BONNEVILLE DAM
FACILITIES DRAINING
AND FISH HANDLING PLANS

Revised on 18 July, 2017 by Bonneville Project Fisheries

TABLE OF CONTENTS

GENERAL

Bonneville Dam fish facilities, turbines and navigation locks are drained for regularly scheduled maintenance and sometimes for emergency operations. These activities often involve handling fish. The following instructions provide guidelines for consistent safety and efficiency when it is necessary to handle fish. This document is subject to change as improvements are developed.

COORDINATION

Facility outages will be scheduled to minimize impact on fish while accomplishing necessary repairs and maintenance on facilities. Project Fisheries will coordinate these activities with Portland District Ops and will ensure that the fisheries agencies and tribes, particularly those whose activities may be impacted, are kept informed. Primary points of contact are the Fish Passage Operations & Maintenance Team (FPOM) representatives.

Project Fisheries coordinate fishway activities with project maintenance and operations personnel. Project Fisheries are also responsible for having fish rescue equipment available and will coordinate to ensure adequate numbers of personnel will be available to handle fish when facilities are drained. Project Fisheries direct drainage activities until fish removal is completed. Before, or at the beginning of each draining operation, a pre-work briefing will be held to explain procedures, responsibilities and safety considerations for all participants.

FISH HANDLING

When facilities are drained, a primary objective is to minimize stress and injury to all fish involved. Generally, the best way to protect fish during facility draining is to avoid having to handle them. Instructions for draining most facilities involve steps, such as operating with low ladder flow just prior to draining, intended to minimize handling fish. When it is necessary to handle fish, there should be plenty of fresh water and fish safe containers. Avoid holding fish in nets unnecessarily, e.g. when waiting for a tank of water to place them. When it is necessary to transport fish in bags, ensure the salvage bags contain a sufficient amount of water and that fish return to fresh water as soon as possible.

Occasionally, large fish (usually sturgeon) must be handled. They will be moved by wrapping them in wet blankets and carrying them by either cargo net (preferred) or securing them in a litter. It may be necessary to use a lifting strap around its tail for control while placing it in a litter.

Tanks should be large enough to carry plenty of water with the fish. Tanks should be covered to keep fish from leaping out. When fish are placed in a transport tank, an oxygen injection system will be used to increase the level of dissolved oxygen in the water. As a rule of thumb, fish placed in tanks will not exceed ½ pound per gallon of water. Reduce fish concentration when river temperature is greater than 65° F. During warm weather, the temperature of water in tanks will be monitored and kept within 2° F of the river release point temperature. Furthermore, the time fish are kept in tanks will be minimized and will not exceed 2 hours.

When possible, adult salmonids and lamprey should be released in the forebay. Juvenile salmonids should be released so they can reach tailwater, either directly or via DSM bypass channels. All sturgeon, whether adult or juvenile, will be released below the project. When the tank contains a mixed load, Project Fisheries must determine the best release location. At this time, the forebay release site is in the navigation lock channel, upstream of the lock chamber. The downstream release site is the Hamilton Island boat launch.

When it is necessary to prioritize attention to different species, generally listed (threatened and endangered) species and adult salmonids should be removed first. Lamprey are relatively stress resistant and can be collected after the salmonids, however they should still be given plenty of fresh water and O2 during transport. Shad tend to be sensitive to handling and stranding stress; they should be handled carefully. All fish, including northern pikeminnow and non-native species, are to be salvaged. Once the more sensitive species are removed, and if water/leakage is available, it will not be necessary to apply additional effort to remove resident fish such as suckers, sculpins, chubs, and pikeminnow. These fish tend to survive well in a foot or so of water for several weeks.

Under some conditions a "safety pool" may be maintained in lieu of salvaging fish. However, it is very important that a very reliable method is used to ensure that fish will not be stranded. Low water alarms will be utilized whenever possible. If it is not possible to use a low water alarm, water level must be continuously monitored to prevent stranding fish.

POWERHOUSE ONE

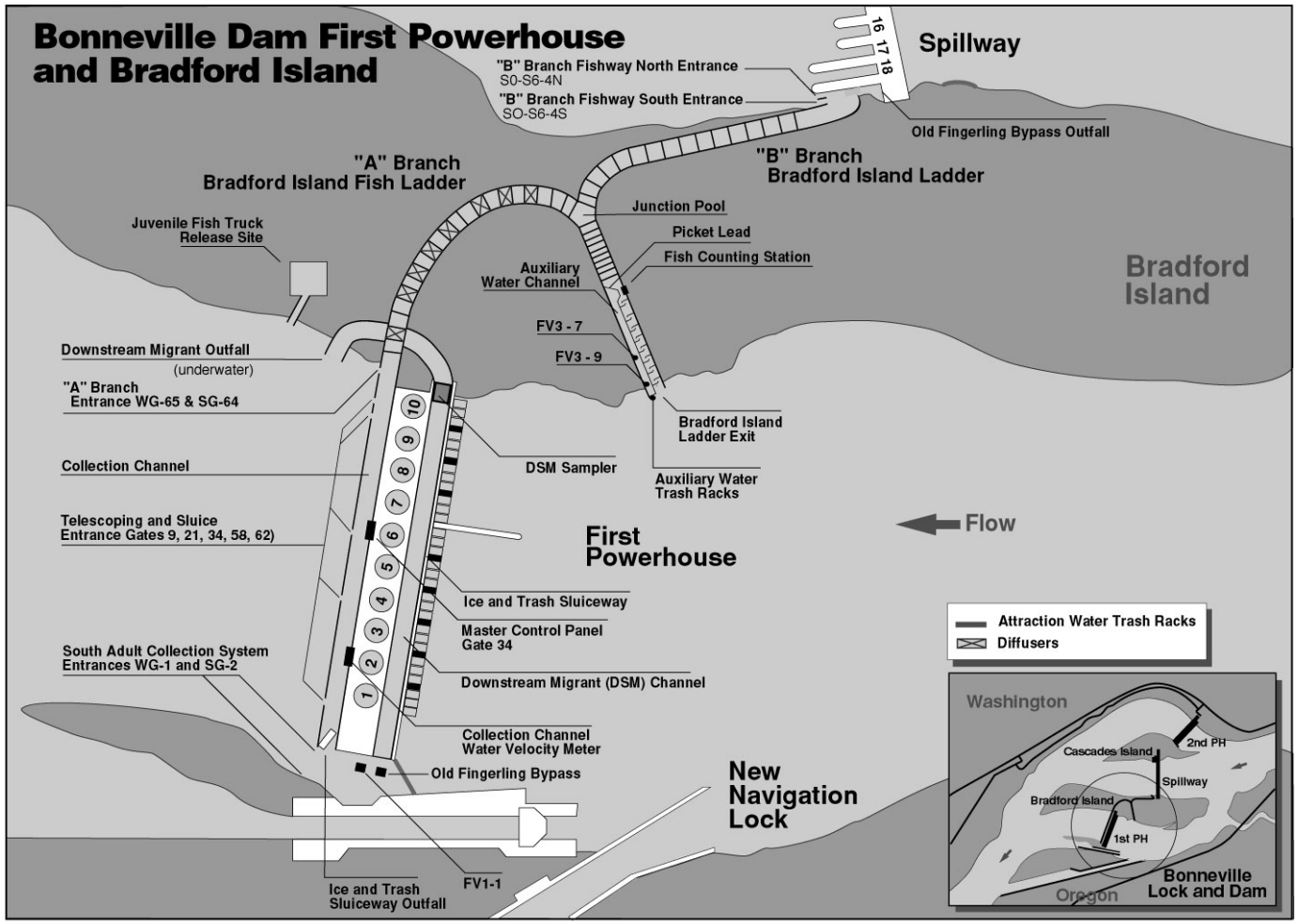

Figure BON-1 Bonneville Dam first powerhouse and Bradford Island fish ladder.

1. BRADFORD ISLAND FISH LADDER

1.1. GENERAL. The following describes procedures for draining the Bradford Island ladder from exit to tailwater, including both A and B branches. It is also possible to drain one branch without the other. Single branch draining is sometimes preferred to allow longer work time on one of the branches or to avoid conflict with the policy of keeping particular fishways operating when certain others are out.

1.2. COORDINATION. Project Fisheries will coordinate outages with Bonneville Control, Portland District Ops, fisheries agencies, and the tribes. Particular care will be taken to coordinate with adult fish counting personnel when their work may be directly impacted.

1.2.1. A-branch will not be taken out of service when the second powerhouse ladder is out (unless specially scheduled), and B-branch should not be drained when the Cascades Island ladder is out.

1.2.2. When PH1 fish passage facilities are down for maintenance, operating priority will shift to PH2 as directed by the Fish Passage Plan.

1.3. PREPARATION

1.3.1. **24 to 96 hours before draining**, stop attraction and auxiliary water flow and drop ladder flow to orifice flow. Shut off count station lights.

1.3.1.1. Close valve FV1-1 (PH1 PCC AWS).

1.3.1.2. Close valve FV4-3 and FV4-4 (B-branch AWS).

1.3.1.3. Close valve FV3-7 (A-branch AWS).

1.3.1.4. Regulate FV3-9 until water has ceased to flow over the over-flow section of the weir of the branch that is being drained. It may be necessary to restrict the ladder exit somewhat. **DO NOT CLOSE THE EXIT**. 3-4' of exit opening is advised or until water flow has ceased to flow over the over-flow section of the weir.

1.3.1.5. Close spill bay 18.

1.3.1.6. Fully open counting station crowder and turn off passage slot and visitor viewing window lights.

1.3.2. **On dewatering day**:

1.3.2.1. Ladders: One extension ladder near the junction pool (B-branch side) and a stepladder at counting station slot for later installation during salvage operation. Don't forget ropes to secure ladders.

1.3.2.2. Stage recovery tank on roadway next to western side of picket leads.

1.3.2.3. Convene safety meeting before starting activity. Describe the procedure for all participants and assign responsibilities.

1.4. DRAIN LADDER

1.4.1. **TO TAILWATER**

1.4.1.1. Close ladder exit and adjust auxiliary water supply valve FV3-9 to drop the water level at the counting station enough to allow draining the regulating section while at the same time maintaining as much water as possible going down the branches.

1.4.1.2. When water level allows, and clearances are placed[1], personnel will enter at the count station window area by ladder. Use a seine to move fish through the vertical slot section (best done with two people on seine and another ahead of the seiners with a dip net encouraging fish towards the count station.

1.4.1.3. Unless very few fish are encountered, place a barrier across the channel directly above the flow splitter section above the count station window. Place the recovery tank close to the barrier at the south end of the channel. Seiners will push fish to this barrier so they can be netted and placed in the recovery tank.

[1]. Clearance points include exit gates, valves FV3-7 and FV3-9, window washers, and counting station crowder.

1.4.1.4. Remove all fish from behind the crowder and the count station flow adjustment louvered section. Place these fish into salvage tank.
1.4.1.5. After the area above the count station is clear of fish, the recovery tank can then be moved to the AWS channel close to the picket leads.
1.4.1.6. While seiners are collecting fish from the ladder, two personnel will proceed up the AWS channel associated with FV3-9 and sweep for fish.
1.4.1.7. Do not clean picket leads during fish salvage operations because debris and silt from the leads fowl the water down the ladder. A special concern is the water that accumulates in the B.I. junction pool, which can hold large numbers of steelhead.
1.4.1.8. Lower valve FV3-9 to about 1" to allow personnel to crawl through the orifices to chase fish to the junction pool.
1.4.1.9. Place barriers (dip-nets suffice) over all orifices to keep fish from returning back up the ladder or going down the branches.
1.4.1.10. Finish closing valve FV3-9. The Riggers can now install the AWS intake bulkhead. The water in the junction pool will remain steady while teams of two proceed down the A and B branches to guide fish to tailwater.
1.4.1.11. After all fish are moved down the branches to diffuser pools or below tailwater, place barriers (with ropes attached for easy removal) over the orifices of the lowest accessible weir to block fish from coming up from tailwater.
1.4.1.12. Once the teams have completed chasing fish down the branches, everyone should return to the Junction Pool. Pumps will be needed to drop water levels.
1.4.1.13. To remove fish from the junction pool, pump water to about 1 foot deep. Seine fish to one wall and dip net fish. Using a crane, place a transport tank in the junction pool to load fish into it. Make sure one person is tracking the species and numbers of fish removed.
1.4.1.14. Once the Junction Pool is empty, personnel can move down to the diffuser pools. Pump water from each diffuser pool, starting with uppermost, to allow access to trapped fish. Fish are most easily removed using dip nets and either fish bags or the transport tank. Crane crew will lower fisheries personnel into each diffuser pool. Unless unusually large numbers of fish are present, it is acceptable to suspend this operation overnight and complete it the next day. **The diffuser pool dewatering process must be continually monitored to prevent stranding fish.**
1.4.2. **BELOW TAILWATER for B-Branch. See section 3. Powerhouse One Collection Channel for A-Branch.**
1.4.2.1. Install bulkheads across fishway entrance slots.
1.4.2.2. Close SO-SG-4N and SO-SG-4S
1.4.2.3. Install fish ladder entrance bulkheads associated with FV4-3 & FV4-4. Salvage fish from this area when the water has dropped low enough to gain access.
1.4.2.4. Pump area out until the water level approaches 1' above the concrete dividers to the lower ladder diffusers (FG3-29 through FG3-33 for B-Branch). Personnel should enter fishway at this point. Continue pumping as needed.
1.4.2.5. Remember to crawl up the ladder to the orifice blocks. Look for fish in the diffuser pools.
1.4.2.6. Occasionally diffuser valve covers are blown off during operation, allowing fish to get beneath diffuser gratings. When one of these covers is found displaced, the corresponding diffuser chamber should be pumped down and searched for fish.
Personnel should be cautioned that submerged diffuser gratings are occasionally missing and could allow a person to fall through. Pay special attention to overhead ice when walking beneath fishway beams during freezing weather.
1.4.2.7 Just before water up, pull entrance bulkheads and open SO-SG-4N and SO-SG-4S.
1.4.2.8 Flush each diffuser for an hour by opening the upper diffuser and moving down the ladder. Open FV3-9 for flushing flow.

1.5. EQUIPMENT REQUIRED
1.5.1. Blanket to help in securing large sturgeon, if encountered.
1.5.2. Cargo net or litter in case it is needed to remove a large sturgeon.
1.5.3. Cinders may be needed for effective seal on ladder exit gate or AWS intake gate.
1.5.4. Crane and basket to place personnel in ladder and to remove fish.

1.5.5. Safety harness and lanyard for each person using the manbasket.
1.5.6. Dip nets to move fish and place them into the fish tank.
1.5.7. Pumps to lower water level in pools for better access to fish.
1.5.8. Extension ladder for access to junction pool.
1.5.9. Flashlights may be needed if done at night or early morning.
1.5.10. Orifice barriers to block fish from re-ascending ladder from pools.
1.5.11. Seine(s) to move fish quickly down from exit beyond counting station and block orifices.
1.5.12. Ropes to secure ladders and place/remove equipment.
1.5.13. Tank truck to release fish back to the river.
1.5.14. Personal protective equipment suitable for wading through pools and handling fish.

1.6. PERSONNEL

1.6.1. Project Fisheries to supervise and lead dewatering activities.
1.6.2. Fish salvage personnel to assist in moving and collecting fish. Project personnel other than biologists may assist if needed, but a biologist must attend at each location where fish are handled.
Eight people are usually enough to cover the dewatering. For the Upper ladder: Three in the upper ladder, three in the AWS, one recording fish information and once catching fish slipping by the count station. For the Branches: a team of three for each branch (two in the ladder one on top observing). Junction Pool: three seining and two- three dip netting fish from the junction pool, one person recording fish information.
1.6.3. Crane operator and signalman to place personnel in the ladder and remove them, to install bulkheads and to place the fish transport tank.
1.6.4. Operator to operate gates and place clearances.

2. BRADFORD ISLAND SINGLE BRANCH DEWATERING.

2.1. GENERAL. A-branch fish ladder leads from the PH1 collection channel. B-branch leads from the south spillway entrances. The procedure below is for draining one branch independently of the other.

2.2. COORDINATION. Project Fisheries will coordinate outages with Bonneville Control, Portland District Ops, fisheries agencies, and the tribes. Particular care will be taken to coordinate with adult fish counting personnel when their work may be directly impacted.

2.2.1. A-branch should not be taken out of service when the second powerhouse ladder is out of service.

2.2.2. B-branch should not be taken out of service when the Cascades Island ladder is out unless previously coordinated.

2.2.3. PREPARATION. **24 to 96 hours before draining**, stop attraction and auxiliary water flow.

2.2.4. **A-BRANCH PREPARATION**

2.2.4.1. Close valve FV1-1 (PH1 PCC AWS).

2.2.4.2. Close valve FV3-7 (A-branch AWS).

2.2.4.3. WG-1 & WG-65 and/or WG-2 & WG-64 should be in manual and open.

2.2.5. **B-BRANCH PREPARATION**

2.2.5.1. Close valve FV4-3 & FV4-4. If installing bulkheads, fish will need to be removed when water levels allow.

2.2.5.2. Close spill bay 18.

2.2.6. **ORIFICE FLOW**

2.2.6.1. Achieving orifice flow is more difficult when dewatering just one branch of Bradford Island.

2.2.6.2. Regulate FV3-9 to drop the water level in both branches. It may be necessary to restrict the ladder exit somewhat. **DO NOT CLOSE THE EXIT**. 3-4' of exit opening is advised or until water flow has ceased to flow over the over-flow section of the weir.

2.2.6.3. Install 2 pumps that put water from the junction pool over the uppermost branch ladder weir to augment flow down the ladder. Flow must be reduced enough to not pull pumps through an orifice. (One orifice block should be installed, then the pumps placed in front of that block, before the second orifice block is installed.)

2.2.6.4. Place concrete barriers on one overflow slot, and install both orifices blocks on the uppermost ladder weir. Some amount of leakage through the orifices is inevitable and is actually helpful in keeping a safe water supply for fish.

2.2.6.5. Bring water level back up by opening the exit and adjusting FV3-9. The water level should be just high enough to spill some water over the top of the unblocked overflow weir section.

2.2.6.6. Install a fence (black plastic mesh has been used in the past) to block any fish from falling back down the branch to be dewatered.

2.2.6.7. The water level in the main ladder section will be lower than normal and the remaining watered up branch will be higher than normal. This configuration will be similar to orifice flow for the branch to be dewatered, so if large amounts of fish are in the ladder, it is possible to run this configuration for a couple days. However, forebay elevation will influence the ladder levels more than usual, as FV3-9 must be in manual. A teletype with a forebay constraint will be necessary if this configuration is used long-term. An example teletype used in the past is included at the end of this document.

2.2.7. **On dewatering day (EITHER BRANCH)**

2.2.7.1. Decrease water level in Bradford Island ladder by further reducing the opening of FV3-9 and/or exit to stop spilling water over the unblocked overflow weir section.

2.2.7.2. Install remaining overflow weir block.

2.2.7.3. Ladders: One extension ladder at the top of A or B Branch for easy entry with ropes to secure ladders.

2.2.7.4. Convene safety meeting before starting activity. Describe the procedure for all participants and assign responsibilities.

2.3. DRAIN LADDER.

2.3.1. When safety clearances are placed, personnel should enter the uppermost section of ladder. Use dip nets to guide fish to tailwater.
Personnel should be cautioned that submerged diffuser gratings are occasionally missing and could allow a person to fall through. Pay special attention to overhead ice when walking beneath fishway beams during freezing weather.

2.3.2. After all fish are moved to diffuser pools or below tailwater, place barriers (with ropes attached for easy removal) over the orifices of the lowest accessible weir to block fish from coming up from tailwater.

2.3.3. Pump water from each diffuser pool, starting with uppermost, to allow access to trapped fish. Fish are most easily removed using dip nets and either fish bags or the transport tank. Crane crew will lower fisheries personnel into each diffuser pool. Unless unusually large numbers of fish are present, it is acceptable to suspend this operation overnight and complete it the next day. **The diffuser pool dewatering process must be continually monitored to prevent stranding fish.**

2.3.4. **IF GOING BELOW TAILWATER FOR B-BRANCH**, install bulkheads across fishway entrance slots.

2.3.5. Pump area out until the water level approaches 1' above the concrete dividers to the lower ladder diffusers (FG5-29 through FG5-33 for B-Branch). Personnel should enter fishway at this point. Continue pumping as needed.

2.3.6. Occasionally diffuser valve covers are blown off during operation, allowing fish to get beneath diffuser gratings. When one of these covers is found displaced, the corresponding diffuser chamber should be pumped down and searched for fish.

2.3.7. Test and install low water alarm at tailwater. **NOTE: If portable pumps are used during the dewatering process, automatic pump shut off devices shall be utilized to prevent stranding fish. If automatic pump shut off devices and low water alarms are not used, the dewatering process must be continually monitored to prevent stranding fish.**

2.4. EQUIPMENT REQUIRED

2.4.1. Orifice barriers (pair) to close the orifices on each end of the uppermost branch weir.
2.4.2. Orifice barriers (pair) to place at bottom of drained portion of ladder to keep fish from stranding.
2.4.3. Weir slot barriers (pair) to block the slots atop each end of the uppermost branch weir.
2.4.4. Blanket to help in securing large sturgeon, if encountered.
2.4.5. Cargo net or litter in case it is needed to remove a large sturgeon.
2.4.6. Crane and basket to place personnel in ladder and to remove fish.
2.4.7. Safety harness and lanyard for each person using the manbasket.
2.4.8. Dip nets to move fish and place them into the fish tank.
2.4.9. Pumps to lower water level in pools for better access to fish.
2.4.10. Extension ladder for access to junction pool.
2.4.11. Fish bags
2.4.12. Flashlights may be needed if done at night or early morning.
2.4.13. Ropes to secure ladders and place/remove equipment.
2.4.14. Tank truck to release fish back to the river.
2.4.15. Personal protective equipment suitable for wading through pools and handling fish.

2.6 PERSONNEL

2.6.1 Project Fisheries to supervise and lead dewatering activities.

2.6.2 Fish salvage personnel to assist in moving and collecting fish. Project personnel other than biologists may assist if needed, but a biologist must attend at each location where fish are handled.

Three people are usually enough to cover single branch dewatering. Two in the ladder and one on top observing.

2.6.3 Crane operator and signalman to place personnel in the ladder and remove them, install orifice blocks and weir slot barriers and to place the fish transport tank or assist in hauling out fish bags.

2.6.4 Operator to operate gates and place clearances.

3. POWERHOUSE ONE COLLECTION CHANNEL (PH1 PCC)

3.1. GENERAL Sections of the powerhouse collection system are sometimes drained. Underwater inspection of all diffuser gratings is also completed twice a year. It is only possible to drain sections of the collection channel in a 3-unit spread. Generally, draining of the channel occurs from the north end to the south end. Section draining groupings are as follows:

3.1.1. A-Branch from tailwater including WG 64 and WG 65 collection channel areas to unit 9.
3.1.2. Units 6, 7, 8.
3.1.3. Units 3, 4, 5.
3.1.4. Units 1 & 2 including WG 1 and WG 2 collection channel areas.

3.2. COORDINATION. Project Fisheries will coordinate outages with Bonneville Control, Portland District Ops, fisheries agencies, and the tribes. Particular care will be taken to coordinate with adult fish counting personnel when their work may be directly impacted.

3.2.1. Whenever parts of the PH1 PCC are taken out of service, operating priority should be shifted to Powerhouse Two and the Washington Shore fish ladder will be fully operational.

3.3. PREPARATION. The A-branch ladder must be drained for the north end of the collection channel to drain. When sections of the PCC are drained south of WG 64 & 65, FPP entrance criteria can be maintained with flow from A-branch.

3.3.1. **24 to 48 hours prior to draining** close FV1-1 and the ice/trash sluiceway.
3.3.2. **Day of dewatering.**
3.3.2.1. After WG 1 & 2 bulkheads are installed, the ITS may be re-opened.
3.3.2.2. Convene safety meeting before starting activity. Describe the procedure; assign duties.

3.4 DRAINING.

3.4.1 Close all PCC diffusers (FG2-2 through FG2-22B).
3.4.2 Install fishway entrance bulkheads as well as collection channel transverse bulkheads into slots associated with the area to be drained.
3.4.3 Open AWS drain valves to start draining the AWS conduit.
3.4.4 After the AWS conduit is drained, diffuser valves may be opened to drain water from the bulkheaded area. DO NOT COMPLETELY DRAIN AN AREA BEFORE FISH ARE REMOVED. Enter when water is 1'-2' deep. *Personnel should be cautioned that submerged diffuser gratings are occasionally missing and could allow a person to fall.*
3.4.5 Seine or net fish and place them in a recovery tank for removal to appropriate release sites.
3.4.6 Once fish are removed the diffuser valves may be opened to drain diffuser chambers.
3.4.7 Just before water up, pull entrance bulkheads and flush diffusers. Open each diffuser for an hour, starting with the top and moving down the ladder. Open FV3-9 for flushing flow.

3.5 EQUIPMENT REQUIRED.

3.5.1 Crane and basket to place personnel in ladder and to remove fish.
3.5.2 Safety harness and lanyard for each person using the manbasket.
3.5.3 Dip nets to move fish and place them into the fish tank.
3.5.4 Fish bags
3.5.5 Flashlights may be needed when the center PCC is dewatered.
3.5.6 Tank truck.
3.5.7 Personal protective equipment suitable for wading through pools and handling fish.

3.6 PERSONNEL

3.6.1 Project Fisheries to supervise and lead dewatering activities.
3.6.2 Fish salvage personnel to assist in moving and collecting fish. Project personnel other than biologists may assist if needed, but a biologist must attend at each location where fish are handled. *Three people are usually enough. Two in the PCC and one on top observing.*
3.6.3 Crane operator and signalman to place personnel in the channel and remove them and to place the fish transport tank or assist in hauling out fish bags.
3.6.4 Operator to operate gates and place clearances.

4. POWERHOUSE ONE TURBINES

4.1. GENERAL. Turbines must be inspected and serviced periodically. This requires draining between head gates and tail logs. After the water reaches tailwater level, the remaining water is pumped out. Fish trapped in the draft tube and scroll case areas must be removed. Fish smaller than about 8" can go through the draft tube floor drains before they can be salvaged, therefore, it is most desirable to minimize numbers of fish involved in the draining process and then to quickly salvage the fish that are trapped.

4.2. COORDINATION. Project Fisheries will coordinate outages with Bonneville Control, Portland District Ops, fisheries agencies, and the tribes.

4.3. PREPARATION.

4.3.1. If a turbine unit draft tube is to be dewatered, it will be operated at speed no load, head gates placed, then tail logs will be placed immediately. This is to flush fish from the draft tube.

4.3.2 Close the orifices.

4.3.3 Have the tank truck filled and parked at the south end of the +55' deck before the draining process begins.

4.3.4 Convene safety meeting before starting activity. Describe the procedure for all participants and assign responsibilities.

4.4 DRAINING

4.4.2 **DRAFT TUBE AND SCROLL CASE.**

4.4.2.1 Place head gates and tail logs immediately after a turbine unit is shut down if the draft tube is to be dewatered. In the case of unit 10 the project will stage tail logs on the +55 deck elevation before the unit is taken out of service. This will allow them to be quickly placed. (This is especially important at unit 10 where as many as 1,000 sturgeon have been trapped in the past).

4.4.2.2 Open the grizzly and drain the draft tube. **The grizzly is notorious for sucking down sturgeon and killing them. Take extra care when walking around the grizzly.**

4.4.2.3 Project Fisheries will physically inspect the scroll case as soon as the hatch has been removed and water levels permit.

4.4.2.4 Fish bags and additional personnel will be available for any stranded fish found in the scroll case. These fish will be transported to the fish truck immediately if found.

4.4.2.5 Water levels in the draft tube will not be allowed to drop to a level that strands fish. Adequate inspections will be conducted to ensure that stranding does not occur.

4.4.2.6 Fish rescue personnel will inspect dewatered turbine draft tubes as soon as the water levels reach a depth permitting visual inspection and the hatch cover is opened.

4.4.2.7 A large holding tank will be available in the draft tube gallery for any fish removed from the draft tube. A smaller transport tank or a large recovery tank will be used to transport fish up through the deck openings to the +55' deck. An alternative if the first suggestion is not available would be to remove the fish via the service elevator.

4.4.2.8 Net fish in the turbine pit. Place them in fish bags and remove them through the entry door.

4.4.2.9 Place fish in fresh water tank in draft tube gallery.

4.4.2.10 When the tank is full, or all fish are caught, roll the tank to the south end of the gallery. Transfer the fish from the tank to fish bags. Haul fish bags to the +55' deck via the elevator.

4.4.2.11 If the unit is planned to be out of service and partially drained for less than 4 days and low numbers of fish are trapped, then it will not be necessary to remove fish from draft tubes as long as an adequate safety pool is maintained. Adequate inspections will be conducted to ensure the safety pool is maintained and fish are in good condition.

4.4.3 **TAIL LOG REMOVAL**.

4.4.3.1 At least one fish biologist will monitor tail logs as they are removed and rescue any stranded fish.

4.4.3.2 Remove fish and place them into the transportation tank.

4.4.3.3 Release fish at appropriate release sites.

4.5 EQUIPMENT REQUIRED

4.5.2 Gate-well dipping basket.

4.5.3 Fish tank. Portable fish tank used for gatewell dipping. Normally kept on +90' deck.

4.5.4 Release Hose to release dipped fish into JBS.

4.5.5 Buckets to flush fish down the release hose.

4.5.6 Fish Tank. Stock tank on dolly in draft tube gallery.

4.5.7 Fish Bags. Used to transport fish out of the draft tube and from the gallery to the tank truck.

4.5.8 Tank Truck.

4.5.9 Dip nets to move fish and place them into the fish tank.

4.5.10 Personal protective equipment suitable for wading through pools and handling fish.

4.5.11 Safety harness and lanyard for each person entering the draft tube.

4.6 PERSONNEL

4.6.2 Project Fisheries to supervise and lead dewatering activities.

4.6.3 Fish salvage personnel to assist in moving and collecting fish. Project personnel other than biologists may assist if needed, but a biologist must attend at each location where fish are handled.

One for gatewell dipping. Two in the draft tube, one on the outside monitoring fish. One for tail log removal.

Operator to operate gates and place clearances.

4.6.4 Clearance Holder to make sure clearances are accepted, fall protection is in place and the draft tube has been reclassified as a non-permit Confined Space.

POWERHOUSE TWO

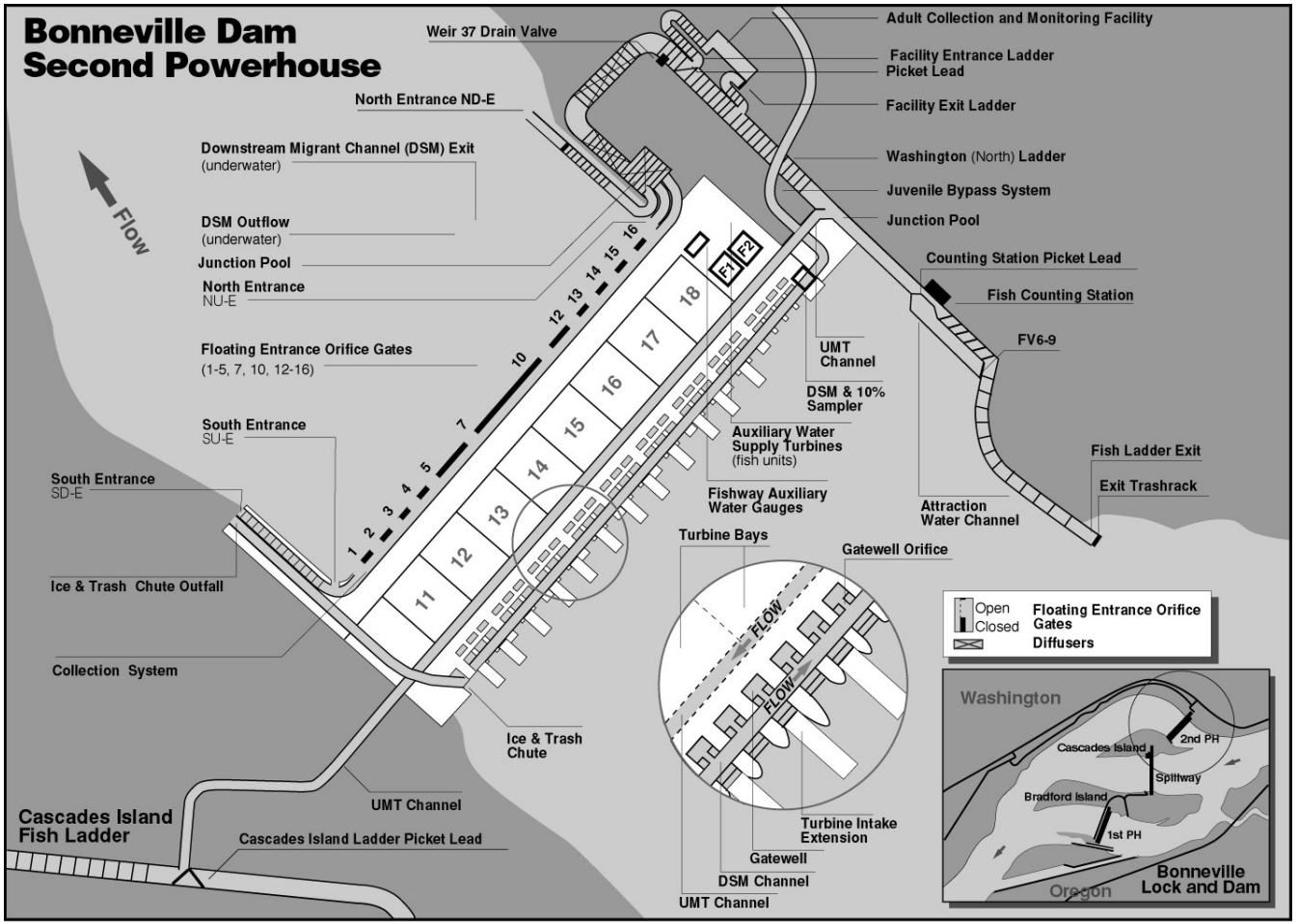

Figure BON-3 Bonneville Dam second powerhouse and Washington (north) fish ladder.

5. WASHINGTON SHORE FISH LADDER

5.1. GENERAL. This procedure is for draining the Washington Shore fish ladder. The standard procedure calls for opening the Cascades Island ladder for fish passage and draining the UMT. A variation is described in the next section (6.) which calls for placing a bulkhead in the PH2 ladder below the UMT, thereby negating the need to open the Cascades Island ladder exit and draining the UMT.

5.2. COORDINATION.

5.2.1. Project Fisheries will coordinate outages with Bonneville Control, Portland District Ops, fisheries agencies, and the tribes. Particular care will be taken to coordinate with adult fish lab operations and adult fish counting personnel when their work may be directly impacted. The Cascades Island ladder counting station is used when the ladder exit is opened, so it should be fully operational.

5.2.2. When PH2 fish passage facilities are down for maintenance, operating priority will shift to PH1 as directed by the Fish Passage Plan.

5.3 PREPARATION.

5.3.1 **24 to 96 hours before draining**, stop attraction and auxiliary water flow and drop ladder flow to orifice flow. Shut off Washington Shore count station lights and open the crowder.

5.3.2 If necessary, set up Cascades Island count station.

5.3.2.1.1 Raise Cascades Island picket leads.

5.3.2.1.2 Open Cascades Island exit.

5.3.3 Install the north UMT bulkhead. This will prevent fish from dropping back and holding in the UMT.

5.3.4 Close valve FV6-9.

5.3.5 If not already drained, the AFF should be dewatered or in such a configuration that will accommodate dewatering with the ladder. The FERL bulkhead **MUST NOT BE INSTALLED.**

5.3.6 Shut down fish units when ladder goes to orifice flow.

5.3.7 Place weir 37 bleed-off valve in manual and close if not already done so.

5.3.8 Have a stepladder by the count station.

5.3.9 **Dewatering day.**

5.3.10 Open FV6-9 enough to keep about 6" of water in the flat area below the counting station, while allowing personnel to move fish through the flow control section.

5.3.11 Supplement flow in the lower ladder by using valve 2 in the AFF. Valve 1 should always be open 100%. Valve 2 may be opened as much as necessary to keep water in the lower ladder. Valve 11 should be open at this time to flush mud out of the system before it is used later in the draining process.

5.3.12 Have tank truck filled with water. Park along the south side of the ladder, near the caged ladder to the catwalk.

5.3.13 Convene safety meeting before starting activity. Describe the procedure for all participants and assign responsibilities. Bring hot water, coffee, tea or other beverages and snacks for volunteers.

5.4 DRAIN LADDER.

5.4.1 **EXIT TO TAILWATER**

5.4.2 Close the exit.

5.4.3 When water levels allow and clearances are places, personnel may enter the ladder via the stepladder at the count station.

5.4.4 Place the salvage tank directly above the picket leads to assist in fish removal.

5.4.5 Pull the picket leads so fish and personnel may move between the ladder and the AWS channel. Do not clean picket leads during fish salvage operations because debris and silt from the leads fowl the water down the ladder.

5.4.6 Move quickly to the top of the ladder to begin moving fish down. A seine should be used to move fish through pools and a dip net to block upper exit from each pool until fish have cleared.

5.4.7 Remove all fish from behind the crowder and the count station flow adjustment louvered section. Place these fish into salvage tank.

5.4.8 While seiners are collecting fish from the ladder, two personnel will proceed up the AWS channel associated with FV6-9 and sweep for fish.

5.4.9 Two to three personnel may also be stationed at the AFF moving fish out of the entrance ladder and into the Washington Shore (if the AFF is not already dewatered). ***See section 8 Adult Fish Facilities for detailed dewatering information.***

5.4.10 Lower valve FV6-9 to about 1" to allow personnel to crawl through the orifices to chase fish to tailwater.

5.4.11 Two personnel will continue to move fish in through the orifices to tailwater.

5.4.12 Upon reaching the exit to the AFF, flow through Valve 2 will need to be reduced.

5.4.13 Valve 11 should be opened to provide minimal flow below the AFF. This flow should be enough to allow two more personnel will enter the ladder at the AFF catwalk and keep fish from stranding on the concrete corner.

5.4.14 The AFF catwalk personnel will move stranded fish around the corner and through the orifices. Fish will continue to be chased down from the two people above the AFF.

5.4.15 The two personnel from above the AFF will continue to chase fish to tailwater.

5.5 EQUIPMENT REQUIRED

5.5.1 Cinders may be needed for effective seal on ladder exit gate or AWS intake gate.

5.5.2 Crane and basket to place personnel in ladder and to remove fish.

5.5.3 Safety harness and lanyard for each person using the manbasket.

5.5.4 Dip nets to move fish and place them into the fish tank.

5.5.5 Extension ladder for access at the AFF catwalk.

5.5.6 Flashlights may be needed if done at night or early morning.

5.5.7 Orifice barriers to block fish from re-ascending ladder from tailwater.

5.5.8 Seine(s) to move fish quickly down from exit beyond counting station and block orifices.

5.5.9 Ropes to secure ladders and place/remove equipment.

5.5.10 Tank truck to release fish back to the river.

5.5.11 Personal protective equipment suitable for wading through pools and handling fish.

5.6 PERSONNEL

5.6.1 Project Fisheries to supervise and lead dewatering activities.

5.6.2 Fish salvage personnel to assist in moving and collecting fish. Project personnel other than biologists may assist if needed, but a biologist must attend at each location where fish are handled.

Eight people are usually enough to cover the dewatering. For the Upper ladder: Three in the upper ladder, three in the AWS, one recording fish information and once catching fish slipping by the count station. Two to move from the upper ladder through the orifices. Three for the AFF entrance ladder and to enter the WS at the AFF catwalk.

5.6.3 Crane operator and signalman to place personnel in the ladder and remove them, to install bulkheads and to place the fish transport tank.

5.6.4 Operator to operate gates and place clearances.

6. WASHINGTON SHORE DEWATERING BELOW UMT CONFLUENCE.

6.1. GENERAL. The procedure below is for dewatering the WA Shore ladder below the UMT confluence. This procedure is preferable over directing fish out the Cascades Island exit, as it reduces the chances of adult fallback through the spillway.

6.2. COORDINATION. Project Fisheries will coordinate outages with Bonneville Control, Portland District Ops, fisheries agencies, and the tribes. Particular care will be taken to coordinate with adult fish lab operations and adult fish counting personnel when their work may be directly impacted.

6.2.1. PREPARATION. **24 to 96 hours before draining**, stop attraction and auxiliary water flow.
6.2.1.1. Shut down both Fish Units.
6.2.2. **ORIFICE FLOW**
6.2.2.1. Achieving orifice flow is more difficult with this method and discretion should be used when deciding how long to operate in this configuration.
6.2.2.2. Regulate FV6-9 to drop the water level in the ladder. It may be necessary to restrict the ladder exit somewhat. **DO NOT CLOSE THE EXIT**. 3-4' of exit opening is advised or until water flow has ceased to flow over the over-flow section of the weir.
6.2.2.3. The Cascades Island ladder water level can be maintained with FV5-9 if desirable.
6.2.3. **On dewatering day**
6.2.3.1. Decrease the water level by further reducing the opening of FV6-9 and/or exit.
6.2.3.2. Installing UMT – WA Shore bulkhead (north side): To install this bulkhead it is necessary to drop the water level to 2-3 feet at the bulkhead slot. Higher water levels make it difficult for the bulkhead to seat properly. Lower water levels don't allow the bottom end of the bulkhead to be pushed against the slot and seal. Use wooden wedges to mate the upper end of the bulkhead with the downstream seal.
6.2.3.3. Ladders: One extension ladder placed downstream of the bulkhead for entry with ropes to secure ladder.
6.2.3.4. Convene safety meeting before starting activity. Describe the procedure for all participants and assign responsibilities.

6.3. DRAIN LADDER.
6.3.1. *Personnel should be cautioned that submerged diffuser gratings are occasionally missing and could allow a person to fall through. Pay special attention to overhead ice when walking beneath fishway beams during freezing weather.*
6.3.2. After the bulkhead is in place, bring the water level back up in the upper ladder by opening the exit fully and adjusting FV6-9. Concurrently, operate valve 2 in the AFF to provide sufficient flow to the lower ladder.
6.3.2.1. As soon as the bulkhead is installed and clearances are in place, salvage from the UMT confluence down to weir 50, where valve 2 water inputs.
6.3.2.2. Add water at weir 38 by turning on valve 11 at the AFF while closing valve 2. Salvage fish from weir 50 down to weir 38.
6.3.3. Lower water levels enough (using valve 11) to crawl through orifices and salvage from weir 38 down to tailwater. This is the most difficult section to salvage due to distance and water supply. It is suggested to utilize two teams, where one team moves quickly down to tailwater rescuing stranded salmonids, and the other moves more slowly clearing each pool of all species.
6.3.4. After all fish are salvaged or below tailwater, place barriers (with ropes attached for easy removal) over the orifices of the lowest accessible weir to block fish from coming up from tailwater.

6.4. The water level in the upper WA Shore ladder and Cascades Island can be returned to approximately normal stages however, forebay elevation will influence the ladder level more than usual, as FV6-9 must be in manual. A teletype with a forebay constraint may be necessary if this configuration is used long-term.

6.5. EQUIPMENT REQUIRED

6.5.1. Orifice barriers (pair) to place at bottom of drained portion of ladder to keep fish from stranding.
6.5.2. Blanket to help in securing large sturgeon, if encountered.
6.5.3. Cargo net or litter in case it is needed to remove a large sturgeon.
6.5.4. Crane and basket to place personnel in ladder and to remove fish.
6.5.5. Safety harness and lanyard for each person using the manbasket.
6.5.6. Dip nets to move fish and place them into the fish tank.
6.5.7. Extension ladder for access to ladder.
6.5.8. Fish bags
6.5.9. Flashlights may be needed if done at night or early morning.
6.5.10. Ropes to secure ladders and place/remove equipment.
6.5.11. Tank truck to release fish back to the river.
6.5.12. Personal protective equipment suitable for wading through pools and handling fish.

6.5 PERSONNEL

6.5.1 Project Fisheries to supervise and lead dewatering activities.
6.5.2 Fish salvage personnel to assist in moving and collecting fish. Project personnel other than biologists may assist if needed, but a biologist must attend at each location where fish are handled.
Five people are usually enough to cover a dewatering with this method. Two teams of two in the ladder and one on top helping to adjust valves and monitor fish in the tank truck.
6.5.3 Crane operator and signalman to place the UMT/WA Shore bulkhead and the fish transport tank or assist in hauling out fish bags.
6.5.4 Operator to operate gates and valves and place clearances.

7. POWERHOUSE TWO COLLECTION CHANNEL (PH2 PCC) AND MONOLITHS

7.1. GENERAL. The PH2 PCC is generally drained in sections. The project has transverse bulkheads to drain one or both monoliths or sections of the PCC. In all cases, the procedure involves pumping water out through the AWS conduit via a fish unit draft tube drain, which in turn drains to the sump located at the south end of the powerhouse. This sump water is then pumped up and out into the B2CC. The AWS has two drain valves at units 11 and 15. Through these two valves, the AWS and ultimately the south monolith can be drained independent of the fish unit draft tube drain valves.

7.2. COORDINATION. Project Fisheries will coordinate outages with Bonneville Control, Portland District Ops, fisheries agencies, and the tribes. Particular care will be taken to coordinate with adult fish lab operations and adult fish counting personnel when their work may be directly impacted.

7.3. PREPARATION. The PH2 fish ladder must be drained before draining the north monolith. The south monolith may be drained, but the Washington Shore ladder would have to operate without the Fish Units for attraction flow.

7.3.1. **24 to 96 hours before draining** go to orifice flow by shutting down attraction and AWS flow.
7.3.2. **Day of dewatering.**
7.3.2.1. Confirm that both fish units are off.
7.3.2.2. Convene safety meeting before starting activity. Describe the procedure for all participants and assign responsibilities.

7.4 DRAINING.

7.4.1 **North Monolith**

7.4.1.1 Install AWS conduit bulkheads, located at the north end of the AWS channel

7.4.1.2 Close diffuser valves B1-8 and C1-10. It is essential that these valves are closed before pumping begins, otherwise water will enter the AWS conduit via the open diffuser and negate any pumping efforts.

7.4.1.3 Drain AWS conduit to the south unwatering sump. The high water alarm will sound at –33'. The project maintains sump elevations at or below –33' to not flood the sump. After the AWS is drained the sump pumps will kick off indicating the sump is at the low \shutoff level.

7.4.1.4 Place transverse bulkheads in the collection channel. They are usually placed at the south end of unit 18

7.4.1.5 Install bulkheads at main fishway entrances NUE, and NDE.

7.4.1.6 Test and install low water alarm in the north monolith.

7.4.1.7 Open fish unit draft tube drain valve to start draining. The draft tube drain valve can be throttled to allow adequate holding water for fish being salvaged from this area. **(Note: Draining the north monolith fishway requires that the tail logs be raised in the fish unit in which the draft tube drain valve is to be used.)** The AWS and North Monolith can also be drained below the North Monolith gratings using the AWS drain valves at units 11 and 15. If this is done, these two valves must be throttled for water control to permit fish salvage.

7.4.1.8 Fish salvage may begin when water levels are 1-2'.

7.4.1.9 If there are large numbers of fish, personnel should seine from the PCC bulkhead back towards the triangle section. This will require 3 to 4 personnel. *Personnel should be cautioned when walking over submerged collection channel diffuser gratings that they are occasionally missing and could allow a person to fall through.*

7.4.1.10 While personnel move fish through main collection channel, at least 2 other personnel should seine down the NUE channel. When fish have been seined out of the NUE channel, this salvage team should hold the seine across the channel at its junction with the collection pool, until the first team has swept beyond this area.

7.4.1.11 After all fish have been seined to the junction pool area they should then be crowded into the upper end of the NDE channel. The seine should then be kept at the upper end of the NDE channel. A second salvage team should then seine from the most westerly part of the NDE channel back east towards the other seine positioned just inside the upper end of the NDE channel.

7.4.1.12 In the last few years, there have not been enough fish to warrant such extensive seining efforts. One to two personnel can usually dip net the dozen or fewer fish from the entire dewatered area.

7.4.1.13 The fish can then be crowded and placed in bags or directly into the recovery tank if it has been lowered.

7.4.1.14 Release fish to the appropriate sites.

7.4.1.15 After all fish have been removed, fully open the draft tube drain valve to drain the monolith.

7.4.2 South Monolith

7.4.2.1 Follow steps 1 through 3 as described for the North Monolith. The North Monolith can remain completely watered up while the South Monolith is being drained.

7.4.2.2 Place transverse bulkheads in the collection channel. They can be placed between any of the bays, but if there is trouble with the bulkhead seals they may have to be set as far south as the north side of unit 11.

7.4.2.3 Install bulkheads at main fishway entrances SUE and SDE.

7.4.2.4 Open diffusion chamber drain valves associated with the section to be dewatered. A maximum of two diffusion chamber valves should be opened at one time. The unwatering pumps can only keep up with the water drained from 2 valves. Special care should be given to not flood the sump.

7.4.2.5 Regulate unwatering valves to control water elevation. Fish salvage may begin when water levels are 1-2'.

7.4.2.6 If there are large numbers of fish, seining should begin in the main collection channel starting at the transverse bulkhead and continuing to the west end of the SDE. This will require 3 to 4 personnel. *Personnel should be cautioned when walking over submerged*

collection channel diffuser gratings that they are occasionally missing and could allow a person to fall through.

7.4.2.7 In the last few years, there have not been enough fish to warrant such extensive seining efforts. One to two personnel can usually dip net the dozen or fewer fish from the entire dewatered area.

7.4.2.8 Fish should be netted and placed in bags or directly into the recovery tank, if available.

7.4.2.9 Release fish to the appropriate sites.

7.4.2.10 After fish salvage, the monolith may be completely drained.

7.5 EQUIPMENT REQUIRED.

7.5.1 Crane and basket to place personnel in ladder and to remove fish.

7.5.2 Safety harness and lanyard for each person using the manbasket.

7.5.3 Dip nets to move fish and place them into the fish tank.

7.5.4 Flashlights may be needed if done at night or early morning.

7.5.5 Seine(s) to school fish.

7.5.6 Ropes to secure ladders and place/remove equipment.

7.5.7 Tank truck to release fish back to the river.

7.5.8 Personal protective equipment suitable for wading and handling fish.

7.6 PERSONNEL

7.6.1 Project Fisheries to supervise and lead dewatering activities.

7.6.2 Fish salvage personnel to assist in moving and collecting fish. Project personnel other than biologists may assist if needed, but a biologist must attend at each location where fish are handled.

Unless there are a lot of fish, two people are usually enough. If there are a lot of fish, four people will be needed to seine and dipnet fish.

7.6.3 Crane operator and signalman to place personnel in the ladder and remove them, to install bulkheads and to place the fish transport tank.

7.6.4 Operator to operate gates and place clearances.

8. ADULT FISH FACILITY (AFF) DRAINING.

8.1. GENERAL. This procedure is for draining the Adult Fish Facility (AFF). This procedure covers full AFF draining independent and in conjunction with Washington Shore as well as guidelines for dewatering entrance or exit ladders independently.

8.2. COORDINATION. Project Fisheries will coordinate outages with Bonneville Control, Portland District Ops, fisheries agencies, and the tribes. Particular care will be taken to coordinate with adult fish lab operations when their work may be directly impacted.

8.3. PREPARATION.

8.3.1. **24 to 96 hours prior to dewatering.**

8.3.1.1. Inform operations of the intent to drain the facility.

8.3.1.2. Check travel of overhead bridge crane to outside access.

8.3.1.3. Halt all trapping operations at least 24 hours prior to dewatering.

8.3.1.4. Completely lower the brail pool.

8.3.1.5. Lower the holding pool bulkhead. Close valve 12. Open valve 16 full open. This encourages fish to move back down the entrance ladder.

8.3.1.6. Keep the exit open. Open valve 15 so the lab doesn't flood.

8.3.2 **Day of dewatering.**

8.3.2.1 Have recovery tank filled and lowered into the lab.

8.3.2.2 Have stepladder ready at the brail pool exit.

8.3.2.3 Have an extension ladder stationed at the count station door.

Stop here to accommodate maintenance work on weirs and pulleys in the entrance ladder. An extension ladder would be placed in the upper entrance ladder for access. Water levels are usually 6" or less.

8.3.2.4 Convene safety meeting before starting. Describe procedures and assign responsibilities.

8.4 DRAINING

8.4.1 **DRAINING INDEPENDENT OF WASHINGTON SHORE FISH LADDER.**

8.4.1.1 Close the exit.

8.4.1.2 Fully open valve 15.

8.4.1.3 If needed, open valve 14 to 10%. Valve 14 will drop the water elevations quickly.

8.4.1.4 Two or three people will enter the exit pool (at the brail pool exit) via the stepladder. The handrail is removable. Tie off the ladder. Net fish and place in the recovery tank. *Fish may be placed in the outside exit ladder if only the inside it to be dewatered.*

8.4.1.5 Fully open valve 14 when all fish have been salvaged.

8.4.1.6 One person will need to walk upstream along the exit to the fishway (topside) to verify fish have dropped back into the channel exit below the last overflow weir section. If so, block the access back into the exit fishway by lowering a weir screen or adult dip net so that it covers the orifice of the first weir upstream of the exit channel.

8.4.1.7 Raise the holding pool bulkhead and dog off in raised position.

Stop here to accommodate maintenance inside the lab. At this point, the exit may be partially opened to provide flow through the ladder. Care must be taken to ensure the exit isn't opened too much otherwise, water elevations will rise above the concrete apron.

8.4.1.8 Personnel should now move to the outside exit ladder by crawling over the concrete apron from inside the lab.

8.4.1.9 Open the waterman valve (manually operated, when open connects exit channel to entrance fishway) to drain water and place a net over the opening to prevent fish from entering. Enter the ladder when water levels allow.

8.4.1.10 Seine, net and bag fish. Have additional personnel haul fish bags up the side of the ladder by rope. Place fish in the recovery tank if available, or release fish into the holding pool.

Stop here to allow work in the exit ladder (such as when PIT tag detectors were installed in 2000). Lower the holding pool bulkhead and open valve 12 about 10% to keep downstream fish in freshwater.

8.4.1.11 When no fish remain in the exit ladder (upstream of the collection pool), use a stick seine, sweep the holding pool and the holding pool entrance channel down to the first weir in the fishway entrance. As fish are moved downstream through the submerged orifice in each weir section, block the upstream side of the orifice with a net or screen. In this manner, continue moving fish downstream to the point where the entrance fishway floor begins to slope. From this point, fish will normally work their way down to the vicinity of the counting station.

8.4.1.12 Once personnel have gotten into deeper water, close the return bulkhead (upstream of the count station). Install a weir block at this point. Personnel may wait and crawl through orifices, or exit the ladder and reconvene at the count station door.

8.4.1.13 Close the entrance bulkhead (downstream of the count station).

8.4.1.14 Move the tank truck to the area between the Washington Shore ladder and the entrance ladder. Have one or two people ready as runners.

8.4.1.15 One person should proceed down into the count station, and open Valve 23 to lower the water in the entrance fishway area to a depth of about one foot. This person will remain at Valve 23 controls maintaining water levels until all fish have been removed. *Please note that valve 23 is very touchy. Water will drain extremely quickly.*

8.4.1.16 Two crew members should descend the extension ladder placed above the count station door. Netted fish shall be released to WS fish ladder through the upstream bulkhead slot. If there are large numbers of fish, fish shall be bagged and placed in the recovery tank.

8.4.1.17 Walk topside to ensure fish have moved down from the weir block (if installed).

8.4.1.18 Once fish have been removed, open Valve 23 to 100%. Remove debris from gratings.

8.4.1.19 Nets or screens placed over weirs may be removed.

8.4.1.20 Notify the control room that you have completed fish salvage and that clearances can be placed. **Note:** *Special attention should be placed on disconnecting the entrance and exit bulkhead hoist power sources. In the past these have been left connected causing an unauthorized opening of the AFF entrance bulkhead stranding fish.*

8.4.2 **DRAINING WITH WASHINGTON SHORE FISH LADDER.** ***(Details in section 6.)***

8.4.2.1 While personnel are dewatering the upper WS ladder, three people need to dewater the AFF exit ladder. Follow 8.4.1.1 through 8.4.1.11, EXCEPT OPEN valve 12 open enough to provide flow while personnel move fish through the holding pool.

8.4.2.2 When WS personnel have reached the AFF exit, valve 2 will be closed and valve 11 opened.

8.4.2.3 Personnel assisting with WS dewater will be ready to enter at the AFF catwalk or the count station. They will move fish around the WS concrete corner.

8.4.2.4 AFF personnel will need to follow 8.4.1.16 through 8.4.1.20.

8.4.2.5 If needed, personnel may continue to assist with the Washington Shore dewater.

8.4.2.6 Once fish are beyond the concrete corner, valves 11 and 12 may be closed.

8.5 EQUIPMENT REQUIRED.

8.5.1 Dip nets to move fish and place them into the fish tank.

8.5.2 Flashlights may be needed if done at night or early morning.

8.5.3 Seine(s) to school fish.

8.5.4 Ropes to secure ladders and place/remove equipment such as weir blocks and nets.

8.5.5 Tank truck to release fish back to the river.

8.5.6 Personal protective equipment suitable for wading and handling fish.

8.6 PERSONNEL

8.6.1 Project Fisheries to supervise and lead dewatering activities.

8.6.2 Fish salvage personnel to assist in moving and collecting fish. Project personnel other than biologists may assist if needed, but a biologist must attend at each location where fish are handled. *Unless there are a lot of fish, three or four people are usually enough. Two for the exit ladder. Two to three seining the collection pool. One person topside and controlling valve 23. Two to three people at the count station bagging and hauling fish. If there are additional people, running bags to the recovery tank is helpful.*

8.6.3 Operator to operate the waterman valve and place clearances.

9. CASCADES ISLAND FISH LADDER

9.1. GENERAL. This procedure is for draining the Cascades Island fish ladder. Procedures for salvage in the ladder are the same whether or not the UMT is drained, however, leaving the UMT watered up for an extended time with the Cascades Island ladder drained is not recommended, as fish will accumulate within the UMT.

9.2. COORDINATION. Project Fisheries will coordinate outages with Bonneville Control, Portland District Ops, fisheries agencies, and the tribes. Particular care will be taken to coordinate with adult fish lab operations and adult fish counting personnel when their work may be directly impacted. Cascades Island fishway should not be dewatered when the other spillway ladder (Bradford Island B-branch) is also dewatered.

9.3. PREPARATION

9.3.1. **24 to 96 hours prior to dewatering.** Go to orifice flow. Turn off count station lights if on.

9.3.1.1. If dewatering CI alone, install the north UMT bulkhead. ***See section 10 for UMT dewatering details.***

9.3.1.2. If also dewatering WS, close FV6-9. It is recommended to break up the dewatering of WS and CI. Each ladder requires several people and many hours.

9.3.1.3. If CI exit is open, close FV5-9. If CI exit is closed, throttle FV5-9 so ladder drops to orifice flow.

9.3.1.4. Close FV5-3 and FV5-4.

9.3.1.5. Close spill bay 1.

9.3.1.6. Set entrances SO-SG-3N and SO-SG-3S to manual and in open positions.

9.3.2. **Day of dewatering.**

9.3.2.1. Have recovery tank filled parked by the CI count station.

9.3.2.2. Make sure there are two extension ladders, one by the picket leads and one off the walkway to the serpentine section.

9.3.2.3. Open lamprey barrier if closed.

9.3.2.4. Convene safety meeting before starting. Describe procedures and assign responsibilities.

9.4 DRAINING.

9.4.1 **TO TAILWATER**

9.4.1.1 Place salvage tank directly below the first set of picket leads when water levels allow. This will aid in removing fish before they move down each weir section to tailwater.

9.4.1.2 Close ladder exit and adjust auxiliary water supply valve FV5-9 to drop the water level to allow personnel to enter the ladder while at the same time maintaining as much water as possible going down the branches.

9.4.1.3 When water level allows, and clearances are placed, personnel will enter the serpentine section by ladder. Use a seine to move fish through the vertical slot section (best done with two people on seine and another ahead of the seiners with a dip net encouraging fish towards the count station.

9.4.1.4 Pull both sets of picket leads. Do not clean picket leads during fish salvage operations because debris and silt from the leads fowl the water down the ladder.

9.4.1.5 Seiners will push fish by the count window. Dip netters can gather fish as they hold just above the CI picket leads (downstream set of leads). Place these fish into salvage tank.

9.4.1.6 While seiners are collecting fish from the ladder, three personnel will proceed up the AWS channel associated with FV5-9 and sweep for fish. Enter the AWS via extension ladder at the AWS picket leads (upstream set of leads). This area drains slowly and usually has a lot of lamprey and resident fish. Once ESA listed species are removed, additional efforts can be made as the water level naturally drops (may take a day).

9.4.1.7 Close valve FV5-9 to allow personnel to crawl through the orifices to chase fish to tailwater. The Riggers can now install the AWS intake bulkhead

9.4.1.8 Two personnel will need to crawl through orifices, moving fish to diffuser pools and tailwater.

9.4.1.9 After all fish are moved down the ladder to diffuser pools or below tailwater, place barriers (with ropes attached for easy removal) over the orifices of the lowest accessible weir to block fish from coming up from tailwater.

9.4.1.10 Pump water from each diffuser pool, starting with uppermost, to allow access to trapped fish. Fish are most easily removed using dip nets and either fish bags or the transport tank. Crane crew will lower fisheries personnel into each diffuser pool. Unless unusually large numbers of fish are present, it is acceptable to suspend this operation overnight and complete it the next day. **The diffuser pool dewatering process must be continually monitored to prevent stranding fish.**

9.4.2 **BELOW TAILWATER**

9.4.2.1 Install bulkheads across fishway entrance slots.

9.4.2.2 Install fish ladder entrance bulkheads associated with FV5-3 & FV5-4. Salvage fish from this area when the water has dropped low enough to gain access.

9.4.2.3 Test and install low water alarm at tailwater. **NOTE: If portable pumps are used during the dewatering process, automatic pump shut off devices shall be utilized to prevent stranding fish. If automatic pump shut off devices and low water alarms are not used, the dewatering process must be continually monitored to prevent stranding fish.**

9.4.2.4 Pump area out until the water level approaches 1' above the concrete dividers to the lower ladder diffusers (FG6-16 through FG6-20). Personnel should enter fishway at this point. Continue pumping as needed.

9.4.2.5 Remember to crawl up the ladder to the orifice blocks. Look for fish in these now dewatered diffuser pools.

9.4.2.6 Occasionally diffuser valve covers are blown off during operation, allowing fish to get beneath diffuser gratings. When one of these covers is found displaced, the corresponding diffuser chamber should be pumped down and searched for fish.
Personnel should be cautioned that submerged diffuser gratings are occasionally missing and could allow a person to fall through. Pay special attention to overhead ice when walking beneath fishway beams during freezing weather.

9.4.2.7 Just before water up, pull entrance bulkheads.

9.4.2.8 Flush diffusers a day before watering back up. Start by opening the upper most diffuser valve and continuing down the ladder. FV5-9 may be opened to provide some flushing flow.

9.5 EQUIPMENT REQUIRED

9.5.1 Crane and basket to place personnel in ladder and to remove fish.

9.5.2 Safety harness and lanyard for each person using the manbasket.

9.5.3 Dip nets to move fish and place them into the fish tank.

9.5.4 Pumps to lower water level in pools for better access to fish.

9.5.5 Extension ladders for access to fish ladder.

9.5.6 Flashlights may be needed if done at night or early morning.

9.5.7 Orifice barriers to block fish from re-ascending ladder from pools.

9.5.8 Seine(s) to move fish quickly down from the AWS channel and exit to the counting station.

9.5.9 Ropes to secure ladders and place/remove equipment.

9.5.10 Tank truck to release fish back to the river.

9.5.11 Personal protective equipment suitable for wading through pools and handling fish.

9.6 PERSONNEL

9.6.1 Project Fisheries to supervise and lead dewatering activities.

9.6.2 Fish salvage personnel to assist in moving and collecting fish. Project personnel other than biologists may assist if needed, but a biologist must attend at each location where fish are handled. Five people are usually enough to cover the dewatering. Two in the serpentine section, two in the AWS, one recorder. Two moving through the orifices. Two for diffuser pools and the entrance.

9.6.3 Crane operator and signalman to place personnel in the ladder and remove them, to install bulkheads and to place the fish transport tank.

9.6.4 Operator to operate gates and place clearances.

10. PH2 UPSTREAM MIGRANT TRANSPORTATION CHANNEL (UMT)

10.1. GENERAL**.** This is the procedure for draining the UMT either alone or with one or both adjacent ladders.

10.2. COORDINATION. Project Fisheries will coordinate outages with Bonneville Control, Portland District Ops, fisheries agencies, and the tribes. Particular care will be taken to coordinate with adult fish lab operations and adult fish counting personnel when their work may be directly impacted.

10.3. PREPARATION.

10.3.1. **24 to 48 hours prior to dewatering day.**

10.3.1.1. If CI is to remain watered up, open the CI picket leads, lamprey barrier, and exit. Ensure video counting is set up.

10.3.1.2. If CI is to be dewatered, follow preparation for CI dewatering in section 9.

10.3.1.3. Install the north UMT bulkhead and adjust FV6-9 as needed.

10.3.1 **Dewatering day.**

10.3.1.1 Have recovery tank filled parked at the north end of the +90' deck.

10.3.1.2 Make sure there is an extension ladder for entry at the north end of the UMT.

10.3.1.3 Convene safety meeting before starting. Describe procedures and assign responsibilities

10.4 DRAINING.

10.4.1 **DEWATERING THE UMT alone or with Washington Shore**

10.4.1.1 Install the south bulkhead.

10.4.1.2 If draining with WS, the north bulkhead may be pulled after WS is completely dewatered. This will allow water to drain from the UMT. **Do this only after WS is dewatered.**

10.4.1.3 Install pumps (the UMT drain is no longer exists) at the north end. The hose may discharge into the WS fishway. **When pumps are used, automatic pump shut off devices and low water alarms will be utilized. If these devices are not used, the dewatering process must be continuously monitored to prevent stranding fish.**

10.4.1.4 Once clearances are hung, personnel may enter at the north end when water is 1-2'.

10.4.1.5 A team of at least two will begin moving a seine from the south to north (the channel is shallower at the south end). This needs to be repeated several times.

10.4.1.6 Lower the fish recovery tank into the UMT, place it near the fish count window. Start to net fish. *If there are enough personnel and WS is watered up, it is acceptable to place fish in a fish bag or net and release them directly into the PH2 ladder rather than the recovery tank.*

10.4.2 **DEWATERING THE UMT with Cascades Island**

10.4.2.1 Once CI is completely dewatered, start with 10.4.1.3, with personnel entering from CI.

10.5 EQUIPMENT REQUIRED

10.5.1 Crane and basket to place the recovery tank in ladder.

10.5.2 Dip nets to move fish and place them into the fish tank or WS ladder.

10.5.3 Pumps to lower water level in pools for better access to fish.

10.5.4 Extension ladders for access to the north end of the UMT.

10.5.5 Seine(s) to move fish from the south to the north end of the UMT.

10.5.6 Ropes to secure ladders and place/remove equipment.

10.5.7 Tank truck to release fish back to the river.

10.5.8 Personal protective equipment suitable for wading through pools and handling fish.

10.6 PERSONNEL

10.6.1 Project Fisheries to supervise and lead dewatering activities.

10.6.2 Fish salvage personnel. Personnel other than biologists may assist, but a biologist must attend at each location where fish are handled. *Five to six people are enough. Two with a seine, one with a dip net, two netting fish at the north end, one recorder.*

10.6.3 Crane operator and signalman to install bulkheads and to place the fish transport tank.

10.6.4 Operator to operate gates and place clearances.

11. SECOND POWERHOUSE DSM2 and SMOLT MONITORING FACILITY (SMF).

11.1 GENERAL. The following procedure is for full draining from the powerhouse to the monitoring facility. Usually done during winter maintenance. The SMF is usually set to bypass mode no later than 31 October. This procedure assumes the facility is not yet in bypass mode. If it is, some of these steps will already be done.

11.2 COORDINATION. Project Fisheries will coordinate outages with Bonneville Control, Portland District Ops, fisheries agencies, and the tribes. Coordinate with PSMFC personnel when their activities may be directly impacted. Powerhouse operators also need to be notified at least 72 hours in advance to allow time for staffing and clearance preparation.

11.3 PREPARATION (For complete draining. NOT for just draining the sample flumes at the SMF). See 11.4.2 for sample flume dewatering instructions.

11.3.1 **24 hours before draining.**

11.3.1.1 Ensure all STSs have been pulled and all available orifices are open.

11.3.1.2 The downstream migration channel (DSM) will be darkened as much as possible. All gallery and orifice lights will be turned off. It is expected that by doing this, fish which would otherwise hold in the DSM will pass and not have to be handled during the draining process.

11.3.1.3 Switch all rotating gates to bypass.

11.3.1.4 Open the Emergency fish release valve (located at the PDS).

11.3.1.5 Raise bypass flume barrier (with the manual winch).

11.3.1.6 Switch the upper switchgate to bypass mode, all flushing water valves should be in auto.

11.3.1.7 Release any fish in the holding tanks (if the AWS valves are to be closed).

11.3.2 Day of dewatering.

11.3.2.1 Ensure all AWS slot valves are open.

11.3.2.2 Flume flushing water control (in the wave area) should be in auto and fully open.

11.3.2.3 Have recovery tank filled and parked at the north end of the +90' deck.

11.3.2.4 Make sure tricycles have good batteries and the tires are full of air.

11.3.2.5 Convene safety meeting before starting. Describe procedures and assign responsibilities

11.4 DRAINING.

11.4.1 **Draining the DSM and bypass flume.**

11.4.1.1 Fully open main Add-in valve and place in manual control.

11.4.1.2 Fully open exit pipe drain valve (EPDV).

11.4.1.3 Switch mechanical screen cleaners 1-3 to manual.

11.4.1.4 Turn off the airburst system.

11.4.1.5 Open ERG, flushing water should turn on automatically.

11.4.1.6 Proceed with closing orifices beginning with the Fish Units and proceeding south to 11A.

11.4.1.7 Close Add-in slot valves, including manual and mechanical valves, very last. Personnel waiting to enter the channel may do so once these valves have been cleared.

11.4.1.8 Once all clearances have been placed, personnel may enter the channel (when water level allows), via extension ladder at the inclined screen or via a stepladder at the south end, through the grating.

11.4.1.9 Move fish from the south end of the DSM to the north, using dip nets. After all fish, are removed from the channel proceed back to the south end of the channel. Inspect behind the Add-in water bars for stranded fish.

11.4.1.10 All recovered fish are to be placed directly into the recovery tank.

11.4.1.11 Once flume flushing water is turned off, proceed down to the open flume at the upper switchgate to inspect for any stranded fish (it takes approximately 40 minutes for the water to recede at this point).

11.4.2 **Dewatering the primary dewatering structure (PDS) and sample flumes. (Leaving the bypass side watered up).** ***DO NOT FOLLOW 11.3 PREPARATION STEPS.***

11.4.2.1 Ensure the upper switchgate is in bypass.

11.4.2.2 Open the 14" emergency fish drain (MF 1) upstream of the (PDS).

11.4.2.3 De-energize screen cleaners.

At this point, all valves could be left alone and the AWS valve at the Head box could be closed if the system needed to be shut down in a hurry.

11.4.2.4 Close the separator bar valve.
11.4.2.5 Close the adult flume flushing nozzle (MF 7).
11.4.2.6 Open all four drain valves under the SDS.
11.4.2.7 Open the three drain valves on the flushing water pipes for the rotating gates.

11.4.3 Dewatering the inside of the building (usually in late October).

11.4.3.1 Release all fish in the holding tanks, if they are not to be sampled.
11.4.3.2 Pull standpipes to completely drain holding tanks and pre-anesthetic tanks.
11.4.3.3 Close 12" raw water supply valve (MF 20) to the holding tanks. Holding tank supply valves (MF 24-26) can be closed instead allowing all water to drain from the pipes.
11.4.3.4 Close raw water supply valve (MF 23) to the holding tank sprayer bars and fish lifts.
11.4.3.5 Pull standpipe in sample trough.
11.4.3.6 Close raw water supply valves (MF 37 and 38) to the recovery tanks. Open drain valves (MF 39 and 40) to drain water from tanks.
11.4.3.7 Close 10" raw water supply valve (MF 21) to upstairs.
11.4.3.8 The air compressors can be turned off at this point.
11.4.3.9 It should be noted that valves MF 3-6, 8-18, and 22 do not need to be adjusted for this procedure.

11.4.4 **Inspecting the two mile pipe.**

11.4.4.1 Either the same day, or a day in the near future, open all flume access hatches and hang clearance cards. Wrap Warning tape around access hatch ballards to warn others of the open hole.
11.4.4.2 Air test each access point. When the pipe has been reclassified as a non-permit required confined space, personnel may enter the flume to inspect for stranded fish, obstructions, or any deficiencies that may harm fish.
11.4.4.3 Enter at hatch #1 (at the VOB) via an extension ladder. Lower in recumbent trikes for quicker and easier inspections.
11.4.4.4 One person shall remain at the hatch #1 and one person at hatch #2. Radios do not work in the pipe; these hatch attendants are critical for ensuring safe passage through the pipe.
11.4.4.5 Once inspectors are seen at hatch #2, the hatch #1 person will move up to hatch #3, and so on until the inspectors are either ready to leave the pipe or they make it to the upper switchgate.

11.5 EQUIPMENT REQUIRED

11.5.1 Dip nets for collecting fish in the DSM.
11.5.2 Ladders for access to the DSM and two mile pipe.
11.5.3 Ropes to secure ladders and place/remove equipment from the two mile pipe.
11.5.4 Tank truck to release fish back to the river.
11.5.5 Tricycles for inspecting flume.
11.5.6 Air monitor for continuous monitoring of the two mile pipe.
11.5.7 Personal protective equipment suitable for wading, handling fish and peddling through the two mile pipe.

11.6 PERSONNEL

11.6.1 Project Fisheries to supervise and lead dewatering activities.
11.6.2 Fish salvage personnel. Personnel other than biologists may assist, but a biologist must attend at each location where fish are handled. *Three to four people are needed. One to accept clearances, two to walk the DSM. Two to inspect the two mile pipe and two as attendants outside the pipe.*
11.7 Operator to place clearances.

12. B2 CORNER COLLECTOR

12.1 GENERAL. The corner collector generally closes with or just before spill ends at the end of August.

12.2 COORDINATION. Project Fisheries will coordinate outages with Bonneville Control, Portland District Ops, fisheries agencies, and the tribes.

12.3 PREPARATION. Request the clearance 24 hours in advance. Make sure a crane is available.

12.4 DRAINING.
12.4.1 Lower the headgate.
12.4.2 Close and tag out the sump pumps.
12.4.3 Open the flushing valve. Let the valve run for 30 minutes.
12.4.4 Once clearances are hung and accepted, personnel may enter the channel at the +55' deck via crane.
12.4.5 Personnel should walk the channel looking for fish and structural damage. Proceed down the channel ONLY to where one can see the river. **DO NOT PROCEED TO THE END OF THE CHANNEL.**
12.4.6 Remove personnel and equipment.

12.5 EQUIPMENT REQUIRED
12.5.1 Dip nets for collecting fish.
12.5.2 Personal protective equipment suitable for wading, handling fish and peddling through the two mile pipe.

12.6 PERSONNEL
12.6.1 Project Fisheries to supervise and lead dewatering activities.
12.6.2 Fish salvage personnel. Two people are needed to walk the channel.
12.6.3 Crane operator and signalman to install bulkheads and to place personnel in the channel.
12.6.4 Operator to place clearances.

13. POWERHOUSE TWO TURBINES

13.1 GENERAL. Turbines must be inspected and serviced periodically. This requires draining between head gates and tail logs. After the water reaches tailwater level, the remaining water is pumped out. Fish trapped in the draft tube and scroll case areas must be removed before being stranded. Fish smaller than about 8" can go through the wall drains before being salvaged. It is, therefore, desirable to minimize numbers of fish involved in the draining process and then to quickly salvage the fish that are trapped.

13.2 COORDINATION. Project Fisheries will coordinate outages with Bonneville Control, Portland District Ops, fisheries agencies, and the tribes.

13.3 PREPARATION.

13.3.1 If a turbine unit draft tube is to be dewatered, it will be operated at speed no load, head gates placed, then tail logs will be placed immediately. This is to flush fish from the draft tube.

13.3.2 Close the orifices.

13.3.3 Set the fish tank, two dip nets and two fish bags in the draft tube gallery, at the unit to be dewatered.

13.3.4 Have the tank truck filled and parked at the south end of the +90' deck.

13.3.5 Convene safety meeting before starting activity. Describe the procedure for all participants and assign responsibilities.

13.4 DRAINING

13.4.1 DRAFT TUBE AND SCROLL CASE.

13.4.1.1 Drain the scroll case and open the wall drains in the draft tube.

13.4.1.2 Project Fisheries will physically inspect the scroll case as soon as the hatch has been removed and water levels permit.

13.4.1.3 Fish bags and additional personnel will be available for any stranded fish found in the scroll case. These fish will be transported to the fish truck immediately if found.

13.4.1.4 Fish rescue personnel will inspect dewatered turbine draft tubes, as soon as the water levels reach a depth permitting visual inspection and the hatch cover is opened.

13.4.1.5 Water levels in the draft tube will not be allowed to drop to a level that strands fish. Adequate inspections will be conducted to ensure that stranding does not occur.

13.4.1.6 Net fish in the turbine pit. Place them in fish bags and remove them through the entry door.

13.4.1.7 Place fish in freshwater in the fish tank in draft tube gallery.

13.4.1.8 When the tank is full, or all fish are caught, roll the tank to the south end of the gallery. Attach the tank to the crane, raise the tank to the –3' level and roll to the elevator.

13.4.1.9 Take the elevator to the +90' deck and transfer fish from the fish tank to the recovery tank.

13.4.1.10 If the unit is planned to be out of service and partially drained for less than 4 days and low numbers of fish are trapped, then it will not be necessary to remove fish from draft tubes as long as an adequate safety pool is maintained. Adequate inspections will be conducted to ensure the safety pool is maintained and fish are in good condition.

13.4.2 **TAIL LOG REMOVAL**.

13.4.2.1 One fish biologist will monitor tail logs as they are removed and rescue any stranded fish.

13.4.2.2 Remove fish and place them into the transportation tank.

13.4.2.3 Release fish at appropriate release sites.

13.5 EQUIPMENT REQUIRED

13.5.1 Fish tank. Portable fish tank used for gatewell dipping and in the draft tube gallery. Normally kept on +90' deck.

13.5.2 Buckets

13.5.3 Fish Bags. Used to transport fish out of the draft tube.

13.5.4 Fire Hose and adapter fitting to fill fish tank in gallery.

13.5.5 Tank Truck.

13.5.6 Dip nets to move fish and place them into the fish tank.

13.5.7 Personal protective equipment suitable for wading through pools and handling fish.
13.5.8 Safety harness and lanyard for each person entering the draft tube.

13.6 PERSONNEL
13.6.1 Project Fisheries to supervise and lead dewatering activities.
13.6.2 Fish salvage personnel to assist in moving and collecting fish. Project personnel other than biologists may assist if needed, but a biologist must attend at each location where fish are handled. *One for gatewell dipping. Two in the draft tube, one on the outside monitoring fish. One for tail log removal.*
13.6.3 Operator to operate gates and place clearances.
13.6.4 Clearance Holder to make sure clearances are accepted, fall protection is in place and the draft tube has been reclassified as a non-permit Confined Space.

OTHER DEWATERINGS

14. NAVIGATION LOCK

14.1 GENERAL. This procedure is written specifically for fish protection when the Bonneville project new navigation lock is drained. This plan does not contain all the steps required to drain the locks. It is only concerned with the safest removal of fish.

14.2 COORDINATION.

14.2.1 Navigation lock draining is usually scheduled for early March. Scheduling requires extensive coordination with commercial river navigators and consideration of salmon passage. Lock outages are coordinated with outages of the other locks throughout the river systems to minimize interference with river traffic.

14.2.2 Outages will be coordinated with regional fish managers.

14.3 PREPARATION.

14.3.1 Appropriate safety clearances must be prepared. Clearances for fish handler safety will include the four tainter valves.

14.3.2 Prepare all necessary equipment.

14.3.3 Fill tank truck and park it at the north downstream side of the navlock.

14.3.4 Convene safety meeting before starting activity. Describe the procedure for all participants and assign responsibilities.

14.4 DRAINING.

14.4.1 Install upstream channel stoplogs. The area between the upstream sill and the stoplogs drain through drain lines into the lock chamber. Return all fish found to the forebay.

14.4.2 Close upstream tainter valves and install upstream tainter valve bulkheads. After bulkheads are set, reopen the upstream tainter valves and place clearances to keep them open until fish salvage is finished.

14.4.3 Using the downstream tainter valves, drain the chamber to tailwater elevation.

14.4.4 Open downstream miter gates to allow access to fish between miter gates and stoplogs.

14.4.5 A contractor will install downstream bulkheads. After downstream bulkheads are installed, open the 4" unwatering" pumps (pumps 3 and 4 are not available during this stage) to lower the pool within the lock chamber. With a tailwater elevation of 15' msl, draining will take about 15 hours.

14.4.6 When the water elevation reaches the diffuser manifolds at -14' msl, be prepared to stop pumping if fish are stranding. If necessary, fish salvage personnel may enter the lock chamber to collect stranded fish, and to prepare for further fish rescue. Access will primarily be by use of the downstream crane or scaffolding.

14.4.7 Place all fish in the recovery tank.

14.4.8 Resume pumping water and continue until the water surface approaches the bottom of the diffusion channels (floor is at -24.25 el). Personnel will be placed by crane on the channel floor or will use ladders to get to there from the -14' elevation.

14.4.9 Place the recovery tank in a convenient location. Bag any fish and place them in the recovery tank or remove them. Remove fish from inside and outside of the diffuser conduit. At least three people should tend each manifold arm.

14.4.10 After all fish have been removed from the diffuser manifold arms, resume pumping the water down to about elevation -30.0'. As receding water allows, send personnel into the "crossover" area in the middle of the lock chamber. Access is through the manifold arms. Two groups of at least 3 people should simultaneously enter the crossover area via the Western manifold arms and the Eastern arms. The group entering from the West must proceed South to enter the fill/unwatering tunnel and those entering via the Eastern arms must proceed toward the North. (The conduit is split horizontally in this area so for one to go opposite of the direction advised, a ladder would be required). From the crossover area, teams should proceed to the upstream ends of their respective tunnels and then move any fish back down toward the crossover area. Both teams should report at the crossover area before proceeding further.

14.4.11 After all personnel have reassembled in the crossover area, pump water down to about -31.0' el. Personnel should proceed again in two teams down the tunnels, beyond the downstream tainter valves.
14.4.12 After both teams have arrived at the slope downstream of the downstream tainter valves, water should be pumped down again to about -33.0' el. Personnel should be able to signal their arrival using radio or flashlight in the bottom of the tainter valve shafts. The teams should then move fish into the diffuser areas, where they (personnel and fish) can be removed.
14.4.13 Place tank by crane on the floor between the two diffuser systems. Suggested crane access is on the north side of the channel beside the road traffic bridge.

14.5 EQUIPMENT REQUIRED.
14.5.1 Recovery tank/tank truck to collect fish and release fish.
14.5.2 Ladders for access to diffusion chamber floors (10' drop).
14.5.3 Flashlights/headlamps and plenty of batteries.
14.5.4 Fish Bags to collect small fish in tunnels.
14.5.5 Crane and basket to place the recovery tank and personnel in the navlock chamber.
14.5.6 Dip nets to move fish and place them into the fish tank.
14.5.7 Personal protective equipment suitable for wading through pools and handling fish.
14.5.8 Safety harness and lanyard for each person entering the draft tube.
14.5.9 Seines to move fish through fill/unwatering tunnels.
14.5.10 Radios though communication will be hindered when personnel are in tunnels.

14.6 PERSONNEL
14.6.1 Project Fisheries to supervise and lead dewatering activities.
14.6.2 Fish salvage personnel. Each team must include one biologist. *Two teams of three.*
14.6.3 Crane operator and signalman to place the fish transport tank and personnel.
14.6.4 Operator to operate gates and place clearances
14.6.5 Lock operators as needed.

Pertinent information: Diagram BDN-1-3/109 Vol 1 sheet G109 shows the fill/empty system.

Upstream miter gate sill	51.00' el.
Lock chamber floor	-14.00' el.
Floor at downstream miter gate.	-15.92' el.
Floor at downstream diffusers	-17.00' el.
Floor of chamber diffuser manifold.	-24.25'
Floor of downstream diffuser manifold	-34.00' el.

Floor of fill/empty tunnel

At upstream tainter valves	-31.00' el.
At crossover (center of chamber)	-31.50' el.
At downstream tainter valves	-32.00' el.
At downstream diffusers	-34.00' el.
Diffuser manifold ports	4'5½" x 2'-3"

Unwatering pumps:

UW1 (North upstream tainter valve)	5,800 gpm
UW2 (South upstream tainter valve)	5,800 gpm
UW3 (North downstream tainter valve)	1,200 gpm
UW4 (South downstream tainter valve)	1,200 gpm
UW5 (North downstream of UW3)	7,000 gpm
UW6 (South downstream of UW4)	7,000 gpm

15. LAMPREY PASSAGE SYSTEMS

15.1 GENERAL. The project currently has 4 Lamprey Passage Systems (LPSs): Bradford Island AWS channel, Cascades Island fish ladder entrance to forebay, WA Shore LFS/LPS, and the WA Shore AWS channel. The procedure for dewatering an LPS is applicable to all LPSs on the project.

15.2 COORDINATION. The Control Room and the FPOM agencies should be notified. The lamprey counting coordinator should be made aware of the dewatering and exact hour the LPS is taken out of service.

15.3 PREPARATION. No clearances are usually required. Assemble necessary equipment.

15.4 DRAINING.
15.4.1 Open all rest box and flume coverings.
15.4.2 Insure that no fish are actively migrating in the flume sections of the LPS and all remaining fish are confined to rest boxes.
15.4.3 Turn water supply pumps off.
15.4.4 Salvage fish from the rest boxes with dip nets.
15.4.5 Remove drain plugs from rest boxes.
15.4.6 Any rest boxes that are inaccessible should be remotely flushed to insure no fish are left inside.
15.4.7 Personnel should walk the length of the LPS and inspect for structural damage and debris.

15.5 EQUIPMENT REQUIRED
15.5.1 Recovery tank/tank truck to collect fish and release fish.
15.5.2 Dip nets (small) for collecting fish.
15.5.3 Fish Bags to collect fish and move to tank.
15.5.4 Personal protective equipment suitable for handling fish.

15.6 PERSONNEL
15.6.1 Project Fisheries to supervise and lead dewatering activities.
15.6.2 Fish salvage personnel. At least two people are needed.

DOCUMENTATION

BONNEVILLE DAM

BIOLOGIST'S FISH RECOVERY REPORT

DATE:_____ TIME:_____ REPORTEE:_____

FISH LADDER/FACILITY/UNIT:_____

REASON FOR OUTAGE:_____

CORPS BIOLOGISTS:_____

OTHER AGENCY REP'S:_____

FISH INFORMATION:

ESTIMATED NUMBER AND SPECIES OF FISH RECOVERED:
LOCATION 1:_____

_____

LOCATION 2:_____

_____

CONDITION OF FISH:_____

OTHER NOTES:_____

_____

LADDER INSPECTION:

DIFFUSER GRATING CONDITION:_____

_____

FISH COUNTING STATION:

PICKET LEADS:_____ **CROWDER WINDOW:**_____

COUNTING WINDOW:_____ **DEBRIS IN LADDER :**_____

OTHER NOTES OR MAINTENANCE NEEDS:

_____

_____

_____

ACTIVITY HAZARD ANALYSIS

ACTIVITY: Tour BON Fish Facilities ANALYZED BY/DATE: REVIEWED BY/DATE:

References are to COE Safety and Health Requirements Manual EM 385-1-1 revised 3 September 1996.

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
General	Falling objects. Collisions. Physical over-exertion. Hazardous Energy Control.	Hard hats shall be worn in all restricted areas (05.D.01). Participants will be advised of the exertion required before starting the tour. Laser pointing devices, such as used in presentations, shall not be directed toward people (06.F.01.j). Provide overview of HECP (12.B.01.C)
Transportation	Collision.	Government vehicle regulations (18.A), posted speed limits and traffic signs shall be followed. Seat belts must always be used (18.B.02).
Tour forebay decks	Crane operation. Openings in deck. Drowning.	Keep distance from crane operation. Openings in deck must be protected. Personnel must stay at least 4' away from any unprotected open holes. At drop-offs over water, personnel must stay behind railing. Life rings are located where there is potential for falling into water (05.I.04).
Tour tailrace decks	Crane operation. Openings in deck. Drowning. Automatically operating equipment.	Keep distance from crane operation. Openings in deck must be protected. Stay at least 4' away from any unprotected open holes. At drop-offs over water, personnel must stay behind railing. Life rings are located where there is potential for falling into water (05.I.04). Keep away from equipment, such as gate hoists that operate automatically.
Tour juvenile fish bypass systems	Noise.	Provide hearing protection in noisy areas (05.C.01).
Tour adult fish lab	Crane operation.	Keep clear of overhead crane when it operates.
Tour juvenile fish facility	Noise.	Provide hearing protective devices. Keep away from equipment, such as sampling tank, as it is operated.
EQUIPMENT USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
Safety helmets Vehicles Hearing protection Life rings	Inspect vehicle safety equipment daily. Inspect life rings regularly.	Vehicle drivers are to be current with defensive driving training (18.B.01). Hazardous Energy Control Procedures training must be current (12.B.01.c).

Example Teletypes for BI Single Branch Dewatering

Sent to: CO
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
BON R 102011 1611 CO TDA BON JDA MCN BPA NPD NPB NPC NPP

ATTN: BONNEVILLE AND BPA

SUBJECT: OPERATIONS TO FACILITATE REPAIRS OF BRADFORD
ISLAND B-BRANCH FISH LADDER

1. TO FACILITATE THE ONGOING REPAIR WORK OF THE BRADFORD
ISLAND B-BRANCH FISH LADDER, OPERATE AS FOLLOWS:

2. EFFECTIVE AT 0600 HOURS ON FRIDAY, OCTOBER 21, AND UNTIL
FURTHER NOTICE, OPERATE THE BONNEVILLE FOREBAY TO A MINIMUM
ELEVATION OF 73.0 FEET AS A HARD CONSTRAINT.

3. CONTINUE TO OPERATE THE BONNEVILLE FOREBAY TO A MAXIMUM
OF 75.5 FEET AS A HARD CONSTRAINT UNTIL FURTHER NOTICE.

...

7. THE MINIMUM FOREBAY ELEVATION OF 73.0 FEET IS IN RESPONSE
TO WATER DEPTH ISSUES IN THE A-BRANCH LADDER WHICH IS
CURRENTLY DEPENDENT ON FOREBAY ELEVATION FOR FLOW DUE TO
REPAIR WORK IN THE B-BRANCH. FOREBAY ELEVATIONS BELOW 73.0
FEET MAY DELAY FISH PASSAGE OVER THE UPPER A-BRANCH LADDER
WEIRS. THE MAXIMUM FOREBAY ELEVATION OF 75.5 FEET WAS
ESTABLISHED SO THAT WATER DOES NOT OVER-TOP THE JUNCTION
POOL WEIR AND FLOW INTO THE DEWATERED B-BRANCH.

9. THIS OPERATION WAS REQUESTED BY BEN HAUSMANN (COE-BON),
AND WAS COORDINATED WITH SCOTT BETTIN (BPA), TRAVIS TOGO

(BPA), KRISTINE BARTLETT (BPA) AND DAVE SMITH (COE-BON).

10. RCC POINT OF CONTACT IS LISA WRIGHT –
OFFICE: (503) 808-3943; CELL (503) 716-6598.
ALTERNATE RCC CONTACT IS DOUG BAUS –
OFFICE (503) 808-3995; HOME (503) 351-3692.

LISA WRIGHT
CENWD/RCC10

Sent to: CO
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
BON R 092612 1005 CO TDA BON JDA MCN BPA NPD NPB NPC NPP

ATTN: BONNEVILLE AND BPA

SUBJECT: FOREBAY RESTRICTION FOR B-BRANCH REPAIRS

1. EFFECTIVE IMMEDIATELY UNTIL FURTHER NOTICE DURING DAYTIME
HOURS OPERATE THE BONNEVILLE FOREBAY FROM 74.5 – 75.5 FEET
AS A HARD CONSTAINT. DAYTIME HOURS FROM SEPTEMBER 17 – OCTOBER
04 ARE 0600 – 1930 HOURS. DAYTIME HOURS WILL CHANGE FOR THIS
OPERATION AND THE REMAINING DAYTIME HOURS MAY BE FOUND IN
THE 2012 FPP IN TABLE BON-5 (PAGE BON-12) WHICH MAY BE FOUND
ON THE FOLLOWING WEBSITE:

http://www.nwd-wc.usace.army.mil/tmt/documents/fpp/2012/index.html

DURING NIGHTTIME HOURS OPERATE BONNEVILLE FOREBAY FROM 73.5
TO 75.5 FEET AS A HARD CONSTRAINT AND 74.5 TO 75.5 FEET AS
A SOFT CONSTRAINT.

2. THE GOAL OF THIS OPERATION IS TO FACILITATE REPAIR WORK
OF THE BRADFORD ISLAND B-BRANCH FISH LADDER AND TO MINIMIZE
THE DURATION A-BRANCH LADDER WEIRS ARE OUTSIDE OF FPP CRITERIA

AS MUCH AS POSSIBLE WHILE PROVIDING BPA WITH FLEXIBILITY DURING NIGHTIME HOURS DUE TO OTHER CONCURRENT OPERATIONAL CONSTRAINTS.

3. THE MINIMUM FOREBAY ELEVATION OF 74.5 FEET DURING DAYTIME HOURS IS INTENDED TO PROVIDE ADEQUATE WATER DEPTH IN THE UPPER BRADFORD ISLAND LADDER DURING ADULT FISH PASSAGE HOURS. THE BRADFORD ISLAND LADDER IS DEPENDENT ON FOREBAY ELEVATION FOR FLOW DUE TO AUXILIARY WATER SYSTEM OUTAGES TO KEEP B-BRANCH DEWATERED. THE MAXIMUM FOREBAY ELEVATION OF 75.5 FEET WAS ESTABLISHED SO THAT WATER DOES NOT OVER-TOP THE JUNCTION POOL WEIR AND FLOW INTO THE DEWATERED B-BRANCH.

5. THIS OPERATION WAS REQUESTED BY BEN HAUSMANN (COE-BON), AND WAS COORDINATED WITH RAY GUAHARDO (COE-BON), BERN KLATTE (COE-NWP), SCOTT BETTIN (BPA), AND BILL BERRY (BPA).

6. RCC POINT OF CONTACT IS DOUG BAUS – OFFICE (503) 808-3995; HOME (503) 351-3692. ALTERNATE RCC CONTACT IS LISA WRIGHT - OFFICE: (503) 808-3943; CELL (503) 716-6598.

DOUG BAUS
CENWD-PDW-RC