2022 Fish Passage Plan

Chapter 3 – The Dalles Dam

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The Dalles Dam *

Project Acronym	TDA
River Mile (RM)	Columbia River – RM 191.5
Reservoir	Lake Celilo
Minimum Instantaneous Flow (kcfs)	Dec–Feb: 12.5 kcfs \ Mar–Nov: 50 kcfs
Forebay Normal Operating Range (ft)	155.0’ – 160.0’
Tailrace Rate of Change Limit (ft)	3’/hr
Powerhouse Length (ft)	2,089’
Powerhouse Hydraulic Capacity (kcfs)	375 kcfs
Turbine Units	22 (BLH Kaplan) + 2 Fish Units
Turbine Generating Capacity (MW)	Rated: 1,808 MW (Units 1-14 @ 78 MW/unit + Units 15-22 @ 86 MW/unit) Maximum: 2,080 MW (Units 1-14 @ 90 MW/unit + Units 15-22 @ 99 MW/unit)
Gatewell Orifice Diameter (in)	One 6” orifice per gatewell
Spillway Length (ft)	1,447’
Spillway Hydraulic Capacity (kcfs)	2,290 kcfs
Spillbays (#)	23
Spillway Weirs (#)	0
Navigation Lock Length x Width (ft)	650’ x 86’
Navigation Lock Max. Lift (ft)	90’

* More information for The Dalles Dam is available on the Corps Portland District website at: www.nwp.usace.army.mil/The-Dalles/

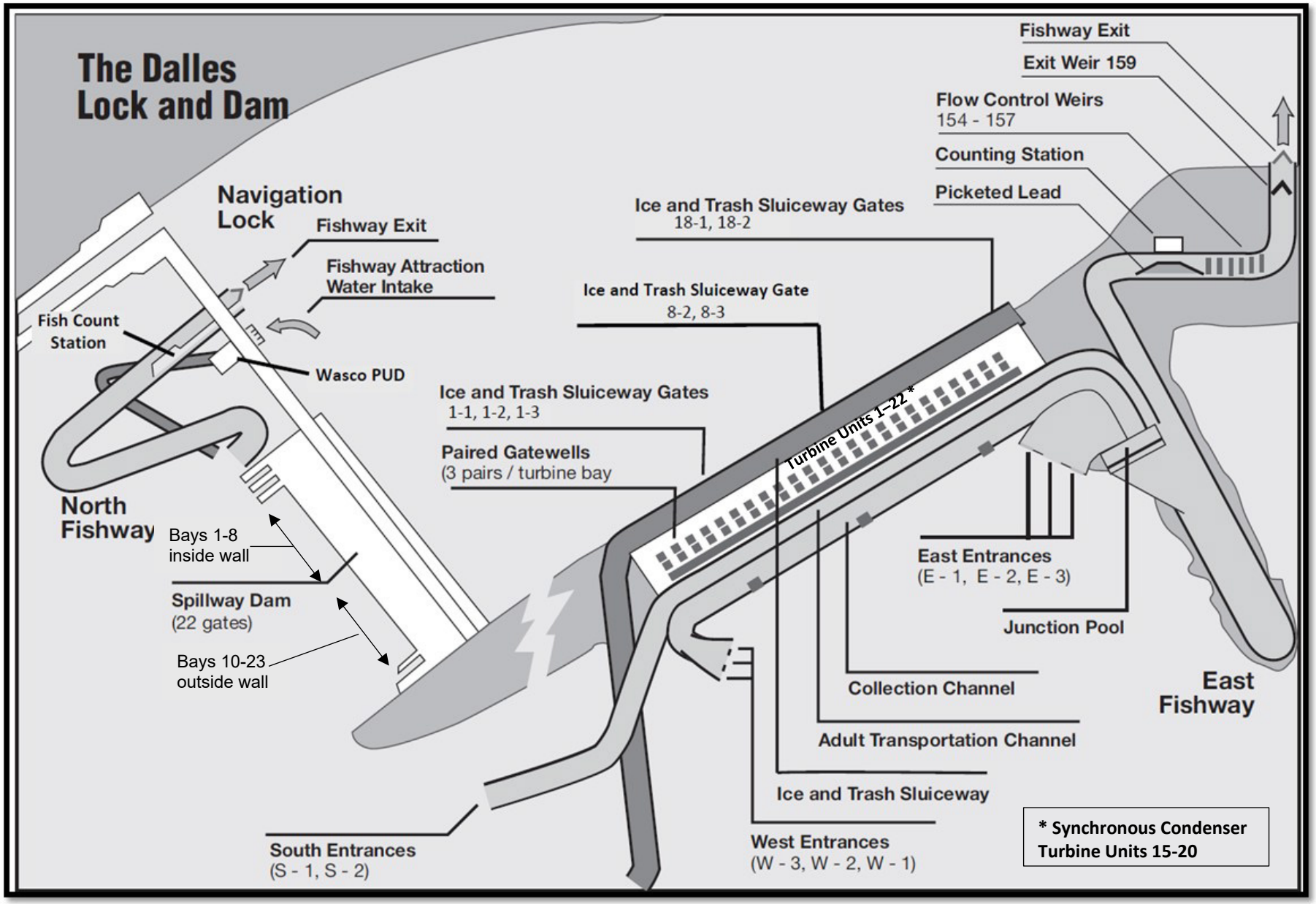


Figure TDA-1. The Dalles Dam General Site Plan.

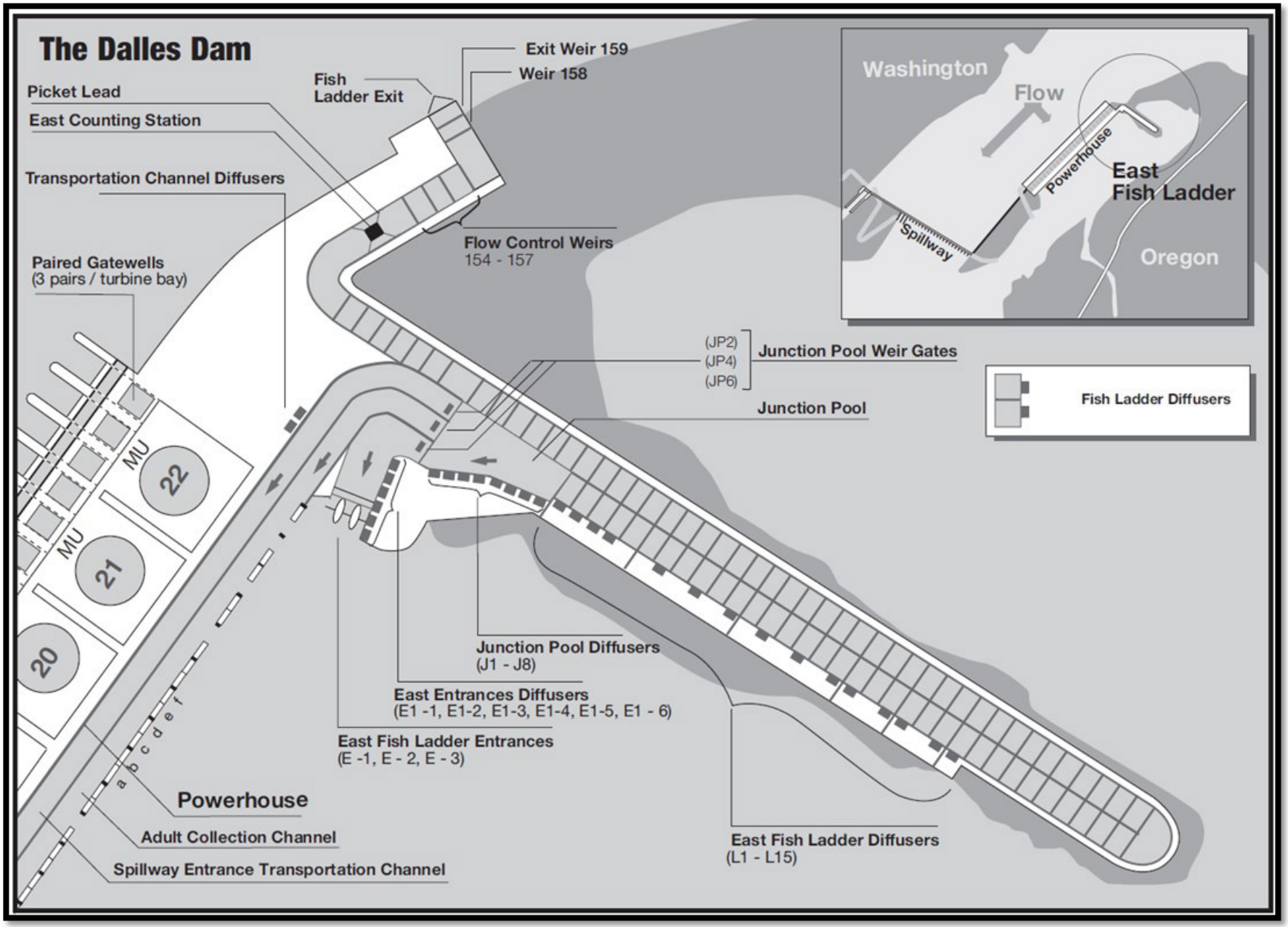


Figure TDA-2. The Dalles Dam East Fish Ladder.

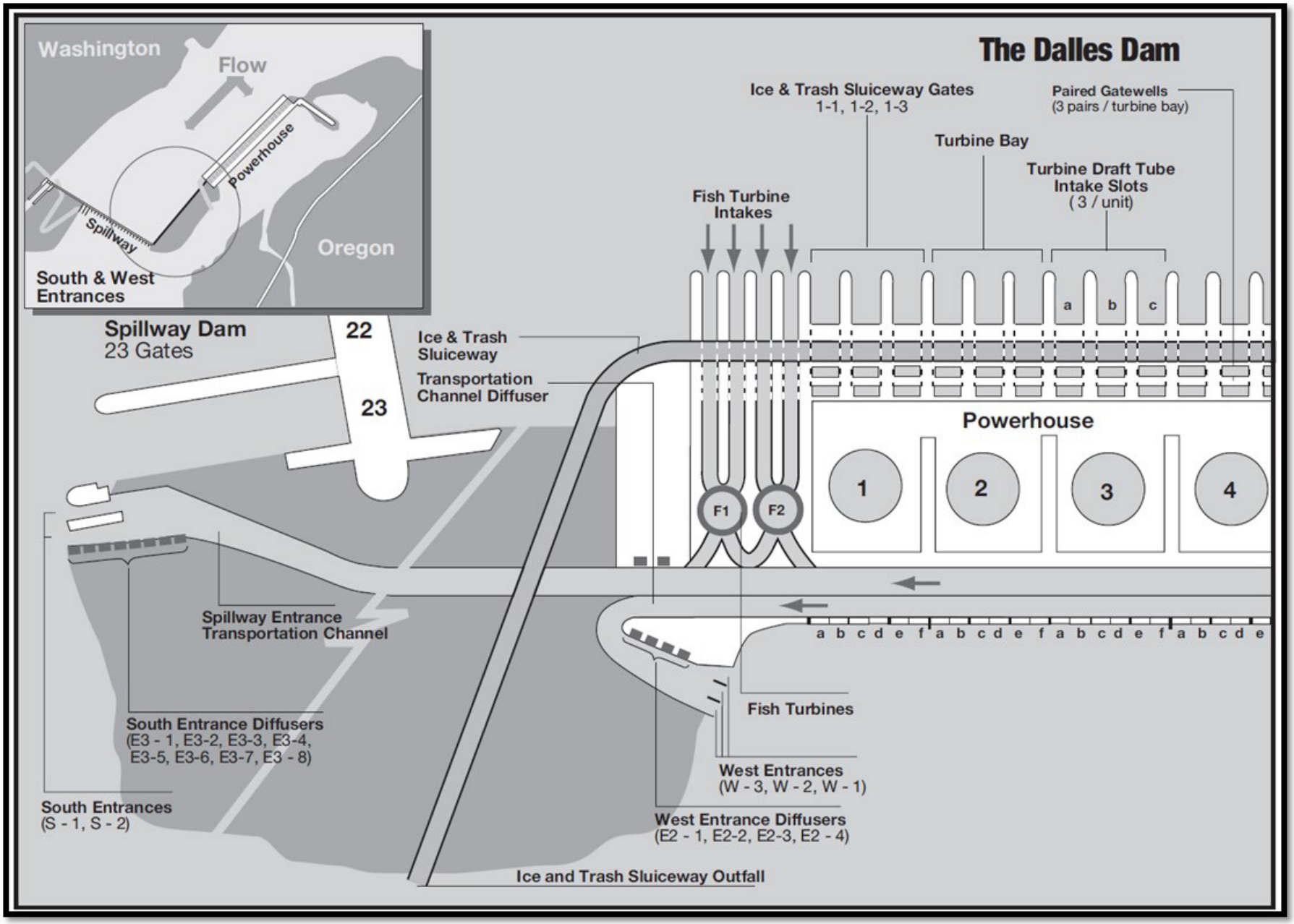


Figure TDA-3. The Dalles Dam South and West Fish Ladder Entrances.

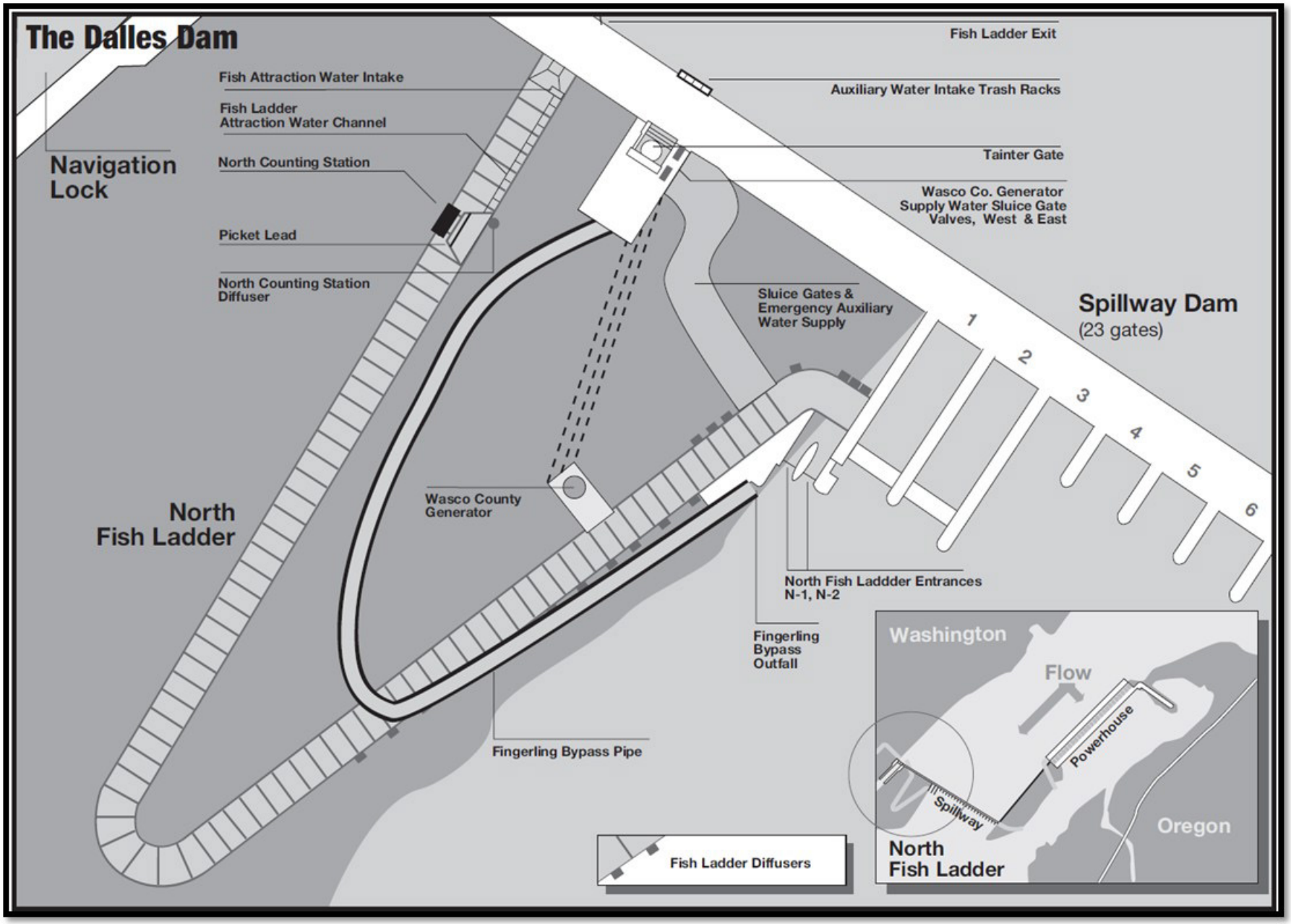
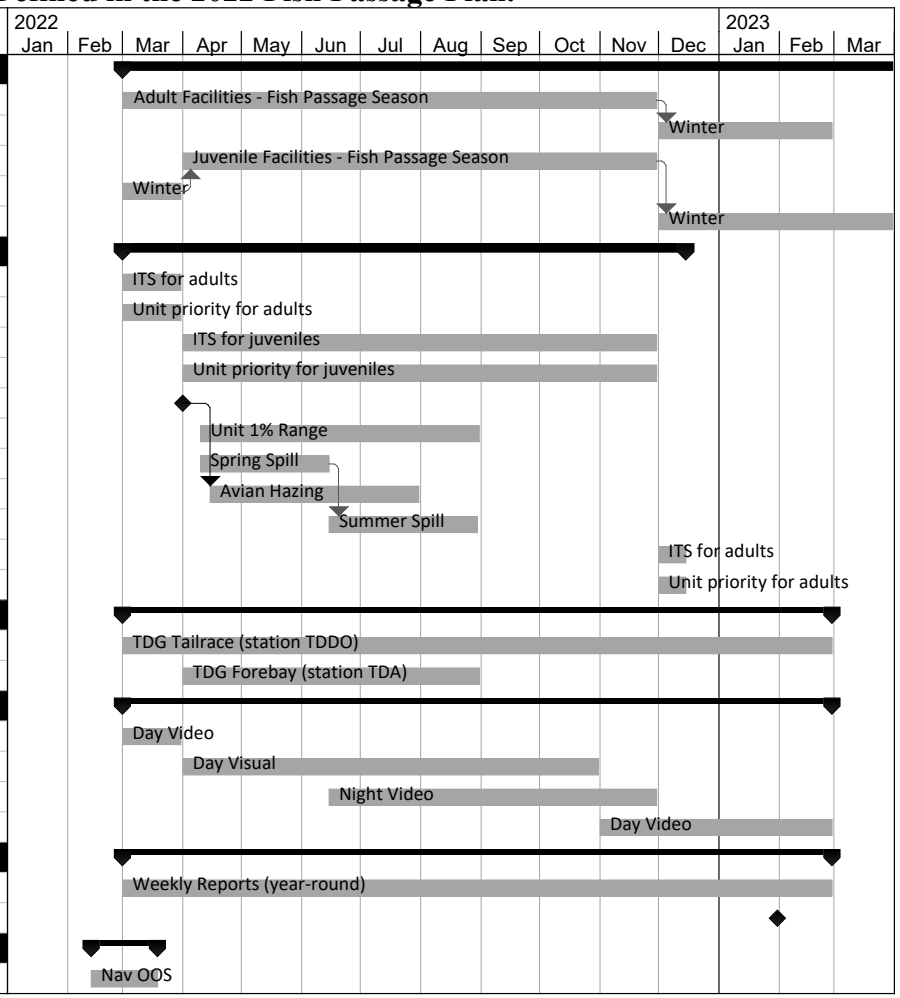


Figure TDA-4. The Dalles Dam North Fish Ladder and Spillway.

Table TDA-1. The Dalles Dam Schedule of Operations and Actions Defined in the 2022 Fish Passage Plan.

Task Name	Start	Finish	FPP Section
FISH PASSAGE FACILITIES	**Tue 3/1/22**	**Fri 3/31/23**	
Adult Facilities - Fish Passage Season	Tue 3/1/22	Wed 11/30/22	2.4.2
Adult Facilities - Winter Maintenance	Thu 12/1/22	Tue 2/28/23	2.4.1
Juvenile Facilities - Fish Passage Season	Fri 4/1/22	Wed 11/30/22	2.3.2
Juvenile Facilities - Winter Maintenance	Tue 3/1/22	Thu 3/31/22	2.3.1
	Thu 12/1/22	Fri 3/31/23	
PROJECT OPERATIONS FOR FISH PASSAGE	**Tue 3/1/22**	**Thu 12/15/22**	
ITS for kelts, adult fallbacks	Tue 3/1/22	Thu 3/31/22	2.4.1.7
Turbine unit priority order for adults	Tue 3/1/22	Thu 3/31/22	4.1
ITS for juvenile passage	Fri 4/1/22	Wed 11/30/22	2.3.2.6
Turbine unit priority order for juveniles	Fri 4/1/22	Wed 11/30/22	4.1
Avian Wires installed NLT April 1	Fri 4/1/22	Fri 4/1/22	App L 4.2
Turbine unit 1% operating range	Sun 4/10/22	Wed 8/31/22	4.2
Spring Spill	Sun 4/10/22	Wed 6/15/22	App E (FOP)
Avian Hazing	Fri 4/15/22	Sun 7/31/22	App L 4.2
Summer Spill	Wed 6/15/22	Tue 8/30/22	App E (FOP)
ITS for kelts, adult fallbacks	Thu 12/1/22	Thu 12/15/22	2.4.1.7
Turbine unit priority order for adults	Thu 12/1/22	Thu 12/15/22	4.1
TDG MONITORING	**Tue 3/1/22**	**Tue 2/28/23**	
TDG Monitoring - Tailrace (year-round)	Tue 3/1/22	Tue 2/28/23	2.2.2
TDG Monitoring - Forebay	Fri 4/1/22	Wed 8/31/22	2.2.2
ADULT FISH COUNTING	**Tue 3/1/22**	**Tue 2/28/23**	
Day Video 0400-2000 PST	Tue 3/1/22	Thu 3/31/22	1.2.2
Day Visual 0500-2100 PDT	Fri 4/1/22	Mon 10/31/22	1.2.2
Night Video 2100-0500 PDT	Wed 6/15/22	Wed 11/30/22	1.2.2
Day Video 0400-2000 PST	Tue 11/1/22	Tue 2/28/23	1.2.2
REPORTS	**Tue 3/1/22**	**Tue 2/28/23**	
Weekly Reports (year-round)	Tue 3/1/22	Tue 2/28/23	2.5.2
Annual Report due NLT Jan 31	Tue 1/31/23	Tue 1/31/23	2.5.2
SPECIAL OPS & STUDIES (APPENDIX A)	**Sun 2/13/22**	**Sat 3/19/22**	
Navigation Lock Outage	Sun 2/13/22	Sat 3/19/22	App A 1.4



1. FISH PASSAGE INFORMATION

Fish passage facilities at The Dalles Lock & Dam are shown in **Figures TDA-1** through **TDA-4** and described below. The annual schedule of project operations, maintenance, and other actions described in the Fish Passage Plan (FPP) and Appendices is included in **Table TDA-1**.

1.1. Juvenile Fish Facilities and Migration Timing

1.1.1. Juvenile Fish Facilities. Turbine units at The Dalles Dam are not screened. Juvenile fish passage routes at The Dalles Dam consist of the spillway, the Ice & Trash Sluiceway (ITS), and one 6" orifice in each turbine unit gatewell. The sluiceway is a rectangular channel that extends along the forebay side of the 22-unit powerhouse that provides a surface passage route for fish. When any of the sluiceway gates (located in the forebay side of the sluiceway) are opened, water and fish are skimmed from the forebay into the sluiceway and released in the tailrace downstream of the project.

1.1.2. Juvenile Fish Migration Timing. There is no juvenile monitoring at The Dalles Dam. The primary juvenile fish passage period at The Dalles Dam is April–November based on monitoring at John Day Dam (see **FPP Chapter 4 - John Day Dam, Table JDA-2**) – juvenile fish arrival at The Dalles Dam is approximately one day later than at John Day. Diel passage of juvenile fish at The Dalles Dam sluiceway is affected by spill and flow conditions. In years of consistently high flow and spill, fish may be distributed higher in the water column and daytime passage may increase.

1.2. Adult Fish Facilities and Migration Timing

1.2.1. Adult Fish Facilities.

1.2.1.1. Adult fish passage facilities at The Dalles Dam consist of a north shore ladder that passes fish collected at the north end of the spillway and an east ladder that passes fish collected at the south end of the spillway and across the downstream face of the powerhouse. The east fishway auxiliary water is provided by two fish turbine units providing 4.7–5.0 kcfs. A backup auxiliary water supply, unscreened for juveniles, can provide 1.5 kcfs if needed. The backup system can be used in conjunction with a single fish unit. Annual maintenance of adult fish facilities is scheduled during the winter maintenance period (December through February) to minimize impacts on upstream migrants. One ladder is dewatered at a time unless otherwise coordinated through FPOM.

1.2.1.2. North Wasco PUD operates a small hydropower facility constructed in 1991 that utilizes the north fishway ladder auxiliary water supply. Adult fishway criteria associated with this facility are monitored and maintained during daily fishway inspections. A backup auxiliary water supply system has been upgraded to facilitate its use if needed. The backup system is the originally constructed water supply to the north fish ladder and does not provide juvenile screening. Survival through this system is unknown.

1.2.2. Adult Fish Migration Timing & Counting.

1.2.2.1. Upstream migrants are present throughout the year and adult passage facilities are operated year-round. Counting of adult salmon, steelhead, bull trout, lamprey, and shad occurs during the dates defined for the current year in **Table TDA-2**, and daily counts are posted online.[1] The presence of other species (i.e., sturgeon, grass carp, Atlantic salmon, etc.) are recorded as comments and reported in the *Annual Fish Passage Report*.

1.2.2.2. Yearly counts through the most recent passage year are used to determine the earliest and latest dates of peak adult passage in **Table TDA-3**.

1.2.2.3. Time-of-day (diel) distributions of adult salmonid activity at The Dalles Dam fishway entrances and exits are shown in **Figure TDA-5**.

Table TDA-2. The Dalles Dam Adult Fish Count Schedule March 2022 – February 2023.

Count Period	Counting Method and Hours *
March 1 – 31	Day Video 0400–2000 hours (PST)
April 1 – October 31	Day Visual 0500–2100 hours (PDT)
June 15 – November 30	Night Video 2100–0500 hours (PDT)
November 1 – end of February	Day Video 0400–2000 hours (PST)

*PST = Pacific Standard Time; PDT = Pacific Daylight Time, in effect during daylight saving time 3/13/22–11/6/22.

Table TDA-3. The Dalles Dam Adult Fish Count Period and Peak Passage Timing (based on yearly counts since 1957, except lamprey since 2000).

Species	Count Period	Earliest Peak	Latest Peak
Spring Chinook	Apr 1 – Jun 3	Apr 13	May 23
Summer Chinook	Jun 4 – Aug 3	Jun 6	Aug 1
Fall Chinook	Aug 4 – Oct 31	Sep 2	Sep 23
Sockeye	Apr 1 – Oct 31	Jun 20	Jul 10
Steelhead	Apr 1 – Oct 31	Jul 9	Sep 23
Coho	Apr 1 – Oct 31	Sep 3	Oct 25
Lamprey	Apr 1 – Oct 31	Jun 29	Aug 1

[1] Daily adult salmon counts: https://www.fpc.org/currentdaily/HistFishTwo_7day-ytd_Adults.htm

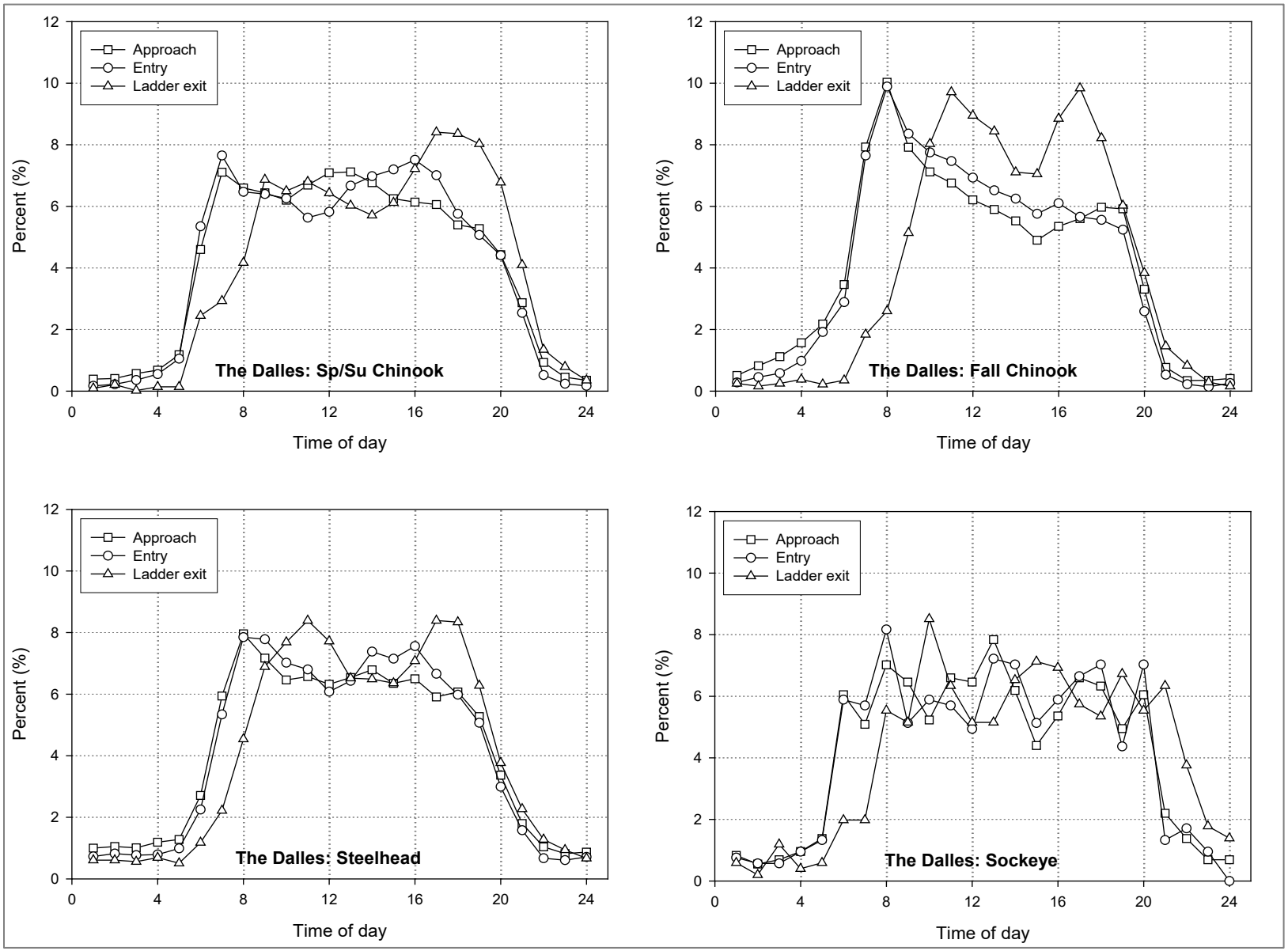


Figure TDA-5. Diel Distribution of Adult Salmonids at The Dalles Dam Fishway Entrances and Exits (*Keefer & Caudill 2008*). Report and summary letter available online at: pweb.crohms.org/tmt/documents/FPOM/2010/2013_FPOM_MEET/2013_JUN/

2. FISH FACILITIES OPERATION

2.1. General

2.1.1. Research, non-routine maintenance, fish-related activities, and construction will not be conducted within 100' of any fishway entrance or exit, within 50' of any other part of the adult fishway, or directly in, above, or adjacent to any fishway, unless coordinated with FPOM or FFDRWG by the Project, District Operations and/or Planning or Construction office. Alternate actions will be considered by District and Project biologists in conjunction with the regional fish agencies on a case-by-case basis.

2.1.2. Yearly special operations related to research are described as currently coordinated in **Appendix A - Special Project Operations & Studies**.

2.1.3. Emergency situations should be dealt with immediately by the Project in coordination with the Project and/or District biologist. If unavailable, the biologists will be informed immediately following the incident of steps taken to correct the situation. On a monthly basis, as necessary, the Project biologist will provide FPOM a summary of any emergency actions undertaken.

2.1.4. All activities within boat restricted zones (BRZ) will be coordinated with the Project at least two weeks in advance unless it is deemed an emergency (see coordination guidance in **Chapter 1 - Overview**).

2.1.5. All fish passage related equipment and operations will be inspected twice daily. Additionally, entrance differential and weir depth 12-hour trends will be monitored daily from the data logging system to track operational changes and included in weekly status reports.

2.2. Spill Management

2.2.1. Spring and summer spill operations for juvenile fish passage are defined in the *Fish Operations Plan* (FOP), included in the FPP as **Appendix E**. Spill patterns are in **Table TDA-7**.

2.2.2. Excessive total dissolved gas (TDG) may harm fish and will be controlled to the extent possible, subject to river conditions. Management tools include system-wide spill distribution through the *Spill Priority List* issued by the Corps Northwestern Division Reservoir Control Center (RCC), night and/or day spill limits, and shaping of spill. Monitoring of TDG at The Dalles Dam occurs during the periods defined in **Table TDA-1**, pursuant to the Corps' annual *TDG Management Plan* and the current *Dissolved Gas Monitoring Plan of Action*.[2]

2.2.3. During spill that occurs December 16 through the end of February, the Ice & Trash Sluiceway (ITS) will be operated if available to provide a surface passage route. Operate three gates on Unit 1 and three gates on Unit 18.

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[2] TDG Management Plan (Appendix 4 of the WMP): pweb.crohms.org/tmt/documents/wmp/
TDG Monitoring Plan of Action: www.nwd.usace.army.mil/Missions/Water/Columbia/Water-Quality/

2.3. Operating Criteria - Juvenile Fish Facilities

2.3.1. Juvenile Fish Facilities - Winter Maintenance Period (December 1 – March 31).

2.3.1.1. Use an ROV to inspect trashracks and main unit intakes. Remove debris from forebay, trashracks, gatewell slots, and gatewell orifices so that these areas are free of debris on the first day of juvenile passage season, April 1.

2.3.1.2. Inspect, lubricate, and test hoist-operated chain gates, end gates, and hoists for operation as needed.

2.3.1.3. Inspect and repair spill gates and control systems as needed so that the spillway can achieve FPP spill patterns April 10 through August 31, except for coordinated changes. No more than two functioning bays within the spillwall may be out at one time in case of spill.

2.3.1.4. Discontinue operation of the ice & trash sluiceway (ITS) from December 16 through the end of February, 24 hours/day, except during periods of spill when the sluiceway will be operated if available, per **section 2.2.3**. Close the endgate and open sluice gates 1-1 and 18-3 to allow fish egress from the ITS when equalized with the forebay. Inspect and correct any epoxy or concrete deficiencies on the ITS walls and floors, where accessible.

2.3.1.5. Ensure avian abatement measures are in place by April 1, in accordance with *Predation Monitoring & Deterrence Action Plans* in **Appendix L** (Table 2 and section 4).

2.3.2. Juvenile Fish Facilities – Juvenile Fish Passage Season (April 1 – November 30).

2.3.2.1. Inspect all gatewells daily.

2.3.2.2. Measure gatewell drawdown at least once per week and more frequently as needed during high debris periods (three times per week or more). Clean trashracks when drawdown in gatewell slots exceeds 1.5’, or as flow conditions dictate.

2.3.2.3. Between June 1 and June 15, determine if there is debris buildup on the trashracks by inspecting three units across the powerhouse that have the most prior operation and will not interfere with sluiceway operation. Rake trashracks as needed (all trashracks can be raked using the Hammerhead crane).

2.3.2.4. Project maintenance will permanently close the gate slot orifices as the unit intakes are serviced over the next few years, utilizing orifice plates as covers.

2.3.2.5. From April 1 through November 30, operate the ITS 24 hours/day per **Table TDA-4** for juvenile fish passage**.** Open gates 1-1, 1-2, 1-3 over operating Main Unit (MU)-1; open gates 8-1, 8-3 over operating MU-8; and open gate 18-2 over operating MU-18. If any these MUs are out of service for more than 10 hours, operate the next available MU and associated gates adjacent to the unit (i.e., if MU-1 is OOS, operate MU-2 w/gates; if MU-18 is OOS, operate MU-17 w/gates or MU-19 w/gates).

Table TDA-4. The Dalles Dam Ice & Trash Sluiceway (ITS) Schedule of Operations.

DATES	SLUICEWAY OPERATION (24 hrs/day)	PURPOSE	FPP Section
March 1–31; December 1–15	OPEN End gate OPEN Sluice gates 1-2, 1-3 / 18-1, 18-2	Adult fallback, kelt passage	**2.4.2.9 (Mar)** **2.4.1.6 (Dec)**
April 1– November 30	OPEN End gate OPEN Sluice gates 1-1, 1-2, 1-3 / 8-1, 8-3 / 18-2	Juvenile passage	**2.3.2.6**
*December 16– end of February	CLOSE End gate OPEN Sluice gates 1-1 / 18-3	No passage. Allows egress when equalized w/ forebay	**2.3.1.4,** **2.4.1.7.ii**

*Dec 16–end of Feb, discontinue ITS operation except during periods of spill when the ITS will be operated if available, per **section 2.2.3**.

2.3.2.6. When units are being dewatered, leave ITS endgate open and close sluice gates to expose gatewell orifices, then install orifice blocker. After orifice-sealing devices are installed, sluice gates should be returned to the open position. All 6” orifices will be closed as units are dewatered. Installation time should be approximately 5 hours.

2.3.2.7. Efforts should be made to keep all petroleum out of gatewells. Project environmental section will determine cleanup efforts if needed. Regardless of unit operating status, oil accumulations will be dealt with promptly.

2.3.2.8. Spill for fish passage will be distributed across the spillbays as defined in the spill pattern table at the end of this chapter (**Table TDA-7**).

2.3.2.9. Operate in accordance with the *Predation Monitoring and Deterrence Action Plans* for The Dalles Dam in **Appendix L** (Table 2 and section 4).

2.4. Operating Criteria - Adult Fish Facilities

2.4.1. Adult Fish Facilities - Winter Maintenance Period (December 1 – end of February).

2.4.1.1. Only one of the two adult fish facilities may be out of service at any one time during the winter maintenance period unless coordinated through FPOM. The operating facility shall be operated in accordance with fish passage season criteria in **section 2.4.2** unless specially coordinated. Outage periods will be minimized to the extent practicable.

2.4.1.2. Dewatering of areas below tailwater can be done every other year as determined by maintenance needs. All diffuser gratings and weirs will be inspected by ROV if not dewatered.

2.4.1.3. Dewater all ladders and inspect for projections, debris, or plugged orifices that could injure fish or slow their progress up the ladder. Make necessary repairs and complete preventative maintenance.

2.4.1.4. Inspect and calibrate all staff gauges and water level indicators. Repair and/or clean where necessary.

2.4.1.5. Pull exit trashracks and/or inspect and clear debris from the ladder exits.

2.4.1.6. Inspect count station equipment and ensure operational. Prior to watering up ladders, reinstall picket leads at counting stations and ensure they are properly seated with a 1" gap (not to exceed 1.25") along the bottom for lamprey passage.

2.4.1.7. Ice & Trash Sluiceway (ITS).

i. From December 1 through December 15, operate the ITS 24 hours/day per **Table TDA-4** for adult fallback and steelhead kelt passage. Open gates 1-2, 1-3 over operating MU-1, and gates 18-1, 18-2 over operating MU-18. If either of these MUs are out of service, operate the next available MU and associated adjacent gates (i.e., if MU-1 is OOS, then operate MU-2 w/gates; if MU-18 is OOS, then operate MU-17 w/gates or MU-19 w/gates).

ii. From December 16 through the end of February (except during periods of spill when the ITS will be operated if available, per **section 2.2.3**), discontinue ITS operation 24 hours/day. Close the endgate and open sluice gates 1-1 and 18-3 to allow fish egress from the ITS when equalized with the forebay.

2.4.2. Adult Fish Facilities – Adult Fish Passage Season (March 1 – November 30).

2.4.2.1. Maintain staff gauges and water level indicators in readable condition at all water levels encountered during the fish passage season and check accuracy weekly. When necessary, clean and/or recalibrate instruments ASAP.

2.4.2.2. Maintain water depth over fish ladder weirs at 1.0' ±0.1'. During adult shad passage season when more than 5,000 shad/day are counted at Bonneville Dam, increase depth to 1.3' ±0.1', except as defined below.

2.4.2.3. Maintain main entrance weir depths at 8' or greater below tailwater. RCC will regulate to maintain a minimum tailwater of 70' msl to remain in the entrance weir criteria operating range.

2.4.2.4. Maintain head on all entrances in the range of 1'–2' (1.5' optimum). When unable to achieve head criteria, refer to **section 3.2.2**.

2.4.2.5. Remove debris as required to maintain head on attraction water intakes and trash racks at all ladder exits below 0.5', with a maximum head on all picket leads of 0.3'. Remove debris when significant amounts accumulate.

2.4.2.6. Measure fishway channel water velocities once per week during adult passage season as part of the fishway inspection program. If operating the AWS backup system, check velocities 3 times per week. A portable flow meter will be used in accessible locations of the fishway channels that are supplemented by auxiliary water and results provided in the weekly fishway status report. Maintain water velocity in the range of 1.5–4.0 feet per second (fps), 2 fps optimum, for the full length of the powerhouse collection channel and the lower ends of fish ladders that are below tailwater.

2.4.2.7. Fishway Temperature Monitoring.

2.4.2.7.a. Measure water temperatures in the count station of each adult fishway and record in the fishway status report. When water temperature reaches 70°F, all fish handling activities will be coordinated through FPOM prior to any action to verify protocols that will be followed.

2.4.2.7.b. From June 1 through September 30, measure water temperature at adult fishway entrances and exits and submit data to the Fish Passage Center (FPC) weekly for posting online.[3] Ensure the location of the monitors meets the following criteria:

i. Within 10 meters of all shore-oriented entrances and exits.

ii. Entrance monitor within 1 meter above the ladder floor and at least 10 meters downstream of ladder diffusers, if possible, to allow for sufficient mixing with surface water.

[3] FPC ladder temperature data: www.fpc.org/smolt/smolt_queries/Q_ladderwatertempgraphv2.php

iii. Exit monitor within 1 meter above the ladder floor and above all diffusers to allow for sufficient mixing with surface water.

iv. If an existing temperature monitoring location is proposed to be used for either the exit or entrance, verify that the site accurately reflects water temperature within 10 meters of the entrance or exit.

2.4.2.8. Adult Fish Counting.

i. Maintain count station crowders and picket leads in operating position while visual counting, video recording, and when the PIT-tag antenna operation is being conducted. The current fish counting schedule is in **Table TDA-2**.

ii. Crowder ranges are: TDA-East = 20–34", TDA-North = 18–38"

iii. When not counting, or if counting is temporarily discontinued due to unscheduled events, open the crowder to full count slot width. The crowder may remain in operating position during the counter's hourly 10-minute break.

iv. During counting, open the crowder as far as possible to allow accurate counting, at least 18". Do not close to less than 18". This will usually occur during high turbidity conditions to allow count accuracy criteria to be achieved. If passage is impaired by this condition, the count slot may be widened until proper passage conditions are achieved, even though count accuracy may be compromised to some degree. Project biologists, FFU, and the fish count supervisor shall coordinate to achieve optimum count slot passage and/or count accuracy conditions.

2.4.2.9. Ice & Trash Sluiceway (ITS). From March 1–31, operate the ITS 24 hours/day for adult fallback and steelhead kelt passage, per **Table TDA-4**. Open ITS gates 1-2, 1-3 over operating MU-1 and gates 18-1, 18-2 over operating MU-18. If either of these MUs are out of service, operate the next available MU and associated adjacent gates (i.e., if MU-1 is OOS, operate MU-2 w/gates; if MU-18 is OOS, operate MU-17 w/gates or MU-19 w/gates).

2.4.2.10. East Fishway.

i. Removable weirs #154–#157 will drop into the ladder at a differential (water surface at respective weir location relative to the forebay) of 1.0' ±0.1'.

ii. Telescoping weir #159 will adjust to maintain 1.1' ±0.1' depth over the weirs, measured below the counting station.

iii. Telescoping weir #158 will always track 1.0' ±0.1' below weir #159 during fishway operation.

2.4.2.11. North Fishway Entrance. Operate one entrance weir, N1. Project biologists will work in conjunction with Wasco County to maintain fishway entrances within criteria.

2.4.2.12. West Powerhouse Entrance. Operate entrance weirs W1 and W2 to maintain a gate crest of 8' or greater below tailwater. W3 will be closed at 81' msl but will remain operational as backup to W1 and W2.

2.4.2.13. East Powerhouse Entrance. Operate entrance weirs E2 and E3 to maintain a gate crest of 8' or greater below tailwater, currently operated at 13' below tailwater. E1 will be closed at 81' msl but will remain operational. At lower tailwater elevations, E1 may be operated manually at any depth to provide criteria entrance differential. Operate east ladder junction pool weirs at the following minimum depths in relation to east entrance tailwater surface elevation: JP6 > 7'

2.4.2.14. South Spillway Entrance. Operate entrance weirs S1 and S2 to maintain a gate crest at 8' or greater below tailwater. Discharge from the two operating fish units will be adjusted to maintain criteria at all associated fishway entrances. Discharge volume is dependent on criteria levels at entrances.

2.4.2.15. Ladder Crowding. Beginning September 1 (after spill for juvenile fish passage has ended), assess ladder crowding daily during peak seasonal passage periods and operate according to the following criteria:

i. If the East Fishway daily counts of combined adult salmonids exceed 25,000 per day (or 20,000 if ladder temperatures are above 70°F), inspect the entire the East Fishway ladder twice each day by walking from the exit to the east entrance and make observations and picture recording at the pool between 157 and 158, the pool downstream of the count station, and the pool at the 180° bend in the ladder.

ii. If Project Biologists determine there is a fish crowding emergency, or if the East Fishway daily count of combined adult salmonids exceeds 35,000 per day (or 30,000 if ladder temperatures are above 70°F), or if any adult salmonid mortality is observed anywhere in the fishway, attempt to alleviate crowding by immediately notifying the control room to coordinate with BPA and implement an emergency spill operation as soon as possible, as follows: 15 kcfs total spill, with Bay 1 open four stops (6 kcfs) and Bays 7 and 8 each open three stops (4.5 kcfs per bay). Continue this operation and daily coordination with FPOM as long as adult counts are greater than or equal to project passage (both ladders) when the operation started, or unless otherwise coordinated with FPOM.

iii. If inspectors see crowding that is not an emergency but is a concern, consult with FPOM to evaluate the situation. If the team determines crowding is severe enough, implement the spill operation as defined above.

2.5. <u>Fish Facilities Monitoring & Reporting</u>

2.5.1. Monitoring.

2.5.1.1. During fish passage season, inspect fish passage facilities at least twice per day, seven days a week, to ensure operations are in accordance with established criteria. A third inspection will be made using the data logging system. Check entrance conditions daily for the previous 24 hours for entrance criteria.

2.5.1.2. During the winter maintenance period, inspect fish passage facilities once a day, seven days per week.

2.5.1.3. More frequent inspections of some facility components will occur per criteria in this document. Additional fishway inspections may be performed by FFU and fish agencies.

2.5.1.4. Report results of all inspections and the readiness of the facilities for operation to FPOM at the meeting immediately prior to the fish passage season.

2.5.1.5. Continue to implement the zebra mussel monitoring program. This includes veliger sampling with plankton net collection, colonization sample units, and dewatering inspections. Samples will be provided to PSU for analysis. These organisms are a serious problem elsewhere in the country and may become introduced into the Columbia River basin. Inspections should also be made when dewatering project facilities.

2.5.2. Reporting.

2.5.2.1. Weekly Reports. Project biologists shall prepare weekly reports throughout the year summarizing project and fish facility operations for each week (Sunday through Saturday), along with an evaluation of resulting fish passage conditions. The reports will be e-mailed to CENWP-OD, CENWD-PDW-R (RCC), and other interested parties as soon as possible the following week. The weekly reports shall include:

i. Out-of-criteria situations and subsequent corrective actions.

ii. Maintenance or equipment malfunctions, breakdowns, or damage, with a summary of resulting repairs.

iii. Adult fishway control calibrations.

iv. AWS closures (i.e., cleaning times).

v. Unusual activities at the project that may have affected fish passage.

2.5.2.2. In-Season. Any adverse or negative impact to fish or fishways shall be reported in a *Memorandum for the Record* (MFR) prepared by Project biologists and sent to FPOM by the next working day, pursuant to the coordination process and template in **FPP Chapter 1 – Overview** (section 2.3.2).

2.5.2.3. Annual Report. Project biologists shall prepare an annual report by January 31 each year, summarizing fish facility operations for the previous year's winter maintenance period and fish passage season, December 1 through November 30. The annual report also will include all actions taken to discourage avian predation at the project, with an overview of the effectiveness. The annual report will be provided to CENWP-OD in time for distribution to FPOM members at the February meeting.

3. FISH FACILITIES MAINTENANCE

3.1. Fish Facilities Routine Maintenance

3.1.1. Routine maintenance of fish facilities will be conducted when fish passage has been documented to be at its lowest, to the extent practicable, to minimize fish impacts. Maintenance that occurs during juvenile or adult passage season that may affect fish passage will be included in the weekly reports. If maintenance requires operating outside of FPP criteria, the work will be coordinated with FPOM per the procedures defined in **FPP Chapter 1–Overview** (section 2.3).

3.1.2. Staff gauges will be installed, cleaned, and/or repaired as required**.**

3.1.3. Ice & Trash Sluiceway (ITS). The ITS will receive preventive maintenance throughout the year. During juvenile passage season (April 1–Nov 30), work will normally be above water, such as maintenance of automatic systems, air lines, electrical systems, and monitoring equipment. All accessible areas are visually inspected for damaged equipment and potential problems to juvenile fish. Problems will be repaired and modifications to the channel and general maintenance completed.

3.1.4. Fishway Auxiliary Water Systems (AWS). Fishway auxiliary water is provided by discharge from hydroelectric turbine systems and/or AWS backup system. Preventive maintenance and routine repair occur throughout the year. Trashracks for the AWS intakes will be raked when drawdown exceeds criteria. When practicable, trashracks will be raked during the time of day when fish passage is least affected.

3.1.5. Turbines & Spillbays. Routine maintenance of turbines and spillbays is a regular and recurring process that requires extended outages, as defined in **section 4.3** and **section 5**. Maintenance that requires operating outside of FPP criteria will be coordinated with FPOM. Certain turbine and spillbay discharges are also used to attract adult fish to fishway entrances, thus maintenance schedules for these turbines and spillbays will reflect equal weight given to fish, power, and water management, and coordinated with appropriate agencies. No other fish-related restrictions regarding maintenance will be placed on any units at this project, except to coordinate research activities. The lowest priority units for scheduling maintenance during fish passage season are F1, F2, 1, 2, 3, 4, 8, and 18 (during ITS operation). Trash racks are raked if necessary, as determined by ROV inspection just prior to juvenile passage season (before April 1), between June 1 and June 15, and whenever debris accumulation is suspected because of increased head across the trash racks.

3.1.6. Adult Collection Systems. Preventive maintenance and repairs occur throughout the year. During the adult fish passage season, maintenance will not involve any operations that will cause a failure to comply with fishway criteria unless specially coordinated. Inspection of parts of the adult collection channel systems, such as diffusion gratings, picket leads, and entrance gates, will be scheduled once per year during the winter maintenance period when the system is dewatered. An inspection during the first week of August with the system watered-up will also be conducted. A diver or underwater video system may be used for underwater inspections. The Project biologist or alternate Corps fish personnel will attend all dewatering activities and inspections potentially involving fish to provide fish input.

3.1.7. Adult Ladders and Count Stations. Adult ladders are dewatered once each year during the winter maintenance period. Unless specially coordinated, only one ladder will be dewatered at a time with the other ladder capable of operating within criteria. Ladders are inspected for blocked orifices, projections into the fishway that may injure fish, stability of the weirs, damaged picket leads, exit gate problems, loose diffuser valves, ladder orifice reduction plates, malfunctioning count station equipment, and other potential problems. Problems identified during passage season that do not affect fish passage, as well as those identified when dewatered, are repaired. Trashracks at the ladder exits and north AWS intake are raked when criteria are exceeded. Trashracks are raked between 1100 and one hour before sunset. Fish count station windows are cleaned as necessary and when practicable.

3.2. Fish Facilities Non-Routine Maintenance

3.2.1. Non-routine or unscheduled fish facility maintenance that may impact fish passage or operation of fish facilities (e.g., repair of diffuser gratings, etc.) shall be coordinated through FPOM on a case-by-case basis by Project and CENWP-OD biologists, per the coordination process described in **FPP Chapter 1–Overview**. CENWP-OD biologists will be notified as soon as possible of any required non-routine maintenance or repairs. The Operations Project Manager has the authority to initiate work prior to notifying CENWP-OD when delay of work will result in unsafe situations for people, property, or fish. Non-routine maintenance that affects fish passage will be included in the weekly reports.

3.2.2. Sluiceway. If a sluiceway chain gate fails, an adjacent gate can be operated until repairs are made. Failed gate hoists will be promptly repaired. The gate will be removed when there are problems with the seal that cannot be promptly repaired. Damage to the epoxy-lined section of the sluiceway will be repaired. The sluiceway may be closed temporarily to install a gatewell orifice plug in preparation for turbine dewatering.

3.2.1. Spillway. If a spill gate becomes inoperable, the operators will make necessary changes to provide spill and then immediately notify the Project Operations supervisor and the Project biologist to determine the best spill pattern to follow until repairs can be made. This interim operation shall be coordinated with FPOM and FFDRWG through the CENWP-OD biologist, who will, depending on coordination, provide additional guidance to the project.

3.2.2. Fishway Auxiliary Water Systems. Most fishway auxiliary water systems operate automatically. If the automatic system fails, Project personnel will manually operate the system as described below and increase surveillance to ensure criteria are being met until the system is repaired. In the event of AWS failure, the project will coordinate with FPOM to determine the best operating procedure.

i. If one of the two fishway auxiliary water turbines fails or malfunctions for any duration, follow the sequential steps below until an entrance head of 1’ is reached:

- Increase discharge of remaining operating fish unit to maximum capacity.
- Open AWS backup water supply.

ii. If both fishway auxiliary water turbines fail or malfunction, regardless of fish passage season, operate the adult passage facility as follows:

- Open AWS backup water supply.
- Raise the south entrance weirs to elevation 81' msl (closed position).
- Close west entrance.
- Close entrance weir E1 and keep E2 and E3 at 8' depth.
- Operate closest available main unit to the east entrance for attraction flow.

iii. If both fishway auxiliary water turbines and the AWS fail or malfunction, regardless of fish passage season, operate the adult passage facility as follows:

- Raise the south entrance weirs to elevation 81' msl (closed position).
- Close west entrance.
- Close entrance weir E1 and E2 and keep E3 at 6' depth.
- Evaluate modifying spill operations at the north shore ladder to enhance adult passage.

iv. If the North Wasco County power unit auxiliary water system fails, start the backup auxiliary water system and operate to maintain north ladder entrance criteria. Schedule unit outages October 1–March 15. If the backup system fails, N1 will remain open with a weir depth of 6' below the tailwater surface.

3.2.3. Powerhouse & Spillway Adult Collection Systems. The Dalles Dam contains several types of fishway entrances. In most cases, if failures occur, the entrance will be operated manually by Project personnel until repaired. If this becomes necessary, Project personnel will increase surveillance on the system to ensure criteria are being met. If the failure will not allow the entrance to be manually operated, the gate will be maintained in an operational position to the extent possible. If not possible, the entrance will be repaired expediently and returned to manual or automatic control at the earliest possible date.

3.2.4. Adult Ladders and Count Stations. Fish ladder structures include picket leads, count stations, fishway exits, and overflow weirs with orifices. Picket leads with excessive spacing (greater than 1"), erosion of concrete around picket leads, or missing pickets can allow fish into areas where escape is not likely. If picket lead failure or concrete erosion occurs, then the timing and method of repair will depend upon the severity of the problem. The decision of whether to dewater the fishway and repair any problem will be made in coordination with FPOM.

3.2.5. Diffuser Gratings. Diffuser chambers for adding auxiliary water to ladders and collection channels are covered by gratings attached by several different methods. Diffuser gratings are normally checked during winter maintenance to confirm they are in place, either by dewatering to physically inspect the gratings, using underwater video cameras and divers, or other methods. Diffuser gratings may come loose during fish passage season due to a variety of reasons. If a grating is known or suspected to have moved, creating an opening into a diffuser chamber, the associated diffuser valve will be closed ASAP. Immediate action must be taken to correct the situation and minimize impacts on fish. If possible, a video inspection should occur as soon as

possible to determine the extent of the problem. If gratings are found to be missing or moved, creating openings into the diffuser chambers, a repair method shall be developed and coordinated with FPOM. Repairs will be made as quickly as possible unless otherwise coordinated.

4. TURBINE UNIT OPERATION & MAINTENANCE

4.1. Turbine Unit Priority Order

4.1.1. Turbine units will be operated in the order of priority defined in **Table TDA-5** to optimize fish passage conditions (excluding synchronous condenser unit operation at Units 15-20). If a unit is out of service, the next unit in the priority order will be operated. Unit priority order may be coordinated differently for fish research, construction, or project maintenance.

Table TDA-5. The Dalles Dam Turbine Unit Priority Order.

PERIOD	UNIT PRIORITY ORDER
March 1–31	1 and 18 †
April 1 – November 30 (Juvenile Fish Passage Season) If additional units needed, operate one unit from each block moving west to east. Repeat as needed.	**1, 8, 18*** Block 2-4, Block 5-7, Block 9-12, Block 13-16, Block 17-22
December 1–15	1 and 18†
December 16 – end of February	Any Order

† Mar 1-31 and Dec 1-15 priority order for adult fallbacks and kelt passage = Units 1 & 18 with two open sluice gates/unit (per **Table TDA-4**).

***Apr–Nov priority order for juvenile fish passage = Units under open sluice gates 1, 8, 18 (per **Table TDA-4**).

4.2. Turbine Unit Operating Range

4.2.1. Turbine unit flow and power output at the lower and upper limits of the ±1% peak efficiency range, and at the operating limit, are defined in **Table TDA-6.** Turbine units will be operated within these ranges according to *BPA's Load Shaping Guidelines* (**Appendix C**), as summarized below.

4.2.2. In-Season: April 10–August 31 (Spring/Summer Spill for Juvenile Fish Passage). Turbine units will be operated within ±1% of peak turbine efficiency (1% range), except under limited conditions and durations when turbines may be operated above the 1% range for the use of reserves or for TDG management during high flows (refer to **Appendix C** for more information). All required fish passage spill operations will be met prior to operating turbines above the 1% range.

At The Dalles Dam, if in-season operation outside the 1% range is necessary, units will be operated in the following priority order: Units 7–14 first, spacing by at least one unit (e.g., 7, 9, 11, 13, 15, 5, 2, 1, 8, etc.). Since each successive unit in this order is thought to pass more fish, the intent is to minimize fish impacts during turbine passage. In-season operation outside the 1% range shall be recorded by Project personnel to provide to BPA on a weekly basis according to the *Guidelines* (**Appendix C**). Operation outside the 1% range may be necessary to:

i. Meet BPA load requests made pursuant to BPA's policy, statutory requirements, and *Load Shaping Guidelines* (**Appendix C**).

ii. If the draft tube is to be dewatered (**section 5.5**), the unit will be operated at full load > 1%, or at speed no load < 1% if not possible to load, for a minimum of 15 minutes prior to installing tail logs to flush fish from the unit.

iii. Operate a turbine unit solely to provide station service.

iv. Comply with other coordinated fish measures.

4.2.3. Off-Season: September 1–April 9. While not required to do so in the off-season, turbines will normally run within the 1% range since it is the optimum point for maximizing energy output of a given unit of water over time. Operation outside the 1% range is allowed if needed for power generation or other needs.

4.3. Turbine Unit Maintenance

4.3.1. Turbine maintenance schedules will be reviewed by Project and District biologists for fish impacts. If maintenance requires operating outside of FPP criteria, work will be coordinated with FPOM per procedures defined in **FPP Chapter 1–Overview**.

4.3.2. If the draft tube is to be dewatered (see **section 5.5**), the unit will be operated at full load above the 1% range (or at speed no load below the 1% range if not possible to load) for a minimum of 15 minutes prior to installing tail logs to flush fish from the unit.

4.3.3. Operational Testing. Some types of turbine maintenance require testing turbine operation throughout its full range before and after maintenance. Operational testing of a unit under maintenance is in addition to a unit in run status required for power plant reliability. Operational testing may deviate from FPP priority order and may require water that would otherwise be used for spill if the project is operating at minimum generation requirements. Water for operational testing will be used from powerhouse allocation when possible and diverted from spill only to the extent necessary to maintain generation system reliability.

i. Pre-Maintenance: Units may be operationally tested for up to 30 minutes before going into maintenance status by running the unit at speed-no-load and various loads within the 1% range to allow pre-maintenance measurements and testing and to allow all fish to move through the unit.

ii. Post-Maintenance: Units may be operationally tested after maintenance or repair while remaining in maintenance or forced outage status. Operational testing may consist of running the unit for up to a cumulative time of 30 minutes (within 1% range) before returning to operational status.

4.3.4. To reduce the chance of debris washing onto the tail log sill during tail log installation in Units 19–22, fish unit loading may be reduced to about 8 MW for 30-60 minutes. Entrance weir E1 may be closed for the same duration.

4.3.5. Wicket gate opening for functional testing on a watered-up unit will not exceed 15 minutes total open time.

Table TDA-6. The Dalles Dam Turbine Unit Power (MW) and Flow (cfs) at ±1% of Peak Turbine Efficiency (Lower and Upper Limits of 1% Range) and Operating Limits. [a]

Project Head (feet)	TDA Units 1–14						TDA Units 15–22					
	1% Lower Limit		1% Upper Limit		Operating Limit [b]		1% Lower Limit		1% Upper Limit		Operating Limit [b]	
	MW	cfs	MW	cfs	MW	cfs	MW	cfs	MW	cfs	MW	cfs
55	33.2	8,369	47.9	12,080	57.0	14,815	36.0	9,020	57.7	14,462	64.4	16,297
56	33.9	8,391	48.9	12,106	58.7	14,955	36.3	8,927	59.6	14,646	66.4	16,494
57	34.7	8,410	50.0	12,134	60.4	15,094	36.7	8,848	61.8	14,909	68.5	16,681
58	35.4	8,415	51.1	12,168	62.1	15,243	37.0	8,763	63.9	15,136	70.5	16,879
59	36.0	8,411	52.3	12,208	63.8	15,384	37.5	8,716	65.2	15,148	72.6	17,092
60	36.7	8,406	53.5	12,251	65.5	15,526	38.2	8,695	66.3	15,099	74.5	17,308
61	37.4	8,408	54.6	12,299	67.2	15,687	38.9	8,699	67.1	14,998	76.6	17,561
62	38.1	8,414	55.9	12,370	68.9	15,865	39.6	8,699	67.7	14,864	78.7	17,790
63	38.8	8,423	57.3	12,459	70.6	16,057	40.4	8,706	68.1	14,655	80.8	18,059
64	39.5	8,434	58.7	12,542	72.3	16,248	41.3	8,725	68.1	14,383	82.9	18,397
65	40.2	8,449	59.9	12,586	73.9	16,433	42.1	8,735	68.4	14,205	85.1	18,829
66	41.0	8,466	60.9	12,584	75.6	16,586	42.9	8,748	69.3	14,155	87.1	19,153
67	41.8	8,487	61.8	12,553	77.2	16,727	43.6	8,764	70.7	14,193	89.3	19,488
68	42.6	8,508	62.6	12,511	78.9	16,879	44.4	8,774	72.2	14,278	91.4	19,711
69	43.4	8,527	63.4	12,466	80.8	17,135	45.1	8,778	73.8	14,364	93.7	19,999
70	44.1	8,543	64.1	12,415	82.2	17,178	45.8	8,785	75.2	14,426	95.7	20,159
71	44.9	8,554	64.8	12,354	83.1	17,019	46.5	8,794	76.6	14,466	97.1	20,046
72	45.6	8,561	65.4	12,282	84.0	16,861	47.3	8,798	77.8	14,495	98.6	20,025
73	46.3	8,566	66.0	12,214	85.0	16,720	47.9	8,800	79.1	14,519	99.9	19,988
74	47.0	8,568	66.7	12,164	85.9	16,593	48.6	8,804	80.4	14,543	101.3	19,926
75	47.6	8,566	67.6	12,157	86.9	16,498	49.4	8,813	81.6	14,571	102.5	19,778
76	48.2	8,556	68.8	12,206	87.9	16,416	50.1	8,825	83.0	14,614	103.8	19,622
77	48.8	8,542	70.2	12,284	89.0	16,343	50.9	8,840	84.5	14,676	104.1	19,023
78	49.4	8,531	71.6	12,361	89.9	16,247	51.7	8,855	86.0	14,737	104.1	18,495
79	50.1	8,530	72.9	12,417	90.8	16,142	52.5	8,874	87.3	14,770	104.1	18,139
80	50.8	8,540	74.0	12,449	91.6	16,014	53.3	8,893	88.5	14,771	104.1	17,841
81	51.4	8,526	75.5	12,530	92.3	15,841	54.1	8,914	89.4	14,742	104.1	17,570
82	51.9	8,512	77.0	12,613	92.8	15,656	54.9	8,936	90.2	14,692	104.1	17,310
83	52.5	8,497	78.5	12,698	93.2	15,469	55.7	8,958	91.0	14,632	103.1	16,887
84	53.1	8,485	79.9	12,771	93.7	15,299	56.5	8,977	91.7	14,562	102.8	16,583
85	53.7	8,471	81.2	12,817	94.1	15,139	57.3	8,993	92.3	14,488	102.6	16,333
86	54.2	8,454	82.4	12,850	94.4	14,971	57.9	8,977	93.4	14,493	102.6	16,097
87	54.7	8,428	83.6	12,883	94.4	14,754	58.4	8,953	94.4	14,471	102.5	15,870
88	55.1	8,398	84.8	12,917	94.4	14,543	58.9	8,925	95.3	14,437	102.4	15,631
89	55.6	8,371	86.1	12,962	94.4	14,346	59.4	8,901	96.1	14,395	102.0	15,362
90	56.0	8,347	87.4	13,015	94.4	14,159	59.9	8,882	96.8	14,342	101.3	15,064
91	56.5	8,328	88.8	13,073	94.4	13,980	60.5	8,871	97.3	14,267	100.4	14,734
92	57.0	8,311	90.1	13,126	94.4	13,807	61.1	8,865	97.8	14,175	99.0	14,364
93	57.6	8,295	91.4	13,176	94.4	13,641	61.7	8,857	98.2	14,091	97.4	13,966
94	58.1	8,281	92.7	13,222	94.4	13,481	62.3	8,839	98.9	14,032	95.9	13,585
95	58.6	8,269	93.9	13,255	94.4	13,326	62.7	8,814	99.6	13,993	94.6	13,247

a. Values provided by HDC (May 2022). Flow (cfs) is a calculated value based on turbine efficiency, project head, and power output (MW).

b. "*Operating Limit*" is the maximum safe operating point based on cavitation or generator limit (added Feb 2018). TDA units 15-22 have a generator limit that restricts turbine output at higher heads. Values shaded in gray indicate the Operating Limit is below the modeled 1% Upper Limit.

5. DEWATERING PLANS

5.1. General

5.1.1. *Guidelines for Dewatering and Fish Handling* (**Appendix F**) and project *Dewatering Plans*[4] have been developed by the projects and approved by FPOM and are followed for most project facility dewaterings. The appropriate plans are reviewed by participants before each salvage operation. The plans include consideration for fish safety and are consistent with the following general guidance.

5.1.2. The Project biologist and/or alternate Corps fish personnel will attend all project activities involving fish handling. The fish agencies and tribes are encouraged to participate in all ladder dewaterings.

5.2. Dewatering – Juvenile Bypass System [*not applicable for TDA*]

5.3. Dewatering – Adult Fish Ladder

5.3.1. Prior to dewatering, when possible, operate the ladder to be dewatered at orifice flow with the AWS off for at least 24 hours but not more than 96 hours. For non-routine or unscheduled maintenance, discontinue fishway auxiliary water and operate the ladder at reduced flow as long as possible (prefer 3-24 hours).

5.3.2. A Project biologist will ensure availability of fish rescue equipment and adequate numbers of personnel necessary to move fish out of the dewatered ladder.

5.3.3. Project personnel will install exit bulkheads to shut down ladder flow. Where possible, a minimum flow of 1"-2" will be maintained in the ladder until fish are rescued.

5.3.4. The Project biologist or alternate Corps fish personnel will oversee fish rescue when the ladders are dewatered. Juvenile fish will be transported and released in the tailrace and adults released in the forebay (except identifiable steelhead kelts should be released into the tailrace).

5.3.5. Orifice blocking devices with attachment ropes tied to handrails may be placed in the lower-most weirs to prevent fish from re-ascending the dewatered portion of the adult fishway. Use of orifice blocking devices will be at the discretion of the Project biologist. The fishway return-to-service checklist is as follows:

i. Remove orifice blocking devices if used.
ii. Activate automation for systems.
iii. Assure all count station lighting is operational.
iv. Open count station crowder
v. Close picket leads.
vi. Remove all tools, equipment, and debris from inside ladder.

[4] Project Dewatering Plans: pweb.crohms.org/tmt/documents/FPOM/2010/

5.4. Dewatering – Powerhouse Collection System

5.4.1. During the pumping or draining operation to dewater a portion or the entire collection channel, the water level will not be allowed to drop so low it strands fish. Personnel shall remain onsite during pumping operations to ensure fish are not stranded or a water level sensor that de-activates the dewatering process will be used.

5.4.2. The Project biologist will ensure that rescue equipment is available if needed.

5.4.3. The Project biologist or alternate Corps fish personnel will provide technical guidance on fish safety and will assist directly in rescue operations.

5.5. Dewatering – Turbine Units

5.5.1. Gatewells need not be dipped as is required at other projects due to the lack of VBSs at The Dalles Dam. Immediately before draining, operate the unit at speed no load briefly to flush fish out of the draft tube. If the turbine unit draft tube is dewatered, operate unit with full load for a minimum of 15 minutes prior to immediately installing tail logs. If not possible to load, operate at speed no load for a minimum of 15 minutes. Install the bottom two tail logs side-by-side first before stacking the remainder to minimize sturgeon from entering the draft tube before dewatering. This is necessary for both scheduled and unscheduled outages.

5.5.2. If a turbine unit is idle and partially dewatered and tail logs are put into place, an adequate safety pool may be maintained for up to 4 days to accommodate fish trapped in the draft tube. If longer timeframes are needed for the safety pool, Project Fisheries will coordinate with FPOM on a case-by-case basis. The safety pool will be maintained at an appropriate level as determined by the Project Biologist.

5.5.3. Fish rescue personnel will inspect dewatered turbine draft tubes and intakes as soon as the water levels reach a depth permitting visual inspection and the hatch cover is opened. The Project biologist or alternate Corps fish personnel will provide technical guidance on fish safety, ensure that rescue equipment is available if needed, and directly participate in fish salvage.

5.6. Dewatering – Navigation Lock

5.6.1. The navigation lock is frequently dewatered for routine maintenance in late February/early March in conjunction with navigation lock outages at Bonneville and John Day dams. The area between the upstream bulkhead and the upstream gate is surveyed for fish as water levels allow. The lateral and pool areas on the floor of the lock are surveyed for fish from above. Most of these areas remain full of water, precluding the ability to implement successful fish salvage operations. Areas where water levels slowly decrease are accessed via crane when pool levels reach a depth of approximately 3 feet. The fill conduits are accessed and checked for fish only if needed and can be done safely. All salvaged fish are removed and transported via bag or tank to be released in the river.

6. FOREBAY DEBRIS REMOVAL

Debris at projects can impact fish passage conditions by plugging or blocking trashracks, gatewell orifices, dewatering screens, separators, or facility piping, resulting in fish injuries, impingement, and descaling. The preferred option is to remove debris at each project when possible to avoid passing a debris problem on to the next project downstream. This is not always possible as some projects do not have forebay debris removal capability. In this case, the only viable alternative is to spill to pass the debris. Special spill operations that don't follow the normal spill schedule or volume limits will be coordinated prior to implementation. Normally, the project will contact CENWP-OD at least two workdays prior to the day the special operation is required. CENWP-OD will then coordinate with FPOM and RCC, as necessary. Once the coordination is complete, RCC will issue a teletype detailing the special operations.

7. RESPONSE TO HAZARDOUS MATERIALS SPILLS

The Dalles Project's guidance for responding to hazardous substance spills is contained in the Emergency Spill Response Plan. In the event of a hazardous materials spill, the Project biologist has the authority to make fishway adjustments outside of operating criteria as necessary to prevent contamination of the ladder until unified command is formed and consultation is established with FPOM. NOAA Fisheries will be notified within 24 hours of a ladder closure.

Project Fisheries will be contacted as soon as possible after a hazardous material release and prior to any modification to fishway operations. The Project biologist will in turn contact the CENWP-OD biologist and FPOM. Attempts should be made to first contact the Project biologist on duty. During fish passage season there is a Project biologist on duty seven days a week. If a Project biologist cannot be reached by radio or in the office, attempts to contact Project Fisheries will occur in the following order (contact info available in the Control Room):

- Bob Cordie (Supervisor); Jeff Randall; James Day; Tammy Mackey

Table TDA-7. [*pg 1 of 5*] The Dalles Dam Spill Patterns for Juvenile Fish Passage at 40% of Total Project Outflow. S*ee notes at end of table*.

PROJECT OUTFLOW			SPILL			TDA 40% Spill Patterns Vertical Gate Opening (ft) per Spillbay [a, b]																						Total Open	
Total	Range (kcfs)		Total	% Range [c]																									
(kcfs)	Low	High	(kcfs)	Low	High	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	(ft)	Note
61.7	61.7	62.5	11.7	18.7%	19.0%							4	4																8	c, d
63.2	62.5	63.9	13.2	20.7%	21.1%							4.5	4.5																9	c, d
64.6	63.9	65.4	14.6	22.3%	22.8%							5	5																10	c, d
66.1	65.4	66.9	16.1	24.1%	24.6%							5.5	5.5																11	c, d
67.6	66.9	68.3	17.6	25.8%	26.3%							6	6																12	c, d
69.0	68.3	69.8	19.0	27.2%	27.8%							6.5	6.5																13	c, d
70.5	69.8	71.2	20.5	28.8%	29.4%							7	7																14	c, d
71.9	71.2	72.6	21.9	30.2%	30.8%							7.5	7.5																15	c, d
73.3	72.6	74.1	23.3	31.5%	32.1%							8	8																16	c, d
74.8	74.1	75.5	24.8	32.8%	33.5%							8.5	8.5																17	c, d
76.2	75.5	77.0	26.2	34.0%	34.7%							9	9																18	c, d
77.7	77.0	78.4	27.7	35.3%	36.0%							9.5	9.5																19	c, d
79.1	78.4	79.8	29.1	36.5%	37.1%							10	10																20	c, d
80.5	79.8	81.2	30.5	37.6%	38.2%							10.5	10.5																21	c, d
81.9	81.2	82.6	31.9	38.6%	39.3%							11	11																22	c, d
83.3	82.6	85.2	33.3	39.1%	40.3%							11.5	11.5																23	c, d
87.0	85.2	87.4	34.8	39.8%	40.9%							12	12																24	c
87.8	87.4	90.0	35.1	39.0%	40.2%			4	4	4	4	4	4																24	c
92.3	90.0	95.5	36.9	38.6%	41.0%			4.2	4.2	4.2	4.2	4.2	4.2																25.2	c, e
98.8	95.5	100.6	39.5	39.3%	41.4%			4.5	4.5	4.5	4.5	4.5	4.5																27	c, e
102.5	100.6	105.0	41.0	39.0%	40.7%		4	4	4	4	4	4	4																28	c
107.5	105.0	111.4	43.0	38.6%	41.0%		4.2	4.2	4.2	4.2	4.2	4.2	4.2																29.4	c, e
115.3	111.4	116.1	46.1	39.7%	41.4%		4.5	4.5	4.5	4.5	4.5	4.5	4.5																31.5	c, e
117.0	116.1	120.0	46.8	39.0%	40.3%	4	4	4	4	4	4	4	4																32	c
123.0	120.0	127.4	49.2	38.6%	41.0%	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2																33.6	c, e
131.8	127.4	134.8	52.7	39.1%	41.4%	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5																36	c, e
137.8	134.8	142.0	55.1	38.8%	40.9%	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7																37.6	c, e
146.3	142.0	149.3	58.5	39.2%	41.2%	5	5	5	5	5	5	5	5																40	c, e
152.3	149.3	156.6	60.9	38.9%	40.8%	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2																41.6	c, e
161.0	156.6	163.9	64.4	39.3%	41.1%	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5																44	c, e
166.8	163.9	171.1	66.7	39.0%	40.7%	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7																45.6	c

PROJECT OUTFLOW			SPILL			TDA 40% Spill Patterns																						Total	
Total	Range (kcfs)		Total	% Range [c]		Vertical Gate Opening (ft) per Spillbay [a, b]																						Open	
(kcfs)	Low	High	(kcfs)	Low	High	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	(ft)	Note
175.5	171.1	178.4	70.2	39.4%	41.0%	6	6	6	6	6	6	6	6																48	c
181.3	178.4	185.6	72.5	39.1%	40.6%	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2																49.6	c
190.0	185.6	193.0	76.0	39.4%	40.9%	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5																52	c
196.0	193.0	200.4	78.4	39.1%	40.6%	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7																53.6	c
204.8	200.4	207.6	81.9	39.4%	40.9%	7	7	7	7	7	7	7	7																56	c
210.5	207.6	214.8	84.2	39.2%	40.6%	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2																57.6	c
219.0	214.8	221.9	87.6	39.5%	40.8%	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5																60	c
224.8	221.9	229.0	89.9	39.3%	40.5%	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7																61.6	c
233.3	229.0	236.1	93.3	39.5%	40.7%	8	8	8	8	8	8	8	8																64	c
239.0	236.1	243.4	95.6	39.3%	40.5%	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2																65.6	c
247.8	243.4	250.6	99.1	39.5%	40.7%	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5																68	c
253.5	250.6	257.9	101.4	39.3%	40.5%	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7																69.6	c
262.3	257.9	265.1	104.9	39.6%	40.7%	9	9	9	9	9	9	9	9																72	c
268.0	265.1	272.4	107.2	39.4%	40.4%	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2																73.6	c
276.8	272.4	279.6	110.7	39.6%	40.6%	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5																76	c
282.5	279.6	286.6	113.0	39.4%	40.4%	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7																77.6	c
290.8	286.6	293.6	116.3	39.6%	40.6%	10	10	10	10	10	10	10	10																80	c
296.5	293.6	300.6	118.6	39.5%	40.4%	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2																81.6	c
304.8	300.6	307.6	121.9	39.6%	40.5%	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5																84	c
310.5	307.6	314.9	124.2	39.4%	40.4%	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7																85.6	c
319.3	314.9	322.0	127.7	39.7%	40.6%	11	11	11	11	11	11	11	11																88	c
324.8	322.0	329.1	129.9	39.5%	40.3%	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2																89.6	c
333.5	329.1	336.4	133.4	39.7%	40.5%	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5																92	c
339.3	336.4	343.5	135.7	39.5%	40.3%	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7																93.6	c
347.8	343.5	350.5	139.1	39.7%	40.5%	12	12	12	12	12	12	12	12																96	c
353.3	350.5	357.4	141.3	39.5%	40.3%	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2																97.6	c
361.5	357.4	364.3	144.6	39.7%	40.5%	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5																100	c
367.0	364.3	371.3	146.8	39.5%	40.3%	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7																102	c
375.5	371.3	378.4	150.2	39.7%	40.5%	13	13	13	13	13	13	13	13																104	c
381.3	378.4	385.4	152.5	39.6%	40.3%	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2																106	c
389.5	385.4	392.3	155.8	39.7%	40.4%	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5																108	c
395.0	392.3	399.1	158.0	39.6%	40.3%	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7																110	c
403.3	399.1	406.0	161.3	39.7%	40.4%	14	14	14	14	14	14	14	14																112	c, f

PROJECT OUTFLOW			SPILL			TDA 40% Spill Patterns Vertical Gate Opening (ft) per Spillbay [a, b]																						Total	
Total	Range (kcfs)		Total	% Range [c]																								Open	
(kcfs)	Low	High	(kcfs)	Low	High	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	(ft)	Note
408.8	406.0	413.0	163.5	39.6%	40.3%	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2																114	c
417.3	413.0	420.0	166.9	39.7%	40.4%	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5																116	c
422.8	420.0	433.9	169.1	39.0%	40.3%	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7																118	c
445.0			175.0	39.3%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				4												122	
450.8			180.8	40.1%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				4		4										126	
456.7			186.7	40.9%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				4		4	4									130	
462.5			192.5	41.6%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				4		4	4		4							134	
468.4			198.4	42.4%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				4		4	4		4			4				138	
474.2			204.2	43.1%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				4		4	4		4			4	4			142	
480.1			210.1	43.8%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				4		4	4		4			4	4	4		146	
485.9			215.9	44.4%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				8		4	4		4			4	4	4		150	
491.7			221.7	45.1%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				8		8	4		4			4	4	4		154	
497.5			227.5	45.7%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				8		8	8		4			4	4	4		158	
503.3			233.3	46.4%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				8		8	8		8			4	4	4		162	
509.1			239.1	47.0%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				8		8	8		8			8	4	4		166	
515.0			245.0	47.6%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				8		8	8		8			8	8	4		170	
520.8			250.8	48.2%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				8		8	8		8			8	8	8		174	
526.5			256.5	48.7%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				12		8	8		8			8	8	8		178	
532.2			262.2	49.3%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				12		12	8		8			8	8	8		182	
537.9			267.9	49.8%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				12		12	12		8			8	8	8		186	
543.7			273.7	50.3%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				12		12	12		12			8	8	8		190	
549.4			279.4	50.9%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				12		12	12		12			12	8	8		194	
555.1			285.1	51.4%		14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7				12		12	12		12			12	12	8		198	
563.3			293.3	52.1%		14.7	14.7	15	15	15	15	15	15				12		12	12		12			12	12	12		203	
568.2			298.2	52.5%		15	15	15.5	15.5	15.5	15.5	15.5	15.5				12		12	12		12			12	12	12		207	
572.5			302.5	52.8%		15	15	16	16	16	16	16	16				12		12	12		12			12	12	12		210	
576.7			306.7	53.2%		15	15	16.5	16.5	16.5	16.5	16.5	16.5				12		12	12		12			12	12	12		213	
580.6			310.6	53.5%		15	15	17	17	17	17	17	17				12		12	12		12			12	12	12		216	
590.5			320.5	54.3%		15	16	18	18	18	18	18	18				12		12	12		12			12	12	12		223	g
595.6			325.6	54.7%		15	16	18	18	18	18	18	18				16		12	12		12			12	12	12		227	
601.1			331.1	55.1%		15	16	18	18	18	18	18	18				16		16	12		12			12	12	12		231	
606.6			336.6	55.5%		15	16	18	18	18	18	18	18				16		16	16		12			12	12	12		235	
612.1			342.1	55.9%		15	16	18	18	18	18	18	18				16		16	16		16			12	12	12		239	

PROJECT OUTFLOW			SPILL			TDA 40% Spill Patterns Vertical Gate Opening (ft) per Spillbay [a, b]																						Total	
Total	Range (kcfs)		Total	% Range [c]																								Open	
(kcfs)	Low	High	(kcfs)	Low	High	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	(ft)	Note
617.6			347.6	56.3%		15	16	18	18	18	18	18	18				16		16	16		16			16	12	12		243	
623.1			353.1	56.7%		15	16	18	18	18	18	18	18				16		16	16		16			16	16	12		247	
625.8			355.8	56.9%		15	16	18	18	18	18	18	18				18		16	16		16			16	16	12		249	
628.5			358.5	57.0%		15	16	18	18	18	18	18	18				18		18	16		16			16	16	12		251	
631.2			361.2	57.2%		15	16	18	18	18	18	18	18				18		18	18		16			16	16	12		253	
633.9			363.9	57.4%		15	16	18	18	18	18	18	18				18		18	18		18			16	16	12		255	
636.6			366.6	57.6%		15	16	18	18	18	18	18	18				18		18	18		18			18	16	12		257	
639.2			369.2	57.8%		15	16	18	18	18	18	18	18				20		18	18		18			18	16	12		259	
641.9			371.9	57.9%		15	16	18	18	18	18	18	18				20		20	18		18			18	16	12		261	
644.5			374.5	58.1%		15	16	18	18	18	18	18	18				20		20	20		18			18	16	12		263	
647.2			377.2	58.3%		15	16	18	18	18	18	18	18				20		20	20		20			18	16	12		265	
649.9			379.9	58.5%		15	16	18	18	18	18	18	18				20		20	20		20			20	16	12		267	
656.4			386.4	58.9%		15	16	18	18	18	18	18	18				21		21	21		21			21	16	12		272	
664.4			394.4	59.4%		15	16	19	19	19	19	19	19				21		21	21		21			21	16	12		278	
672.4			402.4	59.8%		15	16	20	20	20	20	20	20				21		21	21		21			21	16	12		284	
680.3			410.3	60.3%		15	16	21	21	21	21	21	21				21		21	21		21			21	16	12		290	
686.2			416.2	60.7%		15	16	21	21	21	21	21	21		4		21		21	21		21			21	16	12		294	
692.0			422.0	61.0%		15	16	21	21	21	21	21	21		8		21		21	21		21			21	16	12		298	
697.7			427.7	61.3%		15	16	21	21	21	21	21	21		12		21		21	21		21			21	16	12		302	
703.2			433.2	61.6%		15	16	21	21	21	21	21	21		16		21		21	21		21			21	16	12		306	
708.6			438.6	61.9%		15	16	21	21	21	21	21	21		20		21		21	21		21			21	16	12		310	
715.8			445.8	62.3%		15	16	21	21	21	21	21	21		21	4	21		21	21		21			21	16	12		315	
721.6			451.6	62.6%		15	16	21	21	21	21	21	21		21	8	21		21	21		21			21	16	12		319	
727.3			457.3	62.9%		15	16	21	21	21	21	21	21		21	12	21		21	21		21			21	16	12		323	
732.8			462.8	63.2%		15	16	21	21	21	21	21	21		21	16	21		21	21		21			21	16	12		327	
738.1			468.1	63.4%		15	16	21	21	21	21	21	21		21	20	21		21	21		21			21	16	12		331	
745.4			475.4	63.8%		15	16	21	21	21	21	21	21		21	21	21	4	21	21		21			21	16	12		336	
751.2			481.2	64.1%		15	16	21	21	21	21	21	21		21	21	21	8	21	21		21			21	16	12		340	
756.9			486.9	64.3%		15	16	21	21	21	21	21	21		21	21	21	12	21	21		21			21	16	12		344	
762.4			492.4	64.6%		15	16	21	21	21	21	21	21		21	21	21	16	21	21		21			21	16	12		348	
767.7			497.7	64.8%		15	16	21	21	21	21	21	21		21	21	21	20	21	21		21			21	16	12		352	
775.0			505.0	65.2%		15	16	21	21	21	21	21	21		21	21	21	21	21	21	4	21			21	16	12		357	
780.8			510.8	65.4%		15	16	21	21	21	21	21	21		21	21	21	21	21	21	8	21			21	16	12		361	

PROJECT OUTFLOW			SPILL			TDA 40% Spill Patterns Vertical Gate Opening (ft) per Spillbay [a, b]																						Total	
Total	Range (kcfs)		Total	% Range [c]																								Open	
(kcfs)	Low	High	(kcfs)	Low	High	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	(ft)	Note
786.5			**516.5**	**65.7%**		15	16	21	21	21	21	21	21		21	21	21	21	21	21	12	21			21	16	12		**365**	
792.0			**522.0**	**65.9%**		15	16	21	21	21	21	21	21		21	21	21	21	21	21	16	21			21	16	12		**369**	
797.3			**527.3**	**66.1%**		15	16	21	21	21	21	21	21		21	21	21	21	21	21	20	21			21	16	12		**373**	
804.6			**534.6**	**66.4%**		15	16	21	21	21	21	21	21		21	21	21	21	21	21	21	21	4		21	16	12		**378**	
810.4			**540.4**	**66.7%**		15	16	21	21	21	21	21	21		21	21	21	21	21	21	21	21	8		21	16	12		**382**	
816.0			**546.0**	**66.9%**		15	16	21	21	21	21	21	21		21	21	21	21	21	21	21	21	12		21	16	12		**386**	
821.6			**551.6**	**67.1%**		15	16	21	21	21	21	21	21		21	21	21	21	21	21	21	21	16		21	16	12		**390**	
826.9			**556.9**	**67.3%**		15	16	21	21	21	21	21	21		21	21	21	21	21	21	21	21	20		21	16	12		**394**	
834.2			**564.2**	**67.6%**		15	16	21	21	21	21	21	21		21	21	21	21	21	21	21	21	21	4	21	16	12		**399**	
840.0			**570.0**	**67.9%**		15	16	21	21	21	21	21	21		21	21	21	21	21	21	21	21	21	8	21	16	12		**403**	
845.6			**575.6**	**68.1%**		15	16	21	21	21	21	21	21		21	21	21	21	21	21	21	21	21	12	21	16	12		**407**	
851.1			**581.1**	**68.3%**		15	16	21	21	21	21	21	21		21	21	21	21	21	21	21	21	21	16	21	16	12		**411**	
856.5			**586.5**	**68.5%**		15	16	21	21	21	21	21	21		21	21	21	21	21	21	21	21	21	20	21	16	12		**415**	
863.8			**593.8**	**68.7%**		15	16	21	21	21	21	21	21		21	21	21	21	21	21	21	21	21	21	21	16	12	4	**420**	
869.6			**599.6**	**69.0%**		15	16	21	21	21	21	21	21		21	21	21	21	21	21	21	21	21	21	21	16	12	8	**424**	
875.2			**605.2**	**69.1%**		15	16	21	21	21	21	21	21		21	21	21	21	21	21	21	21	21	21	21	16	12	12	**428**	

a. Spill (kcfs) is calculated as a function of total gate opening (ft) at forebay elevation 158.5 feet (revised July 2012).

b. Highlighted spillbays operationally restricted because of structural or wire rope issues and will be used only if needed for dam safety. Spillbay 9 cannot be used due to failure of the trunnion pin in 2009.

c. Uniform spill patterns are critical to increasing juvenile fish survival through the tailrace. Uniform pattern fixed spill rates will result in hourly spill % within ranges in table.

d. TDA minimum generation requirement = 50 kcfs. Therefore, 40% spill is not achievable at total river flow < 84 kcfs (i.e., minimum generation operation).

e. At certain flow ranges, spill could exceed ±1% of target spill of 40%. At total river flow 92,250–161,000 cfs, spill may range from 38.6–41.4% (up to ±1.4% of the 40% rate).

f. Minimum gate opening is 4 ft. At forebay elevation 160 ft, maximum gate opening through bays 1-8 is 14 ft, thus higher bays will be utilized prior to opening any of bays 1-8 more than 14.0 ft. At lower forebay elevations, gate openings can be increased up to 14.7 feet before utilizing higher bays.

g. If gate openings greater than shown in table are needed, to the extent feasible, incrementally increase gate openings. If all available spillbays are fully open and more flow is needed to limit pool surcharge, use restricted spillbays in following priority order: 10, 11, 13, 16, 18, 19, and 23. Fully open each bay as needed before moving to next.

Table TDA-8. Spillway Configuration at Various Flow Ranges.

Min Flow (cfs)	Max Flow (cfs)	Spillbay Gates	Gate Opening per Bay (ft)	Total Gate Opening (ft)	Total Spill (cfs)
62,000	65,000	7,8	4	8	12,000
65,000	71,000	7,8	6	12	18,000
71,000	77,000	7,8	8	16	24,000
77,000	85,000	7,8	10	20	30,000
85,000	97,500	7,8	12	24	36,000
85,000	97,500	1-8	4	24	36,000
97,500	112,500	1-8	4	28	42,000
112,500	127,500	1-8	4	32	48,000
127,500	142,500	1-8	4.5	36	54,000
142,500	157,500	1-8	5	40	60,000
157,500	172,500	1-8	5.5	44	66,000
172,500	187,500	1-8	6	48	72,000
187,500	202,500	1-8	6.5	52	78,000
202,500	217,500	1-8	7	56	84,000
217,500	232,500	1-8	7.5	60	90,000
232,500	247,500	1-8	8	64	96,000
247,500	262,500	1-8	8.5	68	102,000
262,500	277,500	1-8	9	72	108,000
277,500	292,500	1-8	9.5	76	114,000
292,500	307,500	1-8	10	80	120,000
307,500	322,500	1-8	10.5	84	126,000
322,500	337,500	1-8	11	88	132,000
337,500	352,500	1-8	11.5	92	138,000
352,500	367,500	1-8	12	96	144,000
367,500	382,500	1-8	12.5	100	150,000
382,500	397,500	1-8	13	104	156,000
397,500	412,500	1-8	13.5	108	162,000
412,500	438,000	1-8	14	112	168,000