NW FISH PASSAGE TRAINING AND FACILITIES WORKSHOP

DAY 2

North Fork Lewis River

Fish Passage Program

September 21, 2011

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A PACIFICORP COMPANY

Mt. St. Helens

Lower Falls

Merwin Dam

Swift Dam

Yale Dam

Woodland

North Fork Lewis R.

N

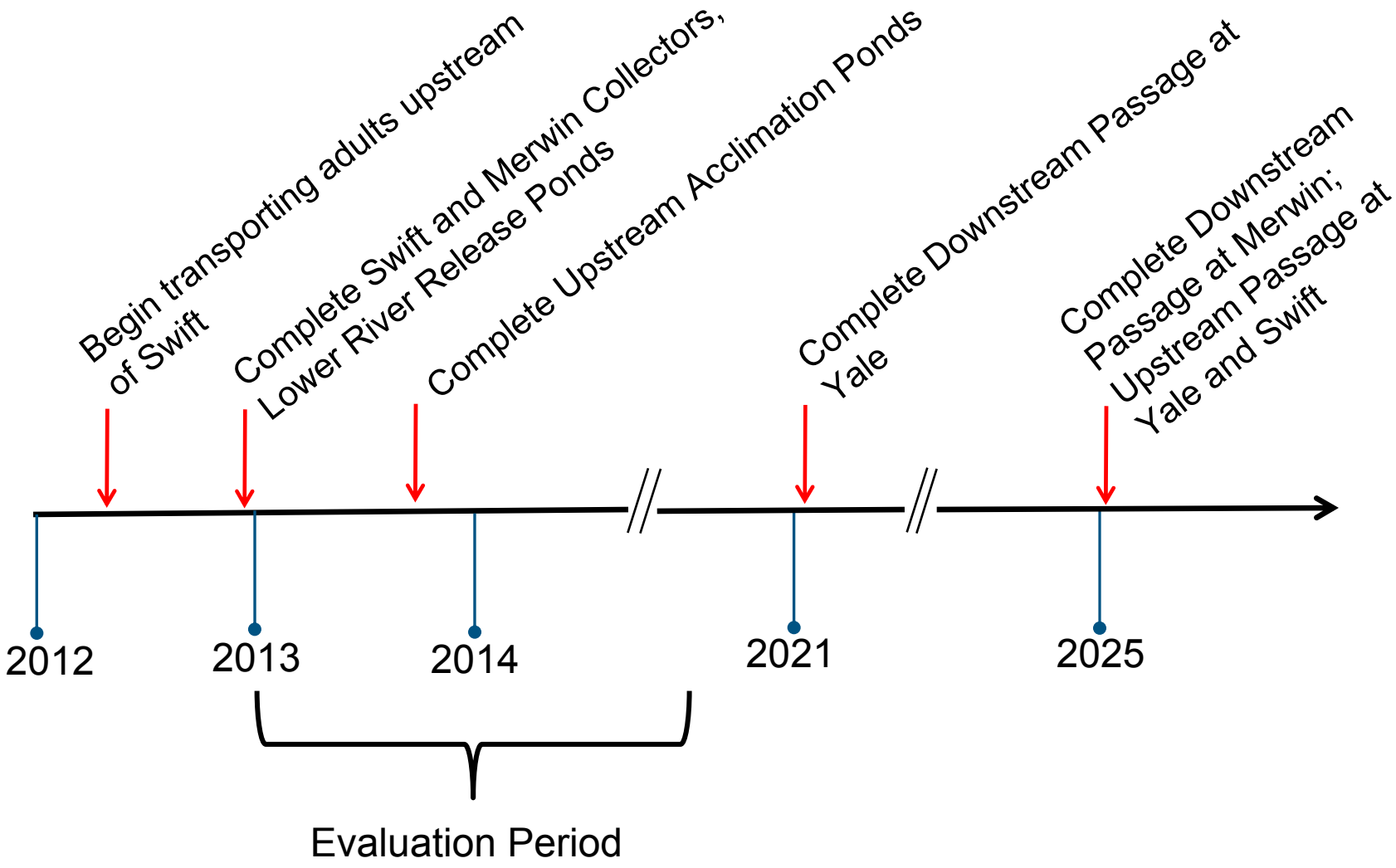
10 Miles

Primary Reintroduction Goal

"To achieve genetically viable, self-sustaining, naturally reproducing, harvestable populations above Merwin Dam greater than minimum viable populations"

From Lewis River Settlement Agreement, November 2004

Collection and Transport Schedule



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Target Species and Upstream Transport Goals

SPECIES	ADULT UPSTREAM TRANSPORT GOAL
Winter Steelhead*	**500**
Spring Chinook	**2,000 (+100,000 juveniles)**
Early Coho	**9,000**

** Broodstock composed entirely of wild origin*

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Hatchery Intervention

- All wild anadromous populations (with the exception of winter steelhead and fall Chinook) are near extinction in the Lewis River
- To meet transportation goals hatchery fish must be used to support program for a minimum period of 15 years
- Natural production will lower hatchery production on a 1:1 basis assessed every 5 years based on Ocean Recruit analysis
- Ultimate goal is to achieve self sustaining runs without the need of hatchery intervention

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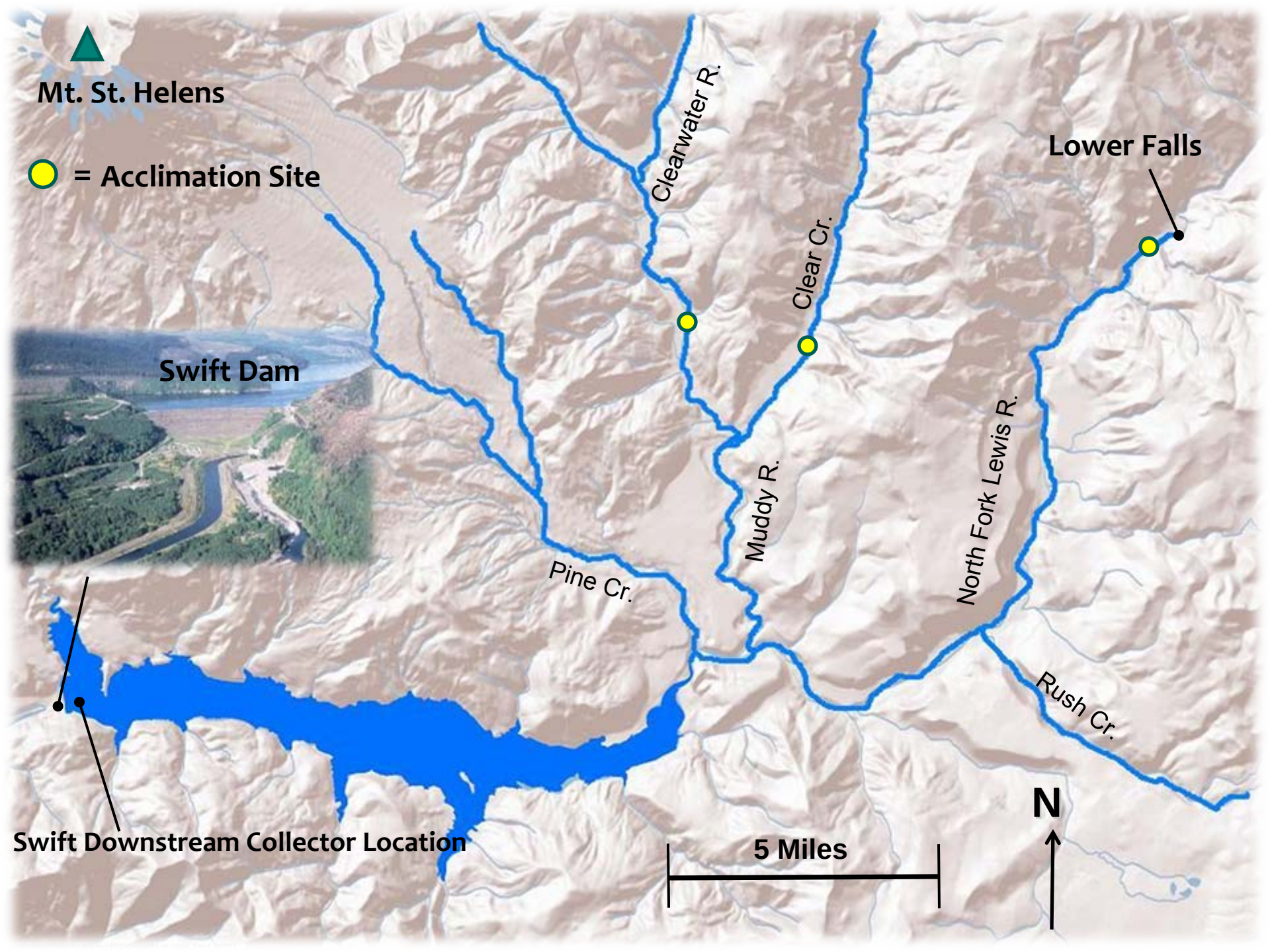
Habitat Preparation Plan

Annual transportation of up to 2,000 coho and spring Chinook upstream of Swift Reservoir for a period of 5 years prior to completion of Swift downstream collector (2007 to 2011)

- Objectives
  - To till gravel and prepare spawning areas
  - To provide early nutrients into spawning areas


Mt. St. Helens
= Acclimation Site
Swift Dam
Clearwater R.
Clear Cr.
Lower Falls
Muddy R.
North Fork Lewis R.
Pine Cr.
Rush Cr.
Swift Downstream Collector Location
5 Miles
N

Habitat Availability and Smolt Production Potential

AREA	AVAILABLE STREAM HABITAT (Miles)	Production Potential Smolts			
		Winter Steelhead	Spring Chinook	Early Coho	TOTAL
Swift	74	27,000	61,000	177,000	265,000
Yale	16	2,500	5,000	55,000	62,500
Merwin	6	3,000	0	19,000	22,000
TOTAL	96	32,500	66,000	251,000	349,500

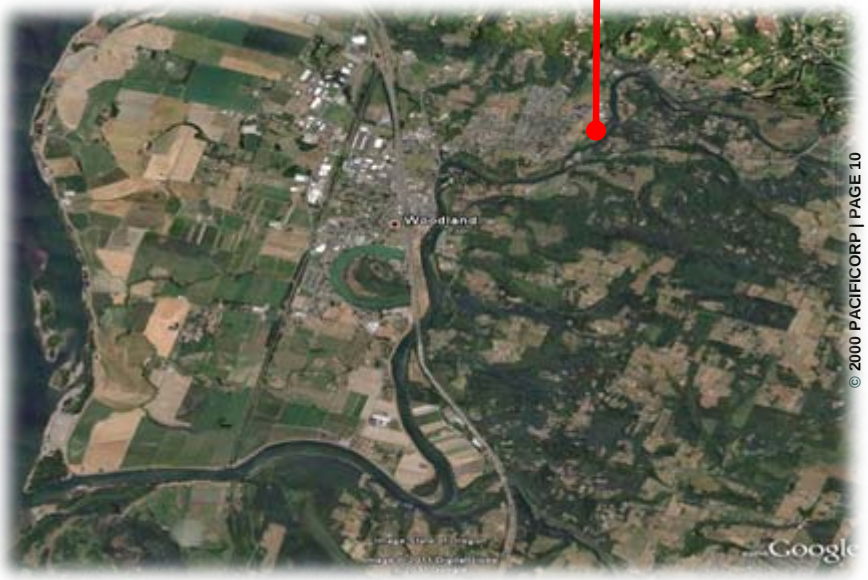
** Production potential represents average number (rounded) from EDT analysis*

Acclimation and release ponds

- **Acclimation Sites**
  - 33,000 1+ Chinook per site (3 sites total)
  - Intended to imprint smolts to upper watershed
  - Acclimation from April to early June (access concerns)
  - All spring Chinook to be wire tagged in adipose fin
  - 10 % to be pit tagged to assess site performance

- **Release Ponds**
  - 12-24 hour hold to assess mortality
  - Reduce related transport stress
  - Volitional release at night

Location of Release Pond (RM 7.2)



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Performance Standards

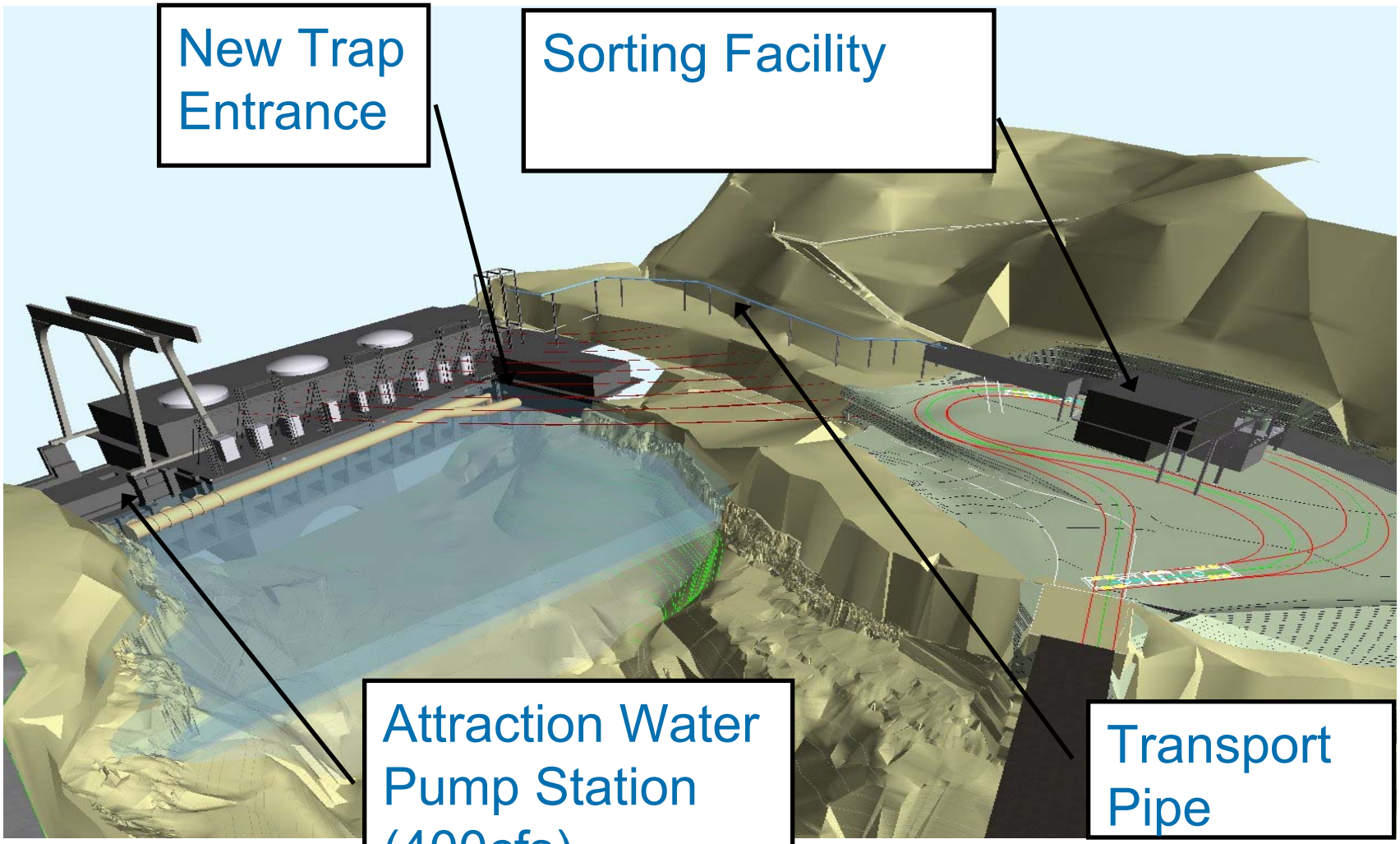
METRIC	STANDARD	DESCRIPTION
Adult Trap Efficiency	98%	*Adults actively migrating past and collected by the trap*
Juvenile Collection Efficiency	95%	*Juveniles available and collected*
Collection Survival	99.5% (smolts)	*Juveniles collected that leave release ponds alive*
Injury	≤ 2%	
Overall Downstream Survival	80%	*Juveniles entering reservoirs that survive to enter river downstream of Merwin Dam*
Upstream Passage Survival	99.5%	*Adults that survive collection and transport*

Annual Monitoring and Evaluation

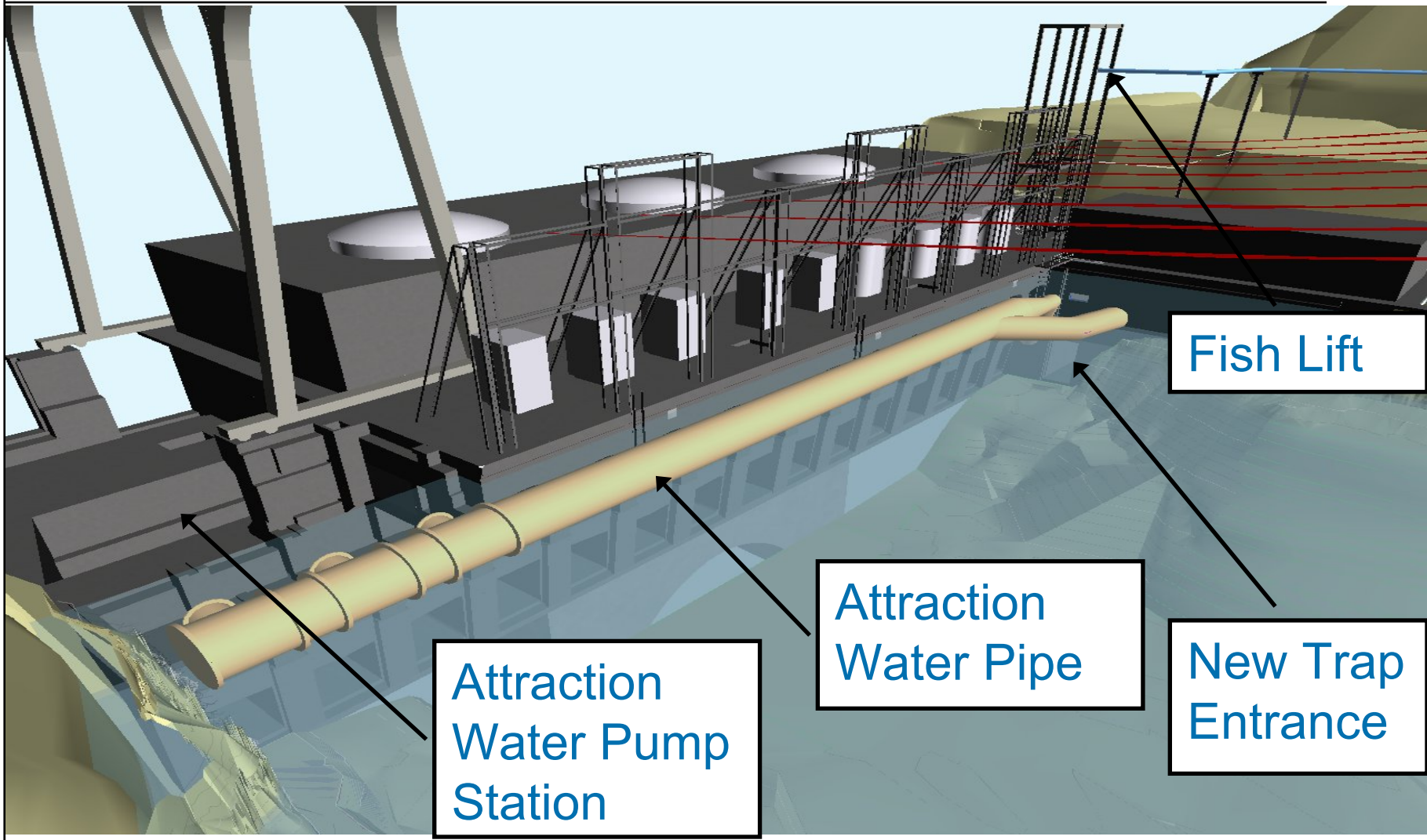
1. *Quantify overall juvenile downstream survival*
2. *Estimate collection efficiency*
3. *Estimate juvenile and adult collection survival*
4. *Determine juvenile Injury*
5. *Quantify the number, by species, of juvenile and adult collection*
6. *Estimate the number of juveniles (production) entering Swift reservoir*
7. *Determine juvenile migration timing*
8. *Quantify adult upstream passage survival*
9. *Estimate adult trap efficiency*
10. *Develop estimates of ocean recruits*
11. *Determine compliance of upstream and downstream passage facilities with hydraulic design criteria*
12. *Determine spawn timing, distribution and abundance of transported anadromous adults and bull trout*
13. *Determine interactions between anadromous and resident fish*
14. *Evaluate when reintroduction goals are achieved*
15. *Determine habitat use of Swift bypass reach*
16. *Maintain compliance and monitoring requirements with 401 certification*
17. *Estimate population size of fall Chinook, spring Chinook and coho in lower river*
18. *Determine spatial and temporal distribution of adults in lower river*
19. *Ecological interactions between juvenile hatchery, wild smolts and resident species (e.g., bull trout)*
20. *Determine juvenile abundance and residence time*
21. *Conduct redd and carcass survey*
22. *Planning, reporting and data analysis of all activities*

Merwin Dam (Existing)

New Merwin Fish Passage Facilities



Merwin Fish Passage Facilities



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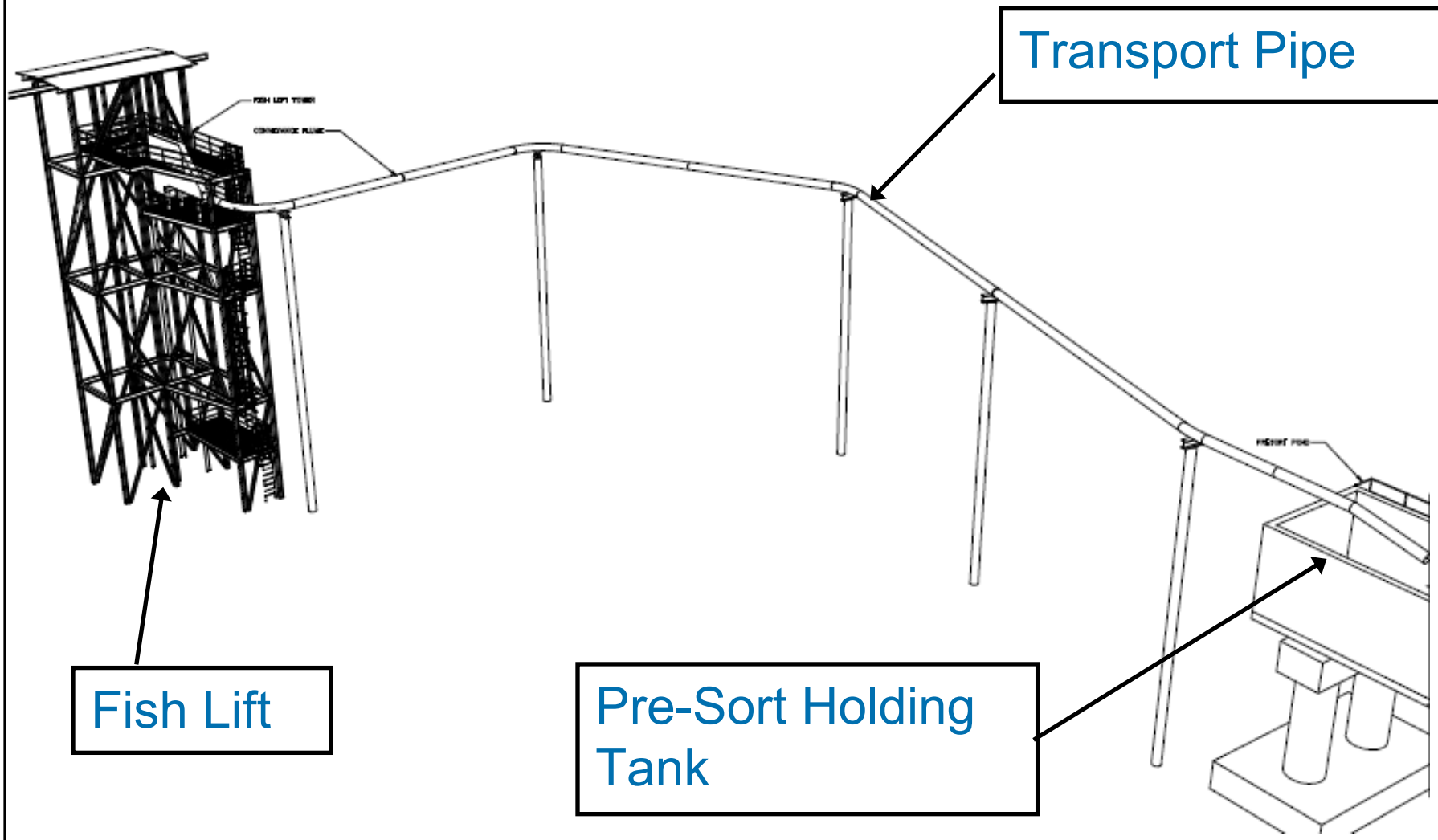
Fish Lift, Transport Flume, and Pre-Sort Tank

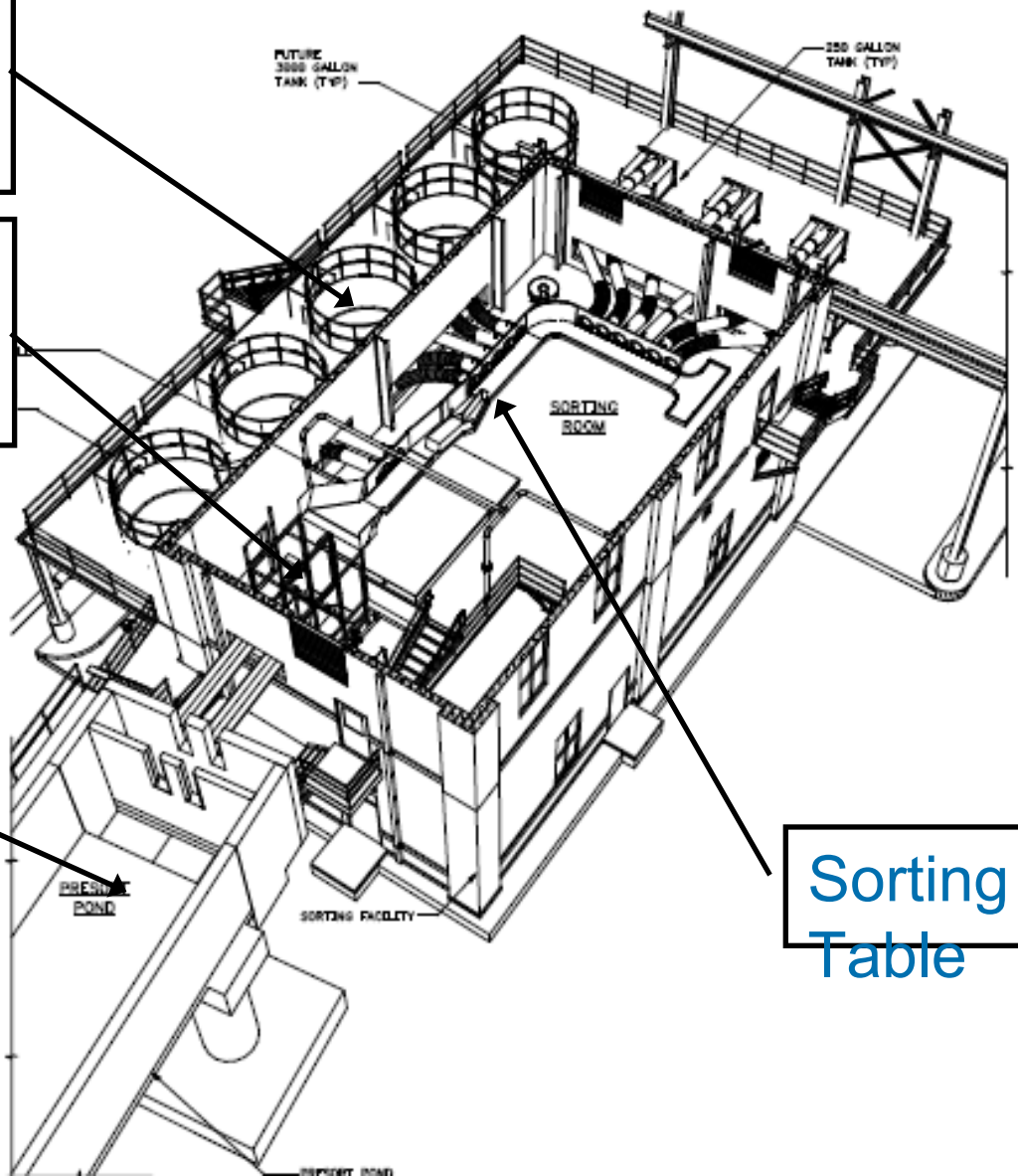


Sorting Facility (inside)

Drive-under Holding Tanks

Electro-Anesthesia

Pre-Sort Tank



Sorting Table

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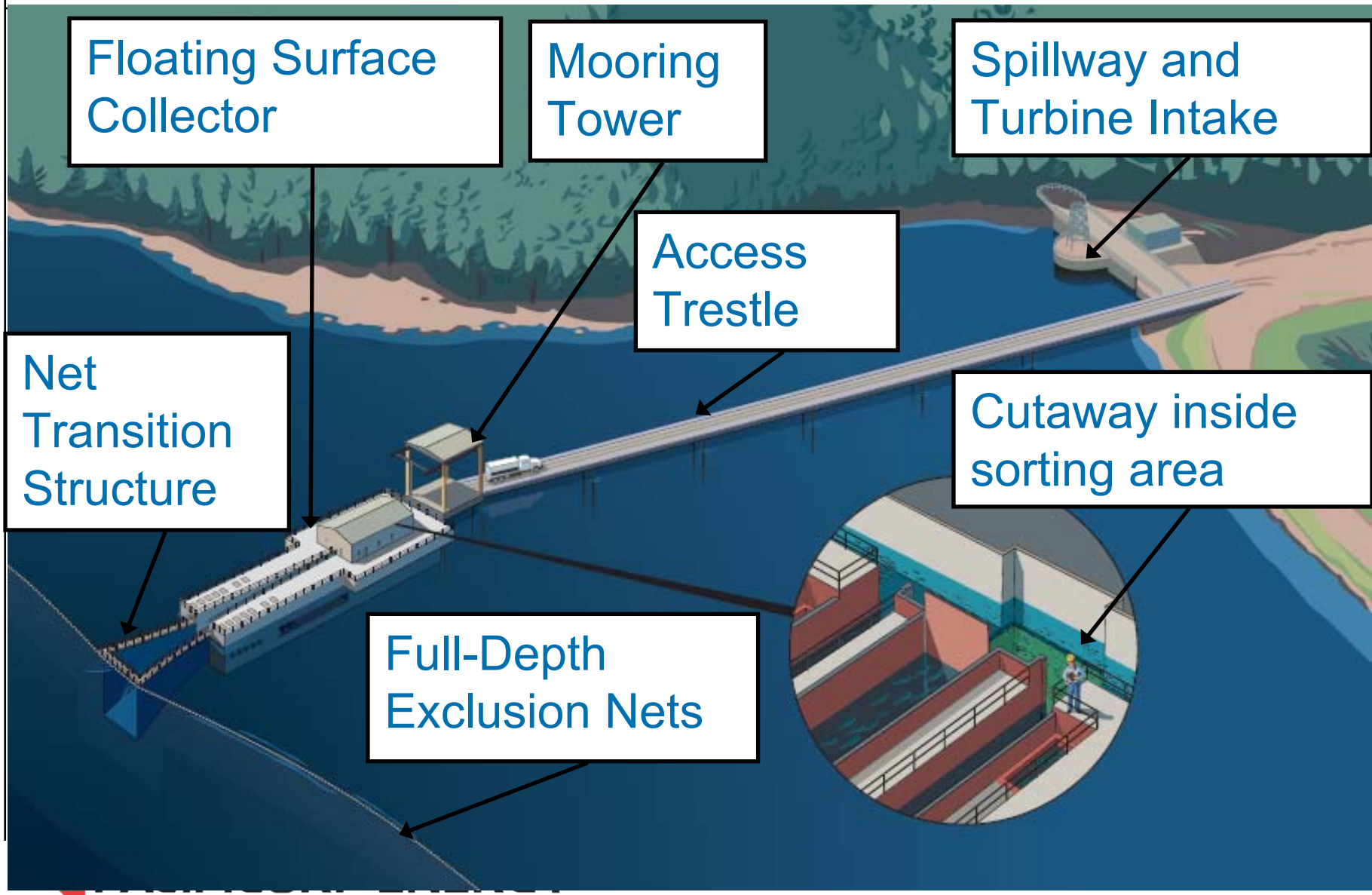
Sorting Area Construction

Pump Station Construction

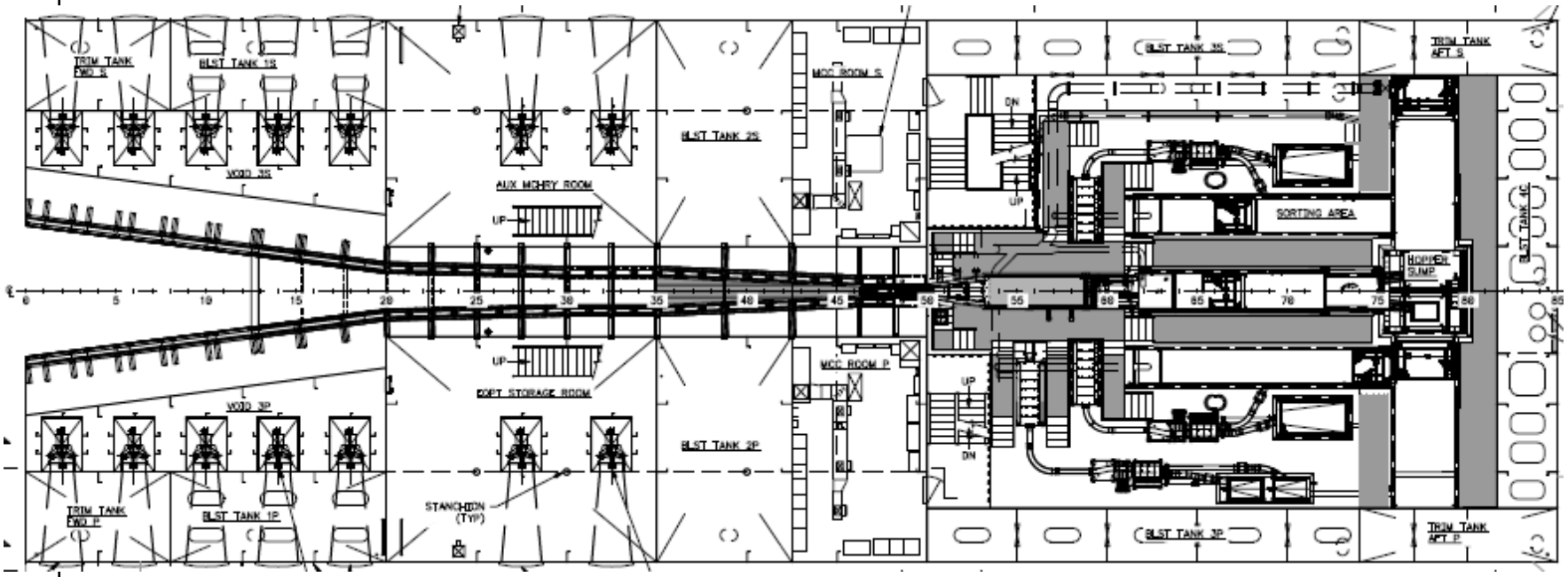
Construction Access for Pump Station

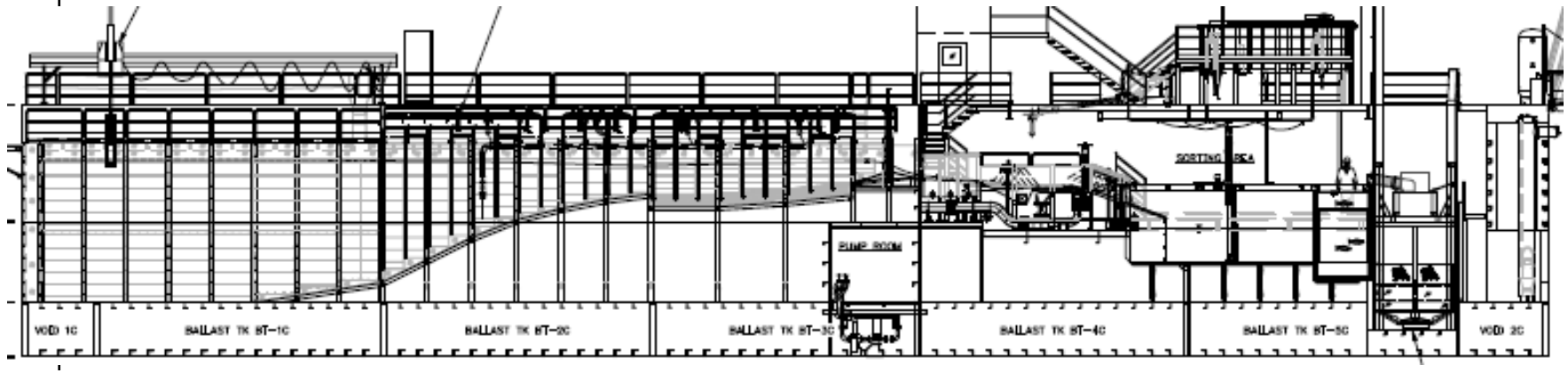
Swift Dam (existing)

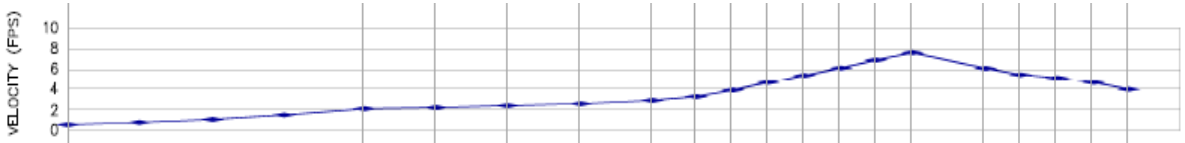
Swift Reservoir Fish Facility



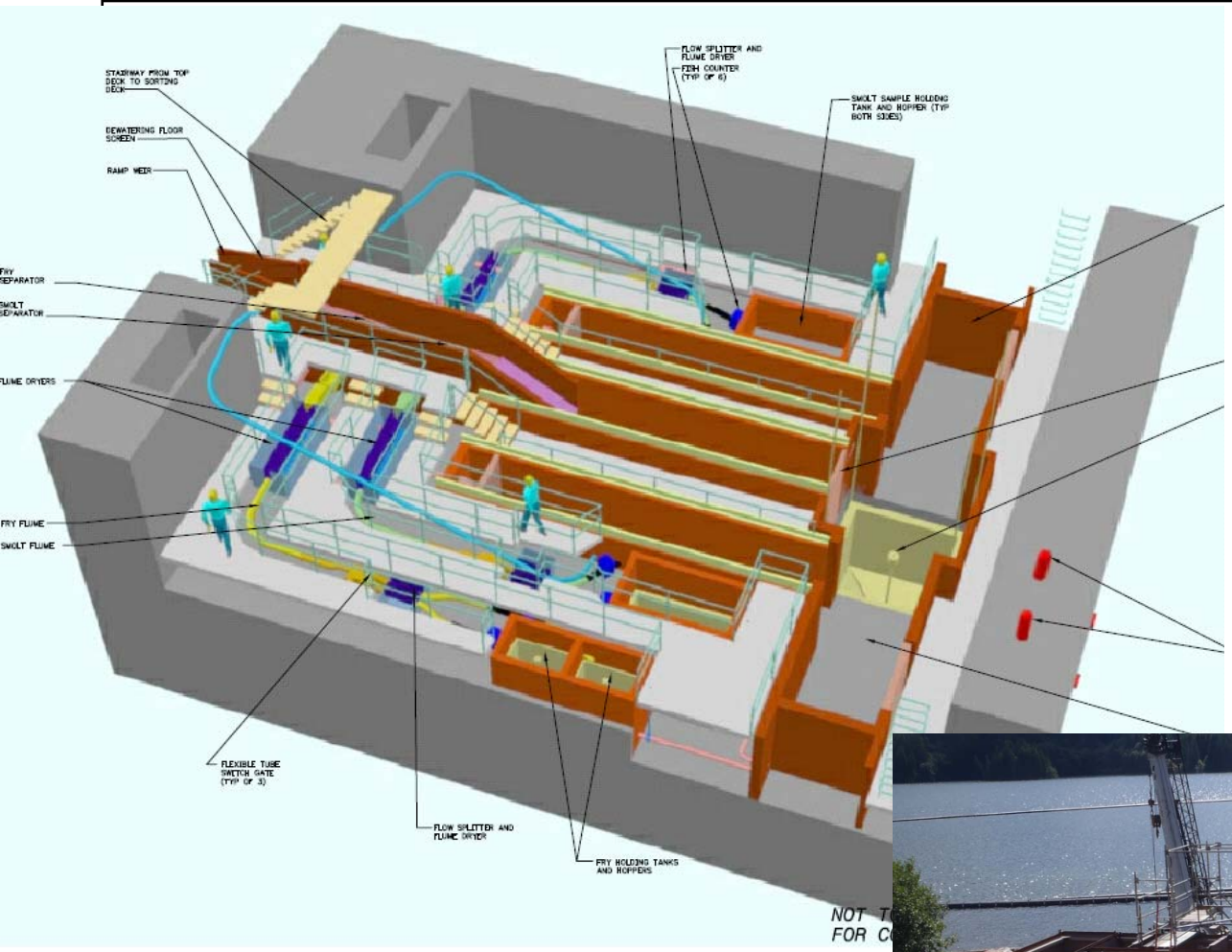
FSC Hydraulics (600 cfs)







Sorting Area on Floating Surface Collector



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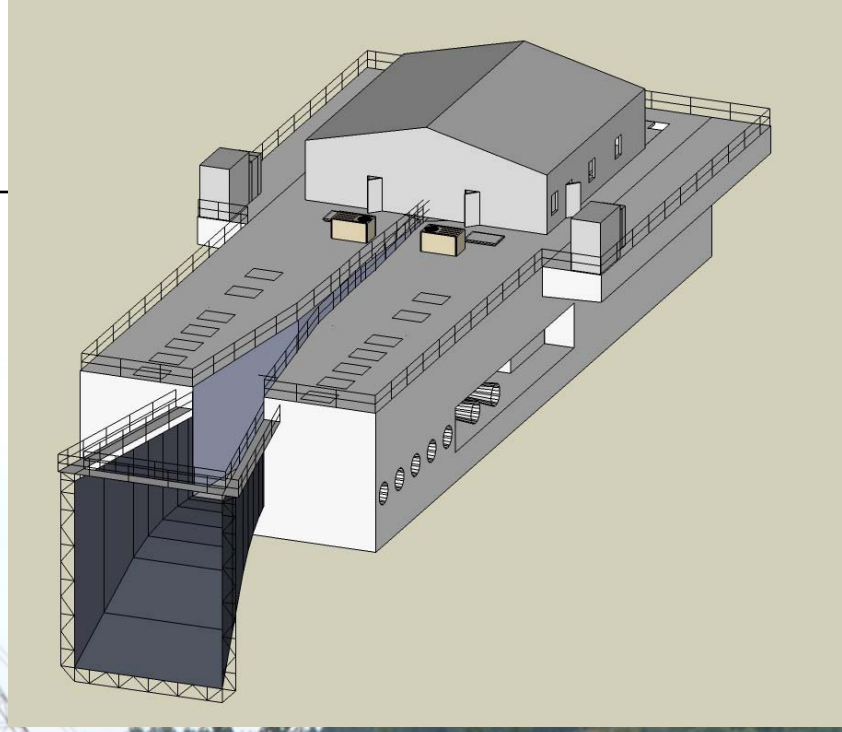
Floating Surface Collector Assembly



Mooring Tower Construction

Lessons Learned (so far)

- Start Early
  - Due to the complexity of these projects, every phase will require extensive effort. It is very difficult to make up time.
- Actively engage stakeholders to avoid surprises
  - Facility design review
  - Permitting (duration)
  - Internal Stakeholders (funding, operations, procurement)
- Learn from others
  - Someone else probably has developed a component that you will use, and has ideas to improve upon it.
  - Thanks to all that have helped us!

Downstream Fish Passage Lessons from the Baker River Hydroelectric Project

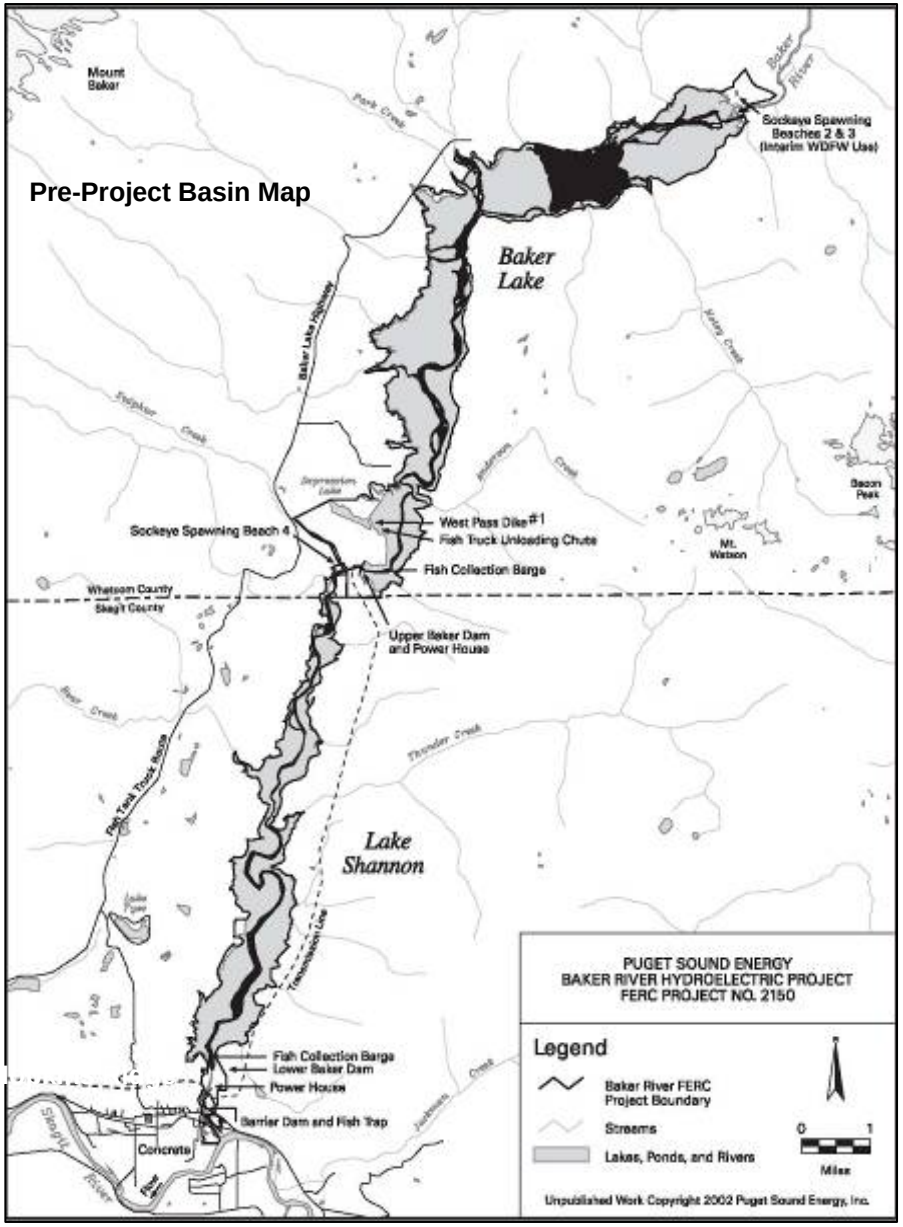
PUGET SOUND ENERGY

Matt Macartney
Principal Engineer – Mechanical
Nick Verretto
Resource Scientist – Fisheries

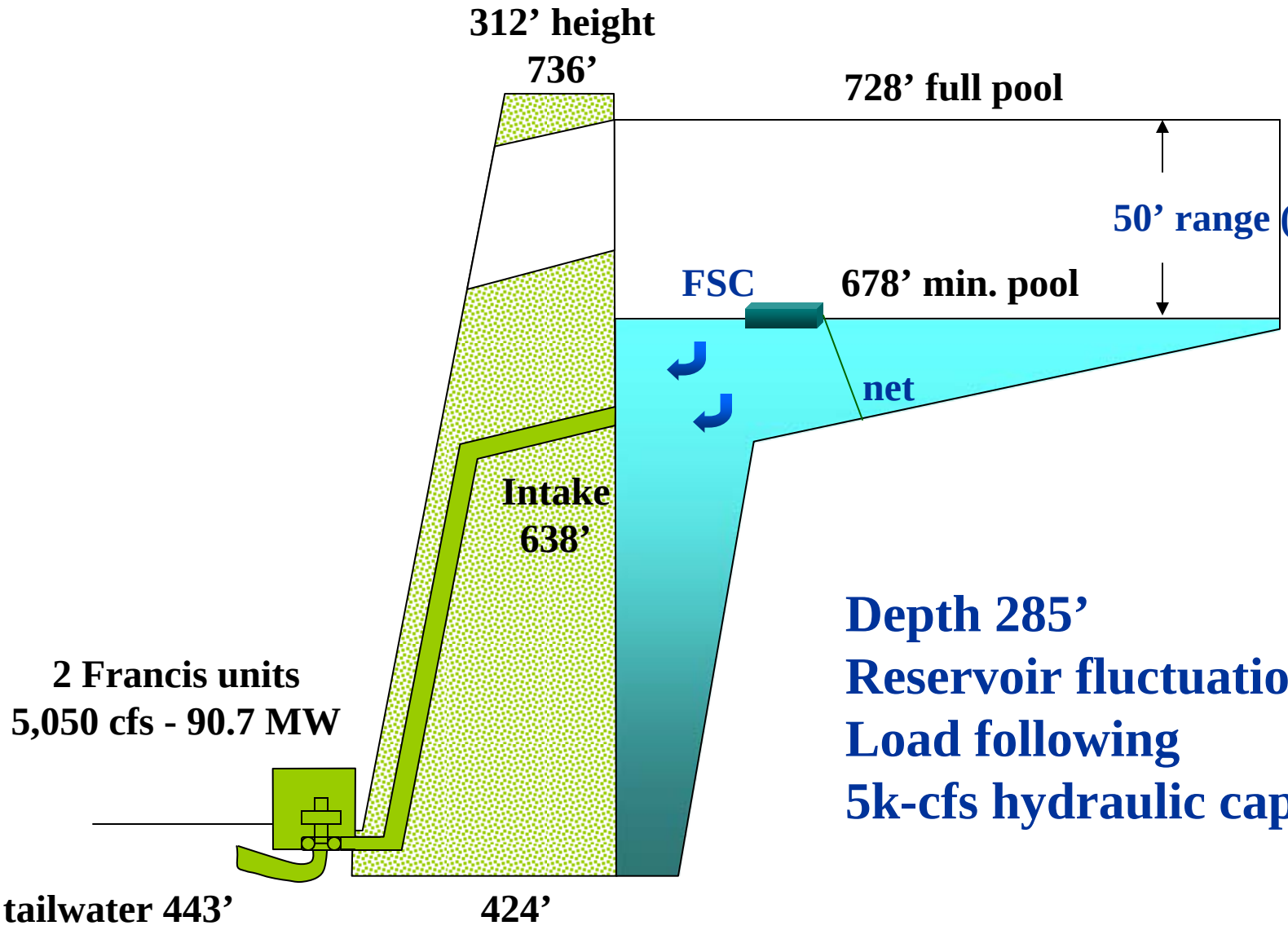
September 21, 2011


Baker River
Project Area
Port Alberni
Richmond
Surrey
BRITISH
COLUMBIA
Saanich
Victoria
Anacortes
Oak Harbor
Bellingham
Mount Vernon
Pasayten Wilderness
Oliver
Osoyoos
Grand Forks
Trail
Creston
Bonners Ferry
Republic
Colville
Winthrop
Newport
Sandpo
Forks
Port Townsend
Olympic N.P.
Everett
Shoreline
Seattle
Kirkland
Renton
Tacoma
Federal Way
Lakewood
Olympia
Hoquiam
Aberdeen
Centralia
Chehalis
South Bend
Pacific Ocean
Chelan
Waterville
Wenatchee
Ephrata
Quincy
Ellensburg
Yakima
Electric City
Spokane
Spokane I.R.
Post Falls
Coeur d'Alene
Opportunity
Moses Lake
Ritzville
Royal City
Othello
La Crosse
Colfax
Moscow
Pullman
Connell
Pomeroy
Lewiston
Richland
Kennewick
Walla Walla
Sunnyside
Yakama Indian Reservation
UNITED STATES
WASHINGTON
Astoria
Seaside
Longview
Stevenson
Hood River
Goldendale
Hermiston
Milton-Freewater
Pendleton
Portland
The Dalles
Hillsboro
Enterprise

Project Description



Upper Baker Dam

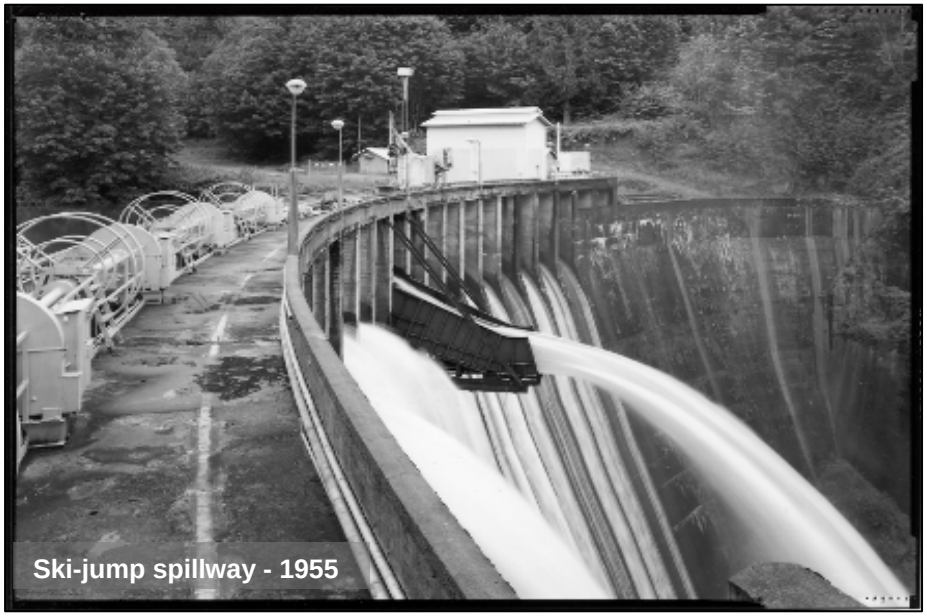


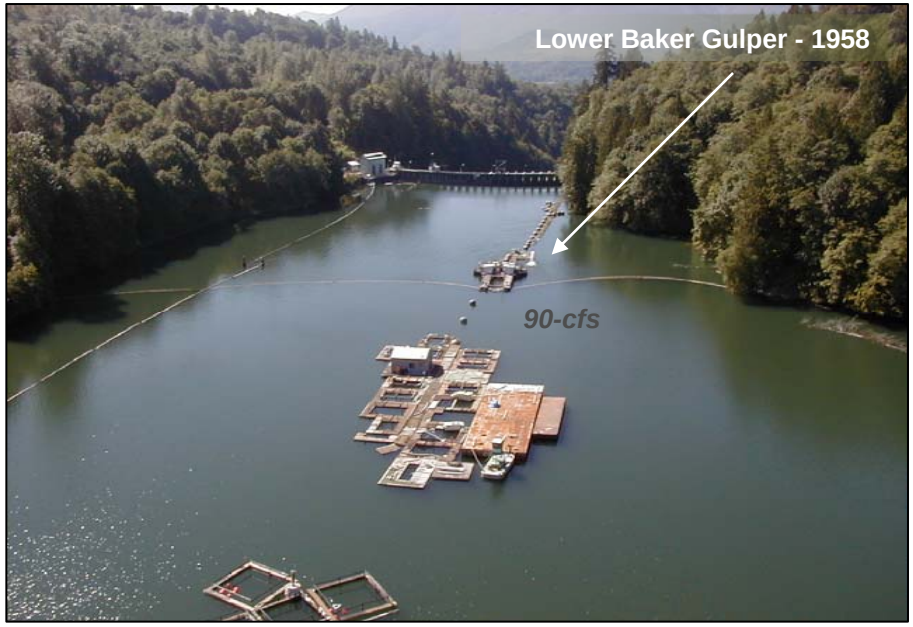
Depth 285’
Reservoir fluctuations
Load following
5k-cfs hydraulic capacity

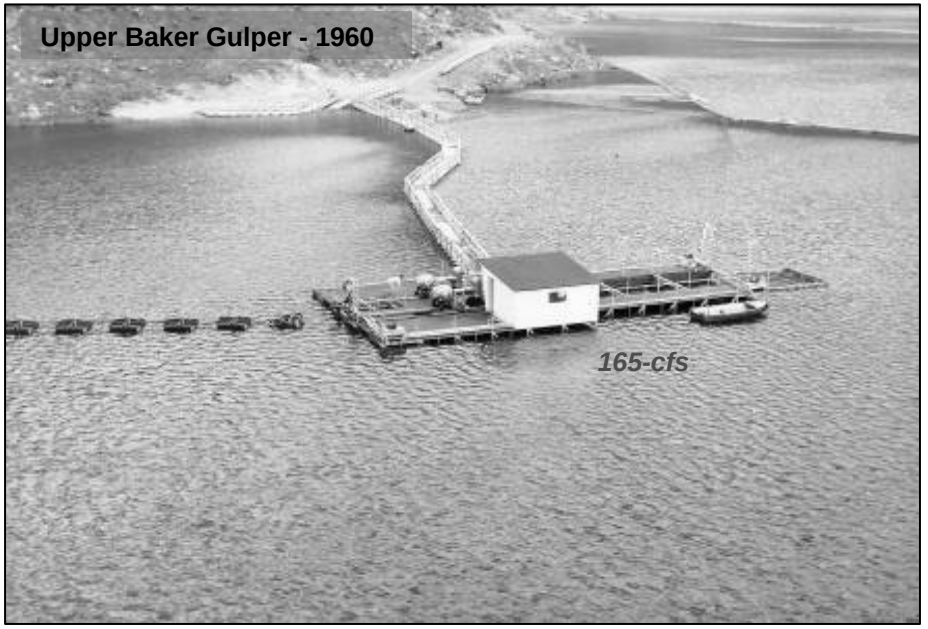
Original Fish Passage

Downstream Passage

- Entrainment
- Ski-jump spillway
- “Gulpers”





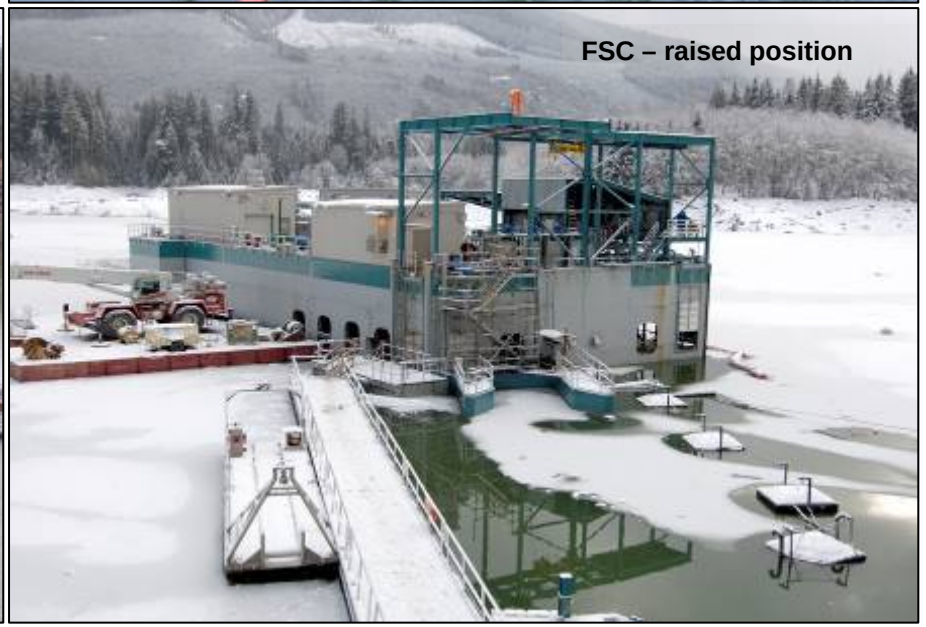


Components – FSC

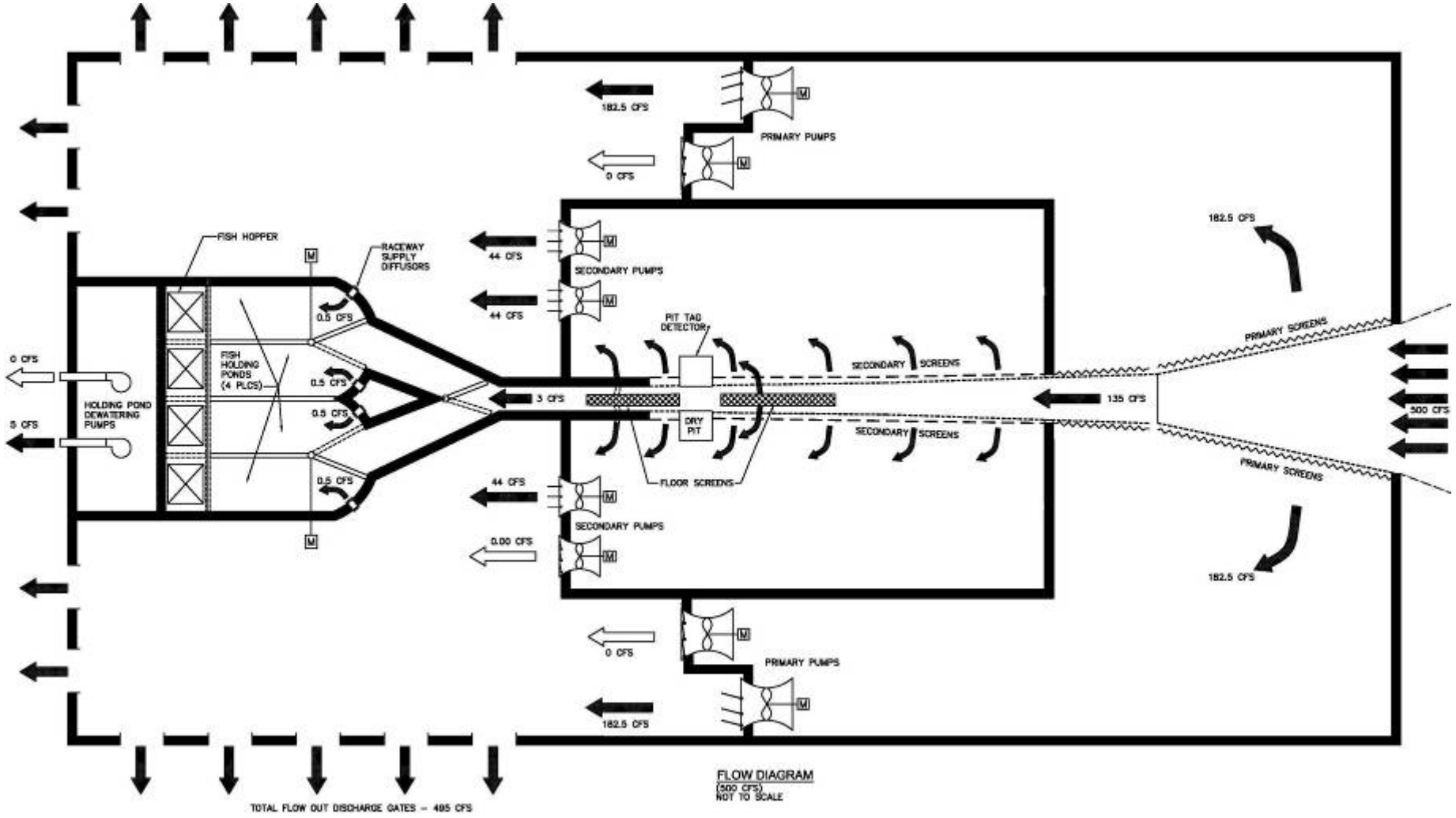
Floating Surface Collector

- “dry-dock” configuration
- 4 primary pumps
- 4 secondary pumps
- 500/1,000-cfs flow
- trap-&-haul


FSC – operating position


FSC – raised position

Hydraulics


182.5 CFS
PRIMARY PUMPS
0 CFS
FISH HOPPER
RACEWAY SUPPLY DIFFUSORS
44 CFS
SECONDARY PUMPS
44 CFS
PIT TAG DETECTOR
182.5 CFS
PRIMARY SCREENS
0 CFS
FISH HOLDING PONDS (4 PLCS)
0.5 CFS
0.5 CFS
0.5 CFS
3 CFS
SECONDARY SCREENS
135 CFS
500 CFS
5 CFS
HOLDING POND DEWATERING PUMPS
DRY PIT
SECONDARY SCREENS
0.5 CFS
FLOOR SCREENS
PRIMARY SCREENS
44 CFS
SECONDARY PUMPS
0.00 CFS
182.5 CFS
0 CFS
PRIMARY PUMPS
182.5 CFS
TOTAL FLOW OUT DISCHARGE GATES = 495 CFS
FLOW DIAGRAM
(500 CFS)
NOT TO SCALE

New FSC Development

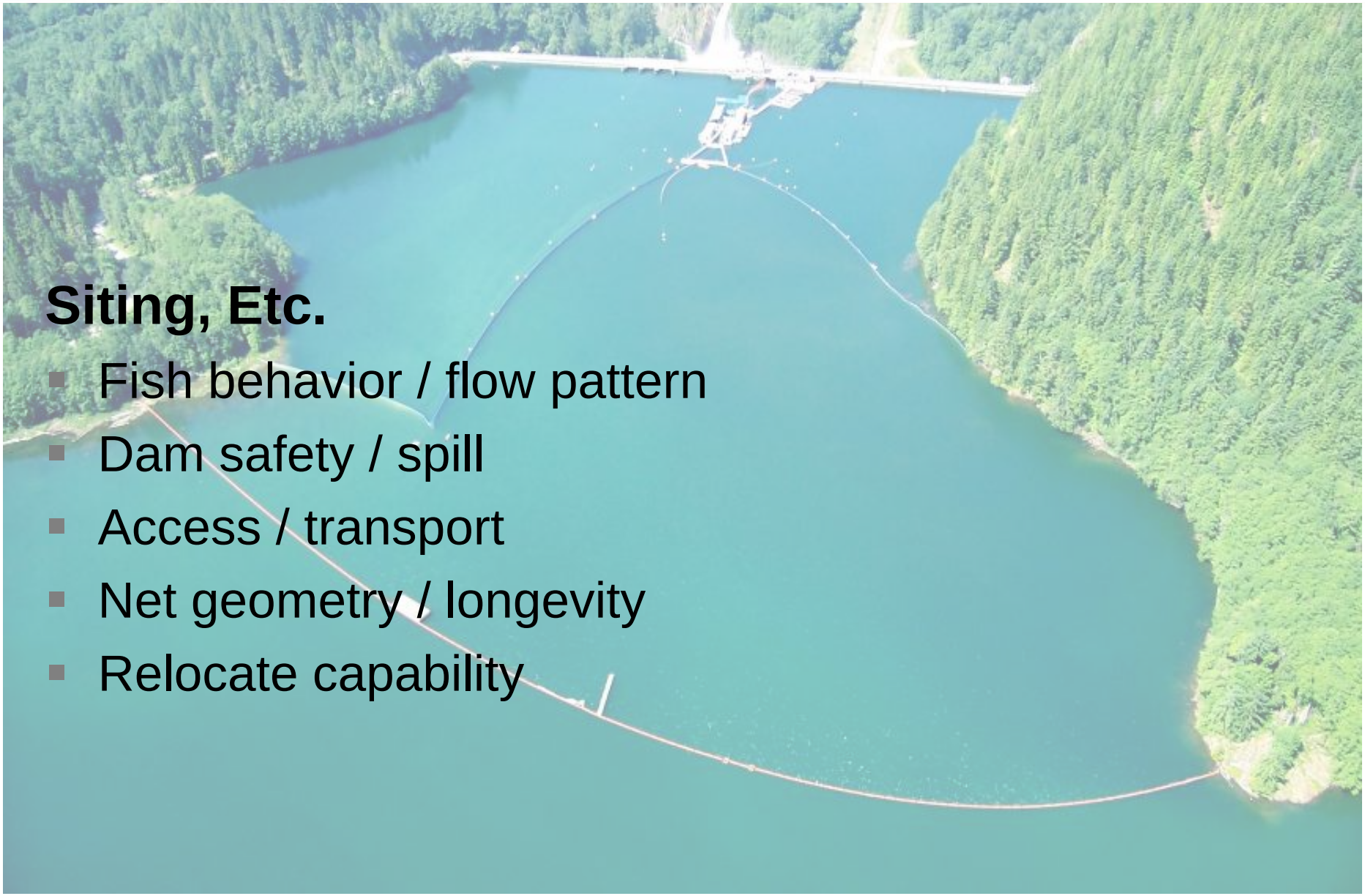
PUGET SOUND ENERGY

Components – NTS & Net

UB NTS launch

UB Net on south bench

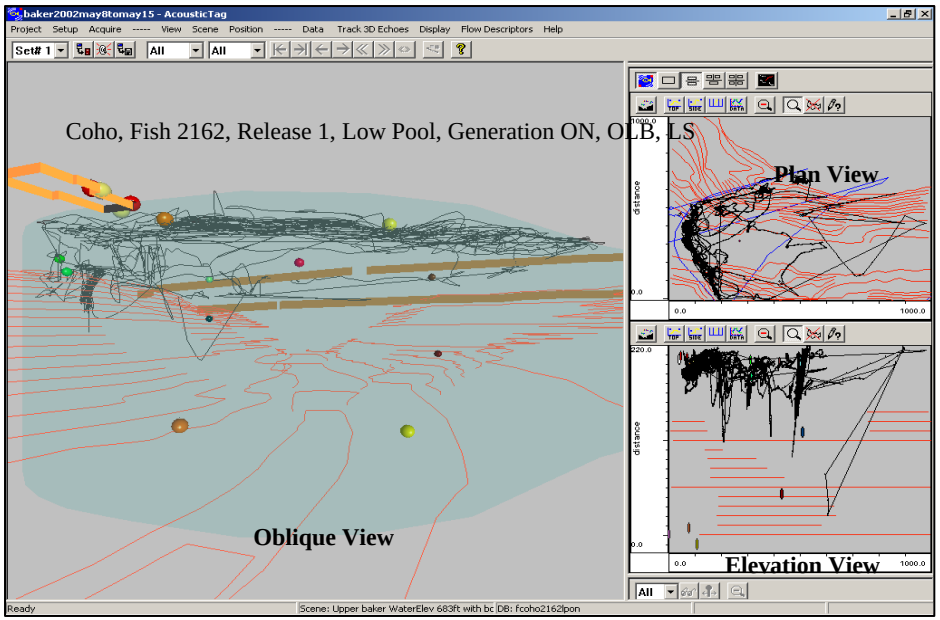
Design Goals - FSC

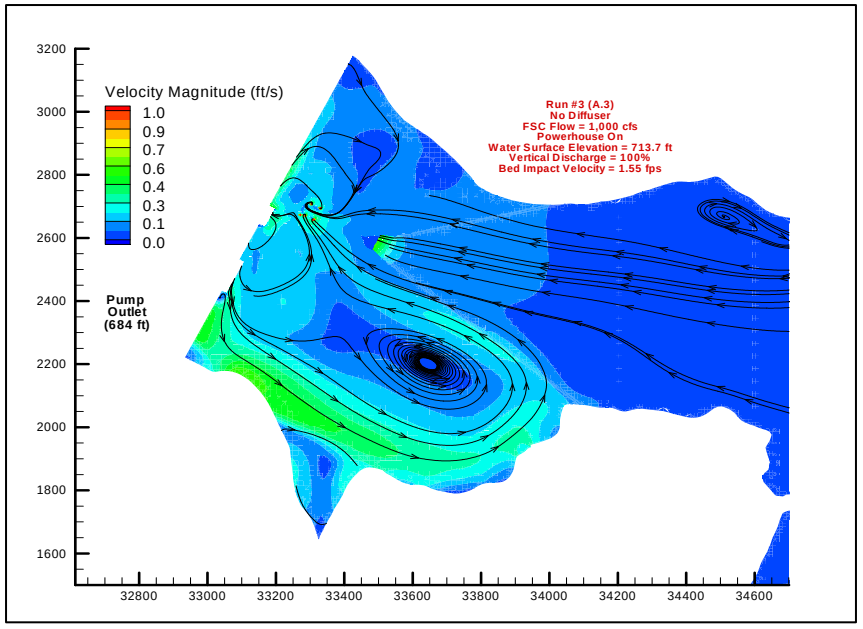


Siting, Etc.

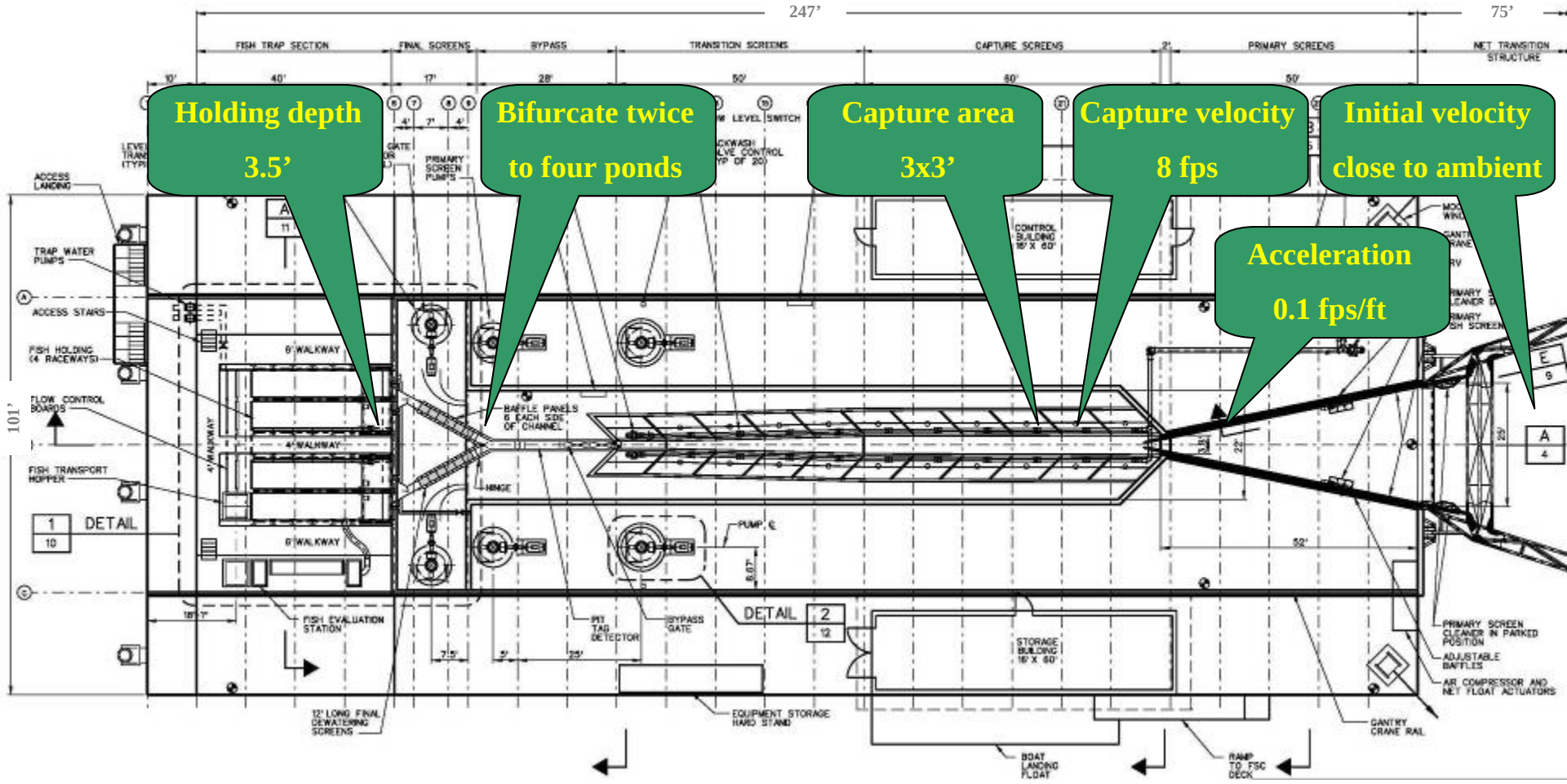
- Fish behavior / flow pattern
- Dam safety / spill
- Access / transport
- Net geometry / longevity
- Relocate capability

New FSC Development

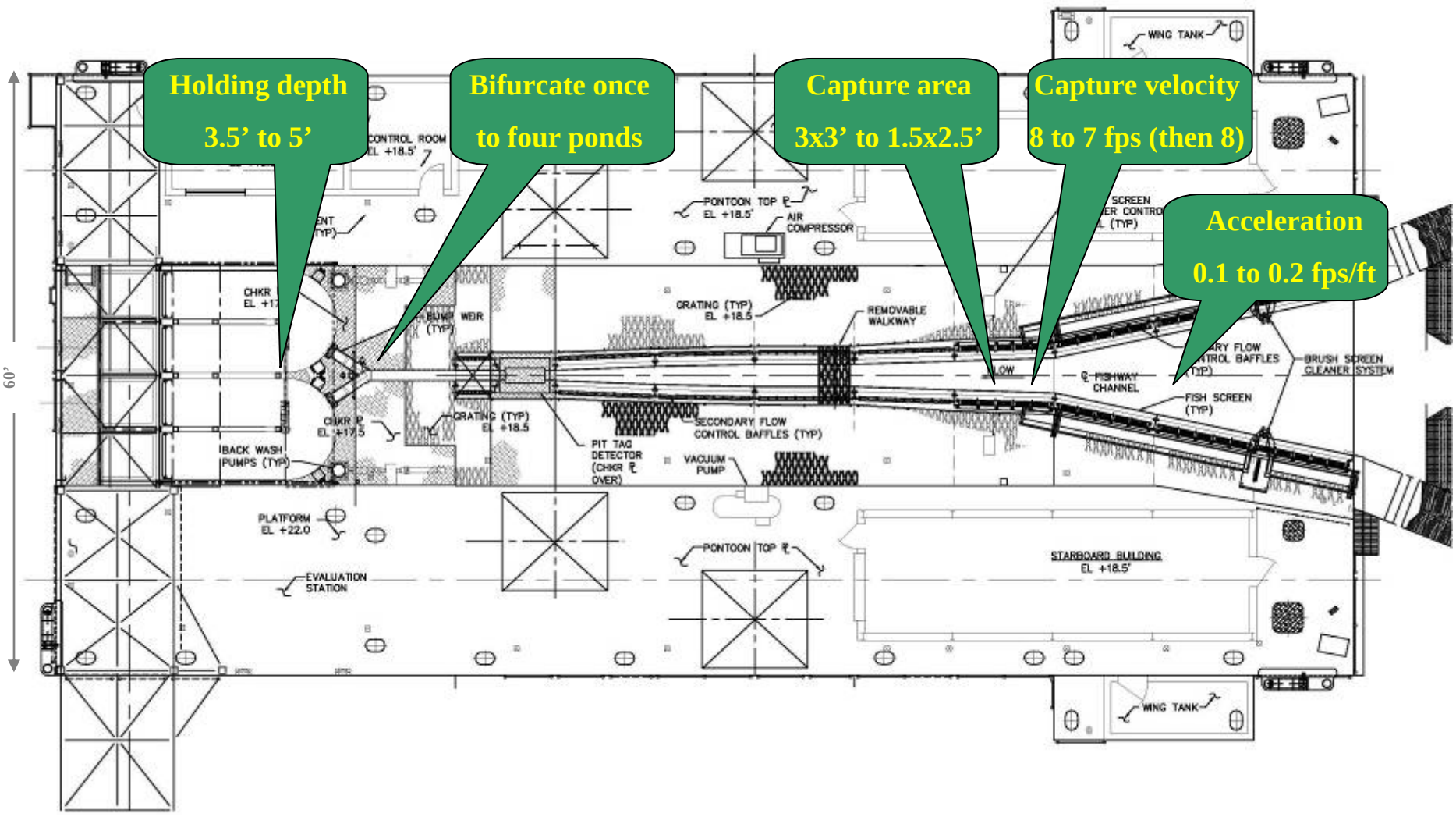




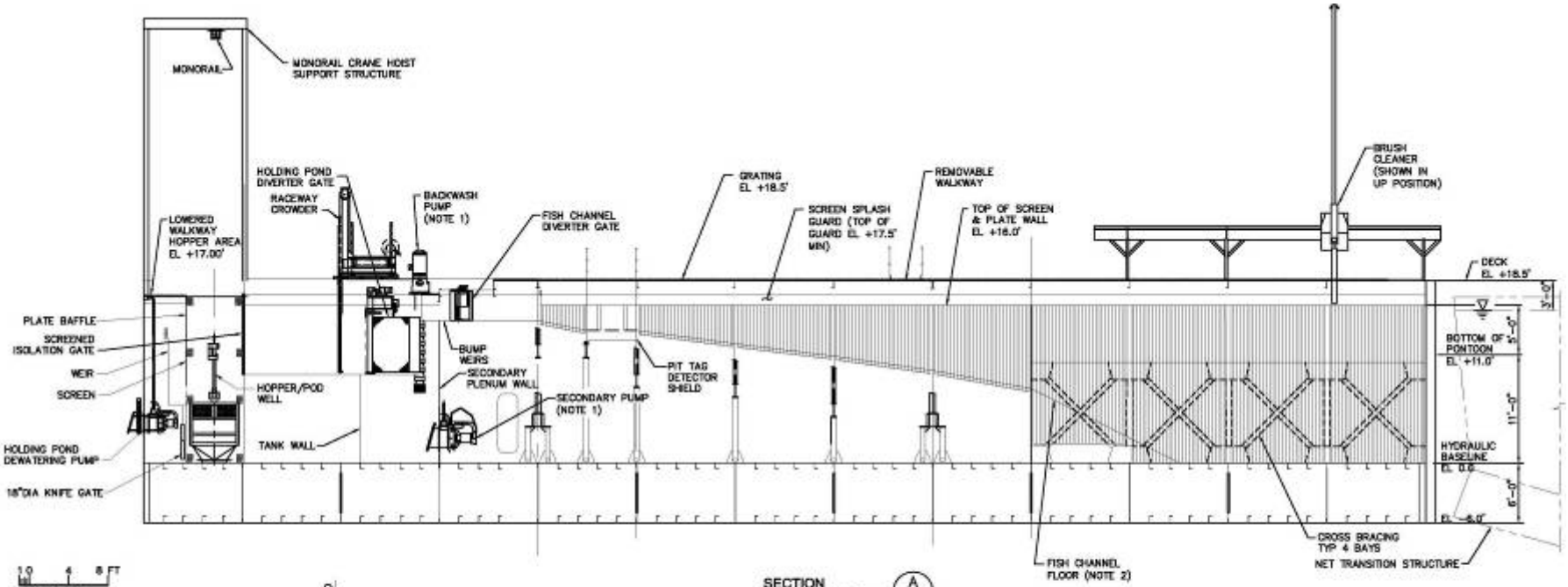
Original Design Hydraulics



Revised Hydraulics



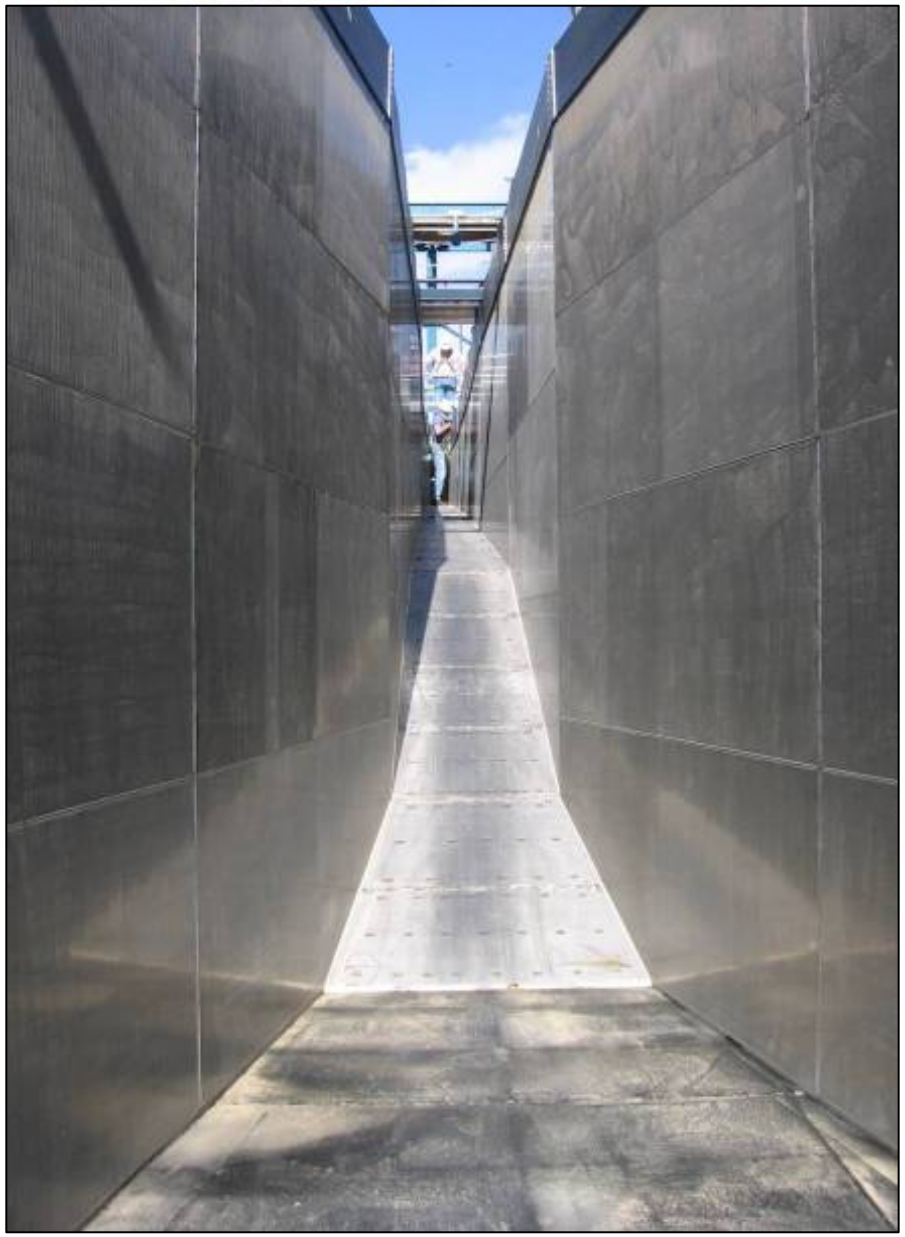
Hydraulic Profile

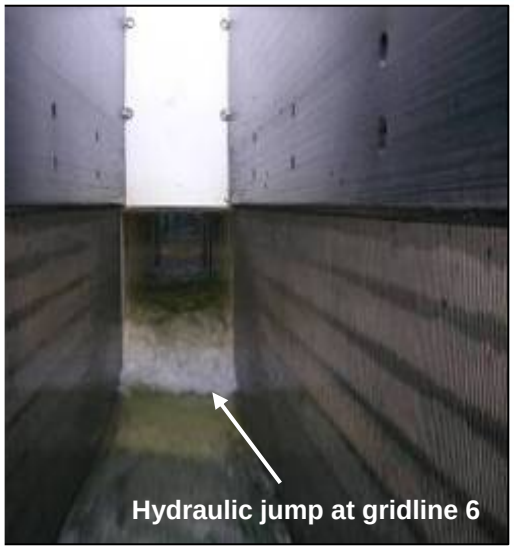


HYDRAULIC DATA-- BASE CASE														
GRID NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FLOW (CFS)	NA	5.00	5.00	3.00	3.00	7.80	25.00	58.30	92.70	134.6	196.6	296.3	398.2	500
WIDTH (FT)	NA	NA	NA	1.00	1.00	1.00	1.80	2.20	2.20	2.85	3.50	7.87	11.83	16.00
DEPTH (FT)	NA	5.00	5.00	0.65	0.82	1.75	2.92	3.97	5.03	7.33	12.67	15.38	15.41	15.42

Criteria vs “Guidelines”

Upper Baker Fish Channel





Upper Baker Floor Flow Control

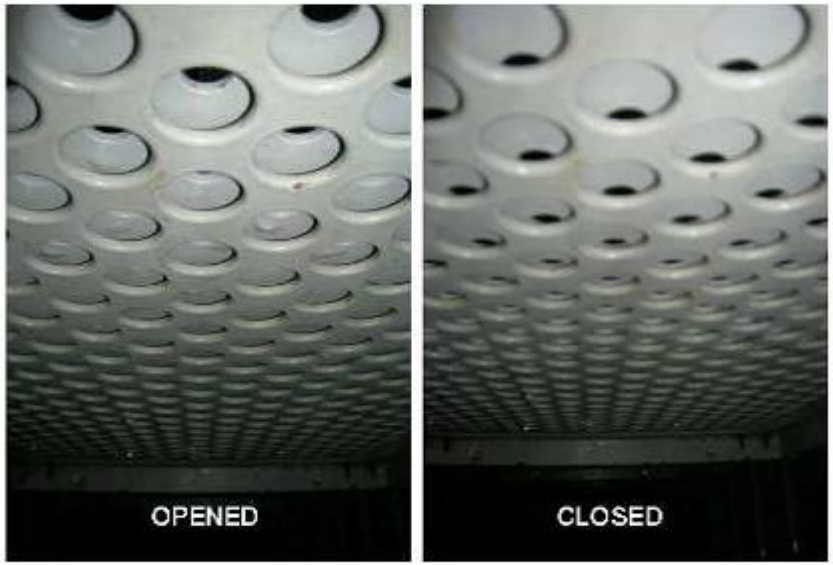


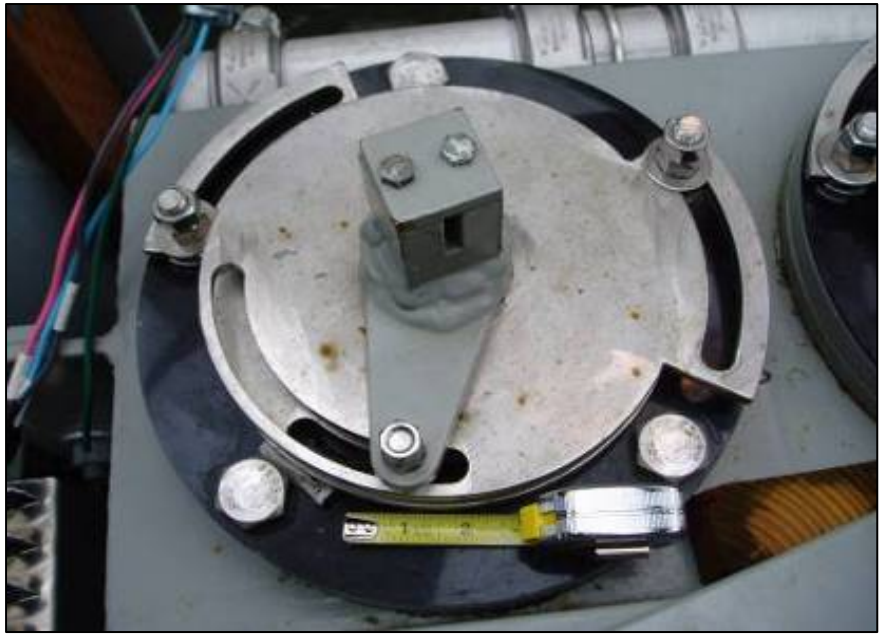
Photo 4-3 Typical Floor Screen Baffle – Perspective 2

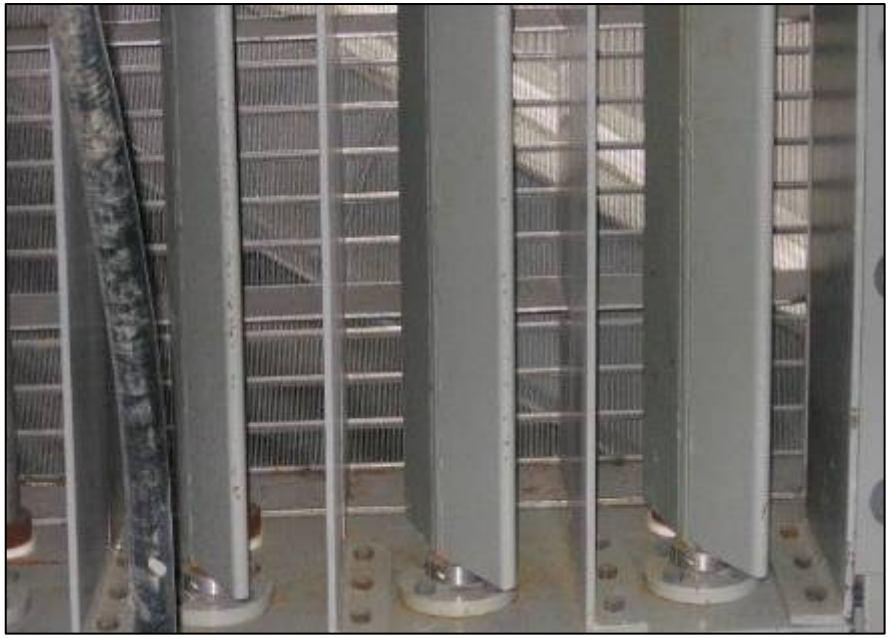
Photo 4-1 Typical Floor Screen Baffle – Full Open, Perspective 1

Photo 4-2 Typical Floor Screen Baffle – Full Closed, Perspective 1

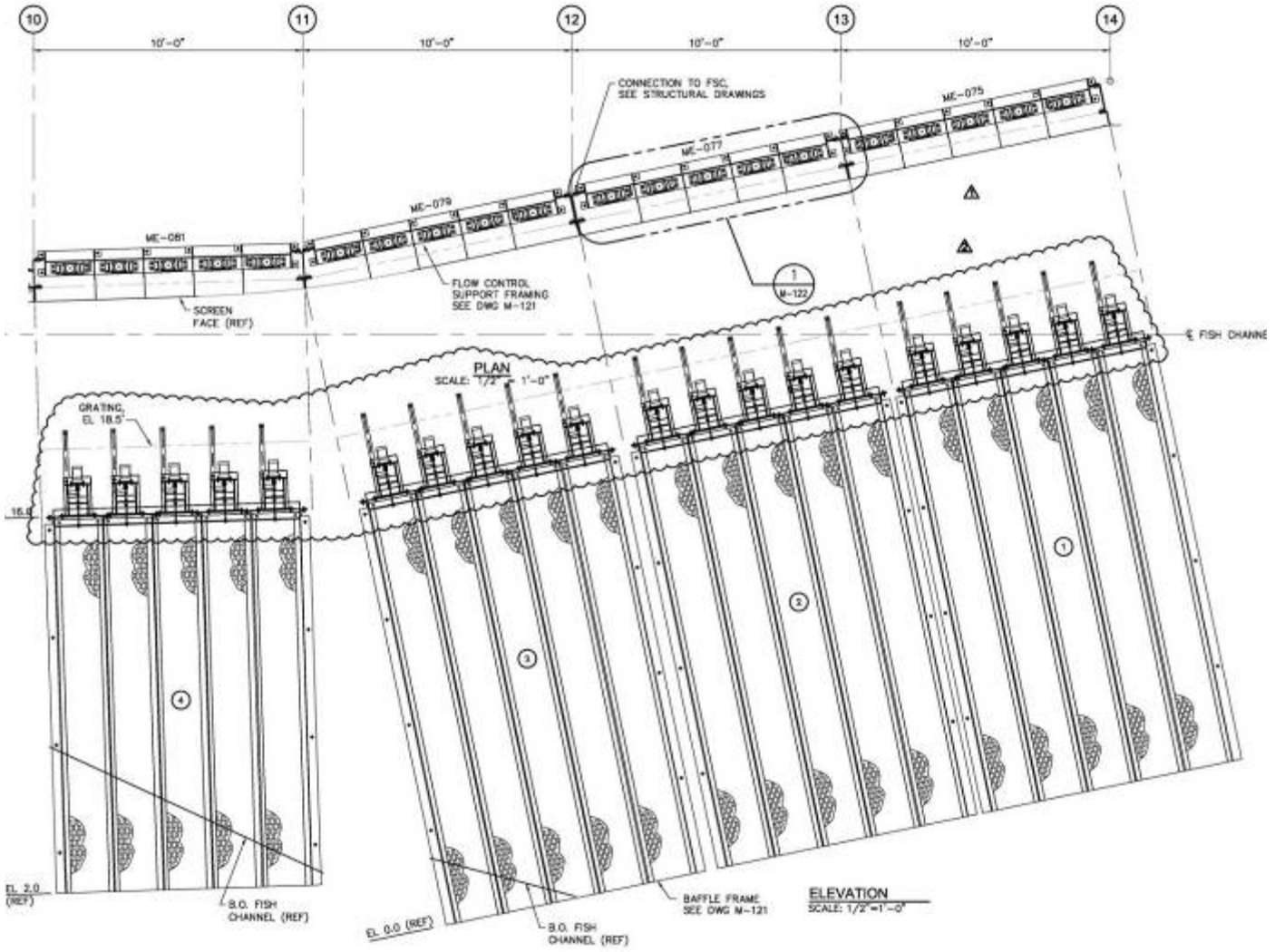
Upper Baker Fish Channel

PUGET SOUND ENERGY

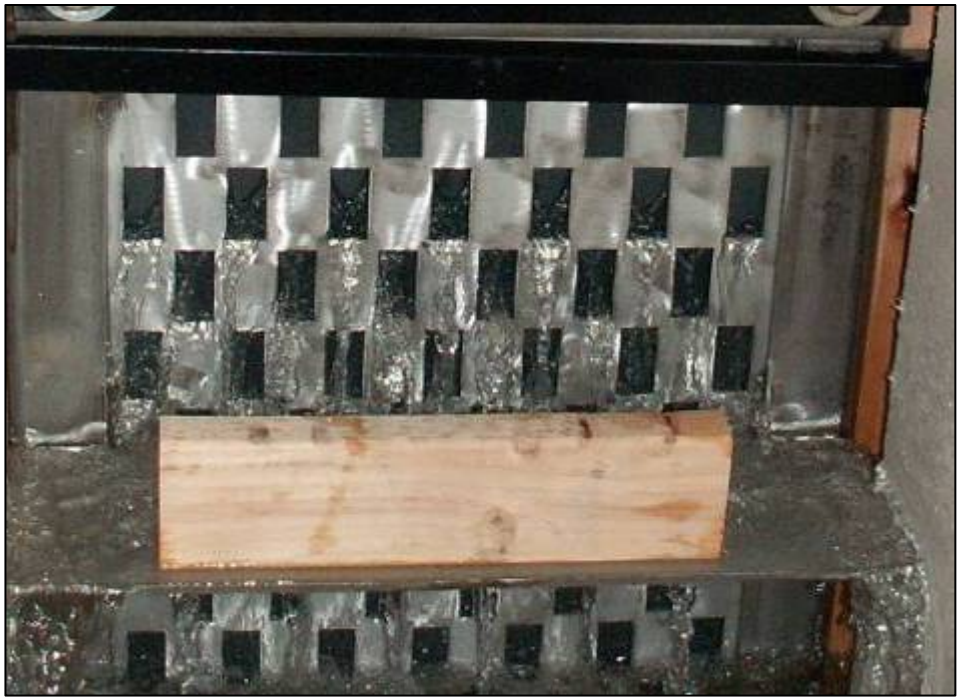




Lower Baker Flow Control



Lower Baker Flow Control



Lower Baker Flow Control