Concurrent Sessions D: Downstream Migrant Surface Collectors-What Works and Doesn't Work - North Fork Dam Floating Surface Collector Design

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Clackamas River Hydroelectric Project and North Fork Development

Willamette River
Oregon City
River Mill Development
Faraday Development
Faraday Diversion Dam

North Fork Development

Estacada
To Portland 25 Miles

Oak Grove Development
Frog Lake
Harriet Lake
Timothy Lake

Mainstem Clackamas
Tributaries —
Dam
Reservoir

North
Aerial View of the Existing North Fork Project

Temporary Screen Structure
Existing Transport Pipe
Fish Ladder
Spillway
Tailrace
Powerhouse
Screen Flow Drain to Tailrace
Existing Ladder Exit & Bypass Entrance
North Fork Dam
Dam
Features of North Fork Dam

• Thin-Wall Concrete Arch Dam
  – 207 Feet High
  – 676 Feet Crest Length
  – 2-Foot Normal Reservoir Fluctuation

• Two Turbine Generators
  – 6,000 cfs Combined Flow
  – Depth to Intake 125 Feet

• Spillway at North End of Dam
  – 3 Spill Gates each 50 Feet Wide

• Existing Downstream Fish Collector & Bypass
  – Associated with the Fish Ladder Exit on the North Bank
  – 7-Mile Bypass Pipe to the Tailrace of River Mill Dam
2001 Acoustic Tag Study Results

Red Areas Represent the Highest Concentration of Detections
Bypass Pipeline to River Mill
Transport Pipe
Tertiary Screen Structure (TSS)
Flow Control
Guide Net
FSC
Submerged Transport Hose
Major Components of the Facility

- **Fish Guide Nets**
  - ¼-inch Square Mesh Dyneema Net
  - 75-Foot Partial Depth
  - Includes Boat Passage Gate

- **Floating Surface Collector (FSC)**
  - 1,000 cfs Attraction Flow
  - 147 Feet Long by 60 Feet Wide

- **Fish Transport Pipeline**
  - 1,500 Feet Long
  - Passes through the Dam

- **Tertiary Screen Structure (TSS)**
  - Located on North Bank
  - Combines Fish Collected at FSC and the Existing Collector
FSC Overall Plan View
FSC Centerline Profile View
Unique Features of the Collector & Passage

• **Net Attached Directly to FSC**
  - No Net Transition Structure
  - Net Attaches Directly to FSC
  - Attachment to Accommodate Raising of FSC

• **Direct Fish Passage to Bypass Pipe**
  - Other FSCs Part of Trap & Haul Programs
  - Transport Pipe Must Pass through the Dam
  - Unique Flow Control

• **Combining Fish Flow with Existing Collector**
  - Tertiary Screen Structure (TSS)
  - Dewater before Passing Fish to River Mill Pipeline

• **Debris Management**
  - Multiple Approaches at both the FSC and the TSS
Separating Net to Raise FSC
Net Attachment to the FSC

GUIDE NET HOIST

1
N-021

PLATE SIZE CHANGES

2
N-020

SIDE CONNECTION SLEEVE
(DETAIL 2 DRAWING N-020)

FLAT BAR WELDED TO FSC

NO PROJECTIONS

1 1/8" DIA BOLT HOLES

1/2" DIA GALV BOLT W/FENDER WASHER AT 24" OC

1/2" DIA SPECTRA ROPE SEWN TO NET FLANGE

PL 3/8" X 2" NET CONN PLATE FULL BOTTOM LENGTH IN 6' SECTIONS RADIUS ALL EDGES

3/8" RADIUS CORNERS

WELD NUT

18.5 OZ PVC-COATED POLYESTER IMPERVIOUS TARP BARRIER MATERIAL FOR 10 FEET EITHER SIDE OF AND BELOW THE FSC.

NET TO BE CONTINUOUS BEHIND TARP MATERIAL FROM ATTACHMENT TO BOTTOM WEIGHT LINE

IMPERMEABLE BARRIER TARP MATERIAL TO 1'-9" ON FSC SIDE PER SECTION A ON DRAWING N-018

NOTES:

1. THE BOLTED CONNECTION OF THE NET/BARRIER FABRIC SHOWN IN DETAIL 1 EXTENDS ALONG THE BOTTOM OF THE FSC AND 3'-0" UP EACH SIDE.

BOTTOM NET CONNECTION TO FSC SECTION
Net Attachment Winch

PORT ISOMETRIC

PLAN
FLOAT SHEAVE GUIDE

SECTION

STARBOARD ISOMETRIC

SIDE NET CONN TO FSC

207x496
FSC Debris Management: Entrance Debris Rack
Transition Channel: From Screen Channel to Transport Pipe
FSC Debris Management: Transition Channel & Debris Trap
3-D Rendering of the FSC
3-D Rendering with Reservoir Water
Submerged Hose Section of Transport Pipe
Transport Hose Attachment
Dam Penetration and Flow Control Plan
Dam Penetration and Flow Control Profile
Dam Penetration Details
Thru-Port Shutoff Valve

1.5” BALL VALVE WITH INSULATION & HEAT TRACE

FLANGED CONNECTION TO TRANSPORT PIPE

GATE BLADE SHOWN IN CLOSED POSITION

BLADE TRAVEL (NOTE 1)

CLOSED
Adjustable Flow Control

**Diagram:**
- **Plan View:**
  - 2" # Air Vent Pipe
  - Beehive Strainer
  - Weldolet Coupler
  - 16" # Flexible Water Suction Hose
  - 18" ID x 36" Wall
  - 8' Radius 10' Bend
  - 16" ID x 36" Wall
  - 8' Radius 10' Bend
- **Elevation View:**
  - Screw Stem Actuator
  - Guardrail
  - Access Platform
  - Rooflet
  - HSS 4x4 Upper Frame
  - HSS 6x6 Outer Frame
  - Shafts and Bearings
  - Platform Framing

**Legend:**
- Plan Scale: 3/4" = 1'-0"
- Elevation Scale: 1/2" = 1'-0"
Tertiary Screen Structure (TSS) Features

• Combines Fish from the FSC and the Existing Collector
• Between 7 cfs and 15 cfs from Existing Collector
• Between 7 cfs and 10 cfs from FSC
• 7 cfs Final Flow to River Mill
• Two Traveling Screens to remove excess flow
• Debris Rack in Fish Pool Between Screens
• Surface Debris Deflector Gate at Fish Exit
• Emergency Fish Bypass to Fish Ladder
FSC & Downstream Passage Design Plan

- Bypass Pipeline to River Mill
- Transport Pipe
- Tertiary Screen Structure (TSS)
- Flow Control
- Guide Net
- FSC
- Submerged Transport Hose
TSS Section View through Traveling Screens
TSS Debris Management: Grizzly Debris Rack
TSS Debris Management: Traveling Screens with Debris Pegs
TSS Debris Management: Deflector Gate at Fish Exit