
*OPERATING GUIDANCE #14***Fish Protection Procedures for Turbine Maintenance**

Dworshak O&M Section

Date of Issue: March 2012

Last Revision: 17 November 2011

1. **PURPOSE:** Define operational procedures to minimize the number of fish that can become trapped when unwatering a penstock/scrollcase for annual maintenance, repairs, or overhaul of a power unit. If any fish are trapped, define proper handling procedures and documentation requirements. **These activities will be followed to completion including the fish protection and recovery provisions outlined in this procedure, regardless of overtime requirements.**
2. This procedure provides a general outline of the unwatering process itself and includes details for only those constraints specifically intended to promote fish survival. It is not intended to address the details of personnel safety policy or procedures, or any detailed operational instructions for the actual unwatering process. Personnel safety provisions are detailed in the appropriate activity hazard analysis. Details of the operational steps for unwatering are covered by separate Operating Procedures. All unwatering efforts will be adhered to in reducing the time incurred throughout the unwatering process.
3. Hydroelectric turbines and water passages must be inspected and serviced periodically. This requires draining the water passages between the emergency (headgate) gates and the tailrace stoplogs. After the water reaches tail water level, the remaining water is drained to an unwatering sump and then pumped out into the river. Any fish trapped in the draft tube area must be removed before being stranded or lost through drains. It is therefore desirable to minimize the numbers of fish involved in the draining process and then to quickly salvage any fish that may have been trapped.
4. The DWR Operations and Maintenance Section will coordinate with the NWW District Operations Technical Support Branch and provide notification at least two weeks if possible in advance of any maintenance requiring unwatering or otherwise potentially affecting fish. District Operations will inform NOAA and other regional fishery agencies through Fish Passage Operations and Maintenance (FPOM) Team standard coordination process when any fish salvage operations are to occur.
5. DWR Operations and Maintenance Section will notify LWG of the need to provide the LWG Fisheries Biologist to lead the planned turbine unit unwatering as soon as possible prior to the date of unwatering. LWG Fisheries Biologist will direct and coordinate the fish protection procedures and the recovery and release process. The exact location for any fish release will be identified and visited just before fish salvage operations begins. If a flume is used, there will need to be flushing flow and the impact velocity with the tailrace will need to be at a level that does not harm fish of the size anticipated in this salvage operation. The LWG Fisheries Biologist will conduct meetings and briefings as necessary to ensure all unwatering team

members are familiar with this Operating Guidance, documenting entrapped fish, and the required ESA safe fish handling and recovery process.

6. LWG Fisheries Biologist directs fish protection and recovery operations with the help of operations and maintenance personnel from the operating project. The LWG Fisheries Biologist may request additional personnel from USFWS Dworshak hatchery personnel to work in concert with and assist with the activity at the discretion of the Dworshak Operations Manager. During the unwatering process, the LWG Fisheries Biologist will be present at the draft tube entry door and will direct and monitor water levels, and fish condition through the final stages of the draft tube unwatering.
7. Several hours before the unit is to be unwatered the DWR Operations Section will contact BPA to get final approval for the outage and make sure all the clearance tags are ready to be placed. Early on the day of the unwatering, the mechanics and operators will coordinate to lower the emergency gate and/or install the intake bulkhead. This will isolate the intake water passage from the forebay. A least one day in advance the LWG Fisheries Biologist will ensure that adequate fish recovery equipment and personnel trained in fish handling are available for the unwatering and fish recovery event. Trained personnel to assist in the salvage procedure may come from local fish facilities and/or district operations division.
8. When the turbine unit draft tube is to be unwatered, the operator will coordinate with local agencies (e.g., USFWS personnel from Dworshak Hatchery), RCC, and BPA to run the unit with a full load for 15 minutes to flush the scroll case and the draft tube of fish. In the case of unit 3, full load will not be achieved and 2.5 kcfs will be used to stay within the river rate-of-change restrictions. At pool elevation of 1520' minimum discharge of 3.5kcfs is required to obtain stable operation and reduce gassing, at the same time a small unit would be cut back to allow for the rate of change which is still limited to 1'/hr on ramp up and down. The operator will close the penstock emergency gate (hydraulic headgate) to drain the water out of the penstock down to tailrace water elevation. Once a seal is confirmed by closing the unit wicket gates and monitoring penstock pressure and flow, the mechanics will place the tailrace stoplogs. The process from flushing the remaining water out of the penstock and confirmation of a seal through complete installation of tailrace stoplogs is estimated to take 4-6 hours barring any complications. All efforts in this step will be made to reduce the time involved from flushing to the installation of stop logs via staging equipment, support supplies material and crews. (Units 1&2 have 2 stop logs each and unit 3 has 4 each). If a seal is not obtained, the process, *including flushing*, must be repeated. Installation of the penstock maintenance bulkhead may be accomplished after the tailrace stoplogs are installed.
9. Once seal is confirmed, the operator will open the penstock drain and the draft tube unwatering valve and start draining the draft tube thorough the unwatering sump. At the same time the sump unwatering pumps will be initially reprogrammed to maintain water level in the draft tube to an elevation between 936 to 938 feet, depending on the unit to provide a sanctuary pool. The draft tube is drained by gravity to the unwatering sump, so by restricting the unwatering sump to a minimum elevation of 936 to 938 feet, the draft tube is also restricted to this minimum elevation. The bottom of the draft tube is at an elevation of 929' for unit 3 and 933' for units 1 and 2, creating a large sanctuary pool between 3 to 7 feet

deep for any trapped fish. The water level in the draft tube will be monitored remotely from the draft tube access door. At no time will the water level in the unwatering sump drop below 936' or 938' depending on the unit, without all aspects of the fish recovery plan in place to include; recovery devices, insulated transport device, etc. Project personnel will have dip nets, lifting sling, and insulated fish carrying tank, and all other required fish recovery equipment and safety equipment at the unit during the final unwatering process.

- 10.** For safety reasons, the draft tube entry door will not be opened until confirmation that the tailrace stoplogs are sealed, i.e.: the water level is verified to be below the draft tube man door petcock and a maximum of two unwatering pumps maintaining the water level in the sump. Once Operations has declared a satisfactory seal has been achieved, the mechanics will then open the draft tube access door, maintenance personnel will place a tube with a bubbling device turned on to provide additional oxygen to any trapped fish. The biologist will deploy sonar into the draft tube capable of viewing fish to determine if a large number of fish are present. If a large number of fish are present, the process will be reversed and the turbine will be readied to be re-run at night when fish are less likely to move into the unit. If an unusually large number of fish are not identified, maintenance personnel will prepare for access into the draft tube.
- 11.** When satisfied all fish recovery preparations are in place, the LWG Fisheries Biologist will authorize the clearance holder to request the water level in the draft tube be lowered to 935 feet for units 1 and 2, and 931.5' for unit 3, a level that allows for safe entry into the draft tube. Upon receiving the clearance holder's request to lower the draft tube water elevation, the shift operator shall contact the LWG Fisheries Biologist to confirm that all fish recovery preparations are complete, and lowering the water level that allows safe entry is authorized. Once the level in the draft tube drops below 935 to 938 feet, the LWG Fisheries Biologist and project maintenance personnel will visually monitor the draft tube water level.
- 12.** When the water is down to a level where entry is safe, approximately two feet in depth, personnel should enter the draft tube through the draft tube access door to inspect for trapped fish. Any live fish will be netted one at a time with a knotless dip net and placed in a lifting sling that is sized to hold the fish and water. The sling will then be lifted vertically to the entry door then transferred directly to large insulated fish carrying tank full of river water with no more than ½ pound of fish per gallon of water in the tank at one time. The container will then be transported to the freight elevator, and be taken to the 1005-foot level erection floor, transferred to the release site as determined by the LWG Fisheries Biologist earlier and released into the tailwater, using a flume if necessary, as determined previously in section 5. All fish handling only once during the process. At all other times the fish transfer will be water to water. Adequate flushing flow must be maintained throughout each step the fish salvage process. If a large number of fish are involved, it may be necessary to remove the salvage personnel, allow a sanctuary pool to refill, allowing the fish to recover from the activity and low oxygen levels.
- 13.** When the LWG Fisheries Biologist has determined that either there are no fish in the draft tube or that all the fish have been safely removed, he will notify the shift operator that all fish

recovery operations are complete. He will also notify the clearance holder that all fish protection restrictions on water levels in the draft tube and unwatering sump have been released.

14. Other considerations for fish protection include the following:

- a.** Annual routine maintenance work windows intended to minimize likelihood of trapping endangered species will be investigated to determine if work can be shifted to a time with less migration of endangered species, although BPA power demands and requirements to control TDG, provide temperature to the river and hatchery along with providing flow augmentation somewhat limit the timing of unit outages. Initially, avoidance of the peak adult fish migration from October thru February. Unwatering work is recommended to occur as soon as possible during the month of September. Adjustments may be considered according to experience.
- b.** A routine annual maintenance schedule will be submitted to NWW Operations, Technical Support Branch, Adult Fish Passage Coordinator for review.
- c.** Within 24 hours of Operation and Maintenance activities being completed, fish salvage activities should be documented with a "Record of Fish Salvage Operations". The records should be maintained providing helpful information to predict the numbers of fish to be salvaged in a forthcoming unwatering activity. The records should also contain comments on how well the unwatering and fish recovery activities preceded, any problems encountered, and observations on fish and holding conditions. Submit this report to NWW-OD-T Adult Fish Passage Coordinator.

15. Equipment required for performing this procedure:

- a.** Hose attached to tailrace deck wash system (river water) for filling fish transfer tanks as needed.
- b.** Two large fish nets, knotless, one for each worker.
- c.** Two small fish nets, knotless, one for each worker.
- d.** Two vinyl slings sized to hold fish and water
- e.** Headlamps for workers in draft tube.
- f.** One radio.
- g.** Waders for workers.
- h.** Rubber or neoprene gloves for workers.
- i.** Wristwatches.
- j.** Thermometers.
- k.** Hard hats, waders/rubber boots, neoprene gloves and rain gear for personnel entering draft tube.
- l.** Fish bucket lifting gear (station at entry door).
- m.** Four wheel carts (2) with 150 gallon fish tanks approximately 1/3 filled with water on each return from the tailrace or industrial water supply. Have supplemental oxygen system, air lines and air stones standing by at same location. The four wheel carts should have a portable source of oxygen and air lines during transport to the release location.
- n.** Hazardous atmosphere monitoring device for sensing inside the draft tube (at entry door).

- o.** Record of Fish Salvage Operations

16. Personnel required for performing this procedure:

- a.** Operators for lift line (lowers and raises fish).
- b.** LWG Fisheries Biologist.
- c.** Shift operator (ensures slow and proper timing of draft tube drainage).
- d.** Four laborers (two inside draft tube to net fish into rubber lifting slings and at least two outside draft tube to transfer fish to release site).

17. Fish Handling Procedures:

- a.** Establish an unwatering coordinator, usually the LWG Fisheries Biologist.
- b.** Roll the unit for about 15 minutes before lowering the emergency gate and tailrace stoplogs. (all done within 4-6 hours)
- c.** Attend a safety meeting and discuss safe operating and Walla Walla District ESA fish handling policy and procedures. Be sure proper clearance procedures are discussed. Also, the draft tube area should be treated as a confined space.
- d.** Begin draining the draft tube as described above. This requires several hours.
- e.** Obtain a tailrace river temperature, draft tube reading.
- f.** Allow the deck wash system to run until the water temperature matches within 2°F of the river temperature, then fill the fish transport tanks with this water.
- g.** Ensure that unwatering is done very slowly once the water is about two feet deep. Mechanics and LWG Fisheries Biologist will monitor water level throughout the unwatering process.
- h.** Two workers enter the draft tube.
- i.** Net fish into fish slings and lift them out of the draft tube via the rope hoist. Nets should be knotless and no more than one fish should be in a net at one time. When it is necessary to transport fish in sanctuary bags, ensure the bags contain a sufficient amount of water and that fish return to fresh water as soon as possible. Pour fish into the fish transfer tank. The LWG Fisheries Biologist will determine if water should be refreshed and if oxygen is needed by monitoring the overall fish condition. Generally from the draft tube to release in the river tailrace, it should take no more than 6 to 8 minutes to capture, transport and release a fish.
- j.** The LWG Fisheries Biologist monitors the number of fish in the transfer tank and, considering the water temperature and holding time, determines when the fish should be

taken to the tailrace to be released to the river. Fish placed in tanks and containers will not exceed ½ pound per gallon of water and will be released as soon as possible.

- k.** When the fish transfer tank exits the powerhouse, use the deck wash system to refresh the water and/or adjust the water temperature as needed. Ensure that the water temperature in the tank, the deck wash system, flume flushing water is within 2°F of the river temperature. May use frozen river ice in maintenance of water conditions during the transport of fish to the tailrace.
- l.** Fish should not be netted twice (once in the salvage location and not again at the release site). The preferred method of releasing fish should to the tailrace flume or river via water to water transfer.
- m.** Complete the Record of Fish Salvage Operations (attached at end of this document). This is a permanent record.

RECORD OF FISH SALVAGE OPERATIONS - DWORSHAK DAM

LWG Fisheries Biologist in Charge: Other Personnel:	Activity	Date	Time
	Emergency Gate in Place		
	Tailrace Stoplogs Installed		
	Draft Tube Door Open		
	Fish Recovery Begins		
Fish Recovery Complete			
Purpose of un-watering:			
River Temperature: (Note: Temperature of containers to be maintained within 2°F of river temperature.)			
Problems/Comments:			

SPECIES AND COUNTS OF FISH RELEASED TO TAILRACE

Species	Female		Male		Comments
	Clipped	Un-clipped	Clipped	Un-clipped	

SPECIES AND COUNTS OF FISH MORTALITIES

Species	Female		Male		Comments
	Clipped	Un-clipped	Clipped	Un-clipped	

****Submit this report to NWW-OD-T Adult Fish Passage Coordinator within 24 hours of fish recovery. FPOM must be notified immediately of any fish mortalities.**