CENWP-OD 19 February 2008

MEMORANDUM FOR THE RECORD

Subject: FINAL Minutes for the 14 February 2008 FPOM meeting.

The meeting was held in the St. Helen's Room, NOAA Fisheries Building, Portland. In attendance:

Last	First	Agency	Office	Email
Adams	Jim	USACE	503-808-3938	James.r.adams@usace.army.mil
Benner	David	FPC	503-230-7564	dbenner@fpc.org
Bettin	Scott	BPA	503-230-4573	swbettin@bpa.gov
Boyd	Scott	USACE	503-808-3995	Scott.w.boyd@usace.army.mil
Cordie	Bob	USACE	541-298-7406	Robert.p.cordie@usace.army.mil
Fredricks	Gary	NOAA	503-231-6855	Gary.fredricks@noaa.gov
Hausmann	Ben	USACE	541-374-4598	Ben.j.hausmann@usace.army.mil
Klatte	Bern	USACE	503-808-3943	Bernard.a.klatte@usace.army.mil
Langeslay	Mike	USACE	503-808-4774	Mike.j.langeslay@usace.army.mil
Lorz	Tom	CRITFC	503-238-3574	lort@critfc.org
Mackey	Tammy	USACE	503-808-4305	Tammy.m.mackey@usace.army.mil
Moody	Greg	USACE	509-527-7124	Gregory.p.moody@usace.army.mil
Rerecich	Jon	USACE	541-374-7984	Jonathan.g.rerecich@usace.army.mil
Richards	Steven	WDFW	509-545-2050	richaspr@dfw.wa.gov
Stansell	Robert	USACE	541-374-8801	Robert.j.stansell@usace.army.mil
Stephenson	Ann	WDFW	360-906-6769	stephaes@dfw.wa.gov
Sweet	Jason	BPA	503-230-3349	jcsweet@bpa.gov
Tackley	Sean	USACE	541-374-8801	Sean.c.tackley@usace.army.mil
Wills	Dave	USFWS	360-604-2500	David_wills@fws.gov

Rerecich and Hausmann were on the phone.

1. January FPOM meeting minutes were approved.

2. Action Items.

2.1 [long time ago] Switch Gate Seal at BON: **ACTION**: JDA and BON will collaborate on new seals. ***STATUS:*** *This item will be carried over to future meetings while JDA continues to work on air bladder seals.*

2.2 [Nov 07] TDA stub weir removal. ***STATUS:*** **Currently on hold, but will be kept in Action Items for now.**

2.3 [Jan 08] Fish counter check in and out procedures. **ACTION:** Mackey and Bailey will collect proper protocols for check in and out for each Project. This information will be sent to G. Moody. ***STATUS:*** *Generic language is best for the contract. Each Project will ensure that the check-in procedures are detailed at annual safety talks. BON has sent A. Stephenson their protocols already. TDA/JDA will send theirs in.*

2.4 [Jan 08] Late season counting ended around 20 December at Lower Granite. **ACTION:** WDFW will send counts to Moody and let FPOM know when the counts are posted. ***STATUS:*** *Won't be posted until March.*

2.5 [Jan 08] FPP hard copies. **ACTION:** Get copy requests to S. Boyd at Feb. FPOM. ***STATUS:*** *FPOM members provided their numbers at the meeting. T. Mackey sent those to S. Boyd on 14 February.*

2.6 Discussion of JDA SMF monitoring operations, is daily sampling necessary all season? **ACTION:** D. Schwartz to set up a meeting to discuss the daily monitoring needs at the JDA SMF. ***STATUS:*** *Waiting for FPAC to discuss. This will be carried over.*

2.7 [Feb 08] PIT tag detection needs at JDA. Should the system remain watered up through November, given the freezing temperatures JDA routinely experiences? NOAA recommended B. Cordie present the temperature data and justify an end date. **ACTION:** B. Cordie will present info to FPOM and submit a FPP change form for JDA 1.1.3.

2.8 [Jan 08] Sea lion task group. **ACTION:** S. Bettin is the chairperson. First task- literature search for the sensitivities of our native fishes. ***STATUS:*** *No action to date.*

2.9 [Feb 08] Sea lion task group. **ACTION:** T. Mackey will send S. Bettin a list of his task group members. ***STATUS:*** *Completed on 14 February.*

2.10 [Feb 08] BON ROV and main dam hydro survey. **ACTION:** B. Hausmann to send details to S. Boyd for a teletype. ***STATUS:*** *completed on 14 February. Teletype sent on 15 February.*

2.11 [Feb 08] BON B2CC closure. **ACTION:** Ops will put together a fact sheet for the March FPOM detailing the issues associated with closing the B2CC on 31 August as opposed to either 29 August or 2 September.

2.12 [Feb 08] BON trolley pipe installation. **ACTION:** D. Schwartz will notify FPOM of any schedule delays.

2.13 [Feb 08] JDA VBS drawdown criteria. **ACTION:** Cordie will draft the FPP language detailing the 1.2' drawdown inspection criteria.

2.14 [Feb 08] Avian lethal take. **ACTION:** Cordie will search for the 1995 SOR with BPA. ***STATUS:*** *Bettin found the SOR, had it searched, found no mention of lethal take. Next step is for USACE to pursue NEPA.*

2.15 [Feb 08] JDA unit priority. **ACTION:** B. Wertheimer or M. Langeslay will try to get the JDA unit priority on the agenda for the 2/24 trip to Mississippi.

2.16 [Feb 08] JDA TSW testing options. **ACTION:** B. Wertheimer will send out the options developed at the 13 Feb. special FFDRWG. T. Mackey will forward those to the FPOM mailing list.

2.17 [Feb 08] JDA TSW testing options. **ACTION:** J. Sweet will discuss 50% spill plus two hours with BPA for spill operations from 10-21 April.

2.18 [Feb 08] FPP McNary 2.3.1.2.d language for drawdown over dewatering screens **ACTION:** Moody will get these done and in to S. Boyd.

2.19 [Feb 08] BON orifice lights. **ACTION:** T. Mackey will send the PNNL orifice light report to FPOM and find more on the study Chelan PUD conducted. ***STATUS:*** *PNNL report was sent on 15 February. Email sent to Chelan PUD fisheries on 15 February.*

2.20 [Feb 08] BON orifice lights. **ACTION:** FPOM will review the PNNL report and provide comments as to which lights to use (LED or halogen) no later than 22 February.

3. Updates. (B. Klatte)

3.1 Pinnipeds at Bonneville. Stansell provided a handout (attached to the minutes with figures re-sized so the minutes aren't quite so large). He will do that for every FPOM during sea lion season and it will be posted to the TMT website. Stansell gave a quick update on lethal take and that trapped pinnipeds will be held so interested parties may adopt them before they are euthanized. Hazing continues though it isn’t as effective as hoped. The Steller sea lions are taking almost as many sturgeon as last year. Not many CA sea lions around yet.

3.2 Bonneville BI fishway. Need to prioritize funds for repairing/replacing Bradford Is. fishway. It appears the Ambursen (old navlock) section may be moving downstream, thus causing issues with installing fish valve bulkheads. Funding will be included in the 2010 budget.

3.3 BON ROV inspection update. Need to take Bay 1 OOS during fishway inspection to look at 15’ debris pile downstream of the bay. Inspection to be on 2/19. This has evolved to include an early morning hydro survey of the main dam, taking Bay 1 out from 0800- 1600. The Project will close the main dam early to allow the BGS work and the hydro survey to occur. During this time the ROV inspection will be conducted at the WA Shore fishway. This will require the fish units to be throttled back. The ROV inspection will then move to the CI fishway. This will require a reduction of flows from the ladder. After the ladder inspection the ROV will move into Bays 1 and 2. This will require the bays be closed and reduced flows from the CI fishway. In essence, there will be no attraction flow for any ladder in the morning and then only at the Washington Shore ladder in the late morning/afternoon. FPOM discussed other options which could not be implemented due to the complicated coordination needed for the clearances and with the other contractors. Concern was expressed about fish in the tailrace that have nowhere to go and the risk of being eaten by a pinniped. That concern was acknowledged. M. Langeslay added that the debris pile in Bay 1 may be the CI fishway abutment concrete and that is something we need to know sooner rather than later. **FPOM says Bonneville may go forward with the ROV/ hydro survey on 19 February**.

3.4 B2CC closing date. August 29, 31 or September 2? Rigging crew cost is $700-1000, but getting volunteers may be difficult on a holiday weekend. R. Kruger was not at the meeting and ODFW expressed the greatest concern about an early or late closure. This conversation will be moved to the March agenda. It is suggested that in future years BON may have a hoist so as to make weekend rigger work a moot point. Klatte would like to get some understanding so if the hoist is not available next time this issue arises, we can get language in the FPP and not have this discussion every year.

3.5 Little Goose cormorant take research. Will be carried over to the March meeting.

4. Bonneville trolley pipe installation. (Schwartz)

4.1. According to our dive schedule for the installation of the pier nose trolley pipes we will be diving at or around units 17, 18 & F1&F2 starting on either late Tuesday the 4th of March or all day on Wednesday the 5th. To have divers in the water at the pier area requires not only the main unit they are working on off but units on either side of them off-line and cleared out. The dive scheduled to install the last (3) three pipes at the north end of PH2 will require the fish units being shutdown during our dive. This will require a full day outage of F1 & F2 on or around Tuesday the 4th or Wednesday the 5th. The region has been in support of the unit outages needed to facilitate the dives but turning off the fish units goes above this original agreement.

4.2. **FPOM agreed to the Bonneville fish unit outage all day on 4 March.**
4.3. D. Schwartz will notify FPOM of any delays.

5. **Lamprey lighting at the viewing windows. (Stansell)**
   5.1. Lamprey counters would like additional lighting outside the count station at BON.
   5.2. G. Fredricks expressed concern about sockeye passage with more lighting. There was discussion about how to improve visibility without impacting salmonid passage. Recommendations included backlighting the crowder, using cameras with night/dark mode, move the camera to a better location. S. Richards explained that crowder lights created more problems with contrast and the shadowy appearance of the fish.
   5.3. **FPOM agrees to allow the lamprey counters to turn on existing lighting above the count station and to play with other options for maximizing visibility. Adding more lights was not agreed to.**

6. **Painting the JDA north count station fishway floor. (Cordie)**
   6.1. The fish counters requested brightening the fishway floor so they could see fish better. G. Fredricks indicated a gray would be ok but anything lighter would not. Several suggestions were made, from powder coated inserts to non-toxic epoxies.
   6.2. **FPOM agreed with cleaning the fishway floor at the JDA count station. A concrete gray, non-toxic paint may also be used.**

7. **Development of JDA VBS drawdown criteria. (Cordie)**
   7.1. Cordie looked at past data and found the highest drawdown was around 1.1'. He suggested reducing the 1.5' criteria to 1.2'.
   7.2. Bettin asked what would happen if that criterion were met. How would the project clean the screens? Cordie indicated there was an old cleaning apparatus in the bone yard that could be used. Several people cautioned against using the thing as it may have a potential to catch fish and may not be in the best condition.
   7.3. Bettin proposed leaving the 1.5' criteria intact but suggested adding additional verbiage about inspecting the screen and exploring cleaning options at 1.2'. Cordie said cleaning would have to be done by dewatering the slot.
   7.4. **FPOM agreed to modify the JDA VBS drawdown criteria. The drawdown criterion is still 1.5' but at 1.2' the project will inspect the screen and prepare to clean it.**
   7.5. Cordie will put the language into a FPP change form.

8. **Development of the fishway velocity task group (start with TDA). (Cordie)** No developments thus far. This will be carried over to the March FPOM agenda.

9. **Avian hazing/lethal take. (Klatte)**
   9.1. It appears the prior lethal take permit may not have had the NEPA paperwork completed. The Corps would need FFU to do a study including retrieving birds and examining stomach contents. Geoff Dorsey provided the following information when asked about a lethal take permit for NWP:

"I concluded then that the Corps had insufficient evidence to support a generalized lethal take of piscivorous migratory birds at the dams. While there is plenty of anecdotal information to suggest that the birds are taking fish, there is no specific information as to what bird species are taking what fish species, the number of fish by species that are being impacted by birds, what are the numbers of salmonids being taken, are fish that are being taken dead, injured or stunned by passage through the structure versus healthy fish. Basically a lot of expense to obtain answers for basic questions that need to be addressed in any lethal take EA. Many birds were killed in the past and either left to float off downriver or else trashed with no effort to document stomach contents.

For the previous EA, the USFWS allowed us to take gulls to protect research fish (balloon tags) but not beyond that line. Bob Stansell did some hazing research to determine efficacy of that methodology if I recall and there are plenty of bird wires in place.

I just don't hold much hope for you obtaining permission from either the general public or USFWS (MBTA permit) to back lethal take.

I'm trying to get some information now on use of green lasers to scare birds away from target areas. KGW Ch. 8 just did a report on their use at the Portland Airport to scare birds off. And we have need in the estuary to do that safely and efficiently. PAO is trying to get the video now." Geoff Dorsey

9.2. BPA suggested that the lethal take may be covered under the 1995 SOR. The SOR may be in a searchable, electronic format. Cordie will search for the document.

9.3. FPOM suggests reviewing the SOR. If lethal take is not covered there, then USACE should consider doing NEPA and getting a permit.

10. Results from the January JDA ERDC trip- unit priority.

10.1. FPP Table JDA-5 - needs to be on the agenda for the next trip.

10.2. FPP JDA 4.2.1.3 – needs to be on the agenda for the next trip.

10.3. Tow boaters update – they are going down to Mississippi the week of 2/24.

10.4. Spill volume (60 v 55) from 10-21 April

10.4.1. M. Langeslay updated the group on the TSW tests. He indicated that the low and high end river flows do not have a good 40% pattern. Wertheimer will send out a list of options for testing to the region. The agencies will need to get their responses back in a timely manner. The next ERDC trip is 2/25.

10.4.2. Fredricks said he saw marginal benefits improvement at 250K flow and 55% spill, but he was told by the Corps that even better conditions were achieved at 51% spill. He acknowledged the controversial nature of reducing spill but suggested that if we could make conditions 'flow neutral" then maybe the region could come to agreement. At 55% spill, flow neutrality could be achieved by spilling an extra hour; at 51% two hours would be required. BPA indicated they were not inclined to move off the BiOp as far as start time for spill at John Day.

10.4.3. Consensus is needed to reduce flow from 10-21 April. Fredricks reiterated that 55% was better than 60% and 50% was probably better than 55%.. He would want to see extra hours of spill with 50% but he wasn't as adamant about the extra hour with 55%. He wants to see a decision made that takes improves conditions for fish. CRITFC concurred and USFWS supported NOAA and CRITFC. WDFW has no comment right now and ODFW was not present. J. Sweet will run the 50% spill plus two hours by his agency.

10.4.4. Bettin suggested to the percent of spill being based on flow (a sliding scale). Others suggested picking a flow volume and going with it for the 12 days. J. Adams brought up TDG issues. M. Langeslay said someone will be looking at TDG during this timeframe.

11. FPP finalization. - Boyd needs final edits. The agencies indicated there would not be any formal comments due to the ongoing FCRPS BiOp litigation.

11.1. Bonneville PH1 unit priority (**see attachment**). Priority discussed on 25 January will carry forward. A future model trip will need to include PH1 priority work.

11.2. Bonneville VBS criteria. Accepted.

11.3. McNary 2.3.1.2.d language for drawdown over dewatering screens. No changes. Moody will get these done and in to S. Boyd.

11.4. Appendix G- increased sampling, fish in the recovery tank, and temps. Denied.

11.5. Appendix K sampling hours. Accepted.

11.6. Appendix J temperature protocols. Accepted.

12. Water forecast. (RCC). People expressed concerns about the low elevation snow levels, though there was some comfort that the warm weekend would also be dry.

13. Other

13.1. Despite the abnormally high debris blockages in the trashracks of Units 11 and 12 in 2007, many FPOM members believe the mortality seen in the 2007 Spring Creek releases was a result of stress, possibly in the gatewell. Dennis Schwartz and Lyle Gilbreath anticipate testing the low, mid and high ends of the 1% and the condition of fish in the gatewells in March. D. Wills mentioned USFWS favors a lower end operation as they believe there is no impact to operating at the lower end and above the cavitation limit. He wanted to know what others thought. G. Fredricks indicated that the lower end throttles the unit and that does not equate good passage conditions for fish. **FPOM recommends starting at a mid-point operation, around 45-55 MW for the Spring Creek releases.**

13.2. BON DSM2 orifice lights. Fredricks read the Battelle report and expressed concern about the light output by LEDs compared to halogens. He recommended the project switch back to halogens. Mackey asked if he compared a dirty halogen lens with a clean LED. As she recalled, those outputs were very similar and those conditions would better reflect real-life. There was a bit of conversation about clean and dirty lenses and what could be done about that. At this time, the Project does not have the man-power to scrub those lenses so the only way to keep them clean is to change them out. This is time-consuming and would be required every couple of weeks to keep the lenses truly clean. Someone suggested FPOM look at the study Chelan PUD did on orifice lights. Mackey to track down the Chelan PUD study and send out the Battelle study. FPOM is tasked with reviewing the report and providing a recommendation NLT 22 February.

13.3. Fish count website. The website now included miscellaneous fish counts that may be downloaded. Fredricks commented that he is having a difficult time accessing the website and that NOAA is getting more restrictive with accessing the web.

14. The meeting was adjourned at 1214. The March meeting will be at NOAA Fisheries, followed by the Shad Task Group meeting. The April meeting will be held at McNary.

15. Finalized results from this meeting.

15.1. FPOM says Bonneville may go forward with the ROV/ hydro survey on 19 February.
15.2. FPOM agreed to the Bonneville fish unit outage all day on 4 March.
15.3. FPOM agrees to allow the lamprey counters to turn on existing lighting above the count station and to play with other options for maximizing visibility. Adding more lights was not agreed to.
15.4. FPOM agreed with cleaning the fishway floor at the JDA count station. A concrete gray, non-toxic paint may also be used.
15.5. FPOM agreed to modify the JDA VBS drawdown criteria. The drawdown criterion is still 1.5' but at 1.2' the project will inspect the screen and prepare to clean it.
15.6. FPOM suggests reviewing the 1995 SOR to see if lethal take of birds is covered. If it is not, then they recommend USACE pursue NEPA.
15.7. FPOM recommends starting BON PH2 units at a mid-point in the 1% range during the Spring Creek National Fish Hatchery releases.

16. The following information was distributed, or emailed prior to, the FPOM meeting:

16.1. Agenda, Fish Passage O&M Coordination Team. Provided by B. Klatte.
16.2. Bonneville PH1 unit priority report. Attached to the agenda. (
16.3. FPOM Calendar. Emailed prior to the meeting. (*this one is updated with TMT and Vicksburg trips*).
16.4. NWW handout. Provided by G. Moody
16.5. Pinniped Status report. Provided by R. Stansell (*photos were resized to better fit in the minutes. The original report is available on the TMT website or from R. Stansell*).
16.6. RCC forecast. Provided by S. Boyd.

U.S. ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT

Hydraulic Study of Bonneville First Powerhouse Turbine Unit Priorities and Ice and Trash Sluiceway Operations for Spring and Summer 2004 Biological Test Program

100% DRAFT

TABLE OF CONTENTS

TABLES

APPENDICES (not included in this draft)

Introduction

The Bonneville Project is located on the Columbia River, 42 miles east of Portland, Oregon at river mile 146. The Bonneville 1st Powerhouse (B1) is located at the south end of the project spanning the river between Bradford and Robin Islands (see Figure 1). Due to the discontinuation of the use of the screen system at Bonneville, the passage of juvenile salmonids through the ice and trash sluiceway is the primary means of bypassing fish safely around B1. The ice and trash sluiceway extends across the B1 forebay immediately above the turbine intakes and adjacent to the gate wells (see Figure 2). The sluiceway has 30 adjustable chain gates (3 labeled a, b, or c above each turbine intake 1 through 10). This series of forebay openings, each separated by a pier, causes the sluiceway channel geometry to be very non-uniform. The channel is also transversely sloped so that it is tied into the geometry of the turbine intake below, overall creating a complicated hydraulic structure to model (see Figure 3). The sluiceway transports fish entering the chain gates through the upper sluiceway channel; over a sill at the south end; to a channel passing perpendicular through the dam; and finally exiting to the B1 tailrace at the south end of the powerhouse in the form of a jet (submerged or unsubmerged depending on tailrace elevation).

Study Objectives

The purpose of this study is to determine optimal B1 operations for juvenile salmon passing through the B1 ice and trash sluice during the 2004 spring and summer biological study seasons. To achieve this goal, three objectives were set. (1) Determine a turbine unit priority for optimum juvenile egress from the B1 tailrace for a range of spring and summer flow conditions. (2) Based on the turbine unit operations established in objective 1, determine the optimal forebay entrance locations for the ice and trash sluiceway for the spring and summer biological testing programs. (3) Determine the optimal gates settings to provide for best attraction and then passage through the system once the juvenile are captured, as well as to allow for instrument placement for the biological evaluation of the study.

Modeling Efforts

The study used a number of hydraulic tools to meet the objectives described above. The first was a 3-dimensional computation fluid dynamics (CFD) model of the B1 tailrace. The third was a CFD model of the B1 forebay. The second a 1:100 scale model of the entire Bonneville project. Lastly, a 1-dimensional (1D) model of the ice and trash sluiceway developed by the Northwest Hydraulic Consultants (NHC) in 1997 was used to simulate conditions in the ice and trash sluiceway. Each tool and how it fits into the overall study is described in more detail below.

Tailrace Modeling

Two models were used to evaluate B1 turbine unit priorities for the 2004 biological test program. The first, a CFD model of the B1 tailrace and the second 1:100 scale physical model. Various operational scenarios were run in both tailrace models to provide information on the egress conditions at B1.

Tailrace CFD Modeling

The tailrace CFD model was developed for the Bonneville Second Powerhouse Corner Collector. The model was documented in “Development and Application of a 3D CFD Model for the Bonneville Project Tailrace for Proposed High Flow Outfall Structures” by Rakowski, Serkowski, Richmond and Guensch, September 2001. The tailrace model was calibrated using data collected in the Bonneville Second Powerhouse tailrace channel. A prototype data set was collected in the B1 tailrace channel in 2003 to further verify the CFD tailrace model. The verification results will be presented in the next section of this report. Numerous operational scenarios were run to determine unit priorities to optimize tailrace egress. The numerical model results were used in conjunction with the 1:100 scale physical model observations (described later) to determine the unit priorities summarized in the Recommended Operations Section.

Tailrace CFD Model Verification Results
Stationary and moving transect Acoustic Doppler Current Profiler (ADCP) and point velocity data were collected in the tailrace of B1. These data were collected to calibrate and verify numerical and physical models of the B1 tailrace. The data collection effort is summarized in Acoustic Doppler Current Profiler and Point Velocity Measurement Field Data Collection, Lower Columbia River Projects” by ENSR, July 2003. The field data was collected on April 8th 2003. Figure 4 summarizes the stationary ADCP data set. Figure 5 summarizes the moving transects data. Table 1 provides hourly readings of project operations. Total river flows as suggested by the moving transects (Figure 5) and the hourly data (Table 1) differ by about 10,000 cfs, thus two CFD runs were made. Table 2 summarizes the project flow conditions and the two CFD model runs. The actual boundary conditions applied to the model for the verification runs is provided in Appendix C of this report along with the boundary conditions of all runs for this study.

Results for the two different CFD runs are shown in Figures 6 and 7. Generally, all transects show a better match under the higher total river flow scenario (Figure 7), Transect 1 is the worst match and is also the transect closest to the turbine draft tubes. In addition, the old navigation channel appears to create a larger shadow than appears in the CFD model as shown at transect locations 3-3, 3-1, 4-2 and 4-1.

Figures 8, 9 and 10 show the depth profiles of velocity magnitude of the measured data versus the velocity magnitude of the model data for a specific transect location. Included in Figures 8 through 10 is the measured data plus and minus two standard deviations. The numerical data easily falls within the “range” of measured data. The fact that the CFD velocity magnitudes profile is consistently less than the measurement profile, especially at the shallower depths, suggests that the grid could be refined to provide a profile more representative of the measured profile. The need to further refine the grid is also demonstrated in Figures 11 and 12. Figures 11 and 12 are for a total river discharge of 270 Kcfs, 140 Kcfs through B2, 100 Kcfs through the spillway and 30 Kcfs through B1 (units 2, 3 and 5). Nine massless particles were released in the B1 Ice and Trash outfall and the disposition of those particles are traced in Figures 11 and 12. In Figure 11 several traces stop on the south shore. Figure 12 is an enlargement of this area. The cell size is not sufficient (small enough) to allow the particles to re-circulate back to the powerhouse. But stopping at the shore or re-circulating back to the powerhouse are both poor egress conditions and in that regard the model is effective in capturing poor egress conditions. Additional grid refinement would most likely improve the ability of the model to reproduce the prototype data but it is not critical to evaluating unit priorities where general flow patterns are required over the B1 tailrace.

Tailrace CFD Model Study
The tailrace study was patterned to identify turbine unit priorities that provided best egress for a 1, 2, 3, and 4 unit scenario. In the end the overall turbine unit priority study considered that a unit, once turned on, would remain in the pattern as more and more turbines were brought online but this was not initially done in the preliminary CFD modeling because at this point we wanted individual optimal operations for each scenario. The numerical model runs did prioritize Units 1, 3, 4, and 6 because they have newer and more fish friendly minimum gap runners (MGR). Table A-1 of Appendix A lists the project operations that were run in the CFD tailrace model. To identify unit priorities that would maximize tailrace egress conditions, several runs were first made with different single turbine units operating. After the optimal first turbine was established, a number of different combinations of two turbine unit operations were tried. Again, these did not all necessarily include the optimum single turbine option because the thought was to find optimal conditions at each scenario (1 turbine, 2 turbine etc.). This was continued for combinations of three turbine and four turbine units operations. All of the turbine unit priority runs were made with the tailwater at 21.0 feet National Geodetic Vertical Datum of 1929 (NGVD29). The spillway was operated at 100,000 cfs and a full load at the Bonneville Second Powerhouse (B2), 138,600 cfs. The operating turbine units at B1 were loaded at 10,000 cfs. For all of the CFD tailrace runs the B1 Ice and Trash Sluiceway was operated at 500 cfs. Figure 13 shows the extent of the tailrace model and the blow up in the left hand side shows the velocity vectors in the B1 tailrace.

Tailwater sensitivity was checked with no result (general flow patterns are not highly variable with tailwater changes and therefore the conditions observed for these unit priority are fairly robust.

Tailrace CFD Study Results
To understand egress from the B1 Ice and Trash Sluiceway nine massless particles were released in the sluiceway outfall. The massless particles do not represent a juvenile fish but represent the path the water in the outfall takes. Figures 14 through 18 show the distribution of the nine particles for the five single turbine unit flow conditions (Units 1, 2, 3, 4, and 6 respectively). Good egress conditions occur when the massless particles move out of the B1 tailrace in the most expeditious manner and ideally towards the center of the channel. Unfortunately, the location of the outfall at the south side of B1 makes a particle path towards the center of the channel unlikely. Figure 14 shows a good egress conditions with just Unit 1 operating. The nine particles all head directly out, although the particles are close to the shoreline. The Unit 2 single turbine operation is similar to the Unit 1 single turbine scenario except the Unit 2 jet stays further off shore than for the Unit 1 operation. Particle tracks for this scenario show that flow leaving the outfall does not move into this jet (Figure 15) therefore the outfall egress along the north shore would be slower with just unit 2 operating than with just unit 1 operating. Figure 16 shows a good egress condition with just unit 3 operating. The nine particles head directly out and the particles move toward the center of the channel. When comparing Figures 14 and 16, the velocities for the Unit 1 case are higher (2 to 3 feet per second) than the Unit 3 case (approximately 1 fps). When Unit 4 is operated (Figure 17) all particles get out of the tailrace but they spend time in a re-circulation cell south of Unit 4. Figure 18 shows results for Unit 6 with the particles appearing trapped in a re-circulation cell south of Unit 6. Results for 2 units, 3

units and 4 units are shown in Appendix A but in general once the single unit scenario was optimized increasing the number of turbines tended to improve egress conditions as long as a large space wasn't left between operating units. More discussion of the tailrace egress conditions, along with recommended unit priorities, is provided in the physical model section.

1:100 Scale Physical Model

The Bonneville Locks and Dam 1:100 General Model, along with other scale models of the Columbia River, are used extensively to determine fish egress patterns based on operations of the powerhouses and spillway. For the purposes of this study the general model was used to corroborate CFD model results and visually confirm and document the proposed unit priorities. Because the B1 structure was replaced in 2000 the model needed to be verified prior to it's use in this study.

1:100 Model Verification

At the time the newer B1 model was constructed and installed in the 1:100 scale general model at Engineering Research and Development Center (ERDC) no data was available for verification. In 2003 tailrace velocities were measured at various locations with an ADCP and, as with the CFD tailrace model, that data set was used to verify the accuracy of the 1:100 scale general model's simulation of the B1 tailrace. The details of the B1 model verification are detailed in Appendix B of this report. A summary of the findings and the relevance to this study are provided below.

The first data check was to use the average velocities along Transect 2 to compute discharge coming from the B1 Powerhouse. The reported discharge through the B1 powerhouse during 8 April 2003 was 59,800 cfs. The powerhouse units and miscellaneous flows of the model were set to match project conditions on 8 April. The computed discharge in the B1 model tailrace was 60,846 cfs, a difference of 1.75 percent. This would tend to verify that the discharge being passed through the B1 is correct and that the velocities obtained in the B1 tailrace along Transect 2 are reasonable.

A comparison of model and prototype component velocities, standard deviations of each component velocity, resultant velocity magnitude and direction for the stations, and depths along each transect are shown in Tables 3 through 5. Figure 19 provides a direct comparison of the velocity vectors in the B1 tailrace. The east and north component velocities for Transect 1 (Table 3) tended to be slightly higher in the prototype than in the model therefore the resultant velocity is also higher. The prototype headings for Station 1-2 are approximately the same as the model. The prototype headings at Station 1-4 are from 20 to over 100 degrees less than the model. The prototype headings for Station 1-6 are from 4 to 8 degrees less in than the model. Standard deviations for the east component flow are greater for the model than the prototype at Station 1-2 with the north component approximately the same. Standard deviations for both the east and north components were greater for the prototype than the model at Station 1-4 and at Station 1-6 the standard deviations for the prototype were slightly greater than the model.

For Transect 2 the east component velocities are higher for the prototype than the model for Stations 2-1 and 2-2, lower for Station 2-3, and very nearly the same for Stations 2-4 through 2-7. The north component is consistently larger for the prototype than the model for all stations.

This makes the resultant magnitude higher for the prototype at most stations than the model, even though there are several magnitudes almost equal and a few were the model exceeds the prototype. All of the headings for the model are from 2 to 8 degrees further clockwise than the prototype, except at Station 2-2 at 20 ft depth, which was 12 degrees greater. Standard deviations for many of the data points are not extremely different for model or prototype.

For Transect 3 the east component velocities, except for a few points, are larger in the prototype than the model. The north values, except for a couple of points, are much larger in the prototype than the model. This generally makes the resultant magnitudes, except for a few points, considerably higher for the prototype than the model. The headings, except for Stations 3-1 and 3-3, are generally 6-17 degrees further clockwise for the model than the prototype. Velocities taken at Stations 3-1 and 3-3 in both the model and prototype were relatively slow with high standard deviations. Standard deviations for the east and north component velocities tend to be considerably higher for the prototype than the model.

Overall the physical model agreed fairly well with the ADCP measurements at the project as well as the CFD model results for the same stations and depths. There is a little concern over the heading of the vectors along the south shore of Bradford Island but for the purposes of this study the model appears to be accurately simulating the B1 tailrace conditions measured on 8 April 2003. More details of the model verification can be found in the ERDC verification report in Appendix B of the report.

Physical Model Study

The 1:100 scale general model of Bonneville Lock and Dam was used to evaluate current direction and velocity (CD&V) conditions in the tailrace below the B1 powerhouse for documentation of flow conditions and powerhouse unit operations. The physical modeling included a variety of operational setups (changes in operations at the B1 and B2 powerhouses and the spillway) and were initially documented with dye release video.

The forebay elevation was maintained at elevation 74.5 ft NGVD2929 for all tests. The tailwater varied from elevation 21.0 ft NGVD29 with a total river discharge of 260,000 cfs, and 17.5 ft NGVD29 with a total river discharge of 200,000 cfs. Operational details for each of the conditions are listed on the individual current direction and velocity figures found in the ERDC data report found in Appendix B of this report.

CD&V data was collected by tracking the path of lighted cylindrical floats submerged to a depth of 9 ft (prototype) as the currents through the test section of the model moved them. The data were collected using the video tracking system (VTS) that records the path of the floats by storing the time stamp and pixel coordinate position of each lighted float moving through the camera view. The data in this file is then post-processed to provide the time stamp and state plane coordinate for each light and converted to velocity vectors throughout the tailrace.

Physical Model Results

Figure 20 shows the set of CD&Vs taken representing the spring flows with the total river discharge set at 260,000 cfs, and B1 Unit 4 operating to a capacity of 10,000 cfs with the remainder of the total river discharge divided through the other structures. The tracks indicated the flow immediately below the operating unit moves out toward the center of the channel, following the angle of the island on the left bank line. The pattern spreads across the channel until exiting at the end of the B1 tailrace, where it is picked up by the flow from the spillway and the B2 powerhouse discharges. The flow just below the B1 Powerhouse on the right descending bank is caught in a clockwise eddy that spreads about half a mile below the structure and returns current back toward the powerhouse. Toward the end of the island on the right, but closer to the waterline, the eddy is smaller, but here also the flow is brought back toward the structure. The flow below the island on the left descending bank is also caught up in a clockwise eddy that spins back into the main B1 channel.

Figure 21 shows the 260,000 cfs flow with units 2 and 4 operation to a capacity of 10,000 cfs each, and the rest of the total river flow dispersed as indicated on the plate. There is a larger flow discharged from the B1 powerhouse that follows the island, and this increases in velocity in the tailrace. Below the structure on the left bank line, the flow distribution is carried to the end of the tailrace. The eddy below the structure on the right still exists, but is not as large as with one unit operating. The eddy effect toward the end of the island on the right is present and extends further downstream, and is further to the center in the tailrace.

With units 2, 3, and 4 operational (Figure 22), the flow pattern appears to follow the channel all the way to the end of the tailrace. There is still an eddy below the structure on the right bank, but this is smaller and does not extend as far downstream as in both previous conditions. The condition seems to eliminate the eddy on the right bank toward the end of the island on the right.

The next series of CD&Vs are of the total river discharge of 200,000 cfs, with the first having Unit 1 in the B1 Powerhouse opened to pass 10,000 cfs (Figure 23). In this pattern, the main volume of flow follows the island on the left descending bank, all the way to the exit of the B1 channel. The clockwise eddy on the right bank is pronounced and affects the flow all the way to the end of the island on the right and has its affect out to the center of the channel. The eddy flow is brought all the way back to the structure and then divides, moving in both a clockwise and counter clockwise pattern just below the structure. Below the island on the left bank, there is a small counter clockwise eddy that forces the flow into the main channel.

The next figure is the same total river flow, but with units 1 and 3 open on the B1 Powerhouse (Figure 24). The flow pattern on the left bank follows the island to the end on the tailrace, but the eddy below the island on the left is more pronounced and closer to the end of the island. On the right, the clockwise eddy toward the end of the island is eliminated, but below the structure to about half a mile below the structure the clockwise eddy still exists, bring flow back toward the powerhouse.

The next figure (Figure 25) has units 1, 3 and 4 operating at 10,000 cfs each. The flow follows the channel and carries all the way to the exit of the tailrace, showing a pattern that crosses to the right bank. There is a small counter clockwise eddy below the end of the island on the left and a large clockwise eddy below the structure to about half way across the channel and extending downstream for a distance.

The last figure (Figure 26) shows a total river of 200,000 cfs with units 1, 3, 4, and 5 opened to 10,000 cfs each. The pattern follows the channel below the unit discharges, and extends to the end of the tailrace. Eddies close to the end of the islands on the left and right are eliminated. There is still a clockwise eddy below the structure on the right where there is no unit discharge, which is similar to the pattern with three units open. The eddy seems to be tighter here but still pronounced.

Turbine Unit Priorities

These results in conjunction with the tailrace CFD results lead the following operations for spring and summer testing. The best unit priority appears to start with Unit 4 and then proceed to units 2,6, and 5 so that operating units are spaced out (one dead unit between operating units) to avoid the south to north eddy that hit the north shore and split, some returning to powerhouse and some exiting to the tailrace. After units 4, 2, 6, 5, are brought on-line, 7 and 10 were compared as a fifth unit with 7 appearing to be a better condition because running 10 created a dead spot in the center of the powerhouse into which flow from units 10 and part of 6 flowed. Unit 7 operation eliminated this and actually helped to train Unit 6 a little better. If additional B1 units are needed the recommended priority is 10, 9, and 8. These last units in the sequence were chosen, without modeling, to help with adult attraction.

Forebay Modeling

The forebay model consists of the B1, B2, and the Spillway and was developed for Prototype Surface Collector at B1 and for fish guidance efficiency (FGE) improvements at B2. The model was calibrated using a variety of data sets and is documented in “Development and Application of a 3D CFD Model for the Bonneville Project Powerhouse 1 and Powerhouse 2” by Rakowski, Serkowski, Richmond and Recknagle, September 2001. A limited number of runs were made in the forebay model to determine how turbine priorities would impact fish guidance into the Ice and Trash Sluiceway.

Forebay CFD Model Study

The biological focus in 2004 is to measure B1 tailrace survival under the best egress conditions. The focus is not to maximize the collection efficiency of the B1 Ice and Trash Sluiceway. Thus forebay hydraulics were not considered in setting unit priorities in 2004. The forebay hydraulics were considered, along with unit priority in establishing which chain gates were to be opened to allow entry into the ice and trash sluiceway. The operating conditions used in the CFD model runs made for this purpose are summarized in Table A-2 in Appendix A of this report.

Forebay CFD Model Results

Figures 27-31 show the velocity magnitude contours and stream traces at Elevation 74 (½ foot below the water surface) for 5 operating conditions. The main thing to note in the forebay model runs is that a re-circulation cell tends to form at the north end of B1 when units 3 and 6 and unit 6 are operated (Figures 27 and 30). It is possible that the re-circulation cell could delay juvenile fish and provide additional opportunity for predation. A recirculation cell also forms in simulations of the units 1 and 3 operation and the Unit 3 only operation but this cell splits off at the edge of the navigation lock exit approximately 200 ft upstream of the face of the powerhouse and therefore is less likely to divert any fish milling in front of the powerhouse. Because the

2004 biological study is not focused on maximizing collection efficiency but maximizing tailrace egress conditions this is noted but not used in determining unit priorities.

In addition to the recirculation cell, the CFD modeling also suggests that, as long as only units south of the training, wall located between units 6 and 7 are operated, the streamlines approaching B1 stay south of the training wall (Figures 27-31). This suggests that chain gates that have been left open north of the training wall in the past to capture fish in that area could be closed if we assume the majority of fish will end up south of the training wall based on the streamlines. Opening gates north of the training wall tend to create poor conditions in the ice and trash sluiceway and should be avoided if possible. For this year's biological program, no chain gates were opened north of the training wall.

1 Dimensional Numerical Modeling

The final step in investigating optimal operations for the ice and trash sluiceway involved the use of the TRASH model. TRASH is a 1D model of the ice and trash sluiceway developed by NHC in 1997. The 1D model provides a tool for determining the discharge, water surface elevations, and average velocities in the ice and trash sluice. The TRASH model was used to find gate settings for the chain gates that provide flow over the weirs and through the channel at velocities greater than 3 feet per second (fps). Ideally, this would have been achievable with single gate settings for forebays ranging from 74 ft to 76.5 ft NGVD29. For the given turbine unit operating (as set through the physical and numerical tailrace modeling described above, only the chain gates above those operating units will be opened in order to optimize attraction into the sluiceway. Therefore, based on the unit priorities, chain gates 2c, 4c, and 6c, were operated so as to offer a sluiceway entrance over each of the first three turbines to be brought on line (units 4, 2, and 6) and to be placed adjacent to units operated later in the unit priority (units 5 and 7). An entrance under this setup will not cover units 10, 9, and 8 but operation of these units is unlikely and therefore it is deemed acceptable.

1 Dimensional Model Verification

The initial TRASH model calibration was done in 1997 using discharge measurements from the 1:40 scale B1 model at the ERDC lab located in Vicksburg, MS. Unfortunately, the sluiceway portion of the 1:40 model had never been calibrated to prototype data and consequently the TRASH model was not verified against prototype data until 2000 when it was verified against water surface measurements taken over two days (November 28, 2000 and December 17, 2000. As a result of those verification efforts, it was found that the TRASH model, as initially calibrated, significantly underestimated the water surface in the ice and trash sluice. This would also cause the model to over estimate flows when the channel gates become submerged because at that point the flow becomes a function of the channel water surface elevation as well as the head over the gate.

As a result of the 2000 data, the initial model calibration was discarded and the model was recalibrated to the 2000 data. Unfortunately, since the 2000 data only included water surface elevations and not sluiceway flows this data set was little more appropriate for calibrating the model, which is meant to provide flow as an output, than that used for the original calibration. The model calibrated with the 2000 data predicted approximately half the flow predicted by the original model calibration.

The two very different model calibrations described above made it necessary to recalibrate the ice and trash sluice model yet again. In order for the TRASH model to simulate the performance of the ice and trash sluiceway with regards to biological criteria, including water surface elevations and flows, it needs to be calibrated to a data set that contains actual water surface elevations and flows for a given operational setup (ideally multiple operations). Therefore, in March 2004 flow measurements and water surface measurements were collected at the ice and trash sluice with the intent of using that data to recalibrate the model to at least one complete calibration data set (flow and water surface). The data collection and calibration are described in more detail in appendix c of this report.

The model, as presently calibrated, is an accurate predictor of flow through the ice and trash sluice until the weirs become submerged. When the weirs become submerged the water surface in the channel impacts the flow through the weir. Any error in the water surface (averaging 0.35 ft lower than prototype as currently calibrated but can be as much as 1 foot on the low side) will act to over predict the flow by as much as 30 % for a single gate operating. The model can function when the gates become submerged but this needs to be accounted for in the modeled results. The second option is to ensure the submerged condition is avoided when using the model by operating the sluiceway to not allow the water surface inside the channel to come equal with the chain gate crest. Limiting model operations to this range could over predict the flow by as much as 8%. Since one of the primary biological criteria for sluiceway operations at the moment is to maintain unsubmerged flow over the chain gates, so that fish aren't likely to return to the forebay once they've entered the sluiceway, this is a viable use of the model. Therefore for the purposes of this study the use of the model is limited to conditions where the water surface in the sluice way is at least one foot lower than the chain gate.

1 Dimensional Model Study

The one dimensional modeled study was conducted to find optimal operating conditions within the ice and trash sluice. There are two constraints set on the chain gate left open for the sluiceway operation. The first is that the biological study only has equipment for a maximum of three chain gates and second that those three gates are to be opened over operating turbines so that the turbine flows will help in attracting juveniles to the chain gate entrances. Since the unit priority, established by the physical and numerical tailrace model study are units 4,2,6,5,7,10,9,8, chain gates 2c, 4c, and 6c were set open to allow for maximum coverage of the forebay under those priorities. As stated in the CFD forebay modeling section, because the turbine unit priority won't likely include running units north of the training wall, no chain gates are operated north of the training wall. With the chain gates chosen the 1D model was used to establish gate elevations to optimize conditions in the ice and trash sluiceway with the following criteria:

Design Criteria:

- Minimum of 3 fps over weirs and throughout channel
- Unsubmerged flow over chain gate entrances
- No gate controls (set and leave operations)
- Maximize flow through the system for better forebay attraction
- Design for Forebay range of 74.5 ft to 76.5

In addition to the design criteria listed above, the equipment used for the biological study requires a minimum of 3 ft of depth over the chain gates at all times to allow for complete detection coverage of the entrances. To allow the head over a gate to drop below 3 ft would compromise the results of the biological study. This criteria turns out to be the overriding criteria for setting gate elevation. Because of this, the ice and trash sluice optimization was conducted with two approaches. The first was to disregard the biological study constraint on head over the weir but accept the constraint on the number of gates and get an optimum operation with three gates. The second approach was to document conditions with the head constraint. This gave an actual and baseline operation to compare to (to see how far off optimal operations we are with the current biological study).

1 Dimensional Model Results

Table 6 summarizes the performance of the ice and trash sluice for all the 1 D model simulations. The table is basically a schematic of the ice and trash sluice for a given operation scenario with the channel velocity provided at each gate. Gates that are open have two additional values the first being the approximate entrance velocity and the lower value being the gate elevation. Velocities highlighted red are below the 3 fps criteria and velocities shaded blue are above the criteria. Gate elevations that are red are submerged by the channel water surface and the gate elevations that are blue are unsubmerged by the channel water surface.

A number of approaches can be taken in setting the gate elevations for chain gate 2c, 4c, and 6c to their optimal elevation for the design forebay elevation. The choice of approach depends on how the criteria are prioritized because not all criteria can be met over the entire range of forebay elevations without some form of gate controls to track the forebay elevation. For the optimum three gate performance scenario it is assumed that a 3 fps velocity over the weir and unsubmerged weir flow are the primary performance criteria to provide a maximum velocity for a given flow scenario and to ensure that fish entering the system can't leave the system if the gate is unsubmerged. In order to achieve this, the maximum gate elevation is set so that at the lowest design forebay the minimum 3 fps entrance velocity is met. This under this scenario the optimal gate elevation is 73.2 ft NGVD29. This elevation provides entrance velocities above 3 fps and unsubmerged weir flow for the design forebay range. The ice and trash sluice channel velocities are above 3 fps downstream of gate 4c except at forebay 74.5 ft NGVD29 where it doesn't reach 3 fps until it gets downstream of gate 2c. Trials 1, 2, and 3 in Table 6 provide optimal 3 gate conditions under this approach for forebays 74.5, 75.5, and 76.5 ft NGVD29 respectively.

As stated before the instruments used in the biological study require a minimum of 3 ft of submergence at all times in order to function properly throughout the biological study. This would require that the gates be set 3 ft below the lowest design forebay (74.5 ft NGVD29), or at elevation 71.5 ft NGVD29. Trial 4, 5, and 6 in Table 6 provide ice and trash sluice conditions for these gate elevations for forebays 74.5, 75.5, and 76.5 ft NGVD29 respectively. Operated like this the ice and trash sluiceway does provide for higher channel velocities and entrance velocities above 3 fps throughout the operating but gates 4c and 6c become submerged at a forebay elevation of 75.5 ft NGVD29. All gates become submerged at the maximum forebay of 76.5 NGVD29.

Recommended Operations
The recommended operations for optimal ice and trash sluice performance with three chain gates open are as follows:

- B1 unit priority (first on to last on) should be 4,2,6,5,7,10,9, and 8.
- Chain gates 2c, 4c, and 6c should be operated to provide a sluiceway entrance over each of the first 3 operating units and adjacent to the next two units in the unit priority.
- The chain gates should be set at an elevation of 73.2ft NGVD29 to provide maximum entrance velocities without submerging any of the opened gates.

Since the instruments that are being used to track fish for this study preclude the last of these recommendations the three gates should be set to provide the minimum submergence required for the instruments (71.5 ft NGVD29) at the minimum design forebay (74.5 ft NGVD29).

It is also recommended that hydraulic data be collected as part of future biological study to evaluate the performance of the ice and trash sluice over a range of forebays and operational scenarios so that the best conditions can be achieved with regards to forebay attraction, ice and trash sluice passage, and tailrace egress. Hydraulic data would allow for improved performance of the 1D model so that it can be expected to give reasonable simulation for submerged flow conditions, which is an important operating range if maximum flow through the system and channel velocities becoming the primary criteria in evaluating performance.

If all criteria are to be met with the ice and trash sluice a larger number of gate openings should be considered in future evaluations as well as automating the gates to track the forebay and provide constant optimal performance throughout the design forebay ranges.

February 2008

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	5	6	7	8 Revised Draft FPP Due to NWD Happy Birthday	9
10	11	12 TDAN dewater	13 TDAN dewater	14 FPOM Meeting-NOAA	15	16
17	18	19 JDAN dewater NWP – Special FFDRWG Bonn NWW – PDT ERDC Little Goose	20 JDAN dewater NWW – PDT ERDC Little Goose	21 NWW – PDT ERDC Little Goose	22 NWW – PDT ERDC Little Goose	23
24	25 NWW Agency Trip – Little Goose NWP Agency Trip John Day TSW	26 NWW Agency Trip – Little Goose NWP Agency Trip John Day TSW	27 NWW Agency Trip – Little Goose NWP Agency Trip John Day TSW	28 SLEDs installed NWW Agency Trip – Little Goose NWP Agency Trip John Day TSW	29 Annual FPP Issued Adult fish facility maintenance ends	

March 2008

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 Adult Passage Season Begins – Start counting at Lower Granite Dam
2	3 Planning Mtg for Lamprey	4 SRWG	5	6	7	8
9	10	11	12 TMT	13 FPOM Meeting- NOAA Shad task group Happy Birthday	14	15
16	17	18	19	20	21	22
23	24	25	26 TMT	27	28	29
30	31					

April 2008

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 Adult Fish Counting Starts all Dams. Juvenile Bypass Season Begins	2	3 Juvenile Spill Starts Snake River Dams – Pools to MOP	4	5
6	7	8	9 TMT	10 FPOM Meeting- McNary	11	12
13	14	15	16	17	18	19
20	21 Snake River Juvenile Transport Begins TSP PDT at ERDC	22 TSP PDT at ERDC	23 TMT TSP PDT at ERDC	24 TSP PDT at ERDC	25 TSP PDT at ERDC	26
27 Happy Birthday	28	29	30			

DRAFT 14 February 2008 FPOM MINUTES

Construction

Ice Harbor:

- Turbine unit 2 – Undergoing annual maintenance. Blade welding completed.
- Turbine unit 6 – remains OOS due to transformer gas problem.
- Turbine Unit 1 - Fire Protection CO_2 system installation in progress.

Little Goose: Turbine unit 5 has been OOS since Feb 7 due to exciter failure.

Lower Granite: Turbine unit 2 remains OOS for rewind and 6-year O/H, with completion in Sept. 2008.

Operations and Maintenance - Juvenile Fish Facilities

McNary: Transport Facility/Bypass System: OOS. Manual floor valves in primary dewaterer replaced. Rectangular screen cleaner being rehabbed. Control cables and retraction springs receiving extra attention.

Ice Harbor:

- Juvenile channel unwatered. Joints and seams being caulked.
- RSW tests scheduled in March to determine cause of structural "shaking". Pretest mtg - Feb 20-21.

Lower Monumental: Air bubbler system pipe mounts being repaired in primary dewaterer. Cleaning brush drive cable being replaced.

Little Goose: Repair/replacement of Primary Dewaterer weir drive gears, shafts, and steel support girder.

Lower Granite: Facility maintenance will be completed as scheduled.

Operations and Maintenance - Adult Fish Facilities

McNary:

- Oregon Ladder OOS. Fish pump 3 operated satisfactorily during tests on Feb. 5. Damaged viewing room window being replaced. NPE, W1, W2, and W3 entrances being serviced, then returned to auto.
- Washington Ladder watered up. Tilting and exit weirs replaced. Auto control systems serviced. PUD turbine unit completed winter maintenance.

Ice Harbor:

- North Shore fish pumps #1 and 3 completed. Fish pump #2 gearbox undergoing manufacturer warranty repairs. North shore ladder to be rewatered Feb 14. South Ladder is in service.

Lower Monumental:

- North ladder rewatered Feb 9-10. Pump #2 OOS due to elliptical bearing wear. Pumps #1 and #3 exhibit similar bearing wear patterns, will require future repairs, but are within acceptable tolerances. Water lubricated bearings will be replaced with oil lubricated bearings.
- The south ladder is currently OOS, no fish found in the exit pool.

Little Goose: Ladder is unaltered for winter maintenance. Water-up will occur as scheduled.

Lower Granite: The ladder is watered up, fish pumps are OOS. Pumps to return as scheduled.

Research

Ice Harbor: RSW: Radio tracking equipment is to be reinstalled March 5.

DRAFT 14 February 2008 FPOM MINUTES

STATUS REPORT – PINNIPED PREDATION AND HAZING AT BONNEVILLE DAM IN 2008

Robert Stansell, Sean Tackley, and Karrie Gibbons
2/14/08

This is the first status report for 2008 on the pinniped predation and hazing activities being conducted at Bonneville Dam. Although intermittent observations occurred in November and December, regular observations began on January 11, Mondays through Fridays, and switched to 7 days a week on February 4. Observations begin roughly an hour before sunrise and end an hour after sunset. **Please remember all data are preliminary and final figures are likely to change some after further analysis and proofing, so be careful about quoting these figures.** Boat based harassment has been conducted since December 12 for Steller sea lions preying on sturgeon, 2 to 5 days a week, and has continued for California sea lions to date. Weekends are not covered. Dam based harassment by USDA WS agents will begin on March 3, for 7 days a week, through the end of May. Data collection will end after May 31, as will harassment activities. Some additional observations will occur as long as sea lions are still present.

The states are anticipating permission from NOAA fisheries for lethal take of up to 30 California sea lions this spring, by lethal injection and/or shooting. The states are also working with the Corps, enforcement agencies, an animal care committee, and various other groups to create a plan to address safety issues and coordination should lethal shooting become allowed. Funding issues have precluded the building of additional traps and a tagging barge to date, but these could be constructed and deployed as early as April. Logistics for a holding facility and potential sites that may want some of these animals also are being explored.

PRELIMINARY RESULTS

Data presented here are up through February 11, 2008. A final report of the 2005-2007 evaluation will be available in March.

PINNIPED ABUNDANCE

The first Steller sea lion (*Eumetopias jubatus*) this season was seen at Bonneville on November 6, 2007, with 4 days of sightings in November and 2 in December. Up to 3 Stellers sea lions were observed at a time. The first California sea lion (*Zalophus californianus*) was seen on November 8, 2007, but only for that one day. California sea lions were seen regularly from January 9. Harbor seals (*Phoca vitulina*) were seen occasionally from August to the present. To date, we have seen as many as 12 Steller sea lions and 3 California sea lions at the dam on any given day (see Figure 1). The most number of pinnipeds total for one day so far was 15 on February 3. A preliminary look at individuals identified at Bonneville Dam so far suggests we have seen about 4 different California sea lions, 12 Steller sea lions, and 2 Harbor seals. Three of the California sea lions have been seen in previous years, while the fourth could not be identified. An additional 6 "Bonneville" animals have been spotted in Astoria in recent months.

PREDATION FIGURES

Unexpanded numbers for fish observed taken between January 11 and February 12 are:

- 34 steelhead (see Figure 2)
- 218 sturgeon (6 larger than 5 feet)(see Figures 2, 3 and 4)
- 4 lamprey
- 118 unidentified (see Figure 2)

Steller sea lions are the primary predators of white sturgeon (*Acipenser transmontanus*) in the Bonneville Dam tailrace (Figure 5). Only six sturgeon were taken by California sea lions in past years; 1 this year and 1 by a harbor seal; (2'). California sea lions are primarily taking steelhead. It is likely that most unknown fish observed caught by Steller sea lions are sturgeon, while those unknown fish observed caught by California sea lions are steelhead.

Most sturgeon are caught at the spillway followed by PH2, while most steelhead are being caught at PH1 and PH2 (Figure 6). Figure 4 shows that sturgeon take is on pace to equal the sturgeon take of last year. However, smaller sturgeon are being taken proportionally more this year than in previous years (Figure 4).

HAZING IMPACTS

Boat hazing began on December 12 and has not had the effect of chasing the Steller sea lions completely away from the project for more than the hours the boats are present. They are chased downstream or underwater during the hazing, but as can be seen in Figure 1, they are back either later in the day or the next day.

SLEDs were installed at PH2 entrances on January 28. PH1 is still OOS. B-branch and Cascade Island entrance SLEDs are waiting on the large crane for installation.

Acoustics were deployed at all major fishway entrances by January 10.

OTHER ITEMS OF INTEREST

So far we have primarily seen Steller sea lions hauled out, typically inside the downstream end of the PH2 corner collector (Figure 7). When tailwater dropped very low on February 11, we saw 7 Stellers and 1 California sea lion hauled out on the spill bay 16 ogee (Figure 9). The trap has not been deployed yet. PSU volunteers are conducting observations between Tanner Creek and Ives Island, and the states may do some supplemental observations between the dam and Tanner Creek. We will present this data as it becomes available to us.

SUMMARY

Pinniped numbers are remaining relatively low, with few California sea lions present at this time. The primary activity at this time is Steller sea lion predation on sturgeon. So far, boat harrassment has not eliminated the presence of Steller sea lions or predation on sturgeon in the Bonneville Dam tailrace.

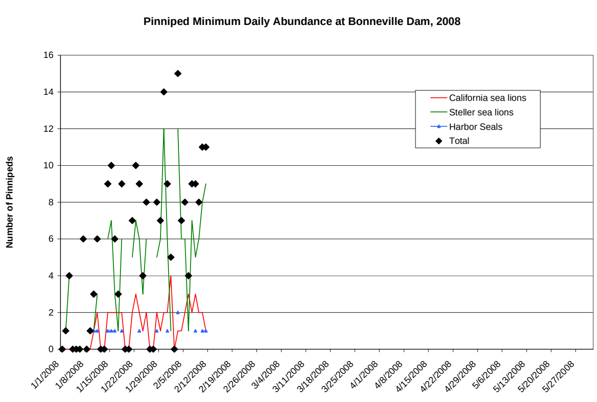

Figure 1. Daily minimum pinniped abundance.

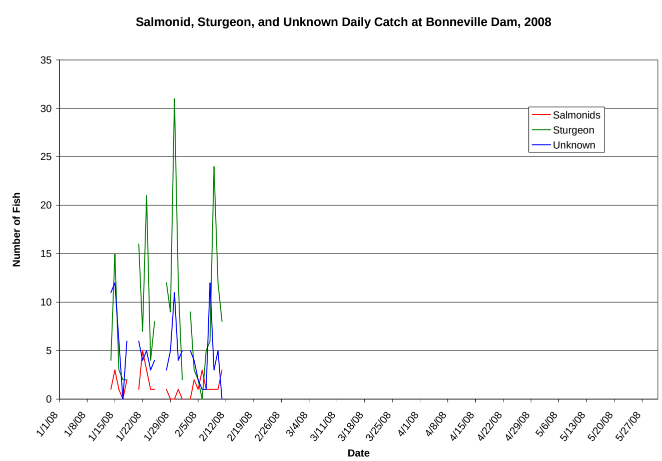

Figure 2. Daily salmonid, sturgeon, and unknown fish predation by pinnipeds, unexpanded observations.

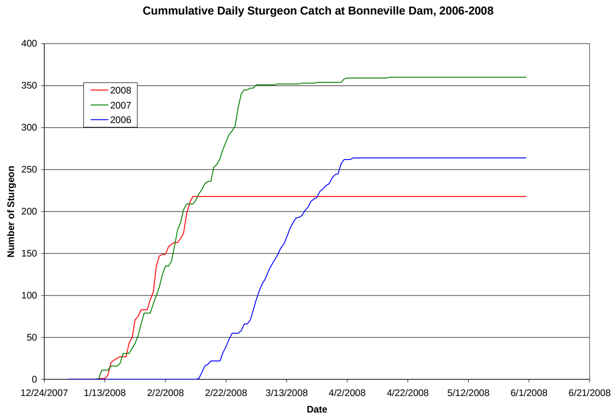

Figure 3. Cumulative estimated daily sturgeon catch by pinnipeds at Bonneville Dam, 2006-2008. 2008 data not expanded yet and preliminary.

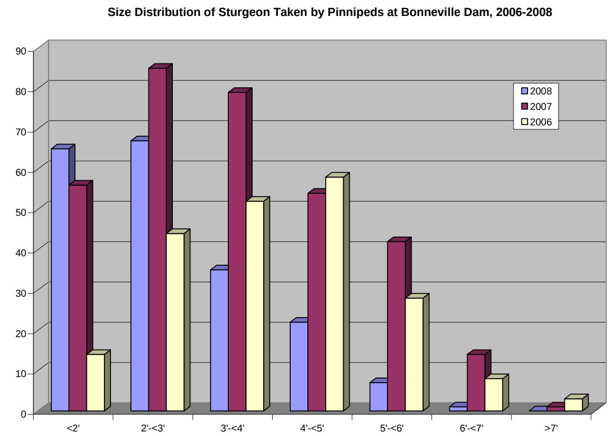

Figure 4. Size distribution of sturgeon caught at Bonneville Dam, 2002-2008.

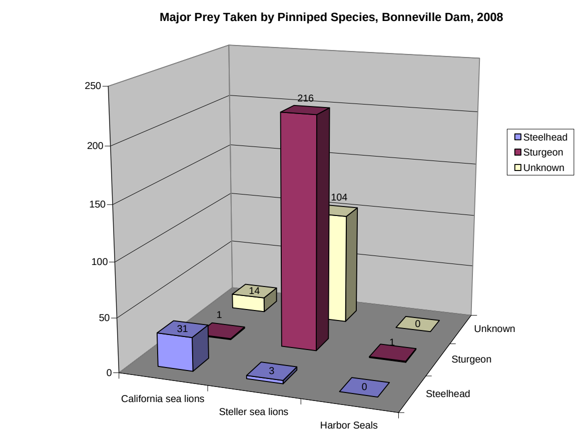

Figure 5. Prey taken by species of Pinniped at Bonneville Dam, 2008.

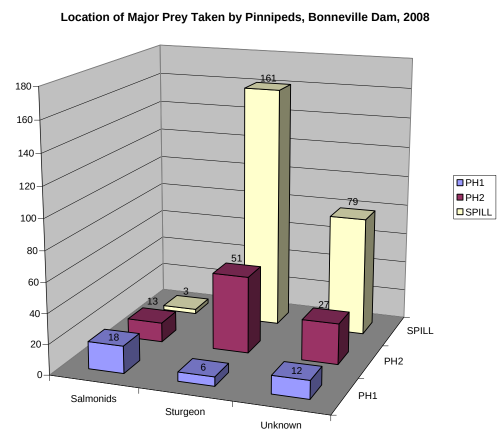

Figure 6. Location of prey taken at Bonneville Dam, 2008.

Figure 7. Steller sea lions using the PH2 Corner Collector outfall as a haulout site.

Figure 8. Steller sea lions hauled out on spill bay 16.