



## FISH PASSAGE CENTER

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### MEMORANDUM

TO: Salmon Managers  
Fishway Inspectors  
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Chuck Peven, Chelan PUD  
Chris Carlson, Grant PUD  
Cal Sprague, COE Portland District  
Rex Baxter, COE Walla Walla District

FROM: Larry Basham

DATE: November 12, 2002

RE: **Fishway Inspections – October 2002**

State and federal inspectors completed inspections at 13 mainstem dams in the lower and upper Columbia River and Snake River in October or early November. Low rainfall in October kept flows reduced throughout the Columbia River. Reversed load factoring was initiated at Priest Rapids Dam and that can in turn change operations at some of the other PUD projects. As an example, flow during the inspection at Priest Rapids Dam was only 50 kcfs while upstream at Rock Island Dam, the flow was about 159 kcfs. Water temperatures were nearly normal at Snake River projects as well as the lower Columbia River. Adult fish passage was fairly consistent when monitoring migration of the fall chinook salmon; however, a portion of the steelhead again held up, resided temporarily (usually days, sometimes a month or two) in tributaries and cooler waters in July, August, and part or all of September before beginning serious migration in Mid-September and October. Overall, most fish facilities were reported operating with few out of criteria problems during the month. Problems as a result of inoperable pumps or fish turbines have caused minimal out of criteria conditions so far this season but there have been some occurrences.

**Bonneville Dam** – Ed Meyer, NMFS, completed an inspection of the adult and juvenile fish facilities on November 2. River Q was 119.7 kcfs with about 3.5 kcfs spill from the two end bays. Water turbidity was 5.0 ft with the water temperature at 54°F for the October inspection.

**Powerhouse I** – At the South end of the powerhouse collection channel Main entrance Gate 2 was submerged 6.2 ft with the head differential at 1.15 ft (ave. of staff gage and PLC reading). Weir Gate 64, located on the North end of the powerhouse was submerged 8.1 ft, with the head differential reported from 1.7 to 2.0 ft. The water velocity in the north end of the powerhouse collection channel was reported

at 1.2 fps, with the south end meter recording 2.4 fps. The five sluice gates were operating satisfactorily during the inspection. The depth of water over the main Bradford fish ladder weirs was 1.1 ft, with 1.2 ft measured at the A-Branch and 1.1 ft at the B-Branch fish ladder for the October inspection (The A-Branch reading was about 0.1 ft high). The exit from the ladder required cleaning, with the picketed lead section at the count station reported clear of debris. Also, FV1-1 had lots of weeds on it and required cleaning.

**B-Branch** - The computer system was not operating during the October inspection and readings were taken from the staff gages. Head differential was reported at 1.7 ft, close to the target of 1.5 ft. The north and main downstream entrances were operating to attract adult fish to the B-Branch fish ladder.

**Cascades Island** - The Cascades Island fishway entrance is similar in design to the B-Branch. The computer system remained out of service, similar to the B-Branch Fishway. The downstream and south entrances were operating. Head differential was about 2.0 ft during the inspection and fell within the criteria of 1.0 ft-2.0 ft. The depth of water over the ladder weirs was 0.9 ft.

**WA shore fishway** –Two small fish turbines supply about 5,000 cfs of water to four main entrance gates, two at each end of the powerhouse, and 12 floating orifice gates along the collection channel. Tailwater elevation permitting, the gates are operated 13 ft submerged below tailwater with the head differential between 1.0 and 2.0 feet and a targeted head of 1.5 feet. Only one of the two fish turbines was operating during the inspection, as major Stator repair was required on the turbine. The Unit was taken off-line at 3 a.m. on November 1 to begin the overhaul of the turbine.

One South Entrance gate (SUE) was reading errant with the Mechanical gate reading 8.5 ft, giving only a 2.9 ft gate depth at that SUE, while the SA-24 Board Reading reported a 6.3 ft gate depth. The SDE was submerged about 6.4 ft with the head differential reported at 0.9 ft. The North Entrance gates were submerged nearly 6.9 ft average with the head differential reported at 1.1 ft for each. In a later conversation with project biologist, Tammy Mackey, it was learned that the project is now operating 3 of the 4 entrances (NUE is closed). The project will operate with only one fish turbine for the remainder of the fish passage season to complete repair of the stator and other necessary upgrades on the turbine prior to next season's fish run. The floating orifice gates along the channel were operating satisfactorily. The water velocity was not reported. The exit from the fish ladder was clear of debris. The depth of water over the ladder weirs was 1.2 ft.

**Overall**, the computer (PLC) system at the B-Branch and Cascades Island fish ladders should be fixed and operable; it has not been in service for this season. The depth of water over the weirs at several ladders were higher than recommended, i.e., 1.2 ft rather than 1.0 ft  $\pm$ 0.1 ft (normal criteria). Velocity of the water flowing at the n. end of the Old powerhouse (1.2 fps) was less than the required 1.5 fps. Staff gages required cleaning at the old powerhouse and spillway entrances. The AWS screens should be cleaned due to the buildup of weeds and debris on them. The WA shore entrances were not set and operating at proper elevations during the inspection. This was later rectified and the project is now operating in automatic at present.

**Juvenile System** – The WA shore juvenile bypass facility was operating with all screens and orifices as required; Unit 16 was off-line. The project was operating the low outfall. The ice/trash sluiceway was operating at the old powerhouse. The flow in the old powerhouse is running south so all fish will be exiting through the ice/trash sluiceway till the end of the fish passage season.

**The Dalles Dam** – Doug Case and Wayne Van derNaald, ODFW, completed an inspection of the fish facilities at The Dalles Dam on October 16. Project discharge was 85.2 kcfs with no spill. Two fish turbines were operating at the OR fishway with a single fish turbine operating at the WA fishway. Water temperature was 63°F, with the turbidity reading at 6.0 ft.

**Washington Shore** - Wasco PUD operates a single turbine unit that supplies water to the diffusion system in the lower WA shore fish ladder and then through main entrance Gate N-1 to the tailwater. Gate N-1 was submerged 9.0 ft below tailwater elevation with a head differential reading of 1.0 ft. The gate depth and head differential at Weir N-1 was operated within the proper criteria range for this October inspection. The PUD trash racks had 0.4 ft head differential. The depth of water reported over the fish ladder weirs was 0.9 ft. The picketed leads at the count station had small amount of debris on the upstream and downstream pickets, while the exit from the fish ladder was reported clear of debris.

**Oregon fishway** – Approximately 4,450 cfs of water was directed to the auxiliary water supply system via the fish turbines. South Entrance Gate S-2 has a bulkhead in place about 8.0 ft deep and this gate is manually regulated to maintain the head differential at this South Entrance. Gate S-1 was submerged 6.1 ft below tailwater elevation, with a head differential reading of 1.2 ft. The project will repair these entrance gates during the winter maintenance period.

At the West Entrance, Gates W-1 and W-2 were submerged 8.25 ft average depth, with the head differential at 1.0 ft using the Selsyns gages. The electronic velocity meter has been out of service for the season; however, estimated water velocities for the inspection ranged from 1.5 fps to 3.0 fps through powerhouse transportation channel.

The East fishway entrance has two operating gates, E-2 and E-3. These gates were submerged 11.75 ft average depth with the head differential at 1.4 ft. These gates continue to pass a large quantity of attraction flow for the adult fish approaching the eastern end of the powerhouse. Gate depths and head differential were within the desired criteria range for this October inspection.

The exit from the fish ladder, as well as the picketed lead section of the counting station, was clear of debris. The project cleans the pickets on a daily basis or as needed depending on the amount of grasses and vegetation in the fish ladder. The depth of water over the fish ladder weirs was 1.0 ft and this reading was satisfactory.

The normal sluice gates, Gates 1-1, 1-2, and 1-3, were operating as required for juvenile fish passage at the project. The North shore juvenile fish facility was operating satisfactorily in bypass mode as well.

**Overall**, the COE should continue repair and assure functionality of their PLC system so that operation of the fishways can be calibrated. During the winter maintenance season, the project should make sure the backup South Gate is repaired and working prior to next season.

**John Day Dam** – Doug Case and Wayne VanderNaald, ODFW, inspected the John Day adult and juvenile fish facilities on October 16. Project Q was 104.4 kcfs with no spill occurring during this inspection. Turbidity was 6.0 ft with the water temperature reported at 61°F. Two north shore (WA), and 3-south shore (OR), fish pumps were operating for the inspection. For most of the season, fish facility equipment has worked satisfactorily.

**OR fishway** – During this inspection, the South shore, SE-1, fishway entrance was operating with the gate depth at 8.2 ft on the gage and 8.6 ft at the panel. Head differential was 1.3 ft using the staff and the panel readings. The gate depth and head at the South Entrance met criteria. The two main entrances at the north powerhouse (Gates NE-1 & NE-2) were submerged 8.0 ft using the staff gages and 8.0 ft submerged using the panel reading. Head differential was 1.1 ft using the staff gage and 1.3 ft using the panel gage. All gate depths and head differentials fell within the criteria range for the North Powerhouse Entrances. Water velocity recorded along the powerhouse collection channel averaged about 2.0 fps for the October inspection. Ten floating orifice gates were operating satisfactorily along the powerhouse collection channel. The picketed lead section at the counting station and the exit from the fish ladder was clear of debris during this inspection. The depth of water over the weirs was 1.1 ft.

**WA fishway** – Gate N-1 was operating at the WA shore fishway. The gate depth was 8.0 ft and 7.8 ft with the head differential reading 1.0 ft using the staff gages and LED gages, respectively. Readings from the WA shore fish ladder were as follows: the picketed lead section at the counting station and the exit from the fish ladder were clear of debris. The depth of water over the fish ladder weirs was 1.1 ft.

**Overall**, the OR and WA fishways were operating close to criteria at the fish ladders and main entrance gates. The LED reading at the North Shore showed the gate depth at 7.8 ft rather than the 8.0 ft required depth. The staff gages and mechanical reading of the gate elevation resulted in a depth of 8.0 ft at the same entrance.

**Juvenile Fish Facility** – The Smolt Monitoring facility was dewatered on October 7 and the juvenile bypass system was operating in bypass mode.

**McNary Dam** – Larry Swenson of the NMFS was accompanied by B. Duke, ODFW, on this inspection of the fishways conducted on October 2. Project Q was 109.2 kcfs with no spill at time of inspection. River temperature was 64°F with turbidity reading at 5.0 ft. A fishway status report was obtained prior to the inspection to compare on-site elevation readings with computer readings.

**Oregon Fishway** – Three fish pumps were operating with pump angles recorded at 23° to 24°. About 450 cfs of water from the juvenile bypass system is added to the powerhouse collection channel flow at the north end of the powerhouse, near the North Entrance gates. Gravity flow water from the forebay is also added in the lower end of the OR fish ladder.

The South Powerhouse and North Powerhouse entrance gates were submerged 8.9 ft and 9.7 ft, respectively, below tailwater elevation, with the head differential reading 1.5 ft at the South and 1.1 ft at the North Powerhouse entrances. Gate depths and head differentials were found close to proper criteria range at the Oregon fishway entrances (0.1 ft less gate depth than required at S Shore). All orifice gates along the collection channel were satisfactorily operating during the inspection. The velocity reported at the south end of the collection channel was about 0.8 fps, and at the northern end of the channel it was nearly 3.7 fps. The depth of water over the fish ladder weirs was 1.0 ft. The exit from the fish ladder was reported clear of debris with the fish counting facility also reported clear of debris.

**Washington Fishway** – The fish turbine operated by North Wasco PUD was supplying sufficient flow to the WA shore fishway entrances to meet criteria requirements. Entrances WFE-2 and WFE-3 were operating with head differential of 1.6 ft and the gates submerged an average depth of 9.0 ft during the inspection. The exit from the fish ladder and picketed leads at the count station were clear of debris. The depth of water over the fish ladder weirs was 1.1 ft for the October inspection.

**Overall**, the adult fish passage facilities at the OR and WA fishways were operating within normal criteria at main entrance gates with sufficient head differential and gate depth reported. Several floating orifice gates were overtopped with water.

**Juvenile Fish Facility** – Debris in front of the project was basically reported as very light.

**Priest Rapids Dam** – I completed an inspection of the adult fish facilities at Priest Rapids Dam on October 22. Project discharge was 49.1 kcfs with 1 kcfs spill for assisting adult fish passage downstream past the project. Water temperature was 60.0°F with the turbidity reading 13.5 ft. Five fish pumps (tailwater) and gravity-flow water (gravity intake gate 9.5 ft open) supplied flow to the supply pool. This pool normally maintains about 6.5 ft head above the tailwater elevation; it was 6.1 ft on this inspection.

**Left Bank Fishway** – At each end of the powerhouse, a slotted entrance is open to attract adult fish into the fishway/channel that leads to the fish ladder. Gate LSE-4 was recorded with 1.5 ft head differential and Gate LSE-2 with 1.2 ft head differential. Gates LSE-4 and LSE-2 were operating within the normal criteria range of 1.0-2.0 ft. Gate LSE-4 met the targeted head differential this month. Water velocity reported at the eastern end of the collection channel was estimated 0.5 fps. For the 4th month in a row, water velocity through that section of the channel was less than the normal for the season. The project should check whether there were diffuser changes made that might slow flows through that end of the channel. The exit from the fish ladder was reported clear of debris during this inspection. The depth of water recorded over the ladder weirs was within criteria and reported at 1.1 ft.

**Right Bank Fishway** – Slotted entrance (RSE-1) was operating with 1.6 ft head differential using water sensor equipment to measure elevations. The staff gages were basically unreadable during the October inspection date at the Right Bank. The head differential of 1.6 ft met the target of 1.5 ft. The fish ladder exit was reported clear of debris, and the picketed leads at the counting station were also clear of debris. The depth of water recorded over the fish ladder weirs was 1.1 ft.

**Overall**, the adult fish passage facility was operating within criteria ranges (1.0 to 2.0 ft) at the main entrance gates when checking the computer reading and readable staff gages and the newer sensor gages. A velocity meter is required to accurately assess flows through the powerhouse channel. We estimated water velocity to be nearly 0.5 fps on the east end of the channel. This area can be a problem area, but normally velocities have been satisfactory until recent inspections. The project should assess whether diffuser changes or other changes were made that has affected water velocities through this area.

**Wanapum Dam** – I completed an inspection of the adult fish passage facilities at Wanapum Dam on October 22. Project discharge was 84 kcfs, with 0.7 kcfs spill (sluice) and the remainder through the five operating turbines. Water temperature was reported at 61°F.

**Left Bank Fishway** – Two fish pumps were operating at 125-rpm average and supplying sufficient flow volume to the adult fishway. The Main Entrance gates are slotted and rely on meeting head differential criteria of 1.0 to 2.0 ft (range) with the preferred target of 1.5 ft at the LSE-2 and 1.25 ft at LSE-3. During the October inspection, the LSE-2 Gate had 1.5 ft and the LSE-3 Gate, 1.3 ft head differential.

Both gates met their targeted head differential and fell within the proper criteria range. Water velocity was estimated at more than 2.0 fps at the East end of the channel and maintained that velocity through the channel toward the West entrance (LSE-3). The exit from the fish ladder was reported clear of debris. The depth of water recorded over the fish ladder weirs was 1.0 ft during the inspection.

**Right Bank Fishway** – Gravity-fed water from the forebay of the project supplies flow to the main entrance gate (RSE-2). The head differential was measured at 1.2 ft and was within the criteria range of 1.0 to 2.0 ft but less than the targeted head of 1.5 ft. The exit from the fish ladder was clear of debris. Depth of water over the fish ladder weirs was 1.0 foot.

**Overall**, fishways were operating within acceptable criteria range during the October inspection.

**Rock Island Dam** – Glen Liner, WDFW, and I completed an inspection of the adult fish facilities on October 21. Project discharge was 158.7 kcfs with no spill occurring during the inspection; spill ended August 26 for the season. Eight turbine units at the new, and 5 of 10 units at the old powerhouse were operating. Turbidity was reported at 17.6 ft with the water temperature reading 60.8° F.

**Left Bank Fishway** – Water from the immediate forebay supplies flow through the diffusion system to the two downstream entrances. Gate depth criterion is: 6.0 ft minimum depth with the head differential maintained between 1 and 2 ft. For the October inspection, the gates were submerged 6.7 ft below tailwater with the  $\Delta H$  at 1.3 ft. The exit from the fish ladder and the picket lead section at the counting station were clear of debris. The depth of water over the ladder weirs was 1.1 ft. All readings at this fishway were satisfactory during this inspection.

**Middle Fishway** – Gravity-flow water from the forebay of the project is directed through the diffusion system to the downstream gate and the side entrance. The downstream gate was submerged 8.9 ft (criteria = 8.5 ft or >) with the  $\Delta H$  reported at 1.1 ft. The side entrance is fixed-open and depends on “head” only to be within criteria. The gate depth and head differential was within proper criteria range during the inspection. The exit from the fish ladder and the picket lead section at the counting window was reported clear of debris. The depth of water over the ladder weirs was 1.1 ft.

**Right Bank Fishway** – The gravity flow water (100% open) plus three fish pumps supply water to the Right Bank Fishway. The attraction water jet was operating as required. The main entrances are fixed-open at 3-ft and require a minimum head differential of 1.0 ft to be within criteria. The RPEs were reported with 1.4 ft “head”, 1.5 ft “head” at the LPE and 1.1 ft at the TRE (downstream) entrance during the October inspection. The tailwater elevation had dropped to nearly 571 ft elevation, and all readings taken at the entrances were found operating within acceptable criteria. The water velocity in the left powerhouse collection channel was 4.2 fps. The exit from the fish ladder and the picket lead section at the counting station was clear of debris. The depth of water recorded over the fish ladder weirs was 1.1 feet.

**Overall**, the adult fishway entrances were operating at satisfactory levels at the Left, Center, and Right Fishways for the October inspection. The installation of the PIT coils will eventually be completed in all ladders, most likely prior to March.

**Rocky Reach Dam** –Glen Liner, WDFW, and I completed an inspection of the Rocky Reach adult fish facilities on October 21. Project Q was only 72.4 kcfs with 8 of 11 main turbine units operating; there was no spill during the inspection. The water temperature was 61.7°F with the turbidity about 21 ft. The project was operating three fish pumps at 57% open and flow was distributed to the LPEs, RPEs, and the spillway entrance.

**Fishway Entrances** -The left powerhouse entrance gates (LPE-1 and LPE-2) were submerged 11.8 ft below tailwater elevation, with the head differential at 1.3 ft during this inspection. Entrance depth (10-ft or >) and head differential (1-2 ft) criteria standards were met. The right powerhouse entrances (RPE-1 and RPE-2) are fixed-open at 3-ft and must maintain head differential between 1-2-ft to meet criteria standards. The RPEs were reported with 1.1 ft head differential and met the criteria standards. The spillway entrance, MSE was operating with gate depth of 12.1 ft with the head differential at 1.6 ft. The same criteria of gate depth and head differential as for the LPEs applies for the Spillway entrance. The head differential and gate depth was satisfactory during this month's inspection. Water velocity through the transportation channel was reported at 1.7 fps. The exit from the fish ladder and picket lead section was clear of debris. The depth of water over the ladder weirs was 1.0 ft. Orifice gates operating along the collection channel were in slots 1, 2, 3, 14, 16, and 20.

**Overall**, the fishway was operating at satisfactory criteria levels relating to gate depth and head differentials at all main powerhouse entrances as well as at the Spillway entrance gate. Note: Main turbine Units 8-11 have been rehabbed and are now adjustable turbines. We need to revisit the DFOP to assess whether Unit 11 should be first off/last on in the turbine operating priority. Second, the spillway entrance and channel was outfitted with an excellent set of lights and this has hopefully improved passage through this entrance in 2002. In addition, everyone should be aware that with the new juvenile bypass system, there are multitudes of people and equipment that are working and being moved about in the forebay and tailwater areas of the project.

**Wells Dam** – Ace Trump, WDFW, and I completed an inspection of the adult fish facilities on October 22. Project discharge was 146.4 kcfs with 9 of 10 main turbine units operating; there was no spill for this inspection date. River temperature was 62°F with the turbidity reading 15.0 ft. To assess calibration of the computer readings, staff gages and deck sensor gages located at the entrance gates are read and recorded. These readings are then compared to the computer readings that are simultaneously phoned in from the shift operator. The readings should come within 0.2 ft of each other to assure calibration of the computer system on a normal inspection.

**East and West Fishways** – At the Wells project, both the east and west fishways are of similar design. Two fish pumps are located on each shore and supply attraction flow to the fishway entrances. The downstream gate operates at 8-ft open with head differential targeted for 1.5 ft at both fishway entrances.

At the **East** fishway, we found the channel elevations varied about 0.2 ft between the three readings. Staff gage readings were somewhat subjective, as the gages required cleaning; however, our estimates were still fairly close to the deck and computer readings. The tailwater staff gage varied about 0.3 ft from the control room and 0.2 ft from the deck gage, but again this may have been due to the condition of the staff gage. Overall, the head differentials from the deck gage, staff gage, computer reading ranged from 1.2 ft to 1.5 ft. This differential appeared satisfactory given the ability to assess the staff gage readings. Depth of water over the ladder weirs was 0.9 ft using the staff gage and 1.0 ft using the computer sensor. The east fish ladder reported a differential through the exit pool to the forebay of 0.9 ft. The normal head through that exit trash rack ranges from 0.5 ft to 0.8 ft so the reading was about 0.1 ft higher than expected. We did not observe buildup of milfoil or grasses on the exit trash rack.

At the **West** fishway, all measuring gages and computer readings were within 0.2 ft for channel and tailwater elevations. The head differential measured varied from 1.3 ft at the deck gage to 1.7 ft using the staff gage and was 1.5 ft for the computer. The end gate was set at 8.0 ft open. The depth of water over the fish ladder weirs was 1.3 ft; this reading was higher than desired. The exit from the west bank fish ladder was 0.9 ft and the project should assess whether the exit required cleaning; Note that both exit head loss readings showed a 0.9 ft differential across the trash rack.

**Overall**, the adult fish facilities were found operating close to the targeted head differential of 1.5 ft at the west and east fishway entrance gates. The depth of water over the ladder weirs was nearly normal at the East fish ladder but was higher than desired on the West fish ladder (1.3 ft) during this inspection. The project is planning to repair problem valves or screens in the fish ladder that have caused the higher than required depth of water at both ladders during the season. The staff gages at the main entrance gates required cleaning. The milfoil should be cleaned from both count stations.

**Ice Harbor Dam** – Steve Richards, WDFW, and I completed an inspection of the adult fish facilities on October 20. Project Q was 17.9 kcfs with two turbine units operating during the inspection. Water temperature was 60°F with turbidity reading of about 7.8 ft. Eight pumps were operating and supplying water to the South Shore and 3 pumps to the North Shore fishway. In addition, about 250 cfs of excess flow from the juvenile bypass system is continually shunted to the South fishway whenever the bypass system is operated.

**South Shore** – The South Shore entrance was submerged 6.7 ft below tailwater with head differential at 2.1 ft. The North powerhouse entrance was submerged 6.9 ft with 1.5 ft head differential. Seven orifice gates were operating along the powerhouse collection channel. The water velocity through the powerhouse collection channel was reported as >2.4 fps. The South shore entrance gate was close to sill (0.4 ft above sill); the North powerhouse entrance gate was operating close to sill (0.3 ft above sill) **Note: same as September inspection**; with the head differentials reported at 1.5 ft or more. The fish ladder was reported with 1.1 ft depth of water over the weirs during the inspection. The exit trash rack and picketed leads at the count station were reported clear of debris. The head loss across the picketed leads at the counting station was up to 0.4 ft and required cleaning.

**North Shore** – The North Shore entrance was submerged 5.6 ft with 1.7 ft head differential using the channel staff gage and the LED tailwater elevation, and 5.6 ft with 1.3 ft head using the LED display for the October inspection. The gate's depth could have been improved (lowered) with the head differential. **Same comment for September inspection**; The elevation of the channel reading for the LED and the staff gage reading varied by 0.4 ft and would suggest that calibration of the system would be required. The fish ladder had 1.0 ft depth of water over the weirs and was satisfactory. The exit trash rack and picketed leads were clear of debris on this inspection date.

**Overall**, the project was operating with reduced gate depths due to low tailwater elevations at the project. The North Shore tailrace staff gage is in need of repair. **The PLC and control systems must be improved through the winter maintenance period. Our channel elevations (taken from the staff gages) were very different from the PLC readings: 341.6' vs 340.7' at South; 341.1' vs 340.8' at North PH; and 341.3' vs 340.9' at North Shore.** The tailwater elevation using the staff gages at the South and North Powerhouse were within 0.1 ft of the elevations used by the PLC, and was satisfactory.

**Lower Monumental Dam** – Steve Richards, WDFW, and I completed an inspection of the adult and juvenile fish facilities on October 16. Project Q was 13.7 kcfs (1 main turbine unit operating) with no spill during the inspection. Water temperature was 61.7°F with the turbidity reading at >4.2 ft. Three turbine-driven pumps operating at 75-rpm average and excess flow from the juvenile bypass system were supplying attraction water to the adult fishway.

**North Shore** – The entrance gates were submerged 8.05 ft (average) below tailwater elevation with the head differential reading 1.8 ft for the inspection. The South Powerhouse entrance gates were on sill and submerged 7.6 ft (average) and maintained head differential of 1.4 ft. The water velocity through the powerhouse collection channel was recorded at >1.6 fps. All readings taken at the North shore entrance gates were considered satisfactory as the head differential fell within the range of 1.0 to 2.0 ft and the gate



depth was more than the 8.0 ft minimum. The south powerhouse gates were on sill so no further depth could be attained; however, the head differential was 1.4 ft and attraction flows should have been satisfactory. The north fish ladder was reported with 1.1 ft depth of water over the ladder weirs. The picketed lead section at the count station was clear of debris. The North Shore fishway exit was even across the trash rack indicating debris should have been minimal.

**South Shore** – Flow to the South Shore entrance gates is provided from the North Shore water supply source plus the South fish ladder flow. The gate depth at SSE-1 was 8.7 ft with the corresponding head differential at 1.2 ft. Gate SSE-2 is a continuous open gate with a 6-ft opening. Gate SSE-1 was on sill so no further depth could be attained at the entrance gate. The south fish ladder was reported with 1.0 ft of water over the ladder weirs. The picketed leads and the exit from the fish ladder were clear of debris during the inspection.

**Juvenile System** -No gatewells or operating orifices were reported with debris.

**Overall**, the adult fish facilities were operating within acceptable criteria ranges for the October inspection when considering that the SPEs were on sill.

**Little Goose Dam** – Barry Clemens, ODFW, (new inspector for the LGS/LGR facilities) and I completed and inspection of the adult fish facilities on October 17. Project discharge was 15.9 kcfs with one main turbine unit operating; no spill occurred during the inspection. Water temperature was 59.7°F with the turbidity reading 4.7 ft. Three turbine-driven pumps operating at 73-rpm average plus excess flow from the juvenile bypass system were supplying water to the adult fishway.

The South Shore fishway entrances, SSE-1 and SSE-2, were submerged 9.35 ft with 1.4 ft head differential using the staff gage and 9.25 ft and 1.4 ft head using the FSC Board readings. Channel velocity recorded at the south end of the channel registered about 2.5 fps with water velocity reported at 1.8 fps at the north shore channel. North Powerhouse entrance gates, NPE-1 and NPE-2, were off sill and submerged 7.2 ft deep with 1.3 ft head differential using the staff gage and 7.1 ft submerged with 1.2 ft head differential using the FSC Board. The North Shore Entrances, NSE-1 and NSE-2, were submerged 6.05 ft average with the “head” at 1.3 ft with the FSC Board for the month. The exit from the fish ladder and the picket lead section at the counting station appeared clear of debris; however, the differential was 0.2 ft head loss across the exit trash rack and 0.1 ft between the upstream and downstream pickets. The depth of water over the ladder weirs was 1.2 ft.

**Overall**, the water velocity reported at the South end of the collection channel is now visually taken by timing pieces (small sticks) through a given distance. The adult fish facilities were operating close to criteria on all items examined. The digital display on auxiliary water pump #1 is burned out and needs repair.

**Lower Granite Dam** – Barry Clemens, ODFW, and I completed an inspection of the adult fish facilities on October 19. During the inspection, project Q was 16.5 kcfs with flow passing through a single turbine unit; no spill occurred during the inspection. Water temperature was 58.3°F (taken at the count station) with the turbidity reading at 4.4 ft. Two electric fish pumps (1 and 2) were supplying flow to the adult fishway entrances and powerhouse collection channel.

The **South Shore** entrances were submerged 8.3 ft and 8.2 ft with  $\Delta H$  of 1.7 ft and 1.8 ft for the respective staff and FSC Board readings.

The **North Powerhouse** entrances were off sill with the weir depth at 8.35 ft using the FSC and staff gage reading. The  $\Delta H$  was 1.2 ft using staff gage and 1.1 ft using the FSC Board readings. The velocity in the powerhouse collection channel was about 0.9 fps at the south end of the powerhouse collection channel and 1.7 fps at the North Shore. Four orifice gates were operating along the powerhouse collection channel [1, 4, 7 and 10].

At the **North Shore**, Gates NSE-1 and NSE-2, were submerged 5.8 ft below tailwater elevation with the head differential reading of 1.1 ft using the FSC Board reading. The staff gage reading gave a head differential of 0.9 ft with the weirs submerged 5.8 ft.

The exit from the fish ladder was reported clear of debris; the picket lead section at the counting station was reported with 0.1 ft head across the pickets and was clear of debris. The depth of water over the fish ladder weirs was 1.1 ft.

**Overall**, the NSEs were less than 6.0 ft submerged below tailwater elevation but head differential was satisfactory. The SSEs and the NPEs had satisfactory gate depth and head differentials during this September inspection. The water velocity at the south end of the collection channel was less than the 1.5 ft minimum criteria.