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MEMORANDUM

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

FROM: Larry Basham

DATE: November 8, 2001

RE: **Fishway Inspections – October 2001**

State and federal inspectors completed inspections at three lower Columbia River dams in October. I was able to complete an inspection of Bonneville Dam on November 7. An additional inspection was completed in November for McNary Dam. I accompanied fishway inspectors at the five PUD projects as well as the four Snake River dams during October. October was the final inspection month for these projects for the year. Tentative winter maintenance schedules have been received for COE projects. Grant County PUD sent their winter maintenance schedules for Priest Rapids and Wanapum dams.

Water temperatures have followed the normal pattern and have reduced to mid 50°F by the end of October. Cooler air temperatures and periods of rain have given some relief from the drought conditions that were persistent during the past season. Overall, adult fish passage should have been satisfactory at most projects through October as fish facilities were operated with few failures or out of criteria conditions.

Bonneville Dam – I completed an inspection of the adult and juvenile fish facilities at Bonneville Dam on November 7. River Q was 106.9 kcfs with about 2 kcfs spill through spillbay 1 for adult fish attraction. Seven of 8 main turbine units and both fish turbines were operating at the WA shore. No turbine units were operating at the old powerhouse. The turbidity of the water was about 12-ft and the water temperature 50.7°F.

Powerhouse I – The main entrances to the powerhouse collection channel were submerged 5.9 ft and 6.7 ft with 1.3 ft head at respective Gates 2 and 64 using the PLC readings. The readable staff gages on the north end of the powerhouse gave a channel to tailwater head differential reading of 1.5 ft. The velocity in the powerhouse collection channel was reported at 1.0 fps at the north end and increased to 2.6 fps at the south end of the channel. The five sluice gates were operating during this 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. The exit from the ladder was rated satisfactory. The picketed lead section had considerable amounts of leaves building up on the inside of the downstream leads but head loss looked to be within criteria across the leads.

B-Branch - The computer system was again not operating, therefore visual readings were taken from the staff gages. Head differential was estimated at 1.0 ft during the inspection; the tailwater staff gage was readable (not always the case). Bay 18 was closed due to construction work in that bay and surrounding area. The south and downstream entrances were open. Entrance requirements were met during the November inspection at the B-Branch Fishway; however, the normal operation generally shows the entrance head to be almost 1.5 ft rather than the 1.0 ft recorded this month.

Cascades Island - The Cascades Island fishway entrance is similar in design to the B-Branch. Both downstream entrances were operating with a head differential of 1.0 ft using the channel staff gage and assuming a tailwater elevation equal to the B-Branch reading. The depth of water over the ladder weirs was 1.15 ft. The computer system remained out of service, similar to the B-Branch Fishway. Entrance requirements were met during the November inspection at Cascades Island Fishway; however, as noted for the B-Branch, the head differential of 1.0 ft was less than the more normal 1.5 ft. Spillbay Gate 1 was open about 8", double the normal flow. Bay 18 was off due to the construction, with that flow shifted to Bay 1.

WA shore fishway - The new powerhouse adult collection system operates with two entrance gates located at each end of the powerhouse. Tailwater elevation permitting, the gates are operated 13 ft submerged below tailwater with the head differential between 1.0 and 2.0 ft.

The South Entrance gates were submerged about 6.8 ft with head differential at 0.9 ft (upstream) and 0.8 ft (downstream). The north shore entrance gates were submerged about 6.8 ft with the head differential ranging from 1.0 to 1.1 ft. Floating orifice gates along the channel were operating satisfactorily. The water velocity meter was out of service again during this inspection. The exit from the fish ladder was clear of debris, as were the serpentine pool sections located upstream from the fish counting station. The depth of water over the ladder weirs was 1.2 ft.

Overall, low tailwater elevations resulted in reduced gate depths at the OR and WA shore fishways. **The computer (PLC) system at the B-Branch and Cascades Island fish ladders should be fixed and operable as soon as possible; it has not been operational for most of this season.** Both downstream gates at the B-Branch and Cascades Island fishways were open and better passage conditions for adult fish should be occurring. **The Project should calibrate the ph staff gages and computer readout (new ph); they differ. The head differentials across gates SUE and SDE were again less than the minimum 1.0 ft.**

Juvenile System - The WA shore juvenile bypass facility was operating with all screens and orifices as required. The project was operating the low outfall based on tailwater elevation at the juvenile fish facility. **The orifice lenses were not clear enough in some cases to determine whether the orifice flow was smooth and the orifices not plugged with debris (continual problem).** The ice/trash sluiceway was operating at the old powerhouse.

The Dalles Dam - Doug Case, ODFW, completed an inspection of the fish facilities at The Dalles Dam on October 12. Project discharge was 88.8 kcfs with flow passing through 7 operating turbines. No spill was occurring during the inspection. Both fish turbines were operating at the OR fishway with a single fish turbine operating at the WA fishway. Water temperature was 63°F with a turbidity reading of 6.0 ft.

Washington Shore - Wasco PUD operates a single turbine unit that supplies water to the diffusion system and into the lower end of the fish ladder. Gate N-1 was submerged 8.7 ft below tailwater elevation with the head differential reading 1.1 ft using the Selsyns gage; 1.4 ft head differential using the staff gage. The gate depth and head differential at Weir N-1 were operated within the proper criteria range. The PUD trash racks had 0.3 ft head differential. The depth of water reported over the fish ladder weirs was 1.0 ft.

Oregon fishway - About 4,780 cfs of water was directed to the auxiliary water supply system via the fish turbines. At the South Entrances, 1.2 ft of head was recorded with 7.4/8.2 ft depth using the Selsyns gage. The

Selsyns gage at the East Entrances gave a reading of 1.4 ft head differential and 11.6\10.6 ft gate depths for the inspection. At the West Entrances, the gate depths were about 8.2 ft average with the head differential about 1.1 ft. These readings were satisfactory. The electronic velocity meter reported a water velocity of 1.7 fps through the collection channel.

The exit from the fish ladder was clear of debris at the exit trash rack. **The East Ladder picket leads required cleaning;** the project inspectors need to clean these pickets on a frequent basis with all the grasses presently floating in the river. The depth of water over the fish ladder weirs was 1.3 ft.

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

Overall, the COE should repair and assure functionality of their PLC system so that operation of the fishways can be calibrated as needed and their readings at the main entrances kept in proper criteria, etc. The East, West and South entrances were out of calibration based on the PLC readings, but were satisfactory when the Selsyns Gage was used for determining elevations.

John Day Dam – Doug Case, ODFW, inspected the John Day adult fish facilities on October 12. Project Q was 87.6 kcfs during the inspection with 5 turbine units operating. Turbidity was 5.0 ft with the water temperature at 63°F. Two north shore (WA) and three south shore (OR) fish pumps were operating to supply flow to the fishways.

OR fishway – During the inspection, the South (OR shore) fishway entrance was operating with a gate depth at SE-1 of 8.0 ft on the gage and 8.5 ft at the panel. Head differential was 1.4 ft using the gage reading and 1.3 ft at the panel board. For this inspection, there was sufficient depth and head at the South Entrance. The two main entrances at the north powerhouse (NE-1 & NE-2) were submerged about 8.25 ft with 1.3 ft “head” using the gages and 8.4 ft submerged with 1.3 ft head differential using the panel reading. Water velocity recorded along the powerhouse collection channel averaged about 1.8 fps during the 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. The depth of water over the weirs was 1.0 ft.

WA fishway – One main entrance gate is operated at the WA shore fishway. The Gage and LED readings were within 0.2 ft so no calibration was required. The gate depth was 8.0 ft with the head differential reading 1.2.ft average. 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 was clear of debris. The depth of water over the fish ladder weirs was 1.0 ft.

Overall, the adult fish facilities were operating close to criteria.

Juvenile Fish Facility – The Smolt Monitoring facility was operating in bypass mode since September 17.

McNary Dam – Larry Swenson, NMFS, completed an inspection of the fishways on October 23 and November 9. Project Q was 104 kcfs with no spill and 10 turbine units operating in October and 123.9 kcfs with 11 turbine units operating in November. River temperature was 58°F and 54°F with a similar turbidity reading of 6.0 ft during the respective October and November inspections. A fishway status report was obtained prior to the inspection to compare on-site elevation readings with computer readings during each inspection.

Oregon Fishway – Three fish pumps were operating with pump angles recorded at 20° to 22° each. About 450 cfs flow 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. All auxiliary water systems were operating through both months.

The South Powerhouse and North Powerhouse entrance gates were submerged 9.5 to 9.9 ft below tailwater elevation, with the head differential reading 1.4 ft at both entrances in October and were reported with 9.3 to 9.7 ft depths and 1.6 ft and 1.8 ft head differential at the respective gates in November. Both gate depths and head differentials were found within proper criteria range at the powerhouse entrances. The orifice gates along the collection channel were operating satisfactorily. The velocity reported at the south end of the collection channel was about 0.5 fps to 0.7 fps, and at the northern end of the channel it was estimated at 2.4 fps to 2.7 fps at the respective October and November inspections. The depth of water over the fish ladder weirs was 1.1 ft during both months. The exit from the fish ladder and the fish counting facility were reported clear of debris. The picketed leads were pulled for the November inspection.

Washington Fishway – The fish turbine operated by North Wasco PUD was supplying sufficient flow to the WA shore fishway entrances to meet criteria levels. Entrances WFE-2 and WFE-3 were operating with head differential of 1.6 ft and 1.5 ft and the gates submerged an average depth of 9.0 ft and 9.4 ft below tailwater elevation during the respective October and November inspections. The exit from the fish ladder and the picket leads at the counting station were clear of debris. The picketed leads were pulled for the November inspection. The depth of water over the fish ladder weirs was 1.0 ft for both inspections.

Overall, the adult fish passage facilities were operating within normal criteria at all main entrance gates on the October and November inspections. The computer printout was compared with the actual on site readings and no calibration appeared necessary; all readings were within 0.2 ft. **The velocity at the South end of the collection channel was below criterion; only 0.5 fps and 0.7 fps were reported during the respective October and November inspections.**

Juvenile Fish Facility – Debris in front of the project was mainly concentrated in front of Units 1C-2A. The screens, orifices, and other juvenile fish facility equipment will be operating through mid-December.

Priest Rapids Dam – Melissa Jundt, NMFS, completed an inspection of the adult fish facilities on October 17. Project discharge was 143.6 kcfs; 1.0 kcfs through spill (being opened during inspection) with all 10 main turbine units operating. Water temperature was 59°F with the turbidity reading 12.3 ft. Fish pumps (tailwater) and gravity-flow water (forebay) discharge water to a large supply pool that distributes this water through diffusers that supply water in the junction pool area and near the main fishway entrances.

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. The orifice gates remain closed through the end of the season. Gate LSE-4 was recorded with 1.0 ft head differential and Gate LSE-2 with 1.0 ft head differential. Both gates were within criteria range of 1.0-2.0 ft; neither gate met the target differential. Water velocity reported at the eastern end of the collection channel was 2.0 fps and was within the criteria range of 1.5 to 4.0 fps. The exit from the fish ladder was reported clear of debris. The depth of water recorded over the ladder weirs was 1.0 ft.

Right Bank Fishway – Slotted entrance (RSE-1) was operating with 1.1 ft of head differential at the time of inspection using the staff gages. The computer readout listed the reading at 1.2 ft. The head differential was reading between the acceptable criteria range of 1.0 and 2.0 ft. The fish ladder exit was reported clear of debris. The depth of water recorded over the fish ladder weirs was 1.0 ft.

Overall, the adult fish passage entrances were operating within criteria ranges (1.0 to 2.0 ft) but below target elevations at LSE-2 & 4 and RSE-1. The operator was asked to increase flow through and to the main entrances. Trapping at the adult trapping site was concluded on 10/16. The trap screening requires repair to assure it operates safely next year.

Wanapum Dam – Melissa Jundt, NMFS, completed an inspection of the fish facilities on October 17. Project discharge was 135 kcfs; all flow was passing through 8 main turbine units. The water temperature was reported 59°F with the turbidity reading same as at Priest Rapids Dam.

Left Bank Fishway – Two fish pumps operating at 145-rpm average, and gravity-fed water from the forebay of the project supply water 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 SE-2 and 1.25 ft at SE-3. During this inspection, the SE-2 Gate had 1.2 ft and the SE-3 Gate, 1.2 ft head differential. Both readings were within the proper range and with SE-3 meeting the target differential. Orifice gates along the powerhouse collection channel remained closed. The water velocity was estimated at 2.8 fps. The exit from the fish ladder was reported clear of debris. The depth of water recorded over the fish ladder weirs was at 0.9 ft.

Right Bank Fishway – Gravity-fed water from the forebay of the project supplies flow to the main entrance gate (REW-2). The head differential measured 1.5 ft and fell within the criteria range of 1.0 to 2.0 ft. The exit from the fish ladder was clear of debris. Depth of water over the fish ladder weirs was 1.1 feet.

Overall, Priest Rapids and Wanapum dams are operating with reverse load factoring to meet spawning requirements for fall chinook below Priest Rapids Dam. As a result, forebay and tailwater elevations are affected on a daily basis that in turn can affect AWS pumps and other water supply systems.

Rock Island Dam – Glen Liner, WDFW, completed an inspection of the fish facilities on October 17. Project discharge was 90 kcfs with flow passing through 7 turbine units at the new powerhouse; no Units were operating at the old powerhouse. Turbidity was reported at 14.2 ft with the water temperature reading 65.7° F.

Left Bank Fishway – Water from the immediate forebay supplies flow through the diffusion system to the two downstream entrances. Gate depth criterion: 6.0 ft minimum and a head differential of 1 -2 ft are normally met under any river flow scenario. The gates were submerged 7.0 ft below tailwater with the ΔH at 1.1 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.

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 7.4 ft (criteria = 8.5 ft or >) with the ΔH reported at 1.6 ft. The side entrance is fixed-open and depends on “head” only to be within criteria. The gate depth was considered satisfactory as the gate was resting on sill, so no further depth could be attained. Head differential was within criteria range on this inspection. The exit from the fish ladder and the picket lead section at the counting window was reported clear of debris during the inspection. 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 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 average “head”, 1.8 ft “head” at the LPE, and 1.2 ft at the TRE (downstream) entrance. The velocity in the left powerhouse collection channel was measured at 4.4 fps. The Attraction Water jet was operating at the Right Bank fishway. 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 within acceptable criteria for the October inspection. In September, the project inspected the diffuser gratings in the Middle Fishway and found that one of the gratings had been dislodged and the project turned off that diffuser valve. In the interim, the project will attempt to keep a minimum of 7.5 ft of gate depth where possible in the Middle Fishway.

Rocky Reach Dam – I inspected the adult fish facilities on October 16 and was accompanied by Chelan PUD fishway attendants. Three fish pumps were operating about 50% open and supplying flow to the LPEs and RPEs. The spillway entrance remained closed.

Fishway Entrances -The left powerhouse entrance gates are operated to maintain a minimum gate depth of 10 feet or more, while the right powerhouse entrances are fixed-open at 3-ft. Two entrance gates were operating at the right powerhouse (RPE-1 and RPE-2) and two gates at the left powerhouse (LPE-1 and LPE-2). Gate depths and head differentials were met on the inspection. Velocity through the transportation channel was, as usual reported more than 1.5 fps but less than 2.0 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 the main entrance gates for the October inspection.

Wells Dam – Stewart Mitchell, WDFW, inspected the adult fish facilities on October 16. Project discharge was 59.7 kcfs with 5 main turbine units operating. River temperature was 62.4°F with the turbidity reading 14 ft. To assess calibration of the computer readings; staff gages and deck sensor gages located at the entrance gates are recorded. These 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 **normally** operates at 8-ft open with head differential targeted for 1.5 ft at both fishway entrances. **Note the exception at the West Entrance.**

At the **East** fishway, the channel and tailwater elevations had dropped at least a foot as project discharge was changing while we took readings. We believe under normal circumstances that these gages would be within the required range among the readings. The Control Room gages, the deck gages, and the staff gages had readings that ranged from 1.3 ft to 1.6 ft for head differential. Depth of water over the ladder weirs was 1.1 to 1.2 ft. The east fish ladder reported a differential through the exit pool to the forebay of 1.0 ft. The normal head through that exit trash rack ranges from 0.5 ft to 0.8 ft, which was high, and will likely require cleaning (**same as for the August and September inspections**).

At the **West** fishway, all measuring gages and computer readings were within 0.2 ft for channel elevation and for the tailwater elevation. The head differential measured was 1.0 ft. The end gate had been reduced from 8.0 ft to 4-ft. ‘Douglas PUD had coordinated with NMFS and WDFW regarding the problem that now exists at Wells Dam. There was approximately 2-ft head differential across the diffuser gratings (side) and to avert potential of blowing off the gratings, flow through the grating system was reduced until the problem could be further addressed by the project’. The depth of water over the fish ladder weirs was 1.2 ft. The exit from the west bank fish ladder was 0.9 ft. Trapping was occurring from Monday through Wednesday from 0800 to 2000h on the West ladder.

Overall, milfoil and grasses have caused the project to change normal operations of their fish passage facilities due to the build-up of these grasses on the diffuser gratings of the West fishway. This situation should be remedied to preclude damage to their screens, etc. It appeared that the exit trash racks should be cleared of debris (based on head loss not visual).

Ice Harbor Dam – Steve Richard, WDFW, completed an inspection of the adult fish facilities on October 18. Project Q was 18 kcfs with flow through Units 1 and 3. Water temperature was 60°F with a turbidity reading of 6.0 ft. Eight pumps were operating and supplying water to the South Shore and 3 pumps to the North Shore

fishways. 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 7.8 ft below tailwater with the head differential at 1.9 ft. The North Powerhouse entrance was submerged 6.1 ft with 1.6 ft head differential. Seven orifice gates were operating along the powerhouse collection channel. The water velocity reported for the channel was 2.7 fps. The South Weir was on sill, hence no further depth was attainable while the North Powerhouse Weir should have been lowered to sill as there was sufficient head to achieve the additional gate depth.

The fish ladder was reported with 1.1 ft depth of water over the weirs with the exit trash rack reported clear of debris. The head loss across the picketed leads at the counting station was 0.3 ft and required cleaning on this inspection.

North Shore – The North Shore entrance was submerged 6.0 ft with 1.4 ft head differential and 6.1 ft and 1.2 ft head differential recording the staff gages and computer readings, respectively. The gate depth and head differential were within criteria range. No calibration was required.

The fish ladder had 1.2 ft depth of water over the weirs with the exit trash rack and picketed leads clear of debris on this inspection.

Overall, it appeared that the Project should have lowered the North Powerhouse Weir to move closer to the 8-ft depth required; the gate was not on sill and there was sufficient head (1.6 ft) to adjust the Weir to a depth of 7.8-7.9 ft. The South count station had 0.3 ft head loss across the pickets and required cleaning.

Lower Monumental Dam – Steve Richards, WDFW, inspected the adult and juvenile fish facilities on October 18. Project Q was 15.1 kcfs with flow through Unit 1. Water temperature was 61.6°F with the turbidity reading > 4.0 ft. Three turbine-driven pumps operating at 73-rpm average along with excess flow from the juvenile bypass system were supplying water to the adult fishway.

North Shore – The North Shore entrance was submerged 8.4 ft below tailwater elevation with the head differential reading an even 2.0 ft. The South Powerhouse entrance gates were on sill with 7.6 ft gate depth achieved and 1.2 ft head differential. The water velocity through the powerhouse collection channel was recorded at 2.3 fps. The readings were considered satisfactory as the head differentials fell within the range of 1.0 to 2.0 ft and the gate depth was greater than the 8.0 ft minimum at the north shore and the south powerhouse gates were on sill and no additional depth could be attained.

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 exit from the ladder had a fairly large amount of debris floating above the ladder exit although the head loss across the trash racks was essentially 0.0 ft. We questioned why the bubbler was not operating.

South Shore – Flow to the South Shore entrance gates is provided from the North Shore water supply source. The gate depth at SSE-1 was 8.4 ft with the head differential at 1.8 ft. Gate SSE-2 is a continuous open gate with a 6-ft opening. All readings were satisfactory.

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.

Overall, the adult fish facilities were rated satisfactory for the October inspection.

Little Goose Dam – Josh Hanson, ODFW, inspected the adult fish facilities on October 19. Project discharge was 12.9 kcfs with flow through Unit 1. Water temperature was 60.7° F with a turbidity reading of 4.3 ft. Three turbine-driven pumps operating at about 74-rpm average, and 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 respectively, 8.1 ft and 6.4 ft depth with 1.7 ft head differential using the staff gage reading, and 7.7 ft and 6.0 ft gate depth with 2.0 ft head differential using the FSC Board Reading. Channel velocity recorded at the south end of the channel registered about 1.0 fps, with the velocity up to 1.8 fps at the north shore channel. Orifice gates along the powerhouse collection channel remained closed for the 2001 adult migration season. North Powerhouse entrance NPE-1 was on sill and submerged 7.8 ft while Gate NPE-2 was submerged 6.1 ft with the “head” at 1.6 ft using the staff gage or the FSC Board reading. The North Shore Entrances were submerged 6.1 ft deep (FSC Reading) with the “head” at 1.6 ft. The exit from the fish ladder and the picket lead section at the counting station appeared clear of debris; however, 0.2 ft head loss was recorded through the exit trash racks and would indicate debris is beginning to build on the trash racks. The depth of water over the ladder weirs was 1.1-1.2 ft.

Overall, the velocity reported at the South end of the collection channel was 1.0 fps and was less than the 1.5 fps called for in the FPP. The SSE-2 and NPE-2 gates were well below acceptable criteria as sufficient depth was available to lower both gates.

Lower Granite Dam – Josh Hanson, ODFW, inspected the adult fish facilities on October 19. Project Q was 16.5 kcfs with 1 of 6 main turbine units operating. Water temperature was 59.5°F (taken at the count station) with the turbidity reading at 4.0 ft. Two electric fish pumps (1 and 3) were supplying flow to the adult fishway entrances and powerhouse collection channel.

The **South Shore** entrances were submerged 8.15 ft average depth with ΔH of 1.7 ft using the FSC Board readings and 7.95 ft with 1.6 ft head differential using the staff gages. The **North Powerhouse** entrances were submerged an average of 8.2 ft with ΔH of 1.2 ft using the FSC Board reading. The staff gage readings were within 0.1 ft different from the FSC so no calibration was needed. The velocity in the powerhouse collection channel was about 0.9 fps at the south end of the powerhouse collection channel and 1.8 fps at the North Shore. Four orifice gates operate along the powerhouse collection channel [1, 4, 7 and 10]. At the North Shore, Gates NSE-1 and NSE-2 were submerged 5.0 ft below tailwater elevation with the head differential reading of 1.8 ft at the staff gage and 1.1 ft using the FSC reading.

The exit from the fish ladder was reported clear of debris as was the picket lead section at the counting station. The depth of water over the fish ladder weirs was 1.2 ft.

Overall, the October inspection reported deeper submergence at the North Powerhouse entrances as the project no longer operates at Minimum Pool elevations. All head differentials were satisfactory. There remains no staff gage or other site gage to measure the North Shore Entrance (tailwater elevation). The velocity at the south end of the powerhouse collection channel was about 0.9 fps and falls below the 1.5 fps minimum criterion. The inspector was unable to see the NPE channel lights; they may be burned out.