



Reservoir Challenge: Rehab or Replace



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WASHINGTON • OREGON • IDAHO



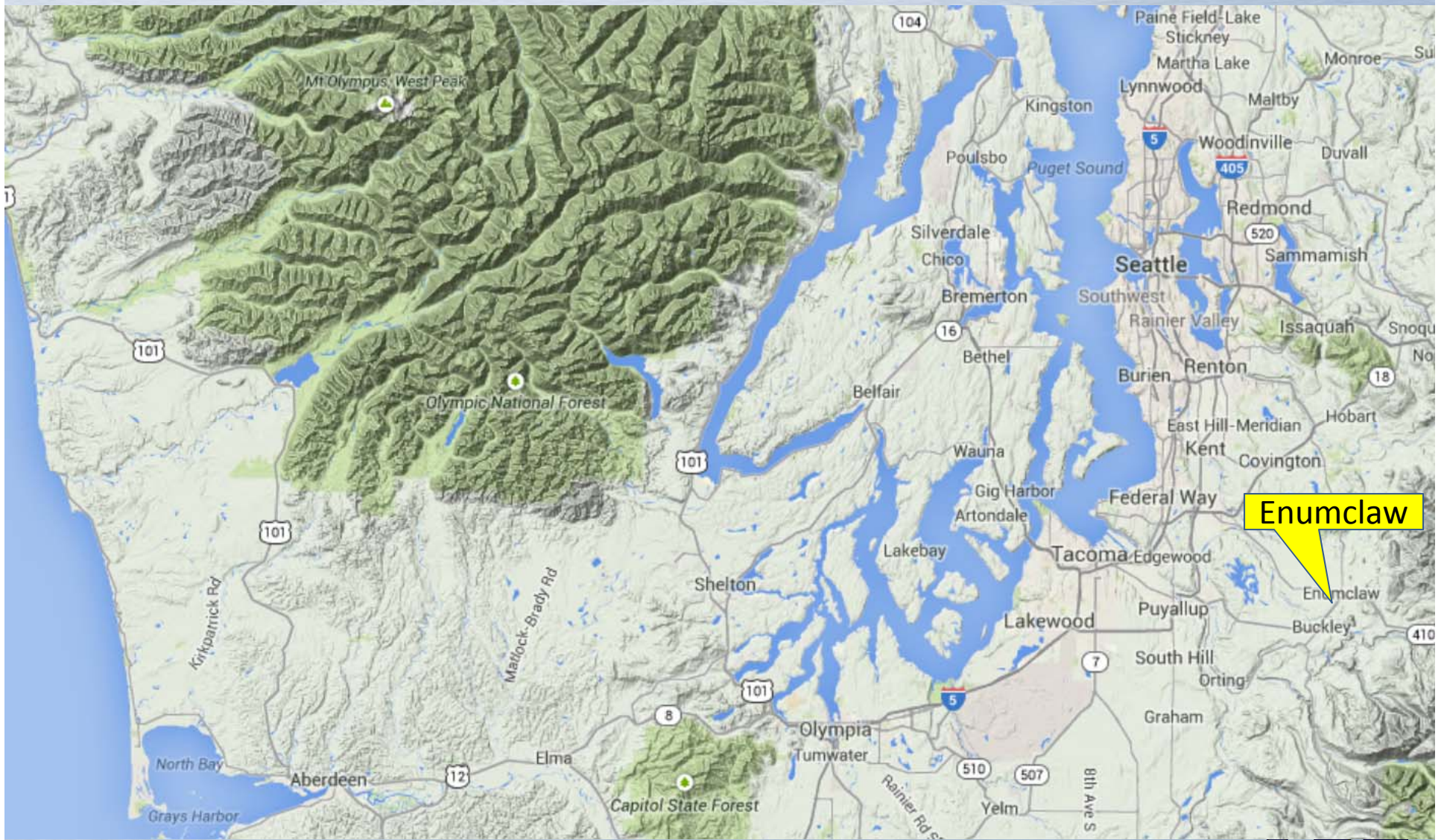
Presentation Overview



- ❑ **Aging water system infrastructure**
- ❑ **What to do, and when, and how**
- ❑ **Here is the story of one City's experience....**

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Stanridge Hill 0.18 MG Reservoir



**Five Reservoirs
Total Storage: 4.7 MG**

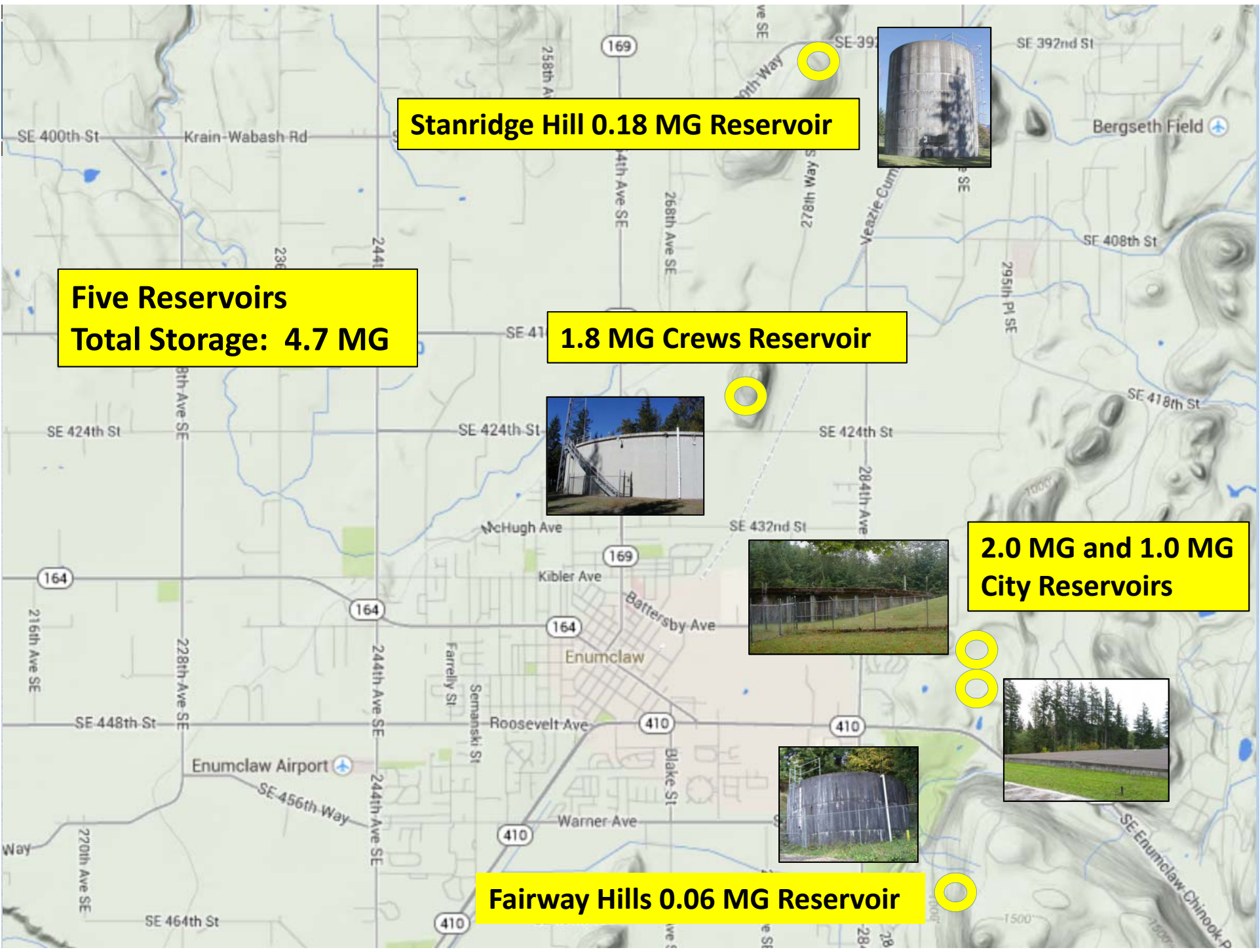
1.8 MG Crews Reservoir



**2.0 MG and 1.0 MG
City Reservoirs**



Fairway Hills 0.06 MG Reservoir



2.0 MG City Reservoir



- ❑ Largest reservoir in system
- ❑ Partially buried terminal reservoir
- ❑ 17 feet Tall, 170 foot diameter
- ❑ Constructed in 1963



2,000,000-gallon tank erected in 10 days with prestressed concrete and INCOR®



Faced with an unprecedented residential boom, the Pacific Northwest's fast-growing Puget Sound area has needed more and more water storage...in a hurry. One notable answer has been "Pritzker" tanks made from high-density, watertight concrete, utilizing "Incor" 24-hour cement.

New to this country, the basic Pritzker design is a series of precast, prestressed barrel shells erected vertically on a circular foundation, with the edge beams of the shells abutting and bolted as columns. The prestressed arch construction maintains all concrete in compression and provides great structural strength.

Typical of these durable, economical constructions is the new 2,000,000 gallon tank erected at Bellevue, Washington, in just ten days. "Incor" High Early Strength Portland Cement was used for all precast, prestressed members. The result? Considerable savings in time and money.

LONE STAR CEMENT CORPORATION, NEW YORK 17, N. Y.

Basic to Pritzker tank design is series of precast barrel arch members set on a circular foundation around 180-in. girth reinforced concrete floor. All design under exclusive license to Pritzker Tank Construction, Inc.

Completed 2,000,000 gallon tank at Bellevue, Washington, presents Pritzker tank appearance, requires no painting. Design Engineer: BOB L. GARDNER & ASSOC., Seattle; General Contractor: FEDERAL PIPE & TANK CO., Seattle; Precast, Prestressed Concrete: GRAYSTONE PRESTRESSED, INC., Redmond.



**INCOR®
24-HOUR
CEMENT**

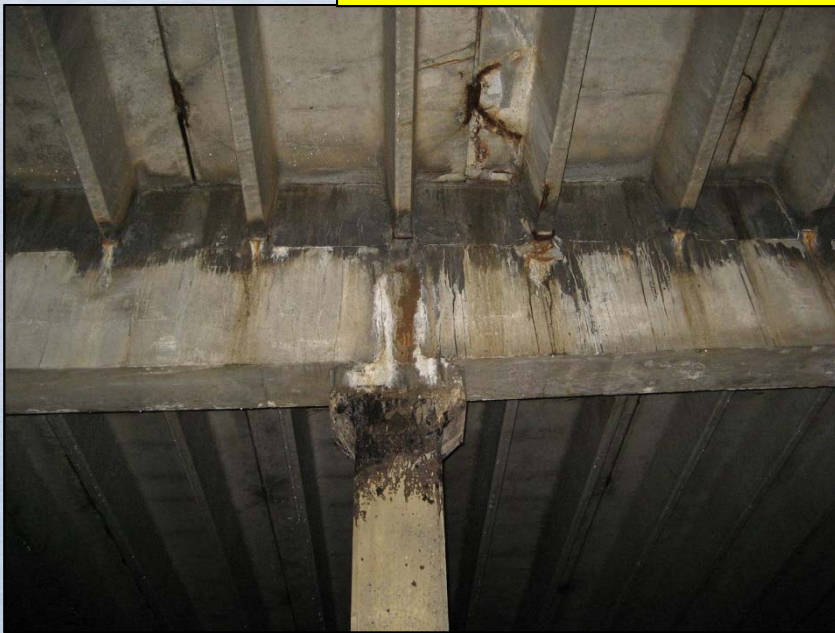
Reservoir Systems



Roof/Ceiling Systems



Floor slab and wall footing



Reservoir Systems



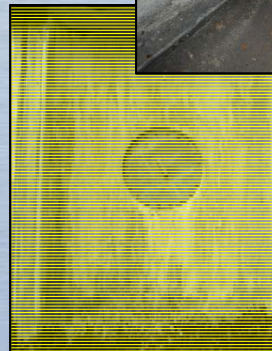
Wall panels and tension ring systems



Columns



Piping/ Appurtenances



Choices

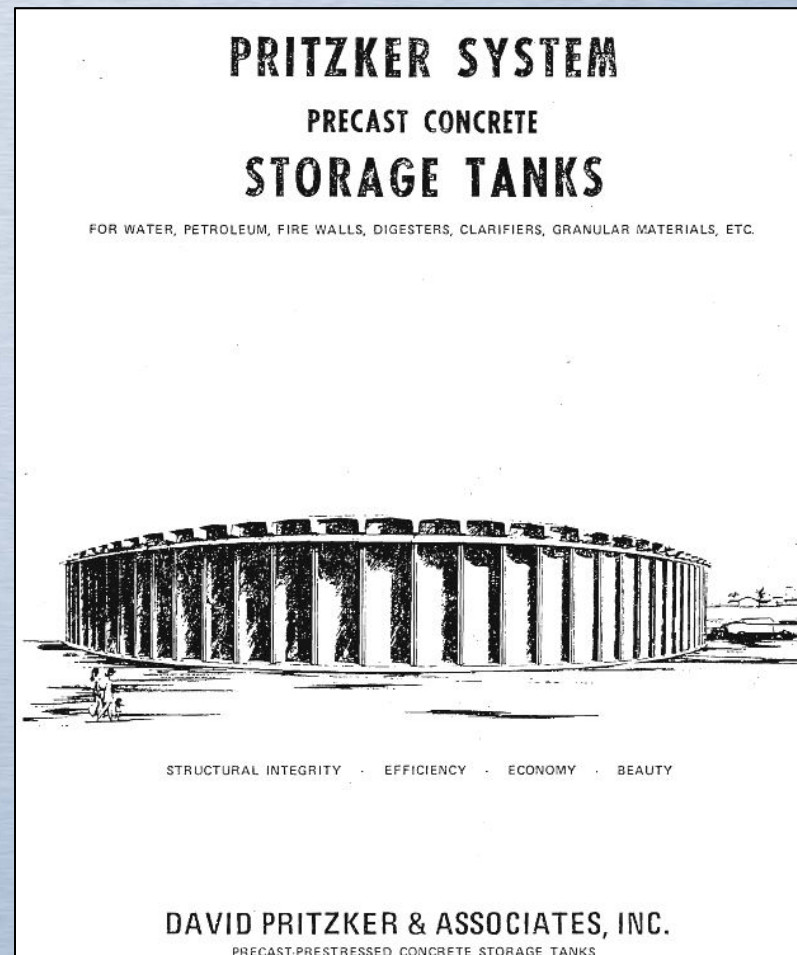
- Repair/Rehabilitate**
- Bring back on line**
- Replace**



History and Analysis



- ❑ **Pritzker Tanks in the US**
- ❑ **History and design theory**



History



- ❑ Pritzker Tanks in the US
- ❑ When things fail



ORANGE COUNTY

METRO

1978

Los Angeles Times

Water Tank Rupture Point Identified

Preliminary inspection pinpoints different area from section spotlighted in a Westminster city engineer says.

By BONNIE HARRIS HAYES, JANET WILSON and GREG HERNANDEZ
TIMES STAFF WRITERS

Westminster officials on Wednesday tentatively identified the weak point in a ruptured 5-million-gallon water tank as the area where the floor meets the precast concrete wall.

A city engineer said the area is not in the same section of the reservoir that had shown signs of rust, cracks, rotted caulking and damaged beams during an independent inspection last year.

"None of the cracks mentioned in that [inspection] report could have

led to this," said Marwan Youssef, the engineer.

The city, though, will spend up to \$30,000 to determine what happened and how it could have been prevented, Youssef said.

He said a vulnerable point in the foundation was the likely cause of the rupture Monday that sent a 6-foot wall of water slamming into a nearby fire station and the Hefley Square Town Homes.

The water burst from the south-east portion of the dome-shaped, above-ground tank—nearly opposite from the northwest area where the problems were noted last December.

The flood—which washed 100

residents from their homes and left six people injured and 10 families homeless—prompted officials to drain a second water reservoir that is identical to the one that failed.

Engineers hired to determine the cause of Monday's rupture will conduct a structural inspection of the second tank, near City Hall, next week.

"We're taking precautions," said Mary Ann Mulligan, a city spokeswoman hired in the wake of the disaster. "Obviously there are safety concerns and things relating . . . to the tanks that we want to look at and address."

The December 1977 structural review may have been the first

independent detailed inspection for the 30-year-old tank, said Gary Heffelfinger, director of the Westminster Water Department. He said he and other city workers have dived into the tanks to look for problems.

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Analysis



- ❑ **Pritzker Tank in Enumclaw**
- ❑ **Signs of concern – Precast roof**



Analysis



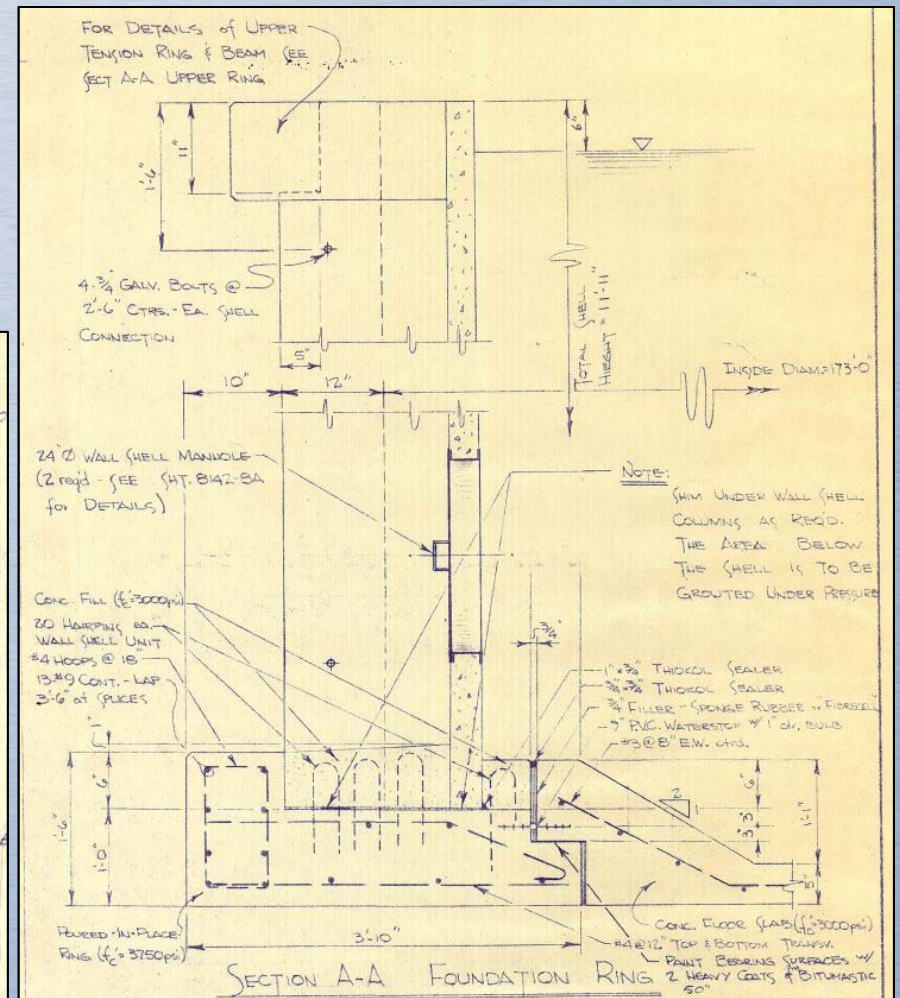
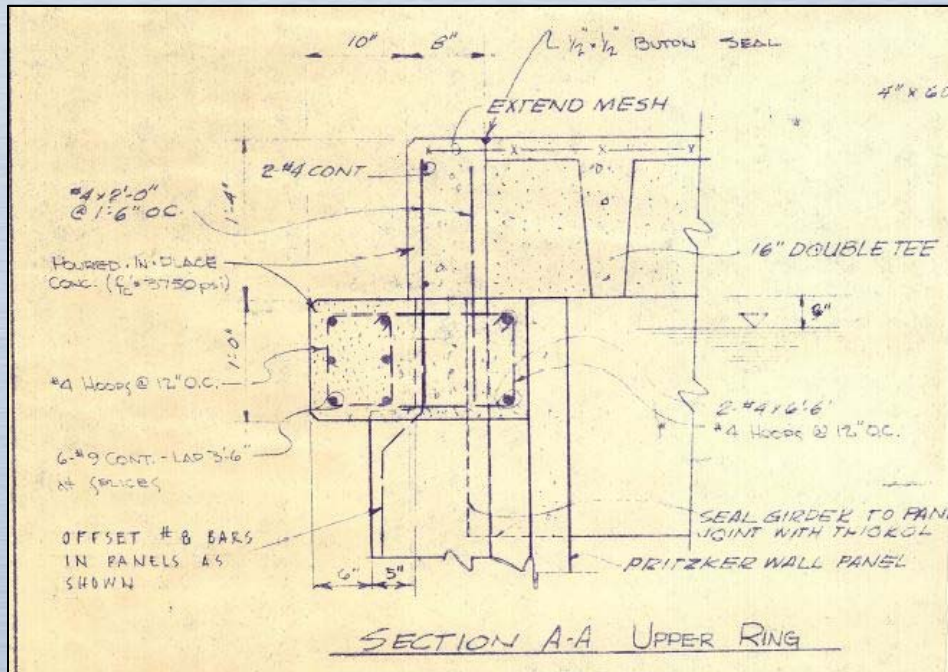
- ❑ **Pritzker Tank in Enumclaw**
- ❑ **Signs of concern – Precast panels**



Analysis



□ Details and potential failure modes



Fill the Tank? Now What?



Fix it:

Reservoir Element	Estimated Construction Cost
Roof system	\$750,000
Precast Wall Panels	150,000
Top and Bottom Tension Rings	400,000
Floor Slab System	150,000
Total	\$1,450,000

Replace it:

Option	Estimated Construction Cost
1. 1.4 MG Reservoir	\$1,575,000
1. 2.0 MG Reservoir	\$1,900,000
1. 3.0 MG Reservoir	\$2,200,000

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Lifecycle Cost and a Decision



Option	Estimated Lifecycle Cost
Repair Existing 2.0 MG Reservoir	\$2,970,000
Replace Existing 2.0 MG Reservoir with 1.4 MG Reservoir	\$2,050,000
Replace Existing 2.0 MG Reservoir with 2.0 MG Reservoir	\$2,500,000

- City is opting to build a new 2.0 MG Reservoir**
- Demo of existing reservoir expected this summer**
- New reservoir on line by 2016**



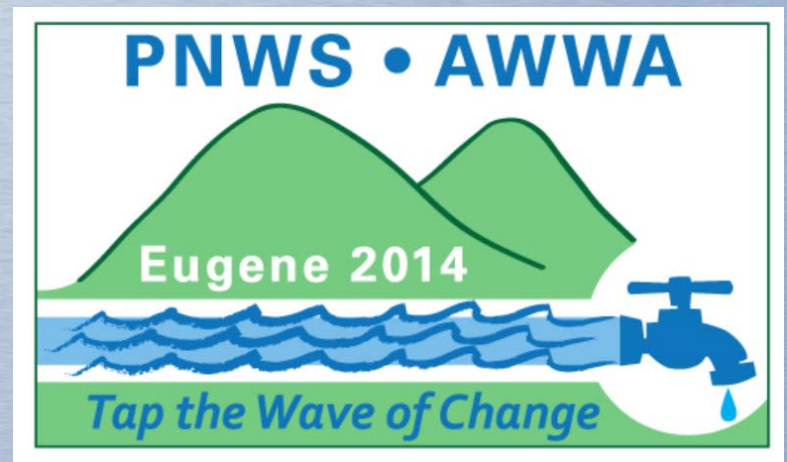
Next Steps



- ❑ **Tank demo**
- ❑ **Design and build new tank**



Thank You!



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