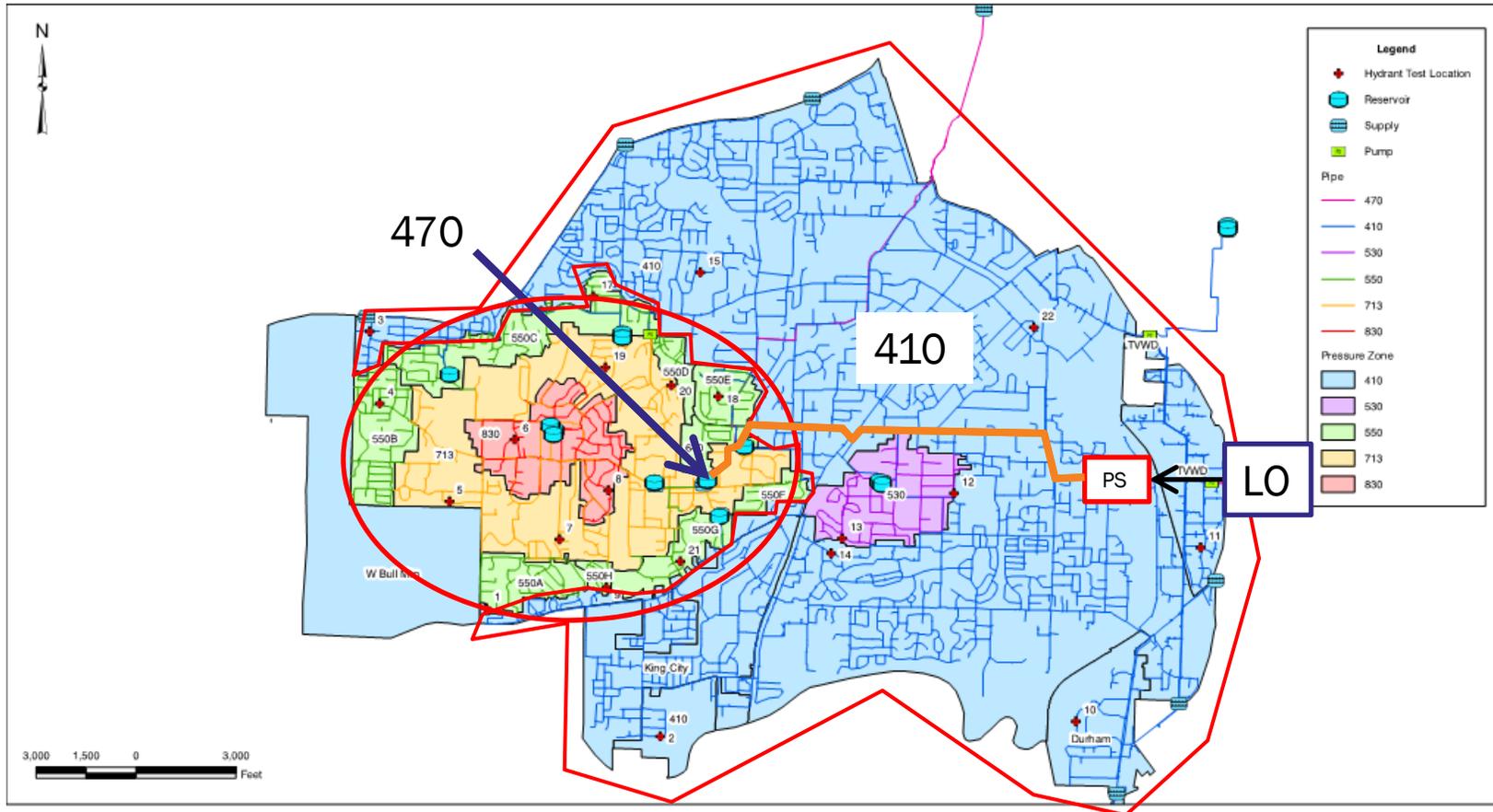
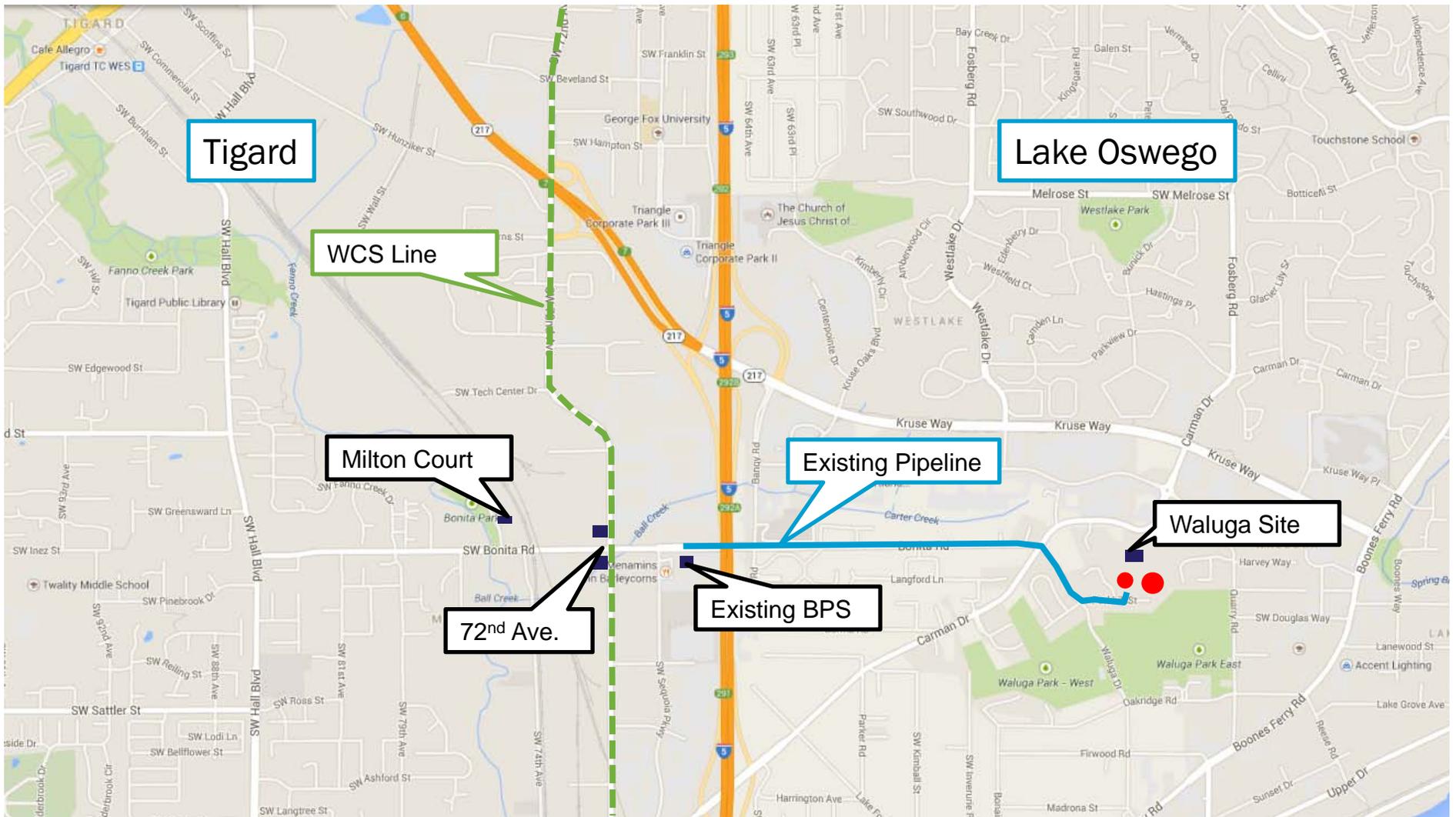


FIGURE 3.2  
HYDRANT TEST LOCATIONS  
WATER SYSTEM MASTER PLAN  
CITY OF TIGARD

# Pump Station Siting Alternatives

- Siting the dual pump station design criteria
  - Utilize existing and city or partnership property
  - Utilize existing pipe/distribution system
  - Close proximity to Washington County Supply Line
  - Provide emergency supply to LO via gravity.
- Four major locations selected
  - Existing BPS site
  - 72<sup>nd</sup>
  - WR2
  - Milton Court

# Pump Station Siting Alternatives

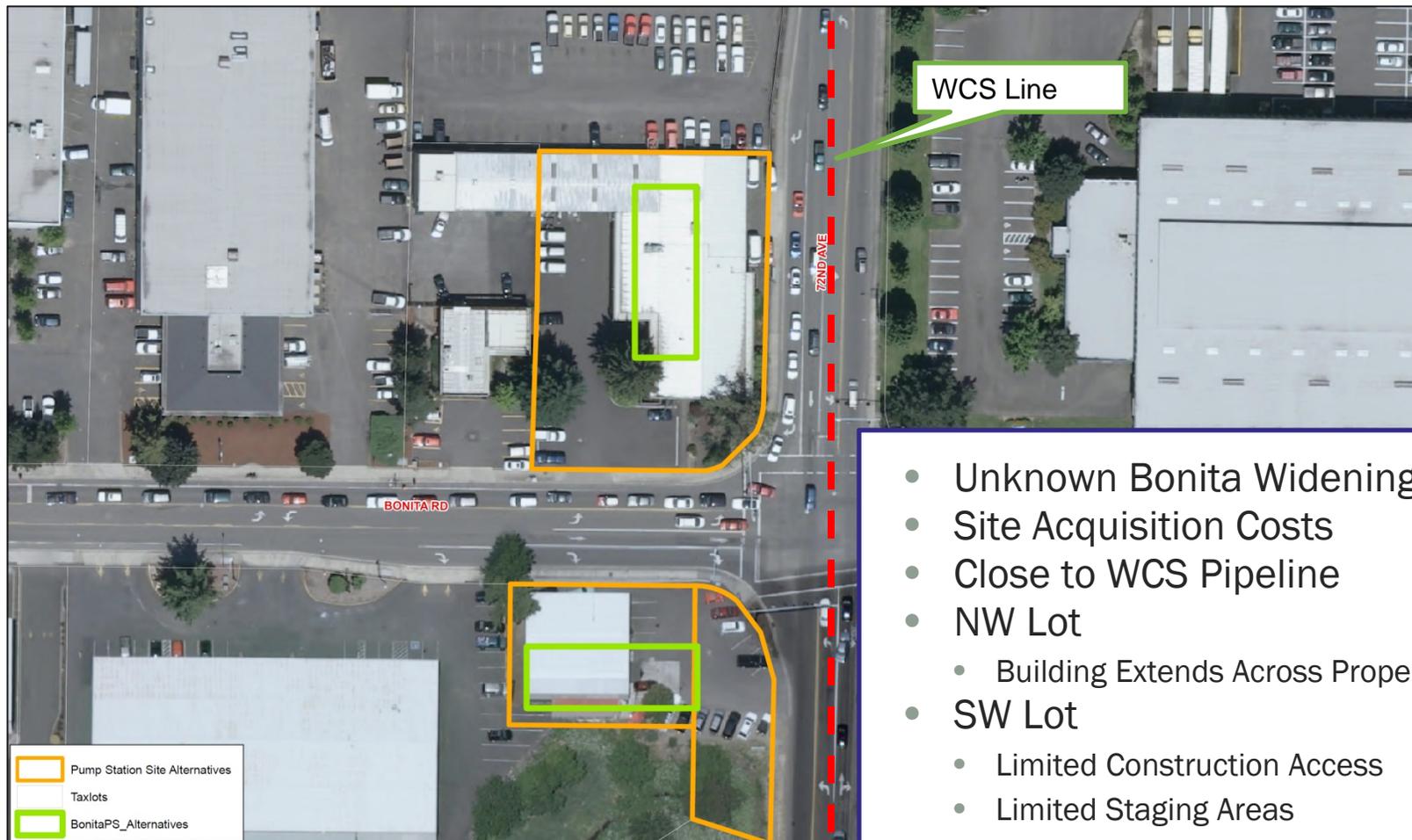


# Siting Alternatives – Existing Site

- Unknown Bonita widening impacts
- ROW/Easement uncertainty
- Setback uncertainty
- Construction access and parking
- Limited Staging Areas
- Site Grading/Slope
- Overhead Power Conflicts

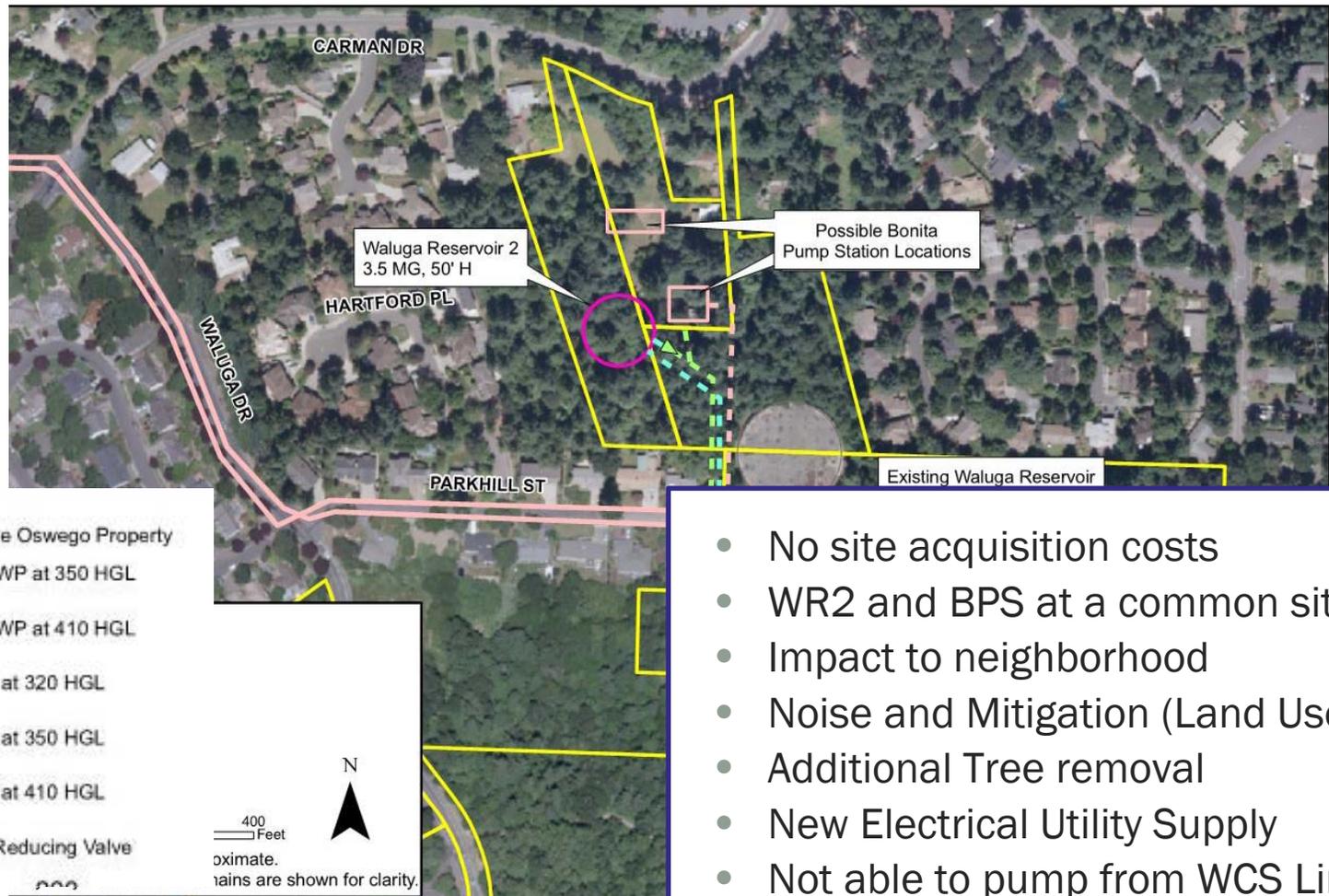


# Siting Alternatives – 72<sup>nd</sup> Locations



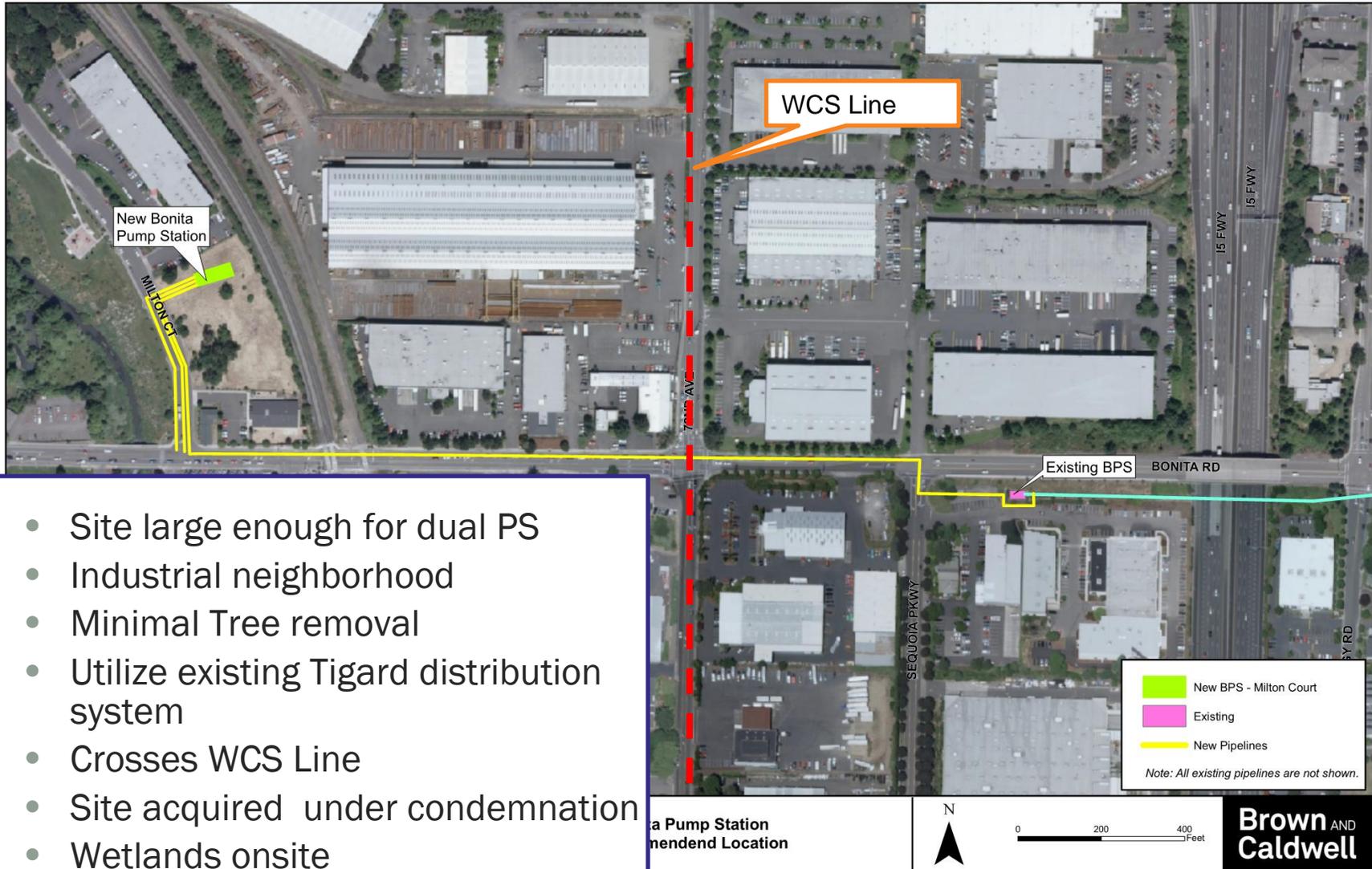
- Unknown Bonita Widening Impacts
- Site Acquisition Costs
- Close to WCS Pipeline
- NW Lot
  - Building Extends Across Property Line
- SW Lot
  - Limited Construction Access
  - Limited Staging Areas
  - Setback and Stream Buffer Impacts

# Siting Alternatives – at Waluga



- No site acquisition costs
- WR2 and BPS at a common site
- Impact to neighborhood
- Noise and Mitigation (Land Use)
- Additional Tree removal
- New Electrical Utility Supply
- Not able to pump from WCS Line

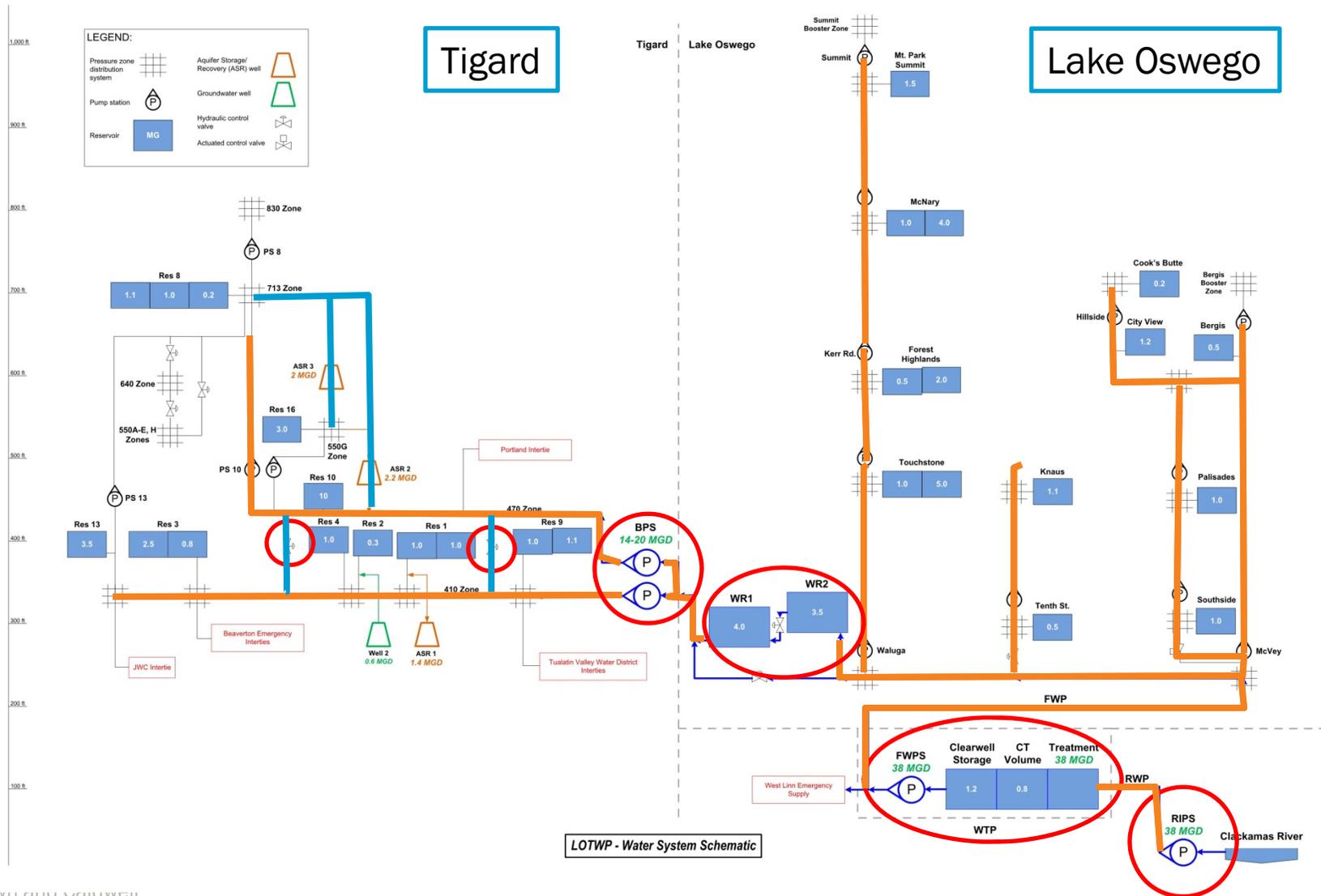
# Siting Alternatives – at Milton Court



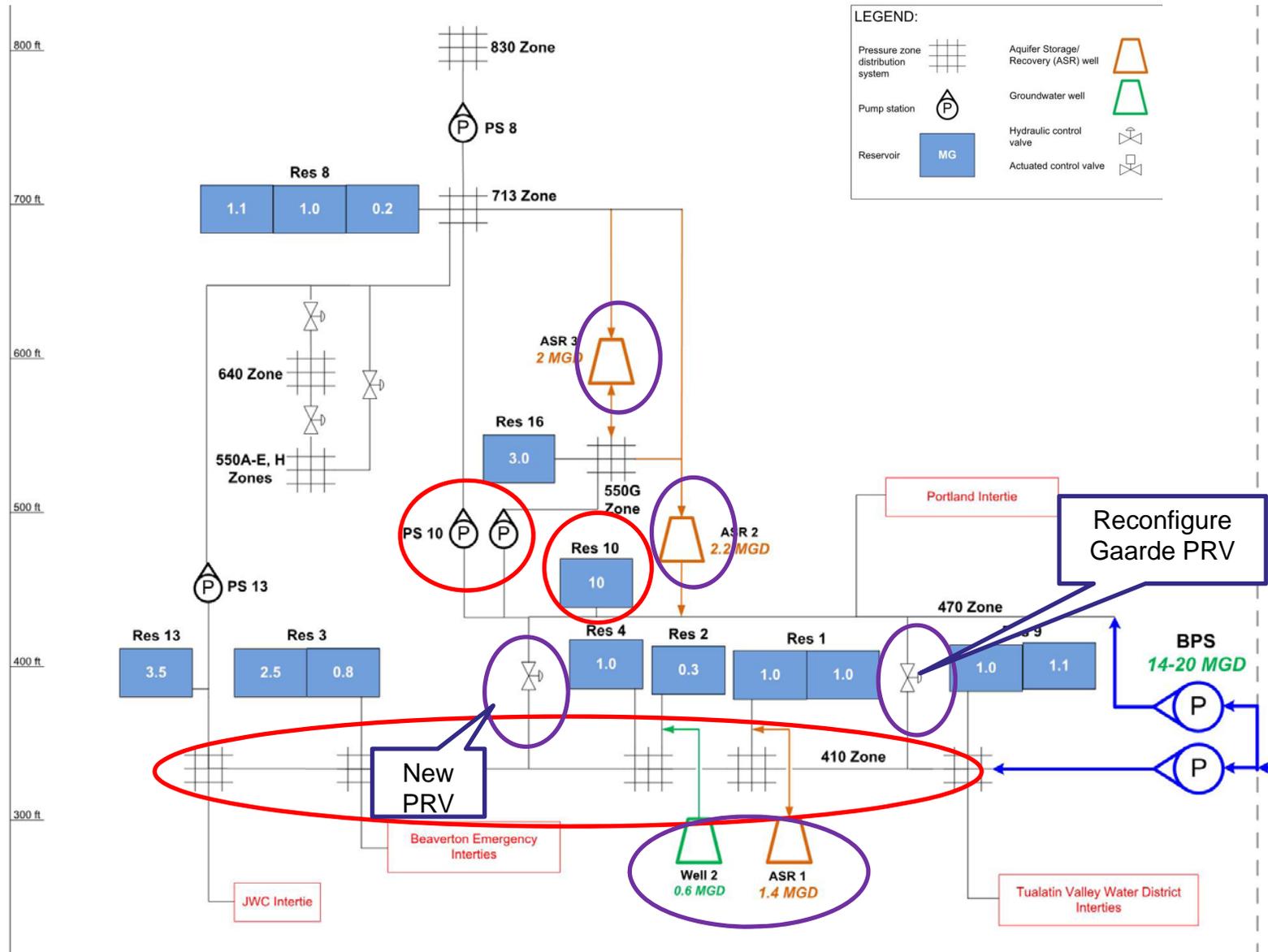
- Site large enough for dual PS
- Industrial neighborhood
- Minimal Tree removal
- Utilize existing Tigard distribution system
- Crosses WCS Line
- Site acquired under condemnation
- Wetlands onsite

B

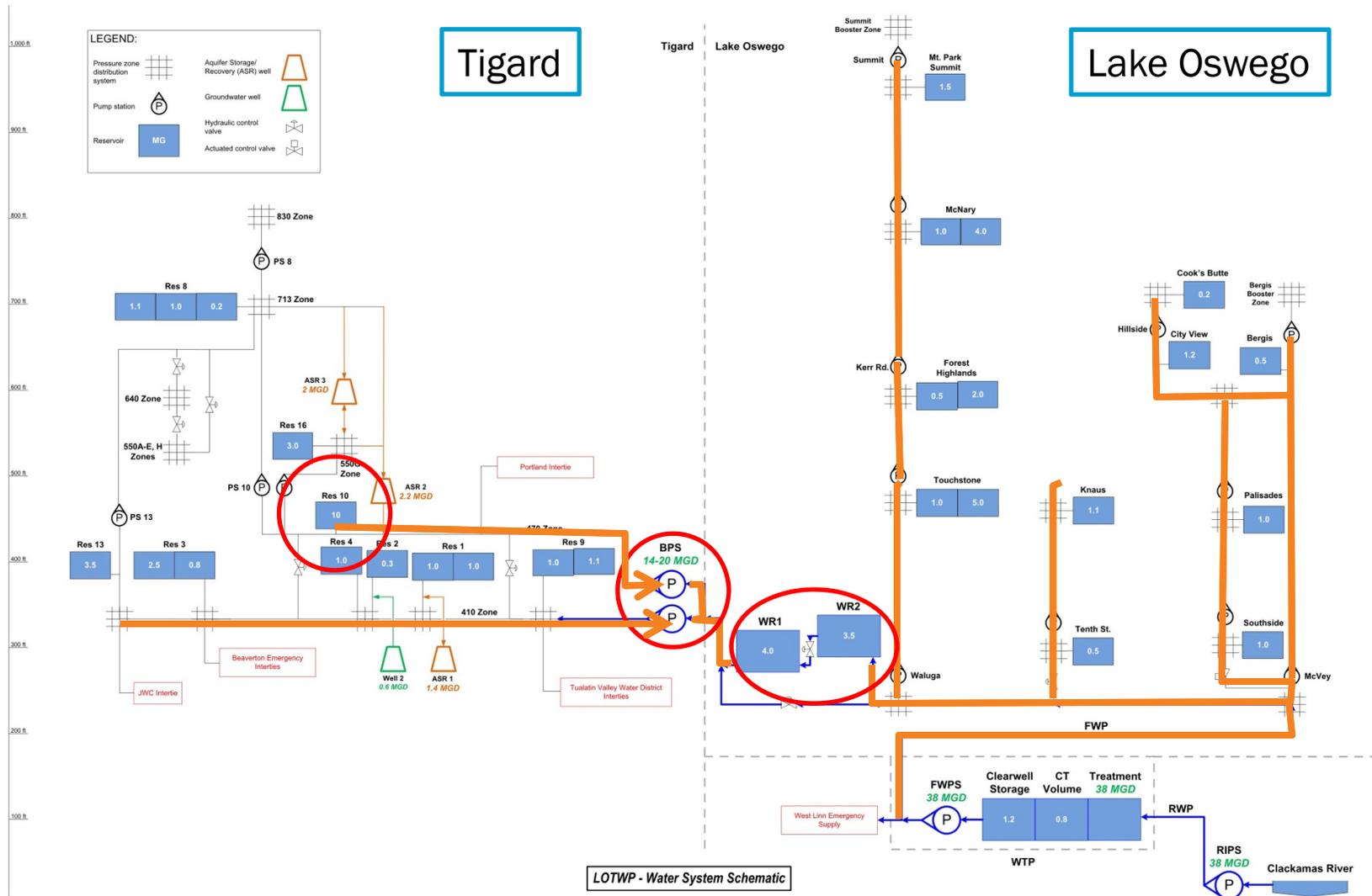
# Hydraulic Integration – Normal Operation



# Hydraulic Integration- Normal Operation



# Hydraulic Integration - Emergency Operation



# System Pumping Flexibility

- 2016 Demands = 14 MGD
  - 410 zone = 9 MGD
  - 470 and upper zones = 5 MGD
  
- Buildout Demands = 20 MGD
  - 410 zone = 14.4 MGD
  - 470 and upper zones = 5.5 MGD

# System Pumping Flexibility

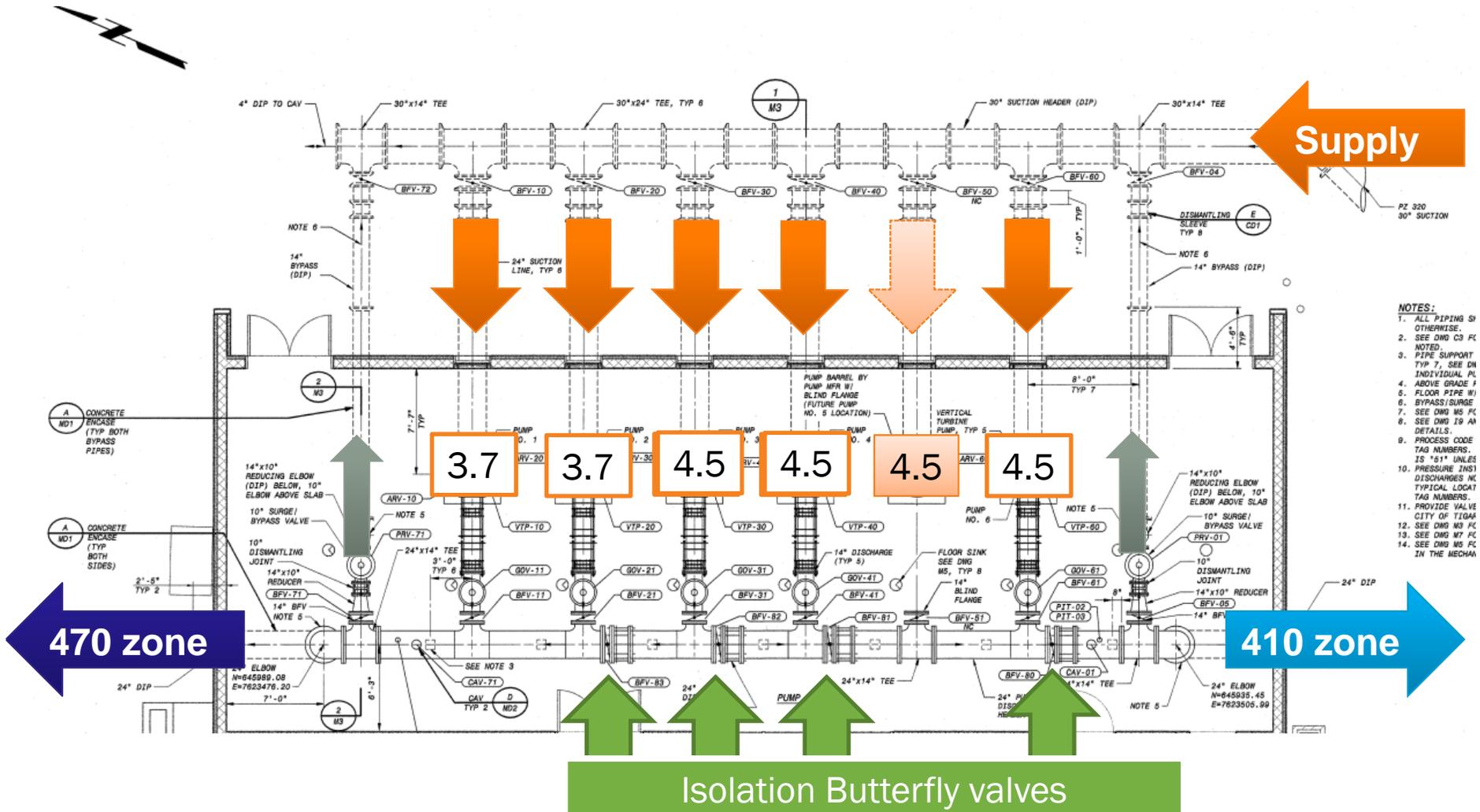
- Pumping Design:
  - Vertical turbine pumps with VFDs
  - Flexibility to pump to two zones and share redundant pump
    - 4 pumps (250hp) with two set points:
      - Set point one for 470 zone @ 2,550 gpm                      3.67 MGD
      - Set point two for 410 zone @ 3,130 gpm                      4.50 MGD
    - 1 pump @ 3,130 gpm (200hp) =                      4.50 MGD
    - 1 future pump @ 3,130 gpm (200hp) =                      4.50 MGD
- PRVs from 470 zone to 410 zone KEY TO DESIGN

# System Pumping Cost Savings

- Energy Trust of Oregon
  - Provides incentives to use energy saving equipment
  - Performs detailed life cycle cost analysis and compares constant speed and VFD pumping strategies
  - Makes recommendations for cost savings installations
  - Make incentive offer
- For BPS – ETO incentive letter included payment of 50% of VFD equipment and installation costs.



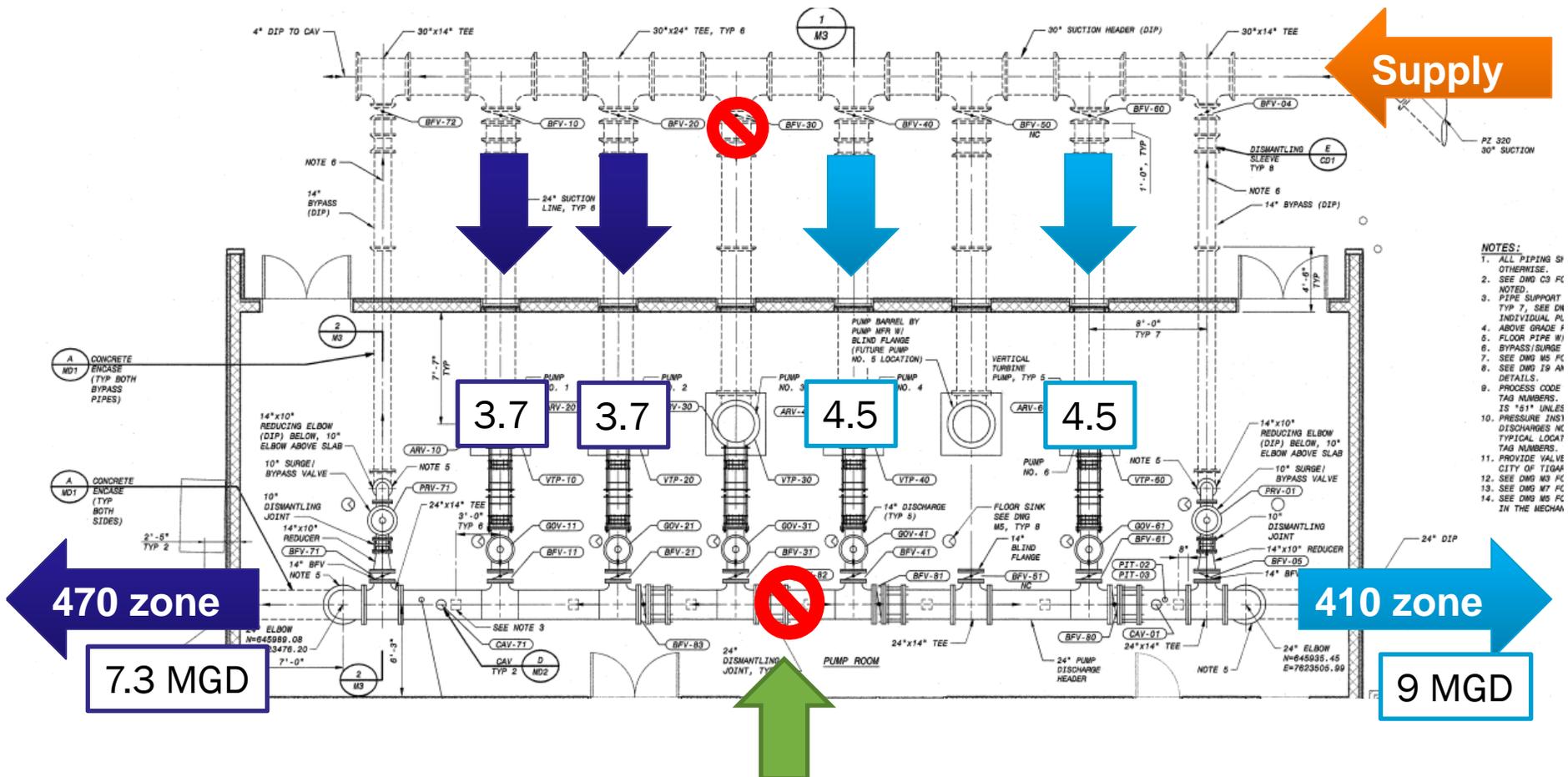
# System Pumping Flexibility



# System Pumping Flexibility

2016 Demands = 14 MGD (Option 1)

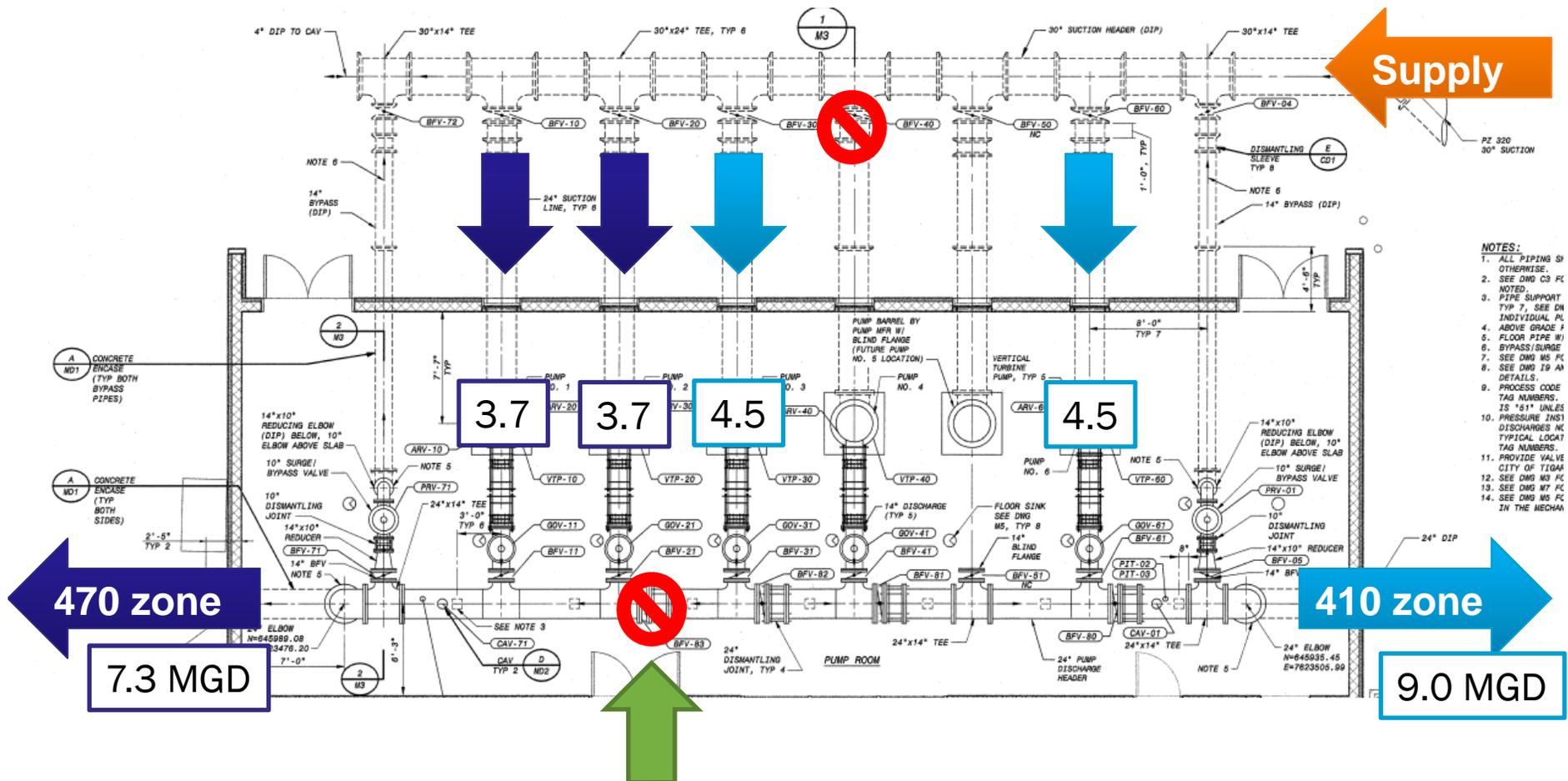
2/2 into the 410/470 zone with one pump out of service = 16.3 MG



# System Pumping Flexibility

2016 Demands = 14 MGD (Option 1)

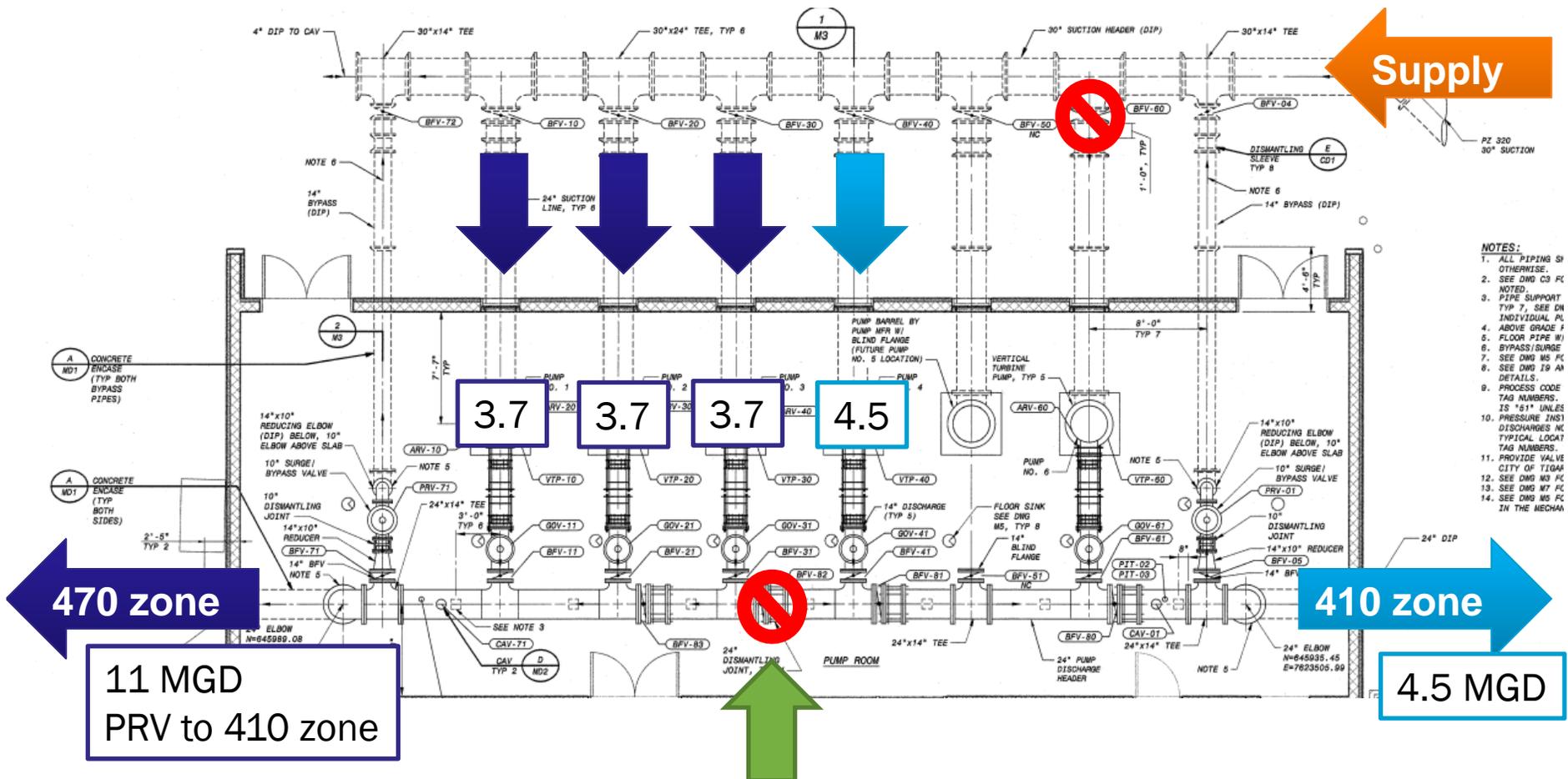
1/3 into the 410/470 zone with one pump out of service = 15.5 MGD



# System Pumping Flexibility

2016 Demands = 14 MGD (Option 2)

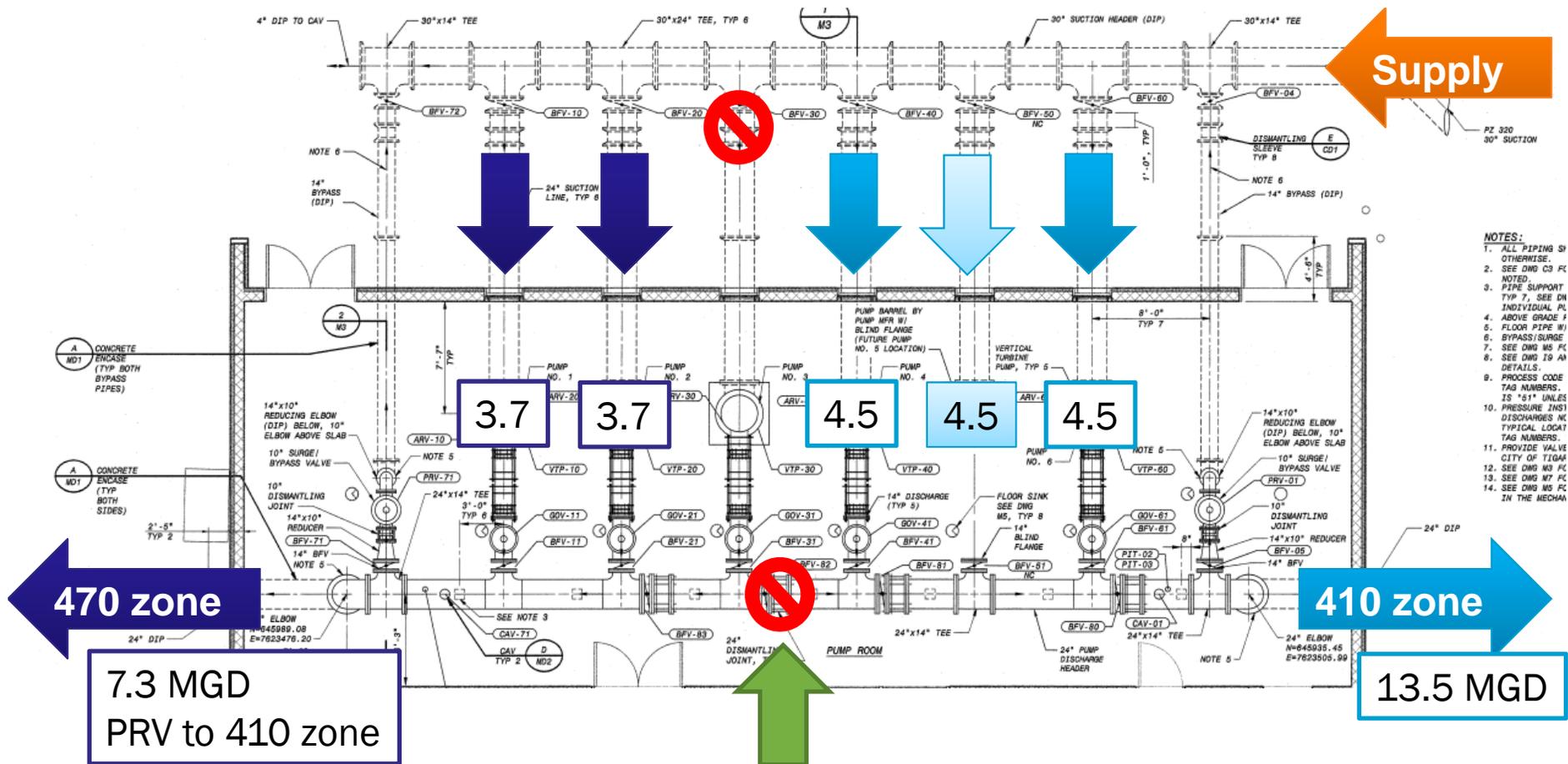
1/3 into the 410/470 zone with one pump out of service = 15.5 MGD



# System Pumping Flexibility

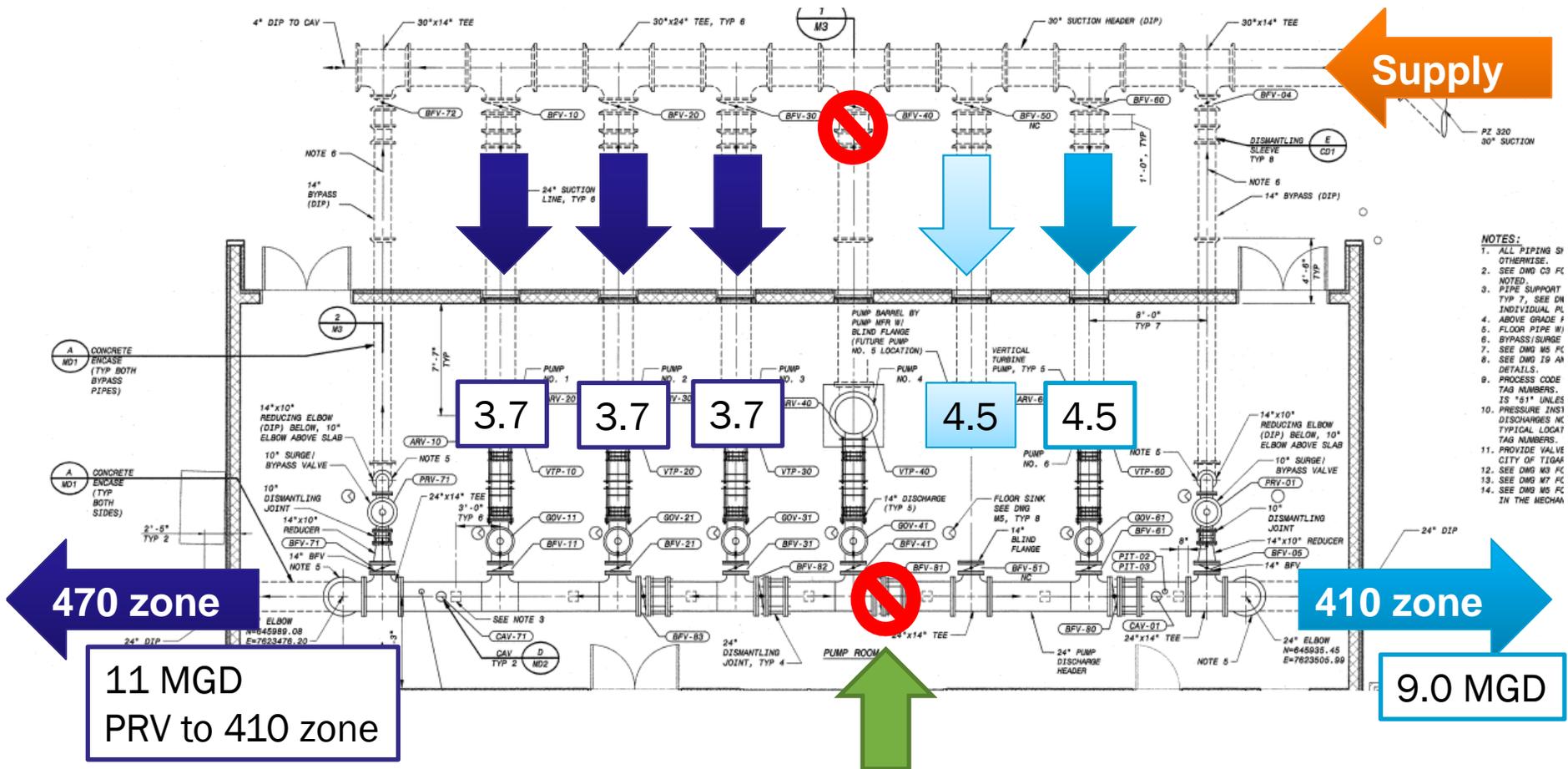
Buildout Demands = 20 MGD (Option 1)

3/2 into the 410/470 zone with one pump out of service = 20.8 MG



# System Pumping Flexibility

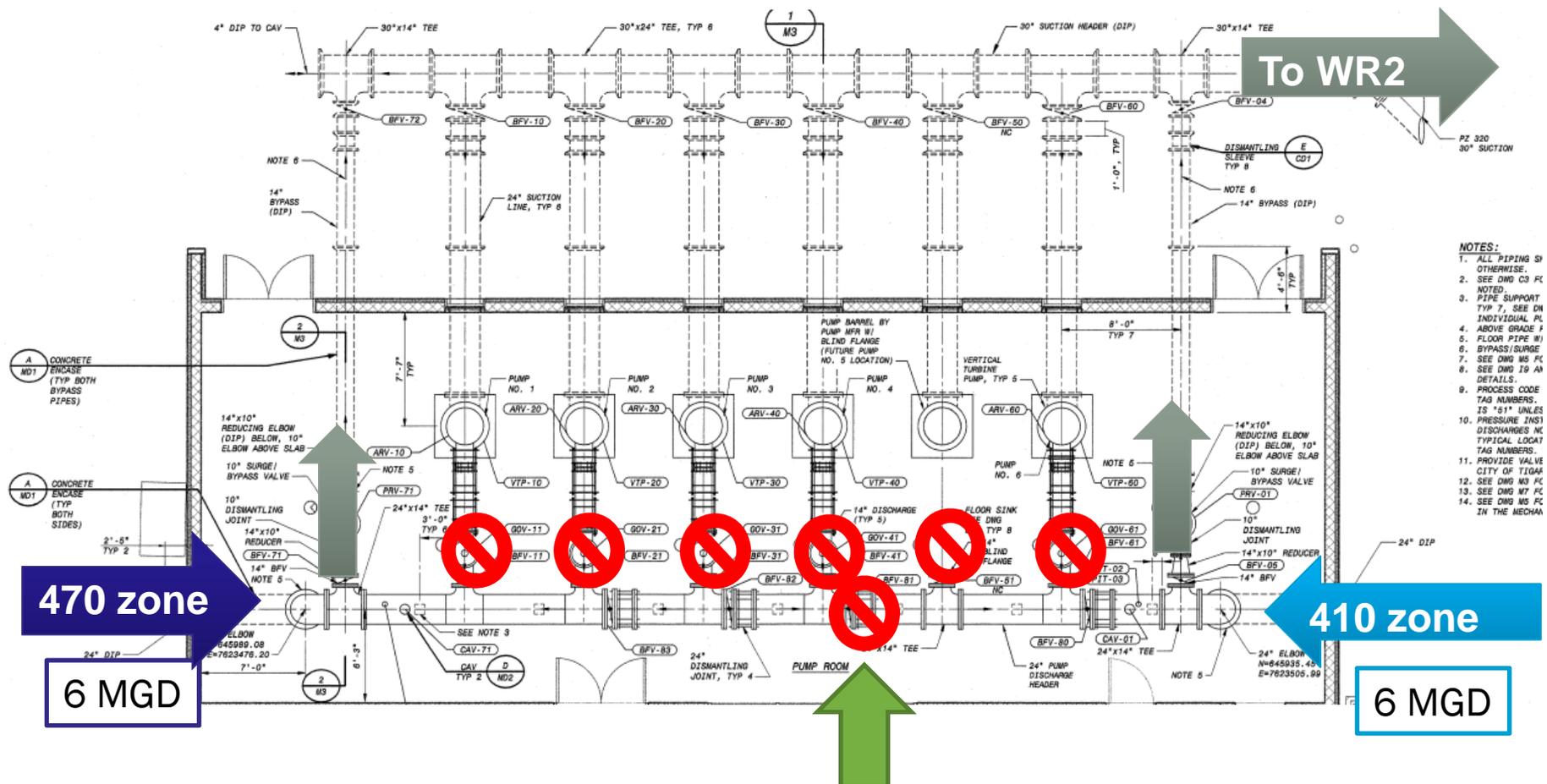
- Buildout Demands = 20 MGD (Option 2)
- 2/3 into the 410/470 zone with one pump out of service = 20 MG



# System Pumping Flexibility

## Emergency Operation

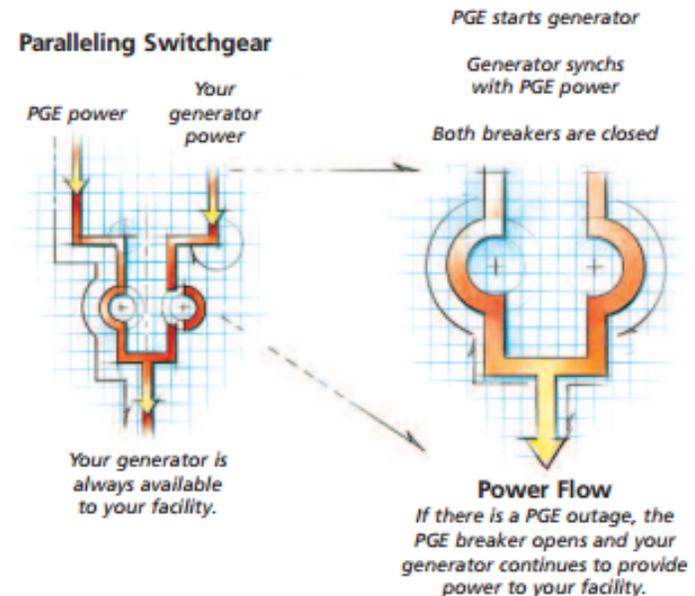
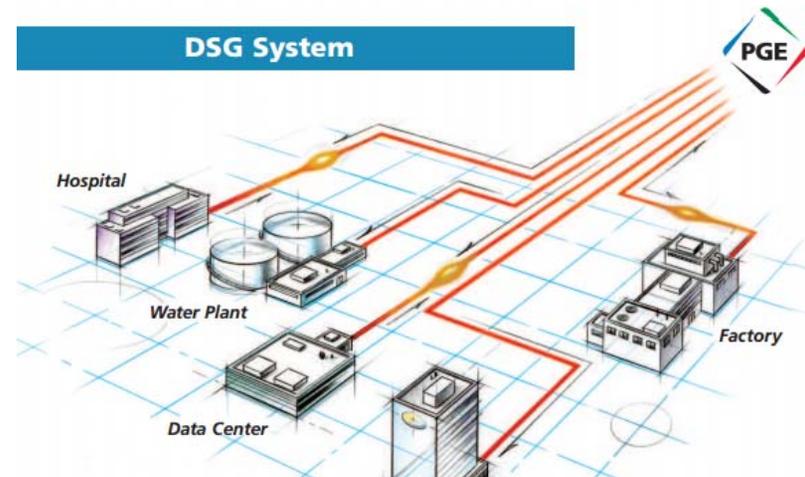
Gravity feed from Tigard to Waluga Reservoir 2 using bypass





# System Pumping Energy Consumption

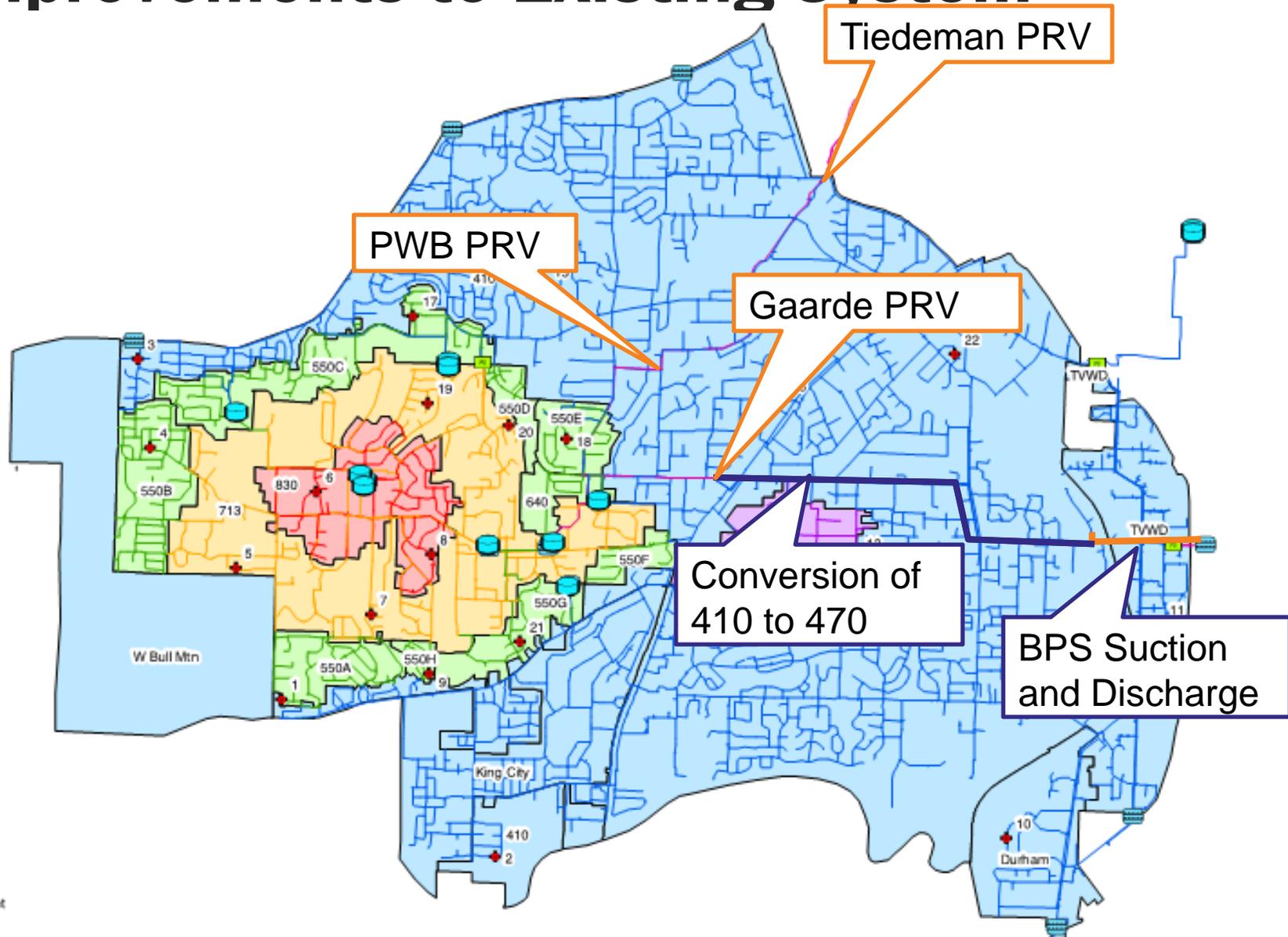
- BPS:
  - Power half of pumps with standby generation
  - (2) 250 hp and (1) 200 hp pumps
  - 13.5 MGD
- Portland General Electric Dispatchable Power Program for standby generators:
  - Provides funding to upgrade switchgear
  - Assumes most routine O&M costs
  - Pays for fuel
  - Pays for additional fuel storage
  - Provides monthly testing under high loads
- Tigard land use did not consider dispatchable power as an emergency



# Improvements to existing system

- Improvements included in LOTWP/BPS project
  - New pipelines to feed BPS
  - New pipeline for discharge into existing mains
  - Conversion of existing 24" to BPS suction
- Improvements required, but not included in LOTWP
  - Conversion of existing mains to different zones
  - Conversion of Gaarde PRV
  - New PWB PRV
  - Opening normally closed isolation valves
  - Ideal existing Tiedeman PRV

# Improvements to Existing System



# Summary

- It's okay to question previous Master Plans...things change.
- Partner with utility staff...they understand their system better than you do
- Think outside of the box..... but within land use requirements

# Questions or discussion.

