

Jun 24th, 3:00 PM - 3:15 PM

## Session C8: River Mill Dam Downstream Migrant Integrated Collector and Bypass

Peter Christensen  
*R2 Resource Consultants*

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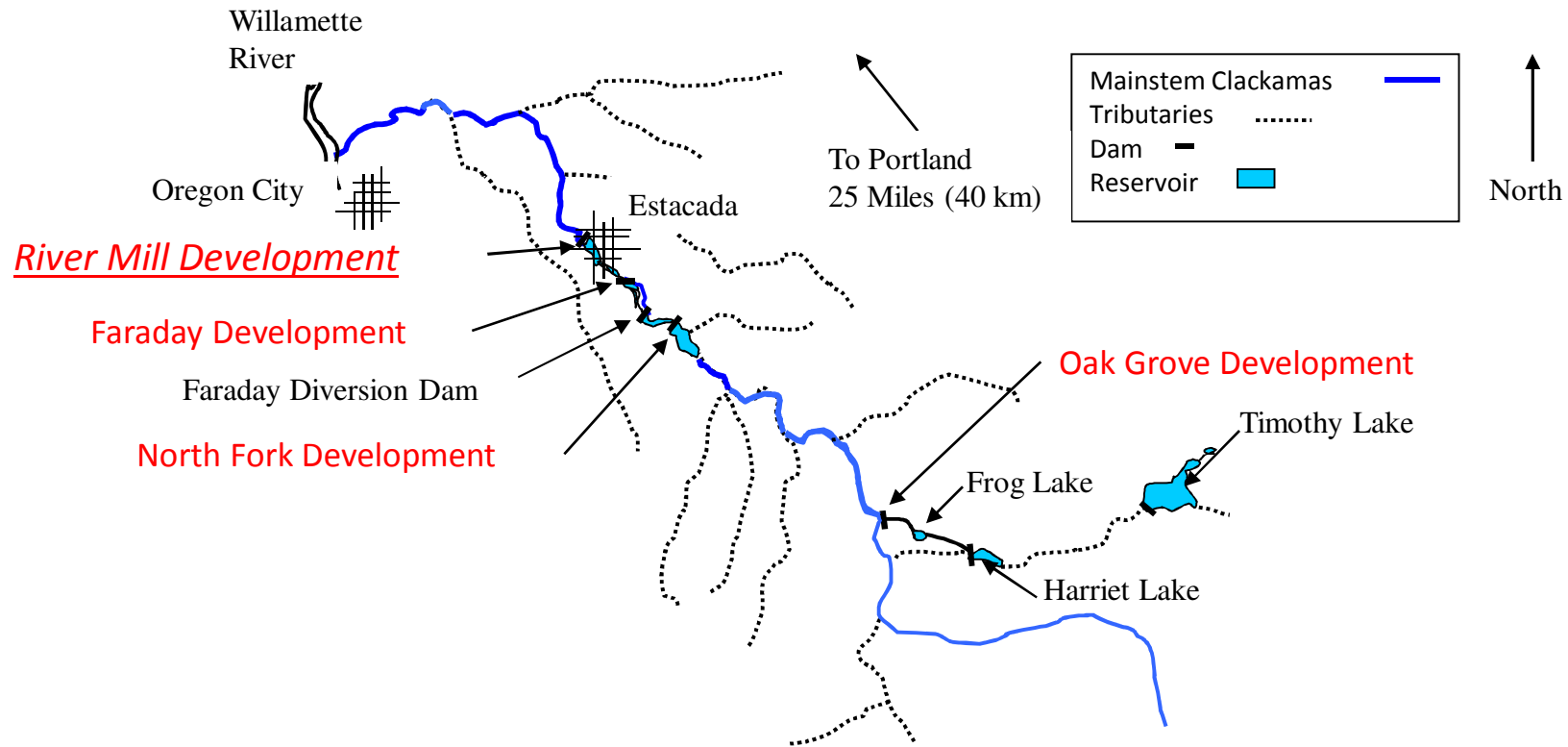
# River Mill Dam Downstream Migrant Integrated Collector & Bypass

Peter Christensen, P.E. — R2 Resource Consultants

◀ **FISH PASSAGE 2015** ▶

International conference on river  
connectivity best practices and innovations

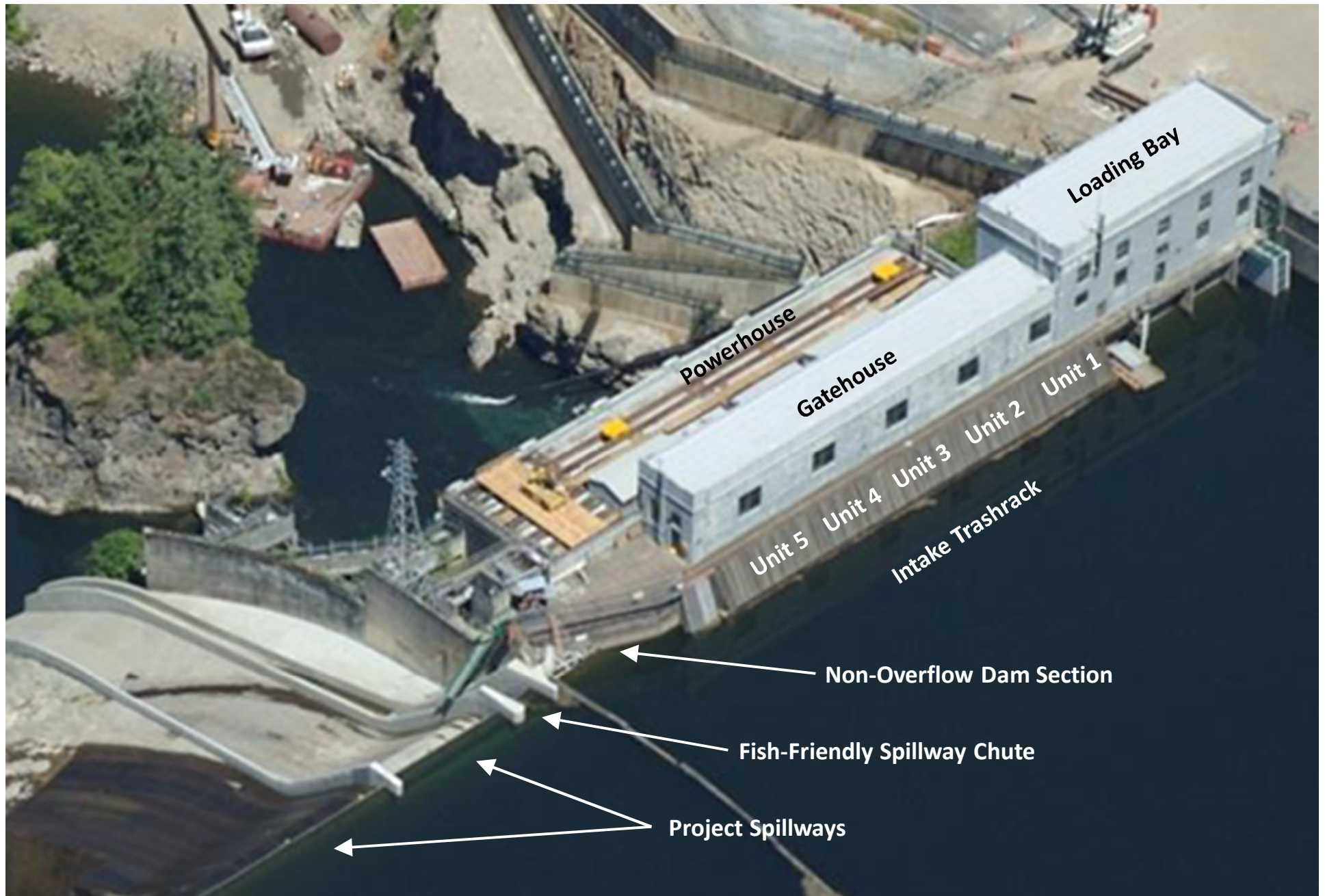
# Clackamas River Hydroelectric Project and River Mill Development



# Clackamas River and River Mill Dam

- **Clackamas River Anadromous Fish Species**
  - Chinook Salmon
  - Coho Salmon
  - Steelhead Trout
  - Pacific Lamprey
- **River Mill Dam**
  - Original Construction 1911-1912
  - Only Surviving Ambursen Dam West of Rocky Mountains
  - Five Units with Combined Capacity of 5,000 cfs (141 cms)
  - Approximately 85 Feet Head

# Original Project Layout (2005)



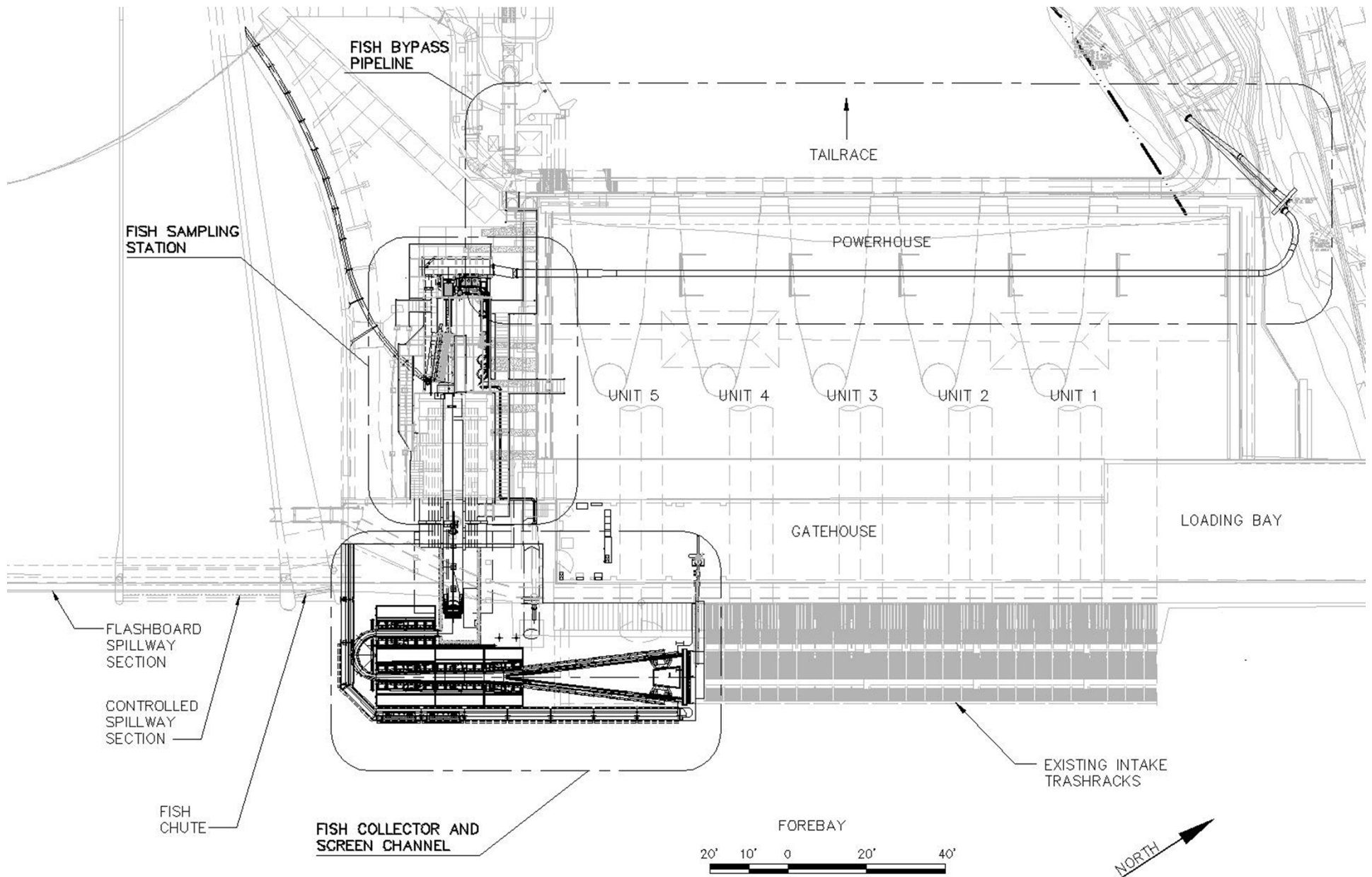
# Experimental Test Channel (2007)



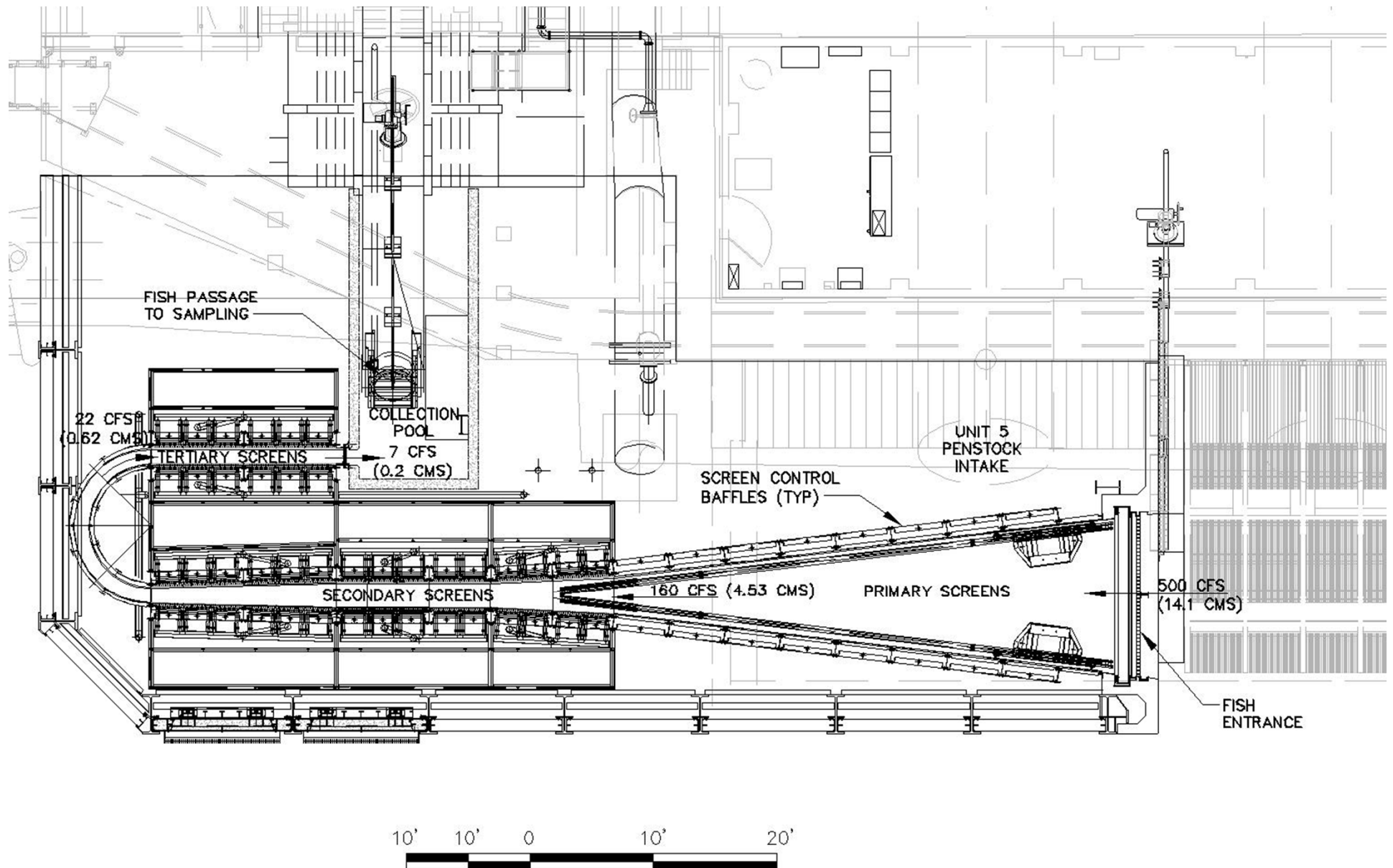
# Integrated Collector & Bypass (2013)



# Overall Collector & Bypass Plan



# Forebay Fish Collector Plan



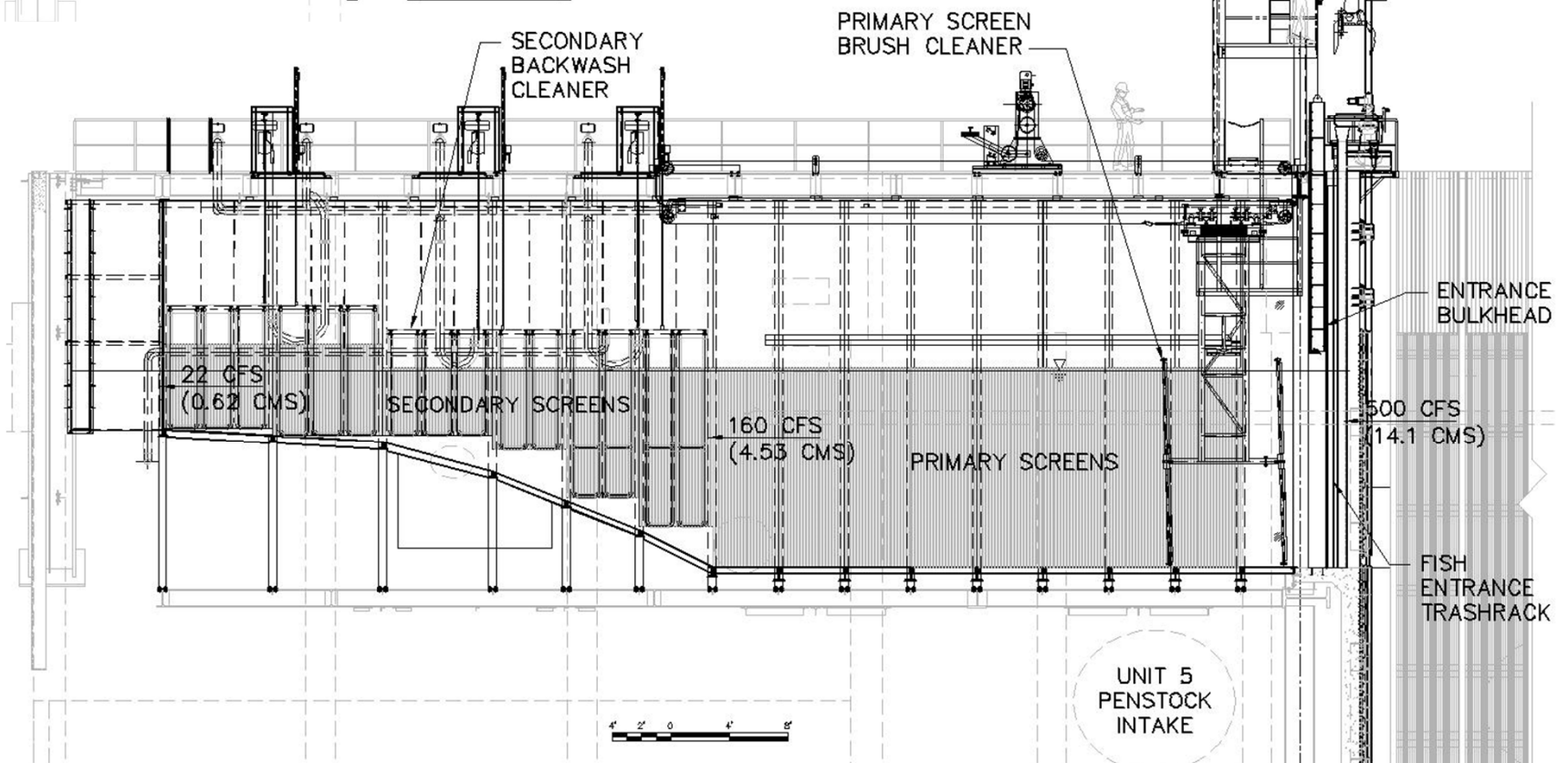
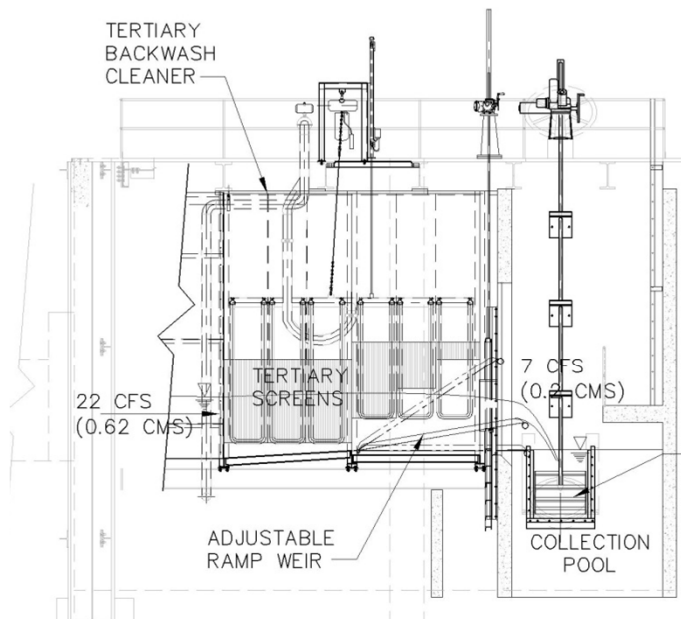
# Forebay Fish Collector Entrance

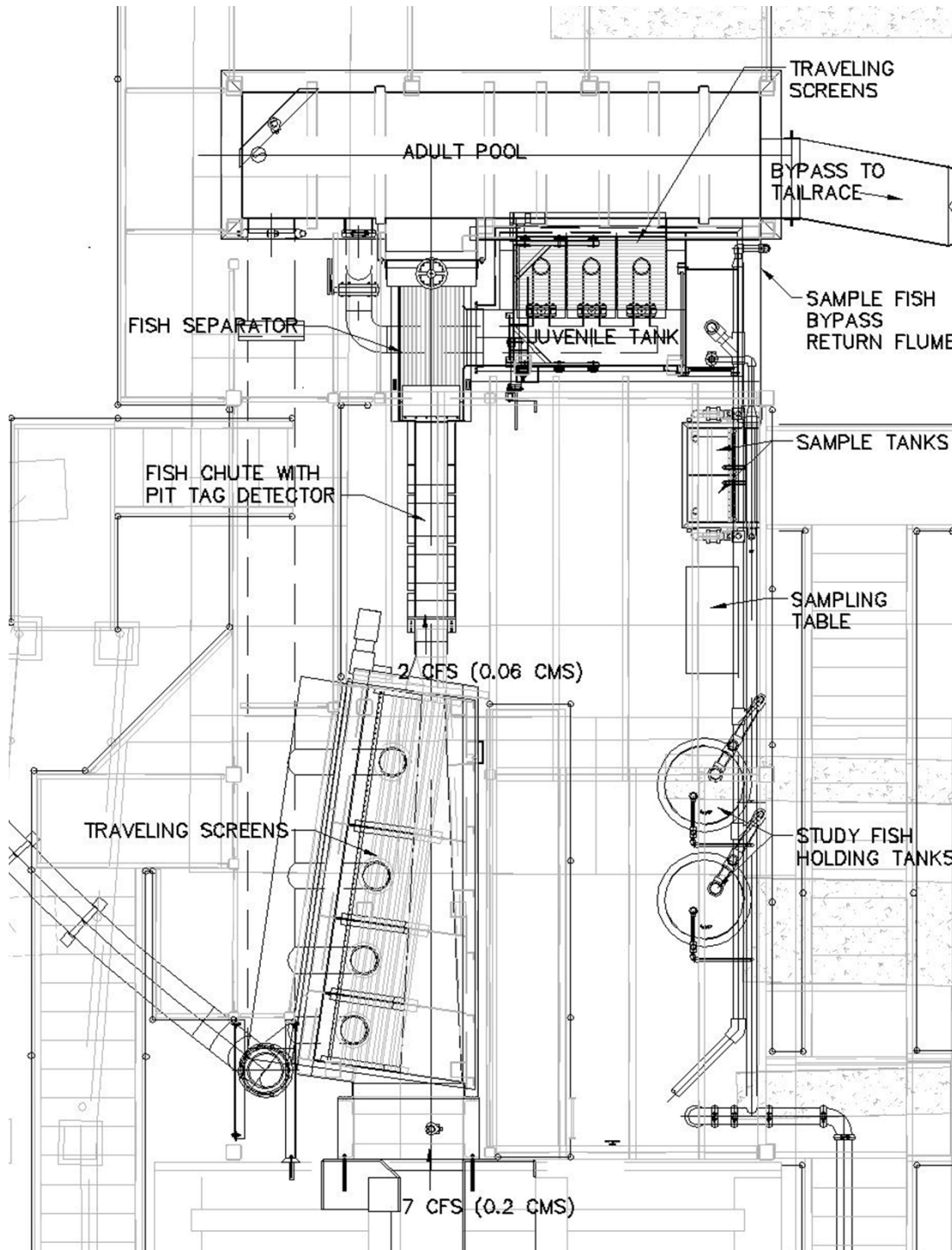


# Forebay Fish Collector Aerial View



# Screen Channel Profiles





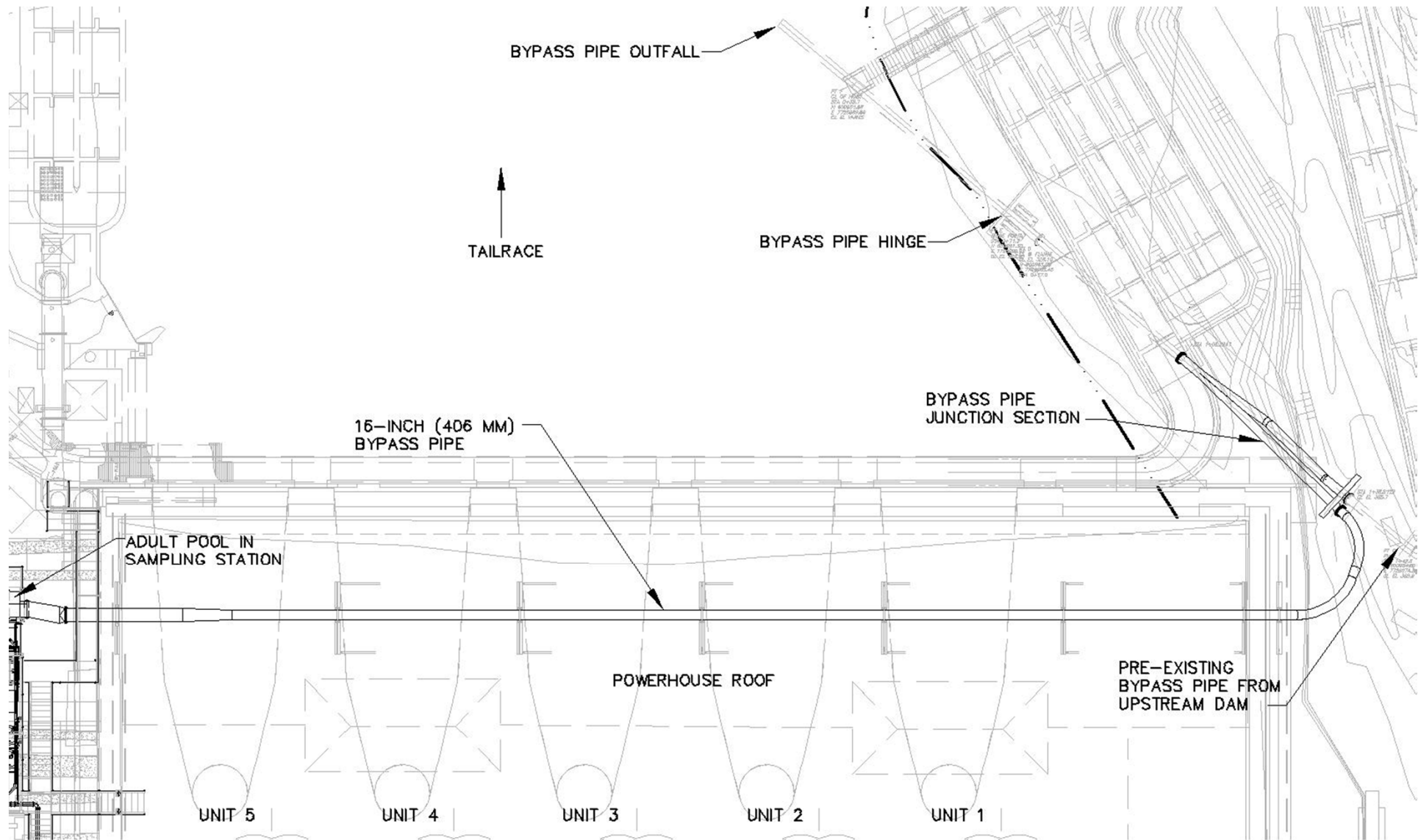
# Fish Sampling Station Plan

- Fish flow is dewatered from 7 to 2 cfs. (0.2 to 0.06 cms)
- Smaller juvenile fish are separated from larger adult fish.
- Juvenile fish are held for sampling.
- Adult fish pass into adult pool and then directly into the downstream bypass pipe.

# Fish Sampling Station on Downstream Side of Dam



# Plan View of Bypass Pipe on Powerhouse Roof



# Bypass Pipe across Powerhouse Roof



# Bypass Pipe Junction and Hinged Discharge



# Biological Monitoring Results

Based on PIT Tag Studies in 2013 and 2014

## Collector Fish Guidance Efficiency

Chinook Salmon	98%
Coho Salmon	99%
Steelhead	96%

## Lake Survival

Chinook Salmon	99%
Coho Salmon	96%
Steelhead	96%

Injury Rates were consistently below 2%

## Summary Points

- Hydro Project Forebays are Hydraulically Unique
- Need to Understand Fish Behavior at Your Project
- Success is Enhanced by Utilizing Natural Behavior
- Physical Constraints can Result in Non-conventional yet Potentially Advantageous Designs