Appendix A

Special Project Operations & Studies

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1. INTRODUCTION

This Appendix describes special project operations and studies planned to occur during the current year that may affect fish passage at the eight Lower Snake and 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. Schedules: All dates shown for studies and special operations are approximate and could begin earlier or later depending on multiple factors, including river flow, contractor schedules, equipment failures, or other real-time conditions. Some studies may not proceed. 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). The Action Agencies will coordinate all significant special operations requests or schedule changes with fisheries agencies and tribes through the appropriate regional forum to inform the final decision.

1.2. Spill: During the 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 Fish Passage Plan as **Appendix E,** and as coordinated through TMT. Spill for juvenile fish passage will begin on April 3 at Lower Snake River projects and on April 10 at Lower Columbia River projects, 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.

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

1.3. Navigation: Annual lock outages are scheduled for routine maintenance and inspections, as well as some non-routine work such as gate machinery replacement and gudgeon crack welding. The 2014 schedule for navigation lock outages is as follows:

(a) March 1–15 (2 weeks): BON, TDA, JDA, MCN, LWG;

(b) March 1-22 (3 weeks): IHR, LMN, LGS.

2. BONNEVILLE DAM

2.1. Bonneville Dam Special Operations.

2.1.1. See **Introduction** sections **1.2** and **1.3** above for special operations at Bonneville Dam regarding spill operations for juvenile fish passage and navigation lock outages for maintenance.

2.2. Bonneville Dam Studies.

2.2.1. March 2014–March 2015: Adult Salmon and Steelhead Migration and Passage Behavior in the Lower Columbia River. This is the second year of a study to address two primary objectives: 1) assess passage behavior of adult salmonids in relation to modifications at BON, TDA, and JDA; and 2) estimate passage success (i.e., conversion rates) from BON to MCN. The study will include evaluation of late-run (October) summer steelhead passage and overwintering behavior at BON, TDA, JDA and MCN. At BON, the primary focus of this study will be on adult passage behavior at the modified Washington Shore Fish Ladder north downstream entrance and Cascades Island entrance.

Installation of new antennas and repairs to existing antennas will be made during the 2013/14 winter maintenance period and completed prior to commencement of tagging in spring of 2014. From late March through October, access will be needed to the BON Adult Fish Facility (AFF) and USACE tagging trailers to collect spring-summer Chinook salmon (up to 600 adult/400 jack), sockeye salmon (400 adult), and steelhead (up to 800 adults), tag with radio and PIT-tags, and release ~8 km below BON. Lower Columbia River projects will monitor for adult salmonids from March through October, then for late-run (overwintering) steelhead from October through March. Access to antennas and receivers for downloading and maintenance will be needed from March 2014 through the 2014/15 winter maintenance period.

2.2.2. May–June 2014: FGE Program PH2 Gatewell Velocity Testing. The USACE Portland District is planning to collect water velocity data at PH2 in late May and early June 2014. A test frame will be in the A-slot of Unit 14 for each test. Unit 14 would be held to a specific range of the 1% for each test day. All testing is scheduled to occur during daylight hours only, 0600-1700. A test frame will be in the A-slot for Unit 15 testing. Unit 15 would be held to a specific range of the 1% for each test day. All testing will occur daylight hours only, 0600-1700. A schedule will be provided to Bonneville Dam Operations. See Memorandum of Coordination (MOC) **14BON02** for further information.

3. THE DALLES DAM

3.1. The Dalles Dam Special Operations.

3.1.1. See **Introduction** sections **1.2** and **1.3** above for special operations at The Dalles Dam regarding spill operations for juvenile fish passage and navigation lock outages for maintenance.

3.2. The Dalles Dam Studies.

3.2.1. March 2014–March 2015: Adult Salmon and Steelhead Migration and Passage Behavior in the Lower Columbia River. This is the second year of a study to address two primary objectives: 1) assess passage behavior of adult salmonids in relation to modifications at BON, TDA, and JDA; and 2) estimate passage success (i.e., conversion rates) from BON to MCN. The study will include evaluation of late-run (October) summer steelhead passage and overwintering behavior at BON, TDA, JDA and MCN. At TDA, the primary focus will be on impacts of the 8/9 extended spill wall and associated spill pattern on passage behavior of adult salmonids.

Installation of new antennas and repairs to existing antennas will be made during the 2013/14 winter maintenance period and completed prior to commencement of tagging in spring of 2014. From late March through October, adult salmon and steelhead will be collected and tagged at the Bonneville Dam Adult Fish Facility and released below BON (see BON section **2.2.1.** above). Lower Columbia River projects will monitor for adult salmonids from March through October, then for late-run (overwintering) steelhead from October through March. Access to antennas and receivers for downloading and maintenance will be needed from March 2014 through the 2014/15 winter maintenance period.

4. JOHN DAY DAM

4.1. John Day Dam Special Operations.

4.1.1. See **Introduction** sections **1.2** and **1.3** above for special operations at John Day Dam regarding spill operations for juvenile fish passage and navigation lock outages for maintenance.

4.2. John Day Dam Studies.

4.2.1. March 2014–March 2015: Adult Salmon and Steelhead Migration and Passage Behavior in the Lower Columbia River. This is the second year of a study to address two primary objectives: 1) assess passage behavior of adult salmonids in relation to modifications at BON, TDA, and JDA; and 2) estimate passage success (i.e., conversion rates) from BON to MCN. The study will include evaluation of late-run (October) summer steelhead passage and overwintering behavior at BON, TDA, JDA and MCN. At JDA, the primary focus will be on the efficacy of improvements to the North Fish Ladder entrance and transition pool area.

Installation of new antennas and repairs to existing antennas will be made during the 2013/14 winter maintenance period and completed prior to commencement of tagging in spring of 2014. From late March through October, adult salmon and steelhead will be collected and tagged at the Bonneville Dam Adult Fish Facility and released below BON (see BON section **2.2.1.** above). Lower Columbia River projects will monitor for adult salmonids from March through October, then for late-run (overwintering) steelhead from October through March. Access to antennas and receivers for downloading and maintenance will be needed from March 2014 through the 2014/15 winter maintenance period.

4.2.2. June–July 2014: BiOp Performance Standard Compliance Test at John Day Dam during Summer Spill Operations. In 2014, Pacific Northwest National Laboratory (PNNL) will conduct the second year of a two year study to assess compliance with the BiOp Juvenile Salmon Performance Standard. This test will utilize acoustic telemetry to estimate dam passage survival for subyearling Chinook salmon. Hydrophones will be deployed on the upstream face of the dam to monitor all major routes of passage available to juvenile salmon. In addition, hydrophones will be deployed in the forebay of the spillway and powerhouse and autonomous receivers will be deployed in both the forebay and tailrace each approximately two kilometers from the dam.

5. McNARY DAM

5.1. McNary Dam Special Operations.

5.1.1. See **Introduction** sections **1.2** and **1.3** above for special operations at McNary Dam regarding spill operations for juvenile fish passage and navigation lock outages for maintenance.

5.1.2. Early April 2014: Units 4 and 11 RTS Testing (post-rewind). Units 4 and 11 are scheduled to be returned to service in Feb 2014. There is a chance that restoration procedures and testing may extend beyond April 1st and will fall within the 1% efficiency operating requirement. If the rewind Units are to be tested correctly, they will be required to operate beyond the efficiency rate of 1% for short periods of time.

5.1.3. April–May 2014: Precise Level Surveys. Dam safety has scheduled the performance of Precise Level surveys at McNary Lock and Dam, in the April/May 2014 time frame. This requires contracted surveyors to have a direct line of sight across the top of the embankment and roadway deck of the powerhouse, spillway, non-overflow sections and Navigation lock, and that the brass cap survey markers do not have anything set over the top of them.

5.1.4. Late April–Early July: Waterfowl Nesting. From the end of April through the beginning of July, the McNary pool may be restricted to an operating range of 337.0–340.0 feet elevation in support of waterfowl nesting on Lake Wallula. Pool elevations are also operated in the range of 338.5–339.5 feet at least once every 4 days during daylight hours for a period of 4–6 hours. A yearly teletype has been issued to regulate the McNary pool in this manner since 1982.

5.1.5. June 2014 and September–October 2014: Periodic Inspection & Hydrographic Survey. There will be a formal Periodic Inspection of the McNary Levees planned for June 2014. Most of the inspection is land based, but there will be an inspection by boat along the shore of the levees to evaluate riverside levee slope protection (riprap). These inspections are accomplished once every five years. A hydrographic survey of the McNary stilling basin is tentative for September/October 2014 (subject to available funding).

5.1.6. June 2014–February 2015: Units 9 and 12 Rewind. Units 9 and 12 will be taken out of service from June 2014 through February 1, 2015, for winding and replacement of various other electrical and mechanical components, from the old excitation system down to the wicket gate servomotors. If the rewind Units are to be tested correctly, they will be required to operate beyond the efficiency rate of 1% for short periods of time.

5.1.7. July 2014: Doble Tests. From July 7 – July 10, 2014, Doble testing of transformer bank T1, and July 14–17, 2014 for Transformer Bank T2, will require their respective turbine units to be out of service (OOS) and unavailable for up to 4 days each transformer bank, during testing. 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.

5.1.8. 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.

5.1.1. Bridge Inspections. The next round of Bridge inspections is scheduled for 2014. Bridges as appurtenance structures to the dam are inspected every two years based on the Federal DOT Bridge Inspection Program. Those Bridges include the Navigation lock upstream split Bascule Bridge, and the Fish Ladder Section 5 and Section 22 Bridge. Inspections require using a boat to inspect under the bridge in the Navigation forebay or the use of a snooper truck from the road way deck. No underwater inspection of piers will be accomplished.

5.2. McNary Dam Studies.

5.2.1. March 2014: Direct Injury and Survival of Adult Steelhead Passing Turbines and Temporary Spillway Weirs (TSW). Turbine unit 12 intake A will be used for the study and turbine operations have been identified as peak turbine efficiency and best geometry (approximately 14 kcfs if sample size allows). Turbines operate within ±1% of peak turbine efficiency (1% range) as a soft constraint from November 1 through March 31; however, operation at the best geometry point (approximately14 kcfs) will be coordinated through FPOM. Turbine testing is expected to require approximately 7 days for completion. A scintillation frame with fish release pipe will be lowered into the unit 12A head gate slot and will require McNary Project assistance. Turbine outages may be required to install direct release pipes in unit 12A. Appropriate coordination with McNary Project personnel will occur for the installation and removal of the unit 12A head gate, and mobilization and install of the fish release pipe structure. This will require the use of the gantry crane.

A TSW will be installed in spillbay 19 or 20 (at the discretion of McNary Project) to conduct the study. The TSW will operate at 10 kcfs assuming a forebay elevation of approximately 339-340 feet mean sea level. The 10 kcfs spill requirement for this study is expected for approximately 4-7 days, 10 hours per day. This operation has previously been accepted by BPA and the Region for the FY14 study. The installation of the TSW will be coordinated through FPOM and will include a request to leave the TSW installed (not spilling) through the fish passage season. The Contractor will be self-sufficient for installation of the fish release pipes at the TSW.

Previous attempts to conduct this study have been unsuccessful due to low adult steelhead returns in 2013. If the full sample size cannot be obtained in 2014, we will only test the turbine operated at peak efficiency and the TSW. Final study dates, turbine outages and operations, and TSW spill will be coordinated appropriately through FPOM. Spill requirements for the study will require further coordination and cooperation with BPA. Equipment removal will occur prior to the beginning of the fish passage season and is expected to occur prior to the last week of March.

Depending upon sample size for the March 2014 study it may be necessary to repeat the study as described above between October 2014 and February 2015. Regional discussion of the 2014 study results will determine the need for a second year of study. Coordination for a follow-on study will occur immediately upon a Regional decision to conduct such a study.

5.2.2. March 2014–March 2015: Adult Salmon and Steelhead Migration and Passage Behavior in the Lower Columbia River. This is the second year of a study to address two primary objectives: 1) assess passage behavior of adult salmonids in relation to modifications at BON, TDA, and JDA; and 2) estimate passage success (i.e., conversion rates) from BON to MCN. The study will include evaluation of late-run (October) summer steelhead passage and overwintering behavior at BON, TDA, JDA and MCN. At MCN, the primary focus will be on the effects of a prototype lamprey entrance installed in the winter of 2013/14 at the south fishway entrance on passage behavior and success of adult salmonids.

Installation of new antennas and repairs to existing antennas will be made during the 2013/14 winter maintenance period and completed prior to commencement of tagging in spring of 2014. From late March through October, adult salmon and steelhead will be collected and tagged at the Bonneville Dam Adult Fish Facility and released below BON (see BON section **2.2.1.** above). Lower Columbia River projects will monitor for adult salmonids from March through October, then for late-run (overwintering) steelhead from October through March. Access to antennas and receivers for downloading and maintenance will be needed from March 2014 through the 2014/15 winter maintenance period.

5.2.3. April–July 2014: BiOp Performance Standard Compliance Test at McNary Dam during Spring and Summer Spill Operations. In 2014, Pacific Northwest National Laboratory (PNNL) will conduct the second year of a two year study to assess compliance with the BiOp Juvenile Salmon Performance Standard. This test will utilize acoustic telemetry to estimate dam passage survival for juvenile steelhead, and yearling and subyearling Chinook salmon. Hydrophones will be deployed on the upstream face of the dam to monitor all major routes of passage available to juvenile salmon. In addition, hydrophones will be deployed in the forebays of the spillway and powerhouse and autonomous receivers will be deployed in both the forebay and tailrace each approximately two kilometers from the dam.

5.2.4. June–October 2014: Adult Pacific Lamprey Passage Success. 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. This study will require Project support to provide power for electronics and access to download data from the PIT-tag detection equipment. Maintenance of equipment will occur during the winter maintenance period when adult fishways are dewatered.

5.2.5. June–October 2014: Underwater Video Monitoring of Adult Fish Ladder Modifications to Improve Pacific Lamprey Passage. The purpose of this study is to use underwater video, acoustic imaging, and/or other non-invasive technologies to count and observe adult salmonids and Pacific lamprey in the fish ladders at McNary Dam. The primary goal of this work is to estimate the number of adult lamprey passing behind the picketed lead gates at count stations and to develop escapement estimates of the total number of lamprey passing McNary Dam. This study will require Project support to provide power for electronics equipment in the fishways, access for the installation, repair, and testing of electronic equipment and access to download data from video camera equipment.

5.2.6. June–October 2014: Adult Lamprey Study. Installation of a prototype adult lamprey passage structure at the McNary Dam South (Oregon) Fish Ladder (SFE2) is expected

to be completed in February 2014. This passage structure will provide a lower velocity passage route into the adult fish ladder. Optical video and DIDSON acoustic cameras will be used to evaluate fine-scale passage behavior of Pacific lamprey at the entrance and exit of the passage structure. As with other lamprey study objectives, operation of the DIDSON and conventional video cameras will occur throughout the adult lamprey passage season (early June–October). Additionally, two half-duplex PIT-tag detectors (4 loops) will be installed into the passage structure to determine the preferred passage route through the varied-velocity baffle box section. The passage structure includes a knife gate which will be opened in early June and closed at the end of October as the adult lamprey migration winds down.

5.2.7. September 2014–March 2015: Adult Steelhead Temporary Spillway Weir (TSW) Passage Efficiency. Hydroacoustic transducers will be installed from outside of the trashrack in a single turbine unit intake on up to 10 turbine units. Turbine unit intakes will be randomly selected and rolling unit outages of 3 units at a time is expected for installation of the transducers. A dive will be required to install and remove transducers and the installation dive is expected to require 5-7 days. Scheduled turbine unit outages will dictate which and how many turbine units will be used for the study and will be coordinated with the McNary Project. No specific turbine unit operation will be tested. Hydroacoustic transducers will also be installed on a TSW in either spillbay 19 or 20 and will be coordinated with the McNary Project. This study is to be conducted in conjunction with the adult steelhead direct injury and survival study (section **5.2.1.** above) and will require 10 kcfs spill over the TSW 24 hours per day in a block design (to be determined) of X number of days "on" and X number of days "off" for the duration of the study to equate to spilling during 50% of the study period. Final study dates, turbine unit outages, installation and removal of equipment and TSW, and spill through the TSW will be appropriately coordinated through FPOM, RCC, BPA and the McNary Project.

6. ICE HARBOR DAM

6.1. Ice Harbor Dam Special Operations.

6.1.1. See **Introduction** sections **1.2** and **1.3** above for special operations at Ice Harbor Dam regarding spill operations for juvenile fish passage and navigation lock outages for maintenance.

6.1.2. March–May 2014: Periodic Inspection. The Periodic Inspection at Ice Harbor Lock and Dam is tentatively scheduled for May 2014. Most of the inspection is land based, but in March an inspection by boat of the upstream and downstream face of the concrete dam, shore line, and embankment slope protection (riprap) is planned. These inspections are accomplished once every five years and are very important for monitoring of the overall condition of the dam features and structure. Prior to this inspection date the Ice Harbor spillway emergency generator will also be tested (tentative for March 2014). During the test we will raise as many of the spillway gates as possible with emergency power to maximize power usage and then close them.

6.1.3. March 2014 and October 2014–March 2015: Main Unit Digital Governor Upgrades. From June 2013 to December 2015, the Main Unit Digital Governors at Ice Harbor will be replaced starting on unit 4 and proceeding up to unit 6. Each unit will take about 5 weeks for the governors to be replaced. Unit 4, 5 and 6 will be complete in March 2014. Unit 1, 2 and 3 will be replaced between October 2014 and March 2015. This will also involve model validation testing that will require the unit be operated outside of the 1% range and out of unit priority order in the Fish Passage Plan. Unit 4, 5, and 6 Model Validation will occur 25 to 31 March 2014, and Unit 1, 2 and 3 testing will occur in March 2015.

6.1.4. April–May 2014: Precise Level Surveys. Dam safety has scheduled the performance of Precise Level surveys at Ice Harbor Lock and Dam, in the April/May 2014 time frame. This requires the contracted surveyors to have a direct line of sight across the top of the embankment and roadway deck of the powerhouse, spillway, non-overflow sections, and Navigation lock and that the brass cap survey markers do not have anything set over the top of them.

6.1.5. July–October 2014: Transformer Oil Replacement. In FY14, Ice Harbor project will be replacing transformer oil on TW-4, TW-5, TJ-0 and TW-0 based on the condition of the oil and the PCB levels within these transformers. Currently the outages are scheduled in 2014 as follows: TJ0 July 21–30; TW0 and TW4 August 4–28, and TW5 September 10–October 1.

6.1.6. August–September 2014: Doble Testing. In 2014, Doble testing will take the following out of service: 3 transformers, TW3, TW4, and TJO and turbine units 3 and 4**.** The outage is tentatively scheduled for August–September, 2014. Since Ice Harbor Dam has multiple transformer banks, transmission lines, and redundant switching capability, the remaining turbine units will be available for operation during these tests. Turbine units will operate within the 1% of peak efficiency operating range, in accordance with the turbine priority order defined in the Fish Passage Plan.

6.1.7. September 2014 –March 2015: Steady State Model Validation Testing. Western Electricity Coordinating Council (WECC) requires steady state model validation testing on a periodic basis to ensure the generating equipment will meet real and reactive power ratings. All

units will be tested on a 1-2 year cycle. Tests will involve running the unit out of fish priority sequence and outside the 1% range. Testing can occur at any time from September 1–March 31, and will not occur during fish passage season (April 1–August 31). Tests will preferably be conducted just after unit annual maintenance, but may happen at other times. Tests will last for a standard of 30 minutes at maximum load with additional time to run the unit along the maximum real/reactive power curve to the minimum settings. Total test time is anticipated to be 90 minutes or less. Test durations will be minimized to the extent possible and will only be run for the purpose of completing the required model validation testing.

6.1.8. Bridge Inspections. The next round of Bridge inspections is scheduled for 2014. Bridges as appurtenance structures to the dam are inspected every two years based on the Federal DOT Bridge Inspection Program. Those Bridges include the spillway road way deck bridge, and the Navigation lock downstream bridge. Bridge inspections require using a boat to inspect under the bridge in the spillway forebay or the use of a snooper truck from the road way deck. No underwater inspection of piers will be accomplished. Inspection of the spillway bridges will be attempted to be accomplished before the spill season.

6.2. Ice Harbor Dam Studies.

6.2.1. February–August 2014: Ice Harbor Turbine Characterization Study. In support of the Ice Harbor turbine replacement program, baseline Sensor Fish data will be collected in one or two of turbine units 1-3. Specific study units may vary depending on scheduled outages and will be coordinated with the Ice Harbor Project. It is expected that 3 or 4 specific turbine operations will be required for testing with 2 release elevations. This study will implement the new generation of Sensor Fish as well as a new release mechanism; therefore, data collection may occur in multiple timeframes as equipment optimization may be intermittently required. Ice Harbor Project support beyond adjusting turbine operations is not expected for this study. Study dates and specific turbine units and operations will be appropriately coordinated with the Ice Harbor Project and/or FPOM once finalized.

6.2.2. March 2014–March 2015: Adult Salmon Study. A study of adult salmon passage in the Lower Columbia River is planned for the 2014 adult passage season using salmon tagged at the Bonneville Dam Adult Fish Facility (AFF) and includes passage and fate through the Lower Snake River. Salmon and steelhead will be collected, tagged with radio-telemetry transmitters and/or PIT-tags, and released below Bonneville Dam (see BON section **2.2.1.** above). Installation and maintenance of any new radio-telemetry antennas or receivers will be completed in March–April 2014 for detecting adult fish tagged at the Bonneville AFF and adult lamprey tagged for the Lower Snake River radio-tracking study. There is no Lower Snake River adult spring Chinook salmon study from Ice Harbor Dam planned for 2014.

6.2.3. May–October 2014: Adult Lamprey Study. A study of Snake River adult lamprey passage is planned for the 2014 adult passage season. The primary goals of the research are to determine fish ladder entrance preferences, migration timing through the ladders, turn-around points in the ladders, fallback rates, and conversion rates between the Lower Snake River dams. Lamprey will be captured and tagged with radio tags and half-duplex PIT-tags at John Day Dam, transported for release below Ice Harbor Dam, and monitored at the four Lower Snake River projects. Radio-telemetry equipment is in place from the adult salmon passage studies and some

additional arrays will be installed in the adult fish ladders in the vicinity of transition or turn pools. Installation and maintenance of radio-telemetry equipment will be completed in May–June prior to the adult lamprey migration season. Access to antennas and receivers for downloading and maintenance will be needed from May through October.

6.2.4. June–October 2014: Underwater Video Monitoring of Adult Fish Ladder Modifications to Improve Pacific Lamprey Passage. The purpose of this study is to use underwater video, acoustic imaging, and/or other non-invasive technologies to count and observe adult salmonids and Pacific lampreys, *Entosphenus tridentatus,* in the fish ladders at Ice Harbor Dam. The goal of this work is to estimate the number of adult lamprey passing behind the picketed lead gates at count stations and to develop escapement estimates of the total number of lamprey passing Ice Harbor Dam. This study will require Ice Harbor to provide power for electronics equipment in the fishways, access for the installation, repair, and testing of electronic equipment and access for the downloading of data from video camera equipment. Maintenance and installation of camera equipment and will occur during the winter maintenance period when adult fishways are dewatered.

6.2.5. June–October 2014: Adult Pacific Lamprey Passage Success. This study will evaluate passage success for adult Pacific lamprey, *Entosphenus tridentatus,* at McNary Dam, Ice Harbor Dam and the remaining Lower Snake River dams, and associated river segments using half-duplex (HD) PIT-tag systems. This study will require Project support provide power for electronics and access for the downloading of 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** sections **1.2** and **1.3** above for special operations at Lower Monumental Dam regarding spill operations for juvenile fish passage and navigation lock outages for maintenance.

7.1.2. January–February 2014: Transient Model Validation (Exciter Step Response). Western Electricity Coordinating Council requires model validation testing on a minimum 5-year cycle to ensure generating equipment responds as planned to system requirements and disturbances. Testing of the Units was last performed in 2009. Unit tests will be accomplished on Lower Monumental Units 1 through 3. As testing will involve running the test unit out of fish priority sequence and outside the 1% criteria, testing is scheduled to occur during the in-water work period between January 2, 2014 and February 28, 2014. Testing will take require operation of each unit for approximately 1 hour with 30 minutes outside the 1% criteria.

7.1.3. February–March 2014: Lower Snake Exciter Replacement: Lower Snake exciter replacement took place at Lower Monumental in FY12. . During the commissioning process at Little Goose, deficiencies were found that affected units previously installed at Lower Monumental and Lower Granite. The PDT has determined that these deficiencies require correction to ensure compliance with contract documents. Units 4-6 at Lower Monumental will undergo re-commissioning to verify designed capabilities are restored to pre-construction levels. This work will also require performance testing and model validation testing. This work is presently scheduled to occur between February 11 and March 3, 2014. The dates for this work are subject to change, but the outages will be scheduled to minimize impacts to fish passage. During this time, it will be necessary to run units out of priority order and outside the 1% operating range. See model validation testing paragraph number 7.1.1 & 7.1.2. This contract work is subject to normal contracting and construction delays.

7.1.4. February–April 2014: Precise Level Surveys. Dam safety has scheduled the performance of Precise Level surveys at Lower Monumental Lock and Dam, in the February/March/April 2014 time frame. This requires the contracted surveyors to have a direct line of sight across the top of the embankment and roadway deck of the powerhouse, spillway, non-overflow sections, and Navigation lock and that the brass cap survey markers do not have anything set over the top of them.

7.1.5. August 2014: Transformer Maintenance. Transformer bank T2 and turbine units 5, and 6 will be taken out of service for maintenance work in 2014 subject to available water flows. The outage is tentatively scheduled for August 11 to August 15, 2014. This work will require a total powerhouse outage, and 100% spill (except for station service) for up to 4 hours. By then, all clearance tags should be hung, and the line could be re-energized allowing generation availability of Units 2, 3, 4, and 1. Turbine unit 1% efficiency operations and turbine priorities will continue to follow fish passage plan requirements during this maintenance work. Another total plant outage will be required on the last day of testing to remove clearance tags and restore T2 bank. The following week, August 18 to August 21, 2014, similar work is tentatively scheduled to be performed on Transformer bank T1 and turbine units 1, 2, 3, and 4 will be taken

out of service for scheduled maintenance work. This work will require a total powerhouse outage, and 100% spill (except for station service) for up to 4 hours. By then, all clearance tags should be hung, and the line could be re-energized allowing generation availability of Units 5 and 6. Turbine unit 1% efficiency operations and turbine priorities will continue to follow fish passage plan requirements during these tests. Another total plant outage will be required on the last day of testing to remove clearance tags and restore T1 bank.

7.1.6. September 2014 –March 2015: Steady State Model Validation Testing. Western Electricity Coordinating Council (WECC) requires steady state model validation testing on a periodic basis to ensure the generating equipment will meet real and reactive power ratings. All units will be tested on a 1-2 year cycle. Tests will involve running the unit out of fish priority sequence and outside the 1% range. Testing can occur at any time from September 1–March 31, and will not occur during fish passage season (April 1–August 31). Tests will preferably be conducted just after unit annual maintenance, but may happen at other times. Tests will last for a standard of 30 minutes at maximum load with additional time to run the unit along the maximum real/reactive power curve to the minimum settings. Total test time is anticipated to be 90 minutes or less. Test durations will be minimized to the extent possible and will only be run for the purpose of completing the required model validation testing.

7.1.7. Long-Term (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 is expected to start in December of 2012 and continue in to 2018.

7.1.8. Bridge Inspections. The next round of Bridge inspections is scheduled for 2014. Bridges as appurtenance structures to the dam are inspected every two years based on the Federal DOT Bridge Inspection Program. Those Bridges include the spillway road way deck bridges and the Navigation lock downstream Bridge. Inspections require using a boat to inspection under the bridge in the spillway forebay or the use of a snooper truck from the road way deck. No underwater inspection of piers will be accomplished. Inspection of the spillway bridges will be attempted to be accomplished before the spill season.

7.2. Lower Monumental Dam Studies.

7.2.1. May–October 2014: Adult Lamprey Study. A study of Snake River adult lamprey passage is planned for the 2014 adult passage season. The primary goals of the research are to determine fish ladder entrance preferences, migration timing through the ladders, turn-around points in the ladders, fallback rates, and conversion rates between the Lower Snake River dams. Lamprey will be captured and tagged with radio tags and half-duplex PIT-tags at John Day Dam, transported for release below Ice Harbor Dam, and monitored at the four Lower Snake River projects. Radio-telemetry equipment is in place from the adult salmon passage studies and some additional arrays will be installed in the adult fish ladders in the vicinity of transition or turn pools. Installation and maintenance of radio-telemetry equipment will be completed in May–

June prior to the adult lamprey migration season. Access to antennas and receivers for downloading and maintenance will be needed from May through October.

7.2.2. June–October 2014: Adult Pacific Lamprey Passage Success. This study will evaluate passage success of adult Pacific lamprey *Entosphenus tridentatus* at McNary Dam, the four lower Snake River dams, and associated river segments using half-duplex (HD) PIT-tag systems. This study will require Project support to provide power for electronics, and access for downloading 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** sections **1.2** and **1.3** above for special operations at Little Goose Dam regarding spill operations for juvenile fish passage and navigation lock outages for maintenance.

8.1.2. Through April 2014: Lower Snake Exciter Replacement. Little Goose units 1 or 2 exciter replacement is ongoing, but may extend into April for testing. This work will also require performance testing and model validation testing. This will require running units out of priority and outside 1%. See model validation testing paragraph number 1.5 and 1.6. This contract work is subject to normal contracting and construction delays or issues.

8.1.3. April–May 2014: Precise Level Surveys. Dam safety has scheduled the performance of Precise Level surveys at Little Goose Lock and Dam, in the April/May 2014 time frame. This requires the contracted surveyors to have a direct line of sight across the top of the embankment and roadway deck of the powerhouse, spillway, non-overflow sections, and Navigation lock and that the brass cap survey markers do not have anything set over the top of them.

8.1.4. August 2014: Coupling Capacitor testing. In 2014, two transformers, T-1 and turbine units 1 to 4 and T-2 Turbine Units 5 and 6 will be taken out of service for Coupling Capacitor testing**.** The outage is tentatively scheduled for August 12th, 2014.

8.1.5. September 2014–March 2015: Steady State Model Validation Testing. Western Electricity Coordinating Council (WECC) requires steady state model validation testing on a periodic basis to ensure the generating equipment will meet real and reactive power ratings. All units will be tested on a 1-2 year cycle. Tests will involve running the unit out of fish priority sequence and outside the 1% range. Testing can occur at any time from September 1–March 31, and will not occur during the spill season (April 1–August 31). Tests will preferably be conducted just after unit annual maintenance, but may happen at other times. Tests will last for a standard of 30 minutes at maximum load with additional time to run the unit along the maximum real/reactive power curve to the minimum settings. Total test time is anticipated to be 90 minutes or less. Test durations will be minimized to the extent possible and will only be run for the purpose of completing the required model validation testing.

8.1.6. Bridge Inspections. The next round of Bridge inspections is scheduled for 2014. Bridges as appurtenance structures to the dam are inspected every two years based on the Federal DOT Bridge Inspection Program. Those Bridges include the spillway road way deck Bridges, and the Navigation lock downstream pedestrian Bridge and the upstream upper and downstream lower bascule bridges. Inspections require using a boat to inspection under the bridge in the spillway forebay or the use of a snooper truck from the road way deck. No underwater inspection of piers will be accomplished. Inspection of the spillway bridges will be attempted to be accomplished before the spill season.

8.2. Little Goose Dam Studies.

8.2.1. March 2014–March 2015: Adult Salmon Study. A study of adult salmon passage in the Lower Columbia River is planned for the 2014 adult passage season using salmon tagged at the Bonneville Dam Adult Fish Facility (AFF) and includes passage and fate through the Lower Snake River. Salmon and steelhead will be collected, tagged with radio-telemetry transmitters and/or PIT-tags, and released below Bonneville Dam (see BON section **2.2.1.** above). Installation and maintenance of any new radio-telemetry antennas or receivers will be completed in March–April 2014 for detecting adult fish tagged at the Bonneville AFF and adult lamprey tagged for the Lower Snake River radio-tracking study. There is no Lower Snake River adult spring Chinook salmon study from Ice Harbor Dam planned for 2014.

During the 2013/14 winter maintenance period, the LGS adult ladder count window slot will be modified to a minimum slot opening of 18’ in preparation of temporary PIT-tag antennae in January 2014.

8.2.2. May–October 2014: Adult Lamprey Study. A study of Snake River adult lamprey passage is planned for the 2014 adult passage season. The primary goals of the research are to determine fish ladder entrance preferences, migration timing through the ladders, turn-around points in the ladders, fallback rates, and conversion rates between the Lower Snake River dams. Lamprey will be captured and tagged with radio tags and half-duplex PIT-tags at John Day Dam, transported for release below Ice Harbor Dam, and monitored at the four Lower Snake River projects. Radio-telemetry equipment is in place from the adult salmon passage studies and some additional arrays will be needed in the adult fish ladders in the vicinity of transition or turn pools. Installation and maintenance of radio-telemetry equipment will be completed in May–June prior to the adult lamprey migration season. Access to antennas and receivers for downloading and maintenance will be needed from May through October.

8.2.3. June–October 2014: Adult Pacific Lamprey Passage Success. This study will evaluate passage success for adult Pacific lamprey, *Entosphenus tridentatus*, at McNary Dam, the four Lower Snake River dams, and associated river segments using half-duplex (HD) PIT-tag systems. This study will require Project support to provide power for electronics and access for downloading data from the PIT-tag detection equipment. Maintenance of equipment will occur during the winter maintenance period when adult fishways are dewatered.

9. LOWER GRANITE DAM

9.1. Lower Granite Dam Special Operations.

9.1.1. See **Introduction** sections **1.2** and **1.3** above for special operations at Lower Granite Dam regarding spill operations for juvenile fish passage and navigation lock outages for maintenance.

9.1.2. March–April 2014: Units 4, 5, 6 Exciter Re-Commissioning. Lower Granite turbine units 4, 5 and 6 are tentatively scheduled for exciter re-commissioning from March 3-16 (Unit 6), March 17-29 (Unit 4) and March 24-April 4 (Unit 5). The re-commissioning may require units to temporarily operate out of the unit priority order defined in the Fish Passage Plan (Lower Granite Dam **Table LWG-5)** and/or outside of the 1% operating range.

9.1.3. April–May 2014: Precise Level Surveys. Dam safety has scheduled the performance of Precise Level Surveys at Lower Granite in the April/May 2014 time frame. This requires contracted surveyors to have a direct line of sight across the top of the embankment and roadway deck of the powerhouse, spillway, non-overflow sections, and Navigation lock and that the brass cap survey markers do not have anything set over the top of them.

9.1.4. August 2014: T1 Bushing Replacement. Lower Granite performed Doble testing of T1/T2 in August 2013 and testing will occur again in 2015 (every-other-year test schedule). The 2013 test results indicated that the T1 phase-C neutral bushing test lead was broken. A line outage is required to replace the bushing and is currently expected to be performed during the normal Doble test timeframe of early to mid-August 2014. The anticipated duration is 5 days for the T1 outage (Units 1-4 OOS) with T2 returning to service nightly, and 3 days for the T2 outage (Units 5-6 OOS) with T1 returning to service nightly.

9.1.5. May 2014 and November 2014: Unit 3 Partial Discharge Analysis (PDA). The PDA measures the health of the generator stator. The two most recent PDA results for Unit 3 indicate extremely poor condition; therefore the unit needs to be analyzed every 6 months. To analyze the unit, it has to be running at or near the 1% upper limit for approximately 4 hours. It takes about 15 minutes to connect the computer to the test points and gather the PDA data. All PDA data will be taken during spring runoff (May 1–31) when running all the units will be in accordance with FPP unit priority (see Lower Monumental Dam **Table LMN-5**). In November, Unit 3 needs to be tested and run, possibly out of the FPP unit priority order for about 4.5 hours.

9.1.6. 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 brief unit outages throughout the year while transporting rebuilt gates from the turbine units to the repair pit and vice versa. Each swap will take 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 no special operations outside the Fish Passage Plan are expected, but it may cause an occasional outage on a priority unit.

9.1.7. Bridge Inspections. The next round of Bridge inspections is scheduled for 2014. Bridges as appurtenance structures to the dam are inspected every two years based on the Federal DOT Bridge Inspection Program. Those Bridges include the spillway road way deck bridges and the spillway gate trunnion pedestrian bridges, the Navigation lock downstream Bridge, and the south shore project access Bridges, and upstream construction facility Bridge. Inspections require using a boat to inspect under the bridge in the spillway forebay or the use of a snooper truck from the road way deck. No underwater inspection of piers will be accomplished. Inspection of the spillway bridges will be attempted to be accomplished before the spill season.

9.2. Lower Granite Dam Studies.

9.2.1. March 2014–March 2015: Adult Salmon Study. A study of adult salmon passage in the Lower Columbia River is planned for the 2014 adult passage season using salmon tagged at the Bonneville Dam Adult Fish Facility (AFF) and includes passage and fate through the Lower Snake River. Salmon and steelhead will be collected, tagged with radio-telemetry transmitters and/or PIT-tags, and released below Bonneville Dam (see BON section **2.2.1.** above). Installation and maintenance of any new radio-telemetry antennas or receivers will be completed in March–April 2014 for detecting adult fish tagged at the Bonneville AFF and adult lamprey tagged for the Lower Snake River radio-tracking study. There is no Lower Snake River adult spring Chinook salmon study from Ice Harbor Dam planned for 2014.

From July through September, adult steelhead will be collected from the Lower Granite adult trap by a contractor for radio-tagging.

9.2.2. April–June 2014: Evaluation of Prototype Overflow Weir and 14-inch Orifice for the Lower Granite Juvenile Bypass System Upgrade. The prototype overflow weir and enlarged 14" orifice that were installed into intake gatewell 5A in the winter 2012/13 will be evaluated for a variety of metrics including survival and travel time during April-June 2014. The following modifications will be made in winter 2013/14, prior to initiation of the 2014 study:

- **(a)** the broad-crested overflow weir that was installed in winter 2012/13 will be modified into a sharp-crested overflow weir;
- **(b)** the 14" orifice that was installed in winter 2012/13 will have a gatewell-side light ring installed;
- **(c)** a temporary in-channel PIT-tag detection system will be installed within the juvenile collection channel.

The 2014 biological testing period, approximately April 15 to June 20, is intended to coincide with peak fish out-migration periods, debris passage and water passage for juvenile spring and fall Chinook salmon, juvenile and adult steelhead and juvenile Pacific lamprey. Preliminary plans for a new Juvenile Fish Facility (JFF) at Lower Granite Dam include the use of the larger 14" orifices with the gatewell-side light ring for fish to pass from gatewells to the collection channel. Results of this study will be used to inform management decisions on final structural modifications and operational changes at Lower Granite Dam to optimize salmonid survival and passage, including determining whether installation of additional overflow weirs is warranted.

Final study plans during the test period will principally mimic the 2013 study plan, as coordinated with RCC and Lower Granite project staff for implementation. In order to conduct

the necessary biological testing, deviations from the standard turbine operating priority order defined in the Fish Passage Plan, Lower Granite Dam **Table LWG-5**, will be necessary in order to operate unit 5 during testing periods (see **Table LWG-5** below with testing priority order).

Unit 2 will remain the first priority unit during the test period to provide fish ladder attraction flow. If low inflow occurs, Unit 1 will be prioritized to provide fish ladder attraction flow. There will be no changes to spill or spill patterns for this study. From April 15–June 30, 2014, unit 5 will be operated at the upper end of the 1% range, or at an alternative fixed discharge if possible, during each test block to provide consistent testing conditions. Based on historical river flow, it is likely that sufficient inflow will permit operation of unit 5 for this test through June 30. Final unit operations will be dictated by final study plans (i.e., days per week) and will be coordinated with RCC and Lower Granite Dam project staff.

Table LWG-1. Lower Granite Dam Turbine Unit Operating Priority Order.

Season	Duration	Unit Priority
March 1 – December 15 Fish Passage Season	Start Units	2, 3, then 4-6 any order, then 1 [a]
	Stop Units [b]	4-6 any order, then 3, 2, 1 [b]
April 15 – June 30 Study of Unit 5 Prototype Bypass Structures [c]	Start Units	2, 5, 3, then 4 or 6 any order, then 1 [a]
	Stop Units [b]	4 or 6 any order, then 3, 5, 2, 1 [b]
December 16 – February 28 Winter Maintenance Season	Stop/Start Units	Any Order

a. Unit 1 has fixed Kaplan blades (non-adjustable) and can only operate in the upper 1% range. The priority order minimizes Unit 1 starts/stops and allows for the longest runtime once Unit 1 is started.

b. Stop units in reverse Start order, except run Unit 1 as long as BPA load request and required spill rate can be met.

c. From April 15–June 30, 2014, unit 5 will be operated at the upper end of the 1% range, or at an alternative fixed discharge if possible, during each test block to provide consistent testing conditions.

9.2.3. Kelt Reconditioning, Transport and In-River Survival. Provide assistance to Nez Perce Tribe for collection of post-spawn steelhead (kelt) off the Lower Granite separator for their reconditioning program. Depending on flow conditions, separator technicians will collect a similar number of A-run and B-run kelt for transfer to CRITFC/NPT researchers at Dworshak Dam reconditioning facilities (about 400 kelt) with remaining kelt PIT-tagged for direct release into the tailwaters (about 1,200-1,400 kelt) and limited release into gatewell 5A as part of the evaluation of prototype overflow weirs and enlarged 14" orifice (see section **9.2.2.** above).

9.2.4. May–October 2014: Adult Lamprey Study. A study of Snake River adult lamprey passage is planned for the 2014 adult passage season. The primary goals of the research are to determine fish ladder entrance preferences, migration timing through the ladders, turn-around points in the ladders, fallback rates, and conversion rates between the Lower Snake River dams. Lamprey will be captured and tagged with radio tags and half-duplex PIT-tags at John Day Dam, transported for release below Ice Harbor Dam, and monitored at the four Lower Snake River projects. Radio-telemetry equipment is in place from the adult salmon passage studies and some

additional arrays will be needed in the adult fish ladders in the vicinity of transition or turn pools. Installation and maintenance of radio-telemetry equipment will be completed in May–June prior to the adult lamprey migration season. Access to antennas and receivers for downloading and maintenance will be needed from May through October.

9.2.5. June–October 2014: Adult Pacific Lamprey Passage Success. This study will evaluate passage success for adult Pacific lamprey, *Entosphenus tridentatus*, at McNary Dam, the four Lower Snake River dams, and associated river segments using half-duplex (HD) PIT-tag systems. This study will require Project support to provide power for electronics and access for downloading data from the PIT-tag detection equipment. Maintenance of equipment will occur during the winter maintenance period when adult fishways are dewatered.

9.2.6. July 2014 – January 2015: Juvenile Fish Bypass System Upgrade Construction. Starting in July 2014, construction activities associated with the Lower Granite Dam fish bypass system upgrade will include the plugging of the fish screen slots and Wagner Horns. The construction project will occur during scheduled turbine unit outages for annual maintenance. Following placement of the plugs, the slots will be dipped to remove all fish prior to the placement of Tremie concrete. Fish removed from the slots will be transported below the dam and released. Fish salvage operations will be coordinated with Project Fisheries and SMP staff. This operation has been coordinated with the region via FPOM as described in Memorandum of Coordination (MOC) **13 LWG 22**. The fish screen slot and Wagner Horn plugs are anticipated to be completed by January 2015.