BAKER RIVER PROJECT RELICENSE

Aquatic Resources Working Group
Technical Sub-committee on Instream Flows

November 17, 2003
9:00 a.m. - 3:00 p.m.
U.S. Forest Service
Conference Room A (425/775-9702)
21905 - 64th Avenue West, Mountlake Terrace, WA

DRAFT AGENDA

1) Introductions and Review Draft Agenda

2) Status of Action Items from September 25, 2003 Instream Flow Meeting

3) Recap Flow and Habitat Modeling Procedures

- HYDROPS Post-Processing: 5 Representative Energy Years (EY) through Level 3, 12 years through Level 4 (EY 1991 to EY 2002)
- Middle Skagit River Flow Routing of HYDROPS Output
  - Travel Time, Accretion, and Stage:Q relationships covered in previous meetings
- Transect weighting
  - Effects of recent flooding on middle Skagit River habitat and flow routing models

    [Project operations and river levels during recent floods.ppt]

    [video:11/08/01 helicopter flight at 12,000 cfs, Sedro-Woolley to Baker]

    [video:11/07/03 helicopter flight at 12,400 cfs, Sedro-Woolley to Baker]

    Analysis Decision: no change to flow routing model?
    minor change to transect weighting?
- Critical Ramping Flow

  [tables and figure:CriticalFlowEvaluation.111003.xls]

  Analysis Decision: critical ramping flow of 28,000 cfs?

4) Integrating Model Results into Decision-Making

- Baseline Conditions through Unregulated Baker/Regulated Skagit
    - Minimum instream flow
    - Ramping
    - Amplitude/Cycling (varial zone)

5) Skagit Hourly Habitat Analyses

- Ramping Rates

  Analysis Decision: WDFW criteria, and monthly table of hours exceeding 2/4/6 inch per hour?

- Varial Zone

  Analysis Decision: (in progress)

- Flows During Spawning Periods

  Analysis Decision: Integrate spawn timing and hourly flows?

- Incubation Flow

  Analysis Decision: Assume 2-day low flow as index of incubation?

- Scour Analyses

  Analysis Decision: Integrate spawning site suitability and shear index?

- Integrate Redd Dewatering and Scour Analyses

  Analysis Decision: Develop index of maximum sustainable spawning habitat?

6) Middle Skagit Daily Habitat Analyses

- PHABSIM (mainstem and secondary channels)
    - Model calibration details
    - Initial results for Chinook spawning Weighted Usable Area (WUA) vs.flow

      Analysis Decision: WUA vs. flow for pink, Chinook, chum and steelhead spawning and Chinook and steelhead rearing?

- Side-channels: Wetted length of all sites and wetted area of all sites vs. mainstem flow

  Analysis Decision: (in progress)

- Backwater sloughs: Wetted length of all surveyed sites, wetted area of all sites, and (in progress) wetted area by 1-ft depth increments of selected sites vs. mainstem flow

  Analysis Decision: Incorporate into Level 4 post-processing?

7) Baker Reservoir Analyses

- Reservoir inflow volume (both Baker Lake and Lake Shannon) by refill periods
- Euphotic zone volume by reservoir pool level and seasonal turbidity

  Analysis Decision: Index of reservoir productivity using monthly pool levels?

8) Schedule and Decision Items

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FINAL MEETING NOTES

Meeting Purpose: Develop a process to resolve flow-related issues for Baker River Project relicensing.

Fish Team Leader: Arnie Aspelund, 425-462-3442, aaspel@puget.com

PRESENT: Arnie Aspelund (PSE), Stuart Beck (R2), Doug Bruland (PSE), Cary Feldmann (PSE), Phil Hilgert (R2), Sue Madsen (R2), Gary Sprague (WDFW), Hal Beecher (WDFW), Chuck Ebel (USACE), Jeff McGowen (Skagit County), Ruth Mathews (TNC), Stan Walsh (Sauk-Suiattle Indian Tribe/Swinomish Tribal Community), Jason Shappart (Meridian Environmental, Inc.), Lorna Ellestad (Skagit County), and Thom Hardy by phone (Utah Water Research Laboratory), Lyn Wiltse, facilitator (PDSA Consulting), and Dawn Schink, (PSE) note taker.

MEETING HANDOUTS

- Annotated Draft Agenda and 66-page package of handouts.
- Figure showing example comparison of minimum instream flow values, varial zone and ramping rate conditions under Recent Conditions/Draft Action/Without Project scenarios.

REVIEW MEETING OBJECTIVES AND AGENDA

MEETING OBJECTIVES

- Report on progress towards development of middle Skagit River habitat models.
- Respond to action items identified at the September 25, 2003 technical subgroup meeting.
- Recommend decision items to the Aquatic Resource Working Group. Participants will review the meeting materials and draft meeting record and submit edits or changes before the next instream flow meeting.

1) Review Draft Agenda

2. Report on Outstanding Action Items (…from Sept 25th meeting) (check indicates completion)

√ Phil to distribute revised charts and tables of energy values at the October 16 RESOLVE session

√ Phil to send out A-09c (Skagit Spawning Survey Report); and

□ A-09d (Skagit Juvenile Salmonids) reports by the October ARWG meeting and include proposed periodicity's for hourly habitat analyses.

√ Phil to develop tables and charts of reservoir inflow volume by various refill periods (i.e., Mar 1 through June 1, Mar 1 through June 15, Mar 1 through June 30).

√ Phil to quantify euphotic zone volume by varying reservoir pool level and seasonal turbidity as one indicator of the effects of reservoir pool levels on sockeye production.

√ Stuart to modify summary charts to reflect energy year, not calendar year.

√ Stuart to recalculate ramping rate hours and events and exclude flow fluctuations above the critical flow level (e.g. assume 18,000 cfs for initial runs).

√ Stuart to recalculate ramping rate hours and events and exclude calculations of less than 2-inches per hour that are allowed under WDFW seasonal and diurnal criteria.

√ Stuart to re-run varial zone analyses using 4, 8, and 12-hour time-steps to address fry stranding during periods of downstream fry movement.

√ Stuart to re-run varial zone analyses using a long period (168-hour) to identify the maximum stage and a short period (12-hour) to establish the minimum stage – reverse of what was presented on 09/25.

3) Recap Flow and Habitat Modeling Procedures

- HYDROPS Post-Processing: 5 Representatives Energy Years (EY) through Level 3, 12 years through Level 4 (EY 1991 to EY 2002); selection of representative years and design of evaluation process is being addressed in the Technical Scenario Team meetings.
- Middle Skagit River Flow Routing of HYDROPS Output
  - Travel Time, Accretion and Stage: Q relationships covered in previous meetings
- Transect weighting
  - Phil and Cary presented PSE's PowerPoint slides of October 2003 floods and operations at the Baker River Project.
  - Effects of recent flooding on middle Skagit River habitat and flow routing models

[video:11/08/01 helicopter flight at 12,000 cfs, Sedro-Woolley to Baker]
[video:11/07/03 helicopter flight at 12,400 cfs, Sedro-Woolley to Baker]
[Transect Weighting Comparison – 111403.doc] (11/14 e-mail 1 of 4)
[UpdatedTransect Weighting.doc] (11/16, e-mail 2 of 4)

Sue showed aerial videos of the middle Skagit River comparing habitat conditions in November 2001 to habitat conditions post-flood in November 2003. Channels conditions looked very similar after the October 2003 floods. Additional wood is lodged along high-water margins, and there is additional fine sediment located on the downstream portions of some bars. The channel change associated with the October 2003 floods was not enough to affect the middle Skagit River flow routing model, and only minor changes were suggested to transect weighting factors. There was a lot of channel change observed at Transect 20, but that transect had already been dropped and the associated habitat values re-apportioned to other transects due to channel change observed in spring 2003.

Analysis Decision:

1) **No change to flow routing model**
2) **We agreed to minor changes to transect weightings**

- Critical Ramping Flow

  [tables and figure:CriticalFlowEvaluation.111003.xls]

  Based on analyses of wetted channel width and wetted surface area versus flow (shown in handouts), R2 suggested a downramping critical flow of 28,400 cfs. Cary Feldmann pointed out that a round number would be simpler to document compliance, and suggested 28,000 cfs or 29,000 cfs. Gary Sprague suggested rounding even more and proposed 30,000 cfs. Cary Feldmann asked the group to consider critical ramping flows for different times of the year so that downramping would not constrain flood control operations. The group also needs to identify a monitoring location where ramping rates can be measured to demonstrate compliance; for instance identifying a particular instream flow study transect and back-calculating stage changes to the USGS gage on the Baker River or the Skagit River.

  Analysis Decision:

  Recommend that the critical downramping flow be set at 30,000 cfs, as measured at the USGS Skagit River gage near Concrete. Monitoring location to be determined.

4) Integrating Model Results into Decision-Making

- Comparisons of minimum instream flows, varial zone, and ramping rates under Recent Conditions, PDEA Draft Action, and Unregulated Baker/Regulated Skagit were presented by Cary Feldmann.
  - Cary suggested it would help advance instream flow discussions if everyone could examine their own starting perspective, and how it may differ between parties.

- Cary handed out a figure showing example comparisons of minimum instream flow values, varial zone, and ramping rate conditions under the three alternatives.
- Stan noted one of his overall objectives is to reduce impacts from instream stage fluctuations as much as possible.
- Stan doesn't think the existing project, operating on a licensing decision made 50 years ago, is a reasonable baseline to judge future actions. Cary responded that nobody expects that the existing operations scenario will represent future conditions, but it is the FERC baseline. Cary suggested that the group should look at alternatives from the perspective of how things are being improved rather than concentrating on how much is changed when compared to a pristine forested condition.
- Ruth acknowledged that the combination of economic and environmental concerns must be balanced to reach settlement. *Because the plants and animals that depend upon the river evolved over millenia it is not appropriate to use the last 50 years of flows that have been altered by the operations of the project as the baseline for determining what is needed for river health. [Comment by Ruth Mathews, TNC]*. She believes that unregulated flow conditions must be examined to identify potential relicensing goals.

5) Skagit Hourly Habitat Analyses

- Ramping Rates
  [1995 Hourly Summary 111403.xls (Figures 15-26)] (11/16, e-mail 2 of 4)
  - Stuart described the handouts explaining that the analyses now include time of day (for WDFW criteria), critical ramping flow of 28,000 cfs, and incorporate the 23 middle Skagit River transects using the flow routing model.
  - The issue is to identify what indicators to use to evaluate the effects of hourly stage increases.
  - Ruth wants the analyses to isolate and quantify stage fluctuations in the Skagit River above the Baker River confluence *separate* from Baker River flow fluctuations *to better understand the impact of the Baker Project operations on the Skagit River. This will help us determine the portion of the combined influence of the Baker Project operations and the natural and human-caused fluctuations in the Skagit River to attribute to each [comment by Ruth Mathews, TNC]*. Cary noted that compliance must be based on what Puget does, not outside influences, such as the Skagit River Project or natural fluctuations in the Sauk River. On the other hand, if the Baker is treated independent of the Skagit River, there will be times when the effects of the Baker River and Skagit River stage fluctuations will be additive. Opportunities to offset upstream Skagit River stage fluctuations will be lost if the

Baker River is considered independent of the Skagit River. R2 was tasked with researching alternatives and presenting them at the next instream flow meeting.

Analysis Decision:

We agreed to recommend that R2 include monthly charts of excursions of WDFW criteria, and stage drops exceeding 1, 2 and 4 inches per hour when flows are less than 30,000 cfs in Level 3 & 4 HYDROPS post-processing analyses.

- Varial Zone

  [*1995 Hourly Summary 111403.xls (Figures 1-14)*] *(11/16, e-mail 2 of 4)*

  - Stuart provided a summary of varial zone analyses that are described in Figures 1-14. The time periods describe the lowest stage and highest stage during each period (i.e., lowest of the low and highest of the high). The 4-hour, 8-hour and 12-hour figures represent analyses of rapid colonization, such as might occur when downstream-migrating fry move into a newly wetted area. All three hourly analyses (4/8/12 hour) exhibited similar patterns of effect between the three alternatives (Recent Conditions/PDEA Action and Unregulated Baker-Regulated Skagit). A 12-hour period was considered an acceptable index to evaluate diurnal colonization by migrating salmonid fry.

  - The 7-day and 28-day figures represent longer-term colonization, such as might occur with benthic invertebrates. Benthic productivity increases as shallow areas remain constantly wetted for up to a month or longer. However, production also occurs with periods as short as a week depending on the substrate and the duration of previous dewatering. After reviewing the various analysis options, the group decided to recommend that 12-hour high flow and 7-day low flow be used to describe effects of flow fluctuations on benthic invertebrates in the varial zone.

    Analysis Decision:

    Recommend that Figures 1 and 8 (Upper extent based on previous 12 hours & lower extent on previous 7 days), and Figures 5 & 12 (Upper and lower extent based on previous 12 hours) be incorporated into Level 3 HYDROPS post-processing analyses.

- Flows During Spawning Periods

  [SalmonSpawnTiming-111403.doc] (11/16, e-mail 1of 4)

  - The group has considered a variety of hydrologic statistics when trying to quantify flows during the salmon spawning period. Statistics such as 10-day high flow, 1-day high flow and 10% exceedance flow all result in flow values over 4,000 cfs, which are so high that an associated 60% incubation flow can not be maintained through emergence. Rather than

a single statistic, R2 suggested that a table be developed that estimates the proportion of salmon spawning at various flow increments, i.e., what percentage of fish are spawning at what flow?

- Using the spawn timing distribution displayed on page 39 *[SalmonSpawnTiming-111403.doc]*, R2 described how an exceedance table could be developed that estimates the proportion of spawning that occurs at various increments of flow for each Energy Year for each alternative.
- Thom asked whether daytime and nighttime spawning differences will be tracked by transect? R2 responded that while they have the capability to track such differences, they would not propose adding this level of complexity to the analysis.

Analysis Decision:
Recommend that R2 integrate spawn timing and hourly flows using the proposed spawn timing periods.

- Incubation Flow
  - Phil discussed using a 1-hour low flow, 1-day low flow or a running 2-day low flow as an index of incubation. Phil noted that dewatering of eggs for less than 2-days could delay maturation even if the eggs remain wet; however, a 2-day low flow would moderate any potential flow spikes related to HYDROPS modeling.

Analysis Decision:
Recommend that R2 use a running 2-day low flow as an index of incubation and quantify the risk of redd dewatering using an assumed spawning suitability factor developed for each transect.

- Scour Analyses
  [ScourAnalysi.doc] (11/16, e-mail 2 of 4)
  [SpawningSuitabltyTR1-2-9-111403.xls] (11/16, e-mail 3 of 4)
  - R2 noted that it is unclear whether flood events decrease egg survival through physical scouring of the egg pockets or through intrusion of fine sediments into the egg pockets that decreases oxygen exchange and smothers the eggs. Both potential effects can be evaluated by modeling shear velocities.

Analysis Decision:
Recommend that R2 integrate spawning site suitability and an index of sediment movement (shear index) to estimate the risk of high flow events affecting egg survival.

- Integrate Redd Dewatering and Scour Analyses

Analysis Decision:

Recommend that R2 develop an index of maximum sustainable spawning habitat that integrates the risk of redd dewatering and effects of flood flows on egg to fry survival.

6) Middle Skagit Daily Habitat Analysis

- PHABSIM (mainstream & secondary
  - Model calibration details
    [PHABSIMHydraulicCalibration.doc] (11/16, e-mail 3 of 4)
    - Stuart described the process that he used to calibrate the PHABSIM model of the 23 middle Skagit River instream flow transects. He essentially followed the approach recommended by the State for the IFG4 model using three velocity data sets.

      Analysis Decision:
      Meeting participants will review the calibration details and provide any comments before the next meeting. At this point, the group recommends that R2's PHABSIM model be accepted as a basis for analysis of potential habitat (Weighted Usable Area) in the middle Skagit River.

  - Initial results of weighted usable area vs. flow for Chinook salmon spawning.
    [WUAChinookSpawning.doc] (11/16, e-mail 3 of 4)

    Analysis Decision:
    Develop WUA vs. flow relationships for pink, Chinook, chum and steelhead spawning, and Chinook and steelhead rearing.

- Off-Channel Habitats - Wetted length of all sites and wetted area of all sites vs. mainstem flow
  [OffChannelSummary – 111403.doc] (11/16, e-mail 4 of 4)
  - Slough habitats are defined as low velocity, backwater areas connected to the mainstem Skagit River at upstream or downstream ends. Sloughs may receive flow contributions from groundwater or tributary sources but velocities are low (<0.1 fps) and not directly related to mainstem river flows. Sloughs typically have fine substrate (silt or organic matter) and support extensive communities of emergent and submergent aquatic vegetation. In comparison to sloughs, side channels are defined as features that are connected to the mainstem at both ends and transmit flowing water from the mainstem at some flow level. Side channels have a well-defined mineral channel substrate (i.e., exposed sand or gravel) that has been recently sorted by flowing water. The downstream end of side channels may be characterized as a slough at some flow levels.
  - Models of middle Skagit River backwater sloughs have been developed to describe daily changes in habitat availability. In general, the analysis of measured sites indicates that as mainstem flows increase, the wetted surface area of backwater slough habitat increases at a uniform rate through the range of modeled mainstem river flows (27,000 cfs for backwater slough habitats).

- Models of middle Skagit River side channels indicate that side channel length and wetted surface area increase at a uniform rate up to about 34,000 cfs, increase rapidly, then level off and show only minor increases in length and wetted surface area at mainstem flows above about 38,000 cfs.
- Power generation at the Baker River Project primarily affects Skagit River flows in the 4,000 cfs to 30,000 cfs range. Since the amount of backwater slough and side channel habitat area increases as mainstem flows increase through this range, meeting participants greed that including calculations as part of HYDROPS post-processing will not provide significant insight in the evaluation of alternative operational scenarios.

  Analysis Decision:

  We agreed to recommend that calculations of backwater slough & side channel data only be used in Level 4 analyses. Ruth will *work with R2 to* consider modify the definition of freshets; and an index of the number of freshets on a monthly basis will be included in Level 3 analyses.

7) Baker Reservoir Analyses

- This topic will be covered in the next Aquatic Resources Working Group or instream flow RESOLVE meeting. This topic is related to instream flows since the availability of water in the reservoirs will affect opportunities to shape flow releases to the Skagit River.

8) Schedule and Decision Items

1. Instream Flow Technical Meeting: Monday - December 15, 2003 – USFS, Mountlake Terrace
2. Aquatics RESOLVE Meeting: Wednesday - December 17, 2003 – USFS, Mountlake Terrace

New/Outstanding Action Items

1) All - Review the meeting materials, draft meeting record and recommended analysis decisions, and submit edits or changes to the meeting record before the next instream flow meeting.
2) All – Let Sue know if you would like a copy of the 2003 helicopter video (Sue will have copies made for Stan, Lorna, PSE and the R2 Baker library).
3) Stuart/Phil – examine alternative locations to measure ramping rate compliance and prepare a recommendation for the group to consider at the next meeting.
4) All – set aside Dec 15th, Monday for next Instream Flow Technical team meeting
5) All – set aside Dec 17th for next Aquatics RESOLVE session - and encourage the "Olympia contingent" to attend the meeting.

Meeting adjourned on time.