

*murraysmith*



# Reservoir Type and Style Selection Help Create a New Pressure Zone

Presented by: Justin Ford, PE

# Agenda





# Introduction/ Background

# Introduction

- Upper Mountain View Pressure Zone (UMVPZ)
- Team members



Owner



Design Engineer



System Modeling, Structural, and  
Electrical Engineering



Environmental and  
Habitat Management

# Introduction



Owner



Design Engineer

# Introduction




System Modeling, Structural,  
and Electrical Engineering

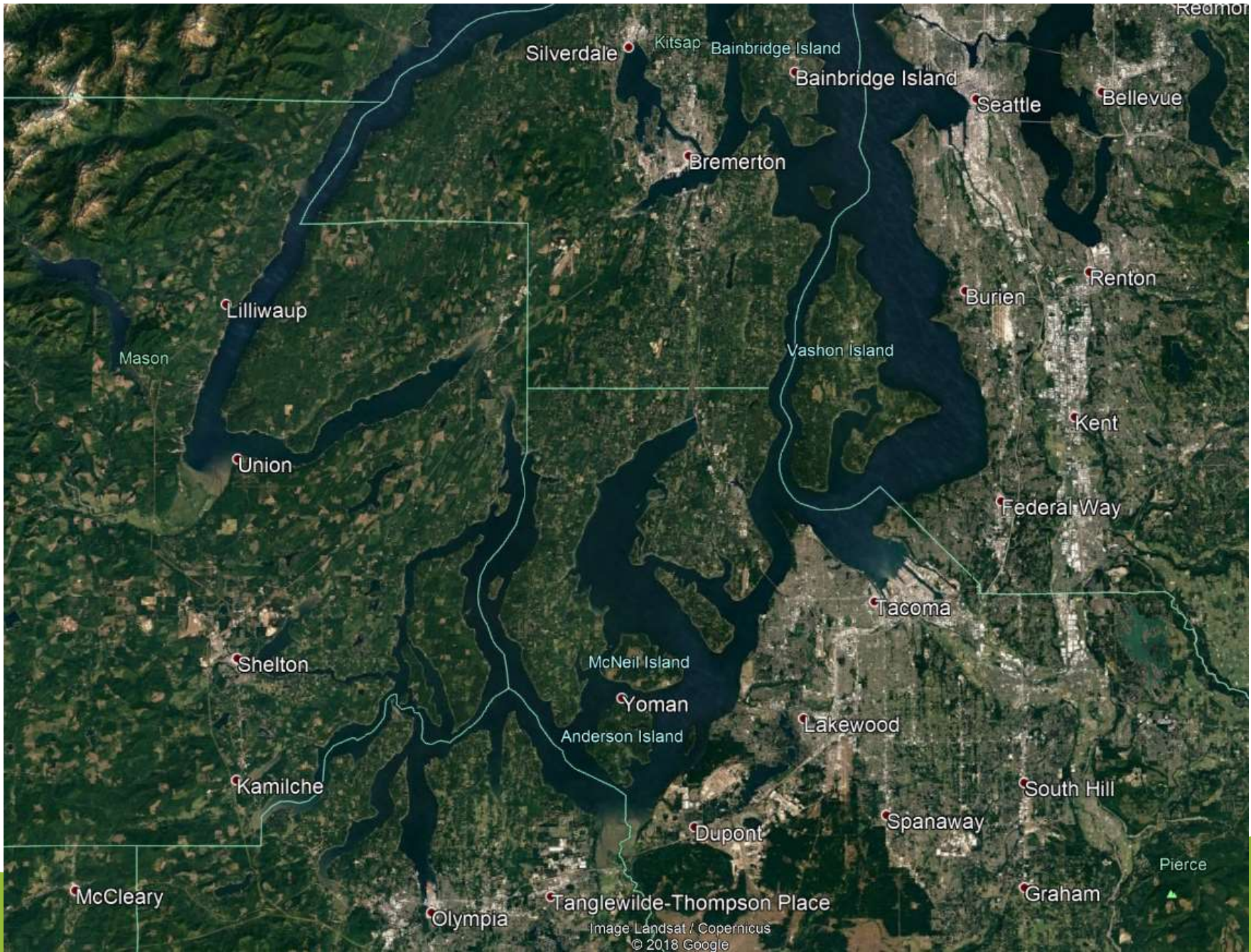


Environmental and  
Habitat Management

# Introduction

- Take-aways
    - Water systems always evolve – proper planning is key
    - Overcoming obstacles – environmental, seismic, schedule
    - Cost effective solutions
- 
- A decorative graphic at the bottom of the slide, consisting of a solid green area with a wavy, irregular top edge that resembles a stylized horizon or a landscape feature.





Silverdale

Kitsap

Bainbridge Island

Bainbridge Island

Seattle

Bellevue

Bremerton

Lilliwaup

Mason

Union

Vashon Island

Burien

Renton

Kent

Federal Way

Tacoma

Shelton

McNeil Island

Yoman

Anderson Island

Lakewood

Kamilche

Dupont

Spanaway

South Hill

McCleary

Olympia

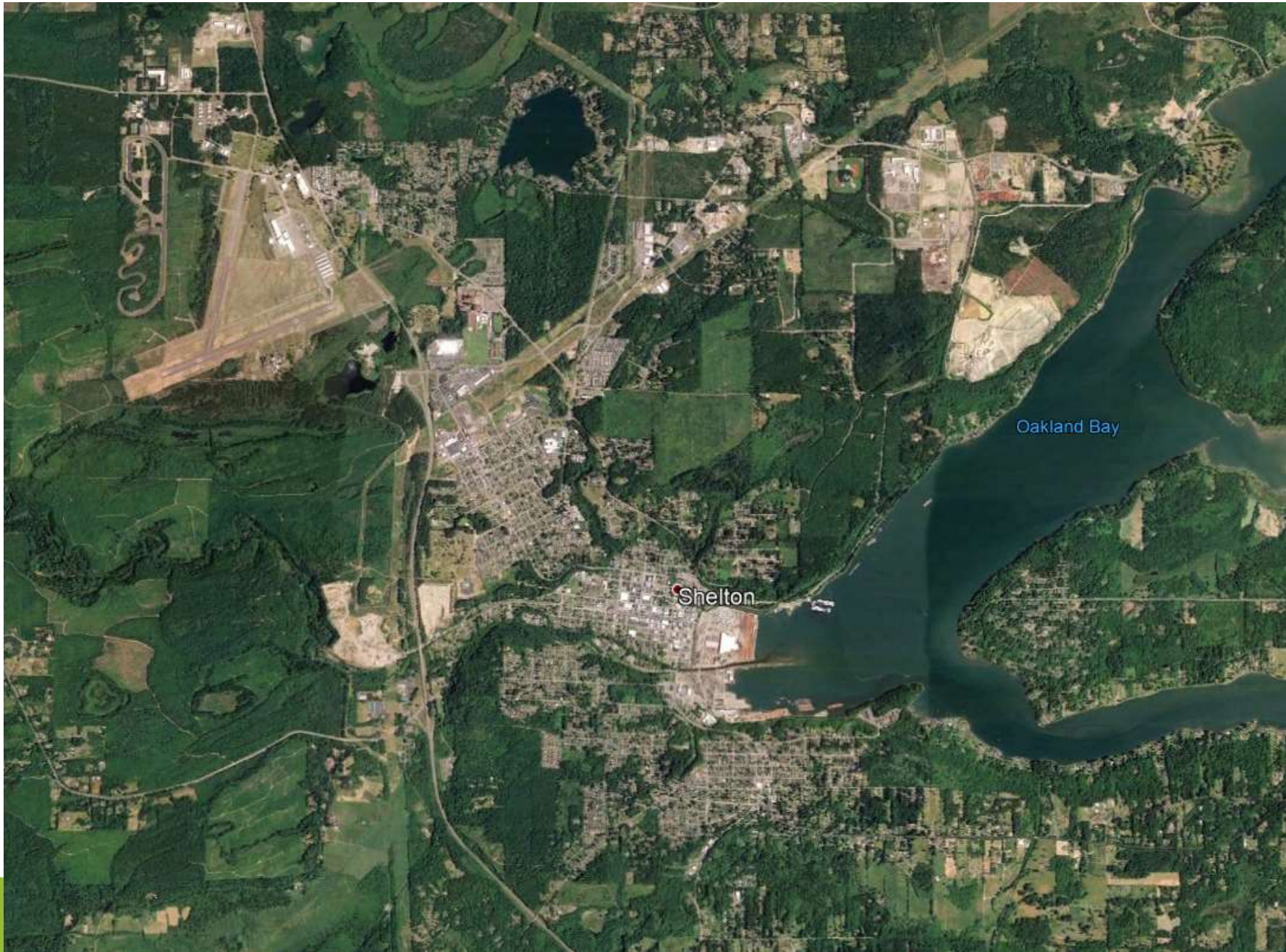
Tanglewilde-Thompson Place

Graham

Pierce

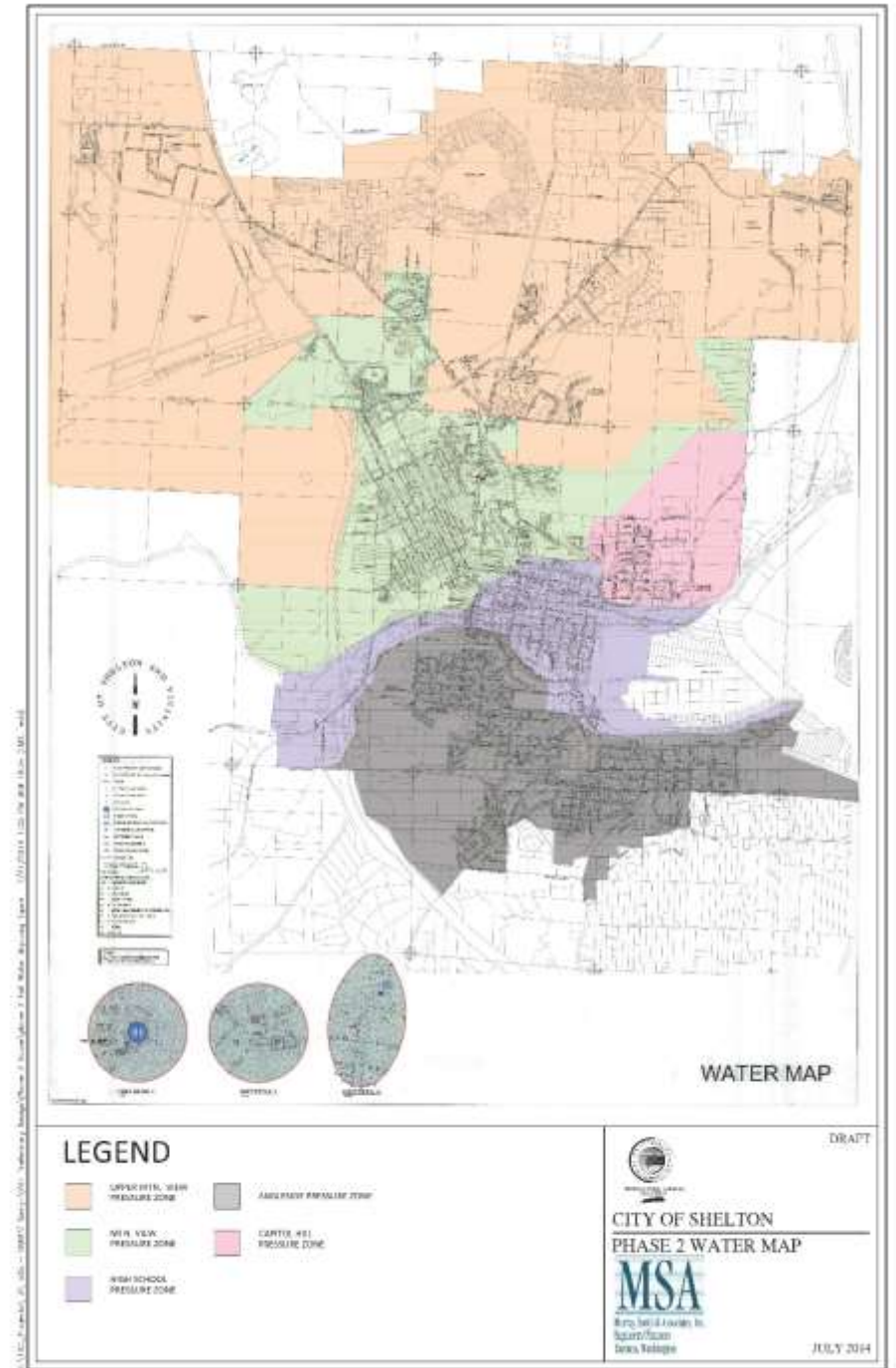
Image Landsat / Copernicus © 2018 Google





# Background

- Timeline
  - 2010: Comprehensive Water System Plan
  - 2013: Basis of Design Report
  - 2014: Prelim/Final Design and Bidding
  - 2015/16: Construction of Phase 1





# Background

- System Information

- Populations

- 2010 Census – approximately 9,800 people
    - Growth estimates include 10,000 people in 2016, continued growth and City expansion

- Demands

- 2029 Projected Flows – Maximum Daily Demand (MDD) of approximately 3,500 gpm
    - Additional large users contribute MDD of almost 300 gpm – almost 10%!

# Background

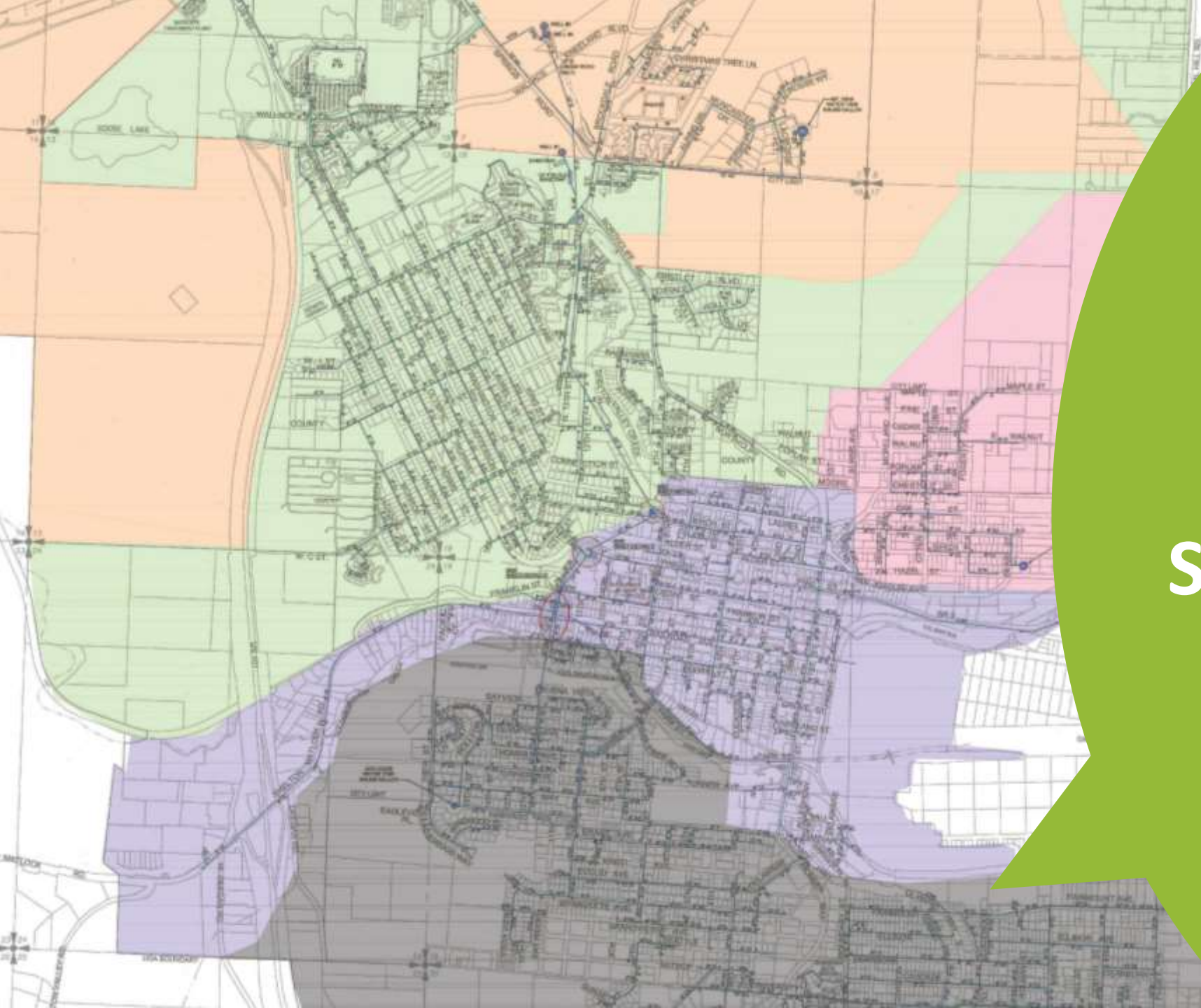
- System Information

- Pressure Zones – City serves five distinct zones, with PRV connections between
- Sources
  - Wells 1, 3, and 4 (1,200 to 1,500 gpm)
  - Historical Shelton Springs source – now only emergency supply
- Pump Stations – booster stations serve various zones (500 to 2,000 gpm)

# Background

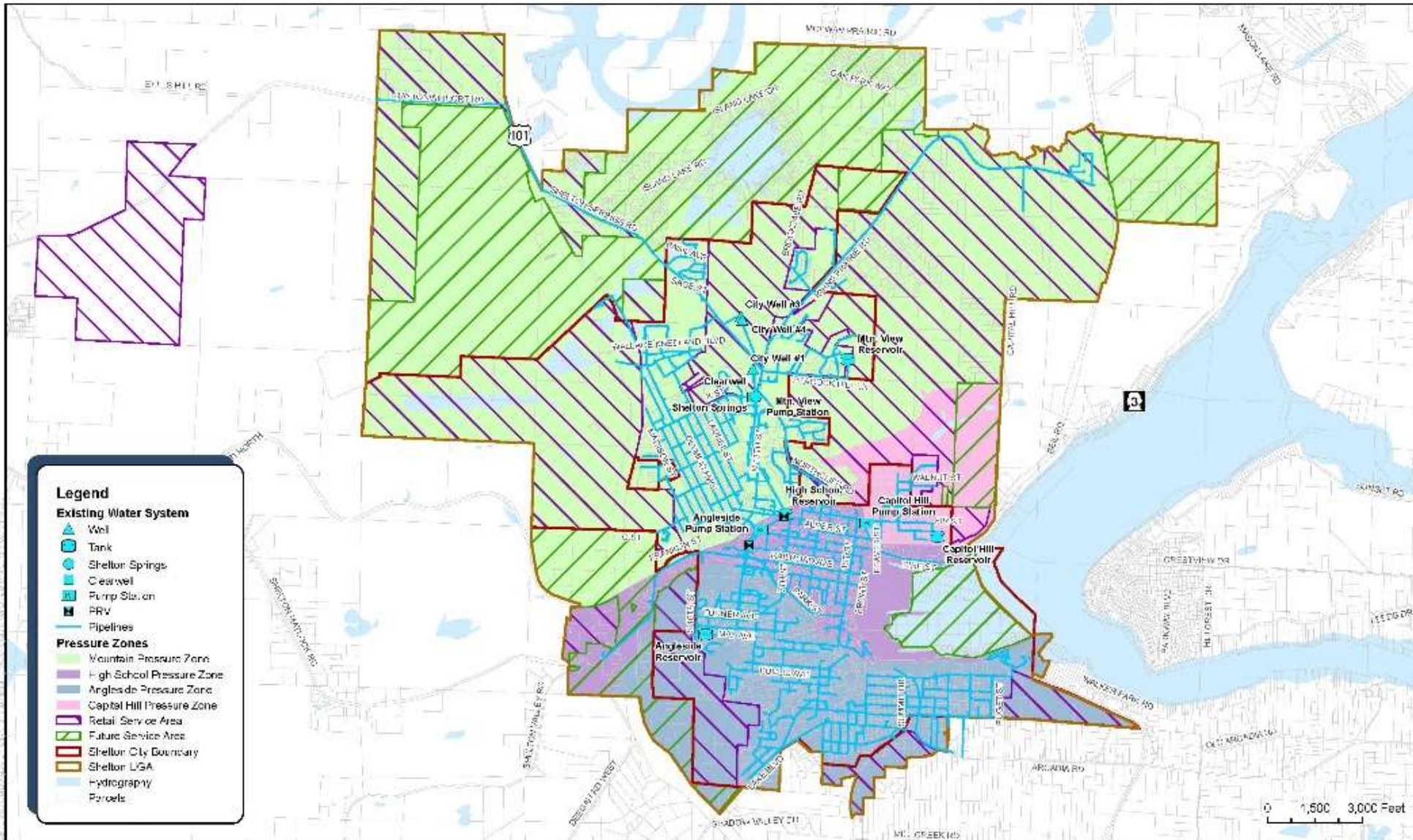
- System Information
  - Storage Facilities – four reservoirs, all ground level, mostly standpipes
    - The UMVPZ project, in multiple phases, will add 1.75 MG of storage
      - 750K gallons elevated
      - 1 MG ground level
- Total project cost estimate is \$16M (Phase 1 elevated tank, \$5M)





# System Planning





# System Planning

- New large users
  - Washington Corrections Center
  - Washington State Patrol Academy
  - Port of Shelton – John’s Prairie
  - Shelton Hills and other Residential
- Creation of UMVPZ (HGL 440')
  - Meet storage deficiencies
  - Increase pressures in pre-existing MVPZ (HGL 373' – 29 psi less)
  - Well modification needed to utilize existing source for higher zone
  - Additional piping to serve more geography out to the City’s URA
- Schedule was a critical driver for WCC and WSPA – needed water as quickly as possible!

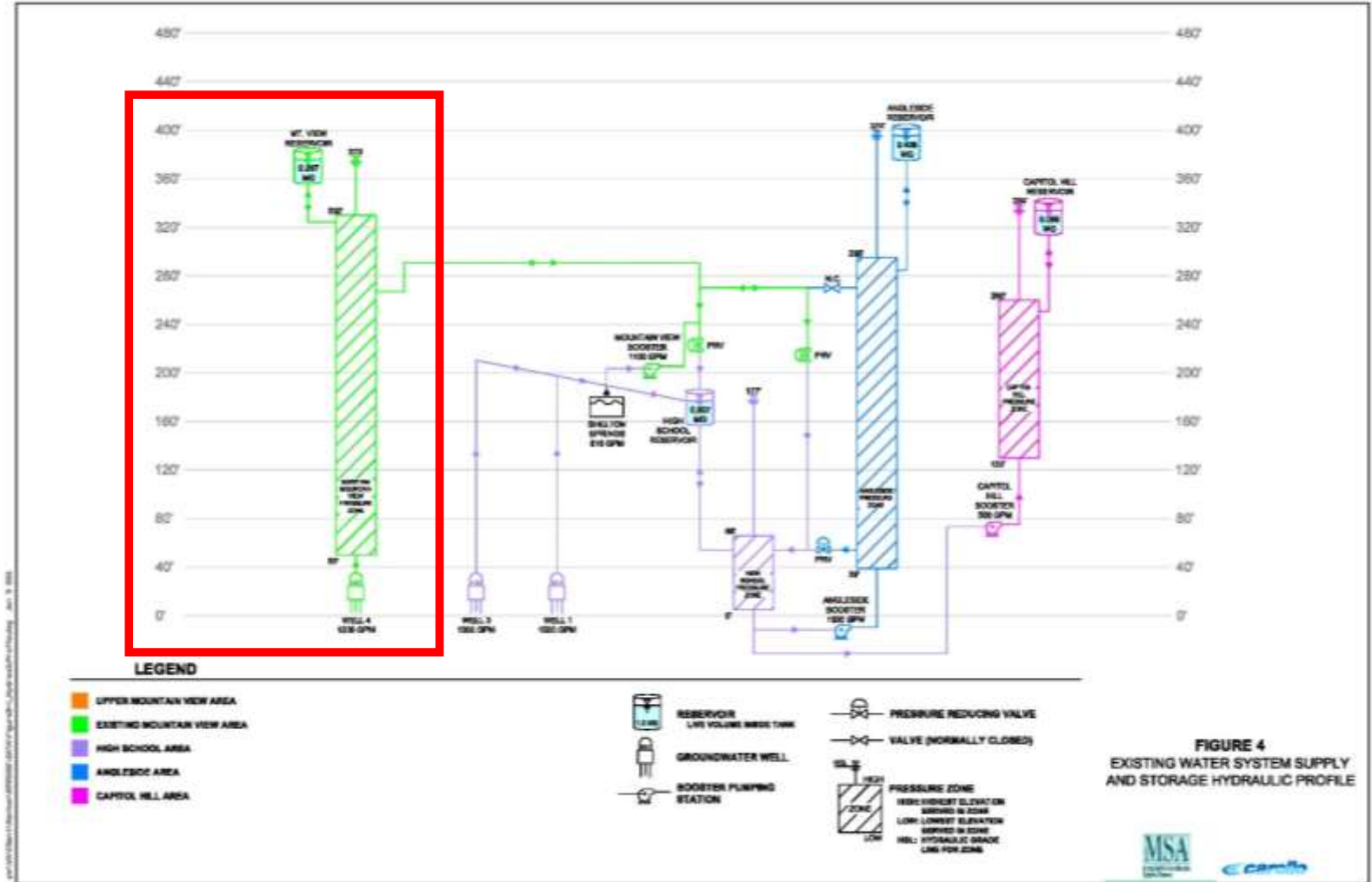
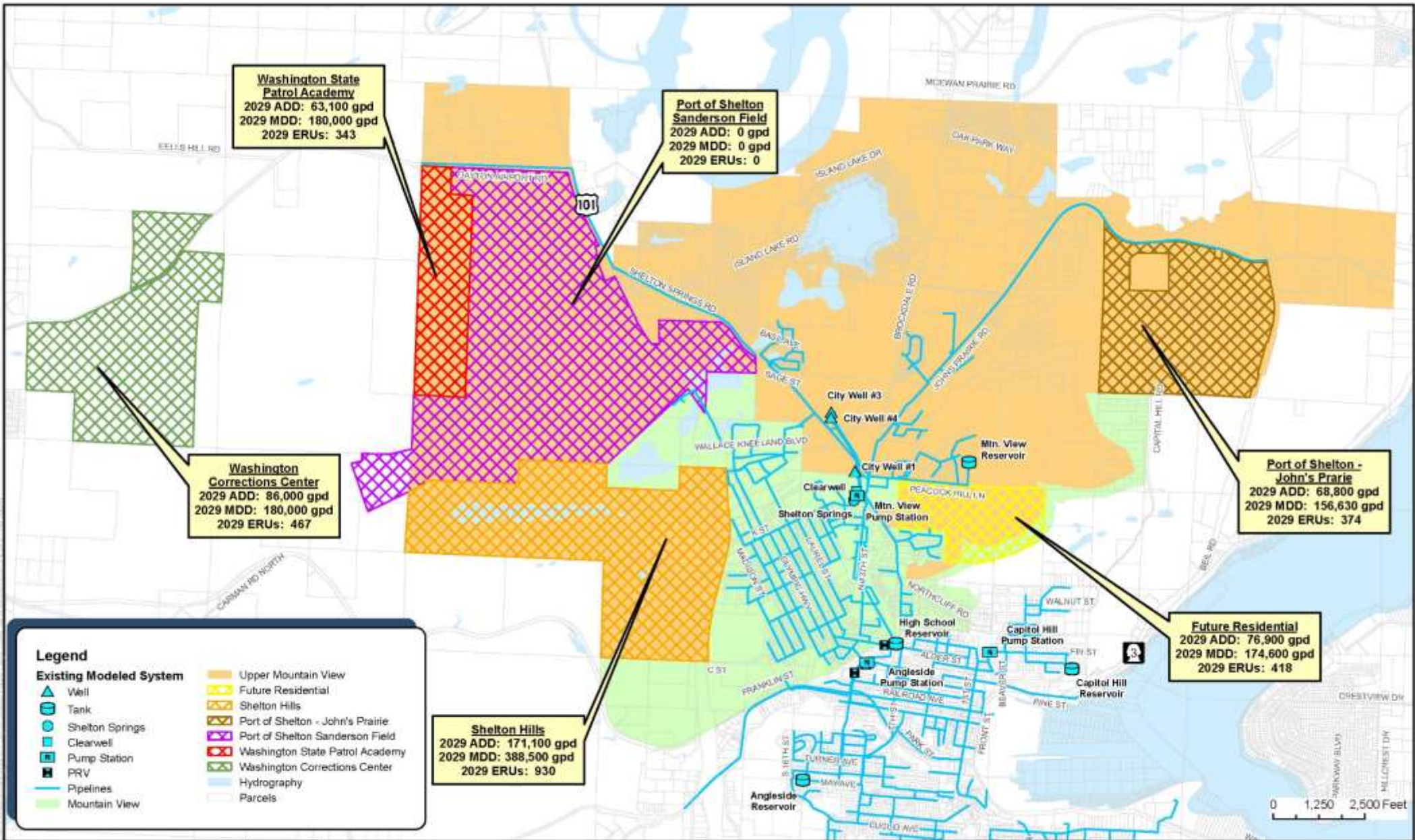


FIGURE 4  
EXISTING WATER SYSTEM SUPPLY  
AND STORAGE HYDRAULIC PROFILE







# Siting and Reservoir Style Selection



# Reservoir Site Selection

- Alternative 1 – on hill, lower overflow height req'd
  - Not high enough, needed a short elevated tank
  - Seismic challenges, bigger support system required
  - More piping to connect to existing system
- Alternative 2 – lower elevation, elevated storage
  - Seismic benefits, greater flexibility
  - Reduced access road and piping length
  - Land acquisition required
  - Environmental challenges

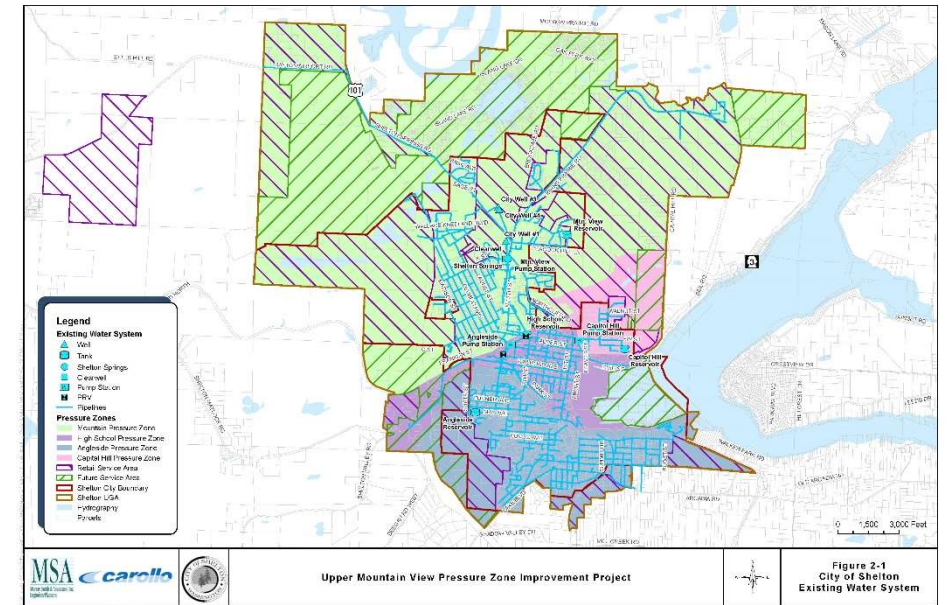


Figure 2-1  
City of Shelton  
Existing Water System



Figure 1



City of Shelton, Washington  
Reservoir Siting Analysis

Conceptual Site Plan - Site  
Option No. 1  
January 2014

**DRAFT**



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13-1505.201



**VICINITY MAP**  
SCALE: 1"=1,000'



SOURCE: BASEMAPPING - MASON COUNTY (NOV 2013), AERIAL PHOTO - ESRI-BING MAPS (2011).

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Figure 2



City of Shelton, Washington  
Reservoir Siting Analysis

Conceptual Site Plan - Site  
Option No. 3  
January 2014

**DRAFT**

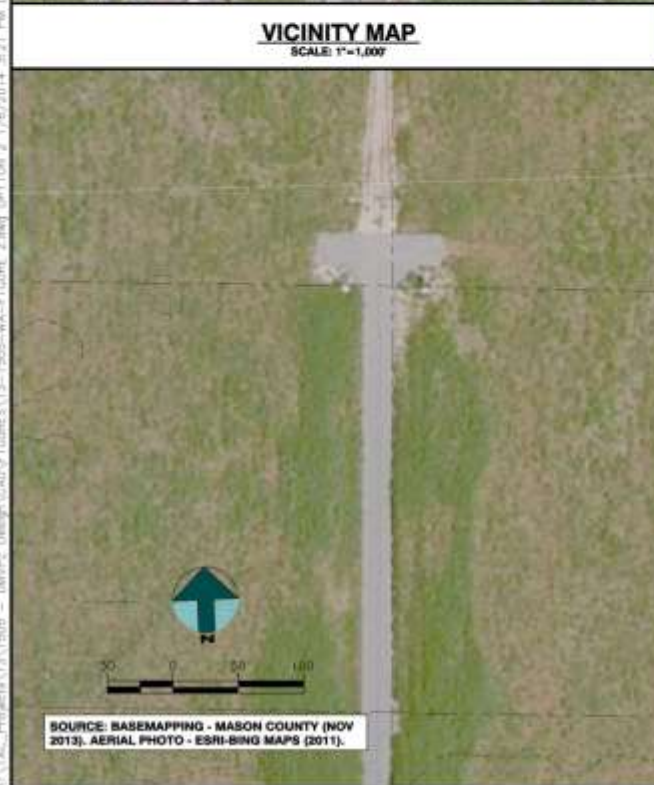


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**VICINITY MAP**  
SCALE: 1"=1,000'



SOURCE: BASEMAPPING - MASON COUNTY (NOV 2013). AERIAL PHOTO - ESRI-BING MAPS (2011).

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Figure 4



City of Shelton, Washington  
Reservoir Siting Analysis

Conceptual Site Plan - Site  
Option No. 3  
January 2014

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**VICINITY MAP**  
SCALE: 1"=1,000'

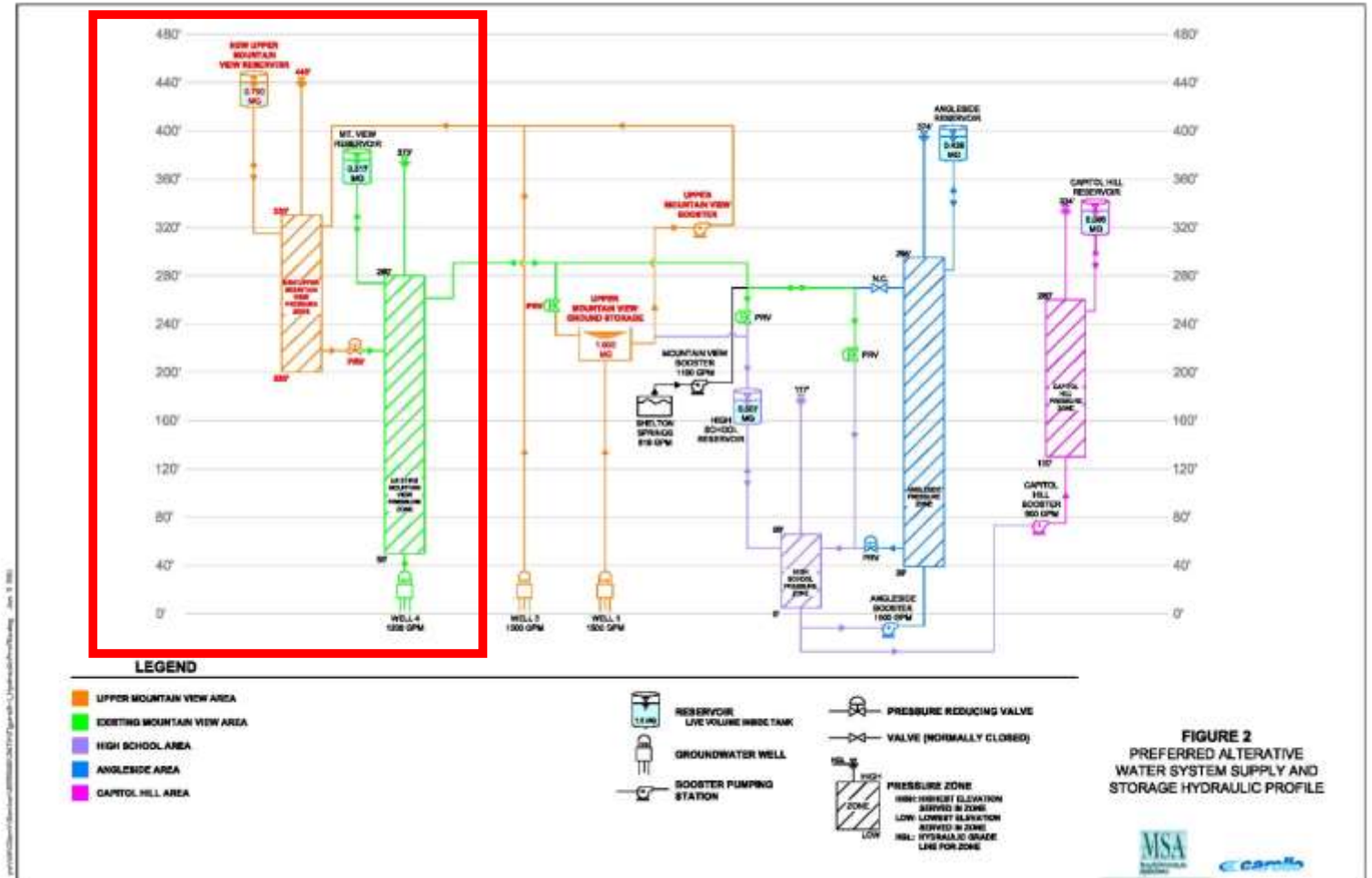


SOURCE: BASEMAPPING - MASON COUNTY (NOV 2013). AERIAL PHOTO - ESRI-BING MAPS (2011).

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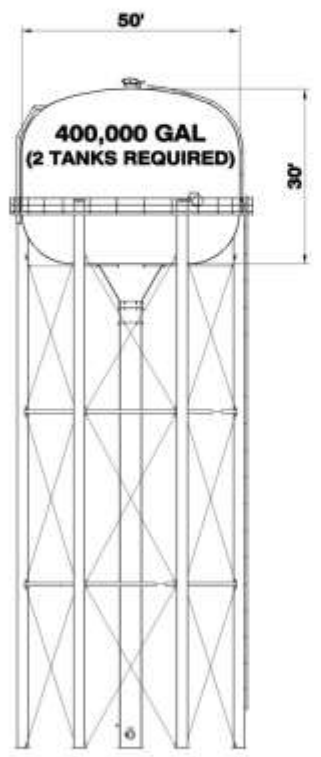
# Reservoir Style Selection

- Site alternative 2 selected
  - One reservoir or two?
- Seismic considerations
  - Improved geotechnical conditions
  - Enough height for structural flexibility

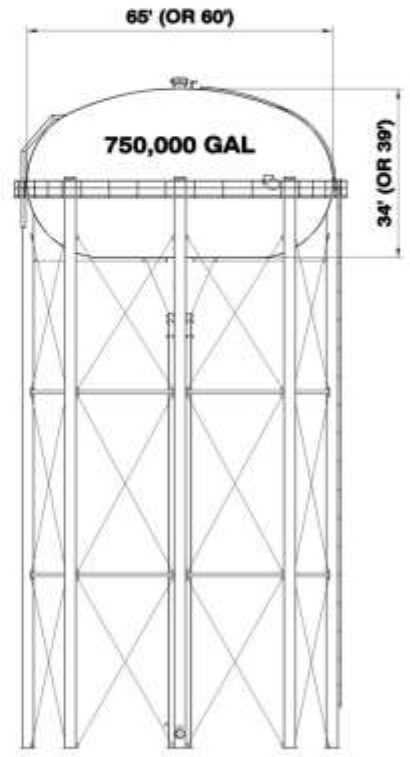




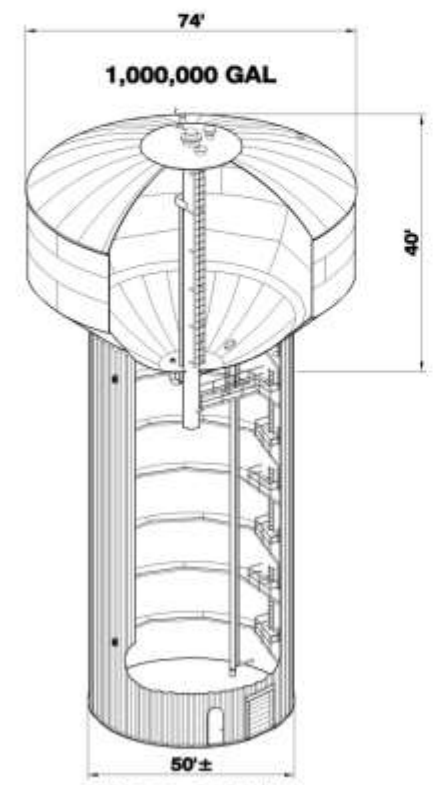
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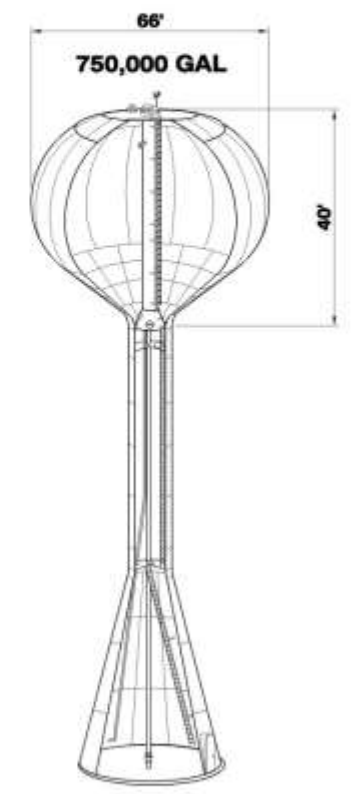
**MULTI-COLUMN TORO-ELLIPSOIDAL**  
**(PHOENIX FABRICATORS AND ERECTORS)**



**MULTI-COLUMN TORO-SPHERICAL**  
**(CALDWELL TANKS)**



**FLUTED-COLUMN HYDROPILLAR**  
**(CB&I)**



**PEDESHERE (SPHEROID)**  
**(MULTIPLE, BUT MORE EXPENSIVE)**

NOTE: DRAWINGS NOT DRAWN TO SCALE.



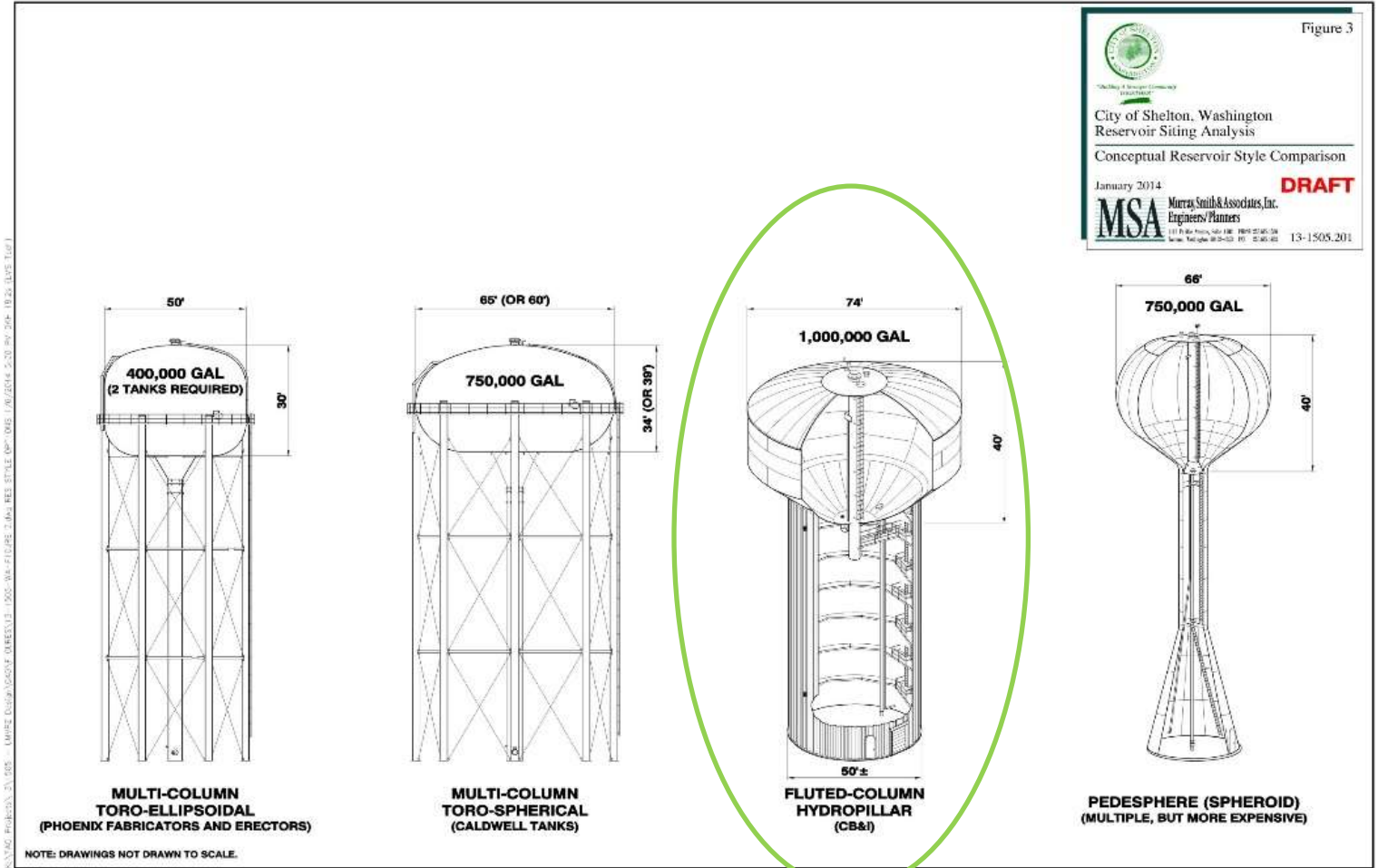
Figure 3

City of Shelton, Washington  
Reservoir Siting Analysis  
Conceptual Reservoir Style Comparison

January 2014 **DRAFT**  
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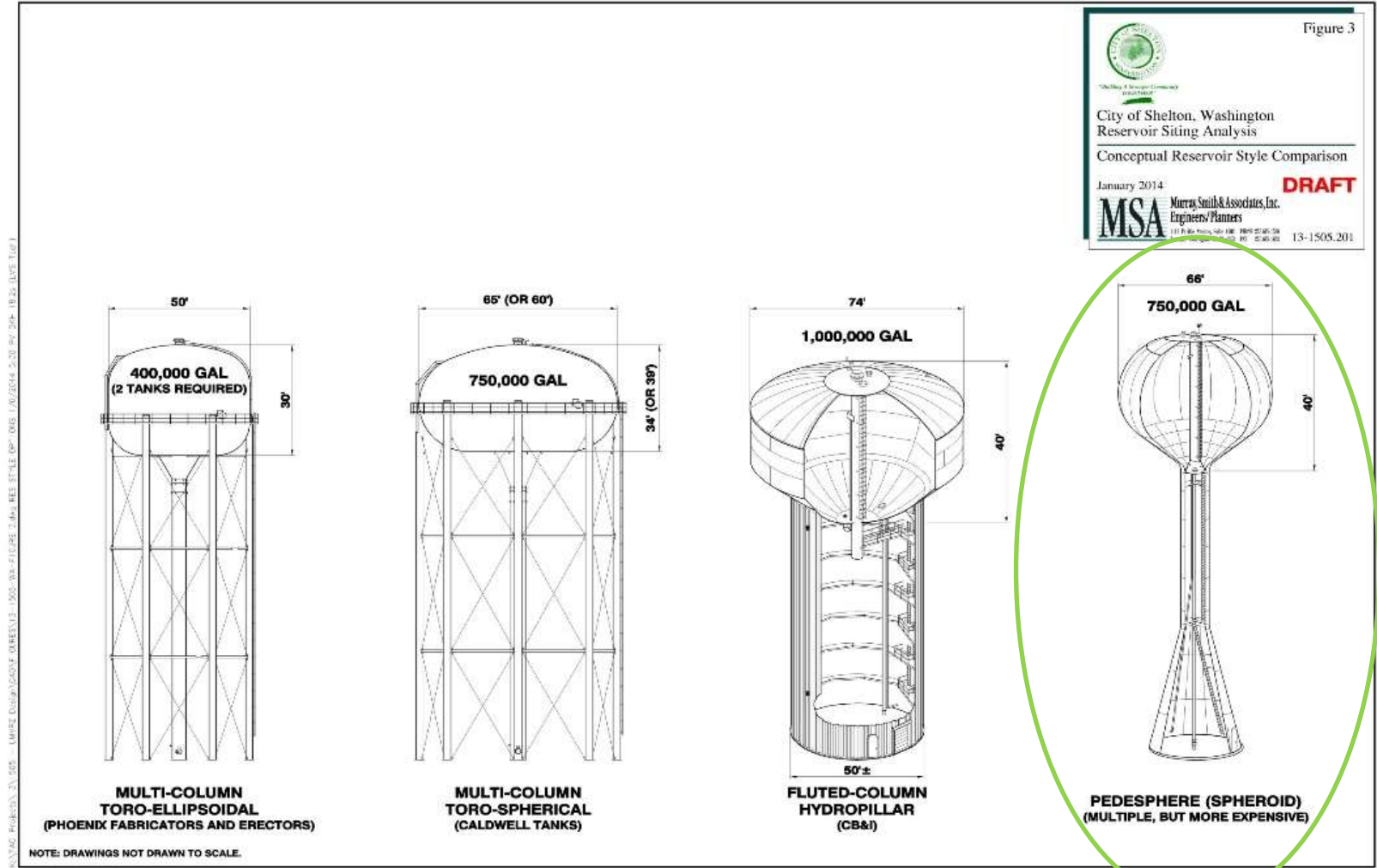
# Reservoir Style Selection

- Style alternatives
  - Fluted column (hydropillar) or composite elevated tank (CET)
    - Medium cost, longest construction timeline
    - Better value at higher volumes



# Reservoir Style Selection

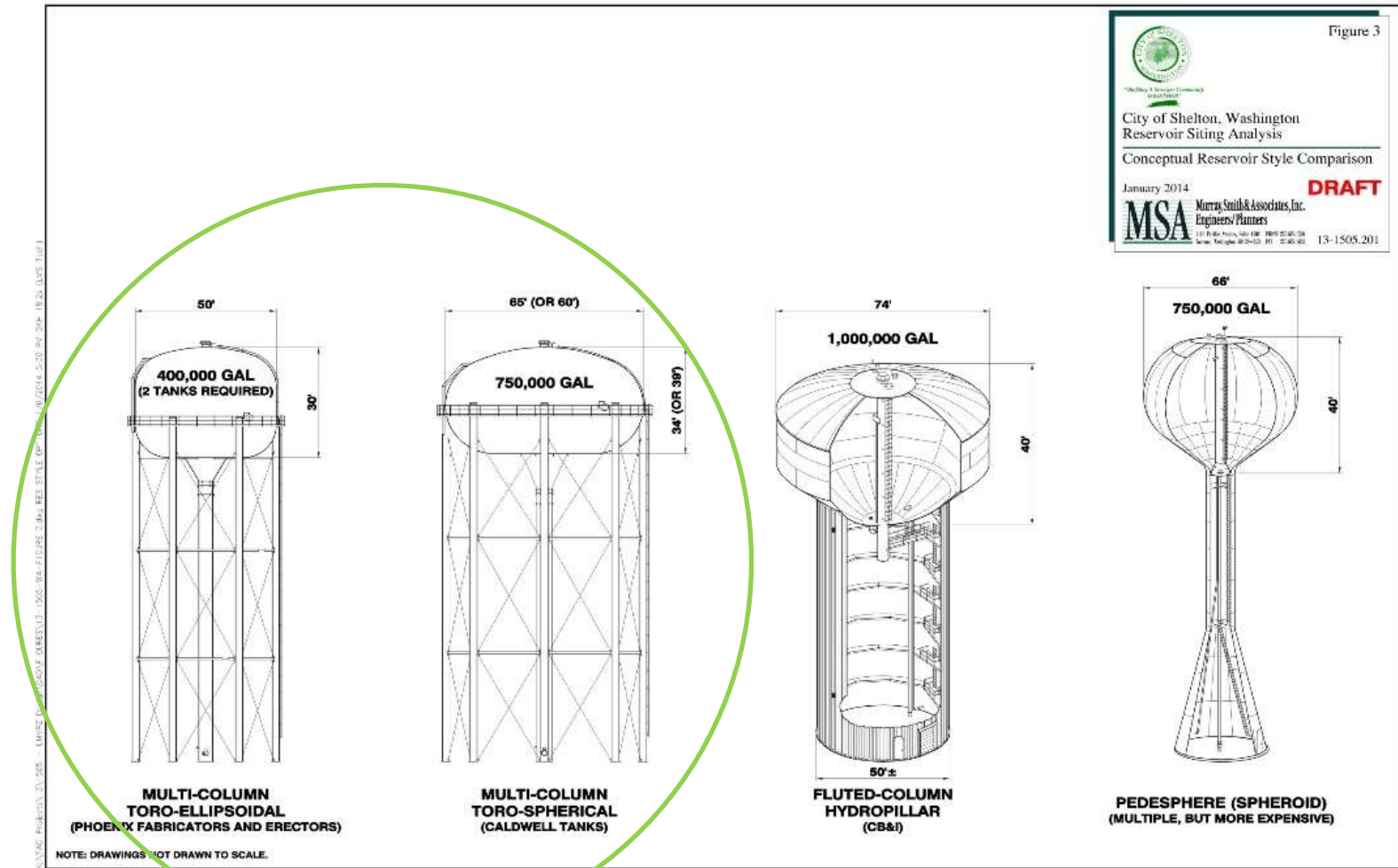
- Style alternatives
  - Spheroid
    - Longer construction timeline
    - Better value at lower volumes
    - High aesthetic value





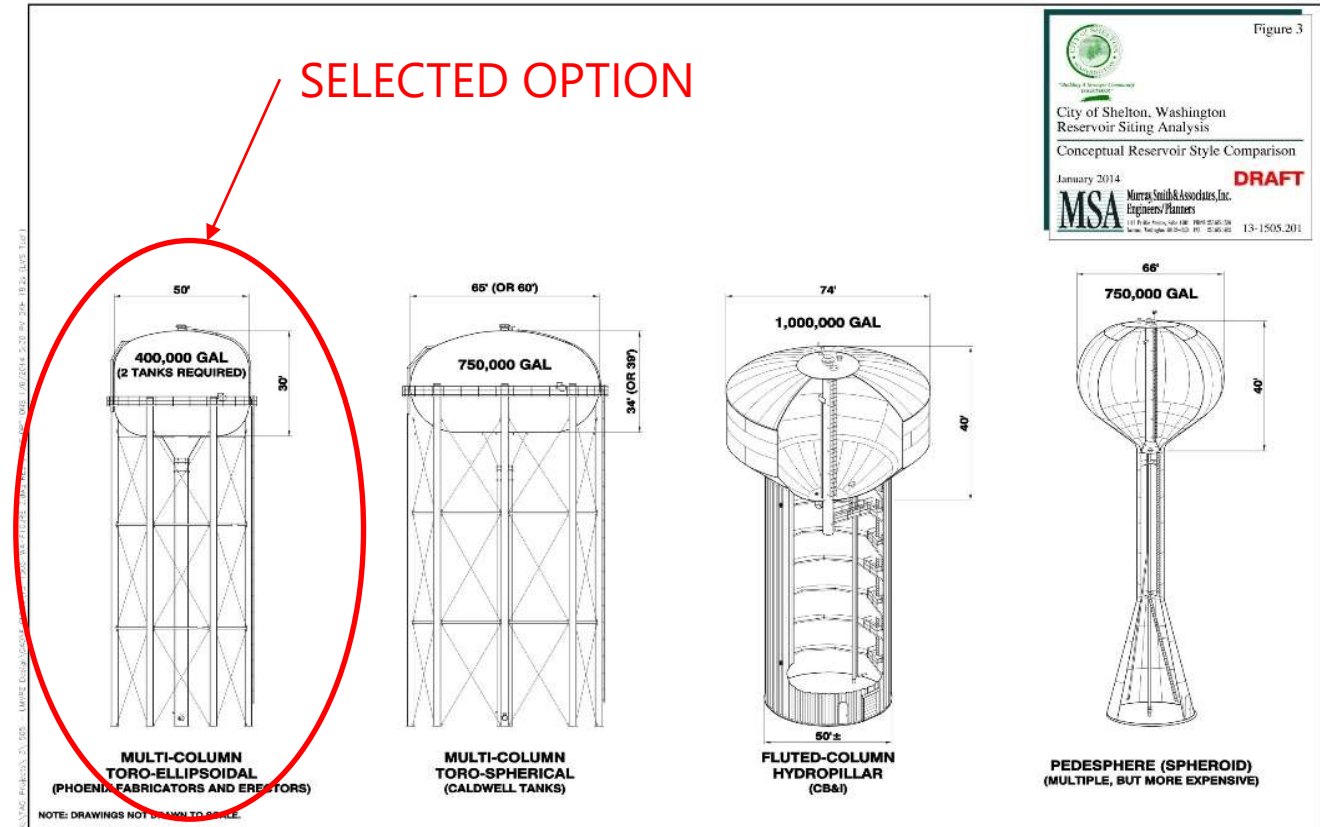
# Reservoir Style Selection

- Multi-column double ellipsoid
  - Fastest construction timeline
  - Good value at volume needed (400K gallon)
  - Environmental help to minimize impact in sensitive habitat



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- Style alternatives
  - Fluted column (hydropillar) or composite
    - Medium cost, longest construction timeline
    - Better value at higher volumes
  - Spheroid
    - Longer construction timeline
    - Better value at lower volumes
    - High aesthetic value
  - Multi-column double ellipsoid
    - Fastest construction timeline
    - Good value at volume needed (400K gallon)
    - Environmental help to minimize impact in sensitive habitat
    - **Selected due to schedule/budget, and footprint**









# Environmental Implications

# Environmental Implications

- Mazama Pocket Gophers
  - Schedule was impacted by further study needed
    - Habitat Management Plan
  - Multi-column tank foundation reduced impact
  - Other mitigation measures
- Species investigated, but not mitigated for
  - Streaked horned lark
  - Taylors checkerspot butterfly



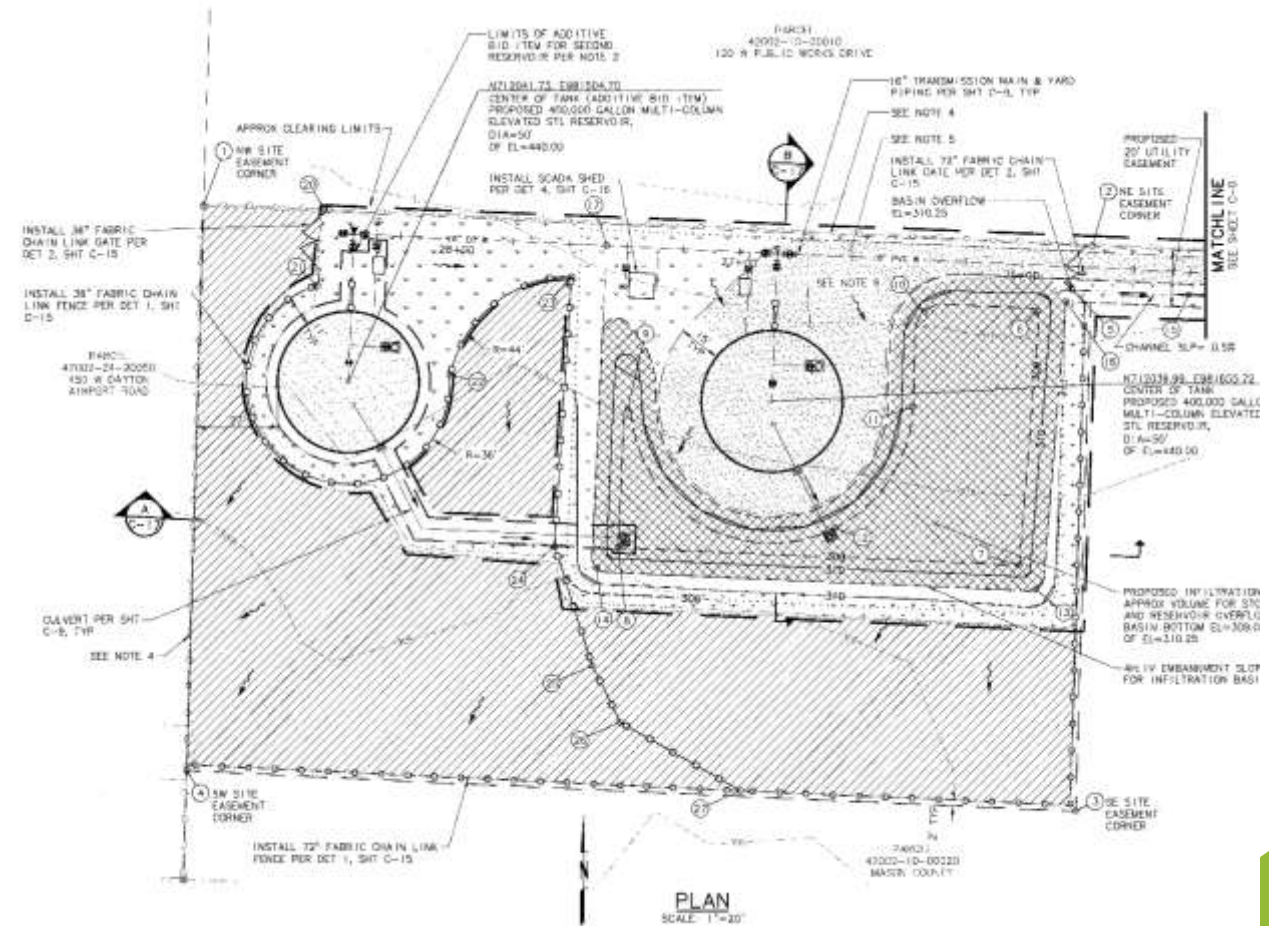


# Construction/ Implementation




# Implementation and Construction


- Permitting
  - Conditional Use
  - FAA, BP, DOH
  - DOE (SEPA, SWPPP)
- Phase 1A – Elevated Reservoir
  - 1 base bid, 2<sup>nd</sup> bid additive
  - Telemetry building
  - Site stormwater
  - 2,000 feet of piping



# Implementation and Construction

- Phase 1B
    - Retrofit Well 3 to feed new UMVPZ, fill elevated reservoir
    - PRV station to continue feeding MVPZ
    - 3,500 feet of piping to connect to system
  - Phases correlate to on/off-site, but all work together to create new zone
  - Storm drainage and overflow detention challenges
  - Benefits of elevated tank versus standpipe
  - Water quality considerations
- 

# Implementation and Construction

- Future Phases
    - Retrofit Well 1 including new ground level reservoir and booster pump station
    - Two other well retrofits
    - Additional zone isolation
    - Rehabilitation of gravity main
- 
- A decorative graphic at the bottom of the slide, consisting of a solid green area that tapers and then rises into a jagged, mountain-like shape on the right side.







08/15/2016 13:02





08/15/2016 12:22









**Q&A**



***murraysmith***



**Thank you!**

