Appendix A

Special Project Operations & Studies

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1. INTRODUCTION

This Appendix to the *Fish Passage Plan* (FPP) describes special project operations and studies planned to occur during the current year that may affect fish passage at the four Lower Snake River and four Lower Columbia River projects. All special operations and studies will be coordinated with the project and appropriate regional agencies. The Corps RCC will issue a teletype to authorize all necessary operational changes and provide guidance to project operators.

1.1. Schedule.

1.1.1. All dates shown for special operations and studies are approximate and could shift earlier or later due to a variety of factors, including: river flow, contractor schedules, equipment failures, or other real-time conditions.

1.1.2. Some studies in this Appendix may not be implemented. Therefore, a final description of studies and outages/operations being conducted will be regionally coordinated prior to April 1 as part of the Corps' Anadromous Fish Evaluation Program (AFEP) via the Fish Facilities Design Review Workgroup (FFDRWG) and/or the Studies Review Workgroup (SRWG).

1.1.3. The Action Agencies will coordinate all significant special operational requests and/or schedule changes with fisheries agencies and tribes through the appropriate regional forum to inform the final decision.

1.2. Spill for Juvenile Fish Passage.

1.2.1. During spring and summer juvenile salmonid outmigration seasons, spill operations for fish passage will be implemented as defined in the *Fish Operations Plan* (FOP; included in the FPP as **Appendix E),** or as coordinated in-season through TMT.

1.2.2. Spill for juvenile fish passage will begin April 3 at Lower Snake River projects (IHR, LMN, LGS, LWG) and April 10 at Lower Columbia River projects (BON, TDA, JDA, MCN), and continue through August 31. Alternative spill patterns to manage total dissolved gas (TDG) and/or fish passage conditions will be coordinated through the Fish Passage Operations & Maintenance (FPOM) regional workgroup.

1.2.3. During periods of high river flow, spill rates and forebay elevation may need to be adjusted at Lower Monumental and Lower Granite dams daily or every-other-day if necessary to provide safe conditions for the fish barge at the juvenile fish facility downstream of the dam.

1.3. Navigation Lock Maintenance.

1.3.1. Annual lock outages are scheduled for routine maintenance and inspections, as well as some non-routine work such as gate structural repairs and machinery replacement.

1.3.2. The schedule for navigation lock outages in **2016** is as follows:

(i) March 5 – March 19 (2 weeks): BON, TDA, JDA
(ii) March 5 – March 26 (3 weeks): MCN, IHR, LMN, LGS, LWG

1.4. Doble Testing at Lower Snake River Projects.

1.4.1. Doble testing of transformers at the Lower Snake River projects is required every three years and must be conducted during warm, dry conditions (July-August). During testing, the transformer and associated units must be out of service (OOS). Tests are scheduled concurrent with already scheduled unit outages to the extent possible, and timed to avoid or minimize impacts to fish. For more information, refer to the project-specific sections of Appendix A below.

1.4.2. The schedule for Doble testing at Lower Snake River projects in **2016** is as follows:

Project	2016 Dates for Doble Testing	Outage (Transformer, Units)	Notes [a]
IHR	Aug 22–26	T1 (Units 1, 2)	Both units already scheduled OOS (U2 for runner replacement; U1 for annual maintenance).
LMN	July 29–Aug 5	T1 (Units 1–4)	All units OOS up to 4 hrs on first and last day for clearances. T2 (Units 5, 6) RTS at night 1800-0600.
LGS	Aug 15–19	T2 (Units 5, 6)	
LWG	Aug 8–12	T1 (Units 1–4)	

a. OOS = out of service; RTS = return to service.

2. BONNEVILLE DAM

2.1. Bonneville Dam Special Operations.

2.1.1. See **Introduction section 1** for special operations related to spill for juvenile fish passage and navigation lock outages for maintenance.

2.2. Bonneville Dam Studies.

2.2.1. There are no studies scheduled for Bonneville Dam in 2016.

3. THE DALLES DAM

3.1. The Dalles Dam Special Operations.

3.1.1. See **Introduction section 1** for special operations related to spill for juvenile fish passage and navigation lock outages for maintenance.

3.2. The Dalles Dam Studies.

3.2.1. There are no studies scheduled for The Dalles Dam in 2016.

4. JOHN DAY DAM

4.1. John Day Dam Special Operations.

4.1.1. See **Introduction section 1** for special operations related to spill for juvenile fish passage and navigation lock outages for maintenance.

4.2. John Day Dam Studies.

4.2.1. There are no studies scheduled for John Day Dam in 2016.

5. McNARY DAM

5.1. McNary Dam Special Operations.

5.1.1. See **Introduction section 1** for special operations related to spill for juvenile fish passage and navigation lock outages for maintenance.

5.1.2. April 2016 – July 2016: Waterfowl Nesting. Since 1982, McNary pool has been operated for waterfowl nesting on Lake Wallula annually from late April through early July. During this operation, the McNary pool may be restricted to an operating range of 337.0'–340.0' elevation. Pool elevations are also operated in the range of 338.5'–339.5' for 4–6 hours during daylight hours at least once every four days.

5.1.3. July 2016: Doble Tests. For more information on Doble testing, see the **Turbine Maintenance** section of the FPP project-specific chapters. From July 11–15, 2016, Doble testing of transformer bank T4, and July 18–22, 2016 for Transformer Bank T5, will require their respective turbine units to be out-of-service (OOS) during testing for up to 5 days each transformer bank. There may be some overlap between the two tests. Since McNary Dam has multiple transformer banks and transmission lines, and redundant switching capability, most turbine units will be available for operation during these tests. Turbine unit 1% efficiency operations and turbine priorities will continue to follow FPP requirements.

5.1.4. Long-Term (Bi-Monthly): Headgate Repair. This is a long-term program to return the headgates to a safe operating condition by adding new roller chain, seals, anodes and other miscellaneous components. The plan will require short unit outages throughout the year while transporting rebuilt gates from the turbine units to the repair pit and vice-versa. Each swap will take from 4-6 hours to complete, and occur approximately every 2 months. Headgate movements are to take place concurrently with other outages as they occur, and the project does not expect any special operations outside FPP criteria.

5.2. McNary Dam Studies.

5.2.1. January 2016 – May 2016: Evaluation of Adult Fish Ladder Modifications to Improve Pacific Lamprey Passage at McNary Dam. This study will use half-duplex (HD) PIT-tag systems to evaluate passage success of adult Pacific lamprey at McNary Dam, the four Lower Snake River projects and associated river segments. Adult Lamprey were captured and tagged at John Day Dam in 2014 and 2015, and tags remain active for 2016. This study will continue to require electrical power for electronics and access to maintain and download data from the PIT-tag detection equipment. Maintenance of equipment will occur during the winter maintenance period when adult fishways are dewatered.

6. ICE HARBOR DAM

6.1. Ice Harbor Dam Special Operations.

6.1.1. See **Introduction section 1** for special operations related to spill for juvenile fish passage and navigation lock outages for maintenance.

6.1.2. March 2016 – May 2017: Unit 2 Turbine Replacement. Starting in March 2016 and continuing through May 2017, the turbine runner on Unit 2 will be replaced. Prior to disassembling the unit, pre-commission testing will be performed without STSs installed. Depending on when the work actually begins, this could result in needing to run the unit without STSs during fish passage season. When the unit returns to service in May 2017, the same testing will be accomplished without STSs in place while the unit is operating for the duration of the tests. Testing is projected to take several days.

6.1.3. August 2016: Doble Testing. For more information on Doble testing, see the **Turbine Maintenance** section of the FPP project-specific chapters. Transmission Line 1 (units 1 and 2) will be out of service for Doble testing August 22-26, 2016. Doble testing is conducted in conjunction with scheduled unit maintenance. Since Ice Harbor has multiple transformer banks, transmission lines, and redundant switching capability, the remaining units will be available for operation during testing and will operate in accordance with FPP priority order within the 1% range. For more information on Doble testing, see the project-specific chapters of the FPP.

6.1.4. October 2016 – December 2016: Unit 4, 5, and 6 Turbine Oil Replacement: Tentatively scheduled to begin in October 2016, unit 4, 5 and 6 will be out of service one at a time for approximately 6 weeks each to replace the turbine oil. This work will be accomplished in conjunction with annual maintenance.

6.2. Ice Harbor Dam Studies.

6.2.1. January 2016 – May 2016: Evaluation of Adult Pacific Lamprey Migration Behavior and Passage Success in the Lower Snake River. This study will use half-duplex (HD) PIT-tag systems to evaluate passage success of adult Pacific lamprey at McNary Dam, the four Lower Snake River projects and associated river segments. Adult Lamprey were captured and tagged at John Day Dam in 2014 and 2015, and tags remain active for 2016. This study will continue to require electrical power for electronics and access to maintain and download data from the PIT-tag detection equipment. Maintenance of equipment will occur during the winter maintenance period when adult fishways are dewatered.

7. LOWER MONUMENTAL DAM

7.1. Lower Monumental Dam Special Operations.

7.1.1. See **Introduction section 1** for special operations related to spill for juvenile fish passage and navigation lock outages for maintenance.

7.1.2. Ongoing through 2018: Lower Monumental Head Gate Rehab: Under the BPA Large Cap Program, parts and materials have been acquired to rehabilitate the headgates at Lower Monumental Dam. To facilitate the process, units will be scheduled out-of-service to remove or replace headgates. The headgates will be serviced in the repair pit and then placed back into service. Deviation from unit priority will be necessary to swap headgates from the unit to the pit. The duration of the outages is expected to be one day. The work started in December of 2012 and will continue in to 2018.

7.1.3. January 2016 – January 2017: Unit 1 Rehab. Current schedule shows onsite work starting in January 2016 and ending January 2017. The unit will be removed from the hole, the hub disassembled and new blade linkages installed, cavitation repair will be done to the blades and scroll case, and a new discharge ring installed. The unit will then be reinstalled and final machining done to achieve proper profiles of the scroll case, blades, and hub. There may be other work, not part of the contract, which will occur at this same time such as blade packing replacement, wicket gate inspections and servo-motor refurbishment. The generator is also scheduled to be re-wound as part of the overall job.

7.1.4. April 2016 – May 2016: Tainter Valve #4 Trunnion Hub Replacement. A contract is to be awarded to follow-up the emergency repairs to Tainter Valve #4's emergency repairs from October 2015 with trunnion hub replacements. The work is to start in early April 2016 and is expected to take approximately one month.

7.1.5. June 2016 – August 2017: Adult Fish Collection Channel Bulkhead Maintenance. Work is going to begin in June 2016 to rehabilitate Adult Fish Collection Channel Bulkheads along the powerhouse. This work is needed to support Diffuser Grating replacement during the in-water work period in FY18. This work will require short duration (up to 5 hours) Fish Pump outages and adjustment of the NPE and SPE's to minimize the pressure differential to facilitate the removal and replacement of bulkheads. The bulkheads will be rehabilitated on the tailrace deck and then returned to service. The work is expected to start in June 2016 and will continue into the second half of 2017.

7.1.6. July 2016 – August 2016: A Phase Ground Switch Repair and MOD Inspections. During the same transmission line outage for T-1 Doble testing July 29-August 5, 2016, BPA employees will be working on the Faulty "A" Phase Grounding Switch and the Motor Operated Disconnects (MOD) servicing the Powerhouse to BPA Substation transmission line. This work was scheduled to occur during Doble testing in 2015 but it wasn't completed.

7.1.7. July 2016 – August 2016: Doble Testing. For more information on Doble testing, see the **Turbine Maintenance** section of the FPP project-specific chapters. Transformer bank T-1 will be taken out-of-service for Doble testing July 29–August 5, 2016. On the first and last day of testing, clearance procedures will require a total powerhouse outage for up to 4 hours and all

project outflow will be spilled (except approximately 5 kcfs for station service). During Doble testing, the line and T-2 will be de-energized between 0600 and 1800 while employees are working and the line and T-2 along with Units 5 and 6 will be available for operation between the hours of 1800 and 0600. Available turbine units will be operated in accordance with FPP priority order and within the 1% range during this work.

7.1.8. July 2016 – July 2017: Powerhouse Monolith Water-stop Replacement. Under the BPA Large Cap Program, Powerhouse Monolith Water-stops are to be replaced during the time frame of July 2016 through July 2017. This will require installation of drilling rigs on the intake deck and insertion of hydrophilic poly urethane membranes to replace the failed water-stops.

7.1.9. November 2016 – March 2017: Debris Removal from Powerhouse Trash Racks. Under the BPA Large Cap Program, Debris is to be removed from the trash racks in front of Unit 1 through 3. This will require outages to be scheduled where divers and equipment can be used to remove the accumulated debris.

7.1.10. January 2017 – June 2017: Unit 2 Liner Replacement. Under the BPA Large Cap Program, Unit 2 is scheduled to receive a liner replacement, scheduled to start January 2017 and go to June of 2017. This work will follow completion of the Unit 1 Rehab. During this time, Unit 2 will be out-of-service. Testing following the repairs will follow paragraph 4.3.5, 6 year overhaul when Unit 2 has its liner replaced.

7.2. Lower Monumental Dam Studies.

7.2.1. January 2016 –May 2016: Evaluation of Adult Pacific Lamprey Migration Behavior and Passage Success in the Lower Snake River. This study will use half-duplex (HD) PIT-tag systems to evaluate passage success of adult Pacific lamprey at McNary Dam, the four Lower Snake River projects and associated river segments. Adult Lamprey were captured and tagged at John Day Dam in 2014 and 2015, and tags remain active for 2016. This study will continue to require electrical power for electronics and access to maintain and download data from the PIT-tag detection equipment. Maintenance of equipment will occur during the winter maintenance period when adult fishways are dewatered.

8. LITTLE GOOSE DAM

8.1. Little Goose Dam Special Operations.

8.1.1. See **Introduction section 1** for special operations related to spill for juvenile fish passage and navigation lock outages for maintenance.

8.1.2. Ongoing through July 2016: Digital Governor Replacement. Governor replacement will take place at Little Goose beginning July 2015, but may extend into 2016. This work will require performance testing and model validation testing. Thus running units out of FPP priority and outside 1%. See model validation testing paragraph. This contract work is subject to normal contracting and construction delays or issues.

8.2. Little Goose Dam Studies.

8.2.1. January 2016 – May 2016: Evaluation of Adult Pacific Lamprey Migration Behavior and Passage Success in the Lower Snake River. This study will use half-duplex (HD) PIT-tag systems to evaluate passage success of adult Pacific lamprey at McNary Dam, the four Lower Snake River projects and associated river segments. Adult Lamprey were captured and tagged at John Day Dam in 2014 and 2015, and tags remain active for 2016. This study will continue to require electrical power for electronics and access to maintain and download data from the PIT-tag detection equipment. Maintenance of equipment will occur during the winter maintenance period when adult fishways are dewatered.

8.2.2. February 2016 – July 2016: FGE Emergency Gate Closure Study. This study is to estimate and compare fish guidance efficiency (FGE) at two adjacent units with head gates in the raised (control) and stored (treatment) operating positions, and to estimate impacts (if any) to FGE and Project juvenile fish passage performance when units are operated with head gates stored. Results will aid in determining the appropriate path forward for restoring the 10-minute emergency head gate closure criterion.

> **8.2.2.a.** Hydroacoustic transducers will be installed on the trashrack and ESBS frames in turbine units 2 and 3. Installation is expected to occur during the in-water work window in February, 2016. A dive to install transducers on the trashracks will require a three-unit outage. Project personnel will assist with alternating unit 2 and unit 3 head gate orientation between raised and stored operating positions once per week on a random block design for the duration of the study beginning approximately 4 April, 2016 through approximately 15 July, 2016. Should low flow limit the Project's ability to operate three turbine units in June and July, an alternating turbine unit operating priority between units 2 and 3 will be necessary to meet the study design, assuming river conditions will permit the operation of two units. Head gates will remain in either the raised or lowered position in units 2 and 3 and unit operation will alternate on the random block design rather than changing head gate position during the low flow period. Adult fish passage will not be affected as all in-water work will be conducted during the work window. No specific turbine unit operating points (MW) are requested for this study. The dive to remove transducers will occur during the in-water work window in FY17.

9. LOWER GRANITE DAM

9.1. Lower Granite Dam Special Operations.

9.1.1. See **Introduction section 1** for special operations related to spill for juvenile fish passage and navigation lock outages for maintenance.

9.1.2. Long-Term (Bi-Monthly): Headgate Repair. This is a long-term program to return headgates to a safe operating condition by adding new roller chain, seals, anodes, and other miscellaneous components. The plan will require brief unit outages throughout the year while transporting rebuilt gates from the turbine units to the repair pit and back. Each swap will take 4–6 hours to complete and occur approximately every 2 months. Headgate movements are expected to take place concurrently with other outages, and no special operations outside FPP criteria are anticipated, but as the program progresses and fewer headgates need repair, it may require an occasional outage on a priority unit.

9.1.3. Long-Term (Bi-Monthly): ESBS Repair. This is a long-term program to return ESBSs to a safe operating condition by tearing down, repainting and rebuilding the screens. The plan will require brief unit outages throughout the year while transporting rebuilt ESBSs from the turbine units to the repair pit and back. Each swap will take 4–6 hours to complete and occur approximately every 2 months. ESBS movements are expected to take place concurrently with other outages and no special operations outside FPP criteria are anticipated, but as the program progresses and fewer screens need repair, it may require an occasional outage on a priority unit.

9.2. Lower Granite Dam Studies.

9.2.1. Ongoing through March 2017: Juvenile Fish Bypass System Upgrade. Construction activities associated with the Lower Granite Dam juvenile bypass system (JBS) upgrade began in 2014 and are expected to continue throughout 2016, with project completion expected in March 2017 (FPOM MOC: 15 LWG 004 and 13 LWG 17).

9.2.1.a. Construction activities in 2016 are anticipated to include the mining the existing juvenile collection channel during 2015/16 winter maintenance period (MOC: 15 LWG 023) and during the extended Juvenile Bypass System (JBS) outage (1 Aug 2016 to 24 March 2017) to widen the collection channel (MOC: 13 LWG 17), mining of the transportation channel through the south non-overflow section of the powerhouse; erection of the new primary and secondary dewatering structures and transportation flume; installation of new primary and emergency bypass outfall structures in the tailrace, and associated components. Work during 2016 will include work within the forebay associated with collection and transportation channel improvements and within the tailrace for outfall construction activities.

9.2.1.b. During the 2015/16 winter work period, the juvenile collection channel is being widened to the final 9.5' channel width in the vicinity of turbine units 5 and 6 (upstream end of collection channel). The collection channel will be widened within the vicinity of Turbine Units 1-4 during the extended winter maintenance period 1 August 2016 to 24 March 2017. Crossover activities involving permanent modifications to the existing juvenile bypass system (JBS) are anticipated to occur during the extended JBS outage

starting August 2016. Lower Granite Dam RSW operations will be extended through 15 December 2016 as part of the extended JBS shutdown as described in MOCs 13 LWG 17 and 15 LWG 025. As discussed within NWW FFDRWG and FPOM, it may be necessary to adaptively manage RSW operations during the 1 September 2016 to 15 December 2016 period to improve fish passage conditions and facilitate in-water outfall construction activities.

9.2.1.c. Activities that require special project operations other than as described above will be coordinated through FPOM and/or FFDRWG, as appropriate. All fish salvage operations will follow standard dewatering procedures and will be coordinated through Lower Granite's fisheries staff in accordance with standard operation procedures. Any deviations from FPP operations will be coordinated through FPOM and/or FFDRWG as appropriate.

9.2.2. January 2016 – May 2016: Evaluation of Adult Pacific Lamprey Migration Behavior and Passage Success in the Lower Snake River. This study will use half-duplex (HD) PIT-tag systems to evaluate passage success of adult Pacific lamprey at McNary Dam, the four Lower Snake River projects and associated river segments. Adult Lamprey were captured and tagged at John Day Dam in 2014 and 2015, and tags remain active for 2016. This study will continue to require electrical power for electronics and access to maintain and download data from the PIT-tag detection equipment. Maintenance of equipment will occur during the winter maintenance period when adult fishways are dewatered.