FINAL - Meeting Summary Notes
Lewis River License Implementation
Engineering Subgroup
January 30, 2008
Fish Passage Meeting Notes

Subgroup Participants Present: (16)

Todd Olson, PacifiCorp
Erik Lesko, PacifiCorp
Arnold Adams, PacifiCorp
Frank Shrier, PacifiCorp
Bryan Nordlund, NOAA Fisheries (NMFS)
Jim Stow, USFWS
Eric Kinne, WDFW
Curt Leigh, WDFW
George Lee, Yakama Nation
Lisa Larson, NHC
Andre Ball, NHC
Brian Hughes, NHC (joined later in the day)
Dana Postlewait, R2 Resource Consultants
Suzanne Picard, R2 Resource Consultants
Ken Bates, Kozmo
Monty Nigus, Black & Veatch

ADMINISTRATIVE

Welcomed attendees to the NHC Facility in SeaTac and reviewed agenda. Todd Olson updated the group on the status of the FERC license. There have been no changes to the license schedule since the previous meeting. For planning purposes, the tentative issuance date is still sometime in April.

The meeting Agenda does not include discussion of the Swift Project. In the interest of time, the group will not review the Swift portion of last meeting's notes.

General Meeting Handouts:

Distributed via email on 1/28/2008 by Kim McCune:

- Meeting agenda for 1/30/2008 subgroup meeting
- Copies of the draft 12/19/2007 subgroup meeting notes

Distributed at meeting 1/30/2008 (paper copies):

- Meeting Agenda for 1/30/2008 meeting
- Copies of the 12/19/2007 subgroup meeting notes

FUTURE MEETING DATES

Future meeting dates were presented to the group for review, as follows:

- March 14, 2008
- April 24, 2008 (new date!)
- June 4, 2008
- July 16, 2008
- August 28, 2008 (new date!)

Curt Leigh will not be able to attend the June 4th meeting.

OTHER ADMINISTRATIVE ITEMS

- None.

o MERWIN TRAP PROJECT

Handouts

- Lewis River Fish Passage – Merwin Upstream Collection and Transport Facility (Settlement Agreement Article 4.3) – Preliminary Engineering – 30% Design Report, prepared by Black & Veatch Corporation and R2 Resource Consultants, Inc., dated January 30, 2008.

Presentations

- Lisa Larson presented a brief PowerPoint presentation recap of the physical model design parameters, construction and the observations made to date. The model was functioning as of last Wednesday, January 23, 2008.

Review of Previous Meetings' Merwin Action Items: See status summary table below.

No.	SUMMARY OF PENDING MERWIN ACTION ITEMS (remaining from previous Meetings)	STATUS
M62	R2 (Postlewait) Determine the range of entrance angles to be evaluated by the physical model. Provide this information to Northwest Hydraulic Consultants.	Done, 45 to 90 degrees are accommodated in model.
M72	R2 (Postlewait) Develop a draft truck disinfection protocol for WDFW review.	Done, Erik Lesko submitted to WDFW.
M73	R2 (Postlewait) Develop and bring copies of calculated velocity profiles through the entrance pool for a variety of relevant flow conditions to the January 24th meeting at the NHC facility in Sea-Tac.	Done, Handouts at meeting.
M74	R2 (Postlewait) Check ladder slot width against anticipated ladder flows.	Done. A 15-inch width is acceptable, matches the 30 cfs flow.
M75	PacifiCorp (Adams) Check capacity of Deluge Valve as possible source of ladder flow.	Done. Valve is a viable water supply option.
M76	R2 (Postlewait) Verify that the physical hydraulic model correctly reflects the best available topography.	Done. Independent check with Ken Bates.

M77	WDFW (Kinne) Provide feedback on Sorting Stations 1 and 2 to R2 by the end of the first week of January so that this feedback can be incorporated into the design prior to the next subgroup meeting.	Done. Design Report distributed today.

Additional Comments on Last Meeting's Merwin Notes:

- In response to the Adult Trap Efficiency (ATE) definition issue identified in last meeting's notes, Bryan Nordlund initiated conversations with WDFW, USFWS, and within NMFS. To date, the agencies recommend:
  - Section 4.1.4 of the Settlement Agreement defines which fish will be used to calculate ATE.
  - "Safe Passage" implies that fish will be evaluated for injuries after they've passed through the trap system, including electro-anesthesia.
  - "Timely Passage" has two aspects: (a) median delay of fish is less than 24 hours and (b) fewer than 5% of active migrating fish take longer than a week to be collected and move through the trap system.
  - "Active Migrants" are all fish that do not drop out of the system.
  - "Drop Outs" are fish which fall into one of the following three categories:
    - Fish that are sport caught.
    - Fish that return to the hatchery instead of the trap.
    - Fish that leave the Lewis River system.
  - In practice, "Drop Outs" are difficult to account for because it's hard to conclusively determine when a particular fish has left the Lewis River system.
  - A recent PIT tag study on the mid-Columbia River (from Priest Rapids to Wells Dam) showed an actual achieved ATE of over 99% (once drop outs were statistically removed from the calculation). Consequently, a target design ATE of 98% for Merwin may be appropriate. Bryan noted that this information is public, from the DART website, adjusted for Wells Hatchery collection.
- Regarding the latest draft of the tailrace fish behavior study, Curt Leigh voiced particular concern for data collection near "the point" by the bridge. This area has previously been considered as a potential second trap entrance location. Curt wants to ensure that quality data will be collected in this area, in case it needs to be looked at in the future as a potential trap entrance location. To address this possibility, current plans for an array location at the bridge have one antenna in the bridge array particularly focused on this site. Frank noted that he knows where this point is, and has confirmed with MaryLouise Keefe (R2) that quality data will be collected. He will follow up with MaryLouise to confirm that necessary data will be collected in a quality manner.
- The Merwin portion last meeting notes can be published as final. (Note: The Swift Project noted from the last meeting will be discussed and updated at the March 14, 2008 Subgroup Meeting.)

MERWIN TRAP AGENDA TOPICS

General Overview of 30% Design Report

- The 30% Design Report was distributed to the Engineering Subgroup. PacifiCorp will distribute additional copies to the Aquatic Coordination Committee (ACC) at their next meeting. Feedback on the report is expected from both the ACC and members of the Engineering Subgroup by the next Subgroup meeting on March 14, 2008.
- The 30% Design Report represents a record of all the project work completed so far. The majority of this information has already been seen and reviewed by the subgroup. Highlights of items that have changed were reviewed by Monty Nigus and Dana Postlewait, including:
- Section 3 – Design Criteria
  - The Design Criteria Document has been presented to the Subgroup a number of times over the last two years. The latest version is included in the Appendix of the report, and compiles all changes from previous drafts. A few items have been added regarding specific criteria for the AWS for the fishway, which were taken from the latest NMFS criteria. Frank Shrier also provided additional spill data for all the projects, which added about two years of recent data.
- Section 4 – Description of Design
  - The trap timing calculations have been updated to better pace the number of fish from the hopper entering the flume at one time. The time allotted to emptying the hopper into the fish flumes has been increased to space fish out more, with the intent of allowing them to enter the flume headfirst to avoid the potential of them trying to swim back up the flume (pipe). The new rate at which fish will be released into the flumes is now approximately 1 fish/second. To compensate for the longer unloading time, the fish lift speed has been increased.
  - The Design Report does not commit to which Pump Bay (2 or 3) will be used for a potential future second trap entrance, either bay is a viable option. For illustration purposes, however, Pump Bay 3 is shown in the drawings.
  - The second trap entrance design has been refined since the last review to route the attraction flow piping and better lay out the diffuser. As it is shown in the design at this time, there is limited amount of space available for diffusers, due to the pipe size necessary to convey the flow. The design shown has a maximum flow of 330 cfs at the second entrance.
  - The sorting table arrangement shown in the Report on pages 16 and 17 depicts an L-shaped table, which was revised last week with coordination between WDFW and R2. This configuration is intended to minimize fish stress and handling time. WDFW is in the process of building a full-scale mock-up of this table arrangement to evaluate its size and layout for efficiency. WDFW will provide feedback to the group within the next couple weeks.

Physical Model Runs in NHC Lab

- Lisa Larson presented PowerPoint slides updating the group on the model's construction and on the latest observations made by the team. Highlights include:
  - The fish entrance angle is adjustable from 45 – 90 degrees.
  - The entrance weir widths are easily adjustable by swapping out pre-cut acrylic panes.
  - All three potential trap locations (corner, pump bay 2, pump bay 3) are independently operable.
  - The model can simulate flow conditions from 11,470 cfs (full generation flow) down to 1,200 cfs (one unit running). The tailwater elevation is maintained by an overflow weir, called the "tailgate".
  - Each turbine unit can be operated independently.
  - A pump station intake is provided at the uncompleted turbine bay 4. Flow supplied to the fish trap entrances will be matched by inflow to this pump station to simulate the anticipated flow conditions throughout the tailrace. Various trash rack alignments will be tested in the future for the pump station.

- The following is an overview of preliminary model runs that have been completed to date and the observations they yielded.
  - At a simulated flow of 400 cfs, the team varied the entrance angle and observed flow patterns in the tailrace. It was generally agreed that the 90° entrance angle was not favorable. The 45° entrance angle was better than the 90° angle, though the jet did not penetrate the simulated forebay as well as in the 69° entrance angle simulation. Of the three entrance angles the team looked at, the 69° entrance angle appeared to be the most favorable configuration.
  - The term "69° entrance angle" implies more accuracy than is appropriate for the qualitative assessments the team is undertaking. Consequently, this entrance angle will be referred to as "70° entrance angle" to round the number.
  - The team took a preliminary look at 600 cfs with both a 4' wide and a 6' wide weir at 70°.
  - Using a piece of red yarn attached to a rod and red dye, it was observed that the discharge from Unit 1 intersects the propagation of the jet from the fish trap entrance, especially at lower entrance weir elevations. The bottom portion of the fish trap entrance jet is sheared off by the Unit 1 flow. The team discussed last week that this flow may potentially be considered wasted water. A possible remedy for this problem could lie in adjusting the shape of the entrance weir. There may be more influence of water released above the top of the tailrace flow.
  - Depending on flow, flow velocity exiting the turbines can vary from 2.5 to 10.7 foot per second (fps) at the face of the powerhouse. Calculations showing the average velocity across each unit at ¼ to full flow, in ¼ flow increments, are provided in the relicensing study AQU5. The actual flow distribution between the three bays associated with each turbine is not known, as there is typically some imbalance in full scale turbines. The average value is believed to be adequate for the analysis.

- A large clockwise eddy was observed in the tailrace. A periodic boil was observed near the middle of the powerhouse, too. Frank Shrier noted that both of these observations in the model are consistent with the flow conditions observed in the field.
- It was visually observed that the river's energy is concentrated in the corner near the fish trap entrance. This observation supports locating the primary fish trap entrance in the corner, as fish would try to move "upstream", where the energy is. Existing radiotag study data supports the corner location as well.

o Discussion turned to what needs to be achieved to move forward:
  - PacifiCorp will try and provide a list of common powerhouse operation scenarios to help guide future model runs at less than full generation. With this list, the team will be able to guide the model study to reflect actual operations. The Settlement Agreement states that powerhouse operation will not be impacted by the operation of the new trap.
  - The Acoustic Doppler Velocimeter (ADV) measurement grid will need to be identified. How many data points are necessary? How should they be spaced? The design team will work with NHC to define the data collection protocol.
  - The ADV work shall include analysis of different entrance weir widths and shapes. The group discussed the following weir shapes:
    - Tall vertical slot.
    - Wide, shallow weir.
    - Wider on the bottom, narrower on the top, like an inverted "T". The contractions at the narrower section help create a plunging vena contracta.
    - Triangular, with the wide end at the top.
    - Triangular, with the wide end at the bottom.
    - Diamond-shaped, a compromise of the two triangular options.
  - In evaluating different weir shapes, it will be beneficial to minimize the number of moving parts. Nordlund commented that it could be possible to design the gate geometry such that it self-regulated, meaning that no moveable flow entrance gate would be needed. Ladder entrance head could be set to track tailwater, with auxiliary water flow adjusted to maintain the proper head level. Since there would be fish passage benefits (no possibility a gate would jam, no noise from a moving gate) and maintenance benefits (no moving parts), Nordlund felt that this was worth exploring.
  - The goal with the model is to get close enough to help decide what to actually build for a weir entrance, as the prototype will have some flexibility also.
o Bryan and Jim briefly left the meeting to caucus amongst themselves. When they returned to the group, the results of their caucus initiated a group discussion of which model runs would be attempted today. The following seven model runs were agreed upon:
  - Run 1: Full powerhouse flow, 70° entrance angle, 400 cfs entrance flow, weir crest at elevation 40.8 feet with a weir width of 5 feet.

- Run 2: Full powerhouse flow, 70° entrance angle, 600 cfs entrance flow, weir crest at elevation 34.9 feet with a weir width of 5 feet.
- Run 3: Full powerhouse flow, 70° entrance angle, 600 cfs entrance flow, weir crest at elevation 37.8 feet with a weir width of 6 feet.
- Run 4: Full powerhouse flow, 70° entrance angle, 1,000 cfs entrance flow, weir crest at elevation 36.4 feet with a weir shaped like an upside-down "T" which is 8 feet wide at the bottom and 6 feet wide at the top.
- Run 5a: Unit 1 operating at 2,700 cfs, the other units off, with a tailwater elevation of 48.2. 70° entrance angle, 200 cfs entrance flow, weir crest elevation at 42.3 feet, with a weir width of 5'.
- Run 5b: Unit 2 operating at 2,700 cfs, the other units off, with a tailwater elevation of 48.2. 70° entrance angle, 200 cfs entrance flow, weir crest elevation at 40.7 feet, with a weir width of 4'.

The group moved into the NHC laboratory and observed model runs 1 – 5b. The group also was able to observe the 45° and 90° angles at trap flow of 400 cfs and 600 cfs, and observed flow patterns with dye.

Discussion of Physical Model Runs in NHC Lab

After completing model runs 1- 5b, the group reconvened in the conference room to discuss their observations. The following points were discussed:

- The general consensus is that the 45° and 90° fish trap entrance angles will no longer be considered. The design and modeling efforts will focus solely on an entrance angle of 65°-70°.
- After observing the flow, the group agreed with the observation described above that entrance flow that is sheared by the draft tube flow is "wasted water", and would have no benefit for this entrance when Unit 1 was running. Stow noted that if the entrance slot extended a little below this "shear zone", it potentially provide a benefit for fish that track the shoreline to deeper water near the fishway entrance.
- Splitting the flow between two generation units, rather than concentrating it with one unit, supports the propagation of the fish trap entrance jet into the tailrace. This is an operational consideration to be explored based on PacifiCorp's preferred operational configurations, unit efficiencies and logistics of what is possible.
    - An eddy observed on the right bank just downstream of the entrance should be minimized. Nordlund stated a desire to minimize the energy contained in this eddy (i.e. eddy velocity and volume), in order to provide conditions for fish that hold in the general eddy area and be correctly oriented toward the fishway entrance. The eddy varied with powerhouse loading, gate geometry and fishway attraction flow. He noted that it is unlikely that the eddy can be eliminated entirely.
- The ADV measurement grid will be determined experimentally. Once it's clear how the ADV instrument will perform in the model, the team will be able to determine an

appropriate measurement grid. It may turn out that one of the measurement points is not fixed, i.e. it may track along the max velocity at the center of the jet.

- The initial measurements will be for weir widths of 4 feet and 6 feet because the team feels that it may not be within the accuracy of the ADV instruments to detect differences between a 5 foot and 6 foot weir. Actual recommended weir widths will be determined by the team later based on the results of the initial ADV measurements. The initial measurements for the two weir widths will be performed for the 400 and 600 cfs attraction flow with the powerhouse simulating full generation.
- The primary parameters for evaluation of various fishway entrances will be the persistence of the entrance jet into the fishway and the general flow patterns in the vicinity. A better entrance is one that is sensed further into the tailrace and the better general pattern is one that leads fish towards the entrance.

No.	**SUMMARY OF PENDING MERWIN ACTION ITEMS (remaining from previous Meetings)**	**STATUS**
	None.	
No.	**SUMMARY OF NEW MERWIN ACTION ITEMS (from January 30th, 2008 Meeting)**	**STATUS**
M78	WDFW (Kinne) Provide feedback on Sorting Table configurations presented in Design Report to R2.	Pending
M79	All (Subgroup) - Review and provide feedback on the 30% Design Report to R2 and Black and Veatch by the next Subgroup Meeting on March 14 2008.	Pending
M80	PacifiCorp (Adams) Provide a list of common powerhouse operation scenarios to help guide future model runs.	Complete – 1/12/08

Meeting was adjourned at 3:30 PM.