

Lake Washington Ship Canal Major Project Status and Fish Passage Improvement Update for WRIA8 Salmon Recovery Council Meeting

Seattle District
U.S. Army Corps of Engineers

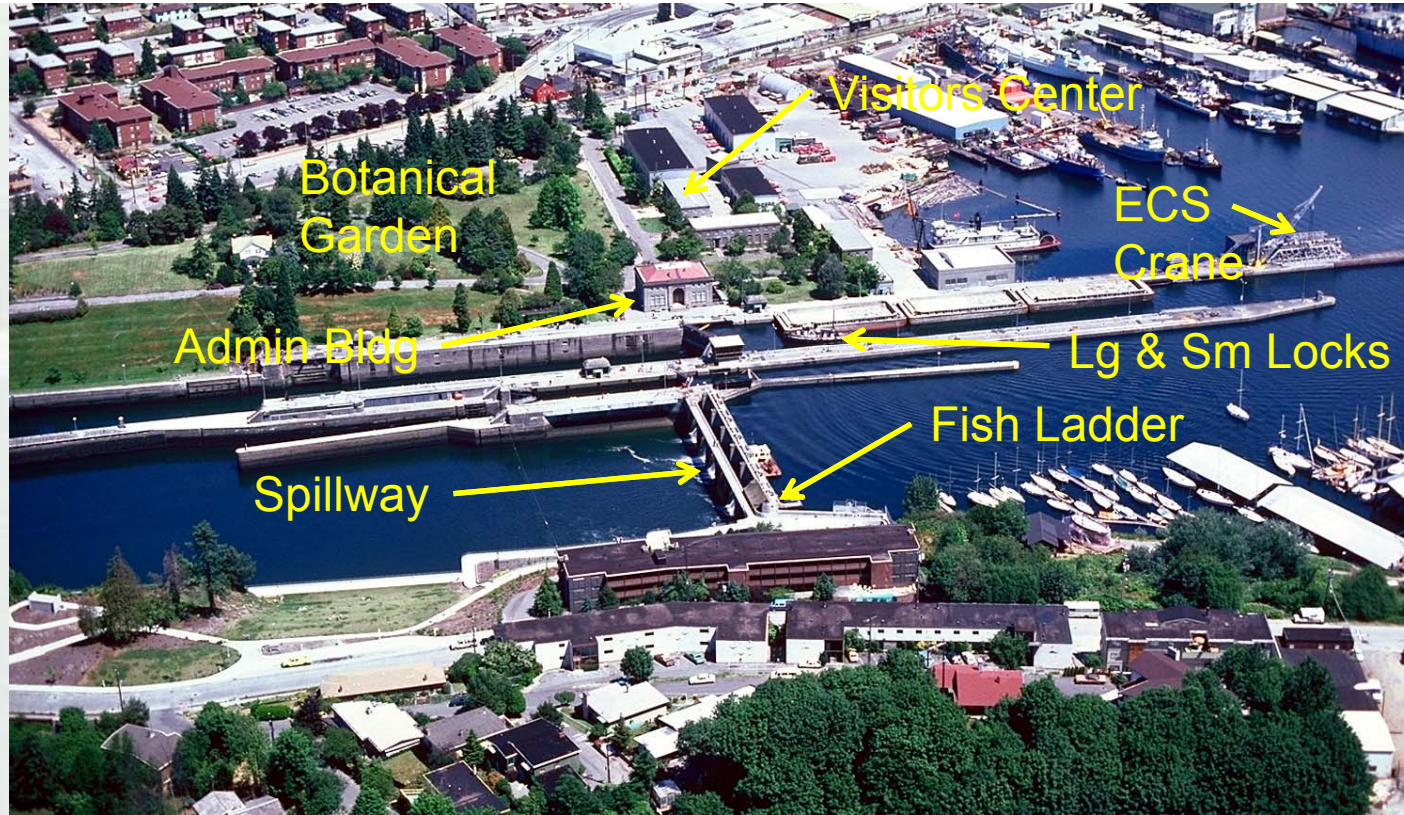
March 17, 2016



®

US Army Corps of Engineers
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Chittenden Locks aka Ballard Locks



- **1.3 Million Visitors Annually**
- **45,000 Vessels Transit Annually (9,000 commercial)**
- **Busiest Locks in the Nation by vessel count**
- **~1 Million Commercial Tons Annually**

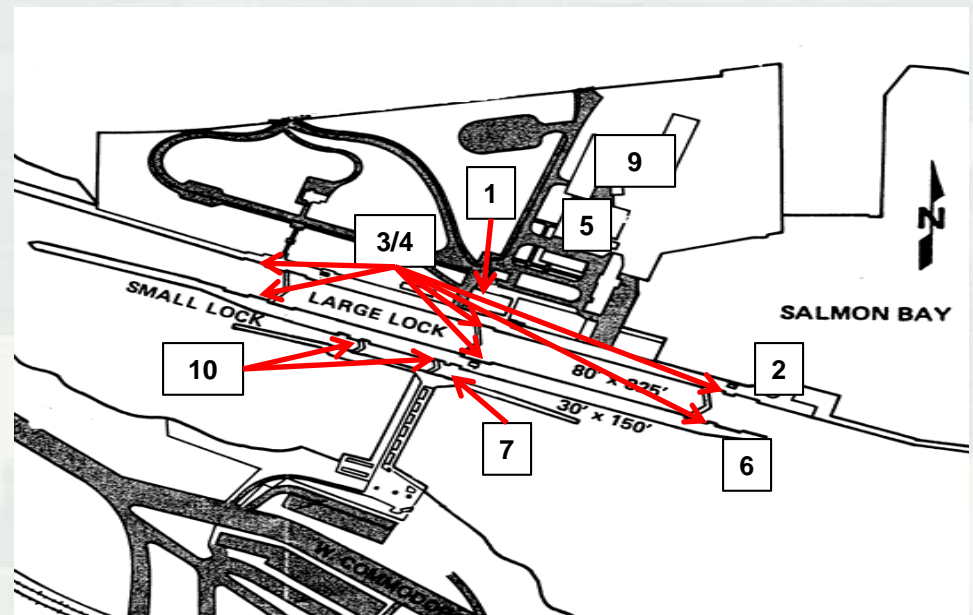


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Prioritized Projects (Needed Repairs)

Projects are prioritized by need, safety, and/or requirement to meet the mission

- ✓ *Monolith Scour Repair - COMPLETE*
 - ✓ *Spillway Radial Gate Replacement – COMPLETE*
1. Pumping Plant Replacement
 2. Large Lock Emergency Closure System Rehabilitation (Crane Replacement)
 3. Filling Culvert Valve and Machinery Replacement (Stoney Gate valves)
-
4. Large Lock Gate Rehabilitation
 5. Seismic Retrofit of Transformer House
 6. Saltwater Drain Intake System and Permanent Solution to Diffuser Well
 7. Emergency Closure for Small Lock
 8. Electrical System Rehabilitation
 9. Maintenance Building Rehabilitation
 10. Small Lock Machinery Replacement



1. Pumping Plant Replacement

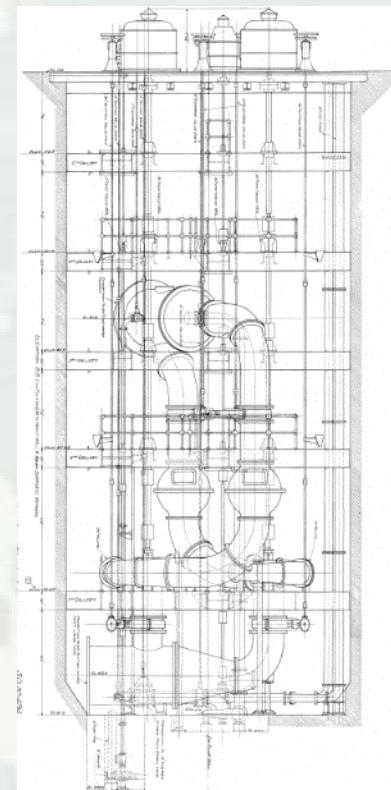
PURPOSE: Dewatering plant for annual maintenance of large and small lock

CONDITION: Out of Service – Red Tagged

- Pumping plant is original (1916)
- Severely corroded and unsafe

STATUS

- Phase 1 Funded and currently in construction (Phase 1 = Demo and make safe)
- Phase “1.5” has been funded (Phase “1.5” = install min. pumping capacity)
- Est. Completion date May of 2017



2. Large Lock Emergency Closure System (ECS – Crane Replacement)

PURPOSE: 1. Stop Uncontrolled Release of Water, 2. Auxiliary Spillway

CONDITION: Derrick crane and electrical controls are original (~1920); currently working, but in poor, un-repairable condition.

STATUS

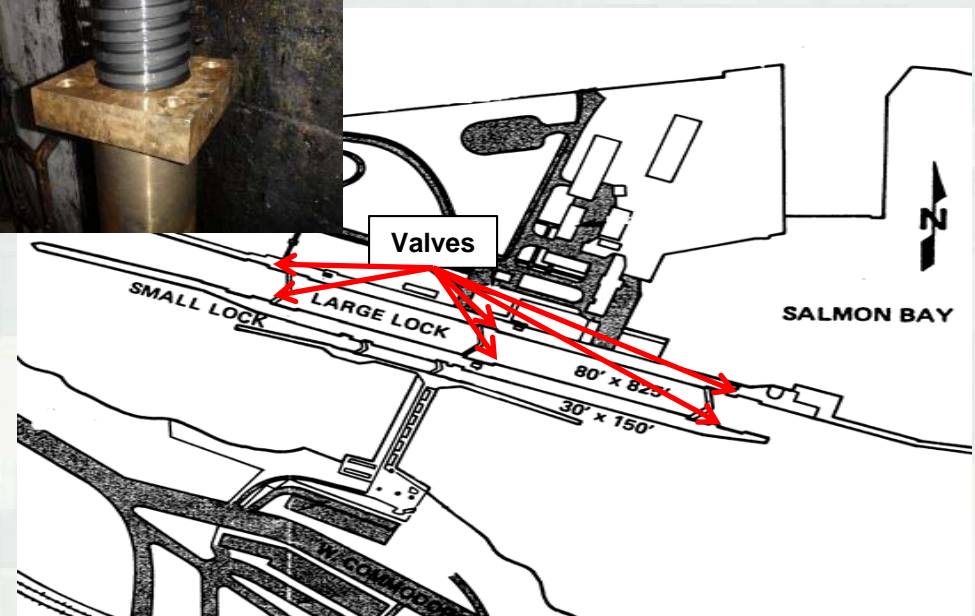
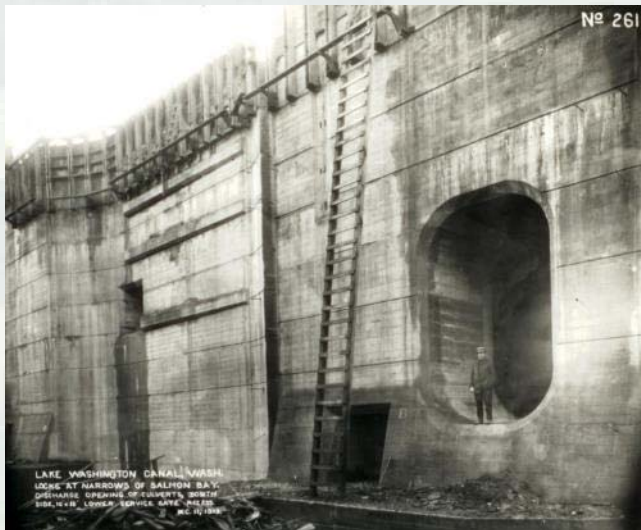
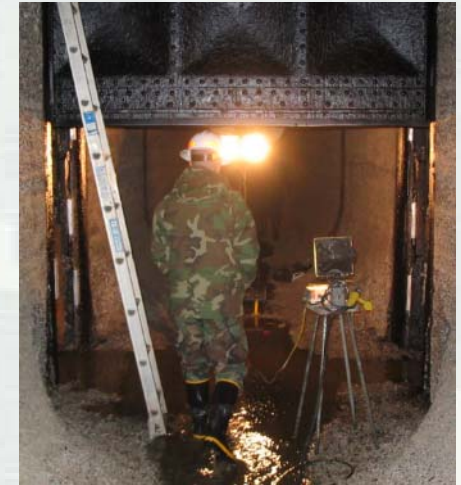
- Design of new crane is at 95%. Complete design anticipated March 2016
- Construction anticipated in 2017 (dependent on funding)
- Total Estimated cost \$3M-\$6M



3. Filling Culvert Valve Replacement

DESCRIPTION AND CONDITION

- “Stoney Gate Valves” are original (1916)
- Total of six valves (two at each miter gate)
- Valves raise or lower lock chamber water elevation
- Machinery to raise and lower the valves are obsolete and unreliable.
- Valve speed cannot be adjusted.



3. Filling Culvert Valve Replacement

CONDITION (Continued)

- Valves on the lake end (fresh water) are in much better condition than the salt water end.
- Valves are heavily corroded and worn



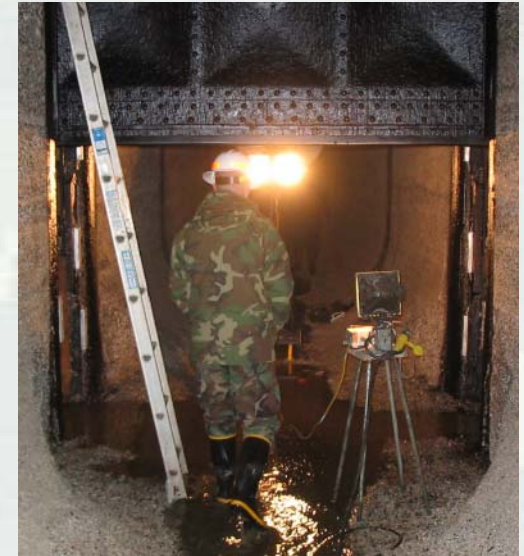
3. Filling Culvert Valve Replacement

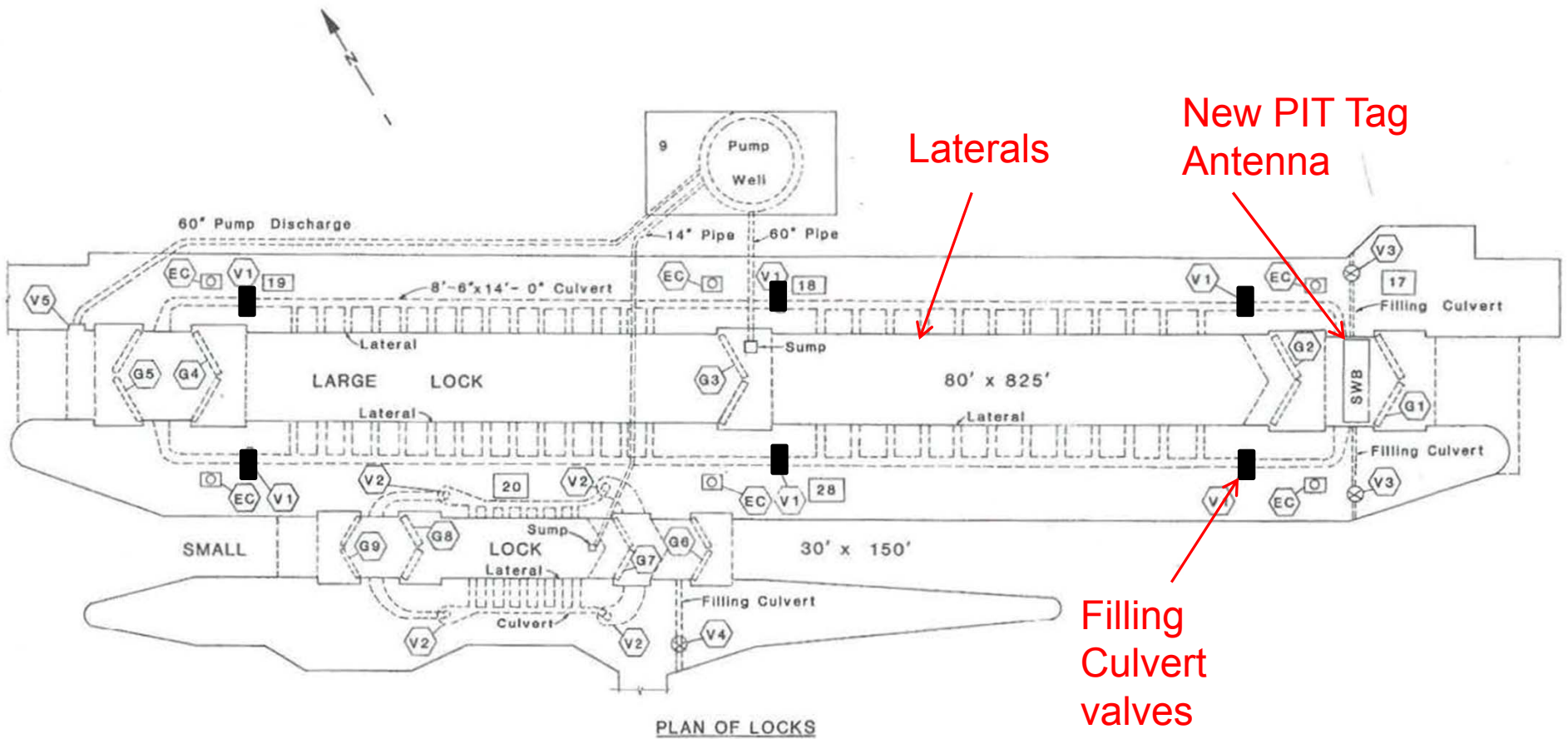
STATUS

- Currently at ~50% design
- Anticipate completed design by fall of 2016
- Construction anticipated 2018 or 2019 (funding dependent)
- Cedar River Instream Flow Commission contributed \$100k in design costs (Thank You!)
- Cost \$3M-\$11M depending on # of valves replaced. Plan on replacing #3 valves and control system first

FUTURE IMPACTS or BENEFITS

- New valves w/ hydraulic controls will reduce water velocity entraining less juvenile salmon
- New valves will drastically reduce maintenance and failures





LEGEND

| | |
|-------------------------------|------------------------|
| 9 Administration Building | EC Electric Capstain |
| 17 Operating House No. 1 | SWB Salt Water Barrier |
| 18 Operating House No. 2 | G1 Gate 1 |
| 19 Operating House No. 3 | G2 Gate 2 |
| 20 Operating House No. 4 | G3 Gate 3 |
| 28 Control Tower | G4 Gate 4 |
| V1 Sluice Gate Valve | G5 Gate 5 |
| V2 Cylindrical Valve | G6 Gate 6 |
| V3 Filling Valve - Large Lock | G7 Gate 7 |
| V4 Filling Valve - Small Lock | G8 Gate 8 |
| V5 Sluice Gate Valve | G9 Gate 9 |

LAKE WASHINGTON CANAL
HIRAM M. LOCKS
OPERATION AND MAINTENANCE MANUAL
GATES, VALVES AND CULVERTS



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SCALE: NONE FILE

Large Lock PIT tag monitoring



Installed Nov 2015 in entrance to north filling culvert
as part of PAS study with WRIA 8



6. Saltwater Drain Intake System

CONDITION

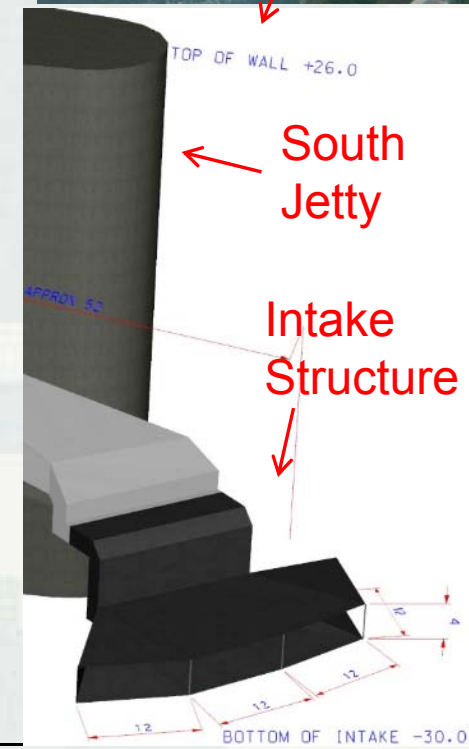
- The intake system has undergone multiple repairs over and is in fragile condition

IMPACTS

- Drain collapse/failure would decrease attraction water to the fish ladder & permit brackish water infiltration in the ship canal and Lake Washington

STATUS

- Budget has been requested for replacement plan and design
- Intake reconstruction rough estimate is \$5-10M



6. Permanent Diffuser Well Solution

CONDITION

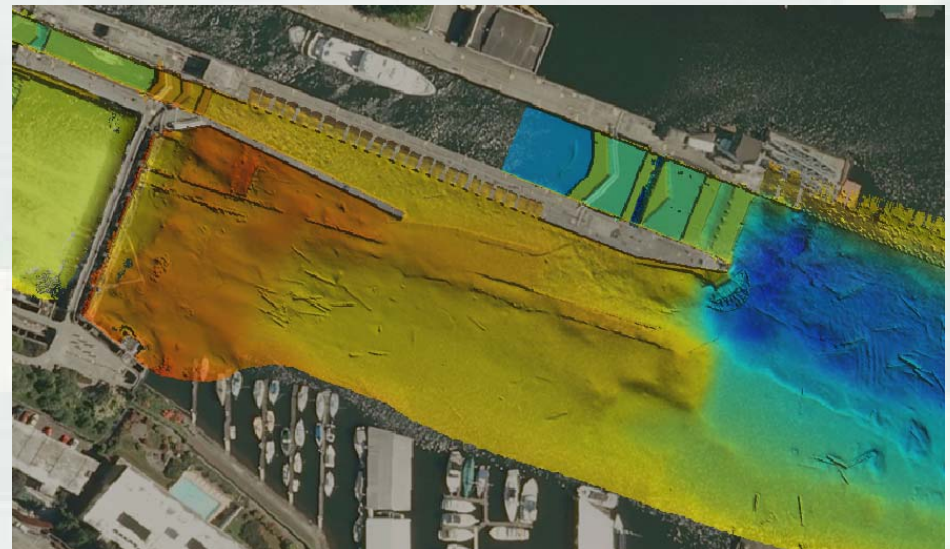
- Temporary structure to prevent adult salmon from entering the saltwater drain and becoming trapped in the diffuser well was installed in 2008
- Still functional and routinely inspected

IMPACTS

- Failure of the temporary structure would allow fish in the diffuser well

STATUS

- Budget requested for design and/or replacement temporary structure
- Temporary structure cost estimate is \$500K- \$1M



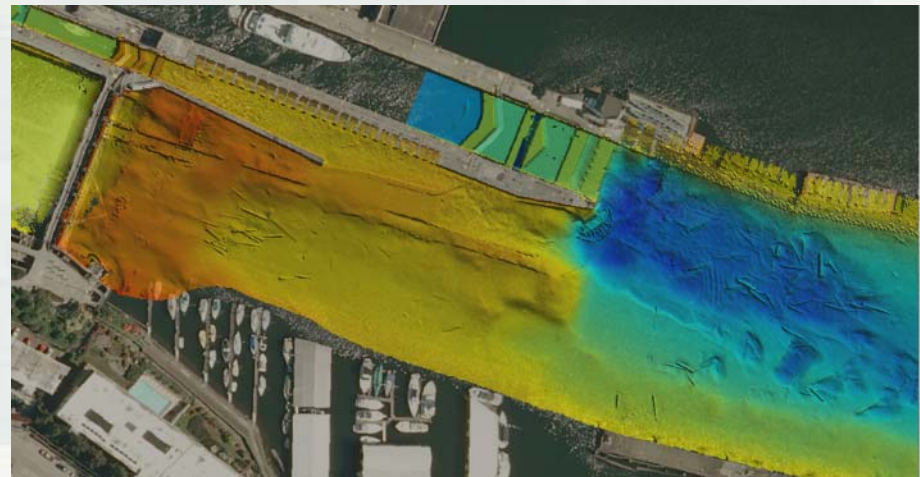
False Locking Study

Current conditions

- ▶ occasional high temp, low dO near Locks where adult Chinook salmon hold
- ▶ thermal migration barrier in ship canal; low dO/anoxic conditions at bottom

Study purpose

- ▶ decrease water temperature by adjusting operations to allow more salt water u/s of the Locks
- ▶ comply with BiOps



Actions

- ▶ adjust lockage frequency; lockage volume; saltwater barrier; saltwater drain;
- ▶ gradually increase saltwater u/s with each study phase



False Locking Study

Results

- ▶ limited salt input → minor temp decrease near Locks, steady dO
- ▶ aggressive salt input →
 - significant temp decrease near Locks
 - increased temp in Lake Union
 - persistent more widespread salt, anoxic conditions in ship canal

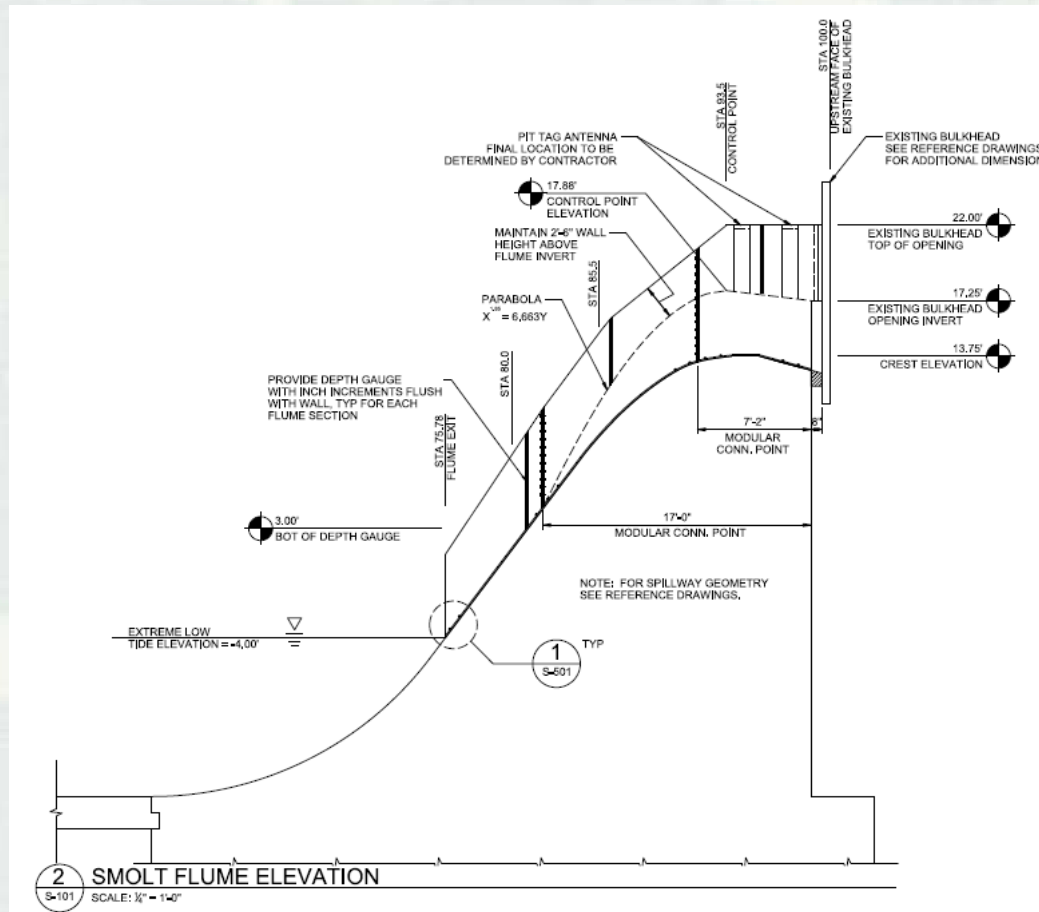



Conclusions

- ▶ WQ near Locks can be substantially improved but may result in negative WQ effects elsewhere in ship canal
- ▶ migration conditions cannot be improved with operational changes
- ▶ WQ can be slightly improved near Locks w/o negative effects elsewhere



New Smolt Flumes



- install & test prototype in late 2016/2017
- substantial design work, testing part of WRIA 8 PAS study 



CHITTENDEN LOCKS



100th 1917-2017 Anniversary



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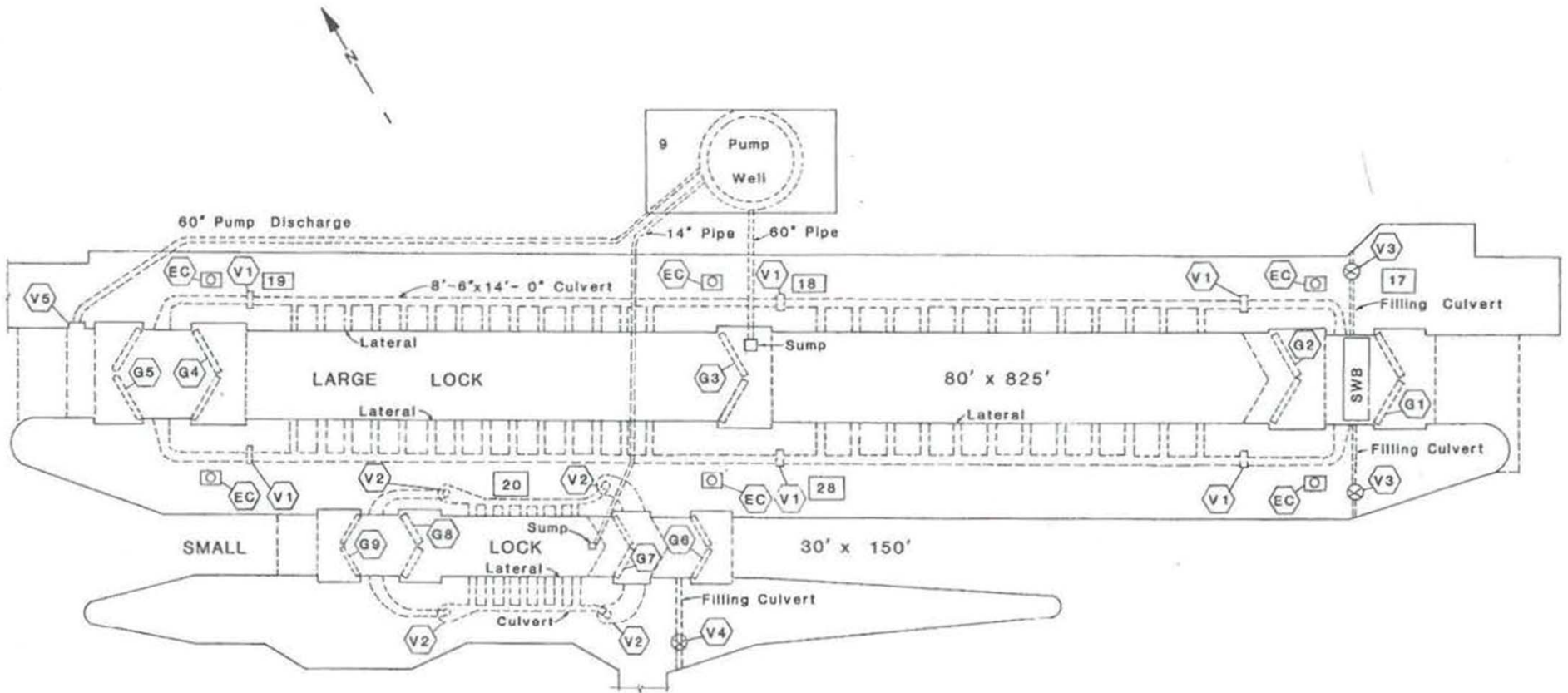


U.S. ARMY

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Thank you for your time
and support!






PLAN OF LOCKS

LEGEND

- | | |
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