

# BONNEVILLE WASHINGTON SHORE FISH LADDER CONTROL SECTION REDESIGN

## FFDRWG UPDATE: 30% DDR

Shari Dunlop  
Technical Lead  
CENWP ENC-HD

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# MAJOR TASKS: RECENT PROGRESS

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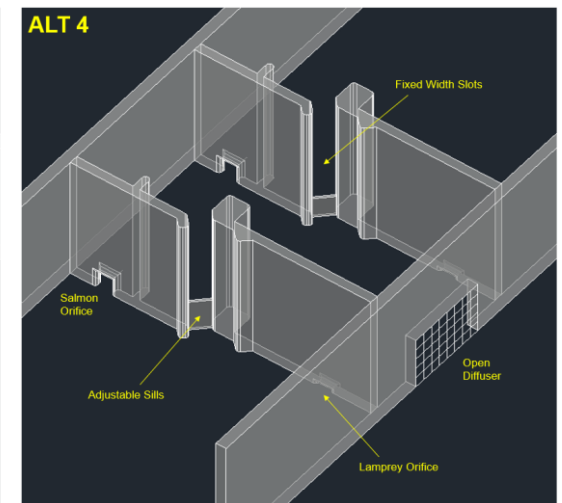
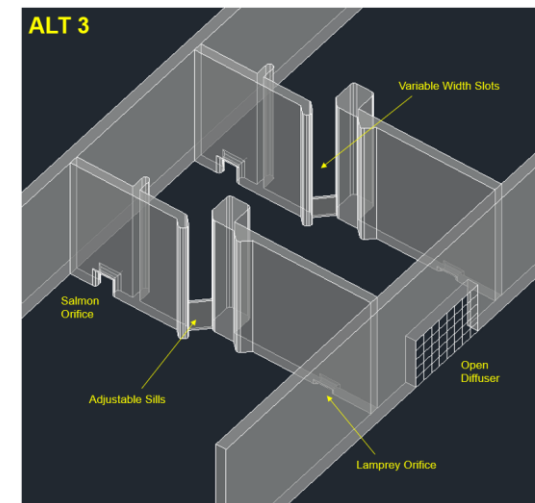
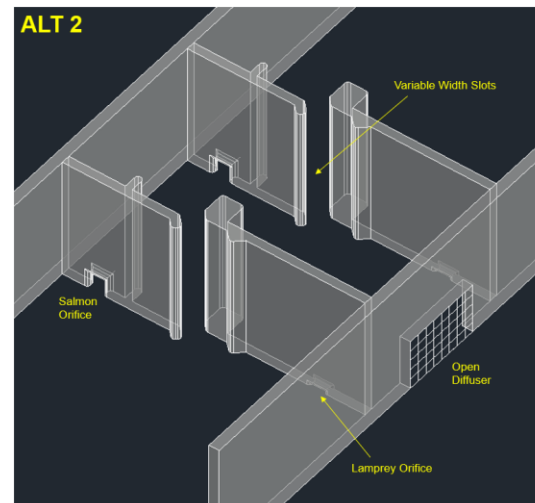
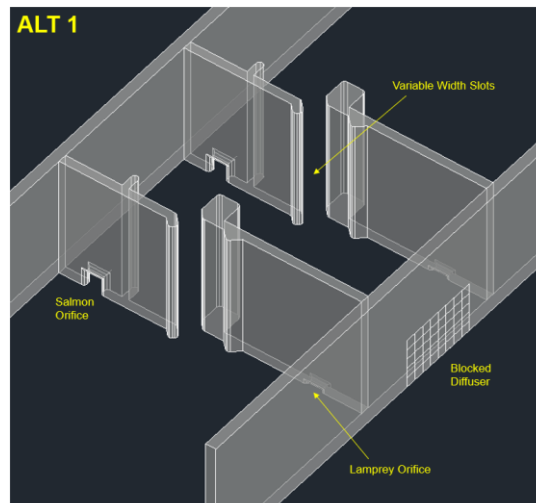
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- Screening-level alternatives evaluation
- Proposed modifications (selected alternative)
  - Existing conditions 3D CAD model
  - Preliminary modifications layout 3D CAD model
  - PIT tag antenna conceptual layout
- Cost estimate
  - Planning level cost estimate
- Documentation
  - 30% DDR

# SCREENING LEVEL ALTERNATIVES EVALUATION



- Compared four variations on the modifications specified by the CRSO EIS
  - Alternative 1: No Sills, Decommission Bleed-Off and Add-In Diffusers, PIT Tag Detection in Control Section
  - Alternative 2: No Sills, Retain Bleed-Off and Add-In Diffusers, PIT Tag Detection in Control Section
  - Alternative 3: Adjustable Sills, Retain Bleed-Off and Add-In Diffusers, PIT Tag Detection in Control Section
  - Alternative 4: Adjustable Sills, Retain Bleed-Off and Add-In Diffusers, Relocate PIT Tag Detection
- Main Differences
  - The use of the bleed-off and add-in diffusers
  - Presence or absence of adjustable sills in the vertical slots
  - The location of the PIT tag detection array after modification



# SCREENING LEVEL ALTERNATIVES EVALUATION

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- Factors Considered
  - Fish Passage Conditions
  - Operation and Maintenance
  - Rough Order of Magnitude Cost Estimate

# SCREENING LEVEL ALTERNATIVES EVALUATION



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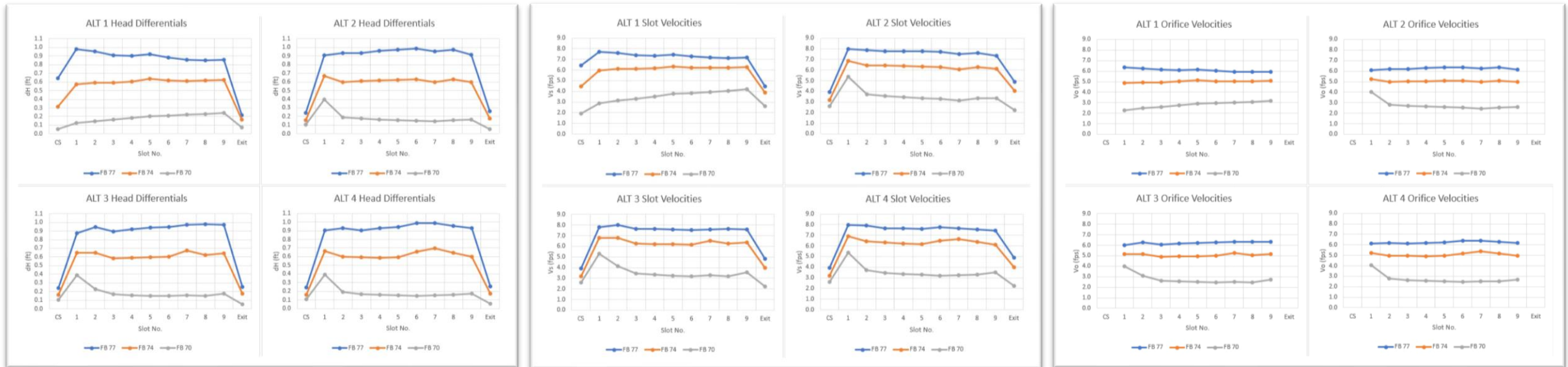
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- Factor 1: Fish Passage Conditions
  - Hydraulic conditions (velocity and head drop) estimated using a spreadsheet model
  - Hydraulic conditions are generally quite similar
    - Alternative 1 has marginally lower average slot velocities but considerably higher velocity through the count station (would need to be addressed through count station/attraction pool modifications)
  - Adherence to criteria
    - Maximum velocity and head drop: all alternatives comply
    - Minimum head drop
      - ✓ At minimum pool FBL = 70: no alternatives comply for existing or modified ladder
      - ✓ At minimum observed over the past 25 years (FBL = 71.2): Alternatives 2, 3 and 4 comply
      - ✓ At 95% exceedance pool (FBL 72.7): all alternatives comply
    - Energy dissipation factor: all alternatives comply
  - Physical condition for Alternatives 3 and 4 is not preferred because the sills would be an impediment to lamprey passage

# SCREENING LEVEL ALTERNATIVES EVALUATION



- Representative hydraulic results



# SCREENING LEVEL ALTERNATIVES EVALUATION



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- Factor 2: Operation and Maintenance
  - Alternative 1: Requires a new picketed lead and control gate to remove excess flow upstream of the count station
    - The gate would be operated either manually or via PLC and would require periodic maintenance
    - The new picketed lead would introduce another location for debris accumulation and cleaning
  - Alternative 2: All components are fully static and introduce no additional operation or maintenance requirements
  - Alternatives 3 and 4: Include actuated sill gates
    - The gates would be operated either manually or via PLC
    - The gates and associated motors would require periodic maintenance
  - Alternative 4 requires more gates than Alternative 3 (9 gates vs. 5 gates)
  - Alternative 4 requires relocation of the PIT tag detection system, which may result in less desirable maintenance access

# SCREENING LEVEL ALTERNATIVES EVALUATION



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- Factor 3: Cost
  - Rough Order of Magnitude Cost Estimate
    - Alternative 1: \$6.8M
    - Alternative 2: \$5.1M
    - Alternative 3: \$6.0M
    - Alternative 4: \$6.8M

Alternative 2 is preferred  
based on anticipated fish passage, O&M and cost factors



# PREFERRED ALTERNATIVE: 30% DDR LEVEL DESIGN



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9

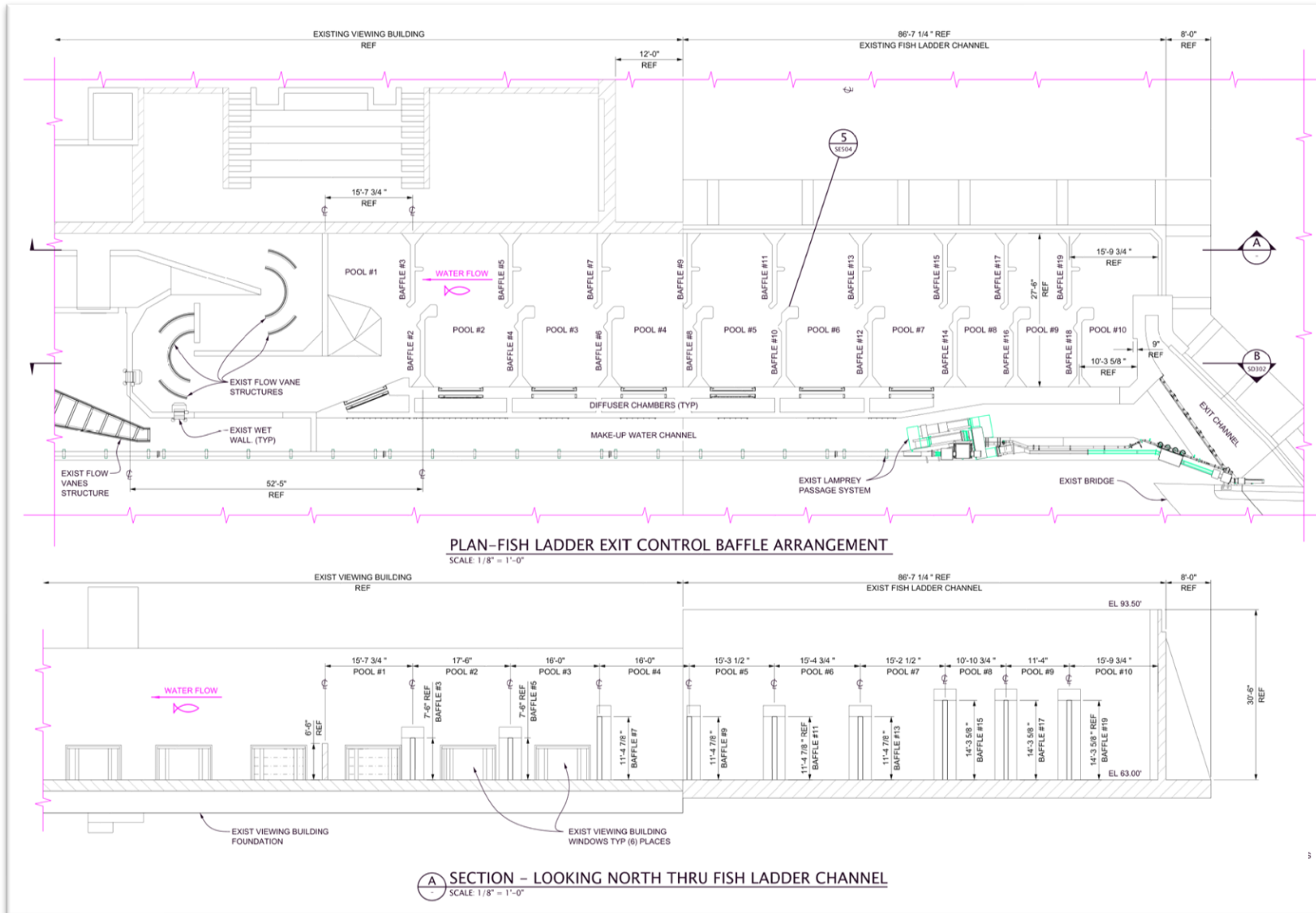
- Major Features of the Work
  - Demolish existing baffles
  - Remove existing PIT tag antennas
  - Install 9 new vertical slot and orifice weirs
    - Slot widths vary from 1.5 feet to 1.7 feet (preliminary dimensions)
    - Include 18-inch square orifice in north baffles; opening flush with invert
    - Include 1.5-inch tall by 16-inch wide “lamprey orifices” in south baffles; opening flush with channel invert
      - ✓ Round edges in all weirs without PIT tag antennas
      - ✓ Chamfer and smooth edges in weirs with PIT tag antennas
  - Move lamprey refuge boxes to south side of ladder control section
  - Install new PIT tag antennas in four consecutive weirs
    - Antennas to be provided in slots and in both sets of orifices
  - Provide access walkways

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10

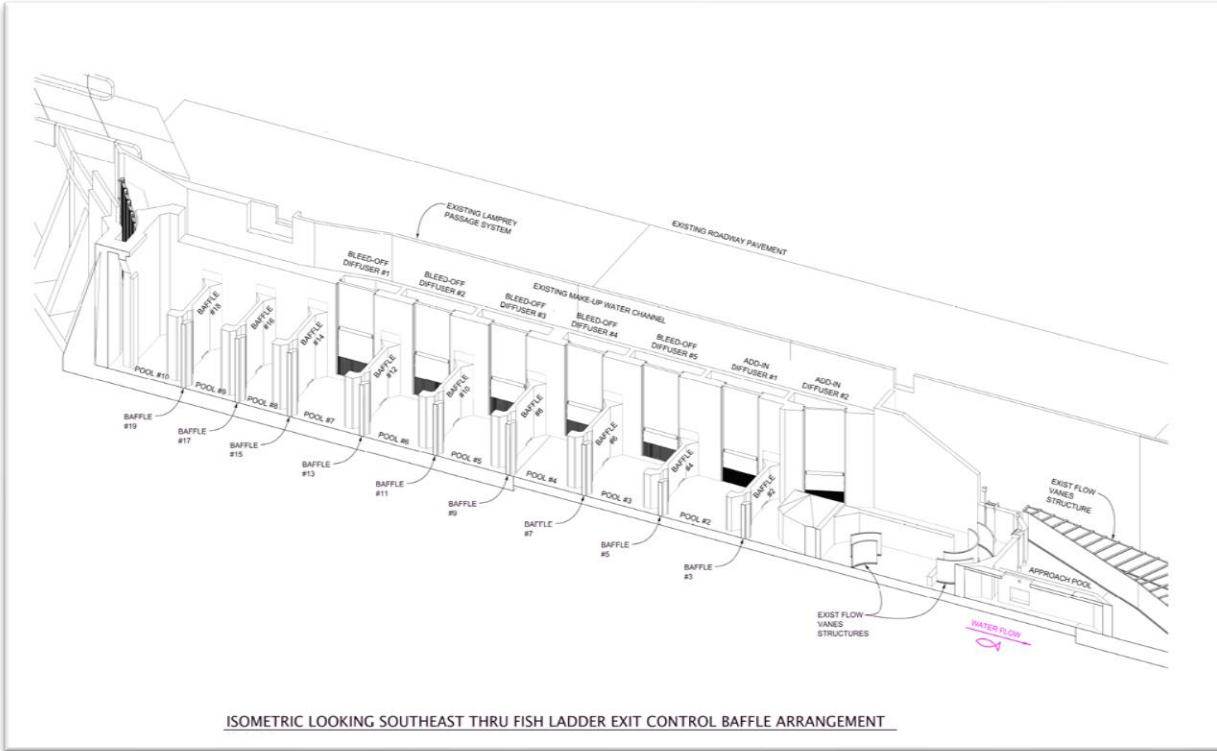


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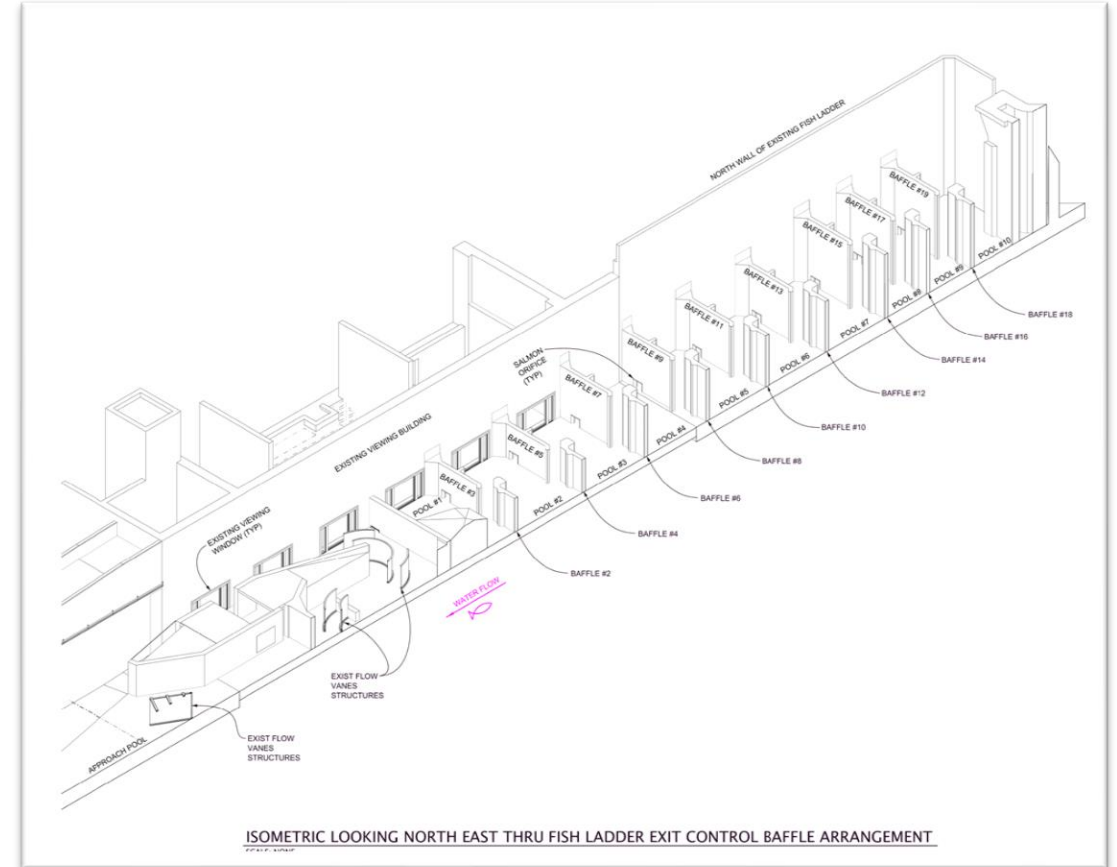


11

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ISOMETRIC LOOKING SOUTHEAST THRU FISH LADDER EXIT CONTROL BAFFLE ARRANGEMENT



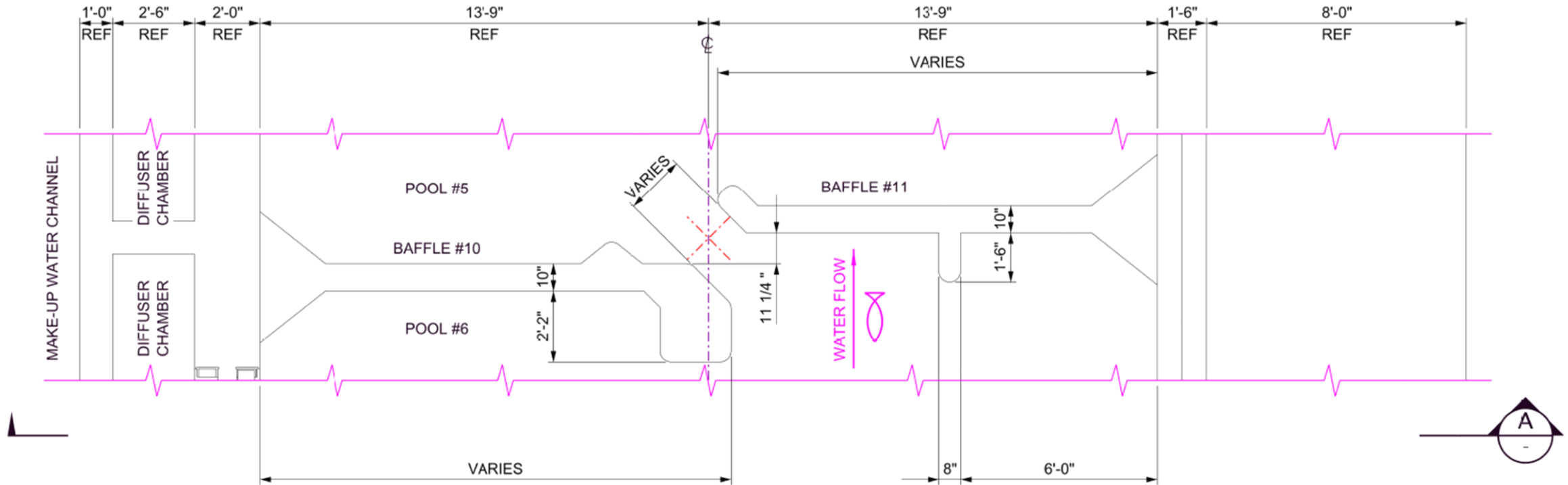
ISOMETRIC LOOKING NORTH EAST THRU FISH LADDER EXIT CONTROL BAFFLE ARRANGEMENT

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12

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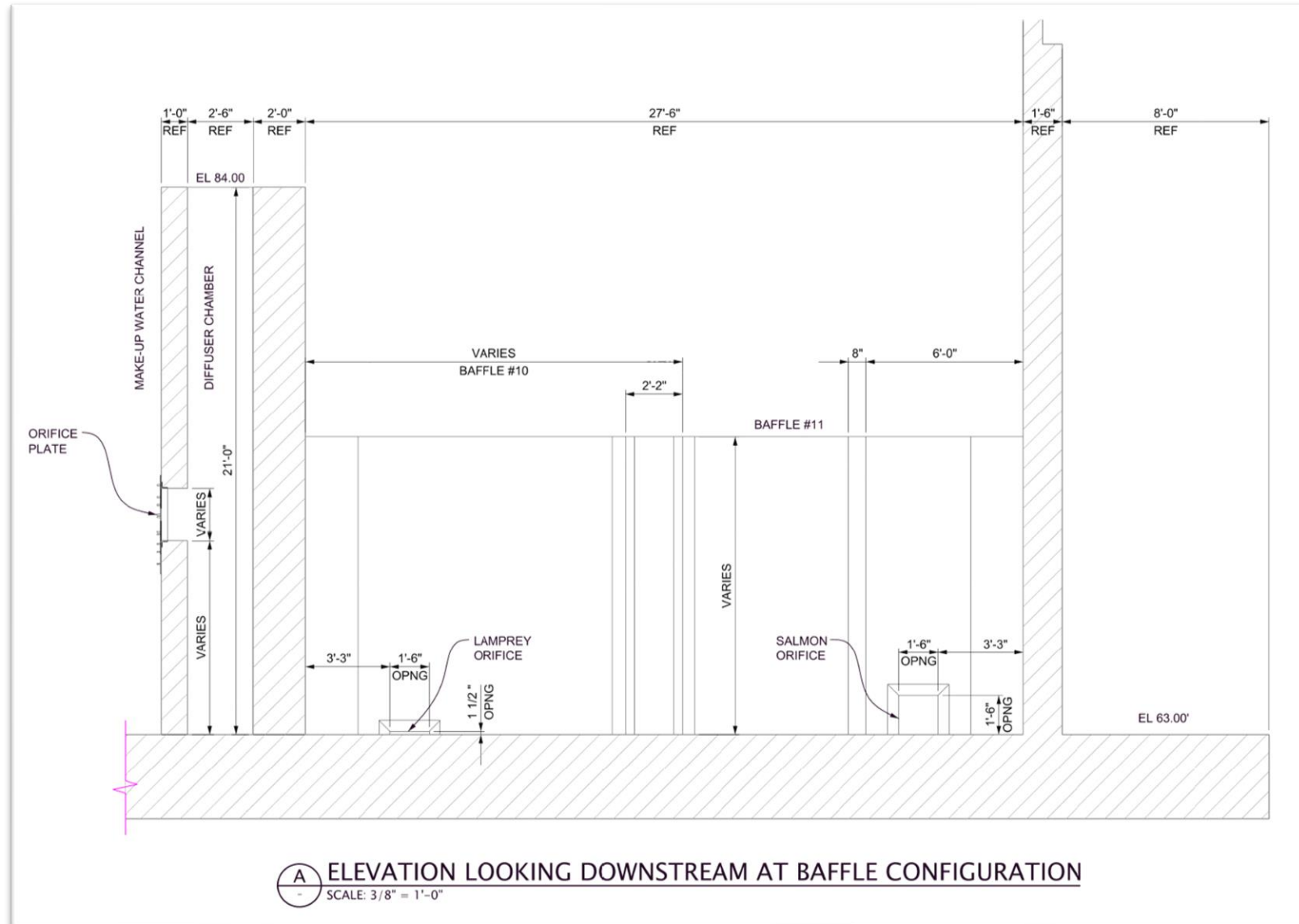
**5 ENLARGED PLAN – TYPICAL FISH LADDER BAFFLE CONFIGURATION**  
SG101 SCALE: 3/8" = 1'-0"

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13

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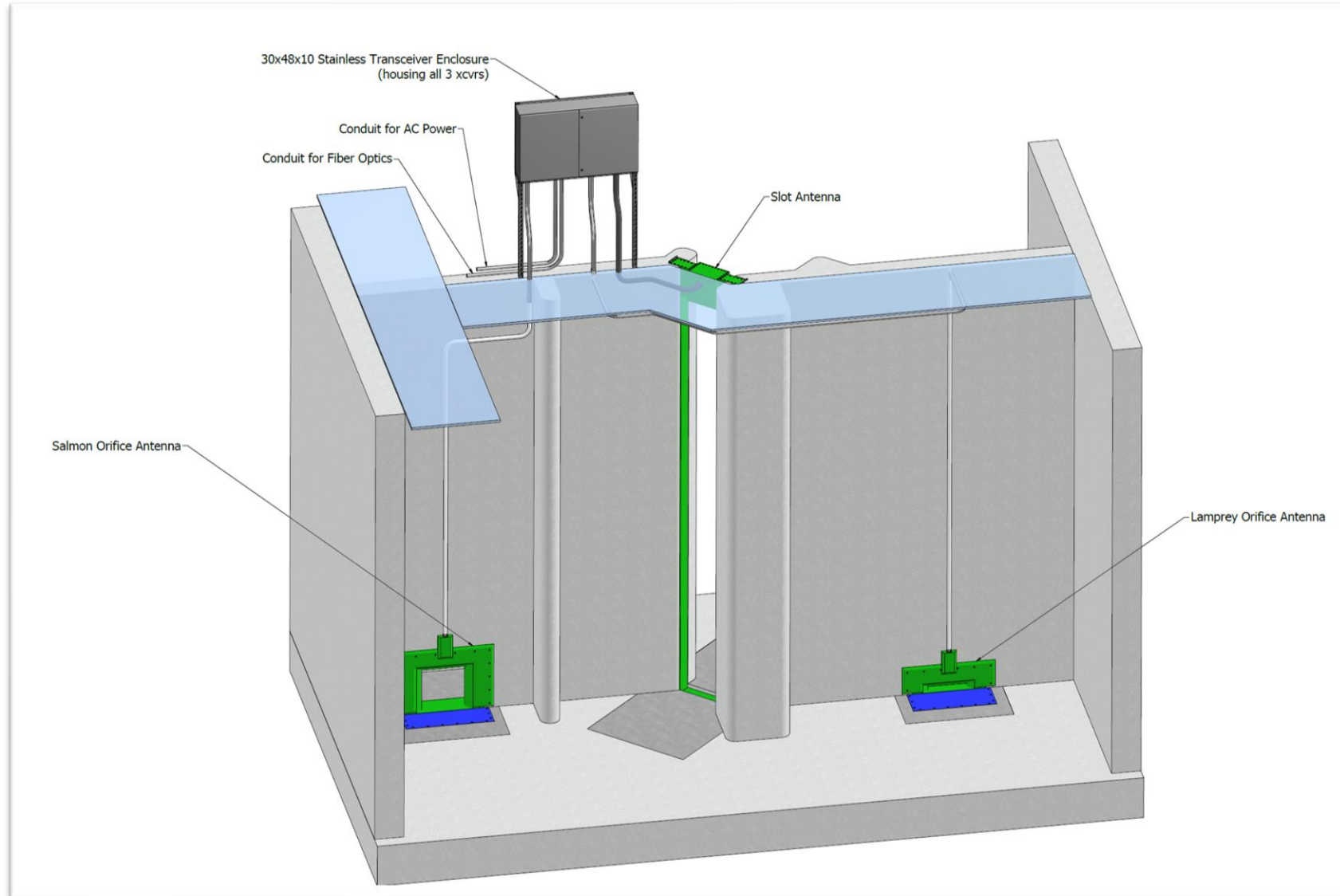


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# NEXT STEPS

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- Develop 3D CFD Model
  - Verify hydraulic conditions and refine weir layout, as needed
  - Verify or refine bleed-off and add-in orifice plate dimensions
- Develop structural design
  - Verify baffle dimensions and connections to existing structure
  - Design access walkways
  - Work with PSMFC to refine PIT tag antenna details, as needed, and incorporate into the weir design
  - Define temporary works required during construction, e.g. shoring of existing channel walls
- Develop electrical design
  - Design electrical infrastructure to support the new PIT tag antennas