

FINAL - Meeting Summary Notes
Lewis River License Implementation
Engineering Subgroup
December 12, 2006
Fish Passage Meeting Notes

Subgroup Participants Present: (17)

Will Shallenberger, PacifiCorp
Sean Flak, PacifiCorp (afternoon portion of meeting only)
Frank Shrier, PacifiCorp
Todd Olson, PacifiCorp (afternoon portion of meeting only)
Eric Kinne, WDFW
Pat Klavas, WDFW
Curt Leigh, WDFW (via phone/web conference)
Jim Stow, USFWS
Bryan Nordlund, NOAA Fisheries (NMFS)
Peter Christensen, R2 Resource Consultants
Dana Postlewait, R2 Resource Consultants
Suzanne Picard, R2 Resource Consultants
Ken Bates, Kozmo
Monty Nigus, Black & Veatch
Brian Friesz, Black & Veatch
Lisa Larson, NWH (morning portion of meeting only)
Brian Hughes, NWH (morning portion of meeting only)

ADMINISTRATIVE

Welcome of attendees and review agenda.

NEXT MEETING

- The next meeting is scheduled for Tuesday, 9:00 am - 4:00 pm, January 30th, at the Merwin Hydro Facility.

FUTURE MEETING DATES

As a reminder, future meeting dates to be held at the Merwin Hydro Facility were set for:

- Tuesday, January 30, 2007 – 9:00 AM to 4:00 PM
- Tuesday, March 13, 2007 – 9:00 AM to 4:00 PM
- Thursday, April 26, 2007 – 9:00 AM to 4:00 PM
- Tuesday, May 29, 2007 – 9:00 AM to 4:00 PM

UPPER RELEASE CHANNEL PROJECT

Upper Release Channel Handouts

Distributed via email on 12/07/2006 by Kim McCune:

- Draft review version of 10/31/06 meeting notes
- Meeting agenda for 12/12/2006 subgroup meeting

Distributed at meeting 12/12/2006 (paper copies):

- Upper Release Spawning Channel Schematic Drawing. 1 page. 8 ½ x 11. Not dated.
- Table: Upper Release Spawning Characteristics: WDOE 11/29/03. 1 page. 8 ½ x 11. Not dated.

Review of Previous Meetings' Upper Release Channel Project Action Items: See status summary table below.

No.	SUMMARY OF PENDING UPPER RELEASE CHANNEL ACTION ITEMS (remaining from previous Meetings)	STATUS
UR1	WDFW (Olson, Leigh) Provide a copy of the WDFW specifications for spawning gravel for use with the constructed channel.	Done
UR2	PacifiCorp (Shrier) Provide a copy of the constructed channel layout proposed by Ecology as part of the 401 to Will Shallenberger.	Done

UPPER RELEASE CHANNEL AGENDA TOPICS

Update and General Discussions

- Channel design will be sectioned to provide spawning habitat for both salmonids and resident fish. The portion of the channel for resident fish will be downstream, approximately 0.7 ft deep, and will have a design velocity of about 1.2 ft/s. The portion of the channel for salmonids will be upstream, approximately 1.2 ft deep, and will have a design velocity of about 1.8 ft/s.
- Required in-stream flow conditions vary by species and the controlling species are Cutthroat and Chinook. The design in-stream flow for Cutthroat which spawn at higher flows is 76 cfs and the design in-stream flow for Chinook which spawn at lower flows is 54 cfs.
- Black & Veatch will do the design, which shall include boulders, irregularly shaped channel edges, riffles, and pools and steps to simulate a natural streambed considering plan form, cross section, and grade to the extent possible.

- Pat Klavas will check stream stability calcs to ensure the specified spawning gravels are large enough to maintain a stable streambed.
- Pat also suggested an engineer be present during construction to assure the intent of the plan is followed.
- Scheduling concerns: The current permit cycle is estimated to take 1.5 to 2 years, which could push the construction out to 2008.

	NEW ACTION ITEMS (From December 12th Meeting):	STATUS:
UR3	WDFW/Black & Veatch (Klavas/Nigus) Pat will work through the calculations to verify that the gravel sizes provided by Ecology for spawning will be large enough to ensure streambed stability. Black & Veatch will provide an updated plan and profile to Pat as a basis for the stability calculations.	Pending
UR4	PacifiCorp (Shrier) Present Upper Release Channel design ideas at the next ACC meeting (Jan 11 th , 2006).	Pending

SWIFT DOWNSTREAM PASSAGE PROJECT

Handouts

Distributed via email on 12/07/2006:

- Agenda and meeting notes as described for Upper Release Channel

Distributed at meeting 12/12/2006:

- Swift FCS Design Criteria as Compared to Other Related Facilities (Revised for this meeting). 6 pages, 11 x 17.
- Biological and Hydraulic Facility Design Criteria Draft Document. 31 pages, 8 ½ x 11.
- FSC Alternatives 1 and 2 Plan and Profile Drawings. 4 pages, 11x17.

Presentations

- PowerPoint presentation on CFD Model (with FSC) by Brian Hughes of NHC.
- PowerPoint presentation titled “Swift FSC Escape Analysis” by Ken Bates covering his updated findings on fish capture velocities.

SUMMARY OF PENDING SWIFT ACTION ITEMS (Remaining from Previous Meetings):		STATUS:
S2	PacifiCorp (Shrier) Look into means to test passive separator concept.	This item to be removed. Active separation to be used instead.
S4	PacifiCorp (Shrier) Discuss desired fry separation goal with Michelle Day (i.e. what percentage of fry separation is acceptable).	Done. Waiting for Feedback from Michelle.
S8	R2/PacifiCorp (Shrier/Christensen) Use results from CFD model to evaluate FSC entrance geometry and entrance flow rate.	Ongoing. Initial CFD results to be presented during this meeting. CFD results to be used in the FSC design process. Action Item to be removed.
S9	PacifiCorp (Shrier) Begin work on FSC M&E Plan and begin discussion on how to evaluate the FSC capture efficiency.	Done
S10	NMFS (Nordlund, Christensen) Provide sketches and information from the Rocky Reach Bypass System geometry.	Done. Bryan will share the information he found today.

S13	WDFW (Kinne, Weinheimer) Provide available size and likely abundance information on the hatchery rainbow trout in the reservoir. Provide length, weight, and girth information. Also provide likely number of fish that may try to move out of the system by comparison to Cowlitz Falls and Mayfield.	Done. 7/8" Clear grader sorts out catchable rainbows for stocking. Fish are approx 4 to the lb.
S18	NMFS (Nordlund) Bryan will review his files on the Rocky Reach project, to see if he can determine what the velocity profiles were before and after modifications to the system. The goal is to determine where the velocity dip was observed in the system where fish rejected the entrance.	Done. Bryan will share the information he found today.
S20	WDFW and NMFS (Kinne, Nordlund) Review Table 5.1 from the handout showing updated figures and tables on design criteria and provide comments to R2 ASAP.	Pending, due by Jan 2 nd , 2007.
S21	WDFW/USFWS/Kozmo/R2 (Klavas, Weinheimer, Stow) Review the holding pond sizing calculations by October 6, 2006. Provide comments to R2	Pending, due by Jan 2 nd , 2007.
S22	PacifiCorp/USFWS/NMFS (Shallenberger, Stow, Nordlund) Do additional research on capture velocity for the species in question. Issues around capture velocity need to be resolved for the FSC design to proceed.	Done. More detail to be presented today.
S23	Subgroup (all) Provide feedback on FSC Design Criteria as shown in the handout labeled "Swift FSC Design Criteria as Compared to Other Related Facilities". Please provide comments to Peter Christensen.	Pending (again). New updates. Due by Jan 2 nd , 2007.
S24	R2 (Christensen) Update table named "Swift FSC Design Criteria as Compared to Other Related Facilities" with the Rocky Reach info received from Bryan Nordlund. Rocky Reach has profile bar screens with a 0.4 ft/s design approach velocity.	Done
S25	Kozmo (Bates) Ken to complete the fish escape analysis and will present his findings at the Dec 12 th meeting.	Done. Results to be presented today.

Additional Comments on Last Meeting's Swift Meeting Notes:

Concerning items S10 and S18, above: Bryan Nordlund supplied a plot of the hydraulic profile from the old Rocky Reach prototype. He also supplied a set of the construction drawings from the current Rocky Reach bypass system and a video of the model study performed of the capture weir.

SWIFT DOWNSTREAM AGENDA TOPICS

Review 10/31/06 Meeting Notes

No additional comments.

CFD Model

- Brian Hughes of NHC showed a PowerPoint presentation on the CFD model runs which include the FSC.
- Four CFD model runs were completed: two for each of two water surface elevations in the reservoir (1,000 ft and 960 ft). Each water surface elevation was evaluated with the powerhouse on at full capacity and with the powerhouse off. Model runs at a low reservoir elevation of 900 ft are currently being done, but are not yet complete.
- CFD model run results:
 - With the powerhouse on, the FSC discharge did not appear to cause a major disruption in baseline flow patterns in the reservoir at either of the two reservoir elevations.
 - With the powerhouse off, the water discharging from the south side of the FSC may create an east-moving current along the south shore. This current may discourage fish from approaching the FSC and needs to be avoided. The water discharging from the north side of the FSC appears to enhance a natural low velocity eddy in the Swift Creek arm that may encourage fish to re-approach the FSC entrance if they miss it the first time.
- Possible solutions to the south shore current include:
 - Removing all south-facing discharge gates from the FSC design and discharging water from the rear of the FSC (toward the power canal).
 - Removing all south-facing gates from the FSC design and discharging all of the FSC flow from the north side of the FSC. Rocky Reach only discharges to one side.
 - Retaining the south-facing discharge gates but only using them when the powerhouse is on. This option may include operating with an FSC flow of only 300 cfs when the powerhouse is off.
- Other observations based on the CFD model:
 - A guide wall on the north side of the power canal may improve hydraulics behind the FSC.
 - The model shows that the large eddy/gyre in the north end of the reservoir would be enhanced by the FSC's operation. This eddy may be beneficial to fish collection. Additionally, the edge of the gyre may define a good location for guide nets.
- The FSC discharge appears to have a greater impact on reservoir flow patterns than was originally anticipated. The reservoir hydraulics may fix its location and therefore it may be feasible to build a permanent structure out to the collector and forego the ability to move the FSC from one reservoir location to another. To compensate for the FSC's lack of mobility, it will be necessary to build additional flexibility into the structure to allow fine-tuning fish attraction. Fish attraction could be manipulated with the use of guide nets, by adjusting the flow discharge locations on the FSC, and/or by adding shrouds to the discharge gates to

change discharge flow direction. Bryan Nordlund was receptive to this idea provided that the design included a high degree of operational flexibility to manipulate fish attraction.

- Clean guide nets would not be expected to have a significant impact on reservoir flow patterns. Guide nets are, however, difficult to keep clean. Partially blocked nets could have a hydraulic impact.
- Debris management needs to be considered in the design. Debris tends to collect in the power canal and at the face of the dam due to the prevailing winds.

Criteria Discussion/FSC Design

- Table 5.1 in the Biological and Hydraulic Facility Design Criteria Draft document has been revised since the last subgroup meeting. Group members are to provide feedback on the new criteria shown in Table 5.1 to R2 Resources by January 2nd, 2007, along with any other comments on the full document.
- There are currently 2 secondary screen configuration alternatives for the group to consider:
 - Alternative 1 – Dewatering screens all along the length of the capture zone.
 - Alternative 2 – Solid walls in the capture zone with no screening at the channel velocities above 6 ft/s.
- Alternative Comparison:
 - Alternative 2 has a shorter total length where the flow velocity is above 7 ft/s.
 - Alternative 2 has a wider capture channel than Alternative 1.
 - Alternative 2 may be easier to control the screening conditions.
 - Alternative 1 has a higher potential maximum velocity (8.0 ft/s) than Alternative 2 (7.2 ft/s).
- Escape velocity presentation by Ken Bates:
 - Escape Velocity model is based on the commonly accepted premise in fish energetics that a fish uses a fraction of its energy equal to the time it swims at a given speed divided by the time it can swim at that speed.
 - The swimming speed equation is based on empirically-derived coefficients. Unfortunately, there is a limited amount of data available for salmonids. A thorough literature review found three studies involving steelhead or rainbow trout from which coefficients could be derived. The results were very similar for all of them. Ken chose the most conservative set of coefficients for use in the model.
 - Assumptions:
 - The model uses a fish's burst swim mode to calculate escape from the capture zone.
 - Fish tend to swim at approximately 2 ft/s relative to the ground.
 - Max burst speed = 15 body lengths/second

- Max prolonged speed = 7 body lengths/second
- Model fish size: 10 in length
- The model shows that the Swift FSC would successfully capture a 10 in steelhead with 13 ft of capture length to spare. For comparison, the model also shows that the Swift FSC would successfully capture a 12 in steelhead with 5 ft of capture length to spare.
- The model was run for the Rocky Reach prototype hydraulics provided by Bryan as a comparison, and it showed that it may have been possible for fish to escape Rocky Reach prototype up to about 18” before capture. This is consistent with field observations.
- It is agreed that the model will need to be re-run for kelts, since kelts will need to be captured at Swift, as well. There are no coefficients available for kelts, but Ken can conservatively use coefficients for healthy adult steelhead, with some reduction given that kelts are not at full strength.

M&E Plan Updates

- The design team is coordinating with the M&E team and will continue to do so throughout the design process.

Sorting and Transfer

- Ken, Peter, Dana, MaryLouise Keefe, Brian, Frank, and Will visited the Cowlitz Falls fish separator last week. The Cowlitz separator has been very effective in sorting fish and the group is looking at using a very similar design at the Swift FSC.
- The Cowlitz Falls separator has a success rate of 85-90% fry separation. At the next ACC meeting, Frank will verify if this success rate is acceptable for the Swift FSC.
- Cowlitz Falls sees no injury and no de-scaling in fish that have been processed with their separator.
- Debris poses a significant problem, however, and at Cowlitz Falls the facility is monitored 24/7 when operating.

Schedule Updates

- The future meeting schedule has changed slightly to accommodate the group’s individual schedules. New meeting dates are as follows:
 - Tuesday, January 30, 2007 – 9:00 AM to 4:00 PM
 - Tuesday, March 13, 2007 – 9:00 AM to 4:00 PM
 - Thursday, April 26, 2007 – 9:00 AM to 4:00 PM
 - Tuesday, May 29, 2007 – 9:00 AM to 4:00 PM

PENDING ACTION ITEMS FOR SWIFT

The following table provides a summary of all pending action items for the Swift Project.

No.	SUMMARY OF PENDING ACTION ITEMS FOR SWIFT (remaining from previous meetings)	STATUS
S20	WDFW and NMFS (Kinne, Nordlund) Review revised Table 5.1 from the handout showing updated figures and tables on design criteria and provide comments to R2 ASAP.	Pending, due by January 2 nd , 2007.
S21	WDFW/USFWS/Kozmo/R2 (Klavas, Weinheimer, Stow) Review the holding pond sizing calculations. Provide comments to R2.	Pending, due by January 2 nd , 2007.
S23	Subgroup (all) Provide feedback on FSC Design Criteria as shown in the revised handout labeled “Swift FSC Design Criteria as Compared to Other Related Facilities”. Please provide comments to Peter Christensen.	Pending, Due by January 2 nd , 2007.
No.	NEW ACTION ITEMS (from October 31st meeting)	STATUS
S26	NOAA (Day) Michelle to provide feedback on fry separation goals.	Pending
S27	WDFW (Kinne) Eric to forward email on catchable size fish and required grating gaps to group.	Pending
S28	Kozmo (Bates) Run fish escape model for kelts. Present findings at next meeting.	Pending

MERWIN TRAP PROJECT

Handouts

Distributed via email on 12/07/2006:

- Agenda and meeting notes as described for Upper Release Channel

Distributed at meeting 12/12/2006:

- None

Presentations

- Frank Shrier presented updates on the Tailrace Study. These slides will be posted to the PacifiCorp website.
- Sean Flak, Dana Postlewait, and Monty Nigus presented updates on the Entrance and Sorting Facility Design.

Merwin: Meeting Action Item Summary

No.	SUMMARY OF PENDING MERWIN ACTION ITEMS (remaining from previous Meetings)	STATUS
M2	PacifiCorp (Shrier/Flak): Investigate the need for a minor amendment to the SA to address interim safety improvements to the fish trap. PacifiCorp will address in the future, in coordination with the ACC.	Item to be removed, to be handled with the ACC by PacifiCorp.
M16	PacifiCorp (Shrier). Try to track down more anecdotal information on the weir that used to be at the entrance to the fish elevator.	Done. No additional info available.
M17	R2 (Postlewait). Provide sketches of alternate fishway entrance designs. Examine options for existing pump inlet below control room, pump inlets along powerhouse, and maybe at the block outs for Unit 4, in addition to the existing fishway channel options.	Done. Next iteration to be presented at next meeting.
M18	R2/BV (Postlewait/Nigus/Kinne) Provide more detail on the fish sorting facility design concepts.	Pending.
M19	R2/BV/PacifiCorp (Picard/Postlewait/Nigus/Shrier) Address comments to the Merwin Meeting notes from 10/31/2006. Discuss these comments at 12/12 meeting.	Done. Comments have been attached to these notes.

M22	B&V (Nigus) Email next iteration of sorting facility sketches out to the subgroup for comments prior to Dec 12 th meeting.	Item to be removed, next iteration in progress.
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Additional Comments on Last Meeting’s Merwin Notes:

Comments on the October 31st meeting notes were received from Kurt Leigh on December 12th, 2006. These comments, labeled Attachment A, have been included in this set of meeting notes.

MERWIN TRAP AGENDA TOPICS

Tailrace Study Updates

- The draft tailrace study has been discussed over the last two meetings. MaryLouise Keefe (R2) is compiling work on the Chinook and Steelhead data. The final report summarizing the findings of the tailrace study should be complete sometime in January.
- Frank Shrier prepared a series of 240 slides developed from the radio tracking study that show the movement from zone to zone for each individual tagged fish. Frank presented an overview of slides representative of typical observed behaviors to supplement the tailrace study report that is being finalized by MaryLouise Keefe. PacifiCorp will post these slides on their web site.
- The tailrace study and Frank’s analysis show that fish tend to traverse along either the face of the dam or in front of the control room area. Any modifications to the fish trap should include entrances in either or both of these locations.
- The study showed that some fish tended to spend a lot of time in the tailrace (on order of a month or more), while others moved through very quickly (in a few hours). The study could not conclude that any one species had a significantly shorter residence time than any other.
- Coho appear to traverse between Zone 7 and the powerhouse more than other fish. Frank noted that coho don’t tend to trap well at the dam – most are trapped at Lewis River Hatchery.
- One of the tailrace study’s shortcomings is that the telemetry cannot identify which fish is being detected if there are multiple tagged fish in the same zone. This limitation tends to obscure group movement, and will result in missed fish detections and fish that enter the trap but are never detected by the radio receivers.
- Study Conclusions:
 - The existing trap entrance location is favorable.
 - An entrance near the control room and existing pump intake screen would also be favorable as it is near the apex of the triangle between the powerhouse and the control room where fish are known to traverse.

- Having more units on tended to attract more fish into the tailrace, though there was no clear pattern between species.
- When unit 1 is running fish tend to surf, or pop in and out of the trap entrance.
- Spring chinook and coho seem to have trouble finding the existing trap entrance, but when they do they are readily captured.

Fishway Entrance Design

- Sean and Dana provided updates on the working meetings held on 11/3 and 11/30 to brainstorm and develop trap entrance alternatives.
- The group focused much of their attention on a fish entrance alternative using a deep slot entrance and a fish ladder in the corner at the existing pump screen location. This alternative is characterized by:
 - Pumped attraction water jet to guide fish.
 - Vertical Slot Ladder.
 - Ability to add a second entrance along the face of the dam.
 - Gates which would allow circumventing several pools/steps which would be unnecessary at higher tailwater elevations.
 - Operates at tailrace elevations corresponding with 5% and 95% exceedance flows
- Frank came up with another possible fish entrance design idea during the meeting. This alternative is characterized by:
 - Location at the existing trap entrance with a vertical slot entrance.
 - 3-4 adjustable automated vertical slot weirs.
 - The sill at the existing entrance would need to be lowered to the floor level to accommodate low-pool conditions.
 - Additional items to consider with this alternative:
 - Daylight is important, especially at the first weir. The team will look into providing skylights.
 - May need to add attraction water flow.
 - The angle of the attraction water flow is important, may want to make this flow angle adjustable.
- R2 will further develop these entrance alternatives by the next meeting.
- A deep entrance at the existing pump bays is also feasible and will be developed further.
- Bryan Nordlund emphasized that natural lighting for the entrance is important.
- Frank Shrier noted that the group should recognize that there is some risk to abandoning the existing entrance, and that final decisions regarding a new entrance should consider this risk.

- The group would like to have an entrance alternative direction selected by February.

Sorting Facility Design

- Monty and Dana presented updates on the sorting facility design to the group.
- The layout currently shown identifies all of the key features, and has been modified from the last meeting to lower the deck levels relative to the 3,000 gallon tanks.
- Development of the sorting table layout and return flumes is now the critical path. Dan Turner (R2) is coordinating with Eric Kinne and Monty Nigus on this task, and is trying to reach a consensus on a layout in the next week or two.
- A recovery tank and return pipe to the tailrace need to be added to the current layout.
- Monty and Sean plan to continue working on the specific site layout for the next meeting. Points on the siting and layout discussed include:
 - Location must allow for future conversion to and use of a fish tram to the Merwin Reservoir.
 - The design needs to have space to retrofit a visual sorting station in the future to allow some fish to be re-routed directly to the tailrace prior to anesthesia.
 - The elevated holding pond may be moved to take better advantage of the site topography.
 - Small tanks could be mounted on standpipes. This configuration would maintain water-to-water transfer capability and eliminate the need to lift the small tanks.
 - Moving all 5 tanks to one side of the sorting facility may eliminate the need for a second truck entrance.

Schedule Update

The current estimate for license issuance (LY0) is now April, 2007. This delay will help accommodate the entrance alternatives analysis.

PENDING ACTION ITEMS

The following table provides a summary of all pending action items for the Merwin project.

Merwin: Meeting Action Item Summary

No.	SUMMARY OF PENDING MERWIN ACTION ITEMS (remaining from previous meetings)	STATUS
M18	R2/BV/WDFW (Postlewait/Nigus/Kinne) Provide more detail on the fish sorting facility design concepts. Logic diagram for the Sorting Facility to be completed by December 19 th , 2006.	Pending

	NEW ACTION ITEMS (from December 12th Meeting)	Status
M23	R2 (Postlewait) Develop more detail on the adjustable vertical slot weir entrance alternative at the existing trap entrance. Details to be presented at the next meeting.	Pending
M24	R2/B&V/WDFW/USFW/NMFS (Postlewait/Nigus/Klavas/Stow/Nordlund) Conference call on January 9 th to discuss progress on adjustable vertical slot weir entrance alternative and other entrance alternatives prior to the next subgroup meeting.	Pending
M25	B&V/R2 (Nigus/Postlewait) Work up more detail on elevator basket/fish loading to be presented at next meeting.	Pending

ADJOURN

Meeting was adjourned at ~3:00 pm.

ATTACHMENT A

From: Curt Leigh [mailto:LEIGHCSL@DFW.WA.GOV]
Sent: Tuesday, December 12, 2006 8:17 AM
To: KB@AquaKoz.com; FrieszBP@bv.com; nigusla@bv.com; burleccb@DFW.WA.GOV;
johnsmjj@DFW.WA.GOV; HML LRN (Kinne, Eric); klavajpk@DFW.WA.GOV;
LEIGHCSL@DFW.WA.GOV; jim_stow@fws.gov; bryan.nordlund@noaa.gov;
michelle.day@noaa.gov; Lesko, Erik; Shrier, Frank; McCune, Kimberly; Flak, Sean; Shallenberger,
Will; dpostlewait@r2usa.com; pchristensen@r2usa.com
Subject: Re: Engineering Subgroup 12/12/06 Agenda, Draft 10/31/06Engineering Subgroup
Meeting Notes

Greetings

I am submitting the attached corrections to page 3 of the October 31 2006 meeting minutes. I copied that portion of the minutes and applied my changes using redline. Thanks

Attached Text:

Additional Comments on Last Meeting's Merwin Meeting Notes:

1. Bryan Nordlund requested that we address the 9/25 meeting notes regarding Cramer's population model (Pg 5, 1st paragraph). He asked for an update on the status of his request to do a model run with the 98% ATE. An action item has been added to address this item at the next subgroup meeting.
2. Curt Leigh questioned the statement on Pg 6, bullet 3 under Objective 4, which read "Fish only spend a few hours in the tailrace, on average". Curt noted that he doesn't believe this statement is true for Chinook and noted that he read the study to say that half of the Chinook spent more than 40 hours, and two spent 182 and 195 more than 80 hours in the tailrace. Curt would like the notes to address all three species, and clarify that the different species behaved differently. An action item has been added to address this request at the next subgroup meeting.
3. Curt Leigh also questioned the statement on Pg 6, bullet 1 under Tailrace Behavior Study Conclusion that read "there was no evidence that operation treatment caused any delay in fish passage". He provided the following quote from the study: "Chinook showed a strong treatment effect of reduced trap efficiency when unit one was operating" (page 5-6) An action item has been added to address this request at the next subgroup meeting.

PacifiCorp's response to Curt Leigh's comments: PacifiCorp has requested that R2 revise their conclusions in the report to reflect that the statistical analysis is based on the ACC approved study objectives and should not be over generalized.