US Army Corps of Engineers
North Pacific Division

Fish Passage Plan for 1990

Corps of Engineers Projects

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FISH PASSAGE PLAN

FOR 1990

FOR CORPS OF ENGINEERS PROJECTS

U.S. ARMY CORPS OF ENGINEERS

NORTH PACIFIC DIVISION

PORTLAND, OREGON

CENPD-EN-WM
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1990 FISH PASSAGE PLAN

1. General. In developing the 1990 Fish Passage Plan (FPP), the Corps has taken the Northwest Power Planning Council's 1989 action, which was to incorporate the spill terms of the Spill Agreement into their Fish and Wildlife Program, into consideration to the fullest extent practicable. Spill will be provided at Lower Monumental, Ice Harbor, John Day and The Dalles Dams in accordance with the modified amendment (Appendix 4) for both spring and summer migrations if such spill does not have nonpower impacts, and BPA agrees to the power loss. Spill operations will begin when the first 10 percent of that migration have passed the dam and will cease when 90 percent of that migration has passed but no later than July 22, 1990 at Lower Monumental and Ice Harbor or later than August 22, 1990 at John Day and The Dalles. At Bonneville Dam the operation plan remains basically unchanged from the Corps' 1989 Juvenile Fish Passage Plan; details of the plan and research are shown in Section 5a(2).

The 1990 FPP will guide the Corps' actions in regard to providing fish protection at the Corps' eight mainstem Columbia and Snake River projects. Other Corps documents and agreements related to fish passage at these projects are intended to be in accord with the FPP.

2. Corps Project Operation and Maintenance. Appendix 1 contains detailed information on the criteria used for the operation and maintenance of fish passage facilities and project operation procedures for fish passage at the Corps projects on the lower Snake and lower Columbia Rivers. These criteria have been developed through consultation with the fish and wildlife agencies and tribes. The Corps has attempted to resolve concerns expressed by the fishery agencies and tribes but some areas of disagreement still exist. If there are discrepancies in criteria between Appendix 1 and Section 5 of the FPP, Section 5 of the FPP will be implemented.

3. Fish Transportation Oversight Team's (FTOT) Annual Work Plan For 1990. This document describes the annual work plan for juvenile fish collection and transportation operations at Lower Granite, Little Goose, and McNary Dams for the 1990 season. It is included at the end of Appendix 1. The FTOT Plan was developed jointly with the fish and wildlife agencies and tribes. The Corps believes that the best available scientific information supports maximum transportation of all juvenile fish. The Corps cannot agree to be a signatory to anything less, but will not actively oppose in 1990 the transportation of juvenile fish in accordance with the appended FTOT annual work plan.

4. Fish Hatchery Release Schedule. This schedule, provided by the fish and wildlife agencies and tribes, is contained in Appendix 2. Hatchery releases should be coordinated to coincide, insofar as possible, with Water Budget operation and the natural juvenile fish migration.

5. Project Operation Criteria. The following paragraphs list, by project, the project specific operating criteria of the 1990 FPP.

a. Bonneville Dam.

The first and second powerhouses at Bonneville both have structural powerhouse juvenile fish bypass systems. Presently juvenile guidance efficiency at the second powerhouse is not satisfactory. Therefore, the units will not be operated at the second powerhouse during the middle 80 percent spring and summer migration period unless units are needed to limit spill to 75,000 cfs during daylight hours (0600 to 2000 hours). Typically, when flows are above the capacity of the first powerhouse units, spill will occur. Units in the second powerhouse may be operated as necessary for fishery research. This restriction on the second powerhouse operations will not apply during periods when the units are being operated for research of after 0600 hours August 16.

(1) Operation for Juvenile Passage.

- Operate juvenile fish passage facilities from March 15 through November 15 in accordance with project operating criteria contained in Appendix 1.

- No restriction on operation of screened units at the first powerhouse.

- The second powerhouse will not be operated during the nighttime hours (2000 to 0600 hours) except as necessary for fishery research.

- The second powerhouse will be operated during the daytime hours (0600 to 2000 hours) if required to limit spill to less than 75,000 cfs. Units 18, 11, and then 17 will be the first units on and last units off. If additional units are needed the operating priority is 12, 16, 13, 14, 15.

(2) Research

- Research activities at the Bonneville second powerhouse will require daily operation of all available units during mid-June to early August for seven three-day test periods lasting approximately eight hours nightly (0000 - 0800 hours). Second powerhouse operations may be requested for several days preceding the first test to establish a representative predator population. There are no tests planned for the first powerhouse or spillway in 1990.

(3) Operation for Adult Passage.

- Operate the project throughout the year in accordance with project operating criteria as specified in Appendix 1.

b. The Dalles Dam.

Approximately 3,600 to 4,000 cfs flow will be routed through the ice and trash sluiceway during the juvenile passage season in accordance with Appendix 1, pages II-7 and 8.

(1) Operation for Juvenile Passage.

- o Operate juvenile fish passage facilities from April 1 through November 15 in accordance with project operation criteria contained in Appendix 4.

- o Spill may be requested by the Fish Passage Center (FPC) in accordance with spill criteria of Section III B2 through B13 of the spill amendment modified for nonpower use (Appendix 6).

- o The Corps will implement an FPC request if all the following conditions are met:

  - BPA agrees to the power loss
  - the request is consistent with dates, hours, and percentage criteria in Appendix 4
  - spill does not cause adverse nonpower or safety impacts

(2) Operation for Adult Passage.

- o Operate the project throughout the year in accordance with project operating criteria as specified in Appendix 1.

c. John Day Dam.

All 16 units are screened and the project has bypass facilities.

(1) Operation for Juvenile Passage.

- o Operate juvenile fish passage facilities from April 1 through October 31 in accordance with operating criteria in Appendix 1.

- o Spill is not required for spring passage of juvenile fish as the passage facility provides juvenile survival greater than 94%.

- o Spill may be requested by the FPC during the summer passage period in accordance with spill criteria of Section III, B2 through B13 of the spill amendment modified for nonpower uses (Appendix 4).

- o The Corps will implement the spill request if all the following conditions are met:
  - BPA agrees to the power loss
  - the request is consistent with dates, hours, and percentage criteria in Appendix 4
  - spill does not cause adverse nonpower or safety impacts

- o When spilling at night (2100 to 0600 hours), spill in south end bays up to 80,000 cfs, then spill the next 20,000 cfs in north end bays. Spill in excess of 100,000 cfs should be split 80 percent in the south bays and 20 percent in the north bays.

(2) Operation for Adult Passage.

- o Operate the project throughout the year in accordance with operating criteria specified in Appendix 1.

- o From 0400 to 2000 hours, March 1 through November 30, operate unit 1 in the 80 to 100 MW range to provide best ladder entrance condition for adult fish passage, unless additional generation is needed to meet firm load.

d. McNary Dam.

All generation units at McNary are screened. The project has facilities to separate juveniles by size, then bypass them either directly to the tailrace or to holding ponds for transport by barge or truck to below Bonneville Dam.

(1) Operation for Juvenile Passage.

- Operate juvenile fish passage facilities, from April 1 through end of bypass season, in accordance with operating criteria and FTOT Annual Work Plan shown in Appendix 1.

(2) Operation for Adult Passage.

- Operate project facilities throughout the year in accordance with operating criteria shown in Appendix 1.

- Operate units 1 and 2 during daylight hours from March 1 through December 31 for adult attraction except as noted in Appendix C to Walla Walla District's Fish Facility O&M criteria (Appendix 1).

e. Ice Harbor Dam.

(1) Operation for Juvenile Passage.

- Operate juvenile fish passage facilities from April 1 through one week after end of bypass season at Lower Granite in accordance with project operation criteria contained in Appendix 1. Approximately 2,700 cfs will be routed through the ice and trash sluiceway for 24 hours per day during the juvenile passage season, beginning one week after Little Goose collection counts reach 1,000 juveniles per day and continuing until one week after Little Goose bypass is closed.

- o Spill may be requested by the FPC in accordance with spill criteria of Section III, B2 through B13 of the spill amendment modified for nonpower uses (Appendix 4).

- o The Corps will implement the spill request if all the following conditions are met:

  - BPA agrees to the power loss
  - the request is consistent with dates, hours, and percentage criteria in Appendix 4
  - spill does not cause adverse nonpower or safety impacts

(2) Operation for Adult Passage.

- o Operate project facilities throughout the year in accordance with operating criteria shown in Appendix 1.

f. Lower Monumental Dam.

Lower Monumental has only a gatewell salvage bypass system.

(1) Operation for Juvenile Passage.

- o Operate juvenile fish passage facilities from April 1 through end of bypass season in accordance with project operation criteria contained in Appendix 1.

- o Spill may be requested by the FPC in accordance with spill criteria of Section III, B2 through B13 of the spill amendment modified for nonpower uses (Appendix 4).

- o The Corps will implement the spill request if all the following conditions are met:
  - BPA agrees to the power loss
  - the request is consistent with dates, hours, and percentage criteria in Appendix 4
  - spill does not cause adverse nonpower or safety impacts

g. Little Goose Dam.

All generation units at Little Goose are screened. The project has facilities to separate juveniles by size, then bypass them either directly to the tailrace or to holding ponds for transport by barge or truck to below Bonneville Dam.

(1) Operation for Juvenile Passage.

- o Operate juvenile fish passage facilities from April 1 through end of bypass season in accordance with operating criteria and FTOT Annual Work Plan shown in Appendix 1.

(2) Operation for Adult Passage.

- o Operate project facilities throughout the year in accordance with operating criteria shown in Appendix 1.

- o Operate unit 1 during daylight hours from March 1 through November 30 for adult attraction.

h. Lower Granite Dam.

All generation units at Lower Granite are screened. The project has facilities to bypass either directly to the tailrace or to holding ponds for transport by barge or truck to below Bonneville Dam.

(1) Operation for Juvenile Passage.

- o Operate juvenile fish passage facilities from April 1 through end of bypass season in accordance with operating criteria and FTOT Annual Work Plan shown in Appendix 1.

(2) Operation for Adult Passage

- o Operate project facilities throughout the year in accordance with operating criteria shown in Appendix 1.

6. Implementation of The Juvenile Fish Passage Plan.

Implementation of the 1990 FPP will require that the Corps coordinate with Bonneville Power Administration, Indian tribes, and the Federal and state fishery agencies. The Fish Passage Managers will be point of contact for the fishery agencies and tribes and the Corps of Engineers' Reservoir Control Center (RCC) will provide the coordination for the project operators as required to determine the operation of the Corps' projects.

RCC daily briefings are held at 1330 hours, Monday through Friday, in the U.S. Custom House. Immediately following these briefings, RCC representatives will be available to meet with the Fish Passage Managers to discuss the latest weather and runoff forecasts, as well as fish, hydrologic and power information to assist in the planning of operations for fish passage for the next few days. Fishery operations or requests by the Fish Passage Managers can then be evaluated in the next days' forecast runs for overall system operational planning.

a. Responsibilities of Fishery Management Agencies and Tribes.

(1) Request spill in accordance with 1989 amendments to the NPPC Fish and Wildlife Program.

(2) Provide RCC with spill priority list and update as needed.

(3) Provide monitoring and surveillance throughout the migration period at predetermined locations such as the fish trap facilities.

(4) Provide status reports on the timing of the downstream migration, including pertinent marked fish release and recovery data, with weekly written reports estimating percentages of run past key projects.

(5) Where biologically feasible, coordinate hatchery releases to ensure they are protected by regulated fishery flows and spills. Release schedules will be provided and updated in a timely manner.

(6) Provide appraisal to the operating agencies of the amount of flexibility in fisheries operations which may affect energy production while maintaining acceptable conditions for migrants.

(7) Provide information on all proposed and scheduled studies or special operations designed to improve fish passage operations which may affect energy production or project operation. Discuss unforeseen changes with the Corps.

(8) Assure that all viable methods and procedures to reduce mortality to migrants are utilized. In addition to spilling this would include such operations as collection and transportation of migrants, use of ice and trash sluiceways, and others.

(9) Coordinate input to water management decisions through the Fish Passage Managers.

b. Responsibilities of the Corps of Engineers.

(1) Provide timely formulation of runoff volume forecasts in January, February, March, April, May, and June to enable the fisheries management agencies and tribes and those in energy production and marketing as much lead time as possible to prepare for operations relative to the impending migration.

(2) Provide the FPC with planned reservoir operations to achieve fishery spill requirements during the period of juvenile migration.

(3) In cooperation with the fishery agencies and tribes, provide monitoring, surveillance, and reporting at Corps projects throughout the migration period.

(4) Discuss project operations with regard to releases and/or transport of hatchery stocks with the FPC.

(5) Discuss project operations with the power and fishery entities to assure that operating flexibility is made available for both fish passage and energy production.

(6) Provide timely information on all proposed and/or scheduled studies or special operations which may negatively impact or otherwise constrain fish passage or energy production. Discuss unforeseen changes in fish passage operation with the FPC.

(7) In the event that specific spill requests by the Fish Passage Center are not implemented or are modified, a written explanation will be provided.

(8) Carry out routine and emergency fish passage operations and maintenance procedures in accordance with criteria in Appendix 1.

(9) Conduct the Dissolved Gas Monitoring Program as described in Appendix 3.

c. Responsibilities of the Bonneville Power Administration.

(1) Report to the RCC and FPC on updated load-resource studies during the April to September period to supplement the NWS River Forecast Center's runoff volume forecast for fish passage planning assistance.

(2) Provide the RCC and FPC their estimate of water available for involuntary spill.

(3) Provide the RCC and FPC their estimate of power market impacts of requested spill operation.

(4) Utilize available flexibility of the Federal Columbia River Basin System to shape flow requirements, spill priorities, and plant generation to minimize fish passage losses.

(5) Adjust system generation to provide adequate water to meet fishery operations requirements in accordance with spill amendment Section III, Para B2 - B13 as modified to provide nonpower uses (Appendix 4).

(6) Implementation of spill priorities on an hour-by-hour basis.

d. Responsibilities of Mid-Columbia Public Utility Districts.

Operate projects for spill transfer in accordance with provisions of the FPP with one and one-half hours notification to start or stop.

e. Resolution of Differences.

Should any major differences arise during the process of implementing the 1990 FPP that cannot be resolved between the RCC and the Fish Passage Managers, these will be referred to the Mainstem Executive Committee. However, the final decision will rest with the Division Engineer.

APPENDIX 1

OPERATION AND MAINTENANCE CRITERIA

FOR FISH PASSAGE FACILITIES

AT CORPS OF ENGINEERS' PROJECTS

(INCLUDING FTOT 1990 ANNUAL WORK PLAN)

CORPS OF ENGINEERS
PORTLAND DISTRICT

FISH FACILITIES

OPERATING STANDARDS
& MAINTENANCE PLANS

1990

FISH PASSAGE FACILITIES OPERATING STANDARDS AND MAINTENANCE PLAN

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Bonneville Dam

I. BONNEVILLE DAM

A. OPERATING STANDARDS

1. Bonneville Dam Adult Fish Passage Facilities

a. **Prior to 1 March**

(1) Inspect all staff gauges and water level indicators; repair and/or clean where necessary.

(2) Dewater all ladders and inspect all dewatered sections of fish facilities for projections, debris or plugged orifices which could injure fish or slow their progress up the ladder. Repair deficiencies.

(3) Inspect for and, when necessary, clear debris in the ladder exits.

b. **1 March through November** (Adult Fish Passage Period)

(1) All Adult Fish Facilities

(a) Water depth over fish ladder weirs: 1.3 (+ or - 0.1) feet.

(b) Head on all entrances: 1.0 to 2.0 feet (1.5 feet preferred). Refer to maintenance plan when unable to achieve head criterion.

(c) A transportation velocity of 1.5 to 4 feet per second (2.0 fps preferred) shall be maintained in the powerhouse collection channel, the lower ends of the fish ladders which are below the tail water, and the adult transportation channel (UMT).

(d) Maximum of 6" head on the first powerhouse attraction water intakes and trash racks at all the ladder exits, with a 4" maximum head on all picketed leads. Debris shall be removed when significant amounts accumulate.

(e) Staff gauges and water level indicators will be readable at all water levels encountered during the fish passage period.

(f) The second powerhouse juvenile bypass system continues to operate with restrictions during

the main part of the juvenile passage period. See second powerhouse juvenile passage standards as it will impact first powerhouse operation and maintenance.

(g) First powerhouse unit operation priority is 1, 2, 10, 8, 9, (3-7). Second powerhouse priority is 18, 11, 17, 12, 16, 13-14, 15.

(2) Spillway Ladders

(a) Spill bay gates 1 and 18 shall be open 4 inches to attract adult migrating fish to the adjacent fishway entrances.

(b) Side entrances SW-SG-5 and SO-SG-7 and downstream entrances SW-SG-1 and SO-SG-2 shall operate as continuously open free-flowing vertical slots. Downstream entrances SW- SG-3 and SO-SG-4 (adjacent to shore) consist of pairs of sluice gates. When the tail water is below 9 feet, both gates shall be open. When the tail water is between 9 and 17 feet, the south sluice gate shall close. When the tail water exceeds 17 feet, both sluice gates shall close.

(3) First Powerhouse

(a) Entrance gate 65 operates as an adjustable height submerged weir with crest elevation 8 feet below tail water for tail water elevations above 17.0. For tail water elevations below 17.0, the weir is fully lowered with crest at elevation 8.5.

(b) Operate powerhouse entrance gates 9, 21, 34, 58 and 62.

i) Orifice A (lower sluice gate) operates (opens) from tail water elevation 7 to 16 on a rising tail water and elevation 15 to 7 on a falling tail water.

ii) Orifice B (upper telescoping gate) operates from tail water elevation 16 to 38 on a rising tail water and 38 to 15 when tail water drops.

(c) Powerhouse entrance gate 1 operates as an

adjustable height submerged weir which acts as the primary control to regulate head between the collection channel and tail race (head on all entrances). Entrance gate 2 is a submerged orifice entrance which operates only when entrance gate 1 is completely lowered to regulate the head between the collection channel and tail race at lower tail water elevations. Gate 1 is fully lowered at tail waters below 22.0; then gate 2 takes over fishway head regulation.

(4) Second Powerhouse

(a) Operate all four north (NUE and NDE) and south (SUE and SDE) entrances. Operate weir crests at elevation 1.0 (fully lowered) for tail water elevations up to 14.0. For tail water elevations greater than 14.0, operate weir crest 13.0 feet below tail water.

(b) Operate all 12 powerhouse floating gate fishway entrances.

(5) Spillway Operations

The following spill schedule (table I-1) shall be followed during the spill period.

c. **1 December through February** (Winter Operating Period)

(1) Operate the adult fish passage facilities according to the fish passage period standards above, except systems may be dewatered or operated out of criteria for repair and maintenance. Adult facilities to be inspected once per day to assure operation as per standards above. Only one of the ladders servicing the two powerhouses and the associated powerhouse collection system (including the auxiliary water supply system) may be out of service or operating out of standard operating criteria at any one time unless specially coordinated. The units in the powerhouse with the fully operating fish facility will be on a first on, last off criteria, except when the powerhouse 1 collection facility is out of service, units 1, 2 and 8 will continue to operate. One of the two ladders servicing the spill channel should be in full operation at all

times unless specially coordinated.

(2) Spill bays 1 and 18 may be on seal.

(3) Adjust crowders at fish counting stations to full open at the end of the counting season.

Table I-1

Spill Schedule for Flows at Bonneville Dam
(Gate Opening in Dogs)*

Gate Number																		Total	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Dogs	KCFS**
4"	1															(1)	4"		
4"	1	1													(1)	1	4"		
4"	1	1	1											(1)	1	1	4"		
4"	1	1	1	1									(1)	1	1	1	4"		
4"	1	2	1	1									1	1	(2)	1	4"	10	35.3
4"	1	2	1	1	1							(1)	1	1	2	1	4"		
4"	1	2	1	1	1	1					(1)	1	1	1	2	1	4"		
4"	1	2	1	1	1	1	1			(1)	1	1	1	1	2	1	4"		
4"	1	2	1	1	1	1	1	1		1	(2)	1	1	1	2	1	4"		
4"	2	2	1	1	1	1	1	1		1	2	1	1	1	2	(2)	4"	20	68.6
4"	2	2	1	1	1	1	(2)	1	1	1	2	1	1	1	2	2	4"		
4"	2	2	1	1	1	1	2	2	(2)	1	2	1	1	1	2	2	4"		
4"	2	2	1	1	1	1	2	3	(3)	1	2	1	1	1	2	2	4"		
4"	2	2	1	1	2	1	2	3	3	1	2	1	1	1	2	(3)	4"		
4"	2	2	1	1	2	1	2	4	(4)	1	2	1	1	1	2	3	4"	30	100.8
4"	2	3	1	1	2	1	2	(5)	4	1	2	1	1	1	2	3	4"		
4"	2	3	1	1	2	1	3	5	(5)	1	2	1	1	1	2	3	4"		
4"	2	3	1	1	2	1	3	(6)	5	1	2	1	1	1	3	3	4"		
4"	2	3	1	1	2	1	3	6	6	1	2	1	1	1	3	(4)	4"		
4"	2	3	1	1	2	1	4	6	(7)	1	2	1	1	1	3	4	4"	40	139.7
4"	2	3	1	2	2	1	4	6	7	(2)	2	1	1	1	3	4	4"		
4"	3	3	1	2	2	1	4	6	7	2	2	1	(2)	1	3	4	4"		
4"	3	3	2	2	2	1	4	(7)	7	2	2	1	2	1	3	4	4"		
4"	3	4	2	2	2	(2)	4	7	7	2	2	1	2	1	3	4	4"		
4"	3	4	2	2	3	2	4	7	7	(3)	2	1	2	1	3	4	4"	50	176.0
4"	3	4	2	2	3	3	4	7	(8)	3	2	1	2	1	3	4	4"		
4"	3	4	3	2	3	3	4	7	8	3	(3)	1	2	1	3	4	4"		
4"	3	4	3	3	3	3	4	7	8	3	3	(2)	2	1	3	4	4"		
4"	3	4	3	4	3	3	4	7	8	3	3	2	2	(2)	3	4	4"		
4"	3	4	3	4	3	4	4	7	(9)	3	3	2	2	2	3	4	4"	60	211.5

Table I-1 (cont.)

Spill Schedule for Flows at Bonneville Dam
(Gate Opening in Dogs)*

Gate Number																		Total	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Dogs	KCFS**
4"	3	4	3	4	4	4	4	7	9	(4)	3	2	2	2	3	4	4"		
4"	3	4	4	4	4	4	4	7	(10)	4	3	2	2	2	3	4	4"		
4"	3	4	4	4	4	4	4	8	10	4	(4)	2	2	2	3	4	4"		
4"	3	4	4	4	4	4	4	8	10	5	4	2	(3)	2	3	4	4"		
4"	3	4	4	4	4	4	4	9	10	(6)	4	2	3	2	3	4	4"	70	246.5
4"	3	4	4	4	4	4	5	9	10	6	4	(3)	3	2	3	4	4"		
4"	3	4	4	4	4	4	5	10	10	6	4	3	3	(3)	3	4	4"		
4"	3	4	4	4	4	4	6	10	11	6	4	3	3	3	3	4	4"		
4"	4	4	4	4	4	4	6	10	11	(7)	4	3	3	3	3	4	4"		
4"	4	4	4	4	4	4	6	11	(12)	7	4	3	3	3	3	4	4"	80	281.0
4"	4	4	4	4	4	5	6	11	12	7	(5)	3	3	3	3	4	4"		
4"	4	5	4	4	4	5	6	11	12	(8)	5	3	3	3	3	4	4"		
4"	4	5	4	5	4	5	6	11	12	8	5	(4)	3	3	3	4	4"		
4"	4	5	4	5	4	5	6	12	12	8	5	4	3	3	(4)	4	4"		
4"	4	5	4	5	4	5	7	12	12	8	5	4	3	(4)	4	4	4"	90	316.1
4"	4	5	4	5	5	5	7	12	12	8	5	4	(4)	4	4	4	4"		
4"	4	5	5	5	5	5	7	12	12	8	5	4	4	4	4	(5)	4"		
4"	5	5	5	5	5	5	8	12	12	8	(6)	4	4	4	4	5	4"		
4"	4	5	5	5	5	5	8	12	12	8	6	5	(5)	4	4	5	4"		
4"	4	5	5	5	5	6	8	12	12	8	6	5	5	4	(5)	5	4"	100	351.2

* ( ) values may be one dog less than value shown. For example: (1) means 0 or 1 dog. (2) means 1 or 2 dogs, etc.

** KCFS approximate values were calculated using a forebay elevation of 76.0 feet.

2. BONNEVILLE DAM JUVENILE FISH PASSAGE FACILITIES

a. First Powerhouse

(1) Prior to 15 March each year (or as early as 1 March depending on timing of Spring Creek National Fish Hatchery releases.)

(a) Remove debris from forebay, trash racks and gate well slots.

(b) Inspect vertical barrier screens for damage, holes, debris accumulations and protrusions (video inspection acceptable). Clean and repair as necessary.

(c) Inspect each Submersible Traveling Screen (STS) and operate on trial run (dogged off at deck level). Install STS in each intake of operational units by 15 March or earlier if a production release of Spring Creek Hatchery tules is scheduled earlier than 15 March. However, installation will not be required before 1 March. The schedule for early hatchery releases will need to be supplied by the fisheries agencies by 1 February in order to coordinate early STS installation.

(d) Operate STSs at angle of 55 degrees from vertical.

(e) Inspect and, where necessary, clean and/or repair all gate well orifices and orifice lighting systems.

(f) Inspect and, where necessary, clean and/or repair dewatering screens and associated equipment.

(g) Inspect and correct any deficiencies of DSM channel and outfall conduit walls and floor.

(h) Inspect and where necessary repair or install gull lines.

(2) **15 March through 15 November**

(a) Remove debris from forebay and trash racks as required to maintain less than 1.5 feet of drawdown in gate well or as indicated by fish

condition (e.g., higher than expected descaling). STSs in units being raked should be run in continuous mode during raking operation. Gate well orifices of the unit being raked must be closed during the procedure.

(b) Inspect each STS and each VBS a minimum of once every three months (video acceptable), less frequent inspections may be allowed by the Project Biologist on STSs which have operated very little since their last inspection. Preferably, inspections will occur immediately prior to peaks in juvenile fish migrations, which begin about 1 May, mid-July and 1 September. Inspections should be concentrated on the priority units and those others with the longer operating time. More frequent inspections may be required by the Project Biologist or under the following conditions: 1) deterioration of fish condition; 2) increased debris load in bypass system; and 3) other indications of STS or VBS malfunctions or failure.

If STS or VBS damage or plugging is detected, follow procedures in Fish Facilities Maintenance Plan. Records of inspections or summary of such records will be made available to the Fish Passage Center by 1 January.

(c) Operate all gate well orifice systems. Inspect each daily to assure that the orifice valves and lights are operating correctly. Back-flush at least every day or more often if indicated by debris accumulations. Replace all burned out orifice lights within 24 hours.

(d) In the DSM downwell area:

i) Maintain between .9 and 1.3 feet of depth, 1 foot preferred, over the end of the DSM inclined dewatering screen.

ii) Maintain differential between forebay and dewatering screen between 5.3 and 5.7 feet.

iii) Maintain drop from dewatering screen to water surface in downwell between 3.0 and 4.5 feet.

iv) Operate dewatering screen trash sweep 1 revolution at 20 minute intervals. The interval between operations may be doubled when the amount of debris passing is light.

(e) Inspect each STS amp gauge readings at least once each shift and record readings once per day. If an STS failure occurs, then follow procedures in Fish Facilities Maintenance Plan.

(f) Inspect all STS gate wells daily. The project will make an effort to clean before gate well water surface becomes one-half covered with debris. However, the project will begin cleaning the gate wells before they become fully covered unless the gate well becomes fully covered overnight or on a weekend, at which time cleaning will begin the next work day. This is to maintain clean orifices and minimize fish injury. The first powerhouse gate well orifices should be closed during the debarking operation. After debarking a gate well, back-flush the orifice in that gate well. Check gate well drawdown.

(g) Coordinate cleaning efforts with personnel operating downstream migrant sampling facilities.

(h) Turbines should be operated at peak efficiency unless the additional generation is needed to avoid operation of a partially or fully unscreened unit or to avoid excess daytime spill (greater than 75 kcfs).

(i) STS cycling operation may begin when the mean length of the majority of the juvenile chinook passing the project reaches or exceeds 112mm. This time will be determined by the Project Biologist. A cycling time of a maximum 20 minutes off and a minimum of 2 minutes on must be followed. Cycling will be discontinued if warranted by fish condition or debris problems.

(j) Inspect and maintain the gull lines strung over the tail race and juvenile fish release areas.

(k) Before 15 April, turbine units without a full complement of STSs may operate to meet load demands. Exceptions to this are:

i) Unscreened units will not operate for the five days following a tule production release from Spring Creek National Fish Hatchery (this operation to start at midnight immediately following the completion of the release) unless BPA needs that additional generation to meet firm energy demands. The release dates will be supplied to the the Project Biologist by the Fish Passage Center as soon as these dates are available. The release date must be received by the Project Biologist one week prior to the release, to facilitate necessary coordination to accomplish the unscreened unit shutdown.

ii) Unscreened units will not operate when the Smolt Monitoring passage index at Bonneville exceeds 10,000 unless BPA needs that additional generation to meet firm energy demands or to avoid excess daytime spill (greater than 75 kcfs).

iii) Units without a full complement of STSs will be the last to be brought on line to meet power demands, and the first off line when the power demand has diminished.

(l) During the period 16 April through August turbine units without a full complement of STSs will not operate except to meet firm energy demands. Units without a full complement of STSs will be the last to be brought on line to meet power demands and the first off line when the power demand has diminished.

(m) During the period 1 September through 15 November, operate the same as the 1-15 March through 15 April period. (see (k) above).

(n) During periods of involuntary spill, open sluice gate 7A to a depth of 3.5 feet and 10C to a depth of 2.5 feet below the minimum expected forebay elevation.

(3) **1 October through 15 November**

STSs may be removed from units as designated by the Project Biologist (at least one-half of the units must remain screened) to reduce wear and facilitate early winter maintenance. Enough units should remain screened such that the average expected river flow (as estimated by the Reservoir Control Center) for this period would pass through screened units. These should be removed from lower priority units. Order of operating priority will be 1) screened first powerhouse units, 2) screened second powerhouse units, 3) unscreened first powerhouse units, and 4) unscreened second powerhouse units.

(4) **16 November through 14 March**

All STSs removed and DSM channel dewatered (see Dewatering Procedures). DSM channel may be dewatered throughout most of this period if STSs must be stored beneath the intake deck, which places the STSs directly in front of the gate well orifices. Additionally, all units should be operated at peak efficiency whenever possible.

b. Second Powerhouse

(1) Prior to 15 March each year (or as early as 1 March depending on earliest release of Spring Creek National Fish Hatchery fish)

(a) Remove debris from forebay, trash racks and gate well slots.

(b) Inspect vertical barrier screens for damage, holes, debris accumulations or protrusions (Video inspection acceptable). Clean and repair as necessary.

(c) Inspect each Submersible Traveling Screen (STS) and operate on trial run (dogged off at deck level). Install STS in each intake of operational units by 15 March or earlier if a tule production release from Spring Creek Hatchery is scheduled earlier than 15 March.

However, installation will not be required before 1 March. Fisheries agencies will provide schedule of early hatchery releases by 1 February to allow time to coordinate preparation.

(d) Operate STSs at angle of 60 degrees from vertical.

(e) Inspect and, where necessary, clean and/or repair all gate well orifices and orifice lighting systems.

(f) Inspect and, where necessary, clean and/or repair dewatering screens and associated equipment.

(g) Inspect and correct any deficiencies of DSM channel and conduit outfall walls and floor.

(h) If required, install, replace or repair gull lines.

(2) 15 March through 15 November

(a) Remove debris from forebay and trash racks as required to maintain less than 1.5 feet of drawdown in gate well or as indicated by fish condition (e.g., higher than expected descaling). STSs in units being raked should be run on continuous during raking operation. Gate well orifices of the unit being raked must be closed during the procedure.

(b) Inspect each STS or VBS a minimum of once every three months (video acceptable), less frequent inspections may be allowed by the Project Biologist on STSs which have operated very little since their last inspection. Preferably, inspections will occur immediately prior to peaks in juvenile fish migrations, which begin about 1 May, mid-July and 1 September. Inspections should be concentrated on the priority units and those others with the longer operating time. More frequent inspections may be required by the Project Biologist or under the following conditions: 1) deterioration of fish conditions; 2) increased debris load in bypass system; and 3) other indications of

STS or VBS malfunctions or failure. If STS or VBS damage or plugging is detected follow procedures in Fish Facilities Maintenance Plan. Records of inspections or summary of such records will be made available to the Fish Passage Center by 1 January upon request.

(c) Operate all gate well orifice systems. Inspect each daily to assure that the orifice valves and lights are operating correctly. Orifices with less than clear flow jet should be cleaned at least once per day. Replace all burned out orifice lights within 24 hours.

(d) Inspect each STS amp gauge readings at least once each shift and record reading once per day. If an STS failure occurs follow procedures in Fish Facilities Maintenance Plan.

(e) Inspect all STS gate wells daily. The Project will make an effort to clean them before they become half covered with debris. However, the Project will begin cleaning the gate wells before they become fully covered unless they become fully covered overnight, or a weekend at which time cleaning will begin the next work day. After debarking a gate well, inspect and if necessary, clean the orifice in that gate well. Check gate well drawdown.

(f) Coordinate cleaning efforts with personnel operating downstream migrant sampling facilities.

(g) Turbines should be operated at peak efficiency unless the additional generation is needed to avoid operation of a partially or fully unscreened unit or to avoid excess daytime spill (greater than 75 kcfs).

(h) STS cycling may begin when the mean length of the majority of the juvenile chinook passing the project reaches or exceeds 112mm. This time will be determined by the Project Biologist. A cycling time of a maximum 20 minutes off and a minimum of 2 minutes on must be followed. Cycling will be

discontinued if warranted by fish condition or debris problems.

(i) Inspect and maintain the lines installed for the purpose of discouraging gull predation on juvenile salmonids.

(j) The second powerhouse juvenile bypass system continues to operate with restrictions. Prior to the tenth percentile of the spring outmigration the second powerhouse units will not be operated for a minimum of five days following a tule production release from Spring Creek Hatchery. Additional restriction days (up to a grand total of fifteen) will be based upon 8 hour (1600 - 2400) powerhouse 1 bypass estimates (summation of each hour's sample expanded for each hour's sample time to an hourly estimate) of 1,000 Spring Creek tules. Eight hour powerhouse 1 bypass passage estimates of Spring Creek tules must remain less than 1,000 for two consecutive nights before the restriction will be lifted or once lifted the counts must exceed 1,000 for one day to reinstate the restriction the next evening at Bonneville 2. Second powerhouse units will not operate during the middle 80 percent (production releases prior to 1 April from Spring Creek Hatchery will not be considered in the computation of this percent) of the spring and summer outmigrations unless the units are needed to limit daytime (0600-2000 PST) spill to less than 75,000 cfs. This date will be provided by the Fish Passage Center to the Corps' Reservoir Control Center whom will relay to the project.

Typically, when flows are above the capacity of the first powerhouse units, spill will occur. Units in the second powerhouse may be operated as necessary for fishery research. This restriction on the second powerhouse will not apply after 15 August. After this date powerhouse 2 is available to meet firm load demands through September. The only research planned this year which will impact second powerhouse operation is continuing studies of fish survival.

(k) Maintain DSM water surface at unit #18 orifices between elevations 64.5 - 65.0.

(l) Maintain water surface on dewatering screen between elevations 60.8 - 61.2.

(m) Maintain water surface in down-well between elevations 54.0 - 58.0.

(3) 1 October through 15 November

STSs may be removed from units as designated by the Project Biologist (at least one-half of the units must remain screened) to reduce wear and facilitate early winter maintenance. Enough units should remain screened such that the average expected river flow (as estimated by the Reservoir Control Center) for this period would pass through screened units. These should be removed from lower priority units. Order of operating priority will be: 1) screened first powerhouse units, 2) screened second powerhouse units, 3) unscreened first powerhouse units, and 4) unscreened second powerhouse units.

(4) 16 November through 14 March

All STSs removed. DSM dewatered (see Dewatering Procedures) only when required for maintenance. The period of maintenance should be minimized to the extent practicable. Facilities, when operating are to be inspected at least once per day to assure criteria are being met. Additionally, all units should be operated at peak efficiency whenever practicable.

B. **MAINTENANCE PLAN**

1. Adult Fish Passage Facilities

a. Fish Passage Season - 1 March through November. (See Operating Standards)

b. Winter Maintenance Season - 1 December through February (see Operating Standards)

c. Fishway Auxiliary Water Systems

(1) Scheduled Maintenance (see Appendix A for coordination procedures) - Bonneville Project auxiliary water systems consist of gravity flow and hydroelectric generating systems. Preventive maintenance and normal repair are carried out throughout the year.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures) - Most fishway auxiliary water systems are operated automatically. If the automatic system fails, then the system can usually be operated manually by project personnel. This will allow the fish facility to operate according to criteria while repair of the automatic system is carried out. When this operation becomes necessary, project personnel will increase the surveillance of the adult system to ensure that criteria are being met.

a) Bonneville First Powerhouse - If any of the valves or any other part of the system fails, then the project is to attempt to maintain criteria by adjusting those valves which continue to function. Conduit pressure must be monitored and not allowed to exceed the established limits. If this maneuver fails to keep the facility operating according to the adult fishway criteria and repairs cannot be made within 24 hours, then close powerhouse entrances (9, 21, 34, 58 and 62), one at a time, starting with gate 9 and proceed north.

If closing the orifice gates fails to achieve a minimum fishway head of 1.2 feet when tail water is greater than 17 feet,

then raise gate 65 weir in one-foot increments up to 6 feet of depth below the tail water surface until a head of 1.2 feet is achieved. If this fails to achieve the proper fishway head, then raise gate 1 weir in one foot increments to 6 foot depth below the tail water surface until a head of 1.2 feet is achieved.

When tail water elevation is less than 17 feet and the gate 65 weir crest is at least 6 feet below tail water, close gate 64 in one-foot increments until the proper head is achieved or the gate is fully closed, then raise gate 65 in one-foot increments up to 6 feet below tail water. If the gate 65 weir crest is less than 6 feet below tail water, then fully open gate 64 and close gate 65. If this fails to achieve the proper fishway head and the gate 1 weir crest is at least 6 feet below tail water, then close gate 2 in one-foot increments until fully closed, then raise gate 1 in one foot increments up to 6 feet below tail water. If the gate 1 weir crest is less than 6 feet below tail water, then fully open gate 2 and close gate 1. At this point maintain the gates' positions regardless of whether criteria are met or not, until the auxiliary water system is repaired.

b) Bonneville Spillway - Two separate fishway auxiliary water valves add water to each spillway ladder (Cascades Island and B-Branch ladders). If one of these valves or any other part of the system malfunctions, the functioning parts of the system are to be adjusted to compensate. If repairs cannot be made in 24 hours, close the sluice gate entrance, if open. This will divert the reduced available water to the entrance slots. If a head of 1.0 foot is still not achieved, stoplogs are to be added to the entrance slots until the desired head or a weir depth of not less than 6 feet below the tail water surface is reached. At this point maintain the gate positions until the

auxiliary water system is repaired.

c) Bonneville Second Powerhouse - If either of the fishway auxiliary water turbines are unable to provide water sufficient to meet full criteria during the fish passage season, raise the North Upstream Entrance (NUE) in one-foot increments until the weir crest is 6 feet below the tail water or a fishway head of a least 1.2 feet is achieved. If this fails to achieve the above criteria then apply the same procedure, until the criteria are achieved, using in addition the North Downstream Entrance (NDE) then, the South Upstream Entrance (SUE), and finally the South Downstream Entrance (SDE). The weir crests for these three entrances should not be raised above 6 feet below tail water. If the correct fishway head is still not achieved after this procedure, then fully close NUE and operate in this configuration until repairs can be made to the system.

If one of the fishway water supply turbine units fails outside the fish passage season, then the ice and trash chute will be used to supplement discharge from the operating unit to allow operation of the fishway according to standards. Care will be taken to keep the trash chute screen free of debris and the downstream end gate will be raised briefly at least once weekly to flush trapped fish out of the chute.

If both of the fishway auxiliary water turbines fail, then the backup fishway auxiliary water system, using gravity flow through the ice and trash sluice way, will be started up. The adult facility will be operated as follows:

1: Close NDE, SUE and NUE;

2: Operate the SDE weir crest at eight feet below tail water;

3: Operate the floating orifice gates.

However, if the backup fishway auxiliary water system must be used for a period exceeding 30 days, then block off as many of the center floating orifice gates as possible and open NDE with a weir depth of eight feet below the tail water water surface. While under this configuration power generation at the second powerhouse will be minimized to reduce fish attraction into this area.

If both auxiliary water systems fail or malfunction, then close SUE, NDE and NUE and raise SDE weir crest to six feet below tail water elevation with the floating orifice gates open. Maintain this configuration until the system is repaired. While under this configuration power generation at the second powerhouse will be minimized to reduce fish attraction into this area unless the first powerhouse facilities are dewatered.

d. Powerhouse and Spillway Adult Fish Collection System

(1) Scheduled Maintenance - (see Appendix A for coordination procedures) - Preventive maintenance and repair occurs throughout the year. During the adult fish passage season this maintenance will not involve any operations which will cause failure to comply with the adult fishway criteria except as specially coordinated or as needed for semi-annual maintenance. Inspection of those parts of the adult collection channel systems which require dewatering, such as diffusion gratings, picketed leads and entrance gates, will be scheduled at least once every ten years with at least one underwater inspection in between unless a channel must be dewatered for fishway modifications or to correct observed problems (See Dewatering Plans). Inspection by a diver or underwater video system may be used for the underwater inspections. This scheduled inspection and any associated maintenance will occur during the winter maintenance period unless specially coordinated. Any non-routine maintenance and

fishway modifications will be handled on a case by case basis.

The Project Biologist will attempt to attend all dewatering activities potentially involving large numbers of fish, as well as inspections to provide fishery input (See Dewatering Plans). However, in the absence of the Biologist, the project will proceed, using all due care to ensure that fish are not stranded or injured. In these circumstances, personnel in charge of the activities will provide reports to the Project Biologist summarizing each fish salvage activity. Information will include at least the following: facility involved, timing, numbers of salmonids and sturgeon handled, condition of fish (alive, stressed or dead) and where the fish were released. If an emergency occurs which threatens fish safety, then the Project Biologist or alternate will be contacted for assistance.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures) - The Bonneville Project contains several types of fishway entrances. In most cases, if a failure occurs the entrance can and will be operated manually by project personnel until repairs are made. If this operation becomes necessary, project personnel will increase the surveillance of the adult system to insure that criteria are being met. In those cases in which the failure will not allow the entrance to be operated manually, the gate will be maintained, to the extent possible, in an operational position. If this is not possible the entrance will be repaired expediently and the entrance will be brought back into manual or automatic control at the earliest possible date.

e. Adult Fish Ladders and Counting Stations

(1) Scheduled Maintenance (see Appendix A for coordination procedures) - The adult fish ladders will be dewatered (see Dewatering Plan) once each year during the winter maintenance period. During this time the ladders will be inspected for blocked orifices, projections into the fishway that may injure fish, stability of the weirs, damaged picketed leads, exit gate

problems, loose diffusion gratings, unreadable or damaged staff gauges, defective diffusion valves and malfunctioning operating equipment at the counting stations as well as other potential problems. Problems identified throughout the passage year that do not affect fish passage through the ladder as well as those identified during the dewatered period may then be repaired.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures) - The Bonneville First Powerhouse ladder was completed in 1937 and the Bonneville Second Powerhouse ladder in 1981. Modification of the first powerhouse ladder was completed during the winter of 1981-82. The structures of the ladders include picketed leads, counting stations, fishway exits and overflow weirs with orifices. Picketed leads can cause problems. Pickets with excessive spacing (greater than 1"), erosion of concrete around the picketed leads or missing pickets can allow fish into areas where escape is not possible. In some instances of picketed lead failure, spare picketed leads and spare installation slots are available. In these cases the spare leads are installed and the damaged leads are removed and repaired. In the remaining instances of picketed lead failure or concrete erosion, the timing and method of repair will depend upon the severity of the problem. The decision of whether or not to dewater the fishway and repair any problems will be made in consultation with the fishery agencies and Indian tribes.

2. Juvenile Fish Passage Facilities

a. Fish Passage Season - 15 March through 15 November (See Operating Standards). Passage season may start as early as 1 March if a Spring Creek National Fish Hatchery release occurs.

b. Winter Maintenance Period - 16 November through 14 March (See Operating Standards). The end of this period may change depending upon early March Spring Creek National Fish Hatchery release.

c. Submersible Traveling Screens (STSs)

(1) Scheduled Maintenance (see Appendix A for coordination procedures) - The STS system will receive preventive maintenance or repair at all times of the year including the winter maintenance period when all STSs may be removed from the intakes. Whenever a generator malfunctions or is scheduled for maintenance, the three STSs in that turbine may be maintained, repaired or exchanged for other STSs needing maintenance or repair. One third of the STSs at Bonneville are scheduled for complete overhaul each year resulting in a three-year maintenance cycle unless future developments indicate that longer life expectancy is possible.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures) - If an STS is found to be damaged or inoperative in an operating unit, refer to Figure I-1. During the peak juvenile passage periods (15 April through August), the day of and four days following a juvenile fish release from Spring Creek National Fish Hatchery or when the juvenile salmonid index at Bonneville exceeds 3,000, a crane crew will be taken off lower priority work or will work overtime to remove and replace (if spare available) a damaged or malfunctioning STS or VBS from any unit needed or likely to be needed for firm energy within the next 48 hours. Crews will work overtime or as call-outs on weekends as required.

d. Juvenile Bypass Systems

(1) Scheduled Maintenance (see Appendix A for

coordination procedures) - The Bonneville juvenile bypass facilities will receive preventive maintenance at all times of the year. During the juvenile fish passage season this will normally be above water work such as maintenance of automatic systems, air lines, electrical systems and monitoring equipment. During the winter maintenance period the systems may be dewatered downstream of the gate well orifices. The systems will then be visually inspected in all accessible areas for damaged equipment and areas that may cause problems to the juvenile fish. Any problem areas identified are repaired if the project is able. In extreme cases the work will be contracted as soon as possible or repaired during the next winter maintenance period. Modifications and general maintenance to the channels are also to be completed at this time. The trash racks are to be raked just prior to the juvenile fish passage season and whenever trash accumulations are suspected because of increased head across the trash racks or increased juvenile fish descaling is noted. Additional raking of trash racks may be necessary when a storm brings large quantities of debris down river to the project. Gate well orifices of the unit being raked should be closed during the procedure (applies only to the first powerhouse).

(2) Unscheduled Maintenance (see Appendix A for coordination procedures)

(a) The Bonneville project's juvenile bypass systems are controlled by automatic systems. When an automatic system fails, it usually can be operated manually. This allows either facility to operate according to criteria while repair of the automatic system is completed. Orifices allow fish out of the gate wells into a bypass channel. When the orifices become plugged with debris they are either mechanically (Second Powerhouse) or pneumatically (First Powerhouse) cleaned out.

Inspect all STS gate wells daily. The project will make an effort to clean before gate well water surface becomes one-half covered with debris. However, the project will begin cleaning the gate wells before they become

fully covered unless the gate well becomes covered overnight or on a weekend, at which time cleaning will begin the next work day. This is to maintain clean orifices and minimize fish injury. The first powerhouse gate well orifices should be closed during the debarking operation. After debarking a gate well, back-flush the orifice in that gate well. Check gate well drawdown.

(b) Bonneville First Powerhouse - If any part of the dewatering screen, downwell or juvenile release conduit fails, making this portion of the system unsafe for juvenile fish, the juveniles will be diverted to the ice and trash sluice way. This operating mode will require the gate at the south end of the downstream migrant (DSM) channel to be removed and a stoplog at the north end to be installed so migrants will flow down into the ice and trash sluice way channel. Sluice-way gate 7A will be opened to a depth of 3.5 feet, gate 10C to 2.5 feet below the minimum expected forebay, and the ice and trash sluice-way end gate will be opened to provide safe transportation flows for juveniles. Forebay elevation will be kept above 74.0 msl. to the extent practicable. The bypass will then continue operating while repairs are completed. In either operating mode, the orifices will be cleaned with the air pressure system at least once per day, when plugged orifices are indicated, or after trash rack raking and gate well debarking.

(c) Bonneville Second Powerhouse - If the bypass system fails in the dewatering section, downwell or release pipe, fish may be released through the emergency relief conduit. This operation will continue until repairs are accomplished or until the end of the fish passage season. Any decision on whether or not to shut this system down for dewatering and repairs will be made in consultation with the fisheries agencies and Indian tribes. During this emergency operating mode, power generation will be minimized at the second powerhouse to the extent possible. Repairs will receive high priority.

During fishway inspection activities the VBSs may be found to be plugged or damaged. In these cases refer to Figure I-1.

3. Turbines and Spillways

Scheduled Maintenance (see Appendix A for coordination procedures) - The maintenance and routine repair of project turbines and spillways is a regular and reoccurring process which requires that units be shut down for up to two months (see Dewatering Plans). The schedule for this maintenance will be reviewed by the Project and Operations biologists and coordinated within NPP, NPD and BPA. Certain turbine and spillway discharges at the projects are secondarily used to attract adult fish to the areas of fishway entrances, to keep predator fish from accumulating in the area of juvenile release sites and to move juveniles downstream away from the project. The maintenance schedules for these turbines and spillways will reflect equal weighting given to fish, power and water management and will be coordinated with the appropriate resource agencies. No other fish related restrictions regarding maintenance will be placed on any units at these projects, except coordinated research activities.

Figure I-1.
Operation and Maintenance when STS or VBS Fail at Bonneville Dam

1. If all available units are operating to meet firm energy demand during low debris conditions, continue operating until step 3 can be accomplished, otherwise proceed to step 2.

2. Units 10, 9, 18, and 17 will operate under any load conditions (except when debris is heavy) with failed STS or VBS until step 3 is done. When debris is heavy, units with a failed STS will be shut down. If either unit 1 or 2 is out of service and the other of these two has a malfunctioning screen, that unit must stay in operation. The failed STS or VBS in any of the above units will be repaired or replaced within 24 hours. Turbine units 1 and 2 will replace 9 and 10 in priority when the First Powerhouse bypass channel flows to the south. Any other unit with failed STS or VBS will be shut down until step 3 can be done or it is required to meet firm energy demand, in which case it will be the last on line and the first off.

3. During working hours, assuming the BPA dispatcher will unload Bonneville on request, the unit will be taken out of service and the failed STS or VBS examined. If possible, repairs will be done the same day, and the unit may return to service. During the peak juvenile passage period (15 April - 30 September), and the 5 days following the day of a juvenile fish release from Spring Creek National Fish Hatchery, or when the juvenile salmonid index at Bonneville exceeds 3,000, an STS fails on a unit required for generation, then a crane crew will work overtime or weekends if necessary to remove and replace (if spare available) the damaged or malfunctioning STS or VBS.

4. If repairs require longer than 1 day, the STS or VBS will be replaced with a spare or one from a long term out of service unit. If all available turbines are required to meet firm energy demands or to control excess spill during daylight hours, unscreened turbines will be operated. The STS or VBS will be replaced with one from Unit 8 then 7 (PH-1) or Unit 15 (PH-2), and the unit will be returned to service. If the unscreened unit must be operated for longer than one week then remove the damaged STS or VBS as advised by the Project Biologist. Order of STS or VBS removal should be slots A-B then C, except at unit 7 where the order of removal should be B, C, A. If the failed STS or VBS is in units 7 or 8 the failed STS or VBS will be removed and repaired.

5. All partially screened or unscreened units will be operated according to Juvenile Operating Standards until a spare or repaired STS or VBS is available for installation.

C. DEWATERING PLAN

1. Adult Fish Ladder

   a. Scheduled Maintenance (see Appendix A for coordination procedures)

      (1) When possible operate ladder to be dewatered at orifice flow for at least 24 hours but no more than 48 hours prior to dewatering.

      (2) Discontinue all fishway auxiliary water supply at least 24 hours but no more than 48 hours prior to dewatering.

      (3) The Project Biologist will assure that fish rescue equipment is available and will coordinate to ensure adequate numbers of personnel will be available to move fish out of the dewatered ladder.

      (4) Project personnel will install head gates to shut down ladder flow. Where possible, a flow of 1-2 inches will be maintained in the ladder until fish are rescued.

      (5) The Project Biologist will try to be available to oversee fish rescue when ladders are dewatered. Rescue personnel will walk the inside of the ladder from the head gates down to tail water salvaging all fish either by moving fish to tail water within the ladder flow or capturing and placing the fish in a large water filled tank which is then transported to the forebay or tail water, whichever is closest, for release. When rescue is accomplished in the absence of the Project Biologist a brief report will be provided which will include: facility involved, timing, salmonids and sturgeon found, fish condition (live, dead or stressed) and where the fish were moved to.

   b. Unscheduled Maintenance (see Appendix A for coordination procedures)

      (1) When possible, discontinue fishway auxiliary water and operate ladder at orifice flow as long as possible (prefer 3-24 hours) prior to dewatering.

(2) Follow steps 3-5 above.

2. Powerhouse Fish Collection System

a. Scheduled Maintenance (see Appendix A for coordination procedures)

(1) During the pumping or draining operation to dewater a portion or all of the collection channel, the water level will not be allowed to drop to a level which strands fish.

(2) The Project Biologist will assure that rescue equipment is available if needed.

(3) The Project Biologist will provide technical guidance on fish safety and will assist directly as needed in rescue operations. Reports will be provided for fish rescue activities which are not attended by the biologist. Information will include facility involved, timing, numbers of salmonids and sturgeon involved and fish condition (live, dead or stressed) and where the fish were returned to water.

3. Turbines

a. When possible, place head gates and tail logs immediately after turbine unit is shut down if draft tube is to be dewatered.

b. If turbine unit draft tube is to be dewatered and turbine unit has been idle, it will be operated when possible, at "speed/no load" and stop logs will then be placed immediately.

c. Water levels in the draft tube will not be allowed to drop to a level which strands fish.

d. 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 will provide technical guidance on fish safety and will directly participate in fish salvage when possible. Reports will be provided for fish rescue activities which are not attended by the biologist. Information will include facility involved, timing, numbers of salmonids and sturgeon involved and fish condition (live, dead or stressed) and where the fish were

returned to water.

e. The Project Biologist will assure that rescue equipment is available if needed.

f. If the Unit is planned to be out of service 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.

The Dalles Dam

II. **THE DALLES DAM**

A. OPERATING STANDARDS

1. Adult Fish Passage Facilities

a. Prior to 1 March each year

(1) Inspect all staff gauges and water level indicators, repair and/or clean where necessary.

(2) Dewater all ladders and inspect all dewatered sections of fish facilities for projections, debris or plugged orifices which could injure fish or slow their progress up the ladder. Repair deficiencies.

(3) Inspect for, and when necessary, clear debris in the ladder exits.

(4) Reinstall picketed leads at counting stations prior to watering up the ladders during maintenance.

b. **1 March through November** (Fish Passage Period)

(1) All Adult Fish Facilities

(a) Water depth over fish ladder weirs: 1.2 feet (+ or − 0.1). 1.3 feet during shad passage (15 May through 31 July) on the east ladder.

(b) Head on all entrances: 1.0 to 1.5 feet (prefer 1.3 to 1.5). Refer to maintenance plan when unable to achieve head criteria.

(c) A transportation velocity of 1.5 to 4.0 feet per second (prefer 2.0 fps) shall be maintained in all channels and the lower ends of the fish ladders which are below the tail water.

(d) Maximum of 6" head on attraction water intakes and trash racks at all the ladder exits, with a 4" maximum head on all picketed leads. Debris shall be removed when significant amounts accumulate.

(e) Staff gauges and water level indicators will be readable at all water levels encountered

during the fish passage period.

(f) Main entrance weir depths: 8 feet or greater below tail water. Weirs will be lowered to bottom when 8 feet depth is not possible.

(2) North Fishway

(a) North Fishway Entrance: Operate entrances N1 and N2 during periods with spill. N2 may be closed during periods with no spill.

(3) Powerhouse

(a) West Powerhouse Entrance: Operate two entrances (W1 and W2).

(b) East Powerhouse Entrance: Operate all three entrances (E1, E2, E3) except as required during low tail water conditions (below el 78') when E1 entrance may be closed.

(c) Operate 12 submerged orifices along the powerhouse collection system. Orifice numbers are: 3, 12, 24, 39, 57, 78, 102, 117, 129, 132, 135, and 136.

(d) The cul-de-sac entrance will remain closed.

(e) South Spillway Entrance: Operate both downstream entrances (S1 and S2).

(4) Spillway Operations

The following spill schedule (Table II-1) shall be followed during the day time (0600 - 2000) for adult migrant attraction.

c. **1 December through February** (Winter Operating Period)

(1) Operate the powerhouse and south spillway adult fish passage facilities according to the fish passage period standards above except the system may be dewatered or operated out of criteria for repair and maintenance. Adjust the counting station fish crowder to full open and pull picketed leads at counting station at the end of the counting season.

(2) Operate the north spillway adult fish passage

facilities according to the following criteria:

(a) No spill period - Operate entrance gate N1, head attainable by ladder flow only. Weir crest 6 feet below tail water.

(b) Spill period - operate according to passage season criteria.

(c) East ladder dewatered or operating out of fish passage period criteria - Operate according to passage season criteria.

(3) Only one of the two fish facilities may be out of service at any one time unless specially coordinated. The lone operating facility should be operated according to passage season criteria unless specially coordinated.

Table II-1

Spilling Schedule for The Dalles Dam (openings in feet).

Based on pool elevation 159.6'

Gate Number																							kcfs
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
(1)																						1	3.0
1	(1)																				1	1	6.0
1	1	(1)																		1	1	1	9.0
1	1	1	(1)																1	1	1	1	12.0
1	1	1	1	(1)														1	1	1	1	1	15.0
1	1	1	1	1	(1)												1	1	1	1	1	1	18.0
1	1	1	1	1	1	(1)										1	1	1	1	1	1	1	21.0
1	1	1	1	1	1	1	(1)								1	1	1	1	1	1	1	1	24.0
1	1	1	1	1	1	1	1	(1)						1	1	1	1	1	1	1	1	1	27.0
1	1	1	1	1	1	1	1	1	(1)				1	1	1	1	1	1	1	1	1	1	30.0
1	1	1	1	1	1	1	1	1	1	(1)		1	1	1	1	1	1	1	1	1	1	1	33.0
1	1	1	1	1	1	1	1	1	1	1	1	(2)	1	1	1	1	1	1	1	1	1	1	36.0
1	1	1	1	1	1	1	1	1	1	2	1	2	1	(2)	1	1	1	1	1	1	1	1	39.0
1	1	1	1	1	1	1	1	2	1	2	1	2	1	2	1	(2)	1	1	1	1	1	1	42.0
1	1	1	1	1	1	2	1	2	1	2	1	2	1	2	1	2	1	(2)	1	1	1	1	45.0
1	1	1	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	(2)	1	1	48.0
1	1	1	1	2	1	2	1	2	2	2	(2)	2	1	2	1	2	1	2	1	2	1	1	51.0
1	1	1	1	2	1	2	2	2	2	2	2	2	(2)	2	1	2	1	2	1	2	1	1	54.0
1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	(2)	2	1	2	1	2	1	1	57.0
1	1	1	1	2	2	2	2	2	2	2	2	(3)	2	2	2	2	2	2	1	2	1	1	60.0
1	1	1	1	2	2	2	2	3	2	3	2	3	2	(3)	2	2	2	2	1	2	1	1	63.0
1	1	1	1	2	2	2	2	3	2	3	2	3	2	3	2	2	2	2	(2)	2	1	1	66.0
1	1	1	1	2	2	3	2	3	2	3	2	3	2	3	2	(3)	2	2	2	2	1	1	69.0
1	1	1	1	2	2	3	2	3	2	3	3	3	2	3	2	3	2	(3)	2	2	1	1	72.0
1	1	1	1	2	2	3	2	3	3	3	3	3	(3)	3	2	3	2	3	2	2	1	1	75.0
1	1	1	2	2	2	3	2	3	3	3	3	3	3	3	(3)	3	2	3	2	2	1	1	78.0
1	1	2	2	2	2	3	2	3	3	3	3	3	3	3	3	(3)	3	3	2	2	1	1	81.0
1	1	2	2	2	2	3	2	3	3	3	3	(4)	3	3	3	3	3	3	2	2	1	1	84.0
1	1	2	(3)	2	3	3	2	3	3	3	3	4	3	3	3	3	3	3	2	2	1	1	87.0
1	1	2	3	2	3	3	2	3	3	4	3	3	3	(4)	3	3	3	3	2	2	1	1	90.0

Table II-1 (Cont.)

Spilling Schedule for The Dalles Dam (openings in feet).

Based on pool elevation 159.6'

Gate Number																						kcfs
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	1	2	3	2	3	4	3	4	3	4	3	4	3	4	3	3	3	3	2	2	(2)	1	93.0
1	1	2	3	2	3	4	3	4	3	4	(4)	4	3	4	3	3	3	3	2	2	2	1	96.0
1	1	2	3	2	3	4	3	4	4	4	4	4	(4)	4	3	3	3	3	2	2	2	1	99.0
1	2	2	3	2	3	4	3	4	4	4	4	4	4	4	3	3	3	3	2	(3)	2	1	102.0
1	2	2	3	2	3	4	(3)	4	4	4	4	4	4	4	4	3	3	3	2	3	2	1	105.0
1	2	2	3	2	3	4	4	4	4	(5)	4	5	4	4	4	3	3	3	2	3	2	1	108.0
1	2	2	3	2	3	4	4	5	4	5	4	5	4	4	4	(4)	3	3	2	3	2	1	111.0
1	2	2	3	2	3	4	4	5	4	5	5	5	4	(5)	4	4	3	3	2	3	2	1	114.0
1	2	2	3	3	3	4	4	5	4	5	5	5	(5)	5	4	4	3	3	2	3	2	1	117.0
1	2	3	3	3	3	4	4	5	(5)	5	5	5	5	5	4	4	3	3	2	3	2	1	120.0
1	2	3	3	4	3	4	4	5	5	5	5	5	5	5	4	4	3	3	(3)	3	2	1	123.0
1	2	3	3	4	3	4	5	5	5	5	5	5	5	5	4	4	3	(4)	3	3	2	1	126.0
1	2	3	3	4	4	4	5	5	5	5	5	5	5	5	(5)	4	3	4	3	3	2	1	129.0
1	2	3	3	4	4	5	5	5	5	5	5	5	5	5	5	4	3	4	(4)	3	2	1	132.0
1	2	3	3	5	4	5	5	5	5	5	5	5	5	5	5	4	(4)	4	4	3	2	1	135.0
1	2	3	4	5	4	5	5	5	5	5	5	5	5	5	5	4	(5)	4	4	3	2	1	138.0
1	2	3	4	5	5	5	5	5	5	5	5	5	5	5	5	(5)	5	4	4	3	2	1	141.0
1	2	3	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	(4)	2	1	144.0
1	2	3	4	5	5	5	5	5	5	6	5	5	5	5	5	5	5	(5)	5	4	2	1	146.9
1	2	3	4	5	5	5	5	(6)	5	6	5	6	5	5	5	5	5	5	5	4	2	1	149.7
1	2	3	4	5	5	5	5	6	5	6	6	6	6	(6)	5	5	5	5	5	4	2	1	152.5
1	2	3	4	5	5	5	5	6	6	6	6	6	(6)	6	5	5	5	5	5	4	2	1	155.3
1	2	4	4	5	5	5	5	6	6	6	6	6	6	6	5	5	5	5	5	4	(3)	1	158.3
1	2	4	4	5	5	6	5	6	6	6	6	6	6	6	5	(6)	5	5	5	4	3	1	161.1
1	2	4	4	5	5	6	6	6	6	6	6	6	6	6	(6)	6	5	5	5	4	3	1	163.9
1	2	4	5	2	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5	4	3	(2)	166.8
1	2	4	5	2	6	6	6	6	6	6	6	6	6	6	6	6	(6)	5	5	4	4	2	169.7
1	2	4	5	2	6	6	6	6	6	(7)	6	6	6	6	6	6	6	5	5	4	4	2	172.7
1	2	4	5	2	6	6	6	(7)	6	7	6	7	6	6	6	6	6	5	5	4	4	2	175.7
1	2	4	5	2	6	7	6	7	6	7	6	7	6	(7)	6	6	6	5	5	4	4	2	178.7

Table II-1 (Cont.)

Spilling Schedule for The Dalles Dam (openings in feet).

Based on pool elevation 159.6'

Gate Number																							kcfs
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	2	4	5	5	6	7	7	7	7	7	(7)	7	7	7	6	6	6	5	5	4	4	2	181.7
1	2	4	5	5	6	7	7	7	7	7	7	7	(7)	7	6	6	6	5	5	4	4	2	184.7
1	2	4	5	(6)	6	7	7	7	7	7	7	7	7	7	6	6	6	6	5	4	4	2	187.5
1	2	(5)	5	6	6	7	7	7	7	7	7	7	7	7	6	6	6	6	5	5	4	2	190.5
1	3	5	5	6	6	7	7	7	7	7	7	7	7	7	7	6	6	6	5	5	4	2	193.5
1	3	5	5	6	7	7	7	7	7	7	7	7	7	7	7	(7)	6	6	5	5	4	2	196.
1	3	5	6	6	7	7	7	7	7	7	7	7	7	7	7	7	(7)	6	5	5	4	2	199.4
1	3	5	6	6	7	7	7	7	7	8	7	7	7	7	7	(8)	7	6	5	5	4	2	202.3
1	3	5	6	6	7	7	7	8	7	8	7	(8)	7	7	7	8	7	6	5	5	4	2	205.0
1	3	5	6	6	7	8	7	8	7	8	7	8	7	(8)	7	8	7	6	5	5	4	2	207.8
1	3	5	6	6	7	8	7	8	8	8	(8)	8	7	8	7	8	7	6	5	5	4	2	210.6
1	3	5	6	6	7	8	8	8	8	8	8	8	7	8	7	8	7	6	(6)	5	4	2	213.4
1	3	5	6	7	7	8	8	8	8	8	8	8	7	8	7	8	7	(7)	6	5	4	2	216.4
1	3	5	7	7	7	7	8	8	8	8	8	8	(8)	8	7	8	7	7	6	5	4	2	219.3
1	3	5	7	7	8	8	8	8	8	8	8	8	8	8	(8)	8	7	7	6	5	4	2	222.1

Values in parentheses may be 1 foot less than the values shown.
For example: (1) means 0 or 1 foot
(2) means 1 or 2 feet

An approved spill schedule which incorporates raising spill bay gates in blocks of four will be implemented when changes in spill discharge are frequent.

2. Juvenile Fish Passage Facilities

a. **Prior to 1 April each year**

(1) Remove debris from forebay, trash racks and gate well slots.

(2) Inspect and, where necessary, clean gate well orifices of debris.

(3) Inspect, test and lubricate chain gates, end gates and hoists for operation as needed.

(4) Inspect and correct any epoxy or concrete deficiencies on walls and floors of ice-trash sluice raceway.

(5) Install or repair gull lines at the ice and trash sluice-way outfall.

b. **1 April through 15 November (Passage Period)**

(1) Clean trash racks as flow conditions dictate or when drawdown in gate well slots exceeds 1.5 feet or as indicated by fish condition at Bonneville (e.g., higher than expected descaling).

(2) Remove debris from forebay when needed, and from gate well slots when gate well water surface is over one-half covered.

(3) Operate all gate slot orifices full time.

(4) Either turbine unit 1 or unit 2 or both units should operate during daylight hours unless specially coordinated.

(5) Operate sluice way gates 1-1, 1-2 & 1-3 at least 16 hours per day (sunrise to sunset) through August, and at least sunrise to sunset from 1 September on with full surface flow (lower or raise sluice gates completely). During nighttime hours the sluiceway should be operated as a plunge pool for the gate slot orifices. During periods of involuntary spill, sluice gates may be operated continuously. Operate the sluiceway end gate full open from sunrise to sunset. During periods when gates do

not operate, set top of bottom end gate at 142 elevation to create orifice plunge pool.

(6) Once each week and more frequently if accumulations of debris are observed, close gates 1-1, 1-2 & 1-3, and open gates 17- 3, 18-1 & 18-2 for two hours to flush out debris and fish being held in the sluiceway channel east of unit 1.

c. General

(1) During chain gate operation, maintain forebay level above elevation 158.0 to the extent practicable.

(2) Maintain orifices clear of debris.

(3) Inspect facilities twice each day.

(4) Operate turbine units at peak efficiency whenever practicable. The best fish passage survival is associated with the highest turbine efficiency.

(5) Follow the schedule in Table II-2 for nighttime spill (2000 - 0600). This schedule was developed for juvenile fish passage.

d. **15 November through March**

(1) Maintain orifices clear of debris.

(2) Set top of bottom end gate at 142 elevation to create orifice plunge pool.

Table II-2

Spilling schedule for The Dalles Dam for Juvenile Fish Passage
2000 - 0600 hours

Total Spill	Spill Bay													
kcfs	10	11	12	13	14	15	16	17	18	19	20	21	22	23
10.5												7		
12.0												8		
13.5												9		
15.0												10		
16.5										6		5		
18.0										6		6		
19.5										7		6		
21.0										7		7		
22.5										8		7		
24.0										8		8		
25.5										9		8		
27.0										9		9		
28.5										10		9		
30.0										10		10		
31.5										7		7		7
33.0										8		7		7
34.5										8		8		7
36.0										8		8		8
37.5										9		8		8
39.0										9		9		8
40.5										9		9		9
42.0										10		9		9
43.5										10		10		9
45.0										10		10		10
46.5										7	6	6	6	6
48.0										7	7	7	6	6
49.5										7	7	7	7	6
51.0										7	7	7	7	7
52.5									6	6	6	6	6	6
54.0									7	6	6	6	6	6
55.5									7	7	6	6	6	6
57.0									7	7	7	6	6	6

Table II-2 (cont.)

Spilling schedule for The Dalles Dam for Juvenile Fish Passage
2000 - 0600 hours

Total Spill	Spill Bay													
kcfs	10	11	12	13	14	15	16	17	18	19	20	21	22	23
58.5									7	7	7	7	6	6
60.0									7	7	7	7	7	6
61.5									7	7	7	7	7	7
63.0								7	6	6	6	6	6	6
64.5								7	7	6	6	6	6	6
66.0								7	7	7	6	6	6	6
67.5								7	7	7	7	6	6	6
69.0								7	7	7	7	7	6	6
70.5								7	7	7	7	7	7	6
72.0								7	7	7	7	7	7	6
73.5							7	6	6	6	6	6	6	6
75.0							7	7	6	6	6	6	6	6
76.5							7	7	7	6	6	6	6	6
78.0							7	7	7	7	6	6	6	6
79.5							7	7	7	7	7	6	6	6
81.0							7	7	7	7	7	7	6	6
82.5							7	7	7	7	7	7	7	6
84.0							7	7	7	7	7	7	7	7
85.5							8	7	7	7	7	7	7	7
87.0							8	8	7	7	7	7	7	7
88.5							8	8	8	7	7	7	7	7
90.0							8	8	8	8	7	7	7	7
91.5							8	8	8	8	8	7	7	7
93.0							8	8	8	8	8	8	7	7
94.5							8	8	8	8	8	8	8	7
96.0							8	8	8	8	8	8	8	8
97.5					7	7	7	7	7	6	6	6	6	6
99.0					7	7	7	7	7	7	6	6	6	6
100.5					7	7	7	7	7	7	7	6	6	6
102.0					7	7	7	7	7	7	7	7	6	6
103.5					7	7	7	7	7	7	7	7	7	6
105.0					7	7	7	7	7	7	7	7	7	7

Table II-2 (cont.)

Spilling schedule for The Dalles Dam for Juvenile Fish Passage
2000 - 0600 hours

Total Spill	Spill Bay													
kcfs	10	11	12	13	14	15	16	17	18	19	20	21	22	23
106.5					8	7	7	7	7	7	7	7	7	7
108.0					8	8	7	7	7	7	7	7	7	7
109.5					8	8	8	7	7	7	7	7	7	7
111.0					8	8	8	8	7	7	7	7	7	7
112.5					8	8	8	8	8	7	7	7	7	7
114.0					8	8	8	8	8	8	7	7	7	7
115.5					8	8	8	8	8	8	8	7	7	7
117.0					8	8	8	8	8	8	8	8	7	7
118.5					8	8	8	8	8	8	8	8	8	7
120.0					8	8	8	8	8	8	8	8	8	8
121.5		7	7	7	6	6	6	6	6	6	6	6	6	6
123.0		7	7	7	7	6	6	6	6	6	6	6	6	6
124.5		7	7	7	7	7	6	6	6	6	6	6	6	6
126.0		7	7	7	7	7	7	6	6	6	6	6	6	6
127.5		7	7	7	7	7	7	7	6	6	6	6	6	6
129.0		7	7	7	7	7	7	7	7	6	6	6	6	6
130.5		7	7	7	7	7	7	7	7	7	6	6	6	6
132.0		7	7	7	7	7	7	7	7	7	7	6	6	6
133.5		7	7	7	7	7	7	7	7	7	7	7	6	6
135.0		7	7	7	7	7	7	7	7	7	7	7	7	6
136.5		7	7	7	7	7	7	7	7	7	7	7	7	7
138.0		8	7	7	7	7	7	7	7	7	7	7	7	7
139.5		8	8	7	7	7	7	7	7	7	7	7	7	7
141.0		8	8	8	7	7	7	7	7	7	7	7	7	7
142.5		8	8	8	8	7	7	7	7	7	7	7	7	7
144.0		8	8	8	8	8	7	7	7	7	7	7	7	7
145.5		8	8	8	8	8	8	7	7	7	7	7	7	7
147.0		8	8	8	8	8	8	8	7	7	7	7	7	7
148.5		8	8	8	8	8	8	8	8	7	7	7	7	7
150.0		8	8	8	8	8	8	8	8	8	7	7	7	7
151.5		8	8	8	8	8	8	8	8	8	8	7	7	7
153.0		8	8	8	8	8	8	8	8	8	8	8	7	7

Table II-2 (cont.)

Spilling schedule for The Dalles Dam for Juvenile Fish Passage
2000 - 0600 hours

Total Spill kcfs	Spill Bay													
	10	11	12	13	14	15	16	17	18	19	20	21	22	23
154.5		8	8	8	8	8	8	8	8	8	8	8	8	7
156.0		8	8	8	8	8	8	8	8	8	8	8	8	8
157.5	8	8	8	8	8	8	8	7	7	7	7	7	7	7
159.0	8	8	8	8	8	8	8	8	7	7	7	7	7	7
160.5	8	8	8	8	8	8	8	8	8	7	7	7	7	7
162.0	8	8	8	8	8	8	8	8	8	8	7	7	7	7
163.5	8	8	8	8	8	8	8	8	8	8	8	7	7	7
165.0	8	8	8	8	8	8	8	8	8	8	8	8	7	7
166.5	8	8	8	8	8	8	8	8	8	8	8	8	8	7
168.0	8	8	8	8	8	8	8	8	8	8	8	8	8	8
169.5	9	8	8	8	8	8	8	8	8	8	8	8	8	8
171.0	9	9	8	8	8	8	8	8	8	8	8	8	8	8
172.5	9	9	9	8	8	8	8	8	8	8	8	8	8	8
174.0	9	9	9	9	8	8	8	8	8	8	8	8	8	8
175.5	9	9	9	9	9	8	8	8	8	8	8	8	8	8
177.0	9	9	9	9	9	9	8	8	8	8	8	8	8	8
178.5	9	9	9	9	9	9	9	8	8	8	8	8	8	8
180.0	9	9	9	9	9	9	9	9	8	8	8	8	8	8
181.5	9	9	9	9	9	9	9	9	9	8	8	8	8	8
183.0	9	9	9	9	9	9	9	9	9	9	8	8	8	8
184.5	9	9	9	9	9	9	9	9	9	9	9	8	8	8
186.0	9	9	9	9	9	9	9	9	9	9	9	9	8	8
187.5	9	9	9	9	9	9	9	9	9	9	9	9	9	8
189.0	9	9	9	9	9	9	9	9	9	9	9	9	9	9
190.5	10	9	9	9	9	9	9	9	9	9	9	9	9	9
192.0	10	10	9	9	9	9	9	9	9	9	9	9	9	9
193.5	10	10	10	9	9	9	9	9	9	9	9	9	9	9
195.0	10	10	10	10	9	9	9	9	9	9	9	9	9	9
196.5	10	10	10	10	10	9	9	9	9	9	9	9	9	9
198.0	10	10	10	10	10	10	9	9	9	9	9	9	9	9
199.5	10	10	10	10	10	10	10	9	9	9	9	9	9	9
201.0	10	10	10	10	10	10	10	10	9	9	9	9	9	9

Table II-2 (cont.)

Spilling schedule for The Dalles Dam for Juvenile Fish Passage
2000 - 0600 hours

Total Spill kcfs	Spill Bay													
	10	11	12	13	14	15	16	17	18	19	20	21	22	23
202.5	10	10	10	10	10	10	10	10	10	9	9	9	9	9
204.0	10	10	10	10	10	10	10	10	10	10	9	9	9	9
205.5	10	10	10	10	10	10	10	10	10	10	10	9	9	9
207.0	10	10	10	10	10	10	10	10	10	10	10	10	9	9
208.5	10	10	10	10	10	10	10	10	10	10	10	10	10	9
210.0	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Use the same pattern trend for spill exceeding 210 kcfs; individual spill bay discharges during nighttime hours should not be less than 7.5 kcfs.

B. MAINTENANCE PLAN

1. Adult Fish Passage Facilities

a. Fish Passage Season - 1 March through November. Operate according to criteria in Operating Standards.

b. Winter Maintenance Season - 1 December through February each year. Operate according to criteria in Operating Standards.

c. Fishway Auxiliary Water Systems

(1) Scheduled Maintenance (see Appendix A for coordination procedures) - The Dalles Project fishway auxiliary water is provided by gravity flow and discharge from hydroelectric turbine systems. Preventive maintenance and normal repair are carried out throughout the year.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures) - Most fishway auxiliary water systems operate automatically. If the automatic system fails, the system can usually be operated manually by project personnel. This will allow the fish facility to operate according to criteria while the repair of the automatic system is carried out. When this operation becomes necessary project personnel will increase the surveillance of the adult system to ensure that criteria are being met.

(a) The Dalles Powerhouse - If one of the two fishway auxiliary water turbines fails or malfunctions during spring or summer adult migration seasons (1 March - 31 July) use the following sequential procedure until a fishway head of 1.2 feet is achieved:

1: Raise the open West Powerhouse Entrance weirs W1 and W2 (W3 normally closed) in one-foot increments until a proper head is achieved or until the weirs reach 6 feet of depth below the tail water surface.

2: Raise the East Entrance weirs E2 and E3 (E1 closed at tail water below 78 feet) in one-foot increments to 6 feet of depth below the tail water surface.

3: Close West Powerhouse Entrance weir W2.

4: Close one East Entrance weir E1.

5: Raise the South Spillway Entrance weirs S1 and S2 in one-foot increments to 6 feet of depth below the tail water surface.

6: Close one South Spillway Entrance (S2).

7: Close alternating floating orifices starting from the west end of the powerhouse.

8: If a fishway head of 1.2 feet is still not achieved leave in this configuration until more auxiliary water becomes available. Then reverse the above procedure.

If one of the fishway auxiliary water turbines fails, malfunctions or is out of service for necessary maintenance during the fall adult migration or winter maintenance season (1 August - 28 February) assuming no spill during this period, use the following sequential procedure until a fishway head of 1.2 feet is achieved:

1: Close the South Spillway Entrance weirs and all diffusers associated with these entrances, including those adjacent to the entrances and those at the west end of the powerhouse.

2: Close entrance E3 (leaving E1 & E2 open at 8' depth).

3: Close all West Entrance weirs but one (W1).

4: Raise W1 to 6' depth.

5: Close every other floating orifice starting from the west end of the powerhouse.

6: Raise the East Entrance weirs in one-foot increments to 6 feet of depth below

the tail water surface.

7: If a fishway head of 1.2 feet is still not achieved, then leave in this configuration until more auxiliary water becomes available.

If both of the fishway auxiliary water turbines fail or malfunction, regardless of fish passage season, the adult fish passage facility will be operated as follows:

1: S1 open with the weir crest 6 feet below the tail water surface, S2 closed;

2: The junction pool weir supplying the powerhouse collection system and west powerhouse entrances will be closed;

3: E3 will be open with the weir crest 6 feet below the tail water surface and E1 and E2 will be closed.

(b) The Dalles North Ladder - If the gravity flow fishway auxiliary water system fails, N1 will remain open with a weir depth of 6 feet below the tail water surface and N2 will be closed.

d. Powerhouse and Spillway Adult Fish Collection System

(1) Scheduled Maintenance - (see Appendix A for coordination procedures) - Preventive maintenance and repair occurs throughout the year. During the adult fish passage season the maintenance will not involve any operations which will cause a failure to comply with the fishway criteria, unless specially coordinated. Inspection of those parts of the adult collection channel systems, such as diffusion gratings, picketed leads and entrance gates, will be scheduled at least once every five years unless a channel must be dewatered for fishway modifications or to correct observed problems. Inspection by a diver or underwater video system may be used for the underwater inspections. This scheduled inspection and any associated maintenance will occur during the winter maintenance period. Any non-routine maintenance and fishway modification will be handled on a case by case basis.

The Project Biologist will attempt to attend all dewatering activities potentially involving large numbers of fish, as well as inspections to provide fishery input (See Dewatering Plans). However, in the absence of the Biologist, the project will proceed, using all due care to ensure that fish are not stranded or injured. In these circumstances, personnel in charge of the activities will provide reports to the Project Biologist summarizing each fish salvage activity. Information will include at least the following: facility involved, timing, numbers of salmonids and sturgeon handled, condition of fish (alive, stressed or dead) and where the fish were released. If an emergency occurs which threatens fish safety, then the Project Biologist or alternate will be contacted for assistance.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures) - The Dalles Project contains several types of fishway entrances. In most cases if failures occur then the entrance can and will be operated manually by project personnel until repairs are made. If this operation becomes necessary, then project personnel will increase the surveillance of the adult system to ensure that criteria are being met. In those cases in which the failure will not allow the entrance to be operated manually, the gate will be maintained, to the extent possible, in an operational position. The entrance will be repaired in an expedient manner and the entrance will return to manual or automatic control at the earliest possible date.

e. Adult Fish Ladders and Counting Stations

(1) Scheduled Maintenance (see Appendix A for coordination procedures) - The adult fish ladders will be dewatered (see Dewatering plan) once each year during the winter maintenance period. During this time the ladders are inspected for blocked orifices, projections into the fishway that may damage fish, stability of the weirs, damaged picketed leads, exit gate problems, loose diffusion valves, ladder orifice reduction plates and malfunctioning operating equipment at the counting stations as well as

other potential problems. Problems identified throughout the passage year that do not affect fish passage, as well as those identified during the dewatered period are then repaired.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures) - The structures of the ladders include picketed leads, counting stations, fishway exits and overflow weirs with orifices.

Picketed leads can cause problems. Pickets with excessive spacing (greater than 1"), erosion of concrete around the picketed leads or missing pickets can allow fish into areas where escape is not possible. If picketed 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 or not to dewater the fishway and repair any problem will be made in consultation with the fishery agencies and Indian tribes.

2. The Dalles Dam Juvenile Fish Passage Facilities

a. Fish Passage Season. 1 April through 15 November each year operate according to the Operating Standards.

b. Winter Maintenance Period. 16 November through March each year operate according to the Operating Standards.

c. Juvenile Collection and Transportation Systems.

(1) Scheduled Maintenance (see Appendix A for coordination procedures) - The Dalles ice and trash sluiceway will receive preventive maintenance at all times of the year. During the juvenile fish passage season this will normally be above water work such as maintenance of automatic systems, air lines, electrical systems and monitoring equipment. During the winter maintenance period the systems are dewatered downstream of the gate well orifices. The system is then visually inspected in all accessible areas for damaged equipment and areas that may cause problems to the juvenile fish. Any problem areas identified are repaired and modifications to the channel and general maintenance are completed. The trash racks are raked just prior to the juvenile fish passage season (1 April), whenever trash accumulations are suspected because of increased head across the trash racks or increased descaling of juvenile fish is noted at The Dalles or Bonneville dams and that Bonneville's trash racks are clean.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures) - The ice and trash sluiceway is now being used as a juvenile bypass system. The chain gates on The Dalles' juvenile bypass system are fully opened during normal operation. If a chain gate fails, an adjacent gate can be operated until repairs can be made. Orifices allow fish out of the gate wells into the sluiceway. If orifices become plugged with debris then they can be manually cleaned. The gate wells will be inspected daily and debris removed (debarked) when floating debris covers more than one- half the water surface. If one of the gate hoists fail, repair promptly. The gate will be removed when there are problems

with the seal and the difficulty cannot be repaired promptly. If the epoxy lined section of the sluiceway is found to be damaged, it will be repaired.

3. Turbines and Spillways

Scheduled Maintenance (see Appendix A for coordination procedures) - The maintenance and routine repair of project turbines and spillways is a regular and reoccurring process which requires that units be shut down for up to two months (see Dewatering Plan). The schedule for this maintenance is reviewed by the Project and Operations biologists and coordinated within NPP, NPD and BPA. Certain turbine and spillway discharges at the projects are secondarily used to attract adult fish to the area of fishway entrances. The maintenance schedules for these turbines and spillways will reflect equal weighting given to fish, power and water management and will be coordinated with the appropriate resource agencies. No other fish related restrictions regarding maintenance will be placed on any units at this project, except to coordinate research activities.

C. DEWATERING PLAN

1. Adult Fish Ladder

a. Scheduled Maintenance (see Appendix A for coordination procedures)

(1) When possible, operate ladder to be dewatered at a reduced flow for at least 24 hours but no more than 48 hours prior to dewatering.

(2) Discontinue all fishway auxiliary water supply at least 24 hours but no more than 48 hours prior to dewatering.

(3) The Project Biologist will assure that fish rescue equipment is available and will coordinate to ensure adequate numbers of personnel will be available to move fish out of the dewatered ladder.

(4) Project personnel will install head gates to shut down ladder flow.

(5) The Project Biologist will attempt to attend all ladder dewaterings and oversee fish rescue. Rescue personnel will walk the inside of the ladder from the head gates down to tail water salvaging all fish either by moving fish to tail water within the ladder flow or capturing and placing the fish in a large water filled tank which is then transported to the forebay or tail water, whichever is closest, for release. When rescue is accomplished in the absence of the Project Biologist a brief report will be provided which will include: facility involved, timing, salmonids and sturgeon found, fish condition (live, dead or stressed) and where the fish were moved to.

b. Unscheduled Maintenance (see Appendix A for coordination procedures)

(1) When possible, discontinue fishway auxiliary water and operate ladder at orifice flow as long as possible (prefer 3-24 hours) prior to dewatering.

(2) Follow steps 3-5 above.

2. Powerhouse Fish Collection System

   a. Scheduled Maintenance (see Appendix A for coordination procedures)

      (1) During the pumping or draining operation to dewater a portion or all of the collection channel, the water level will not be allowed to drop to a level which strands fish.

      (2) The Project Biologist will assure that rescue equipment is available if needed.

      (3) The Project Biologist will provide technical guidance on fish safety and will assist directly when possible in rescue operations. Reports will be provided for fish rescue activities which are not attended by the biologist. Information will include facility involved, timing, numbers of salmonids and sturgeon involved and fish condition (live, dead or stressed) and where the fish were returned to water.

3. Turbines

   a. When possible, place head gates and tail logs immediately after turbine unit is shut down if draft tube is to be dewatered.

   b. If turbine unit draft tube is to be dewatered and the unit has been idle for any length of time, it will be operated when possible, at "speed/no load" and stop logs will then be placed immediately.

   c. Water levels in the draft tube will not be allowed to drop to a level which strands fish.

   d. 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 will provide technical guidance on fish safety and when possible, will directly participate in fish salvage. Reports will be provided for fish rescue activities which are not attended by the biologist. Information will include facility involved, timing, numbers of salmonids and sturgeon involved and fish condition (live, dead or stressed) and where the fish were returned to water.

e. The Project Biologist will assure that rescue equipment is available if needed.

f. If the Unit is planned to be out of service 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.

John Day Dam

III. JOHN DAY DAM

A. OPERATING STANDARDS

1. Adult Fish Passage Facilities

a. Prior to 1 March each year

(1) Inspect all staff gauges and water level indicators, repair and/or clean where necessary.

(2) Dewater and inspect all ladders and all other dewatered sections of fish facilities for projections, debris or plugged orifices which could injure fish or slow their progress up the ladder. Repair deficiencies.

(3) Inspect for and, when necessary, clear debris in ladder exits.

(4) Reinstall picketed leads at counting stations prior to watering up ladders during maintenance.

(5) Repair or when necessary upgrade netting at top of both fish ladders to keep fish from leaping out of the ladders.

b. 1 March through November (Fish Passage Period)

(1) <u>All Adult Fish Facilities</u>

(a) Water depth over fish ladder weirs: 1.2 (+or - 0.1 feet).

(b) Head on all entrances: 1.0 to 1.7 feet (prefer 1.5). Refer to maintenance plan when unable to achieve head criteria.

(c) A transportation velocity of 1.5 to 4.0 feet per second (prefer 2.0 fps) shall be maintained in all channels and the lower ends of the fish ladders which are below the tail water.

(d) Maximum of 6" head on attraction water intakes and trash racks at all the ladder exits, with a 4" maximum head on all picketed leads. Debris shall be removed when significant amounts accumulate.

(e) Staff gauges and water level indicators will

be readable at all water levels encountered during the fish passage period.

(f) Main entrance weir depths: 8 feet or greater below tail water. Weirs fully lowered when 8 feet depth is not possible.

(2) North Fishway

Operate two downstream gates (N1 and N2). Use staff gauge located around the first ladder bend to calculate entrance head. Doing so helps account for the velocity head associated with these entrances.

(3) Powerhouse

(a) Operate entrances NE-1 and NE-2.

(b) Operate ten powerhouse floating orifices (numbers 1, 2, 3, 6, 9, 12, 15, 17, 18, 19).

(c) Operate SE-1.

(d) From 0400-2000 P.S.T. operate powerhouse turbine unit #1 near 100 megawatts (+ or − 10MW) to facilitate best entrance conditions, unless additional load is required to meet firm energy demands and that load cannot be attained with another fully screened unit.

(4) Spillway Operations

The following spill schedule (Table III-1) shall be followed during the spill period. This schedule will be followed during daytime 0600 - 2000 for adult fish attraction. See table III-2 for the nighttime spill schedule.

c. **1 December through February** (Winter Operating Period).

(1) All Adult Fish Facilities

(a) Water depth over fish ladder weirs: 1.2 feet (+ or − 0.1).

(b) Only one of the two fish facilities may be out of service at a time except under extreme situations. The other facility must be operated at passage season criteria unless

specially coordinated.

(c) Main entrance weir depths: 6 feet or greater below tail water. Weirs fully lowered when 6 feet depth is not possible.

(d) Pull picketed leads at counting stations and have crowders adjusted such that the counting slots are fully open at the end of the counting season.

(e) Maximum of 6" head on attraction water intakes and trash racks at all ladder exits. Debris shall be removed when significant amounts accumulate.

(2) North Fishway

(a) Operate gate N1 with N2 closed with entrance head as follows for various conditions:

i) No spill - that attainable by ladder flow and one auxiliary water pump.

ii) With spill - Standard passage season head (1.0 to 1.7 with 1.5 target).

iii) South ladder dewatered or operating below winter standards - Operate according to passage season standards.

(3) Powerhouse

(a) Head on all entrances - 1.0 foot.

(b) Operate NE-2 with NE-1 closed.

(c) Operate all ten floating orifices.

(d) Operate SE-1.

Table III-1

Spill Schedule for John Day Dam in Gate Opening Stops
Daytime pattern for adult fish attraction

Gate Number										
1	2	3	4	5 to 10	11 to 16	17	18	19	20	KCFS
1									(1)	8.2
1	1							(1)	1	6.4
1	1	1					(1)	1	1	9.6
1	1	2					(2)	1	1	12.8
1	2	1				(1)	2	1	1	16.0
1	1	2	2			(2)	2	1	1	19.2
1	2	2	2			2	2	(2)	1	22.4
1	2	2	2	0 or 2	0 or 2	2	2	2	1	60.8
1	2	2	2	(3)	(3)	2	2	2	1	80.0
1	2	3	3	3	3	(3)	2	2	1	84.8
1	2	3	3	3	3	3	(3)	2	1	86.4
1	2	3	3	(4)	(4)	3	3	2	1	105.6
2	3	4	4	(4)	(4)	4	4	3	2	118.4
2	3	4	4	(5)	(5)	4	4	3	2	137.6
2	4	4	5	(6)	(6)	4	4	3	2	160.0
2	4	5	5	6	6	(5)	4	3	2	163.2
2	4	5	6	6	6	5	(5)	3	2	166.4
2	4	6	6	6	6	(6)	5	3	2	169.6
2	4	6	6	6	6	6	(6)	4	2	172.8
2	4	5	6	(7)	(7)	6	6	4	2	190.4
2	4	6	7	7	7	(7)	6	4	2	195.2
2	4	6	7	(8)	(8)	7	6	4	2	214.4
2	4	6	8	8	8	(8)	6	4	2	217.6
2	4	6	8	(9)	(9)	8	6	4	2	236.8
2	4	6	9	(10)	(10)	8	6	4	2	257.6
2	5	6	9	10	10	(9)	6	4	2	260.8
2	5	6	9	(11)	(11)	9	6	4	2	280.0

Continue as in rows above, opening from ends toward center, using 1 stop increments on innermost gate of gates 5 - 16 if necessary.

Gates 1, 2, 18, 19 and 20 limits at 9 stops.

Circled values may be 1 stop less than value shown.

Each stop equals about 1.6 kcfs.

Nighttime spill will follow juvenile spill schedule.

2. Juvenile Fish Passage Facilities

a. **Prior to 1 April each year**

(1) Remove debris from forebay, trash racks and gate well slots.

(2) Inspect all vertical barrier screens for damage, holes, debris accumulations or protrusions (video inspection acceptable). Clean and repair when necessary.

(3) Inspect each Submersible Traveling Screen (STS) and operate on trial run (dogged off at deck level). By 1 April, STS in each intake of operational units.

(4) Inspect and, where necessary, clean and/or repair all gate well orifices and orifice lighting systems.

(5) Inspect, maintain and, where necessary, repair the DSM conduit tainter gate.

(6) Inspect and correct any deficiencies of walls and floor DSM conduit, raceway, and outfall.

b. **1 April through 31 October**

(1) Remove debris from forebay and trash racks as required to maintain less than 1 foot of additional drawdown in gate well or as indicated by fish condition (e.g., higher than expected descaling). The trash racks for at least units 1, 2, and 3 should be raked again before 15 June. Raking should proceed to the north as long as substantial debris continues to be collected. STSs in units being raked should run on continuous during raking operation. Gate well orifices of the unit being raked must be closed during the raking operation.

(2) Inspect each STS and VBS a minimum of once every two months (video acceptable). Preferably, inspections will occur immediately prior to peaks in the juvenile fish migrations (mid-May and mid-July). Inspections should be concentrated on the priority units and those others with the longer operating time. More frequent inspections may be required under the

following conditions: 1) deterioration of fish condition; 2) increased debris load in bypass system; and 3) other indications of STS or VBS malfunction or failure. If STS or VBS damage or plugging is detected, follow procedures in Fish Facilities Maintenance Plan.

(3) Operate all gate well orifices. Inspect daily to assure that the orifice lights are operating. Replace all burned out orifice lights within 24 hours. Close and open each orifice every day or as indicated by debris accumulations in the gate wells

(4) Inspect each STS watt meter readings at least once each shift. If an STS failure occurs follow procedures in Fish Facilities Maintenance Plan.

(5) Inspect all gate wells daily and clean when water surface over one-half covered with debris. Gate well orifice of the gate well being cleaned must be closed during the operation. Each VBS should be cleaned within three weeks either side of 1 July unless visually inspected and found free of debris.

(6) Coordinate cleaning efforts with personnel operating downstream migrant sampling facilities.

(7) Turbines should be operated at peak efficiency unless the additional generation is needed to avoid operation of a partially or fully un-screened unit.

(8) STS operation cycling may begin when the mean length of the majority of juvenile chinook passing the project reaches or exceeds 112 mm. This time will be determined by the Project Biologist. A cycling time of a maximum 20 minutes off and a minimum of 2 minutes on must be followed. Cycling will be discontinued if warranted by fish condition or debris problems. STSs in intakes used for juvenile indexing will run continuously.

(9) On 1 April and through August, turbine units without a full complement of STSs may operate only to meet firm energy demands. Units without

a full complement of STSs will be the last to be brought on line to meet firm power demands and the first off line when that demand diminishes.

(10) During the period 1 September through 31 October turbine units without a full complement of STSs may operate to meet load demands. Exceptions to this are:

(a) Six days following juvenile fish release in the John Day pool unscreened units will not operate unless BPA needs that additional generation to meet firm energy demands. The release dates will be supplied to the Project Biologist by the Fish Passage Center as soon as these dates are available. The release date must be received at least one week prior to the release to facilitate necessary coordination to accomplish the unscreened unit shutdown.

(b) Unscreened units will not operate when the NMFS smolt passage index at John Day exceeds 20,000 unless BPA needs that additional generation to meet firm energy demands.

Units without a full complement of STSs will be the last to be brought on line to meet power demands and the first off line when the power demand diminishes.

c. 1 October through 31 October

STSs may be removed from the powerhouse turbine units designated by the Project Biologist with no more than eight of the sixteen units unscreened to reduce wear and facilitate early winter maintenance. Enough units should remain screened to allow the average expected river flow, provided by the Reservoir Control Center, for that period to pass through screened units. Units are available to meet load demands and should be operated at peak efficiency whenever possible. Unscreened or partially unscreened units will be on a last on, first off operation.

d. 1 November through March

All STSs removed. DSM channel dewatered (see Dewatering Plans) only when required for maintenance. The period of maintenance should be minimized to the

extent practicable. Additionally, all units are available to meet power demands and should be operated at peak efficiency whenever practicable.

e. **General**

The spill schedule shown in Table III-2 will be followed for nighttime spill (2000 - 0600) for juvenile fish passage.

Table III-2

Nighttime Spill Schedule for John Day Dam
for 2000 to 0600 hours

TOTAL SPILL KCFS	Spill Bay																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
9.6																				6
11.2																				7
12.8																				8
14.4																				9
16.0																			5	5
17.6																			5	6
19.2																			6	6
20.8																			6	7
22.4																			7	7
24.0																			7	8
25.6																			8	8
27.2																			8	9
28.8																			9	9
30.4																		6	6	7
32.0																		6	7	7
33.6																		7	7	7
35.2																		7	7	8
36.8																		7	8	8
38.4																		8	8	8
40.0																		8	8	9
41.6																		8	9	9
43.2																		9	9	9
44.8																	7	7	7	7
46.4																	7	7	7	8
48.0																	7	7	8	8
49.6																	7	8	8	8
51.2																	8	8	8	8
52.8																	8	8	8	9
54.4																	8	8	9	9
56.0																	8	9	9	9
57.6																	9	9	9	9
59.2																7	7	7	8	8
60.8																7	7	8	8	8
62.4																7	8	8	8	8

Table III-2 (cont.)

Nighttime Spill Schedule for John Day Dam
for 2000 to 0600 hours

TOTAL SPILL KCFS	Spill Bay																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
64.0																8	8	8	8	8
65.6																8	8	8	8	9
67.2																8	8	8	9	9
68.8																8	8	9	9	9
70.4																8	9	9	9	9
72.0																9	9	9	9	9
73.6															7	7	8	8	8	8
75.2															7	8	8	8	8	8
76.8															8	8	8	8	8	8
78.4															8	8	8	8	8	9
80.0															8	8	8	8	9	9
81.6	1														8	8	8	8	9	9
83.2	1	1													8	8	8	8	9	9
84.8	1	1	1												8	8	8	8	9	9
86.4	1	1	1	1											8	8	8	8	9	9
88.0	1	1	1	2											8	8	8	8	9	9
89.6	1	1	2	2											8	8	8	8	9	9
91.2	1	2	2	2											8	8	8	8	9	9
92.8	2	2	2	2											8	8	8	8	9	9
94.4	2	2	2	3											8	8	8	8	9	9
96.0	2	2	3	3											8	8	8	8	9	9
97.6	2	3	3	3											8	8	8	8	9	9
99.2	3	3	3	3											8	8	8	8	9	9
100.8	3	3	3	3	1										8	8	8	8	9	9
102.4	3	3	3	3	1										8	8	8	9	9	9
104.0	3	3	3	3	1										8	8	9	9	9	9
105.6	3	3	3	3	1										8	9	9	9	9	9
107.2	3	3	3	3	1										9	9	9	9	9	9
108.8	3	3	3	3	2										9	9	9	9	9	9
110.4	3	3	3	3	2									7	8	8	8	8	8	8
112.0	3	3	3	3	2									8	8	8	8	8	8	8
113.6	3	3	3	3	2									8	8	8	8	8	8	9
115.2	3	3	3	3	2									8	8	8	8	8	9	9
116.8	3	3	3	3	3									8	8	8	8	8	9	9

Table III-2 (cont.)

Nighttime Spill Schedule for John Day Dam
for 2000 to 0600 hours

TOTAL SPILL	Spill Bay																			
KCFS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
118.4	3	3	3	3	3									8	8	8	8	9	9	9
120.0	3	3	3	3	3									8	8	8	9	9	9	9
121.6	3	3	3	3	3									8	8	9	9	9	9	9
123.2	3	3	3	3	3									8	9	9	9	9	9	9
124.8	3	3	3	3	3	1								8	9	9	9	9	9	9
126.4	3	3	3	3	3	1								9	9	9	9	9	9	9
128.0	3	3	3	3	3	1							8	8	8	8	8	8	8	8
129.6	3	3	3	3	3	1							8	8	8	8	8	8	8	9
131.2	3	3	3	3	3	1							8	8	8	8	8	8	9	9
132.8	3	3	3	3	3	2							8	8	8	8	8	8	9	9
134.4	3	3	3	3	3	2							8	8	8	8	8	9	9	9
136.0	3	3	3	3	3	2							8	8	8	8	9	9	9	9
137.6	3	3	3	3	3	2							8	8	8	9	9	9	9	9
139.2	3	3	3	3	3	2							8	8	9	9	9	9	9	9
140.8	3	3	3	3	3	3							8	8	9	9	9	9	9	9
142.4	3	3	3	3	3	3							8	9	9	9	9	9	9	9
144.0	3	3	3	3	3	3							9	9	9	9	9	9	9	9
145.6	3	3	3	3	3	3						8	8	8	8	8	8	8	8	9
147.2	3	3	3	3	3	3						8	8	8	8	8	8	8	9	9
148.8	3	3	3	3	3	3	1					8	8	8	8	8	8	8	9	9
150.4	3	3	3	3	3	3	1					8	8	8	8	8	8	9	9	9
152.0	3	3	3	3	3	3	1					8	8	8	8	8	9	9	9	9
153.6	3	3	3	3	3	3	1					8	8	8	8	9	9	9	9	9
155.2	3	3	3	3	3	3	1					8	8	8	9	9	9	9	9	9
156.8	3	3	3	3	3	3	2					8	8	8	9	9	9	9	9	9
158.4	3	3	3	3	3	3	2					8	8	9	9	9	9	9	9	9
160.0	3	3	3	3	3	3	2					8	9	9	9	9	9	9	9	9
161.6	3	3	3	3	3	3	2					9	9	9	9	9	9	9	9	9
163.2	3	3	3	3	3	3	2				8	8	8	8	8	8	8	8	9	9
164.8	3	3	3	3	3	3	3				8	8	8	8	8	8	8	8	9	9
166.4	3	3	3	3	3	3	3				8	8	8	8	8	8	8	9	9	9
168.0	3	3	3	3	3	3	3				8	8	8	8	8	8	9	9	9	9
169.6	3	3	3	3	3	3	3				8	8	8	8	8	9	9	9	9	9
171.2	3	3	3	3	3	3	3				8	8	8	8	9	9	9	9	9	9

Table III-2 (cont.)

Nighttime Spill Schedule for John Day Dam
for 2000 to 0600 hours

TOTAL SPILL KCFS	Spill Bay																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
172.8	3	3	3	3	3	3	3	1			8	8	8	8	9	9	9	9	9	9
174.4	3	3	3	3	3	3	3	1			8	8	8	9	9	9	9	9	9	9
176.0	3	3	3	3	3	3	3	1			8	8	9	9	9	9	9	9	9	9
177.6	3	3	3	3	3	3	3	1			8	9	9	9	9	9	9	9	9	9
179.2	3	3	3	3	3	3	3	1			9	9	9	9	9	9	9	9	9	9
180.8	3	3	3	3	3	3	3	2			9	9	9	9	9	9	9	9	9	9
182.4	3	3	3	3	3	3	3	2		8	8	8	8	8	8	8	8	9	9	9
184.0	3	3	3	3	3	3	3	2		8	8	8	8	8	8	8	9	9	9	9
185.6	3	3	3	3	3	3	3	2		8	8	8	8	8	8	9	9	9	9	9
187.2	3	3	3	3	3	3	3	2		8	8	8	8	8	9	9	9	9	9	9
188.8	3	3	3	3	3	3	3	3		8	8	8	8	8	9	9	9	9	9	9
190.4	3	3	3	3	3	3	3	3		8	8	8	8	9	9	9	9	9	9	9
192.0	3	3	3	3	3	3	3	3		8	8	8	9	9	9	9	9	9	9	9
193.6	3	3	3	3	3	3	3	3		8	8	9	9	9	9	9	9	9	9	9
195.2	3	3	3	3	3	3	3	3		8	9	9	9	9	9	9	9	9	9	9
196.8	3	3	3	3	3	3	3	4		8	9	9	9	9	9	9	9	9	9	9
198.4	3	3	3	3	3	3	3	4		9	9	9	9	9	9	9	9	9	9	9
200.0	3	3	3	3	3	3	3	4	8	8	8	8	8	8	8	8	9	9	9	9
201.6	3	3	3	3	3	3	3	4	8	8	8	8	8	8	8	9	9	9	9	9
203.2	3	3	3	3	3	3	3	4	8	8	8	8	8	8	9	9	9	9	9	9
204.8	3	3	3	3	3	3	4	4	8	8	8	8	8	8	9	9	9	9	9	9
206.4	3	3	3	3	3	3	4	4	8	8	8	8	8	9	9	9	9	9	9	9
208.0	3	3	3	3	3	3	4	4	8	8	8	8	9	9	9	9	9	9	9	9
209.6	3	3	3	3	3	3	4	4	8	8	8	9	9	9	9	9	9	9	9	9

Spill bay openings are expressed in gate stops.

Use the same pattern trend for spill levels exceeding 210 kcfs (i.e. 80% at south bays, 20% at north bays).

B. MAINTENANCE PLAN

3. Adult Fish Passage Facilities

a. Fish Passage Season - 1 March through November (see Operating Standards).

b. Winter Maintenance Season - 1 December through February (Operating Standards).

c. Fishway Auxiliary Water Systems

(1) Scheduled Maintenance (see Appendix A for coordination procedures) - The John Day Project has pump style auxiliary water systems. Preventive maintenance and normal repair are carried out throughout the year.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures) - The fishway auxiliary water systems are operated mostly automatically. If the automatic system fails, the system can usually be operated manually by project personnel. This will allow the fish facility to operate according to criteria while the automatic system is repaired. If this operation becomes necessary then project personnel will increase the surveillance of the adult system to ensure that criteria are being met.

a) John Day South Ladder - If one of the three fishway auxiliary water turbines fails, assuming all three turbines are being used to meet criteria, bulkheads will be installed in the failed turbine discharge conduit and the output of the two remaining turbines will be increased to bring the fishway into agreement with the adult fishway criteria.

If a second turbine unit fails, bulkheads will be installed in the second failed turbine discharge conduit and the adult fish facility will be operated as follows until a fishway head of 1.2 feet is achieved:

1: Raise the south powerhouse entrance weir (SE1) in one-foot increments to 6 feet of depth below the tail water

surface;

2: Raise the north powerhouse entrances (NE1, NE2) in one-foot increments to 6 feet of depth below the tail water surface.
3: Close NE1.

4: Close the center five floating gate submerged orifice entrances starting at the north end (17, 15, 12, 9, 6);

5: If the above criteria are still not achieved, then leave in this configuration until more auxiliary water becomes available. Then reverse the above procedure.

If all three turbine units fail, bulkheads will be installed in the failed turbine discharge conduits and the adult fish facility will be operated as follows until repairs can be made:

1: SE1 will be open with the weir crest 6 feet below the tail water surface;

2: Cross channel bulkheads will be placed in the powerhouse collection channel between units 2 and 3.

3: The floating orifice gate in front of unit 2 will be closed, leaving the floating orifice gate in front of unit 1 open.

(a) John Day North Ladder This system can operate according to the adult fishway criteria under most conditions by using fewer than the six fishway auxiliary water pumps. If one pump fails, one of the standby pumps will be started up. This routine will be followed until the available pumps can no longer meet the adult fishway criteria. If this occurs, then N2 will be raised in one-foot increments until a fishway head of 1.0 feet is met or until the weir crest reaches a depth of 6 feet below the tail water surface. If this fishway criterion is still not met, N1 will

be raised in one- foot increments until that criterion is met or the weir crest reaches a depth of 6 feet below the tail water surface. If criterion is still not achieved close N2 and the N1 weir will be maintained at the 8 foot level. If head of 1.0 is not met, then raise N1 in one-foot increments until the weir crest reaches a depth of 6 feet below tail water surface. Maintain in this condition until repairs reach a stage which allows more water to be added to the system. The weirs should then be opened in the reverse order in which they were closed.

d. Powerhouse and Spillway Adult Fish Collection System

(1) Scheduled Maintenance (see Appendix A for coordination procedures) - Preventive maintenance and repair occurs throughout the year. During the adult fish passage season this maintenance will not involve any operations which will cause a failure to comply with the adult fishway criteria. Inspection of those parts of the adult collection channel systems which require dewatering such as diffusion gratings, picketed leads and entrance gates, will be scheduled at least once every ten years with at least one underwater inspection in between unless a channel must be dewatered for fishway modifications or to correct observed problems (see Dewatering Plan). Inspection by a diver or underwater video system may be used for the underwater inspections.

This scheduled inspection and any associated maintenance will occur during the winter maintenance period. Any non-routine maintenance and fishway modifications will be handled on a case by case basis.

The Project Biologist will attempt to attend all dewatering activities potentially involving large numbers of fish, as well as inspections to provide fishery input (See Dewatering Plans). However, in the absence of the Biologist, the project will proceed, using all due care to ensure that fish are not stranded or injured. In these circumstances, personnel in charge of the activities will provide reports to the Project Biologist summarizing each fish salvage

activity. Information will include at least the following: facility involved, timing, numbers of salmonids and sturgeon handled, condition of fish (alive, stressed or dead) and where the fish were released. If an emergency occurs which threatens fish safety, then the Project Biologist or alternate will be contacted for assistance.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures) - The John Day Project contains several types of fishway entrances. In most cases if failures occur then the entrance can and will be operated manually by project personnel until repairs are made. In those cases in which the failure will not allow the entrance to be operated manually the gate will be maintained, to the extent possible, in an operational position until expedient repairs are affected. If this is not possible, then the entrance will be repaired in an expedient manner (receive high priority) and the entrance will be brought back into manual or automatic control at the earliest possible time.

e. Adult Fish Ladders and Counting Stations

(1) Scheduled Maintenance (see Appendix A for coordination procedures) - The adult fish ladders will be dewatered once each year during the winter maintenance period (see Dewatering Plan). During this time the ladders are inspected for blocked orifices, projections into the fishway that may injure fish, stability of the weirs, damaged picketed leads, exit gate problems, loose diffusion gratings, unreadable or damaged staff gauges, defective diffusion valves and malfunctioning operating equipment at the counting stations as well as other potential problems identified throughout the passage year that do not impact fish passage, as well as those identified during the dewatered period are then repaired.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures) - The structures of the ladders include picketed leads, counting stations, fishway exits and overflow weirs with orifices. Pickets with excessive spacing (greater than 1"), erosion of concrete around

the picketed leads or missing pickets can allow fish into areas where escape is not possible. In some instances of picketed lead failure there are spare picketed leads and spare installation slots. In these cases the spare leads are installed and the damaged leads are removed and repaired. In the remaining instances of picketed lead failure or concrete erosion, the timing and method of repair will depend upon the severity of the problem. The decision of whether or not to dewater the fishway and repair any problem will be made in consultation with the fishery agencies and Indian tribes, according to the described coordination procedures (Appendix A).

4. Juvenile Fish Passage Facilities

a. Fish Passage Season. 1 April through 31 October (see Operating Standards)

b. Winter Maintenance Period. 1 November through March (see Operating Standards).

c. Submersible Traveling Screens (STS).

(1) Scheduled Maintenance (see Appendix A for coordination procedures) - The STS system will receive preventive maintenance or repair at all times of the year including the winter maintenance period. Whenever a generator malfunctions or is scheduled for maintenance, the three STSs in that turbine may be maintained, repaired or exchanged for other STSs needing maintenance or repair. About one third of the STSs at John Day are scheduled to get a complete overhaul each year resulting in a three year maintenance cycle unless future developments indicate that a longer life expectancy is possible.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures) - If an STS is found to be damaged or inoperative in an operating unit refer to Figure III-1. During the peak juvenile passage periods (16 April to 31 August), the six days following a juvenile fish release in the John Day pool or when the 24 hour juvenile salmon passage by John Day exceeds 20,000 a crane crew will be taken off lower priority work or will work overtime to remove and replace (if spare available) a damaged or malfunctioning STS or VBS from any unit needed or likely to be needed for power within the next 48 hours. Crews will work overtime or on weekends as required.

d. Juvenile Bypass Systems.

(1) Scheduled Maintenance (see Appendix A for coordination procedures) - The John Day juvenile bypass facilities will receive preventive maintenance at all times of the year. During the juvenile fish passage season this will normally be above water work such as maintenance of automatic systems, air lines, electrical

systems and monitoring equipment. During the winter maintenance period the system is dewatered downstream of the gate well orifices. The system is then visually inspected in all accessible areas for damaged equipment and areas that may cause problems to the juvenile fish. Any problems identified are repaired if the project is able. In extreme cases the work will be contracted as soon as possible or repaired during the next winter maintenance period. Modifications and general maintenance to the channel are also completed at this time.

The trash racks are raked just prior to the juvenile fish passage season (1 April) and whenever trash accumulations are suspected because of increased differential across the trash racks or increased juvenile fish descaling is noted at John Day Dam or increased accumulations of tumbleweeds in the forebay. Additional raking of trash racks may be necessary when a storm brings large quantities of debris down river to the project. The gate well orifices must be closed during the raking process.

(2) Unscheduled Maintenance (see Appendix A for coordination procedures).

(a) John Day's juvenile bypass system is controlled by automatic systems. If the automatic system fails it can usually be operated manually. This allows the facility to operate according to criteria while repair of the automatic system is completed. If the orifices become plugged with debris they are mechanically cleaned out. The gate wells will be inspected daily and debris removed (debarked) when it covers over one-half of the water surface to maintain clean orifices and minimize fish injury. The gate well orifices must be closed during the debarking process.

(b) If the bypass system fails in the powerhouse conduit, tainter gate, or transportation outfall making the system unsafe for fish, the decision to dewater for repairs will be made in consultation with the fisheries agencies and Indian tribes. During this emer-

gency operating mode, power generation will be minimized. If this operating mode is expected to last longer than four days all units required for generation will be sequentially shut down, fish salvaged from the gate well, the STS removed and the unit restarted. The orifice gates will be closed then opened once each day to float any debris accumulating around the orifice. During fishway inspection activities VBSs may be found to be plugged with debris or damaged. In these cases refer to Figure III-1.

5. Turbines and Spillways

Scheduled Maintenance (see Appendix A for coordination procedures) - The maintenance and routine repair of project turbines and spillways is a regular and reoccurring process which requires that units be shut down for up to two months (see Dewatering Plan). The schedule for this maintenance will be reviewed by project and Operations biologists and coordinated within NPP, NPD and BPA. Certain turbine and spillway discharges at the projects are secondarily used to attract adult fish to the area of fishway entrances, to keep predator fish from accumulating in the area of juvenile release sites and to move juveniles downstream away from the project. The maintenance schedules for these turbines (Appendix B) and spillways will reflect equal weighting given to fish, power and water management and will be coordinated with the appropriate resource agencies. No other fish related restrictions regarding maintenance will be placed on any units at these projects, except to coordinate research activities.

Figure III-1.

Operating and Maintenance Instructions in the Event of STS or VBS Failure at John Day Dam.

1. If the project is operating with all available units to meet firm energy demands during low debris conditions continue operating until step 3 can be done, otherwise go to step 2.

2. Unit 5 (the station service unit) will continue in operation under any load conditions (except during high debris period) with a failed STS or VBS until step 3 can be accomplished. Under high debris load conditions any unit with a failed or malfunctioning STS or VBS will be shut down. If it is the priority unit, the failed STS or VBS will be repaired or replaced within 24 hours. Any other unit with a failed STS or VBS will be shut down until step 3 can be accomplished or that unit is required to meet firm energy demands, in which case that unit will be the last to be brought on line and the first off line.

3. During working hours, assuming the BPA dispatcher will unload John Day on request, the unit will be taken out of service and the failed STS or VBS will be examined. If the required repairs can be done that day, they will be done and the unit may then be returned to service. During the peak juvenile passage period (16 April - 31 August), six days following a juvenile fish release in the John Day pool, or when the 24-hour juvenile salmonid passage by John Day exceeds 20,000, if an STS or VBS fails on a unit required for generation, then a crane crew will be taken off lower priority work, will work overtime or weekends to remove and replace (if spare available) the damaged or malfunctioning STS or VBS.

4. If repairs require longer than the rest of the day, the STS or VBS will be replaced with a spare or one from a long term out of service unit. If this is not the situation begin removing the replacement STS or VBS from the northernmost unit and move sequentially to the south. STSs or VBSs should be removed from the A-slot first, B-slot second, C-slot third.

5. Operation of all partially screened or unscreened units will be restricted according to the Operating Standards until a spare or repaired STS or VBS is available for installation.

B. DEWATERING PLAN

1.Adult Fish Ladder

a. Scheduled Maintenance (see Appendix A for coordination procedures)

(1) When possible, operate ladder to be dewatered at orifice flow for at least 24 hours but no more than 48 hours prior to dewatering.

(2) Discontinue all fishway auxiliary water supply at least 24 hours but no more than 48 hours prior to dewatering.

(3) The Project Biologist will assure that fish rescue equipment is available and will coordinate to ensure adequate numbers of personnel will be available to move fish out of the dewatered ladder.

(4) Project personnel will install head gates to shut down ladder flow. Where possible, a flow of 1-2 inches will be maintained in the ladder until fish are rescued.

(5) The Project Biologist will oversee fish rescue if possible when ladders are dewatered. Rescue personnel will walk the inside of the ladder from the head gates down to tail water salvaging all fish either by moving fish to tail water within the ladder flow or capturing and placing the fish in a large water filled tank which is then transported to the forebay or tail water, whichever is closest, for release. When rescue is accomplished in the absence of the Project Biologist a brief report will be provided which will include: facility involved, timing, salmonids and sturgeon found, fish condition (live, dead or stressed) and where the fish were moved to.

b. Unscheduled Maintenance (see Appendix A for coordination procedures)

(1) When possible, discontinue fishway auxiliary water and operate ladder at orifice flow as long as possible (prefer 3-24 hours) prior to dewatering.

(2) Follow steps 3-5 above.

2. Powerhouse Fish Collection System

a. Scheduled Maintenance (see Appendix A for coordination procedures)

(1) During the pumping or draining operation to dewater a portion or all of the collection channel, the water level will not be allowed to drop to a level which strands fish.

(2) The Project Biologist will assure that rescue equipment is available if needed.

(3) The Project Biologist will provide technical guidance on fish safety and will assist in rescue operations as required.

3. Turbines

a. When possible, place head gates and tail logs immediately after turbine unit is shut down if draft tube is to be dewatered.

b. If turbine unit draft tube is to be dewatered and turbine unit has been idle for longer than three hours it will be operated when possible, at "speed/no load" and stop logs will then be placed immediately.

c. Water levels in the draft tube will not be allowed to drop to a level which strands fish.

d. 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 will provide technical guidance on fish safety and will directly participate in fish salvage as needed. Reports will be provided for fish rescue activities which are not attended by the biologist. Information will include facility involved, timing, numbers of salmonids and sturgeon involved and fish condition (live, dead or stressed) and where the fish were returned to water.

e. The Project Biologist will assure that rescue equipment is available if needed.

f. If the turbine unit is planned to be down for less

than 4 days and low numbers of fish are trapped, then removal of fish will not necessary as long as an adequate "safety pool" is maintained.

APPENDIX A

INSPECTION PROGRAM AND COORDINATION

COLUMBIA RIVER PROJECTS

A. INSPECTION PROGRAM

1. During the juvenile fish passage season, the juvenile fish passage facilities will be inspected by project personnel, at least once during each working shift, to assure that the systems are operating according to criteria.

2. During the adult fish passage season project personnel will make visual inspections of the adult fish passage facilities each day at daylight and at least once during the day shift (0800-1600 P.S.T.) to assure that the systems are operating according to standard operating criteria.

3. During both the adult and juvenile fish passage seasons, the Project Biologist will oversee the fish passage facilities by spot checking, and reviewing project inspection reports. The biologist will coordinate with the projects' operations superintendents, fish counters and appropriate researchers conducting work on either the adult or juvenile facilities.

4. During the winter maintenance period, the Project Biologist will oversee facility operation as above and will inspect each dewatered fish passage facility.

5. Just prior to the juvenile fish passage season project personnel will inspect the STSs, VBSs and gate well orifices and again at least once every three months at Bonneville Dam and every two months at John Day Dam. Preferably, inspections will occur immediately prior to peaks in juvenile fish migrations. A video monitoring system may be used in these inspections.

6. There will be monthly inspections of project fish facilities by fishery agencies and tribal representatives.

B. COORDINATION PLAN

1. Scheduled Maintenance - Project managers plan in advance for the maintenance activities that are to occur on their respective projects each year. These activities include maintenance of the turbine generators, navigation locks, adult and juvenile fish facilities and the spillway dam. These activities may also include special tasks conducted by the projects for various research groups. The maintenance for these activities is traditionally set at particular times of the year to coincide with such things as low fish passage, low power demand, low river flows and equal distribution of work load.

   The projects' turbine and spillway maintenance schedules will be reviewed annually by project and Operations biologists for fishery impacts. The fishway maintenance schedule will be submitted to the Project Biologist by 15 September each year, for coordination with NPP, NPD, the fishery agencies and Indian tribes. Other scheduled maintenance needs will be coordinated by the Project Biologist when they may impact the projects' ability to keep the fish facilities operating according to the fishway operating standards. This coordination should take place far enough in advance so that conflicts between fishery needs and required project maintenance can be resolved.

   The project fishway maintenance schedules will be considered tentative, but any changes should be coordinated by the Project Biologist as early as possible. Examples of activities requiring coordination are:

   a. Dewatering of turbine intakes and draft tubes.

   b. Closing of fishway entrances.

   c. Interruption of auxiliary fishway water.

   d. Ladder dewatering or lowering of the water level.

   e. Cycling of STS during fish passage season.

2. Unscheduled Maintenance - Unscheduled maintenance or repair will need to be handled by the project manager on a case by case basis using the available information. Unscheduled maintenance or repair is defined as the correction of any situation that impacts fish passage and survival, or impairs the projects' ability to operate the facilities according to standard operating criteria. Coordination will begin as soon as the need for such work becomes apparent.

The project manager has the authority to initiate the work prior to beginning coordination when, in his opinion, delay of the work will result in an unsafe situation for people, property or fish. Information needed for the above coordination includes:

a. Description of the problem.

b. Type of repair necessary.

c. Length of time for repair.

d. Expected impacts on fish passage.

e. Description of any priority work or situation that prevents the repair from proceeding immediately.

3. The Project Biologist will be notified when work requested by any entity may impact fish passage or survival. Also notification of the Project Biologist is strongly recommended when project personnel observe work being conducted by other groups which may impact fish passage.

   The Project Biologist must be notified when a malfunction or accident occurs on or near the project which may impact fish passage or survival. Such malfunctions or accidents would include petroleum spills, chemical spills, vehicle accidents or natural disasters.

APPENDIX B
TURBINES USED AT NPP COLUMBIA RIVER PROJECTS FOR FISH

Project	Turbine	Dates Required	Remarks
Bonneville	1,2	1 March- 30 November	Used for fish attraction to gate 1 and for flows for juvenile outfall (ice-trash sluiceway) when JBS flows south.
	7,8	1 January- 31 December	One of these units must stay on to provide secure power to Bonneville hatchery.
	9,10	1 March- 30 November	Used for adult fish attraction to gate 65 & flows for Bradford Is. juvenile transportation & juvenile bypass outlet
	11	1 March- 30 November	Used for adult fish attraction to the second powerhouse upstream & downstream south shore fishway entrances.
	17,18	1 March 30 November	Used for adult fish attraction to the second powerhouse north shore fishway entrances & flow for juvenile bypass outlet.
The Dalles	1,2	1 March- 30 November	Operated during daylight for juvenile fish & Ice & Trash sluice entrance attraction.
John Day	1	1 March- 30 November	Used for adult fish attraction to SE1 and orifice gate 1.

Outages longer than 1 day (maximum of 2 units per project per year) will occur during low juvenile and adult fish passage periods (15 October to 1 March) unless specially coordinated.

WALLA WALLA DISTRICT

FISH FACILITY

OPERATIONS AND MAINTENANCE PLAN

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WALLA WALLA DISTRICT

FISH FACILITY

OPERATIONS AND MAINTENANCE PLAN

I. McNary Dam

A. Adult Fish Passage Facilities

1. Facilities Description: The adult fish passage facilities at McNary are comprised of separate north and south shore facilities. The north shore facilities are made up of a fish ladder with counting station, a small collection system, and a gravity-flow auxiliary water supply system. The collection system has three downstream entrances and a side entrance into the spillway basin. Two of the downstream entrances are used during normal operation. The gravity-flow auxiliary water supply system takes water from the forebay through a series of conduits and distributes it through diffusers at the bottom of the ladder and in the transportation channel. There are four main conduits numbered 1 to 4, with conduits 1 and 4 providing the required flow. Conduits 2 and 3 were sealed off when the fishlock was deactivated and are not available for use. The south shore facilities are comprised of a fish ladder with counting station, two south shore entrances, a powerhouse collection system, and gravity and pumped auxiliary water supply systems. The powerhouse collection system contains three downstream and one side entrance into the spillway basin at the north end of the powerhouse, twelve floating orifices located across the powerhouse, and a common transportation channel for all of the entrances. At the north end of the powerhouse, two of the downstream entrances are used during normal operation with the other downstream and side entrances closed. The gravity-flow auxiliary water is provided by one conduit from the forebay and supplies the diffusers at the bottom of the ladder at tailwater level. The pumped auxiliary water is supplied by three electric pumps with variable-pitched blades. Two pumps are capable of providing the required flow when the third pump is bulkheaded to prevent water from flowing back through the pump to the river. The electric pumps supply the auxiliary water for the diffusers at the entrances and in the transportation channel.

2. Fish Passage Season: 1 March through 31 December operate according to criteria in Appendix C.

3. Scheduled Maintenance: Scheduled maintenance of a facility which must be unwatered to work on or whose maintenance will have a significant effect on fish passage will be done during the winter maintenance period from 1 January to 1 March. Maintenance of facilities which will not effect fish passage may be conducted during the rest of the year. Maintenance is normally conducted on one fish ladder at a time during the winter to provide some fish passage at the

project at all times. Appendix B contains the scheduled maintenance that is normally conducted each year. When facilities are not being maintained during the winter maintenance period, they will be operated according to the criteria in Appendix C unless otherwise coordinated with the fishery agencies and tribes.

4. Unscheduled Maintenance: Unscheduled maintenance which will significantly effect the operation of a facility will be coordinated with the fishery agencies and tribes (see Appendix A for coordination procedures). If part of a facility malfunctions or is damaged during the fish passage season and the facility can still be operated within criteria without any detrimental effects on fish passage, repairs may not be conducted until the winter maintenance period or until fewer numbers of fish are passing the project so there will be less impact of it being unwatered or taken out of service. If part of a facility is damaged or malfunctions that may significantly impact fish passage, it will be repaired as soon as possible.

(a) Fish Ladders and Counting Stations. The fish ladders contain tilting weirs, fixed weirs, counting stations with picketed leads, and fish exits with trash racks. If any part of the fish ladder fails or is blocked with debris during the fish passage season, efforts will first be made to correct it without unwatering the ladder. Trash racks, picketed leads, tilting weir mechanisms, and counting stations can sometimes be repaired or maintained without unwatering the ladder. The decision on whether to unwater the ladder and make repairs during the fish passage season or wait until the winter maintenance period will be made after consultation with the fishery agencies and tribes.

(b) North Shore Auxiliary Water Supply System: During normal operation, conduits 1 and 4 are operated along with entrance weirs WFE2 and WFE3. Conduit #4 feeds diffusers 1 through 4 and conduit #1 feeds diffusers 5 through 12. Each diffuser has two or more rotovalves which control the amount of water going into a diffuser. If a rotovalve fails, the closest rotovalve that is closed will be opened to provide the required flow. If more rotovalves fail than there are closed valves and it is not possible to operate the entrances within criteria, WFE2 weircrest will be raised at one-foot increments to maintain the required 1.0 to 1.5 head differential. If this is not possible by the time the weir reaches 4 feet below tailwater, the entrance will be closed. If one conduit fails, WFE2 will be closed and WFE3 will be operated as deep as possible to maintain the 1.0 to 1.5 feet head differential. If it is not possible to maintain the head differential at a depth of 6 feet or greater, the weir will be maintained at 6 feet regardless of the head. If both conduits fail, WFE 2 will be closed and WFE3 operated at a depth of 6 feet until repairs can be made.

(c) South Shore Auxiliary Water Supply System: The south shore auxiliary water is made up of a combination of gravity flow from the forebay and pumped water from the tailrace. The gravity flow supplies the diffusers above weir 253 (diffusers 7 through 14) and the pumps supply the diffusers below weir 253 (diffusers 1 through 7 and the main unit diffusers). Diffuser 7 is where both systems meet

and is supplied by either gravity flow or pumped flow. The gravity flow diffusers are regulated by rotovalves and the pumped flow diffusers by sluicegates. If a rotovalve fails, the nearest closed rotovalve will be opened to supply the flow. If more rotovalves fail than there are closed valves the sluicegates in diffusers 3 through 7 will be opened more to provide the required transportation flows. If any sluicegates fail, the sluicegates nearest it will be opened further to make up the water. If one pump fails, the other two pumps will be operated to maintain the facilities within criteria. If two pumps fail, SFE2 and NFE3 will be closed and SFE1 and NFE2 will be operated as deep as possible to maintain the 1.0 to 1.5-foot head differential. If all three pumps fail, the powerhouse transportation channel will be bulkheaded off at the junction pool and SFE1 and SFE2 operated a deep as possible and to maintain the 1.0 to 1.5 head differential. If a depth of 6 feet on both gates cannot be maintained, SFE2 will be closed. If the gravity flow and pumped auxiliary water supply systems both fail, the powerhouse transportation channel will be bulkheaded off at the junction pool, SFE2 closed, and SFE1 operated at 6 feet below tailwater until repairs can be made.

(d) Fishway Entrances: The fishway entrances are made up of main entrance weirs with hoists and automatic controls, and floating orifices which regulate themselves with tailwater fluctuations. If any of the automatic controls malfunction the weirs can usually be operated manually by project personnel and kept within criteria. If there is a further failure which prevents the entrance from being operated manually, the entrance may be lowered down and left in an operating position or an alternate entrance opened until repairs can be made. If a floating orifice fails, it will be pulled out of the water and replaced with a spare floating orifice.

B. Juvenile Fish Passage Facilities

1. Facilities Description: The juvenile facilities at McNary Dam are made up of traveling screens, gatewell orifices, bypass flume, and transportation facilities. The transportation facilities include an upwell and separator structure, raceways, distribution system for distributing the fish among the raceways, a sampling and marking building, truck and barge loading facilities, and associated water supply lines.

2. Fish Passage Season: 1 April to end of transport and bypass season operate according to criteria in Appendix D and the Fish Transportation Oversight Team's (FTOT) Annual Work Plan (Appendix E).

3. Scheduled Maintenance: Scheduled maintenance of the juvenile facilities is conducted during the entire year as listed in Appendix B, Fish Facility Scheduled Maintenance. Long-term maintenance or modification of facilities which require them to be out of service for extended periods of time are conducted during the winter maintenance period from 1 November to 31 March. During the fish passage season, parts of the facilities are maintained on a daily, weekly, or longer interval to keep them in proper operating condition.

4. Unscheduled Maintenance: Unscheduled maintenance which will have a significant impact on juvenile fish passage should be coordinated with the fishery agencies and tribes. Maintenance of facilities such as traveling screens, which sometimes break down during the fish passage season, will be carried out according to the FTOT annual plan (Appendix E). In these cases, repairs will be made as prescribed and the fishery agencies and tribes notified through established channels agreed to in the plan. Other unscheduled maintenance will be coordinated as per Appendix A.

(a) Traveling screens: Traveling screens are inspected periodically throughout the juvenile migration season with a video monitoring system. If a screen is found to be damaged or malfunctions at any time, measures will be taken in accordance with the FTOT Annual Work Plan (Appendix E).

(b) Gatewell orifices and bypass flume: Each gatewell has two orifices with valves to allow fish to exit the gatewell. Under normal operation, one orifice per gatewell is operated in accordance with Appendix D. If an orifice becomes blocked with debris or is damaged, it will be closed and the alternate orifice for that gatewell operated until repairs can be made. The bypass flume is operated to transport juveniles to the collection facility or the overflow screens can be pulled to bypass them into the ice and trash sluiceway which enters the tailrace by turbine unit 14. If there are any problems with the flume, efforts will first be made to repair it without dewatering. If that is not possible, the flume will be dewatered and repaired as soon as possible. Traveling screens will remain in operation and the juveniles allowed to accumulate in the gatewells for up to two days. If repairs are to take longer than two days, a salvage program will be initiated to dipnet the juveniles from the gatewells until repairs are made and the system watered up again.

(c) Transportation Facilities: The transportation facilities can be operated to either collect and hold juveniles for the transportation program or to bypass them back to the river through the ice and trash sluiceway. If part of the facility malfunctions or is damaged, efforts will first be made to bypass the fish around the damaged area. If this is not possible, the overflow screens in the bypass flume will be pulled to bypass fish directly into the ice and trash sluiceway and around the transportation facilities or the entire bypass system may need to be dewatered to allow repairs to be made.

Ice Harbor Dam

II. Ice Harbor Dam.

A. Adult Fish Passage Facilities.

1. Facilities Description: The adult fish passage facilities at Ice Harbor are made up of separate north and south shore facilities. The north shore facilities include a fish ladder with counting station, a small collection system, and a pumped auxiliary water supply system. The collection system includes two downstream entrances and one side entrance into the spillway basin. In normal operation one downstream entrance is used and the other two entrances are closed. The auxiliary water is supplied by three electric pumps with either two or three pumps operated at any one time, depending on tailwater. The south shore facilities are comprised of a fish ladder with counting station, two south shore entrances, a powerhouse collection system, and a pumped auxiliary water supply system. The powerhouse collection system includes two downstream entrances and one side entrance into the spillway basin at the north end of the powerhouse, twelve floating orifices, and a common transportation channel. One of the downstream north powerhouse entrances and seven of the floating orifices are used during normal operation. At the south shore entrances, one entrance is normally used. The auxiliary water is supplied by eight electric pumps of which from five to seven are normally used to provide the required flows.

2. Fish Passage Season: 1 March to 31 December operate according to criteria in Appendix C.

3. Scheduled Maintenance: Scheduled maintenance of a facility which must be unwatered to work on or whose maintenance will have a significant effect of fish passage will be done during the winter maintenance period from 1 January to 1 March. Maintenance of facilities which will not effect fish passage may be conducted during the rest of the year. Maintenance is normally conducted on one fish ladder at a time during the winter to provide some fish passage past the project at all times. Appendix B contains the scheduled maintenance that is normally conducted each year. When facilities are not being maintained during the winter maintenance period, they will be operated according to the criteria in Appendix C unless coordinated otherwise with the fishery agencies and tribes.

4. Unscheduled Maintenance: Unscheduled maintenance which will significantly effect the operation of a facility will be coordinated with the fishery agencies and tribes (see Appendix A for coordination procedures). If part of a facility malfunctions or is damaged during the fish passage season and the facility can still be operated within criteria without any detrimental effects on fish passage, repairs may not be conducted until the winter maintenance period or until fewer numbers of fish are passing the project. If part of a facility is damaged or malfunctions that may significantly impact fish passage, it will be repaired as soon as possible.

(a) Fish Ladders and Counting Stations: The fish ladders contain fixed weirs, counting stations with picketed leads, and fish exits with trash racks. If any part of the ladder fails or

is blocked with debris during the fish passage season, efforts will first be made to correct it without unwatering the ladder. Trash racks, picketed leads, and counting stations can sometimes be repaired or maintained without unwatering the ladder. The decision on whether to dewater the ladder and make repairs during the fish passage season or wait until the winter maintenance period will be made after consultation with the fishery agencies and tribes.

(b) North Shore Auxiliary Water Supply System: The north shore facilities contain three electric pumps which provide auxiliary water to the diffusers at the bottom of the ladder and at the entrances. During normal operation two or three pumps are required, depending on the tailwater elevation, to provide the necessary auxiliary water. If a pump fails during a two-pump operation, the pump on standby will be operated to provide the necessary flows. If a pump fails during a three-pump operation, NEW1 will be raised until the required 1.0 to 1.5-foot head differential is achieved. If this cannot be met by the time the weir reaches 6 feet below tailwater, the gate will remain at that level regardless of the head. If two or all three pumps fail, the weir will be maintained at a level of 6 feet below tailwater until repairs are made.

(c) South Shore Auxiliary Water Supply System: The south shore auxiliary water is supplied by eight electric pumps. Fluctuating tailwater levels require from five to seven pumps to be operated to provide the auxiliary water. If one pump fails, a standby pump will be started to keep the fishway within criteria. If more pumps fail, this procedure will continue until all the standby pumps are in operation. If criteria cannot be met, the floating orifices should be closed in the following order: OG-12, OG-10, OG-8, and OG-6. If the required head differential of 1.0 to 1.5 feet cannot be reached when the floating orifices are closed, SSE 1 and NFE 2 will be closed equally at one-foot intervals until it is reached or until the weirs are 5 feet below tailwater. Then the remaining floating orifices should be closed in the following order: OG-4, OG-1, and OG-2. If there is still not enough auxiliary water to maintain the head differential on the two main entrances, NFE 2 will be closed, the transportation channel bulkheaded off at the junction pool, and SSE 1 operated as deep as possible to maintain the head differential. If it cannot be maintained at a depth of 6 feet or greater, the weir will remain at 6 feet regardless of the head.

(d) Fishway Entrances: The fishway entrances are made up of main entrance weirs with hoists and automatic controls, and floating orifices which regulate themselves with tailwater fluctuations. If any of the automatic controls malfunction, the weirs can usually be operated manually by project personnel and kept within criteria. If there is a further failure which prevents the entrance from being operated manually, an alternate entrance will be opened until repairs can be made. If a floating orifice fails, it will be pulled out of the water and the entrance bulkheaded off until the floating orifice is repaired.

B. Juvenile Fish Passage Facilities.

1. Facilities Description: The juvenile passage facilities at Ice Harbor consist of 6-inch orifices drilled through the concrete leading from the gatewells to the ice and trash sluiceway, and electric hoists attached to the A-slot gates of the ice and trash sluiceway to allow operation of the sluiceway as a surface bypass system.

2. Fish Passage Season: 1 April to one week later than Lower Granite transport and bypass season operate according to criteria in Appendix D.

3. Scheduled Maintenance: Scheduled maintenance of the juvenile facilities is conducted during the non-fish passage season from the end of the bypass season (approximately 1 September) to 31 March as listed in Appendix B. Long-term maintenance or modifications to the facilities which require them to be out of service are done during this time period. During the fish passage season, the facilities are inspected on a daily basis to insure that they are operating correctly.

4. Unscheduled maintenance: Unscheduled maintenance which will have a significant effect on fish passage will be coordinated with the fishery agencies and tribes as per Appendix A. If orifices become blocked with debris, they will be cleared by project personnel as soon as possible. If a sluiceway gate hoists fails, the gate will be closed and an alternate gate opened until repairs can be made.

Lower Monumental Dam

III. Lower Monumental Dam

A. Adult Fish Passage Facilities.

1. Facilities Description: The adult fish passage facilities at Lower Monumental are comprised of north and south shore fish ladders and collection systems with a common auxiliary water supply. The north shore fish ladder connects to two north shore entrances and the powerhouse collection system. The powerhouse collection system has two downstream and one side entrance into the spillway basin at the south end of the powerhouse, ten floating orifices, and a common transportation channel. The two north shore entrances, two downstream south powerhouse entrances, and five of the floating orifices are used during normal operation. The south shore fish ladder has two downstream entrances and a side entrance into the spillway basin. The two downstream entrances are used during normal operation. The auxiliary water is supplied by three turbine-driven pumps located in the powerhouse on the north side of the river. The water is pumped into a supply conduit which travels under the powerhouse collection channel, distributing water to the powerhouse diffusers, and under the spillway to the diffusers in the south shore collection system.

2. Fish Passage Season: 1 March through 31 December operate according to criteria in Appendix C.

3. Scheduled Maintenance: Scheduled maintenance of a facility which must be unwatered to work on or whose maintenance will have a significant effect on fish passage will be done during the winter maintenance period from 1 January to 1 March. Maintenance of facilities which will not have a significant effect on fish passage may be conducted during the rest of the year. Fishway auxiliary water supply pumps require monthly, semi-annual, and annual maintenance. Monthly maintenance requires a one-day outage per pump, semi-annual maintenance requires a two-day outage per pump in July, and annual maintenance requires a two-week outage per pump during the winter maintenance period. Maintenance is normally conducted on one fish ladder at a time during the winter to provide some fish passage at the project at all times. Appendix B contains the scheduled maintenance that is normally conducted each year. When facilities are not being maintained during the winter maintenance period, they will be operated according to the criteria in Appendix C unless otherwise coordinated with the fishery agencies and tribes.

4. Unscheduled Maintenance: Unscheduled maintenance which will significantly effect the operation of a facility will be coordinated with the fishery agencies and tribes (see Appendix A for coordination procedures). If part of a facility malfunctions or is damaged during the fish passage season and the facility can still be operated within criteria without any detrimental effects on fish passage, repairs may not be conducted until the winter maintenance period or until fewer numbers of fish are passing the project. If part of a facility is damaged or malfunctions that may significantly impact fish passage, it will be repaired as soon as possible.

(a) Fish Ladders and Counting Stations: The fish ladders contain fixed weirs, counting stations with picketed leads, and fish exits with trash racks. If any part of the ladder fails or is blocked with debris during the fish passage season, efforts will first be made to correct it without unwatering the ladder. Trash racks, picketed leads, and counting stations can sometimes be repaired or maintained without unwatering the ladder. The decision on whether to dewater the ladder and make repairs during the fish passage season or wait until the winter maintenance period will be made after consultation with the fishery agencies and tribes.

(b) Auxiliary Water Supply System: The auxiliary water for the fish ladders and the collection systems is supplied by three turbine-driven pumps on the north shore with all three pumps being required for normal operation. If one, two, or all three pumps fail, the fishway will be adjusted in the following manner until repairs can be made: SPE 2 and SSE 2 will be closed and SPE 1 raised to provide the required 1.0 to 1.5 foot head differential in the system. If the desired head differential cannot be reached by the time SPE 1 reaches 5 feet below tailwater, the floating orifices should be closed starting at OG-9 and working north across the powerhouse. If the head differential still cannot be maintained when all the floating orifices are closed, SPE 1 should be closed, the collection channel bulkheaded off at the junction pool, and NSE 1 and 2 and SSE 1 operated as deep as possible to maintain the head. If it cannot be maintained at a depth greater than 6 feet, the weirs should be maintained at 6 feet regardless of the head differential.

(c) Fishway Entrances: The fishway entrances are made up of main entrance weirs with hoists and automatic controls, and floating orifices which regulate themselves with tailwater fluctuations. If any of the automatic controls malfunction, the weirs can be operated manually by project personnel and kept within criteria. If there is a further failure which prevents an entrance from being operated manually. The weirs can usually be left in a lowered position while repairs are being conducted or the entrance closed and the water redistributed to other entrances while repairs are made. If a floating orifice is damaged, it will be pulled out of the water and the entrance bulkheaded off until it is repaired.

B. Juvenile Fish Passage Facilities.

1. Facilities Description: The juvenile facilities at Lower Monumental consist of an embedded pipe running the length of the powerhouse from turbine unit 1 to unit 6 and then dropping down to the tailrace deck, releasing the fish downstream of turbine unit 6. Each gatewell slot contains one orifice to allow fish to move from the gatewell into the bypass pipe.

2. Fish Passage Season: 1 April to one week later than Lower Granite transport and bypass season operate according to criteria in Appendix D.

3. Scheduled Maintenance: Scheduled maintenance of the juvenile facilities is conducted during the non-fish passage season

from the end of the bypass season (approximately 1 September) to 31 March as listed in Appendix B. Long-term maintenance or modifications to the facilities which require them to be out of service are done during this time period. During the fish passage season, the facilities are inspected on a daily basis to insure that they are operating correctly.

4. Unscheduled Maintenance: Unscheduled maintenance which will have a significant effect of fish passage will be coordinated with the fishery agencies and tribes as per Appendix A. During daily inspections, gatewell slots are monitored for debris build-up and are cleaned when it accumulates to prevent the orifices from becoming blocked. The bypass pipe should be routinely closed twice per week and blown back with air to clear any blocked orifice. If the orifices or the bypass pipe appear to be blocked with debris they will be cleaned by project personnel as soon as possible.

Little Goose Dam

IV. Little Goose Dam

A. Adult Fish Passage Facilities.

1. Facilities Description: The adult fish passage facilities at Little Goose are made up of one fish ladder on the south shore, two south shore entrances, a powerhouse collection system, north shore entrances with a transportation channel underneath the spillway to the powerhouse collection system, and auxiliary water supply system. The powerhouse collection system is comprised of ten floating orifices, two downstream entrances and one side entrance into the spillway basin on the north end of the powerhouse, and a common transportation channel. Four of the floating orifices and the two downstream entrances at the north end of the collection system are normally used. The north shore entrances are made up of two downstream facing entrances and a side entrance into the spillway basin with the two downstream entrances normally used. The auxiliary water is supplied by three turbine-driven pumps that pump water from the tailrace into the distribution system for the diffusers.

2. Fish Passage Season: 1 March through 31 December operate according to criteria in Appendix C.

3. Scheduled Maintenance: Scheduled annual maintenance of a facility which must be unwatered to work on or whose maintenance will have a significant effect on fish passage will be done during the winter maintenance period from 1 January to 1 March. Maintenance of facilities which will not have a significant effect on fish passage may be conducted during the rest of the year. Fishway auxiliary water supply pumps require monthly, semi-annual, and annual maintenance. Monthly maintenance requires a one-day outage per pump, semi-annual maintenance requires a two-day outage per pump in July, and annual maintenance requires a two-week outage per pump during the winter maintenance period. Appendix B contains the scheduled maintenance that is normally conducted each year. When facilities are not being maintained during the winter maintenance period, they will be operated according to the criteria in Appendix C unless otherwise coordinated with the fishery agencies and tribes.

4. Unscheduled Maintenance: Unscheduled maintenance which will significantly effect the operation of a facility will be coordinated with the fishery agencies and tribes as per Appendix A. If part of a facility malfunctions or is damaged during the fish passage season and the facility can still be operated within criteria without any detrimental effects on fish passage, repairs may not be conducted until the winter maintenance period or until fewer numbers of fish are passing the project. If part of a facility is damaged or malfunctions that may significantly impact fish passage, it will be repaired as soon as possible.

(a) Fishladder and Counting Station: The fishladder contains fixed weirs, a counting station with picketed leads, and a fish exit with trashrack. If any part of the ladder fails or is blocked with debris during the fish passage season, efforts will first

be made to correct it without unwatering the ladder. Trash racks, picketed leads, and counting stations can sometimes be repaired or maintained without unwatering the ladder. The decision to dewater the ladder and make repairs during the fish passage season or wait until the winter maintenance period will be made after consultation with the fishery agencies and tribes.

(b) Auxiliary Water Supply System: The auxiliary water for the fish ladder and the powerhouse collection system is supplied by three turbine-driven pumps on the south shore with all three pumps being required for normal operation. If one, two, or all three pumps fail, the fishway will be adjusted down in the following manner to get the best fish passage conditions possible until repairs can be made: First, NSE 2 and NPE 2 should be closed and NPE 1 operated to provide the required 1.0 to 1.7-foot head differential. If the desired head differential cannot be maintained at a depth of 5 feet or greater, then NSE 1 should be raised until a depth of 5 feet below tailwater is reached. If the head differential cannot be maintained at this point, floating orifices OG-6 and OG-4 should be closed and SSE 1 and 2 should be raised at one-foot increments until 6 feet below tailwater is reached. If the head differential still cannot be maintained, the transportation channel to the north shore should be bulkheaded off at the end of the powerhouse collection channel. Next, OG-10 and OG-1 should be closed followed by NPE 1 and the powerhouse collection channel bulkheaded off at the junction pool. SSE 1 and 2 should then be operated as deep as possible to maintain the head, but not shallower than 6 feet regardless of the head.

(c) Fishway Entrances: The fishway entrances are made up of main entrance weirs with hoists and automatic controls, and floating orifices which regulate themselves with tailwater level. If any of the automatic controls malfunction, the weirs can be operated manually by project personnel and kept within criteria. If there is a further failure which prevents an entrance from being operated manually, the weirs can usually be left in a lowered position while repairs are being conducted or the entrance closed and the water redistributed to other entrances while repairs are made. If a floating orifice is damaged, it will be pulled out of the water and the entrance bulkheaded off until it is repaired.

B. Juvenile Fish Passage Facilities.

1. Facilities Description: Little Goose's juvenile facilities consist of a bypass system and juvenile transportation facilities. The bypass system contains traveling screens, gatewell orifices, a bypass channel running the length of the powerhouse, a metal flume mounted on the face of the dam and the upper end of the fish ladder, a dewatering structure to eliminate excess water, two emergency bypass systems, and a corrugated metal flume to transport the fish to either the transportation facilities or to the river. The transportation facilities include a separator structure, raceways for holding fish, a distribution system for distributing the fish among the raceways, a sampling and marking building, truck and barge loading facilities, and associated water supply lines.

2. Fish Passage Season: 1 April to end of transport and bypass season operate according to criteria in Appendix D and the Fish Transportation Oversight Team's (FTOT) Annual Work Plan (Appendix E).

3. Scheduled Maintenance: Scheduled maintenance of the juvenile facilities is conducted during the entire year as listed in Appendix B, Fish Facility Scheduled Maintenance. Long-term maintenance or modification of facilities which requires them to be out of service for extended periods of time are conducted during the winter maintenance period from the end of the bypass season (approximately 1 September) to 31 March. During the fish passage season parts of the facilities are maintained on a daily, weekly, or longer interval to keep them in proper operating condition.

4. Unscheduled Maintenance: Unscheduled maintenance which will have a significant impact on juvenile fish passage should be coordinated with the fishery agencies and tribes. Maintenance of facilities such as traveling screens, which sometimes break down during the fish passage season, will be carried out according to the FTOT Annual Work Plan (Appendix E). In these cases, repairs will be made as prescribed and the fishery agencies and tribes notified through established channels agreed to in the plan. Other unscheduled maintenance will be coordinated as per Appendix A.

(a) Traveling Screens: Traveling screens are inspected periodically throughout the juvenile migration season with a video monitoring system. If a screen is found to be damaged or malfunctions at any time, measures will be taken in accordance with the FTOT Annual Work Plan (Appendix E).

(b) Gatewell Orifices: Each gatewell has two 12-inch orifices with air operated valves to allow fish to exit the gatewell. Under normal operation, one orifice per gatewell is operated in accordance with Appendix D. To minimize blockage from debris, orifices should be rotated every other day.

(c) Dewatering Structure: The dewatering structure acts as a transition from the collection channel to the corrugated metal flume. An inclined screen allows excess water to be bled off, with all fish and remaining water transitioning into the corrugated metal flume. The excess water is either discharged into the river or used as the water supply for the transportation facilities. The dewatering structure contains a trash sweep for cleaning the inclined screen of impinged debris. If the trash sweep breaks and interferes with juvenile fish passage through the structure or if the inclined screen is damaged, an emergency bypass system at the upstream end of the dewatering structure will be used to bypass juveniles while repairs are made. Operation of the emergency bypass system requires the juvenile bypass system to be unwatered and stoplogs inserted at the upper end of the inclined screen. The emergency bypass is then opened and the bypass system operated with 6 gatewell orifices open. Orifices will then need to be routinely rotated in order to let juveniles emigrate from all of the gatewell orifices.

(d) Bypass Flume: The corrugated metal flume transports

juveniles to either the transportation facilities or to the river below the project. If there is a problem with the flume which interferes with it's operation, an emergency bypass system at the upper end of the flume can be opened and all of the fish in the bypass system diverted to the river below the project through a 30-inch pipe while repairs are made.

(e) Transportation Facilities: The transportation facilities can be operated to either collect and hold juveniles for the transportation program or to bypass them back to the river. If part of the facility malfunctions or is damaged, efforts will first be made to bypass the fish around the damaged area. If this is not possible, the fish will be bypassed around the transportation facilities.

Lower Granite Dam

V. Lower Granite Dam

A. Adult Fish Passage Facilities.

1. Facilities Description: The adult fish passage facilities at Lower Granite are made up of one fish ladder on the south shore, two south shore entrances, a powerhouse collection system, north shore entrances with a transportation channel underneath the spillway to the powerhouse collection system, and an auxiliary water supply system. The powerhouse collection system is comprised of ten floating orifices, two downstream entrances and one side entrance into the spillway basin on the north end of the powerhouse, and a common transportation channel. Four of the floating orifices and the two downstream entrances at the north end of the collection system are normally used. The north shore entrances are made up of two downstream entrances and a side entrance into the spillway basin with the two downstream entrances normally used. The auxiliary water is supplied by three electric pumps that pump water from the tailrace to the diffusers with two pumps normally used to provide the required flows.

2. Fish Passage Season: 1 March through 31 December operate according to criteria in Appendix C.

3. Scheduled Maintenance: Scheduled maintenance of a facility which must be unwatered to work on or whose maintenance will have a significant effect on fish passage will be done during the winter maintenance period from 1 January to 1 March. Maintenance of facilities which will not effect fish passage may be conducted during the rest of the year. Appendix B contains the scheduled maintenance that is normally conducted each year. When facilities are not being maintained during the winter maintenance period, they will be operated according to the criteria in Appendix C unless otherwise coordinated with the fishery agencies and tribes.

4. Unscheduled Maintenance: Unscheduled maintenance which will significantly effect the operation of a facility will be coordinated with the fishery agencies and tribes as per Appendix A. If part of a facility malfunctions or is damaged during the fish passage season and the facility can still be operated within criteria without any detrimental effects on fish passage, repairs may not be conducted until the winter maintenance period or until fewer numbers of fish are passing the project. If part of a facility is damaged or malfunctions that may significantly impact fish passage, it will be repaired as soon as possible.

(a) Fishladder and Counting Station: The fishladder contains fixed weirs, a counting station with picketed leads, an adult fish trap located in an offshoot from the ladder, and a fish exit with trashrack. If any part of the ladder fails or is blocked with debris during the fish passage season, efforts will first be made to correct it without unwatering the ladder. Trash racks, picketed leads, and counting stations can sometimes be repaired or maintained without unwatering the ladder. If the fish trap malfunctions or is damaged, fish may be passed around it until repairs are made. The decision to

dewater the ladder and make repairs during the fish passage season or wait until the winter maintenance period will be made after consultation with the fishery agencies and tribes.

(b) Auxiliary Water Supply System: The auxiliary water for the fish ladder and the powerhouse collection system is supplied by three electric pumps. During normal operations and most flow conditions, two pumps are capable of providing the required flows. If a pump fails during the two-pump operation, the pump on standby will be operated to make up the flows. If two pumps fail, NSE 2 and NPE 2 will be closed and NPE 1 raised in one-foot increments to provide the required 1.0 to 1.7-foot head differential. If the head cannot be maintained by the time the top of the weir reaches 5 feet, the floating orifices should be closed in the following order: OG-4, OG-7, OG-10, and OG-1. If the head in the system still cannot be maintained at this point, SSE 1 and SSE 2 should be raised in one-foot increments until 5 feet below tailwater is reached. If all three pumps fail, NSE 1 and NPE 1 should be closed, the powerhouse collection channel bulkheaded off at the junction pool, and SSE 1 and SSE 2 operated at 6 feet below tailwater regardless of the head.

(c) Fishway Entrances: The fishway entrances are made up of main entrance weirs with hoists and automatic controls, and floating orifices which regulate themselves with tailwater level. If any of the automatic controls malfunction, the weirs can be operated manually by project personnel and kept within criteria. If there is a further failure which prevents an entrance from being operated manually. The weirs can usually be left in a lowered position while repairs are being conducted or the entrance closed and the water redistributed to other entrances while repairs are made. If a floating orifice is damaged, it will be pulled out of the water and the entrance bulkheaded off until it is repaired.

B. Juvenile Fish Passage Facilities.

1. Facilities Description: Lower Granite's juvenile facilities consist of a bypass system and juvenile transportation facilities. The bypass system contains traveling screens, gatewell orifices, a bypass channel running the length of the powerhouse, and a bypass pipe to transport the fish to the transportation facilities or to the river. The transportation facilities include an upwell and separator structure to separate the fish from the excess water, raceways for holding fish, a distribution system for distributing the fish among the raceways, a sampling and marking building, truck and barge loading facilities, and associated water supply lines.

2. Fish Passage Season: 1 April to end of transport and bypass season operate according to criteria in Appendix D and the Fish Transportation Oversight Team's (FTOT) Annual Work Plan (Appendix E).

3. Scheduled Maintenance: Scheduled maintenance of the juvenile facilities is conducted during the entire year as listed in Appendix B, Fish Facility Scheduled Maintenance. Long-term maintenance or modification of facilities which require them to be out of service for extended periods of time are conducted during the

winter maintenance period from the end of the bypass season (approximately 1 September) to 31 March. During the fish passage season parts of the facilities are maintained on a daily, weekly, or longer interval to keep them in proper operating condition.

4. Unscheduled Maintenance: Unscheduled maintenance which will have a significant impact on juvenile fish passage should be coordinated with the fishery agencies and tribes. Maintenance of facilities such as traveling screens, which sometimes break down during the fish passage season, will be carried out according to the FTOT Annual Work Plan (Appendix E). In these cases, repairs will be made as prescribed and the fishery agencies and tribes notified through established channels agreed to in the plan. Other unscheduled maintenance will be coordinated as per Appendix A.

(a) Traveling Screens: Traveling screens are inspected periodically throughout the juvenile migration season with a video monitoring system. If a screen is found to be damaged or malfunctions at any time, measures will be taken in accordance with the FTOT Annual Work Plan (Appendix E).

(b) Gatewell Orifices: Each turbine intake has 4 orifices, 2 in the bulkhead slot and 2 in the fish screen slot, with 8-inch slide gates for allowing the fish to exit the slots. Under normal operation, a total of 36 orifices are operated with 24 being bulkhead slot orifices and 12 being fish screen slot orifices. At least 1 orifice is open in each bulkhead slot with the fish screen slot orifices rotated open and close on an every other day basis. If an orifice becomes blocked with debris it will be cleaned; however, a damaged orifice will be closed and the alternate orifice for that gatewell operated until repairs can be made.

(c) Bypass Pipe: The bypass pipe goes from the end of the powerhouse bypass channel to the transportation facilities downstream of the dam. All juvenile fish in the bypass system must pass through this to the transportation facilities or to the tailrace. If any part of the bypass pipe is damaged, the gatewell orifices will be closed and the bypass system unwatered until repairs can be made. Traveling screens will remain in operation and the juveniles allowed to accumulate in the gatewells for up to two days. If repairs are to take longer than two days, a salvage program will be initiated to dipnet the juveniles from the gatewells until repairs are made and the system watered up again.

(d) Transportation Facilities: The transportation facilities can be operated to either collect and hold juveniles for the transportation program or to bypass them back to the river. If part of the facility malfunctions or is damaged, efforts will first be made to bypass the fish around the damaged area. If this is not possible, the fish will be bypassed around the transportation facilities or the entire bypass system unwatered until repairs are made.

APPENDIX A

COORDINATION PROCEDURES

Appendix A
Coordination Procedures

1. Scheduled maintenance: Scheduled maintenance is the normal preventative maintenance conducted at yearly or other intervals to maintain facilities in proper operating condition.

a. Adult fish passage facilities: Scheduled maintenance of fish ladders, collection systems, and fish pumps which must be unwatered to maintain or whose maintenance will take the facilities out of operating criteria will be conducted during the winter maintenance period. Project Operations Branch (NPWOP-PO) will coordinate the District's winter maintenance outages with the fishery agencies and tribes, usually at the September Fish Passage Development and Evaluation Program Technical Coordinating Committee (FPDEPTCC) Meeting. Project Managers shall inform NPWOP-PO prior to 1 September of their estimated winter maintenance for that year.

Information required should include:

(1) Facilities to be unwatered or taken out of service.

(2) Estimated dates of outages.

(3) Type of maintenance to be performed.

(4) Any special maintenance or modifications to be done.

b. Juvenile fish passage facilities: Most scheduled maintenance of juvenile facilities occurs during the non-fish passage season when facilities are not in service. At projects with collection and transportation facilities, some scheduled maintenance occurs at daily, weekly, or longer intervals to keep the facilities in operating criteria. Scheduled maintenance will be conducted as stated in the Juvenile Facilities Operating Criteria (Appendix D) and FTOT Annual Work Plan (Appendix E) agreed to by the Corps, fishery agencies, and tribes. Major modifications of the juvenile facilities to be conducted during the non-fish passage season will be coordinated with the fishery agencies and tribes by NPWOP-PO prior to any work being done.

c. Turbine unit and spillways: Certain turbine units and spillway gates are operated on a priority basis to provide attraction flows to the ladder entrances. Annual maintenance of turbine units and spillgates or modifications which take them out of service, should be coordinated with NPWOP-PO far enough in advance so that effects on fish passage can be minimized.

2. Unscheduled maintenance: Unscheduled maintenance is the correction of any situation which prevents the facilities from operating according to criteria or which will impact fish passage and

survival. Unscheduled maintenance will be coordinated with the fishery agencies and tribes on a case-by-case basis by NPWOP-PO. NPWOP-PO will be notified as soon as possible after it becomes apparent that maintenance repairs are required. The Project Manager has the authority to initiate work prior to notifying NPWOP-PO when in his opinion delay of the work will result in an unsafe situation for people, property, or fish. Information required by NPWOP-PO includes:

a. Description of the problem.

b. Type of outage required.

c. Impact on facility operation.

d. Length of time for repairs.

e. Expected impacts on fish passage.

APPENDIX B

FISH FACILITY

SCHEDULED MAINTENANCE

PROJECT: McNary

TYPE OF MAINTENANCE: Scheduled

ITEM	TIME OF YEAR	MAINTENANCE OR MEASURE TAKEN
Adult Fish Passage Facilities		
North and south shore fish ladders	Annually in January and February	Dewater and clean ladders of all debris. Inspect and perform preventative maintenance and repairs as required.
North and south shore fish counting stations	Annually in January and February	Inspect, clean, and perform preventative maintenance on picketed leads and counting station equipment.
South shore attraction water pumps	Annually in January and February	Inspect and perform required preventative maintenance.
Entrance weir hoists and automatic control systems	Biannually in March and September	Inspect and perform required preventative maintenance.

PROJECT: McNary

TYPE OF MAINTENANCE: Scheduled

ITEM	TIME OF YEAR	MAINTENANCE OR MEASURE TAKEN
Juvenile Fish Passage Facilities		
Traveling screens	Annually from November through March	Perform annual maintenance, overhauls, and rehabilitations as required.
	During the juvenile outmigration as per FTOT Annual Work Plan	Inspect with underwater TV camera.
Bypass facilities: orifices and collection and bypass flume	Annually from November through March	Inspect and perform preventative maintenance and repairs as required.
	Daily during the transportation season	Inspect and maintain daily. Repair damaged parts as soon as possible.
Transportation facilities: Upwell and separator, raceways, sample tank, barge and truck loading facilities, and associated water supply lines	Annually from November through March	Inspect and perform preventative maintenance and repairs as required.
	Daily or weekly during the transportation season	Inspect and maintain on a daily or weekly basis depending on the item. Repair damaged parts as soon as possible.
Trash racks	Annually in February and March and throughout the juvenile transport and bypass season per FTOT Annual Work Plan.	Clean trash racks of debris.

PROJECT: Ice Harbor TYPE OF MAINTENANCE: Scheduled

ITEM	TIME OF YEAR	MAINTENANCE OR MEASURE TAKEN
Adult Fish Passage Facilities		
North and south shore fish ladders	Annually in January and February	Dewater and clean ladders of all debris. Inspect and perform preventative maintenance and repairs as required.
North and south shore fish counting stations	Annually in January and February	Inspect, clean, and perform preventative maintenance on picketed leads and counting station equipment.
North and south shore attraction water pumps	Annually in January and February	Inspect and perform required preventative maintenance.
Powerhouse collection system entrance weir hoists	Annually in March	Inspect and perform required preventative maintenance.
Juvenile Fish Passage Facilities		
Sluiceway gate hoists and controls	Annually from September through March	Inspect and perform preventative maintenance and repairs as required.
Gatewell orifices	Annually in March	Inspect and cleanout debris.
Trash racks	Annually in March	Clean trash racks of debris.

PROJECT: Lower Monumental TYPE OF MAINTENANCE: Scheduled

ITEM	TIME OF YEAR	MAINTENANCE OR MEASURE TAKEN
Adult Fish Passage Facilities		
North and south shore fish ladders	Annually in January and February	Dewater and clean ladders of all debris. Inspect and perform preventative maintenance and repairs as needed.
North and south shore fish counting stations	Annually in January and February	Inspect, clean, and perform preventative maintenance on picketed leads and counting station equipment.
Attraction water pumps	Annually in January and February; monthly, and semi-annually in July	Inspect and perform required annual, monthly, and semi-annual maintenance.
Powerhouse collections system entrance weir hoists	Biannually in April and October	Inspect and perform required preventative maintenance.
Juvenile Fish Passage Facilities		
Orifices and bypass pipe	Annually in March	Inspect and clean out debris.
Trash racks	Annually in March	Clean trash racks of debris.

PROJECT: Little Goose TYPE OF MAINTENANCE: Scheduled

ITEM	TIME OF YEAR	MAINTENANCE OR MEASURE TAKEN
Adult Fish Passage Facilities		
Fish ladder	Annually in January and February	Dewater and clean ladder of all debris. Inspect and peform preventative maintenance and repairs as required.
Fish counting station	Annually in January and February	Inspect, clean, and perform preventative maintenance on picketed leads and counting station equipment.
Attraction water pumps	Annually in January and February, monthly, and semi-annually in July	Inspect and perform required annual, monthly, and semi-annual maintenance.
Powerhouse collection system and transportation channels	Annually in January and February	Inspect and perform preventative maintenance and repairs as required. Replace lights in transportation channel.

PROJECT: Little Goose TYPE OF MAINTENANCE: Scheduled

ITEM	TIME OF YEAR	MAINTENANCE OR MEASURE TAKEN
Juvenile Fish Passage Facilities		
Traveling screens	Annually September through March	Perform annual maintenance, overhauls, and rehabilitation as required.
	During the juvenile outmigration as per FTOT Annual Work Plan	Inspect with underwater TV camera.
Bypass facilities: orifices, bypass gallery, dewatering structure, and corrugated metal flume.	Annually September through March	Inspect and perform preventative maintenance and repairs as required.
	Daily or as required during the transportation season	Inspect and maintain daily or as required. Repair damaged parts as soon as possible.
Transportation facilities; separator, raceways, sampling facilities, truck and barge loading facilities, and associated water supply lines	Annually September through March	Inspect and perform preventative maintenance and repairs as required.
	Daily or as required during the transportation season	Inspect and maintain daily or as required. Repair damaged parts as soon as possible.
Trash racks	Annually in March and throughout the transport and bypass season per FTOT Annual Work Plan	Clean trash racks of debris.

PROJECT: Lower Granite TYPE OF MAINTENANCE: Scheduled

ITEM	TIME OF YEAR	MAINTENANCE OR MEASURE TAKEN
Adult Fish Passage Facilities		
Fish ladder	Annually in January and February	Dewater and clean ladder of all debris. Inspect and perform preventative maintenance and repairs as required.
Fish counting station	Annually in January and February	Inspect, clean, and perform preventative maintenance on picketed leads and counting station equipment.
Powerhouse collection and transportation channels	Annually in January and February	Inspect and perform preventative maintenance and repairs as required. Replace lights in transportation channel.
Fish ladder secondary exit water supply pumps	Quarterly	Inspect and test pumps.
Attraction water pumps	Annually in January and February, and quarterly	Inspect and perform required annual and quarterly preventative maintenance.
Adult fish trap	Annually in March	Inspect and perform required preventative maintenance.

PROJECT: Lower Granite TYPE OF MAINTENANCE: Scheduled

ITEM	TIME OF YEAR	MAINTENANCE OR MEASURE TAKEN
Juvenile Fish Passage Facilities		
Traveling screens	Annually September through March	Perform annual maintenance, overhauls, and rehabilitations as required.
	During the juvenile outmigration as per FTOT Annual Work Plan	Inspect with underwater TV camera.
Bypass facilities: orifices, bypass gallery, and bypass pipe	Annually September through March	Inspect and perform preventative maintenance and repairs as required.
	Daily or as required during the transportation season	Inspect and maintain daily or as required. Repair damaged parts as soon as possible.
Transportation facilities: upwell and separator, raceways, sampling facilities, barge and truck loading facilities, and associated water supply lines	Annually September through March	Inspect and perform preventative maintenance and repairs as required.
	Daily or as required during the transportation season	Inspect and maintain daily or as required. Repair damaged parts as soon as possible.
Trash racks	Annually in March and throughout the transport and bypass season per FTOT Annual Work Plan	Clean trash racks of debris.

APPENDIX C

OPERATING STANDARDS FOR ADULT FISH PASSAGE FACILITIES

McNARY DAM

Operating Standards for Adult Fish Passage Facilities

Fishway Ladders

Water depth over weirs: 1.0 to 1.3 feet

Head on all Entrances

Head range: 1.0 to 1.5 feet

North Shore Entrances (WFE 1 & 2)

Operate 2 downstream gates

Weir depth: 8.0 feet or greater below tailwater.

North Powerhouse Entrances (NFE 2 & 3)

Operate 2 downstream gates.

Weir depth: 9.0 feet or greater below tailwater.

Powerhouse Collection System

Operate 12 floating orifices (O.G. numbers, 1, 3, 4, 8, 14, 21, 26, 32, 37, 41, 43, and 44).

South Shore Entrances (SFE 1 & 2)

Operate 2 entrances.

Weir depth: 9.0 feet or greater below tailwater.

Transportation Velocity

1.5 to 4 feet per second.

Head on Trashracks

Maximum head of 0.5 feet on ladder exits and attraction water intakes.
Maximum head on picketed leads shall be 0.3 feet.

Staff Gauges and Water Level Indicators

Shall be readable at all water levels encountered during fish passage period.

Turbine Unit Operating Priority

Unit operation will be 1, 2, 14, 4 through 10, and then 3, 11, 12, 13, consecutively. If warm water temperatures in the summer result in higher than normal mortality in the juvenile fish collection system, refer to the summer unit operation schedule in the FTOT Annual Work Plan.

MCNARY SPILLWAY PATTERN FOR ADULT FISH PASSAGE
DISCHARGES IN KCFS AT FOREBAY ELEVATION 340

KCFS SPILL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	TOTAL STOPS
1.5	1																					1
4.5	1	1																			1	3
8.0	1	1	1																	1	1	5
12.0	1	1	1	1															1	1	1	7
14.2	1	2	1	1															1	1	2	9
18.2	1	2	1	1	1													1	1	1	2	11
22.2	1	2	1	1	1	1											1	1	1	1	2	13
26.2	1	2	1	1	1	1	1									1	1	1	1	1	2	15
30.2	1	2	1	1	1	1	1	1							1	1	1	1	1	1	2	17
32.2	1	2	1	1	1	1	1	1	1						1	1	1	1	1	1	2	18
33.3	2	2	1	1	1	1	1	1	1						1	1	1	1	1	1	2	19
37.3	2	2	1	1	1	1	1	1	1	1			1		1	1	1	1	1	1	2	21
41.3	2	2	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	2	23
44.9	2	2	1	1	1	1	1	1	1	1	1	2	2		1	1	1	1	1	1	2	25
48.5	2	2	1	1	1	1	1	2	1	1	1	2	2		2	1	1	1	1	1	2	27
52.1	2	2	1	1	1	2	1	2	1	1	1	2	2		2	1	2	1	1	1	2	29
54.3	2	3	1	1	1	2	1	2	1	1	1	2	2		2	1	2	1	1	1	3	31
57.9	2	3	1	2	1	2	1	2	1	1	1	2	2		2	1	2	1	2	1	3	33
61.5	2	3	1	2	1	2	1	2	1	2	2	2	2		2	1	2	1	2	1	3	35
62.3	2	3	1	2	1	2	1	2	2	2	2	2	2		2	1	2	1	2	1	3	36
64.4	3	3	1	2	1	2	1	2	2	2	2	2	2		2	1	2	1	2	1	3	37
68.0	3	3	1	2	1	2	2	2	2	2	2	2	2		2	2	2	1	2	1	3	39
70.2	3	4	1	2	1	2	2	2	2	2	2	2	2		2	2	2	1	2	1	4	41
73.6	3	4	1	2	1	2	2	2	2	2	2	3	3		2	2	2	1	2	1	4	43
75.4	3	4	2	2	1	2	2	2	2	2	2	3	3		2	2	2	1	2	1	4	44
78.8	3	4	2	2	1	2	2	2	2	3	3	3	3		2	2	2	1	2	1	4	46
82.4	3	4	2	2	2	2	2	2	2	3	3	3	3		2	2	2	2	2	1	4	48
85.8	3	4	2	2	2	2	2	3	2	3	3	3	3		2	2	3	2	2	1	4	50
89.2	3	4	2	2	2	2	2	3	3	3	3	3	3		3	2	3	2	2	1	4	52
92.6	3	4	2	2	2	3	2	3	3	3	3	3	3		3	3	3	2	2	1	4	54
96.1	3	4	2	2	2	3	3	3	3	3	3	3	3		4	3	3	2	2	1	4	56
98.2	3	5	2	2	2	3	3	3	3	3	3	3	3		4	3	3	2	2	2	4	58
101.6	3	5	2	2	3	3	3	3	3	3	4	3	3		4	3	3	2	2	2	4	60
102.8	4	5	2	2	3	3	3	3	3	3	4	3	3		4	3	3	2	2	2	4	61
104.5	4	5	2	2	3	3	3	3	3	3	4	3	3		4	3	3	3	2	2	4	62

MCNARY SPILL PATTERN FOR ADULT FISH PASSAGE

...CONTINUED

KCFS SPILL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	TOTAL STOPS
107.3	4	5	2	2	3	3	3	3	3	4	4	3	3		4	3	3	3	2	2	5	64
109.0	4	5	2	2	3	3	3	3	3	4	4	3	3		4	3	3	3	3	2	5	65
112.4	4	5	2	2	3	3	3	3	4	4	4	3	3		4	4	3	3	3	2	5	67
115.8	4	5	2	2	3	3	3	3	4	4	4	3	4		4	4	4	3	3	2	5	69
118.0	4	5	2	2	3	3	3	3	4	4	4	3	4		4	4	4	3	3	3	6	71
121.4	4	5	2	2	3	3	3	3	4	4	4	4	4		4	4	4	3	4	3	6	73
124.2	5	5	2	3	3	3	3	3	4	4	4	4	4		4	4	4	3	4	3	6	75
125.9	5	5	2	3	3	3	3	4	4	4	4	4	4		4	4	4	3	4	3	6	76
128.2	5	6	2	3	3	3	3	4	4	4	4	4	4		4	4	4	3	4	4	6	78
131.6	5	6	3	3	3	4	3	4	4	4	4	4	4		4	4	4	3	4	4	6	80
134.4	6	6	3	4	3	4	3	4	4	4	4	4	4		4	4	4	3	4	4	6	82
137.6	6	6	3	4	3	4	3	4	4	4	5	4	5		4	4	4	3	4	4	6	84
139.8	6	7	3	4	3	4	3	4	4	4	5	4	5		4	4	4	3	4	4	7	86
141.4	6	7	3	4	3	4	4	4	4	4	5	4	5		4	4	4	3	4	4	7	87
142.5	7	7	3	4	3	4	4	4	4	4	5	4	5		4	4	4	3	4	4	7	88
145.7	7	7	3	4	3	4	4	5	4	4	5	4	5		5	4	4	3	4	4	7	90
148.9	7	7	3	4	3	4	4	5	4	5	5	5	5		5	4	4	3	4	4	7	92
152.3	7	7	4	4	3	4	4	5	4	5	5	5	5		5	4	4	4	4	4	7	94
155.0	7	8	4	4	3	4	4	5	4	5	5	5	6		5	4	4	4	4	4	7	96
158.3	7	8	4	4	3	4	4	5	5	5	5	5	6		5	4	5	4	4	4	7	98
161.6	7	8	4	4	4	4	4	5	5	5	6	5	6		5	4	5	4	4	4	7	100
164.9	7	8	4	4	4	5	4	5	5	5	6	6	6		5	4	5	4	4	4	7	103
167.6	8	8	4	4	4	5	4	5	5	6	6	6	6		5	4	5	4	4	4	7	104
169.3	8	8	4	4	4	5	4	5	6	6	6	6	6		5	4	5	4	4	4	7	105
171.9	8	8	4	4	4	5	4	5	6	6	6	7	6		5	4	5	4	4	4	8	107
175.1	8	8	4	4	4	5	4	5	6	6	7	7	7		5	4	5	4	4	4	8	109
178.3	8	8	4	4	4	5	5	5	6	6	7	7	7		5	5	5	4	4	4	8	111
181.6	8	8	4	4	4	5	5	5	6	7	7	7	7		6	5	5	4	4	4	8	113
184.3	8	9	4	4	4	5	5	6	6	7	7	7	7		6	5	5	4	4	4	8	115
187.6	8	9	4	4	4	5	5	6	7	7	7	8	7		6	5	5	4	4	4	8	117
190.8	8	9	4	5	4	5	5	6	7	7	7	8	7		6	5	5	4	5	4	8	119
191.8	9	9	4	5	4	5	5	6	7	7	7	8	7		6	5	5	4	5	4	8	120
210.3	9	10	4	5	5	6	5	6	7	8	8	9	9		7	6	5	5	5	4	9	132
234.0	10	11	5	6	5	6	6	6	7	8	9	10	10		9	8	6	5	6	5	10	148

Operating Standards for Adult Fish Passage Facilities

Fishway Ladders

Water depth over weirs: 1.0 to 1.3 feet

Head on all Entrances

Head range: 1.0 to 1.5 feet

North Shore Entrance (NEW 1)

Operate downstream gate closest to shore.

Weir depth: 8 feet or greater below tailwater when tailwater is high enough to permit it. At low flow and tailwater, maintain a 6-foot or greater depth.

North Powerhouse Entrance (NFE 1 & 2) *

Operate 1 downstream gate.

Weir depth: 8 feet or greater below tailwater.

Powerhouse Collection System

Operate 7 floating orifices (O.G. numbers 1, 2, 4, 6, 8, 10, and 12).

South Shore Entrance (SFE-1) *

Operate entrance closest to powerhouse.

Weir depth: 8 feet or greater below tailwater.

Transportation Velocity

1.5 to 4 feet per second.

Head on Trashracks

Maximum head of 0.5 feet on ladder exits and attraction water intakes.

Maximum head on picketed leads shall be 0.3 feet.

* At extremely low tailwater and river flows, entrance weirs may bottom out and not reach 8 feet below tailwater.

Ice Harbor Dam (Continued)

Staff Gauges and Water Level Indicators

Shall be readable at all water levels encountered during fish passage period.

Turbine Unit Operating Priority

Unit operation will be : 1, 2, 3, 4, (5 or 6 in either order).

ICE HARBOR SPILLWAY PATTERN FOR ADULT FISH PASSAGE

GATE NUMBERS										TOTAL
1	2	3	4	5	6	7	8	9	10	STOPS
(1)									1.5	2.5
1	(1)							1	1.5	4.5
1	1	(1)					1	1	1.5	6.5
1	(2)	1					1	2	1.5	8.5
1	2	1	(1)			1	1	2	1.5	10.5
1	2	1	1	(1)	1	1	1	2	1.5	12.5
1	2	(2)	1	1	1	1	2	2	1.5	14.5
1	2	2	(2)	1	1	2	2	2	1.5	16.5
1	2	2	2	(2)	2	2	2	2	1.5	18.5
1	2	2	2	(3)	3	2	2	2	1.5	20.5
1	2	2	(3)	3	3	3	2	2	1.5	22.5
1	2	(3)	3	3	3	3	3	2	1.5	24.5
1	2	3	3	(4)	4	3	3	2	1.5	26.5
1	2	3	3	4	4	4	3	2	1.5	27.5
1	2	3	3	5	(5)	4	3	2	1.5	29.5
1	2	3	(4)	5	5	4	3	3	1.5	31.5
1	(3)	3	5	5	5	4	3	3	1.5	33.5
1	3	(4)	5	6	5	4	3	3	1.5	35.5
(2)	3	4	(6)	6	5	4	4	3	1.5	38.5
2	3	4	6	6	(6)	5	4	3	1.5	40.5
2	3	(5)	6	6	6	5	4	3	1.5	41.5
2	3	5	6	(7)	6	5	5	3	1.5	43.5
2	3	5	(7)	7	6	6	5	3	1.5	45.5
2	3	(6)	7	8	6	6	5	3	1.5	47.5
2	(4)	6	7	8	6	6	5	4	1.5	49.5
2	4	6	7	8	(7)	7	5	4	2	52
2	4	6	(8)	8	7	7	6	4	2	54
2	4	6	8	(9)	8	7	6	4	2	56
2	4	(7)	8	9	9	7	6	4	2	58
2	4	7	(9)	10	9	7	6	4	2	60
2	4	7	(10)	10	9	8	6	4	2	62
2	4	7	10	11	9	8	(7)	4	2	64
2	4	7	(11)	11	10	8	7	4	2	66
2	4	(8)	11	12	10	8	7	4	2	68
2	4	8	11	13	10	(9)	7	4	2	70

1/ Circled value may be 1 foot less than value shown.
For example: (1) means 0 or 1 foot.
(2) means 1 or 2 feet.

LOWER MONUMENTAL

Operating Standards for Adult Fish Passage Facilities

Fishway Ladders

Water depth over weirs: 1.0 to 1.3 feet

Head on all Entrances

Head range: 1.0 to 1.5 feet

North Shore Entrances (NSE 1 & 2)

Operate both gates.

Weir depth: 8 feet or greater below tailwater.

Powerhouse Collection System

Operate 5 floating orifices (O.G numbers 1, 3, 5, 7, 9).

South Powerhouse Entrances (SPE 1 & 2) *

Operate both downstream gates.

Weir depth: 6 feet or greater below tailwater.

South Shore Entrances (SSE 1 & 2)

Operate both downstream gates.

Weir depth: 8 feet or greater below tailwater.

Transportation Velocity

1.5 to 4 feet per second.

Head on Trashracks

Maximum head on picketed leads, such as around counting station, shall be 0.3 feet.

* The fishery agencies and tribes have requested a weir depth of 8 feet or greater below tailwater. Project personnel should attempt to obtain depths as close to this as possible within existing pump capacities.

Staff Gauges and Water Level Indicators

Gauges shall be readable at all water levels encountered during fish passage period.

Turbine Unit Operating Priority

Unit operation will be: Daytime (0600 to 1800 h) 1, 2, 3, 4, 5, 6
Nighttime (1800 to 0600) 3, 6, 5, 4, 2, 1
(Nighttime operation from 1 April to 31 July for juvenile fish passage)

Spillway Operation

The spillway will be operated according to the following spillgate pattern to minimize impacts on upstream migrating adult salmonids.

Special nighttime spills for bypassing juvenile salmonids may require different spillgate patterns to maximize their efficiency for bypassing juveniles. If these spills occur, special patterns will be provided at that time.

LOWER MONUMENTAL SPILL PATTERN

Gate Numbers								Total	
1	2	3	4	5	6	7	8	Stops	kcfs
1								1	1.1
1							1	2	2.2
1	1						1	3	3.3
1	1					1	1	4	4.4
2	1					1	1	5	6.1
2	1					1	2	6	7.8
2	1	1				1	2	7	8.9
2	1	1			1	1	2	8	10.0
2	1	1	1		1	1	2	9	11.1
2	1	1	1	1	1	1	2	10	12.2
2	1	1	1	1	1	1	3	11	13.9
2	1	1	1	1	1	2	3	12	15.6
2	1	1	1	1	2	2	3	13	17.3
2	1	1	1	2	2	2	3	14	19.0
2	1	1	1	2	2	3	3	15	20.0
2	1	1	1	2	2	3	4	16	22.5
2	1	1	1	2	3	3	4	17	24.3
2	1	1	1	3	3	3	4	18	26.0
2	1	1	1	3	3	4	4	19	27.7
2	1	1	1	3	3	4	5	20	29.5
2	1	1	1	3	3	5	5	21	31.2
2	1	1	1	3	4	5	5	22	33.0
2	1	1	2	3	4	5	5	23	34.0
3	1	1	2	3	4	5	5	24	36.6
3	1	2	2	3	4	5	5	25	38.4
3	2	2	2	3	4	5	5	26	40.2
3	2	2	2	3	4	5	6	27	41.9
3	2	2	2	3	4	6	6	28	43.6
3	2	2	2	3	5	6	6	29	45.3
3	2	2	2	4	5	6	6	30	47.0
3	2	2	3	4	5	6	6	31	48.7
3	2	3	3	4	5	6	6	32	50.4
3	2	3	3	4	5	6	7	33	52.1
3	2	3	3	4	5	7	7	34	53.8
3	2	3	3	4	6	7	7	35	55.5
3	2	3	3	5	6	7	7	36	57.2
3	2	3	4	5	6	7	7	37	58.9
3	2	4	4	5	6	7	7	38	60.6
3	2	4	4	5	6	7	8	39	62.3
3	2	4	4	5	6	8	8	40	64.0
3	2	4	4	5	7	8	8	41	65.7
3	2	4	4	6	7	8	8	42	67.4
3	2	4	5	6	7	8	8	43	69.1
3	2	4	5	6	7	8	9	44	70.8
3.5	2.5	4	5	6	7	8	9	45	72.5
3.5	2.5	5	5	6	7	8	9	46	74.2
3.5	2.5	5	5	6	7	9	9	47	75.9
3.5	2.5	5	5	6	8	9	9	48	77.6
3.5	2.5	5	5	7	8	9	9	49	79.3
3.5	2.5	5	6	7	8	9	9	50	81.0

Operating Standards for Adult Fish Passage Facilities

Fishway Ladder

Water depth over weirs: 1.0 to 1.3 feet

Head on all Entrances

1.4 to 1.7 feet on south shore entrances.

1.0 to 1.5 feet on north powerhouse entrances.

0.8 to 1.5 feet on north shore entrances. (Preferably 1.0 to 1.5 if possible.)

North Shore Entrances (NSE 1 & 2)*

Operate both downstream gates.

Weir depth: 6 feet or greater below tailwater.

North Powerhouse Entrances (NPE 1 & 2) *

Operate both downstream gates.

Weir Depth: 6 feet or greater below tailwater.

Powerhouse Collection System

Operate 4 floating orifices (numbers 1, 4, 6, and 10).

South Shore Entrances (SSE 1 & 2)

Operate both gates.

Weir depth: 8 feet or greater below tailwater.

Transportation Velocity

1.5 to 4 feet per second.

* The fishery agencies and tribes have requested a weir depth of 8 feet or greater below tailwater. Project personnel should attempt to obtain depths as close to this as is possible within existing pump capacities.

Tunnel Lights

Lights in the tunnel section, under the spillway, shall be on during fish passage period.

Head on Trashracks

Maximum head of 0.5 feet on ladder exits and attraction water intakes.

Maximum head on picketed leads shall be 0.3 feet.

Staff Gauges and Water Level Indicators

Shall be readable at all water levels encountered during fish passage period.

Turbine Unit Operating Priority

Unit operation will be: Operate unit 1, 2, 3, and then 4 - 6.

LITTLE GOOSE SPILLWAY PATTERN FOR ADULT FISH PASSAGE

GATE NUMBERS								TOTAL STOPS	TOTAL KCFS
1	2	3	4	5	6	7	8		
(1)							1		
1	(1)					1	1		
1	1	(1)			1	1	1		
1	1	1	(1)	1	1	1	1		
1	1	(2)	1	1	2	1	1	10	19
1	1	2	(2)	2	2	1	1		
(2)	1	2	2	2	2	1	2		
2	2	2	2	2	2	(2)	3		
(3)	2	2	2	2	2	2	3		
3	2	3	(3)	2	2	2	3	20	39
3	3	3	3	2	(3)	2	3		
3	3	3	3	2	3	(3)	4		
3	3	3	(4)	3	3	3	4		
4	3	(4)	4	3	3	3	4		
4	4	4	4	3	3	(4)	4	30	60
5	(5)	4	4	3	3	4	4		
5	5	(5)	4	4	3	4	4		
5	5	5	4	4	(4)	4	5		
5	(6)	5	5	4	4	4	5		
5	6	5	5	4	4	(5)	6	40	80
(6)	6	5	5	4	5	5	6		
6	6	5	5	(5)	5	6	6		
(7)	6	5	5	5	5	6	7		
7	6	5	(6)	6	5	6	7		
7	6	(6)	6	6	6	6	7	50	100
7	6	6	(7)	7	6	6	7		
7	(7)	6	7	7	7	6	7		
7	7	(7)	7	7	7	7	7		
8	7	7	7	7	7	7	(8)		
8	7	8	(7)	8	7	7	8	60	120
8	7	8	(8)	8	8	7	8		
8	(8)	8	8	8	8	8	8		
(9)	8	8	8	8	8	8	9		
9	8	(9)	8	9	8	8	9		
9	8	9	(9)	9	9	8	9	70	140

1/ Circled values may be 1 increment less than indicated.

For examole: (2) means 2 or 1 increments.
(3) means 3 or 2 increments.

LOWER GRANITE

Operating Standards for Adult Fish Passage Facilities

Fishway Ladder

Water depth over weirs: 1.0 to 1.3 feet

Head on all Entrances

Head range: 1.0 to 1.7 feet.

1.5 to 1.7 feet on South Shore entrance is required to maintain the necessary transportation flow at bottom of ladder and first bend in channel.

North Shore Entrances (NSE 1 & 2)

Operate both downstream gates.

Weir depth: 7 feet or greater below tailwater.

North Powerhouse Entrances (NPE 1 & 2)

Operate both downstream gates.

Weir depth: 8 feet or greater below tailwater.

Powerhouse Collection System

Operate 4 floating orifices (numbers 1, 4, 7, and 10).

South Shore Entrances (SSE 1 & 2)

Operate both gates.

Weir depth; 8 feet or greater below tailwater.

Transportation Velocity

1.5 to 4 feet per second.

Tunnel Lights

Lights in the tunnel section, under the spillway, shall be on during fish passage period.

Head on Trashracks

Maximum head of 0.5 feet on ladder exits and attraction water intakes.

Maximum head on picketed leads shall be 0.3 feet.

Staff Gauges and Water Level Indicators

Shall be readable at all water levels encountered during fish passage period.

Turbine Unit Operating Priority

Unit operation will be: 1, 2, 3, and then 4 - 6.

LOWER GRANITE SPILLWAY PATTERN FOR ADULT FISH PASSAGE
DISCHARGES IN KCFS AT FOREBAY ELEVATION 737

GATE NUMBER								TOTAL	TOTAL
1	2	3	4	5	6	7	8	STOPS	FLOW
1								1	1.75
1							1	2	3.50
1						1	1	3	5.25
1	1					1	1	4	7.00
1	1				1	1	1	5	8.75
1	1	1			1	1	1	6	10.50
1	2	1			1	1	1	7	12.37
1	2	1			1	2	1	8	14.25
1	2	1	1		1	2	1	9	15.99
1	2	2	1		1	2	1	10	17.86
1	2	2	1	1	1	2	1	11	19.61
1	2	2	2	1	1	2	1	12	21.48
1	2	2	2	2	1	2	1	13	23.35
1	2	2	3	2	1	2	1	14	25.27
2	2	2	3	2	1	2	1	15	27.14
2	2	2	3	3	1	2	1	16	29.06
2	2	2	3	3	2	2	1	17	30.93
2	2	3	3	3	2	2	1	18	32.85
2	3	3	3	3	2	2	1	19	34.77
2	3	3	4	3	2	2	1	20	36.67
3	3	3	4	3	2	2	1	21	38.61
3	3	4	4	3	2	2	1	22	40.53
3	3	4	4	3	3	2	1	23	42.45
3	4	4	4	3	3	2	1	24	44.37
3	4	4	4	4	3	2	1	25	46.29
3	4	4	5	4	3	2	1	26	48.21
3	4	5	5	4	3	2	1	27	50.13
4	4	5	5	4	3	2	1	28	52.05
4	5	5	5	4	3	2	1	29	53.97
4	5	5	5	4	4	2	1	30	55.89
4	5	5	5	5	4	2	1	31	57.81
4	5	5	6	5	4	2	1	32	59.73
4	5	6	6	5	4	2	1	33	61.65
4	6	6	6	5	4	2	1	34	63.57

APPENDIX D

OPERATING STANDARDS FOR

JUVENILE FISH PASSAGE FACILITIES

OPERATING STANDARDS

FOR JUVENILE FISH PASSAGE FACILITIES

McNARY DAM

Prior to April 1 each year

Powerhouse

Forebay Area and Intakes

1. Remove debris from forebay and trash racks.
2. Rake trash racks
3. Remove debris from gatewell slots.
4. Measure and log drawdown in gatewell slots.

Submersible Traveling Screens

5. Inspect screens and operate on one trial run.
6. Log results of trial run.

Gallery Bypass Flume

7. Orifice lights operational.
8. Orifices clean and operational.
9. Clear plastic spools on orifices clean.
10. Orifice valves operational.
11. Water dissipation screens clean and ready for operation.

Sorter and Raceways

12. No rough edges on perforated plate.
13. Check wet separator and fish distribution system for operation.
14. All raceway retainer screens and crowder brushes in good order with no holes or protruding wires.
15. Raceways clean of debris

McNary Dam (Continued)

16. Sample and holding tanks smooth and clean.

17. All electronic counters checked for operation.

18. Inspect PVC pipes to insure they are clear of debris and cracks. Repair if required.

Fish Trailers

19. All systems operate properly.

20. No leaks around air stone fittings.

    a. Plugs in end of air stones.

    b. Turn stones on lathe if necessary to allow free air passage through stones.

21. Each trailer carries two 5-inch hoses and necessary 5-inch "Kamlock" caps.

22. All valves operating properly.

23. Overall condition of trailer in good shape including hatch covers, release gates, and oxygen manifold system.

Maintenance Records

24. Record all maintenance and inspections.

OPERATING STANDARDS

FOR JUVENILE FISH PASSAGE FACILITIES

McNARY DAM

April 1 - End of Transport and Bypass Season

Powerhouse

Forebay Area and Intakes

1. Remove trash from forebay.

2. Inspect gatewell slots daily and clean as required.

3. Remove debris from forebay and trashracks as required to maintain less than one foot of additional drawdown in gate slots. Additional raking may be required when heavy debris loads are present in the river. Fish quality will also be an indicator of debris buildup on the trash racks.

4. Coordinate cleaning effort with personnel operating downstream migrant facilities.

5. Log drawdown differentials once a week.

Submersible Traveling Screens

6. Inspect, operate, and cycle screens as per FTOT plan.

Gallery Bypass Flume

7. Operate one orifice per gate slot.

8. Orifices clean and operating.

9. Orifice lights operating on open orifices.

10. Orifice valve either full open or closed.

11. Water dissipation screens clean.

12. Maintain pinch valve in good operating condition and operate as open as is possible.

13. Adjust water flow over sorter to maintain a smooth, stable flow condition.

Sorter and Raceways

14. Operate in accordance with FTOT plan.

OPERATING STANDARDS

FOR JUVENILE FISH PASSAGE FACILITIES

ICE HARBOR DAM

Prior to April 1 each year

1. Remove debris from forebay and gatewell slots.

2. Rake trash racks.

3. Inspect and clean orifices of debris. Video inspection permitted.

4. Test that chain gates are operational.

5. Run gates on manual and automatic operation.

April 1 to End of Bypass Season

6. Remove debris from forebay.

7. Remove debris from trashracks as required to maintain less than one foot of additional drawdown in gate slots. Additional raking may be required when heavy debris loads are present in the river.

8. Inspect orifices daily and clean as required.

9. Inspect gatewell slots twice a week and clean as required.

10. Operate chain gates 1A, 2A, 3A, 4A, 5A, and 6A at maximum flows allowed by sluiceway capacity 24 hours a day.

Maintenance Records

11. Record all maintenance and inspections.

OPERATING STANDARDS FOR

JUVENILE FISH PASSAGE FACILITIES

LOWER MONUMENTAL DAM

Prior to April 1 each year

1. Remove debris from forebay and gatewell slots.

2. Rake trash racks.

3. Inspect and clean orifices. Video inspection permitted.

4. Check regulating valve for full open.

5. Check and repair downstream migrant pipe and air valve as required.

April 1 to End of Bypass Season

7. Remove debris from forebay and trashracks as required to maintain less than one foot of additional drawdown in gate slots. Additional raking may be required when heavy debris loads are present in the river.

8. Inspect gatewell slots twice a week and clean when required.

9. Close bypass pipe and blow back with air twice per week to maintain clean orifices. If a heavy debris load is present, blow back more frequently. If outfall flow appears to be less than normal, check orifices for blockage.

10. Inspect facilities daily.

Maintenance Records

11. Record all maintenance and inspections.

OPERATING STANDARDS

FOR JUVENILE FISH PASSAGE FACILITIES

LITTLE GOOSE DAM

Prior to April 1 each year

Powerhouse

Forebay Area and Intakes

1. Remove debris from forebay and gatewell slots.

2. Rake trash racks.

3. Measure drawdown in gatewell slots.

Submersible Traveling Screens (STS)

4. Inspect screens for good running order and operate on one trial run (dogged off on deck).

5. Log trial run.

Collection Gallery

6. Makeup water gate operational.

7. Orifice lights operational.

8. Orifices clean and operational.

Dewatering Structure

9. Inclined screen clean and in good condition with no holes.

10. Cleaning brush system maintained and operational.

11. Overflow weirs maintained and tested.

Tailrace Area

Sorter and Raceways

12. Flume switch gate maintained and operational.

13. Flume smooth with no rough edges.

14. Perforated plate edges smooth with no rough edges.

15. Check wet separator and fish distribution system for operation as designed.

Little Goose Dam (Continued)

16. Brushes on crowder in good order.

17. Crowder operates properly.

18. All slide gates and switch gates in and around separator and raceways in good operating order.

19. Retainer screens in place with no holes or sharp wires protruding.

20. Barge and truck loading pipes free of debris, cracks, or blockages.

21. Barge loading boom maintained and tested.

Sampling Facility

22. Building and all equipment operable.

Maintenance Records

23. Record all maintenance and inspections.

OPERATING STANDARDS

FOR JUVENILE FISH PASAGE FACILITIES

LITTLE GOOSE DAM

April 1 to end of transport and bypass season

Powerhouse

Forebay Area

1. Remove debris from forebay.

Intakes

2. Inspect gatewell slots daily (preferably early in day shift) and remove debris when needed.

3. Clean trash racks in front on units as recommended in FTOT work plan.

4. Coordinate cleaning effort with personnel operating downstream migrant facilities.

5. Log drawdown differentials at least once a week.

Submersible Traveling Screens (STS)

6. Inspect screens as recommended in FTOT Plan.

7. Make formal determination at end of season with FTOT transport inspection for adequacy of screen mesh and replacement if necessary.

Collection Gallery Checks

8. Orifice clean and operating.

9. Orifice lights operating.

10. Orifice jets not hitting backwall (bypass gallery full).

11. Makeup water gate and float control equipment operational.

12. Operate at least one 12-inch orifice per slot when possible.

13. Water surface at collection channel exit at proper elevation.

Dewatering Structure

14. Trash sweep operating correctly.

15. Overflow weirs operating correctly.

Little Goose Dam (Continued)

16. No holes in inclined screen.

Tailrace

Sorter and Raceways

16. No holes in screens.

17. Crowder brushes in good operating condition.

18. Retainer screens in raceway clean with no holes or protruding wires.

19. Operate wet separator and fish distribution system as designed.

20. Truck and barge loading facilities in good operating condition.

Inspection

21. Inspect fish facilities once each shift.

Maintenance Records

22. Record all maintenance and inspections.

OPERATING STANDARDS

FOR JUVENILE FISH PASSAGE FACILITIES

LOWER GRANITE DAM

Prior to April 1 each year

Powerhouse

Forebay Area and Intakes

1. Remove debris from forebay and gatewell slots.
2. Rake trash racks.
3. Measure drawdown in gatewell slots.

Submersible Traveling Screens (STS)

4. Inspect screens for good running order and operate on one trial run (dogged off on deck).
5. Log trial run.

Collection Gallery

6. Makeup water gates and float control equipment operational.
7. Orifice lights operational.
8. Orifices clean and operational.

Tailrace Area

Sorter and Raceways

9. 42-inch and 48-inch sluice gates operational.
10. Incline screens clean and in good shape with no holes.
11. Perforated plate edges smooth with no rough edges.
12. Check wet separator and fish distribution system for operation as designed.
13. Brushes on crowder in good order.
14. Crowder operates properly.

Lower Granite Dam (Continued)

15. All slide gates in and around separator and raceways in good operating order.

16. Retainer screens in place with no holes or sharp wires protruding.

Sampling/Marking Facility

17. Building and all operational equipment operable.

Barges

18. All pumps in good working order.

19. Dump gates operational.

20. No rough edges or support beams protruding into compartments.

21. No brass or galvanized fittings in circulation lines.

22. All loading hoses properly installed so fish will not hit sides of compartments or support beams when loading.

23. Loading hoses in good shape with rubber gaskets in "Kamlock" fittings.

24. Inside edges of Kamlock Lock joints should be beveled to avoid sharp edges.

25. Warning system operational.

26. Provide net and/or deck covers.

Log Maintenance

27. Record all maintenance and inspections.

OPERATING STANDARDS FOR

JUVENILE FISH PASSAGE FACILITIES

LOWER GRANITE DAM

April 1 to End of Transport Season and Bypass Season

Powerhouse

Forebay Area and Intakes

1. Remove debris from forebay.

2. Clean trash racks in front of units as recommended in FTOT work plan.

3. Coordinate cleaning effort with personnel operating downstream migrant facilities.

4. Inspect gatewell slots daily (preferably early in day shift), and remove debris when needed.

5. Log drawdown differentials at least once a week.

Submersible Traveling Screens (STS)

6. Inspect screens as recommended in FTOT plan.

7. Make formal determination at end of season for adequacy of screen mesh and replacement if necessary.

Collection Gallery Checks

8. Orifices clean and operating.

9. Orifice lights operating.

10. Orifice jets not hitting backwall, bypass gallery full.

11. Makeup water gates and associated float controls operational.

12. Alternate orifices in fish screens slots daily (6 open).

13. Bulk head slots orifices opening (18) (6 unit operation).

Tailrace Area

Sorter and Raceways

16. 42-inch and 48-inch sluice gate operational.

17. Maintain stable water conditions in upwell at sorter.

Lower Granite (continued)

18. No holes in screens.

19. Crowder and brushes in good operating order.

20. All slide gates and inflow gates in and around separator and raceways operational.

21. Raceway retainer screens to be clean and have no holes or protruding wire.

Barges and Trucks

22. Barge and truck loading pipes free of debris, cracks, or blockages.

Towboats

23. Capable of making turn-around trip in less than 84 hours.

Inspection

24. Inspect fish facilities once each shift.

Maintenance Records

25. Record all maintenance and inspections.

APPENDIX E

FISH TRANSPORTATION OVERSIGHT TEAM'S

1990 ANNUAL WORK PLAN

ANNUAL WORK PLAN FOR JUVENILE FISH

TRANSPORT OPERATIONS

LOWER GRANITE, LITTLE GOOSE, AND MCNARY DAMS
1990

by FISH TRANSPORTATION OVERSIGHT TEAM

I. Introduction:

A. This work plan describes operations and establishes criteria for the transportation of juvenile salmon and steelhead from Lower Granite, Little Goose, and McNary dams (collector dams) to the tailrace of Bonneville Dam. The Fish Transportation Oversight Team (FTOT) is an interagency team supported by state and Federal fishery agencies, the Columbia River indian tribes, the Corps of Engineers, and regional governing bodies to provide oversight for the transport program. The fishery agencies and tribes provide biological oversight through the Columbia Basin Fish and Wildlife Authority (CBFWA). On-site biological assistance is provided by state agencies at Lower Granite, Little Goose, and McNary Dams through Cooperative Agreements between the Corps (CENPW) and Idaho Department of Fish and Game (IDF&G), Oregon Department of Fish and Wildlife (ODF&W), and Washington Department of Fisheries (WDF), respectively.

B. The transport program will be coordinated with other fishery monitoring, research, and management activities by FTOT. Coordination will be achieved among CBFWA members through the Fish Passage Advisory Committee, the Fish Passage Center (FPC), CENPW, and other agencies as required.

II. Objective: The work plan objective is to maximize survival of fish collected and transported by:

A. Providing safe and efficient collection and barge or truck transport of juvenile salmon and steelhead from collector dams to release points below Bonneville Dam;

B. Inspecting facilities prior to, during, and after the juvenile transportation season. Inspections will be conducted by FTOT, project biologists, and project managers to ensure facility readiness, operation according to FTOT criteria, and to determine maintenance, replacement, and/or modification requirements for the following transportation season;

C. Identifying and recommending programs or facility changes that would benefit fish collection and transportation or bypass operations;

D. Assuring that collection, transport, and release site facilities are ready for operation prior to the beginning of transport operations.

E. Assuring that collection, transport, and release site facilities are properly maintained throughout the transport season;

F. Establishing operating criteria for facilities,barges, and trucks including fish holding and transport densities, sampling rates, and facility operations and maintenance;

G. Coordinating changes needed to accommodate fluctuations in the outmigration with project, CBFWA, and FPC personnel;

H. Coordinating transport evaluation and other research with the transportation program in 1990;

I. Participating in the training of new personnel associated with collection and transport facilities and equipment;

J. Providing all parties involved a list of emergency points of contact and appropriate telephone numbers so that corrective responses can be coordinated efficiently;

K. Preparing an annual report detailing transportation activities and results for the previous year, and identifying maintenance, replacement, or modifications needed for the next transport season.

III. Project Operations for Juvenile Fish Protection:

A. CENPW is responsible for maintaining and operating all collection and transportation facilities and equipment in a manner that provides for safe collection, transportation, and bypass of juvenile fish. Procedures to meet this responsibility are:

1. Turbine Operation:

a. Turbines will be operated within 1 percent of peak efficiency (Bell, 1981) to minimize mortality of fish passing through turbines. Turbine operation data will be available from the powerhouse operator upon request.

2. Turbine Unit Priority:

a. Research has shown some turbine units collect more fish than others. These units shall receive priority when power demand or river flows require operation of more than one unit. At Lower Granite and Little Goose dams, priority units will be loaded from 1 through 4, while at McNary Dam, 4 through 10 will be the priority units. Unit 14 at McNary Dam will also be given priority because it provides flow needed to move juvenile fish through the collection flume, and 1 and 2 will be given priority for providing adult fish attraction flow. At McNary Dam, loading will proceed from 1, 2, 14, 4 through 10, 3, 11, 12, to 13.

b. During mid-summer, water temperatures at McNary Dam usually increase to levels which cause higher than normal fish mortality in the collection system. When that occurs, Units 14, 13, 12, 11, 10, 9, and 8 shall be operated in that order. Units should be operated within 1 percent of peak efficiency, and starting and stopping of units should be avoided. If more generation is needed, additional units may be operated within the 1 percent of peak efficiency criteria. If units cannot be operated consecutively from Unit 14 toward Unit 1, orifices will be closed for non-operating units between operating units. Orifices will be closed one hour after unit shut-down and re-opened immediately when the unit is re-started. If such units are off for more than seven days, gatewells will be inspected and accumulated fish will be removed by gatewell dipping.

3. Submersible Traveling Screens (STS) Operations:

a. Installation: STSs will be installed and operated in Units 1 and 2 at Lower Granite and Little Goose Dams by March 15, 1990. Remaining STSs will be installed and in operation by April 1, 1990. At McNary, STSs will be installed and operated in Units 4 through 10 by March 15, 1990, and remaining STSs will be installed and operating by April 1, 1990.

b. Cycling: STSs will be operated in a cycling mode throughout the season at Lower Granite and Little Goose Dams. At McNary Dam, when the average fork length of chinook salmon in the daily sample at the collection facility is less than 112 millimeters (mm), or when a sudden decline in fish condition warrants, STS shall be operated in a continuous mode. Cycling may resume when chinook fork length exceeds 112 mm and/or fish condition has improved to an acceptable level. Immediately after resumption of screen cycling, fish condition will be monitored to verify that the operational change has not affected

or has improved fish condition. FTOT will be notified before a change from continuous or cyclic operation of STSs is made by project managers, and effects of the change in operation will be reported to FTOT.

c. Maintenance: The number and condition of fish collected is directly related to efficient operation of STSs. Continuous monitoring of STS operation will be provided by annunciation (automatic warning system) to the powerhouse control room. Project operators will inform project biologists immediately of any STS malfunctions. Project biologists and managers will make on-site decisions to remove from operation units with malfunctioning screens. Project biologists will notify FTOT of such actions. Figure 1 prescribes actions to be taken.

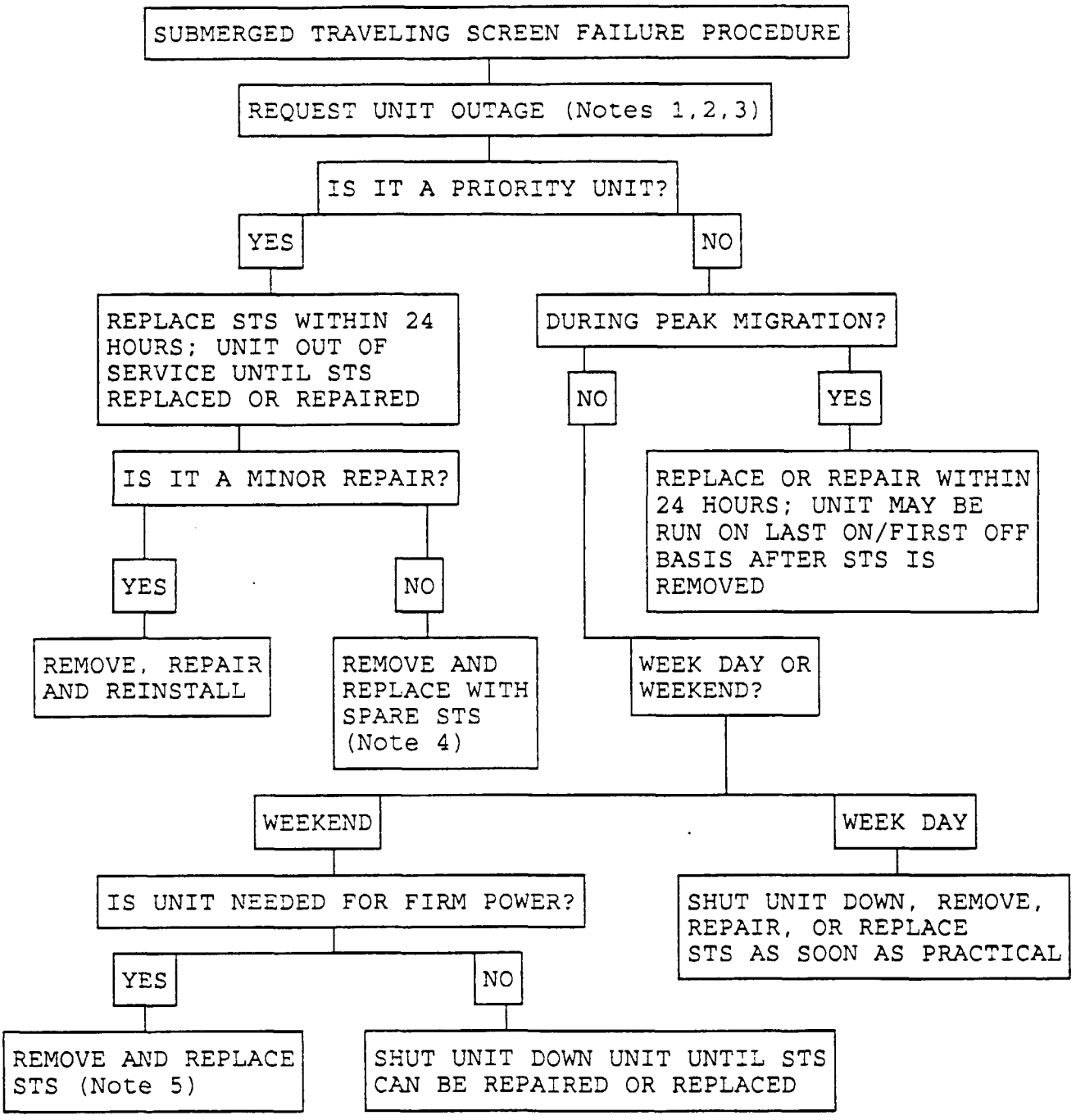
d. Weekend procedures: If an STS malfunctions on a weekend when maintenance crews are not available to repair or replace the STS, the unit must be shut down and generation switched to another, fully screened unit. If all fully screened units are in operation, generation may exceed the within 1 percent of peak efficiency criteria starting with the lowest priority units, or water may be spilled until the STS in the affected unit can be removed and repaired or replaced. If the affected unit is required for adult fish passage attraction flow (Unit 1 at Lower Granite and Little Goose Dams, and Units 1 and 2 at McNary Dam), any decision must be coordinated by FTOT with the FPC before the unit is shut off.

e. Spare STSs: Spare STSs are provided at each collector dam, one each at Lower Granite and Little Goose, and two at McNary Dam. If the spares are in use and additional STSs are needed to replace damaged STSs in priority units, they will be taken from a non-operating unit (out of service for long term maintenance or overhaul) or from the C slots of the lowest priority units on line. The low priority units from which a STS has been removed may be operated on a last on/first off basis without a full complement of screens.

4. Facility Inspections:

a. FTOT will inspect all transport facilities prior to, during, and following the transport season. Project biologists and CE management personnel will accompany FTOT inspections.

b. STS inspections: Television (TV) inspections at Lower Granite and Little Goose Dams will begin during the third and fourth week of April. Subsequent inspections will be



Notes:
1. A unit must not be run with a known damaged or malfunctioning STS;
2. Project biologists should be notified immediately of STS damage or malfunctions; biologists will notify FTOT of the problem and anticipated repair time;
3. If a screen malfunctions, all units are operating, and additional generation is needed, loadings above the 1 percent peak efficiency criteria may be placed on units starting with the lowest priority progressing to the highest priority units;
4. If no spare screen is available, a C slot screen from the lowest priority unit may be used;
5. Any unit operated with less than 3 STSs may be operated on a last on/first off basis.

conducted within one month of the last inspection as long as STS operation continues.
At McNary Dam, STSs will be inspected in at least two units per week.
At all projects, unscheduled STS inspection may be required if:
(1) fish condition deteriorates;
(2) debris loading in the collection system increases; or
(3) other indications of STS or collection system malfunction occurs.
STS inspection may be waived by FTOT on a case-by-case basis if conditions (like high water temperature) warrant.

c. Vertical Barrier Screen (VBS) Inspections: Inspection of vertical barrier screens for damage or debris accumulation will be conducted at all District projects. The District will attempt to contract VBS inspections in 1990. Damaged VBSs will be repaired or replaced. After all VBSs have been inspected and results are available the frequency of future inspections will be determined. VBS inspection results will be recorded by the project biologist and reported to FTOT annually.

d. Flume Inspections: At McNary Dam, the flume will be dewatered, inspected and repaired if necessary in early June when juvenile fish abundance is low.

5. Peak Migration Periods: For the purpose of transport operations, the peak migration period is defined as beginning when total collection at an individual project reaches 20,000 fish per day (actual peak days have ranged from 250,000 to 680,000 fish per day). Normally, truck transportation will be used before and after the peak, and barge transportation will be used during the peak. Peak migration generally occurs between April 15 and May 31 at Lower Granite, Little Goose and McNary Dams. At McNary Dam a summer peak also occurs from July through August.

B. Debris Problems and Trash Raking:

1. Debris will be removed from trashracks and the forebay surface in front of turbine units prior to STS installation and thereafter as it accumulates. When project biologists detect higher than normal descaling rates, trashracks will be raked again. Additional raking of trashracks may be necessary as determined by project biologists when local storms or high (flood) water cause increased quantities of debris to come down the river.

At McNary Dam trash racks will be raked concurrent with TV inspections of STSs unless determined unnecessary by the project biologist.

2. When trash raking is conducted at Little Goose and Lower Granite Dams, unit outages may be required. When the center trashrack (B slot) is being raked, adjacent units may be operated. When the A or C slot is being raked, the adjacent unit should be shut down so debris dislodged from the slot being raked is not drawn into the adjacent slot. Gatewell orifices must be closed in the unit being raked.

At McNary Dam, adjacent units will be monitored during trash raking and appropriate steps taken if trash is drawn into an adjacent unit. Project biologists will inform FTOT prior to trashrack raking in addition to noting raking times and results in their logbooks. Screen inspections should be coordinated with trash raking operations to minimize unit outages.

C. Collection Facility Operations:

1. Once transport operations begin, collection facilities will be staffed 24 hours per day until operations cease. Fish will be bypassed to the river if they are not transported.

2. Gatewell orifices will be checked and cycled daily when necessary from the beginning to the end of collection or bypass operations.

3. Water level in the gallery or flume will be checked daily. Flows at the juvenile fish separator will be monitored at least every 15 minutes throughout separator operations.

4. When collection and bypass systems are not meeting FTOT criteria, project managers and biologists will make operational changes that bring facility operations back within FTOT criteria, and notify FTOT as soon as possible. FTOT will coordinate changes with FPC.

a. McNary Dam: If average daily project flows exceed or are projected to exceed 220 thousand cubic feet per second (kcfs) for 5 consecutive days, fish will be separated by size and smaller fish will be bypassed as long as yearling chinook salmon predominate in the collection. If average daily flows are projected to drop below 220 kcfs for approximately 5 days, transportation will be maximized to prevent bypassing fish into deteriorating flow conditions. If existing or projected conditions warrant a change in this criterion, FTOT will coordinate recommended changes with FPC prior to the change. When subyearling chinook salmon predominate over yearling chinook salmon in the collection sample, all collected fish will be

transported. Sub-samples will be examined for marks or for use in research, then released to the tailrace or transported. Maximum collection and transportation of all species will be implemented when average daily flows are at or below 220 kcfs and projected to remain below 220 kcfs for 5 consecutive days.

b. Lower Granite Dam: All fish collected will be transported except those required to be released for approved fish research or monitoring activities.

c. Little Goose: If average daily flow exceeds 100 kcfs, fish will be separated by size and smaller fish will be bypassed to the tailrace. If average daily flows are projected to drop below 100 kcfs for 5 consecutive days, transportation will be maximized to prevent bypassing fish into deteriorating flow conditions. Because of the extended period expected for fish to move through the lower Snake River under low-flow conditions, it is desirable to anticipate sub-minimum flows as far in advance as practicable (approximately 3-5 days) and initiate transportation of all species at that time. If existing or projected conditions warrant a change in the criteria, FTOT will coordinate recommended deviations with FPC prior to implementation. Larger fish will be transported until approximately 80 percent of the yearling chinook salmon migrants (as determined by the FPC) have passed and steelhead numbers predominate. When that happens, all fish collected will be transported.

D. Sampling Procedures:

1. Sampling will be accomplished in accordance with sampling guidelines developed by CBFWA (Appendices I and II).

2. Fish that are sampled will be counted by electronic counting tunnels verified and adjusted by hand counts. All fish number estimates, raceway, truck, and barge loading densities and rates will be based on a sample of fish collected. Samples will be taken for approximately 3 to 5 minutes per hour, 24 hours per day. Samples may be split into more, shorter sample periods by project biologists depending on the capability of sample timing equipment.

3. Species composition and weight samples will be taken to determine loading densities for raceways, barges, and trucks. Project personnel will keep a running total of hourly estimates of fish numbers, raceway totals, and direct loading totals for barges based on these estimates.

4. Where smolt monitoring activities are conducted at

collector dams, project biologists will utilize daily total information gathered by smolt monitoring personnel.

E. Facility and Equipment Logbooks and Records:

1. To document collection and transportation activities, the following items will be logged at each dam:

a. STS activity - A log of STS operation and inspection information will be maintained by the project biologist. Changes in operational modes, malfunctions, repairs, and replacements will be noted including a description, the date, and hour of occurrence.

b. Trash raking - The state and project biologist shall note conditions causing a request for trash raking, when raking occurred, and whether fish condition improved. If fish condition did not improve, follow-up measures will also be recorded.

c. Fingerling Facilities - Daily records will be maintained of fish counts by hour, by day, and by species, numbers and species of fish trucked or barged, number and species of fish sampled, descaling rates, and mortality rates. Records will be transmitted daily to CENPW for processing and transmittal to CENPD. Facility personnel will follow standard operating procedures (SOPs), and will note in facility logbooks accomplishment of SOPs at various stations at the collection facilities. General observations of fish condition and juvenile fish passage will be documented in facility logbooks by state biologists.

d. Truck and Barge Logbooks: Each truck and barge shall have a logbook for recording fish loading rates, fish condition, estimated mortalities, equipment malfunctions, and accomplishment of scheduled work under the SOPs. When consecutive loading of trucks or barges occurs at downstream projects, truck drivers or barge riders will record numbers and condition of fish loaded. Towboat captains will keep logbooks on towboat activities. Barge riders will be authorized as inspectors by the Contracting Officer's Representative to initial entries noting towboat passage, loading, or fish release activities, and comments on barging operations.

F. Loading Criteria:

1. Raceways - Maximum raceway holding capacity will be 0.5 lbs. of fish per gallon of water. Inflow to raceways is

approximately 1200 gallons per minute (gpm) at Lower Granite and Little Goose dams, and 1000 gpm at McNary Dam. Individual raceway volume is approximately 12,000 gallons of water at Lower Granite and Little Goose dams. The permanent raceways at McNary Dam hold 5,000 gallons each, and two temporary raceways hold 7,400 gallons each. The 0.5 pounds per gallon criterion is not to be exceeded without FTOT review and approval. Such decisions will be coordinated with FPC, and a joint decision whether to exceed criteria or bypass fish to the river will be made based on: (1) species composition; (2) total anticipated collection during the critical holding period; (3) in-river fish passage conditions; and (4) fish condition. Project biologists will provide FTOT information upon which to base these decisions.

2. McNary Dam - Loading criteria of 0.5 lbs. fish/gal. of water will be adhered to regardless of collection capabilities. When fish poundage in raceways reaches holding capacity, fish will be bypassed to the tailrace.

3. Lower Granite and Little Goose Dams - Raceway capacity may temporarily exceed 0.5 pounds per gallon at Lower Granite and Little Goose dams when steelhead exceed 80 percent of the total fish collected. Capacity may be increased up to 1.0 pounds per gallon for short durations during high collection days. When yearling chinook comprise more than 20 percent of the daily collection, they shall not be held over 0.5 pounds per gallon.

4. Distribution among Raceways: Collected fish should be spread among raceways to minimize crowding and stress and to reduce the risk of disease transmission. Additional groups should be added to each raceway at the discretion of the project biologist until holding capacity is reached.

5. Holding Time: Maximum holding time in raceways shall not exceed two days except that prior to April 5, fish may be held up to four days at Lower Granite, Little Goose, and McNary Dams if collection estimates are less than 1000 fish per day at each dam.
Holding times will be reviewed and approved by FTOT prior to implementation.

6. Truck and Barge Capacities: Loading criteria are 5 pounds of fish per gpm inflow for barges and 0.5 pounds of fish per gallon of water for trucks. Capacities per vehicle are:

Barge	Capacity (gal)	Inflow (gpm)	Fish Capacity (lbs)
SOCKEYE (2127)	85,000	5,200	26,000

BLUEBACK (2817)	85,000	5,200	26,000
STEELHEAD (4382)	100,000	10,000	50,000
COHO (4394)	100,000	10,000	50,000
CHINOOK (8105)	150,000	15,000	75,000
KING SALMON (8106)	150,000	15,000	75,000
Truck	3,500		1,750

IV. Transport Operations:

A. Operating Dates:

1. Starting Operations - Transport operations will start during the last two weeks of March at Lower Granite and McNary Dams. Start-up at Lower Granite Dam will be triggered by fish counts at the FPC smolt monitoring traps on the Clearwater River above Lewiston, Idaho, and on the Snake River at Clarkston, Washington, in addition to general flow and fish movement information provided by the FPC. Start-up at McNary Dam will be based on general flow and fish movement information provided by FPC from the mid-Columbia smolt monitoring stations. Evaluation of new facilities will begin at Little Goose Dam on about March 1, 1990; transportation will start after April 1.

2. Summer Transport Operations- At McNary Dam, summer operations will begin when subyearling chinook numbers exceed yearling chinook in the daily sample.

3. Ending Operations - Transport operations at Lower Granite Dam will end during the last two weeks of July when fish collection drops below 500 fish per day for five consecutive days, or when water temperatures and fish condition make collection impractical. Transport may be terminated during the first two weeks of July at Little Goose Dam depending on the same fish number and condition criteria applied at Lower Granite Dam.

At McNary Dam, operations may be terminated when fish numbers fall below 1,000 fish per day for five consecutive days. Holding time may be increased up to 4 days upon approval by FTOT.

B. Truck Operations: Five fish transport trucks are available for hauling fish. Normally two of these trucks will be at Lower Granite Dam, one at Little Goose Dam, and two at McNary Dam. Trucks may be redistributed to meet transport demands.

1. Truck Release Sites: The normal spring release site for trucked fish will be at Bradford Island adjacent to Bonneville First Powerhouse. The normal summer release site will be at the Hamilton Island boat ramp below Bonneville Dam on the

Washington shore. Releases may be adjusted from site to site depending on conditions observed by truck drivers and FTOT representatives. Changes will be made upon approval by FTOT.

2. Operation of Truck Life Support Systems: Truck drivers will be trained by project biologists on the operation of truck life support systems, the requirements of fish to be met, and signs of stress for which to watch. Routine checks will be made on support systems and fish condition at check points identified by project biologists. Life support system data and information on fish condition will be entered into the truck driver's logbook at each check point and at the release point. The truck driver's logbook will be reviewed by the project biologist upon the truck driver's return on each trip.

C. Barge Operations: Six fish barges will be available for use in 1990. Combined use of barges will allow from 26,000 to 76,000 pounds (small and medium sized barges operated in tandem) of fish to be transported at one time. It takes approximately 90 hours to make a trip from Lower Granite Dam to the release site near the Skamania light buoy below Bonneville Dam and return. When collection approaches 20,000 fish per day at Lower Granite Dam, barging operations will begin. Direct loading of barges will be accomplished when possible. As fish numbers increase, additional barges will be rotated into the transport schedule as necessary. During all spring operations, barges will take on additional fish at Little Goose and/or McNary Dam as barge capacity allows. When available barge capacity is exceeded, trucks may be used from Little Goose or McNary Dam to supplement barge transport. When combined barge/truck capacity is exceeded, FTOT will decide whether excess fish will be transported at higher densities, held for additional days, or bypassed to the river. During the summer, two barges will be used from McNary Dam. A round trip from McNary Dam to the release point takes less than 48 hours. One barge will leave McNary Dam every two days when fish numbers are low, and every day during higher fish collection days. Summer barge operations will continue while collection at McNary exceeds 20,000 fish per day or trends indicate numbers will exceed the 20,000 trigger number. The number of barges used will be governed by the number of fish collected and towboats may be used on an intermittent basis shifting from one to two barge operations as authorized by CENPW-FTOT.

1. Barge Riders: CENPW barge riders will accompany each barge trip, supervising all loading and release operations, and barge operations enroute. Barge riders will be trained on barge operation, maintenance, and emergency procedures by project biologists and maintenance personnel. Barge riders will also be cross-trained in facility operations, and may rotate with

facility operators as decided by project management. Barge riders shall be responsible for monitoring fish condition, barge equipment operations, and water quality (temperature and dissolved oxygen levels) at regular intervals during downriver trips. Barge riders shall maintain logbooks recording loading activities and times, loading densities by barge compartment, and information on equipment operations. During routine monitoring SOP forms shall be filled out during routine monitoring on which equipment operated, equipment operation readings, fish mortality and water quality. At each subsequent dam where fish are loaded onto the barge, the barge rider shall make appropriate notations in the logbook. The barge rider shall also serve as an inspector for the towboat contract, and record information required by the Contracting Officer's Representative, and shall initial the captain's logbook confirming operational information and lockage times. Any unresolved differences between barge riders and towboat crews shall immediately be reported to the Contracting Officer's Representative.

V. Emergency Notification Procedures:

A. A complete listing of persons to be notified in case of emergencies and their business and home telephone numbers will be provided to each person involved in the transport program. Facility operators, truck drivers, and barge riders will be trained on emergency notification procedures by project biologists and FTOT. In case of emergency, the person involved will immediately notify his supervisor, or the next person up the line until the emergency has been properly reported and corrective action has been initiated. In addition to telephone reporting, barge riders will report emergencies by the towboat radio to the nearest Corps dam. The operator on duty will relay the message to the person or persons identified by the barge rider.

B. Emergency procedures will be followed at any time an emergency occurs, 24 hours per day, seven days per week during the transport season. Emergencies will be reported to FTOT immediately.

VI. State Agency Roles:

A. The fishery agencies and tribes are legally responsible for biological oversight of fish at transportation dams. CENPW funds state fish biologists or culturists at each collector facility by Cooperative Agreements with IDF&G, ODF&W, and WDF. IDF&G personnel work at Lower Granite Dam, ODF&W personnel at Little Goose Dam, and WDF personnel at McNary Dam.

B. Task Orders under the Cooperative Agreements specify

that state agency personnel at collector dams accomplish specific tasks for the project manager including:

1. Supervising or conducting handling, inspection, and recording of data from fish sampled at the collection facility;

2. Evaluating and recording fish condition, and recommending operational changes or inspection of facilities if fish condition indicates a problem exists;

3. Providing hand counts of sampled fish, assisting the project biologist in adjusting electronic fish count, checking hourly and daily fish counts for accuracy, and coordinating facility counts with counts of FPC smolt monitoring teams where appropriate;

4. Conducting quality control inspections of collection facilities and transport equipment including visits to other collection facilities and rides on transport equipment when work schedules can be so arranged;

5. Monitoring the effects of smolt monitoring and research projects on transportation activities and reporting impacts to the project biologist;

6. Participating in gatewell dipping as required to monitor fish condition, and;

7, Preparing text and tabular information for project and FTOT annual reports.

VII. Dissemination of Information:

A. Project biologists at each collector dam will be responsible for entering all pertinent information into the computer database and for transmitting daily reports to the Harris computer in CENPW. Weekday information will be transmitted by noon on the day collected. Weekend information will be transmitted to CENPW on the Monday following the weekend when data collection occurred.

B. CENPW will process the reports and transmit them to the Amdahl computer in CENPD.

C. CENPW will also coordinate daily reporting with the FPC Smolt Monitoring Program for their dissemination of information to user groups. The FPC will provide weekly summary reports of fish collected and transported in conjunction with their reports on Water Budget management, smolt monitoring activities, and hatchery release information.

VIII. Project Requirements for Fishery Agency Activities and Research:

A. Coordination: Agencies and tribes expecting to work at Corps dams will provide early coordination including work proposals, evidence of approval by CBFWA, and project needs and requirements through written correspondence to the Chief, Operations Division, of CENPW (or CENPP for Portland District projects), and shall not start work until written approval has been received;

B. Protocol: To maintain good working relationships and safe working conditions, fishery agencies, tribes, and research organizations will be required to follow courtesy and safety protocols as follows.

1. Check in with the Project Manager upon first arrival at the project to receive information on who will be the project point of contact, and what courtesy and safety requirements must be followed;

2. Notify the point of contact whenever arriving or departing from the project so they will know where personnel will be working and when they will be on the project;

3. Adhere to project clearance, safety, and work procedures, and;

4. Notify the Project Manager or his representative of unscheduled or non-routine work and activities.

APPENDIX I - Sampling Guidelines for Sampler Dams in 1990
APPENDIX II- Guidelines for Increased Fish samples at McNary and Lower Granite Dams in 1990

Reference:

Bell, Milo C. 1981. Recommendations for turbine generation loadings and blade gate relationships of the best survival of juvenile migrants at the eight Columbia Basin dams operated by the Corps of Engineers. Unpublished report prepared under contract to the Corps of Engineers.

APPENDIX 1

GUIDELINES FOR SAMPLER DAMS IN 1990

A. INTRODUCTION

Each year the fishery agencies and tribes are faced with the need to sample significant numbers of smolts at the transport collector dams and other sample points. These samples are used to monitor survival, abundance, and to evaluate bypasses, the transportation program, and other research. Because capability exists to sample an extremely high percentage of the total run at each collection point, it is necessary to set guidelines for sampling at these projects to prevent the sampling program from overly impacting fish survival.

To minimize impacts of research and evaluation work on these runs, no more than 10 percent of the total run should be sampled during the season. Further, since a mix of transportation and in-river passage is being used to reduce mortality, neither segment (transported or bypassed) should be sampled at a rate exceeding 10 percent. (These guidelines presume that only a small percentage of sampled fish die as a result and that most are returned to the river or transported with a relatively good, though reduced, chance of survival).

Based on the presumption that in 1990, sample sites other than projects that collect fish for transport will sample fish at a combined rate of less than 3 percent of the entire run, and that sampling done at sites other than transport dams will not require handling more than three percent of any one population segment, the following specific sampling guidelines are proposed for use at the transport dams:

B. LOWER GRANITE

1. Sampling Objective

   Not to exceed the lesser of 3 percent of the estimated weekly outmigration or 10 percent of the weekly total of smolts collected and/or bypassed.

2. Daily Sampling Rate (as obtained hourly by the sampler).

   The daily sampling rate should remain constant during any given 24 hour (0700 - 0700) sample period to the extent possible. ~~If a sample rate change occurs then fish should be placed into compartments so each group can be counted separately~~. Changes in sample rate should be made as close to the start of a new daily

sample period as feasible. There is a potential problem of edge effect when sample times of short duration are used. To reduce this effect it is recommended that a minimum time of 1 minute per hour, or a 15 second sample every 15 minutes be taken. To allow flexibility in obtaining fish without adding confusion to meeting the sampling objective (above), the daily sampling rate, (0700 to 0700) may not exceed the sampling objective except as follows:

a. For two days during any one week (Sunday to Saturday) the sampling rate may be doubled (the lesser of 6 percent of the outmigration or 20 percent of smolts collected or bypassed), provided that.

b. For each day that the sample rate is raised above the sampling objective, there must be a day within the same week in which the sample rate is lowered an equal or greater amount.

c. A minimal number of fish would be sampled each day at collector projects, regardless of a and b above, to obtain information on species composition, weight and descaling. This information is required for safe and efficient operation of the juvenile fish transportation program.

3. Coordination

All researchers must inform FTOT of their previously approved fish needs prior to March 15. FTOT will coordinate the sampling to maximize efficiency of fish use. Researchers must apprise the Corps biologist of their exact fish needs at the earliest possible date. Requests for in-season deviations from these guidelines must be routed through the FTOT.

C. LITTLE GOOSE

1. Sampling Objective

As required to determine pound counts, species composition, enumeration, quality control, etc. for standard bypass and transport operations. Generally not to exceed 1.5 percent of daily collection and/or bypass.

D. MCNARY

Same as for Lower Granite

APPENDIX 2

GUIDELINES FOR INCREASED FISH SAMPLES AT MCNARY AND LOWER GRANITE DAMS IN 1990

A. INTRODUCTION

In order to evaluate the success of transporting spring chinook smolts to below Bonneville Dam, the fishery agencies and tribes have authorized the Corps to conduct a marking program.[1] However, workers are having difficulty collecting and marking the number of spring chinook required in approved study plans. This is because increasing numbers of marked fish are begin released from upriver sites.

It is questionable whether the required numbers of markable fish for the transport evaluation program and PIT tag study can be obtained using the established sampling guidelines (APPENDIX 1). The fishery agencies and tribes have agreed to waive portions of these guidelines for the purpose of these studies in 1990.

Allowable exceptions to the established guidelines are as follows:

B. LOWER GRANITE

1. Sampling Objectives

a. To safely handle the required numbers of fish to operate the transport program and monitor the smolt migration.

b. To provide previously-approved numbers of markable fish to conduct the transport evaluation and PIT tag study.

2. Daily Sampling Rate

If sampling under established guidelines (APPENDIX 1) is insufficient to meet objective 1b, then the sampling rate may be increased to a level that will provide previously-approved numbers of markable fish as per the

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[1]Marking and release of control fish below Little Goose Dam is contingent upon Snake River flows above 100 KCFS daily Average Flow (DAF). If flows are projected to be below 100 KCFS DAF, marking control fish will not be done because the chance of survival in large enough numbers to be meaningful is low.

study plan. However, this rate may not be increased if it would result in more than 25,000 fish being in the sample tank. At no time shall the total sample held in the tank exceed 2600 pounds at Lower Granite. The above criteria are to be implemented during a 24 hours sample period in which double shifting is occurring for marking transport evaluation fish.

a. If the average daily mortality for yearling chinook in the sample exceeds 2 percent for three consecutive days then the sampling rate will be returned to the previously-established rate (APPENDIX 1). If the mortality is not reduced to 2 percent or less after two consecutive days at the reduced rate, it will be assumed the problem is not with the sample density and the rate can be increased as necessary.

C. LITTLE GOOSE

Follow established guidelines (APPENDIX 1)

D. MCNARY

1. Sampling objective

Same as Lower Granite

Except that during years that high numbers of fish are required for experimental purposes, the sample time will be from noon to noon. This reduces the sample tank holding time by allowing workers to move fish from the sample tank before the next days sample begins.

2. Daily Sampling Rate

If the sample collected under established guidelines (APPENDIX 1) is insufficient to meet objective 1b, then the sampling rate may be increased to a level that will provide previously-approved numbers of markable fish as per the study plan. However the rate may not be increased if it would result in more than 15,000 fish being collected in the sample during the 24 hour sampling period. Changes in the sample rate should be made as close to the start of a new 24 hour sample period as possible. Multiple sample rate changes within a sample period should be avoided.

The following constraints to holding fish in the sample tank apply:

a. If the average daily mortality for yearling chinook in the sample exceeds 2 percent for three consecutive days then the sampling rate will be returned to the previously-established rate (APPENDIX 1). If the mortality is not reduced to 2 percent or less after two consecutive days at the reduced rate, it will be assumed the problem is not with the sample density and the rate can be increased as necessary.

b. If the average daily mortality for juvenile sockeye (in the "A" or "B" tanks) exceeds 3 percent for three consecutive days, the sampling rate will be returned to the previously-established rate (APPENDIX 1). If the mortality is not reduced to 3 percent or less after two consecutive days at the reduced rate, it will be assumed the problem is not with sample density and the rate can be increased as necessary.

APPENDIX 2

FISH HATCHERY RELEASE SCHEDULE

3. Include Migration Year 00 - 00

4. Specific Agency - Hatchery

5. Specific Race and Species

6. Specific River/Rive Zone

7. Specific Release Site

8. Include Non-Hatchery Y

9. Include Below Bonneville N

Cmd-5 Job Jobqueued

FROM 9/01/89 TO 12/31/90

AGCY	HATCHERY	SPECIES AGE & STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
IDFG	MAGIC VALLEY	SU STEELHEAD A	89	4	90	4/09/90 5/01/90	1,200,000	SAWTOOTH	SALMON R	SNAK	90315	45K CWT 10-42-14..16; 42K FB
		SU STEELHEAD B	89	4	90	4/09/90 5/01/90	900,000	E F SALMON R	E F SALMON R	SNAK	90316	90K CWT 10-42-33..38
		SU STEELHEAD B	89	61	90	9/11/90 9/12/90	163,000	SLATE CRK	SALMON R	SNAK	90312	
	*			HATCHERY TOTAL.			2,263,000	FROM 3 RELEASES				*
	MCCALL	SU CHINOOK 1 SOUTH FORK	88	24	90	3/16/90 3/23/90	1,083,000	S F SALMON R	S F SALMON R	SNAK	90309	300K CWT US CANADA 10-30-34,38; 60K FB
	*			HATCHERY TOTAL.			1,083,000	FROM 1 RELEASES				*
	NIAGARA SPRINGS	SU STEELHEAD A	89	4	90	4/09/90 5/01/90	300,000	SALMON R	SALMON R	SNAK	90317	REL NEAR MOUTH OF HAMMER CREEK 45K CWT 10-42-21..23
		SU STEELHEAD A	89	4	90	4/09/90 5/01/90	800,000	HELLS CANYON	SNAKE R	SNAK	90318	
		SU STEELHEAD A	89	4	90	4/09/90 5/01/90	300,000	LITTLE SALMON R	SALMON R	SNAK	90319	REL AT HAZARD CREEK
		SU STEELHEAD A	89	4	90	4/09/90 5/01/90	500,000	PAHSIMEROI R	PAHSIMEROI R	SNAK	90320	45K CWT 10-42-24..26
		SU STEELHEAD A	89	50	90	9/19/90 9/22/90	603,000	SALMON R	SALMON R	SNAK	90311	EXCESS FISH PLANTED INTO TRIBS. OF SALMON R- YANKEE FK, HAZARD CR, FRENCH CR, MOYES CR, SPRING CR, AND INDIAN CR.
	*			HATCHERY TOTAL.			2,503,000	FROM 5 RELEASES				*
	PAHSIMEROI	SU CHINOOK 1 PAHSIMEROI	88	24	90	3/15/90 3/25/90	1,071,200	PAHSIMEROI R	PAHSIMEROI R	SNAK	90310	
	*			HATCHERY TOTAL.			1,071,200	FROM 1 RELEASES				*
	POWELL	SF CHINOOK 1 CLEARWATER	88	35	90	10/16/89 10/18/89	240,500	RED R	S F CLEARWATER	SNAK	90301	
		SF CHINOOK 1 CLEARWATER	88	18	90	10/17/89 10/19/89	314,500	LOCHSA R	CLEARWATER R	SNAK	90302	REL. AT POWELL HATCHERY
	*			HATCHERY TOTAL.			555,000	FROM 2 RELEASES				*

FROM 9/01/89 TO 12/31/90

AGCY HATCHERY	SPECIES AGE & STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
IDFG RAPID RIVER	SP CHINOOK 1 RAPID RIVER	89	24	90	3/12/90 3/22/90	2,500,000	RAPID R	RAPID R	SNAK	90306	300K CWT US CANADA 10-32-13..18; 60K FB 150K UNALLOCATED
	SP CHINOOK 1 RAPID RIVER	88	24	90	3/20/90 3/21/90	550,000	HELLS CANYON	SNAKE R	SNAK	90307	
	SP CHINOOK 1 RAPID RIVER	88	24	90	3/20/90 3/22/90	250,000	LITTLE SALMON R	SALMON R	SNAK	90326	
*			HATCHERY TOTAL.			3,300,000	FROM 3 RELEASES				*
SAWTOOTH	SP CHINOOK 1 SALMON	88	35	90	10/12/89 10/12/89	395,350	SAWTOOTH	SALMON R	SNAK	90303	91.8 CWT 10-32-22,23
	SP CHINOOK 1 SALMON	88	22	90	3/17/90 3/17/90	1,500,000	SAWTOOTH	SALMON R	SNAK	90308	300K CWT US CANADA 10-32-20,21,24 10-40-8; 60K FB
	SP CHINOOK 1	88	22	90	3/19/90 3/20/90	200,000	YANKEE FORK	SALMON R	SNAK	90314	
	SP CHINOOK 1	88	22	90	3/21/90 3/23/90	517,000	E F SALMON R	E F SALMON R	SNAK	90313	100K CWT 10-32-11,12
*			HATCHERY TOTAL.			2,612,350	FROM 4 RELEASES				*
**			AGENCY TOTAL...			13,387,550	FROM 19 RELEASES				**

FROM 9/01/89 TO 12/31/90

AGCY	HATCHERY	SPECIES / AGE & STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
NMFS	MONTLAKE	SOCKEYE WENATCHEE	88	80	90	12/13/89 12/13/89	3,021	CLE ELEM R.	YAKIMA R	MCOL	90509	REL ABOUT 5 MI BELOW CLE ELUM LAKE 100% CWT 23-29-35
		HATCHERY TOTAL.					3,021	FROM 1 RELEASES				
	Montlake	SOCKEYE WENATCHEE	88	25	90	11/01/89 11/30/90	25,987	CLE ELEM LAKE	YAKIMA R	MCOL	90505	OUTMIGRATION FROM LAKE CLE ELUM DEPENDENT UPON WATER REACHING THE SPILLWAY (ELEV. 2223)
	Montlake ←	SOCKEYE WENATCHEE	88	25	90	11/20/89 6/01/90	12,069	CLE ELEM R.	YAKIMA R	MCOL	90508	
	Montlake ←	SOCKEYE WENATCHEE	88	25	90	3/15/90 3/15/90	25,422	CLE ELEM LAKE	YAKIMA R	MCOL	90506	OUTMIGRATION FROM LAKE CLE ELUM DEPENDENT UPON WATER REACHING THE SPILLWAY (ELEV 2223)
		SF CHINOOK 1	89	15	90	4/03/90 5/20/90	100,000	BELOW LGS DAM	SNAKE R	SNAK	90501	100% CWT 23-24-(19-20); 100% FR
		SU STEELHEAD	89	5	90	4/10/90 5/25/90	42,000	BELOW LGS DAM	SNAKE R	SNAK	90502	100% CWT 23-24-(39-44); 100% FR
	Montlake ←	SOCKEYE WENATCHEE	88	25	90	5/01/90 5/01/90	25,500	CLE ELEM LAKE	YAKIMA R	MCOL	90507	OUTMIGRATION FROM LAKE CLE ELUM DEPENDENT UPON WATER REACHING THE SPILLWAY (ELEV 2223)
		HATCHERY TOTAL.					230,978	FROM 6 RELEASES				
		AGENCY TOTAL...					233,999	FROM 7 RELEASES				

put sockeye together under Montlake or Hatchery

NMFS = Agency

FROM 9/01/89 TO 12/31/90

AGCY	HATCHERY	SPECIES / AGE & STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
DFW	BIG CANYON	SP CHINOOK 1 RAPID RIVER	88	20	90	4/01/90 4/07/90	90,000	BIG CANYON CR	WALLOWA R	SNAK	90124	ACCLIM
		SU STEELHEAD WALLOWA	89	5	90	4/23/90 4/30/90	275,000	BIG CANYON CR	WALLOWA R	SNAK	90116	
*				HATCHERY TOTAL.			365,000	FROM 2 RELEASES				*
	BONNEVILLE	SP CHINOOK 1 CARSON	88	12	90	10/13/89 10/13/89	82,098	MEACHAM CR	UMATILLA R	LCOL	90102	75K CWT 07-50-63; 07-51-01,02 REL NEAR BONIFER
		SP CHINOOK 1 CARSON	88	11	90	10/18/89 10/18/89	75,733	MINTHORN POND	UMATILLA R	LCOL	90104	75K CWT 07-47-53,54,57
		SP CHINOOK 1	88	9	90	3/12/90 3/16/90	150,000	HOOD R	HOOD R	LCOL	90132	
		FA CHINOOK 1 BONNEVILLE URB	88	7	90	3/26/90 3/30/90	200,000	UMATILLA R	UMATILLA R	LCOL	90100	TRIBAL RELEASE
		SP CHINOOK 1 CARSON	88	9	90	4/13/90 4/16/90	100,000	MEACHAM CR	UMATILLA R	LCOL	90103	
*				HATCHERY TOTAL.			607,831	FROM 5 RELEASES				*
	CASCADE	COHO TANNER CR	88	15	90	3/07/90 3/30/90	700,000	YAKIMA R	YAKIMA R	MCOL	90114	75K CWT; DIRECT STREAM PLANTS
		COHO TANNER CR	88	15	90	3/23/90 3/27/90	775,000	UMATILLA R	UMATILLA R	LCOL	90106	
*				HATCHERY TOTAL.			1,475,000	FROM 2 RELEASES				*
	IMNAHA	SP CHINOOK 1 IMNAHA	88	18	90	4/01/90 4/07/90	250,000	IMNAHA R	IMNAHA R	SNAK	90129	ACCLIM
*				HATCHERY TOTAL.			250,000	FROM 1 RELEASES				*
	IRRIGON	SU STEELHEAD WALLOWA	89	5	90	4/16/90 4/22/90	200,000	GRANDE RONDE R	GRANDE RONDE R	SNAK	90119	
		SU STEELHEAD WALLOWA	89	5	90	4/23/90 4/30/90	112,500	WALLOWA R	WALLOWA R	SNAK	90117	
		SU STEELHEAD WALLOWA	89	5	90	4/23/90 4/30/90	50,000	SPRING CR CHNL	WALLOWA R	SNAK	90118	NON-ACCLIM GROUP

FROM 9/01/89 TO 12/31/90

AGCY	HATCHERY	SPECIES AGE & STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
ODFW	IRRIGON	SU STEELHEAD IMNAHA	89	5	90	4/23/90 4/30/90	250,000	LT SHEEP CR	IMNAHA R	SNAK	90121	
		SU STEELHEAD IMNAHA	89	5	90	4/23/90 4/30/90	80,000	IMNAHA R	IMNAHA R	SNAK	90122	
		SU STEELHEAD WALLOWA	89	5	90	4/25/90 4/25/90	100,000	WILDCAT CR	GRANDE RONDE R	SNAK	90120	FB
		FA CHINOOK 0 BONNEVILLE URB	89	90	90	5/07/90 5/18/90	3,000,000	UMATILLA R	UMATILLA R	LCOL	90101	200K CWT
*				HATCHERY TOTAL.			3,792,500	FROM 7 RELEASES				*
	LOOKINGGLASS	SP CHINOOK 1 RAPID R	88	20	90	4/01/90 4/07/90	620,000	LOOKINGGLASS CR	GRANDE RONDE R	SNAK	90123	
		SP CHINOOK 1 RAPID R	88	20	90	4/01/90 4/07/90	30,000	HURRICANE CR	WALLOWA R	SNAK	90125	
		SP CHINOOK 1 RAPID R	88	20	90	4/01/90 4/07/90	30,000	WALLOWA R	WALLOWA R	SNAK	90126	
		SP CHINOOK 1 RAPID R	88	20	90	4/01/90 4/07/90	80,000	GRANDE RONDE R	GRANDE RONDE R	SNAK	90127	PLANTED IN UPPER GRANDE RONDE
		SP CHINOOK 1 RAPID R	88	20	90	4/01/90 4/07/90	70,000	CATHERINE CR	GRANDE RONDE R	SNAK	90128	
		SP CHINOOK 1 IMNAHA	88	18	90	4/01/90 4/07/90	120,000	IMNAHA R	IMNAHA R	SNAK	90130	
		SP CHINOOK 1 IMNAHA	88	18	90	4/01/90 4/07/90	80,000	BIG SHEEP CR	IMNAHA R	SNAK	90131	
*				HATCHERY TOTAL.			1,030,000	FROM 7 RELEASES				*
	ROUND BUTTE	SP CHINOOK 1 DESCHUTES	88	9	90	4/12/90 4/17/90	210,000	DESCHUTES R	DESCHUTES R	LCOL	90153	67K CWT; LADDER EVALUATION
		SP CHINOOK 1 DESCHUTES	88	6	90	4/12/90 4/17/90	60,000	DESCHUTES R	DESCHUTES R	LCOL	90154	35K CWT; DIRECT RELEASE GROUP
		SU STEELHEAD	89	5	90	4/12/90 4/17/90	162,000	DESCHUTES R	DESCHUTES R	LCOL	90155	155K AD,LM CLIP
*				HATCHERY TOTAL.			432,000	FROM 3 RELEASES				*

FROM 9/01/89 TO 12/31/90

AGCY HATCHERY	SPECIES AGE & STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
ODFW WALLOWA	SU STEELHEAD WALLOWA	89	5	90	4/23/90 4/30/90	500,000	WALLOWA R	WALLOWA R	SNAK	90115	ACCLIM
*					HATCHERY TOTAL.	500,000	FROM	1 RELEASES			*
**					AGENCY TOTAL...	8,452,331	FROM	28 RELEASES			**

FROM 9/01/89 TO 12/31/90

AGCY	HATCHERY	SPECIES / AGE & STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FFC LOT ID	COMMENTS
UMTR	BONIFER	SP CHINOOK 1 CARSON	88	9	90	3/26/90 3/30/90	80,000	BONIFER	UMATILLA R	LCOL	90602	75K CWT
		SU STEELHEAD UMATILLA	89	7	90	5/14/90 5/18/90	30,000	BONIFER POND	UMATILLA R	LCOL	90607	
		SP CHINOOK 0 CARSON	89	11	91	10/15/90 10/19/90	75,000	BONIFER POND	UMATILLA R	LCOL	90603	75K CWT
*						HATCHERY TOTAL.	185,000	FROM 3 RELEASES				*
	MINTHORN	COHO TANNER CR	88	15	90	3/23/90 3/27/90	75,000	MINTHORN POND	UMATILLA R	LCOL	90604	25K CWT; REL IN UPPER RACEWAY
		COHO TANNER CR	88	15	90	3/23/90 3/27/90	75,000	MINTHORN POND	UMATILLA R	LCOL	90605	25K CWT VOLITIONAL RELEASE; LOWER RACEWAYS
		COHO TANNER CR	88	15	90	3/23/90 3/27/90	75,000	MINTHORN POND	UMATILLA R	LCOL	90606	25K CWT, REL NEAR MINTHORN
		SU STEELHEAD UMATILLA	89	7	90	5/14/90 5/18/90	30,000	MINTHORN POND	UMATILLA R	LCOL	90107	100% CWT
*						HATCHERY TOTAL.	255,000	FROM 4 RELEASES				*
**						AGENCY TOTAL...	440,000	FROM 7 RELEASES				**

FROM 9/01/89 TO 12/31/90

AGCY	HATCHERY	SPECIES AGE & STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOI ID	COMMENTS
USFW	CARSON	SP CHINOOK 1 CARSON	88	18	90	4/20/90 4/27/90	2,100,000	CARSON	WIND R	LCOL	90201	100K REL 4/27/90
*				HATCHERY TOTAL.			2,100,000	FROM 1 RELEASES				*
	DWORSHAK	SP CHINOOK 1 CLEARWATER	88	20	90	3/26/90 3/30/90	300,000	CROOKED R	S F CLEARWATER	SNAK	90237	
		SP CHINOOK 1 CLEARWATER	88	20	90	3/26/90 3/30/90	350,000	LOCHSA R	CLEARWATER R	SNAK	90238	PLANTED AT POWELL SITE
		SP CHINOOK 1 CLEARWATER	88	20	90	4/10/90 4/10/90	1,200,000	DWORSHAK	N F CLEARWATER	SNAK	90203	480K CWT 5-21-62,63; 5-22-5,60..63; 5-23-5,6; 23-29-30,31 60K FB
		SU STEELHEAD B	89	6	90	4/23/90 4/30/90	350,000	KOOSKIA	N F CLEARWATER	SNAK	90231	
		SU STEELHEAD B	89	6	90	4/23/90 4/30/90	200,000	NEWSOME CK	S F CLEARWATER	SNAK	90232	
		SU STEELHEAD B	89	6	90	4/23/90 4/30/90	200,000	CROOKED R	S F CLEARWATER	SNAK	90233	
		SU STEELHEAD B	89	6	90	4/23/90 4/30/90	200,000	AMERICAN R	S F CLEARWATER	SNAK	90234	
		SU STEELHEAD B	89	6	90	4/23/90 4/30/90	250,000	MILL CR BRIDGE	S F CLEARWATER	SNAK	90235	
		SU STEELHEAD B	89	6	90	4/23/90 4/30/90	200,000	ELDORADO CRK	CLEARWATER R	SNAK	90236	
		SU STEELHEAD B	89	5	90	4/30/90 5/04/90	1,100,000	DWORSHAK	N F CLEARWATER	SNAK	90204	120K CWT 5-20-44..49; 60K FB
*				HATCHERY TOTAL.			4,350,000	FROM 10 RELEASES				*
	ENTIAT	SP CHINOOK 1	88	18	90	4/19/90 4/19/90	695,000	ENTIAT R	ENTIAT R	MCOL	90205	
*				HATCHERY TOTAL.			695,000	FROM 1 RELEASES				*
	HAGERMAN	SU STEELHEAD A	89	4	90	4/10/90 5/03/90	300,000	SAWTOOTH	SALMON R	SNAK	90206	45K CWT 10-42-14..16

FROM 9/01/89 TO 12/31/90

AGCY	HATCHERY	SPECIES & STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
USFW	HAGERMAN	SU STEELHEAD B	87	5	90	4/10/90 5/03/90	200,000	HAZARD CR	LITTLE SALMON R	SNAK	90207	45K CWT 10-42-30..32 REL NEAR MOUTH OF HAZARD CREEK
		SU STEELHEAD B CLEARWATER	88	4	90	4/10/90 5/03/90	200,000	SHOUP BRIDGE	SALMON R	SNAK	90240	
		SU STEELHEAD B CLEARWATER	88	4	90	4/10/90 5/03/90	200,000	SALMON R	SALMON R	SNAK	90241	REL AT CHALLIS
		SU STEELHEAD A	89	4	90	4/10/90 5/03/90	200,000	N F TRAP	SALMON R	SNAK	90321	
		SU STEELHEAD A	89	4	90	4/10/90 5/03/90	100,000	LITTLE SALMON R	SALMON R	SNAK	90322	45K CWT 10-42-27..29
		SU STEELHEAD B	89	5	90	4/10/90 5/03/90	300,000	SLATE CR	SALMON R	SNAK	90323	REL AT MOUTH OF SLATE CR
*					HATCHERY TOTAL.		1,500,000	FROM 7 RELEASES				*
	KOOSKIA	SP CHINOOK 1 CLEARWATER	88	20	90	3/29/90 4/03/90	400,000	KOOSKIA	N F CLEARWATER	SNAK	90208	
		SP CHINOOK 1 CLEARWATER	88	20	90	3/29/90 4/03/90	250,000	ELDORADO CR	CLEARWATER R	SNAK	90239	
*					HATCHERY TOTAL.		650,000	FROM 2 RELEASES				*
	LEAVENWORTH	SU STEELHEAD LEAVENWORTH	88	7	90	4/12/90 4/12/90	100,000	LEAVENWORTH	WENATCHEE R	MCOL	90210	
		SP CHINOOK 1 LEAVENWORTH	88	18	90	4/18/90 4/18/90	2,300,000	LEAVENWORTH	WENATCHEE R	MCOL	90325	51K FR
		SP CHINOOK 0 LEAVENWORTH	89	40	90	5/03/90 5/03/90	125,000	LEAVENWORTH	WENATCHEE R	MCOL	90324	REARED AT WELLS H UNTIL JUST PRIOR TO RELEASE
*					HATCHERY TOTAL.		2,525,000	FROM 3 RELEASES				*
	LWHITE SALMON	SP CHINOOK 1 L W SALMON	88	15	90	4/13/90 4/13/90	500,000	LWHITE SALMON	LWHITE SALMON R	LCOL	90213	
		FA CHINOOK 0 BONN. URB	89	100	90	5/03/90 5/10/90	2,000,000	YAKIMA R	YAKIMA R	MCOL	90211	

FROM 9/01/89 TO 12/31/90

AGCY	HATCHERY	SPECIES / AGE & STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOI ID	COMMENTS
USFW	LWHITE SALMON	FA CHINOOK 0 BONN. URD	89	55	90	6/07/90 6/07/90	500,000	LWHITE SALMON	LWHITE SALMON R	LCOL	90212	
		SP CHINOOK 0 L W SALMON	89	45	90	6/07/90 6/07/90	1,000,000	LWHITE SALMON	LWHITE SALMON R	LCOL	90214	
	*				HATCHERY TOTAL.		4,000,000	FROM 4 RELEASES				*
	SPRING CRK	FA CHINOOK 0 SPRING CREEK	89	90	90	3/15/90 3/15/90	3,000,000	SPRING CRK	LOWER COLUMBIA	LCOL	90215	
		FA CHINOOK 0 SPRING CREEK	89	65	90	4/19/90 4/19/90	4,000,000	SPRING CRK	LOWER COLUMBIA	LCOL	90216	
		FA CHINOOK 0 SPRING CREEK	89	35	90	5/24/90 5/24/90	3,300,000	SPRING CRK	LOWER COLUMBIA	LCOL	90217	
	*				HATCHERY TOTAL.		10,300,000	FROM 3 RELEASES				*
	WILLARD	COHO 1 WILLARD	88	24	90	4/16/90 4/16/90	2,900,000	WILLARD	LWHITE SALMON R	LCOL	90218	
	*				HATCHERY TOTAL.		2,900,000	FROM 1 RELEASES				*
	WINTHROP	SP CHINOOK 1 WINTHROP	88	18	90	4/17/90 4/17/90	1,100,000	WINTHROP	METHOW R	MCOL	90219	
	*				HATCHERY TOTAL.		1,100,000	FROM 1 RELEASES				*
	WARM SPRINGS	SP CHINOOK 1 WARM SPRINGS	88	9	90	9/27/89 9/27/89	162,978	WARM SPRINGS R	WARM SPRINGS R	LCOL	90242	80% CWT 05-20-26..31,61..63; 05-21-05,40,41; 05-40-20,21
		SP CHINOOK 1 WARM SPRINGS	88	13	90	4/05/90 4/05/90	562,500	WARM SPRINGS	WARM SPRINGS R	LCOL	90220	
		SP CHINOOK 0 WARM SPRINGS	89	10	90	10/04/90 10/04/90	232,000	WARM SPRINGS	WARM SPRINGS R	LCOL	90221	
	*				HATCHERY TOTAL.		957,478	FROM 3 RELEASES				*
**					AGENCY TOTAL...		31,077,478	FROM 36 RELEASES				**

FROM 9/01/89 TO 12/31/90

AGCY	HATCHERY	SPECIES AGE & STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
WDF	KLICKITAT	SP CHINOOK 0 KLICKITAT	88	27	90	10/03/89 10/03/89	29,500	UPPER KLICKITAT	KLICKITAT R	LCOL	90013	
		SP CHINOOK 1 KLICKITAT	88	9	90	4/15/90 5/01/90	800,000	KLICKITAT R	KLICKITAT R	LCOL	90035	
		COHO TYPE-N	88	20	90	4/15/90 6/30/90	1,350,000	KLICKITAT R	KLICKITAT R	LCOL	90038	VOLITIONAL RELEASE
		FA CHINOOK 1 PRIEST RAPIDS	89	80	90	6/01/90 6/30/90	4,000,000	KLICKITAT R	KLICKITAT R	LCOL	90037	
		SP CHINOOK 1 KLICKITAT	89	50	90	6/15/90 6/15/90	200,000	UPPER KLICKITAT	KLICKITAT R	LCOL	90036	
	*				HATCHERY TOTAL.		6,379,500	FROM 5 RELEASES				*
	LYONS FERRY	FA CHINOOK 1 SNAKE R	88	8	90	4/16/90 4/16/90	400,000	LYONS FERRY	SNAKE R	SNAK	90049	
		FA CHINOOK 0 SNAKE R	89	100	90	6/11/90 6/15/90	1,400,000	LYONS FERRY	SNAKE R	SNAK	90014	
	*				HATCHERY TOTAL.		1,800,000	FROM 2 RELEASES				*
	PRIEST RAPIDS	FA CHINOOK 0 PRIEST RAPIDS	89	40	90	6/01/90 6/30/90	5,000,000	BELOW PRD DAM	MID COLUMBIA R	MCOL	90041	
	*				HATCHERY TOTAL.		5,000,000	FROM 1 RELEASES				*
	RINGOLD	SP CHINOOK 1 KLICKITAT	88	10	90	~~3/26/90~~ 4/02 ~~4/06/90~~ 4/07	1,000,000	RINGOLD	MID COLUMBIA R	MCOL	90040	
	*				HATCHERY TOTAL.		1,000,000	FROM 1 RELEASES				*
	ROCKY REACH	FA CHINOOK 0	89	400	90	3/21/90 3/22/90	680,000	ABOVE RIS	MID COLUMBIA R	MCOL	90048	
		FA CHINOOK 1 PRIEST RAPIDS	88	8	90	4/23/90 4/27/90	220,000	ABOVE RRH DAM	MID COLUMBIA R	MCOL	90042	
		COHO TYPE-S	88	20	90	5/01/90 5/30/90	460,000	ABOVE RRH DAM	MID COLUMBIA R	MCOL	90043	
	*				HATCHERY TOTAL.		1,360,000	FROM 3 RELEASES				*

FROM 9/01/89 TO 12/31/90

AGCY	HATCHERY	SPECIES / AGE & STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOT ID	COMMENTS
WDF	TUCANNON	SP CHINOOK 1 TUCANNON	88	15	90	4/01/90 4/30/90	132,000	TUCANNON R	TUCANNON R	SNAK	90039	
	*					HATCHERY TOTAL.	132,000	FROM 1 RELEASES				*
	WASHOUGAL	COHO TYPE-N	88	20	90	4/01/90 4/30/90	2,500,000	KLICKITAT R	KLICKITAT R	LCOL	90032	
	*					HATCHERY TOTAL.	2,500,000	FROM 1 RELEASES				*
	WELLS	SU CHINOOK 1 WELLS	88	8	90	4/23/90 4/27/90	250,000	BELOW WELLS DAM	MID COLUMBIA R	MCOL	90044	
		SU CHINOOK 1 WELLS	89	90	90	5/01/90 5/15/90	400,000	METHOW R	METHOW R	MCOL	90045	
		SU CHINOOK 1 WELLS	89	60	90	5/25/90 6/10/90	1,240,000	BELOW WELLS DAM	MID COLUMBIA R	MCOL	90046	
		SU CHINOOK 1 WELLS	89	20	90	7/01/90 7/15/90	200,000	BELOW WELLS DAM	MID COLUMBIA R	MCOL	90047	
	*					HATCHERY TOTAL.	2,090,000	FROM 4 RELEASES				*
**						AGENCY TOTAL...	20,261,500	FROM 18 RELEASES				**

FROM 9/01/89 TO 12/31/90

AGCY	HATCHERY	SPECIES AGE & STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FFC LOI ID	COMMENTS
WDW	CHELAN	SU STEELHEAD WELLS	89	5	90	4/20/90 4/20/90	40,000	ENTIAT	ENTIAT R	MCOL	90405	
		SU STEELHEAD WELLS	89	5	90	4/29/90 4/29/90	160,000	WENATCHEE R	WENATCHEE R	MCOL	90406	
	*			HATCHERY TOTAL.			200,000	FROM 2 RELEASES				*
	EAST BANK	SU STEELHEAD RINGOLD	89	5	90	4/29/90 4/29/90	180,000	WENATCHEE R	WENATCHEE R	MCOL	90407	
	*			HATCHERY TOTAL.			180,000	FROM 1 RELEASES				*
	LYONS FERRY	SU STEELHEAD PAHSIMEROI	89	5	90	4/20/90 4/30/90	120,000	TUCANNON R	TUCANNON R	SNAK	90413	40K CWT 63-08-38,41-R3 REL AT MARENGO 40K CWT 63-39-11,12 REL AT CURL LAKE
		SU STEELHEAD PAHSIMEROI	89	5	90	4/20/90 4/30/90	100,000	LYONS FERRY	SNAKE R	SNAK	90414	40K CWT 63-08-21,42-R3
		SU STEELHEAD WELLS	89	5	90	4/20/90 4/20/90	100,000	WALLA WALLA R	WALLA WALLA R	MCOL	90416	40K CWT 63-39-7,8
		SU STEELHEAD WELLS	89	5	90	4/26/90 4/26/90	140,000	WALLA WALLA R	WALLA WALLA R	MCOL	90415	40K CWT 63-39-9,10
		SU STEELHEAD WELLS	89	5	90	4/26/90 4/26/90	20,000	MILL CR	WALLA WALLA R	MCOL	90457	
		SU STEELHEAD PAHSIMEROI	89	5	90	4/30/90 4/30/90	120,000	ASOTIN CR	SNAKE R	SNAK	90412	40K CWT 63-07-25-R3, 63-14-22R3
	*			HATCHERY TOTAL.			600,000	FROM 6 RELEASES				*
	NACHES	SU STEELHEAD YAKIMA	89	5	90	4/10/90 4/10/90	50,000	NACHES R	NACHES R	MCOL	90409	
	*			HATCHERY TOTAL.			50,000	FROM 1 RELEASES				*
	RINGOLD	SU STEELHEAD RINGOLD	89	5	90	4/29/90 4/29/90	100,000	RINGOLD	MID COLUMBIA R	MCOL	90410	
	*			HATCHERY TOTAL.			100,000	FROM 1 RELEASES				*
	SKAMANIA	SU STEELHEAD SKAMANIA	89	5	90	4/20/90 4/20/90	60,000	KLICKITAT R	KLICKITAT R	LCOL	90418	

FROM 9/01/89 TO 12/31/90

AGCY	HATCHERY	SPECIES AGE & STOCK	BRD YR	SIZE #/lb	MGR YR	RELEASE DATES	NUMBER RELEASED	RELEASE SITE	RIVER NAME	ZONE	FPC LOI ID	COMMENTS
WDW	SKAMANIA	WI STEELHEAD SKAMANIA	89	5	90	4/20/90 4/20/90	10,000	WHITE SALMON R	WHITE SALMON R	LCOL	90432	
		SU STEELHEAD SKAMANIA	89	5	90	4/25/90 4/25/90	5,000	WHITE SALMON R	WHITE SALMON R	LCOL	90419	
		CUTTHROAT	89	4	90	5/01/90 5/01/90	5,000	ROCK CREEK	LOWER COLUMBIA	LCOL	90446	
	*			HATCHERY TOTAL.			80,000	FROM 4 RELEASES				*
	VANCOUVER	SU STEELHEAD SKAMANIA	89	5	90	4/20/90 4/20/90	45,000	KLICKITAT R	KLICKITAT R	LCOL	90417	
		SU STEELHEAD SKAMANIA	89	5	90	4/20/90 4/20/90	40,000	WIND R	WIND R	LCOL	90420	
	*			HATCHERY TOTAL.			85,000	FROM 2 RELEASES				*
	WELLS	SU STEELHEAD WELLS	89	5	90	4/21/90 5/09/90	110,000	OKANOGAN R	OKANOGAN R	MCOL	90401	
		SU STEELHEAD WELLS	89	5	90	4/21/90 5/11/90	80,000	SIMILKAMEEN R	OKANOGAN R	MCOL	90402	40K CWT
		SU STEELHEAD WELLS	89	5	90	4/21/90 5/11/90	420,000	METHOW R	METHOW R	MCOL	90403	30K CWT
	*			HATCHERY TOTAL.			610,000	FROM 3 RELEASES				*
	YAKIMA	SU STEELHEAD YAKIMA	89	5	90	4/15/90 4/15/90	40,000	YAKIMA R	YAKIMA R	MCOL	90408	
	*			HATCHERY TOTAL.			40,000	FROM 1 RELEASES				*
**				AGENCY TOTAL...			1,245,000	FROM 21 RELEASES				**
****				TOTAL RELEASE..			75,797,858	FROM 136 RELEASES				****

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* L A S T P A G E *
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APPENDIX 3

DISSOLVED GAS MONITORING PROGRAM

PLAN OF ACTION FOR 1990

The Plan of Action for the 1990 operations consists of six phases:

(1) Program start-up;
(2) Instrument Installation;
(3) In-season Monitoring;
(4) Instrument Removal and Storage;
(5) Data Compilation, Analysis and Storage; and
(6) Program Evaluation and Report.

Phase 1: Program Start-Up

Responsible parties (See Table 1) will be contacted during the December 1989-January 1990 to ensure a good and mutual understanding of the objectives of the monitoring program, including data to be collected, instrument location, procedures to be used, etc.

Negotiations for equipment service and maintenance contracts for Corps instruments will be finalized by 1 February 1990. COMMON SENSING is likely to be retained as "sole source provider" in the absence of other alternate sources. A multiple year (3 years) continuous and year-round contract will be written to save on costs and paper work, as well as to provide minimal winter-time maintenance.

Current MOU's with BPA regarding the continued use of the two BPA tensionometers on loan to the Corps will be updated as needed.

Phase 2: Instrument Installation

The list of the instruments to be installed and their assigned locations is given in Table 2. This calls for the same instrument deployment as in 1989.

The instruments are scheduled for installation and interface with SUTRON DCP's by 15 April 1990 at the latest at all Corps stations. The WQ staff hydrologist, together with COMMON SENSING and SUTRON representatives will jointly perform the installation, calibration and testing of all equipment at those stations. Selected project personnel may be requested to assist as needed. Project staff familiarization with the Program details will be carried out at each project during the instrument installation trips. Each project will be instructed on how to dry the probe once a week at its monitoring station. An instruction packet will be provided by NPD, along with pictures and description of the procedure to be followed.

Phase 3: In-season Monitoring

Actual data collection and transmission activities will start on or before 15 April and continue until Labor Day. Exact starting dates will be coordinated with the Reservoir Control Center, project biologists and cooperating agencies.

The following data will be collected approximately every four hours :

- Water Temperature (WC), ^{o}C
- Barometric Pressure (BH), mm of Hg
- TDG Pressure (NT), mm of Hg
- Dissolved Oxygen Pressure (OP), mm of Hg
- Nitrogen + Argon Pressure (NP), mm of Hg.

A 2-channel station will monitor WC and NT; a 3-channel: WC, BH and NT; a 4-channel: WC, NT, OP, and NP; and a 5-channel: all five parameters. The minimum required are WC, BH and NT.

The PUD's may continue to use 1989 CBT Coding sheets (or equivalents). Data transmission via CBT teletype will be done twice a day between 0915 to 1100 hours and 2115 to 2300 hours. The Corps' WQ Group will provide all necessary assistance, if needed. The same CBT coding sheets, once filled out, will be sent to WQ every three weeks for data reconciliation.

All Corps, USBR and PUD tensionometers interfaced with a SUTRON DCP will be powered by a 110V, AC line with internal battery back-up. Data collected by these instruments will be transmitted automatically every four hours, via the GOES Satellite, to the Corps' ground-receive station in Portland. After decoding, these data will be automatically transmitted to the AMDAHL computer for storage in the CROHMS data base.

In-season instrument and operational problems should be reported to WQ, who will then arrange for the necessary repairs to be made as expeditiously as possible.

Daily reports summarizing TDG saturation levels at all monitoring stations will be prepared and disseminated by WQ each day by 1330 hours. Reports 101, 102 and 103 will contain the following information (See Figure 1):

- Station Identifier
- Date and Time of the Tensionometer Probe Readings
- Water Temperature, ^{o}C
- Barometric Pressure, mm of Hg
- TDG Pressure, mm of Hg
- Calculated TDG Saturation Percent (%)
- Project Hourly Spill, KCFS (QS)
- Project Total Hourly Outflow, KCFS (QR)
- Number of Spillway Gates Open

The same information, except the calculated TDG saturation, will also be available for viewing by those who have access to CROHMS. Reconciliation between data received via the CBT and those manually recorded on the coding sheets will be made by WQ before the data are permanently stored in the WQ Data Base.

Efforts will be expanded to determine the contribution of each dam to the total accumulative dissolved gas saturation during the monitoring season. A ride on a fish transportation barge or a special Corps' boat will be arranged to make in-situ measurements along a selected reach of the Columbia River where heavy spill is scheduled to occur.

Phase 4: Instrument Removal and Storage

Shortly after the end of the monitoring season the tensionometers will be removed from the various projects by WQ personnel. The 110-AC power line will be disconnected; the DCP interface cable wrapped with a plastic cover to protect against moisture; and the instruments packed and returned for regular maintenance and service by the service and maintenance contractor. These instruments will be ultimately stored at the Division office until the beginning of the next monitoring season.

Phase 5: Data Compilation, Analysis and Storage

Time and manpower permitting, statistical analyses will be conducted to develop trends and relationships between spill and TDG saturation. Efforts will continue in the model calibration and application of GASSPIL (dissolved Gas) and COLTEMP (Water temperature) models.

Phase 6: Program Evaluation and Summary Report

An office report will be prepared to summarize the highlights of the 1990 TDG monitoring program. It will include a general program evaluation of the adequacy and timeliness of the information received from the field, and how that information is used to help control TDG supersaturation and high water temperature throughout the Basin.

TABLE 1
List of Contact Persons

Projects	Names	Position	Phone Numbers
Int'l Boundary	Dan Lute	Hydrologist (USBR)	(208) 334-1970
Grand Coulee	Dan Lute	Hydrologist (USBR)	(208) 334-1970
Chief Joseph	Joe Munk	Ch. of Operations	(509) 686-5501
Wells	Mike Erho	Biologist (Douglas)	(509) 884-7191
Rocky Reach	Steve Hays	Biologist (Chelan)	(509) 663-8121
Rock Island	Steve Hays	Biologist (Chelan)	(509) 663-8121
Priest Rapids	Mike Dell	Biologist (Grant)	(509) 754-3541
Lower Granite	Jesse Smiley	Ch. of Operations	(509) 843-1493
Little Goose	Ray Eaking	Ch. Of Operations	(509) 399-2233
Lo.Monumental	Sarah Wik	Biologist (CENPW)	(509) 522-6629
Ice Harbor	Sarah Wik	Biologist (CENPW)	(509) 522-6629
McNary	Brad Eby	Reservoir Mgmt	(503) 922-3211
John Day	Gary Dunning	Power Proj.Supt.	(503) 739-2227
The Dalles	Larry Kerr	Power Proj.Supt.	(503) 296-1181
Bonneville	Phil Jordan	Ch. of Operations	(503) 374-8442

Preist Rapids monitoring station - D/S station before confluence of Snake River.

TABLE 2
1990 Dissolved Gas Monitoring Network

Sta.ID	Location	Owner	Model of Tensionometer	Channels No.
CIBW	Boundary	USBR	TGO-FT	4-auto
GCGW	D/s GCL	USBR	TGO-FT	4-auto
CHJ	Forebay	NPD/BPA	TBO-FTR-002	5-auto
WEL	Forebay	Douglas PUD	FT	2-ch.
RRH	Forebay	Chelan PUD	FT	2-ch.
RIS	Forebay	Chelan PUD	FT	2-ch.
PRD	Forebay	Grant PUD	TBO-FTR	4-auto
LWG	Forebay	NPD	TGO-FTR-011 *	5-auto
LGS	Forebay	NPD	TGT-FR- 003 *	3-auto
LMN	Forebay	NPW	TGO-FTR-007 *	5-auto
IHR	Forebay	NPW	TGO-FTR-008 *	5-auto
MCQW	Forebay-WA	NPD/BPA	TBO-FTR-005 *	5-auto
MCQO	Forebay-OR	NPD/BPA	TBO-FTR-006 *	5-auto
JDA	Forebay	NPD	TGO-FTR-009 *	5-auto
TDA	Forebay	NPD	TB-F- 001 *	3-auto
BON	Forebay	NPD	TB-F- 002 *	3-auto
WRNO	Warrendale	NPD	TBO-FTR-001 *	5-auto

Notes :
USBR - U.S. Bureau of Reclamation
NPD - North Pacific Division
NPW - Walla Walla District
BPA - Bonneville Power Administration
* - Instruments upgraded in October 1989

FIGURE 1

$RE,101

REPORT 101
TOTAL DISSOLVED GAS REPORT
FOR 01 JUN 1989

RUN DATE 01 JUN 1989

CBTT	PROJECT	DATE	TIME	WA TM DEG C	BARO PRES	TD GAS PRES	TD GAS %
CIBW	BOUNDARY		+	+	+	+	+
		31MAY89	1000	8.3	736.3	849.3	115.3
		31MAY89	1300	8.4	733.8	849.3	115.7
		31MAY89	1700	8.7	735.0	872.4	118.7
		31MAY89	2100	8.6	736.3	874.9	118.9
		01JUN89	0100	8.4	738.7	865.1	117.1
		01JUN89	0600	8.0	736.3	861.5	117.0
		01JUN89	0900	8.1	736.3	867.6	117.8

CBTT	PROJECT	DATE	TIME	WA TM DEG C	BARO PRES	TD GAS PRES	TD GAS %	SPL GS	TOT NUMB GR	GATES
GCGW	GRD COULEE	31MAY89	0500	9.7	985.3	835.6	84.8	0.0	74.0	0
		31MAY89	0900	10.0	1050.1	840.5	80.0	0.0	159.9	0
		31MAY89	1300	10.3	951.2	846.6	89.0	0.0	141.1	0
		31MAY89	1700	10.4	842.5	845.4	100.3	0.0	149.9	0
		31MAY89	2100	10.3	888.9	839.3	94.4	0.0	148.5	0
		01JUN89	0100	10.2	947.5	836.8	88.3	0.0	80.9	0
		01JUN89	0500	9.8	896.2	834.4	93.1	0.0	31.4	0
		01JUN89	0900	10.4	887.7	847.3	95.5	0.0	154.7	0
CHJ	CHIEF JOSEPH	31MAY89	0500	11.5	742.4	822.9	110.9	0.0	79.3	0
		31MAY89	0900	11.5	744.8	826.6	111.0	0.0	151.5	0
		31MAY89	1300	12.1	744.8	832.7	111.8	0.0	145.6	0
		31MAY89	1700	12.3	742.4	841.3	113.3	0.0	156.2	0
		31MAY89	2100	12.2	742.4	838.8	113.0	0.0	154.3	0
		01JUN89	0100	11.8	743.6	832.7	112.0	0.0	61.1	0
		01JUN89	0500	11.7	743.6	829.1	111.5	0.0	41.2	0
		01JUN89	0900	11.7	744.8	831.5	111.6	0.0	171.7	0
WEL	WELLS DAM	31MAY89	0500	12.3	744.0	816.0	109.7	7.8	91.4	4
		31MAY89	0900	12.3	745.0	815.0	109.4	0.0	156.1	0
		31MAY89	1300	12.3	744.0	818.0	109.9	0.0	172.6	0
		31MAY89	1700	12.4	742.0	817.0	110.1	0.0	172.6	0
		31MAY89	2100	12.3	742.0	818.0	110.2	10.0	182.5	5
		01JUN89	0100	12.4	744.0	821.0	110.3	8.2	100.2	3
		01JUN89	0500	12.4	744.0	821.0	110.3	5.6	76.3	3
		01JUN89	0900	12.5	746.0	820.0	109.9	0.0	167.0	0
RRH	ROCKY REACH DAM	31MAY89	0500	11.9	743.0	811.0	109.2	0.0	89.9	0
		31MAY89	0900	12.0	743.0	811.0	109.2	0.0	132.0	0
		31MAY89	1300	12.2	743.0	818.0	110.1	0.0	176.3	0
		31MAY89	1800	12.4	742.0	823.0	110.9	0.0	170.4	0
		31MAY89	2100	12.5	742.0	823.0	110.9	0.0	167.3	0
		01JUN89	0200	12.4	743.0	818.0	110.1	0.0	122.7	0
		01JUN89	0500	12.4	743.0	816.0	109.8	0.0	98.1	0
		01JUN89	0900	12.5	744.0	816.0	109.7	0.0	134.8	0
RIS	ROCK ISLAND DAM	31MAY89	0500	16.5	749.0	832.0	111.1	0.0	95.3	0
		31MAY89	0900	22.3	751.0	850.0	113.2	0.0	117.2	0
		31MAY89	1300	13.2	749.0	825.0	110.1	0.0	182.6	0
		31MAY89	1800	12.6	749.0	825.0	110.1	0.0	176.8	0
		31MAY89	2100	12.7	749.0	830.0	110.8	0.0	172.4	0
		01JUN89	0200	12.9	749.0	830.0	110.8	0.0	112.4	0
		01JUN89	0500	13.0	749.0	828.0	110.5	0.0	107.6	0
		01JUN89	0900	13.7	751.0	825.0	109.9	0.0	103.8	0

APPENDIX 4

SECTION III, PARA B2 - B13 OF THE

SPILL AMENDMENT FOR SPILL AT

CORPS OF ENGINEERS' PROJECTS

TO PROVIDE NONPOWER USES

SPILL FOR JUVENILE FISH PASSAGE - The following spill plan contains the portion of the MOA pertaining to a one-year spill agreement.

a. The operation of turbines at Federal hydroelectric projects causes mortality to juvenile migrating anadromous fish. Passage of water over spillways rather than through turbines during periods of juvenile anadromous fish migration can reduce turbine-related mortality of juvenile anadromous fish. This Agreement is intended to provide improved fish passage conditions through the commitment of spill for juvenile anadromous fish and avoidance of turbine impacts.

b. Specific Principles for Implementation

1. Spill for juvenile fish passage at the Federal Columbia River Hydroelectric Projects shall be provided in accordance with the terms of this agreement insofar as the spill does not impact nonpower uses. The following table sets forth fundamental principles of this agreement.

2. Spill Table

	Spill Season	Spill Percentages (a)	
(Columns)	(1)	(2)	(3)
		--average	(range)--
L.Monumental			
Spring	4/15-5/31	70%	(65-75)
Summer	6/1 -7/22	70%	(65-75)
Ice Harbor			
Spring	4/15-5/31	25%	(15-35)
Summer	6/1 -7/22	25%	(15-35)
John Day			
Spring	N/A N/A		
Summer	6/7 -8/22	20%	(15-25)
The Dalles(b)			
Spring	5/1 -6/6	10%	(5-15)
Summer	6/7 -8/22	5%	(0-10)

(a) Spill for 12 hours/day at LMN and IHR, 10 hours/day at JDA, and 24 hours/day at TDA.

(b) During both the spring and summer the daily spill level at The Dalles Dam can be shaped on a seasonal basis by plus or minus 5% of the daily spill percentage indicated in the spill table.

3. Spill Requests - The agencies and tribes shall request that spill be provided in accordance with the Spill Table and other provisions of this agreement. Such requests shall be transmitted by the Fish Passage Center (FPC) to the Corps of Engineers' Reservoir Control Center (RCC) and BPA. The parties shall honor all requests by the Agencies and Tribes that are necessary for the implementation of this agreement and consistent with this agreement as long as the request does not impact nonpower uses. The agencies and tribes may request adjustments or modifications to the dates, hours, and percentages of spill to be provided, in accordance with this agreement.

4. Spill Seasons - Dates for the initiation and cessation of spill of fish passage under this agreement shall be determined in the following manner. The agencies and tribes, using the best available data and sound scientific methods, shall estimate the 10 and 90 percent passage dates ("estimated dates") for the spring and summer migrations. Information and analyses employed by the fishery agency and tribes in developing the estimates of the 10 and 90 percent passage dates shall be provided to the parties.

a. Spring spill may be requested at LMN, IHR and TDA on the respective estimated dates of 10 percent passage at each dam, but not before the respective spring starting dates in the Spill Table.

b. The spring spill period shall end on the respective estimated dates of 90 percent passage but, except as provided in subsection d below, no later than the spring ending dates in the table.

c. The parties recognize that there may be considerable overlap between the spring 90% and summer 10% passage dates. In the event these dates do not overlap, no spill shall be requested between the estimated date of 90 percent spring passage and the estimated date of 10 percent summer passage.

d. The parties also recognize that the estimated 90% spring passage date may extend beyond the spring season ending dates in the Spill Table. If neither 90 percent of spring migrants nor 10 percent of summer migrants have passed LMN or IHR by May 31 or TDA by June 6, then summer spill levels may be requested until 90 percent of spring migrants have passed.

e. Except as provided in subsection d above, summer spill may be requested at LMN, IHR, JDA and TDA on the estimated date of 10 percent passage, but not before the summer starting dates in the Spill Table.

f. The summer spill period shall end at LMN, IHR, JDA and tDA on the estimated date of 90 percent passage, but not later than the summer ending dates in the Spill Table.

5. Pre-Season Adjustments to Spill Percentages at LMN and IHR - The allocation of available spill between LMN and IHR may be adjusted in pre-season planning by mutual consent of the parties. No in-season spill transfers shall be allowed. This provision is intended to allow flexibility to improve overall fish passage, based on new information, without increasing

power system impacts. Factors that must be considered in determining the power impacts of such reallocations include differences in head between the projects and changes in the frequency of powerhouse shutdowns due to nonspilled flows inadequate to maintain turbine loading.

6. In-Season Adjustments to Spill Percentages at LMN and IHR - The method for determining the instantaneous spill percentages shall vary depending on the month and the April 1, Jan-Jul volume runoff forecast at Lower Granite (LGR).

a. When that forecast is less than 23 million acre feet (MAF), spill requests by the agencies and tribes during all months shall be based on the percentages and hours in the Spill Table and daily average flows and shall be calculated by the agencies and tribes in accordance with the following formula, hereinafter referred to as the Daily Average Method:

(Daily Avg Q * % Spill / Period Q) * (12 hours/N hours) = X

Where:

Daily Avg Q = projected daily average flow at the project

% Spill = the percent spill required by the Spill Table

Period Q = total average river flow during the requested spill period

12 hours = the number of hours of spill prescribed by the Spill Table

N hours = the number of hours of spill requested by the agencies and tribes

X = the instantaneous spill percentage required during the requested hours of spill which shall in no event exceed 100%

For example, with a daily average flow of 85 kcfs, and a 12 hour spill period average flow of 70 kcfs, the 70 percent spill from the table would equate to 85 percent instantaneous spill for 12 hours or 100 percent instantaneous spill for 10 hours.

(85 kcfs * 70% / 70) * (12 Hrs/12) = 85%, or

(85 kcfs * 70% / 70 kcfs) * (12 Hrs/10 Hrs) = 102%

b. When that forecast is greater than 30 MAF, spill requests by the agencies and tribes during all months shall be based on the percentages and hours in the Spill Table and shall be calculated by the agencies and tribes in accordance with the following formula, hereinafter referred to as the Instantaneous Method:

12 Hrs * % Spill) / N Hrs = X

Where:

12 Hrs = the number of hours of spill prescribed by the Spill Table

% Spill = the percent of spill required by the Spill Table

N Hrs = the number of hours of spill requested by the fishery agencies and tribes

X = the instantaneous spill percentage required during the requested hours of spill which shall in no event exceed 100%

For example, 70 percent spill for 12 hours could be concentrated by request of the agencies and tribes into 84 percent for 10 hours or 100 percent for 8 hours.

c. When that forecast is between 23 and 30 MAF (inclusive), instantaneous spill levels requested by the agencies and tribes during April, May and June shall be calculated using the Instantaneous Method and spill during July shall be calculated by the agencies and tribes using the Daily Average Method.

7. In-Season Adjustment to Spill Percentages at JDA - At JDA the instantaneous spill percentage requests by the agencies and tribes shall be based on the percentage and hours in the Spill Table and shall be calculated by the agencies and tribes in accordance with the following formula:

$$(10 \text{ Hrs} * \% \text{ Spill}) / \text{N Hrs} = X$$

Where:

10 Hrs = the number of hours of spill prescribed by the Spill Table

% Spill = the percent of spill required by the Spill Table

N Hrs = the number of hours of spill requested by the agencies and tribes

X = the instantaneous spill percentage required during the requested hours of spill which shall in no event exceed 50%

For example, 20 percent spill for 10 hours could by request of the agencies and tribes be adjusted to 17 percent for 12 hours or 25 percent for 8 hours.

8. In-Season Adjustments to Spill Percentages at TDA - At TDA the instantaneous spill percentage requested by the agencies and tribes will be based on the percentages and hours in the spill table and the daily average flow, and will be calculated by the agencies and tribes in accordance with the following formula:

$$(\text{Avg Q} * \% \text{ Spill} / \text{Period Q}) * (24 \text{ Hrs} / \text{N Hrs}) = X$$

Where:

Avg Q = projected daily average flow at the project

% Spill = the percent spill required by the Spill Table

Period Q = total average river flow during the requested spill period

24 hours = the number of hours of spill prescribed by Spill Table

N hours = the requested number of hours of spill

X = the instantaneous spill percentage required during the requested hours of spill which shall in no event exceed 50%

For example, with a constant flow of 220 kcfs the 10 percent spill rate listed in the Spill Table could provide an instantaneous spill level of 10% for 24 hours, or, on request of the fishery agencies and tribes, 20 percent for 12 hours.

If, however, the daily average flow is 220 kcfs and the average river flow during the spill period is 165 kcfs, then the instantaneous spill percentage could be 27 percent for 12 hours or 32 percent for 10 hours at the discretion of the agencies and tribes:

(220 kcfs * 10% / 165 kcfs) * (24 Hrs / 12 Hrs) = 27%, or

(220 kcfs * 10% / 165 kcfs) * (24 Hrs / 10 Hrs) = 32%

9. Seasonal Spill Shaping - The daily spill percentage may be adjusted at the request of the agencies and tribes within the ranges specified in the parentheses and footnote in the Spill Table. The purpose of this operational flexibility is to provide an increased level of spillway bypass for a greater number of smolt migrants. The agencies and tribes shall be allowed this operational flexibility, provided that each day of increased spill is balanced by a day of decreased spill. For example, if agencies and tribes initial spill requests at LMN are for 65 percent, then each day of spill at that reduced percentage would entitle the agencies and tribes to request a day at 75 percent.

The determination of when to request more or less spill shall be made by the agencies and tribes. For example, earned days of a higher percentage spill would not be considered used unless requested by the agencies and tribes, regardless of whether the project actually provides higher spill than requested.

The agencies and tribes shall use this flexibility to shape spill to the fish migration and shall provide information and rationale in support of their requests. The rationale for their requests shall be based on available data and sound scientific methods. For the purposes of the above discussion, no spill shall be shifted from one season to the other.

a. In the Snake River in spring and summer, the agencies and tribes may request low spill days at the beginning of the season. Each such low day requested shall entitle them to request two high spill days during the peak of the migration, and shall obligate them to request (i.e. repay) one low spill day after the peak of the migration. The low and high day figures are

contained in the parentheses and footnote in the Spill Table. The number of low days that may be requested to earn high days is limited to 10 days, or 25 percent of the number of days between the estimated 10 percent passage date and the ending date in the Spill Table, whichever is less.

b. At TDA in spring, the formula described above in subsection a. applies, except the limitation on the number of low days that may be requested is eight.

c. At JDA and TDA in summer, the agencies and tribes may earn 1 high spill day for each low spill day requested and there is no limit on the number of low spill days that may be requested. The agencies and tribes may also request up to 14 unearned high days before requesting any low days provided that all unearned high days must be repaid with low days by July 15.

10. Spill Hours - Daily spill levels, determined by the agencies and tribes pursuant to this agreement, shall be spilled during hours requested by the agencies and tribes. No spill shall be requested to occur between 0600 and 1800 hours at LMN, IHR or JDA. During the migration periods specified in this agreement, BPA shall not make operational requests that result in nighttime spills less than 8.675 kcfs at LMN and 3.325 kcfs at IHR. Spill at TDA shall be provided during any hours requested by the agencies and tribes, subject to infrequent system reliability limitations imposed by BPA during the peak generating hours 0600-1000 and 1800-2000. Placement of limitations on spill at TDA during these peak generating periods shall be dealt with on a case-by-case basis. Notwithstanding these limitations, spill at all projects may be requested for all hours from 1800 hours on Fridays through 0600 hours on Mondays ("weekends"). Holidays shall be treated the same as weekends.

11. Hourly Spill Shaping - The agencies and tribes may request daily shaping of spill for fish passage. The decision to provide a higher percentage for fewer hours or a lower percentage for more hours rests with the agencies and tribes. If spill is higher than requested due to project operations, no reduction in hours or accounting against future requests shall occur.

The agencies and tribes may request a pre-scheduled constant level of spill during the allowable spill hours. At TDA, however, spill requests may specify two different spill rates, one for daytime and one for nighttime. The two spill rates may not be used to obtain a greater volume of water than would be available with one spill rate. Spill shall be provided at the hourly rates requested by the agencies and tribes. This subsection shall apply whether spill percentages are determined using the Instantaneous or Daily Average methods.

12. Maximum Instantaneous Spill Levels - Spill requested by the agencies and tribes at LMN and IHR may equal up to 100 percent of the instantaneous flow at each project. Summer spill requested at JDA shall be limited to 50 percent of the instantaneous flow at JDA, and spring and summer spill requested at TDA shall be limited to 50 percent of the instantaneous flow at TDA.

If BPA decides that any request consistent with this agreement for shaping prescheduled spill on any day cannot be implemented due to system reliability

problems, then modifications to the shaping shall be made in consultation with the agencies and tribes. Such modifications shall affect only the shape of spill and shall not reduce the spill for that day.

Following such consultations, a complete description of the reasons that the request cannot be implemented shall be provided to the fishery agencies and tribes. This communication shall be followed by a written explanation within one week. The parties anticipate that the occurrence of such modifications shall be very infrequent. If such modifications occur more frequently and at a frequency unacceptable to the agencies and tribes, they may pursue such remedies available to them including withdrawal from this agreement.

13. Prescheduling - Spill requests shall be prescheduled by the agencies and tribes through the FPC. Spill requests shall be provided to the RCC by 1500 each Monday through Thursday (Figure 1). Spill requests for weekends, Mondays, and holidays shall be pre-scheduled on Thursday. Spill requests for Tuesday after 1800 through 1800 on Wednesday shall be prescheduled no later than 1500 hours on Monday. The same prescheduling procedure shall be followed on Tuesday and Wednesday of each week. Spill requests for all projects for Friday after 1800 through 0600 hours on Tuesday shall be prescheduled no later than 1500 on Thursday. Spill requests at TDA for the 0600 through 1800 on Tuesday shall be prescheduled on Monday by 0900 through the RCC. Allowance of prescheduling outside these specified times shall be at BPA's discretion.

BPA shall provide the Summary of Planned Daily Operation, 30-day version, to the FPC on a weekly basis. Upon request and as needed, BPA shall provide technical assistance to the agencies and tribes so that the FPC can estimate daily average flows and average flows for the daily spill period, in order to determine the instantaneous spill percentages in subsections 6, 7 and 8.

Modifications by the agencies and tribes to prescheduled spill requests are discouraged but may be allowed. Requests by the agencies and tribes for such modifications shall be dealt with by BPA on a case-by-case basis. The parties anticipate that the occurrence of such modifications shall be very infrequent.

14. Use of Surplus (Overgeneration) Spill - Any remaining spill available after meeting the requirements of this agreement will be allocated among Federal and non-Federal hydroelectric projects according to a spill priority list established by the FPC.

15. Special Operations - Special operations outside of this agreement may be sought by the agencies and tribes to protect fish. For example, if guidance for all species does not meet the FPE standard, special operations may be requested to provide protection to fish not meeting the standard. Such operations shall be considered by BPA on a case by case basis.

16. Continued Operation of Ice and Trash Sluiceways - The parties shall request operation of the ice and trash sluiceways at IHR and TDA as in recent years during the implementation of this agreement. Juvenile fish protection provided through spill shall be in addition to, not in lieu of, protection provided through such sluiceway operation.

FIGURE 1

Spill Request Deadlines

Day and Hours That Spill Request is Implemented	Deadline for Providing Spill Request	Applicable Hydroelectric Projects
Friday (after 1800 hrs)	Thursday by 1500 hrs	All
Saturday (all hours)	Thursday by 1500 hrs	All
Sunday (all hours)	Thursday by 1500 hrs	All
Monday - Tuesday (0000 hrs) (1800 hrs)	Thursday by 1500 hrs	All
Tuesday - Wednesday (1800 hrs) (1800 hrs)	Monday by 1500 hrs	All
Wednesday - Thursday (1800 hrs) (1800 hrs)	Tuesday by 1500 hrs	All
Thursday - Friday (1800 hrs) (1800 hrs)	Wednesday by 1500 hrs	All
Tuesday (0600 - 1800 hrs)	Monday by 0900 hrs	TDA
Holidays	Thursday by 1500 hrs	All