Study Plan for the Estimation of Juvenile Steelhead Survival through the Priest Rapids Project in 2016

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1.0 Introduction

The Priest Rapids Project (hereafter the Project) is owned and operated by Public Utility District No. 2 of Grant County (Grant PUD). The Project includes two hydroelectric developments, Wanapum and Priest Rapids dams.

On April 17, 2008 the Federal Energy Regulatory Commission (FERC) issued its Order Issuing New License for the Priest Rapids Project to Grant PUD (FERC No. 2114). Incorporated into the New License was Term and Condition 1.1 – NMFS 2008 Biological Opinion for the Priest Rapids Project (NMFS 2008) (adapted from Action 1, NMFS 2004) and 401 Water Quality Certification Section 6.4.6.a.

> *FERC shall require Grant PUD to make steady progress toward achieving a minimum 91% combined adult and juvenile salmonid survival performance standard at the Priest Rapids and Wanapum developments (i.e., each dam). The 91% standard includes a 93% project-level (reservoir and dam) juvenile performance standard. NMFS recognizes that it is not currently possible to measure the 91% combined adult and juvenile survival standard. Grant PUD shall therefore continue to conduct dam and reservoir smolt survival studies, evaluating progress toward meeting 93% juvenile Project passage survival. This standard can be measured at each development individually, or as a composite of survival at the two developments.*
>
> *NMFS recognizes that the juvenile standard has already been achieved for UCR spring-run Chinook salmon. FERC shall require Grant PUD to at least maintain this level of survival. FERC shall ensure that Grant PUD achieves the juvenile standard for UCR steelhead, as measured after 3 consecutive years of evaluation, by 2013. Grant PUD can compensate for a failure to achieve the performance standard at one of its developments by exceeding the performance standard at the other development (i.e., at a minimum, by the same percentage amount below the survival performance standard at the development failing to meet performance standards). If Project survival exceeds the minimum combined juvenile and adult performance standard specified above, as measured per the specifications listed below, off-site mitigation obligations can be reduced by a commensurate amount.*

In 2003-2005, Grant PUD released radio and PIT-tagged juvenile anadromous salmonids (e.g., yearling Chinook) as part of the continuing effort to monitor and evaluate survival of fish migrating through the Priest Rapids Project (Project) (Anglea et al. 2004, 2005a and 2005b). Acoustic tag studies were first conducted in 2004 and were employed in additional studies throughout the Project in 2006-2011, 2014 and 2015 (Timko et al. 2007 and 2008; Sullivan et al. 2009; Timko et al 2010 and 2011; Thompson et al 2012; Hatch et al. 2015). Grant PUD's proposed juvenile salmonid survival and passage behavior study for 2016 is designed to provide relevant information and empirical evidence on survival rates and passage behavior (e.g., route selection) of run-of-river juvenile steelhead as they migrate through the Project with the continued use of acoustic telemetry.

Meeting survival performance standards for juvenile steelhead in the Project has been a challenge for Grant PUD. Grant PUD has implemented operational measures to increase fish passage survival that has included new bypass structures at both dams. At Wanapum Dam, a newly constructed fish bypass (the Wanapum Fish Bypass or WFB), which began operating in the spring of 2008, has collected up to 50-80% of juvenile steelhead passing at this dam in a given year and has provided the safest downstream passage route for smolts that pass at this location (survival is nearly 100%) (Sullivan et al. 2009; Timko et al. 2010; Timko et al. 2011; Hatch et al. 2015). At Priest Rapids Dam, prototype top-spill bulkhead testing was conducted between 2006 and 2010; the new bypass was constructed and operational in the spring of 2014 at Spill bays 20-22, the Priest Rapids Fish Bypass (PRFB).

Performance standards for steelhead were evaluated for three consecutive years (2008-2010), and as outlined in the NMFS 2008 Biological Opinion (BiOp), must average 86.49% or higher to meet the licensed agreements. The

performance standards for steelhead in 2008-2010 was 81.05%, which fell short of the performance standard goals by nearly 5%. The estimated survival of juvenile steelhead, based on acoustic tag studies that were conducted in 2008 was 82.76%, in 2009 was 83.09% and in 2010 was 77.29%; all three years failed to meet the BiOp standard of 86.49%. The 2014 study marked the first year that the Project survival standard (86.49%) was met for steelhead, which was estimated at 89.34%. Results from the 2015 survival and behavior studies have not been finalized at the time of writing this draft 2016 study plan; however, the draft Project survival estimates for juvenile steelhead is 83.71% (Skalski et al. *in progress*). In 2016, juvenile steelhead survival performance standards will continue to be measured as Grant PUD strives to meet a three-year consecutive average (2014-2016) that meets or exceeds the minimum Project performance standard goal of 86.49%.

2.0 Objectives

This study plan describes Grant PUD's proposal to conduct a survival and passage behavior study at Wanapum and Priest Rapids dams and the associated reservoirs during the spring smolt out-migration for the year 2016 using acoustic-tag tracking techniques. The following tasks will be addressed:

Task 1) Estimate survival for steelhead smolts passing through the Priest Rapids Project using the paired-release model;

Task 2) Estimate FPE through the bypass and any other non-turbine passage routes and relative route-specific survival for steelhead smolts at Wanapum and Priest Rapids dams (similar to Skalski et al. 2014);

Task 3) Estimate migration rate, forebay residence times, and tag detection efficiency of steelhead smolts through the Wanapum and Priest Rapids developments (similar to Hatch et al. 2015);

Task 4) Continue to support the evaluation of avian predation impacts through the recovery of PIT tags at avian nesting colonies on the Mid-Columbia Plateau with collaborative efforts between Grant PUD and Real Time Research in conjunction with NOAA Fisheries, USGS-Oregon Cooperative Fish and Wildlife Research Unit, and Oregon State University;

3.0 Site Description

3.1 Wanapum Dam

Wanapum Dam is located on the Columbia River at river mile (RM) 416, 19 miles upstream of Priest Rapids Dam, and 38 miles downstream from Rock Island Dam. The dam has a 1,540 ft long powerhouse, oriented approximately with river flow, and an 832 ft long spillway at approximately a 45° angle to flow. The powerhouse has 10 Kaplan turbine units, numbered from north to south, with a combined generating capacity of 1,038 megawatts. There are additional intake structures for six potential future units. Each turbine unit has three intake slots, designated A, B and C from north to south.

The Wanapum Dam spillway contains 12 tainter gates, each 65-ft tall by 50-ft wide. These gates open at the bottom to produce submerged spill at a depth of 65 ft. The WFB is 20 ft wide, and normally spills 20 kcfs of surface water. The sluiceway opens from the top, as opposed to the tainter gates of the spillway, which open from the bottom. The normal maximum discharge of the sluiceway is 1,920 cfs.

The WFB is located at Future Unit 11 (Figure 1). At a forebay elevation of 570 ft the WFB can operate to pass an estimated 5, 10, 15, or 20 kcfs.

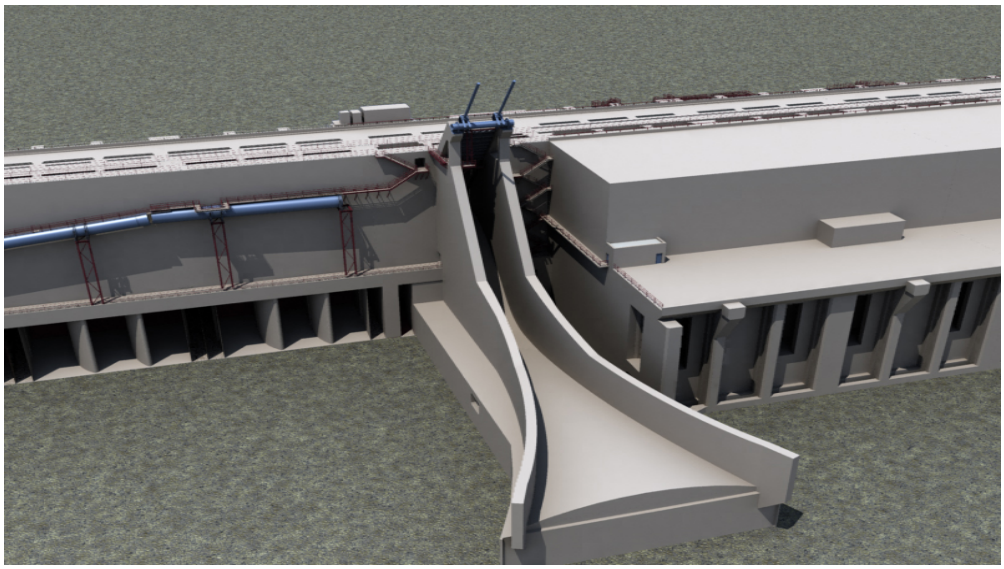

Figure 1. Graphic diagram of the Wanapum Fish Bypass (WFB) showing the downstream exit.

3.2 Priest Rapids Dam

Priest Rapids Dam is located at RM 397 and is 105 miles upstream of McNary Dam. The dam is 19 miles downstream of Wanapum Dam and approximately 70 miles upstream from the confluence of the Snake and Columbia rivers. Normal maximum forebay elevation is 488 ft above MSL and the normal operating head is 78 ft.

The dam has a 1,025 ft long powerhouse located at the northeast end, oriented approximately perpendicular to river flow, and a 1,152 ft long spillway on the southwest end of the dam. The powerhouse has 10 Kaplan turbine units, numbered from west to east, with a combined nameplate generating capacity of 956 megawatts. Each turbine unit has three intake slots, designated A, B, and C from east to west.

The spillway contains 22 tainter gates, each 50 ft tall by 40 ft wide. These gates open at the bottom to produce submerged spill at a depth of 50 ft. Each spill bay passes an average of 8-10 kcfs under normal operating conditions. The PRFB (Priest Rapids Fish Bypass) was constructed at spillbays 20, 21, and 22 and became operational in 2014 as a bypass structure to downstream migrating smolts; the bypass operates as three independent surface-spill gates, each passing up to 9 kcfs (Figure 2).

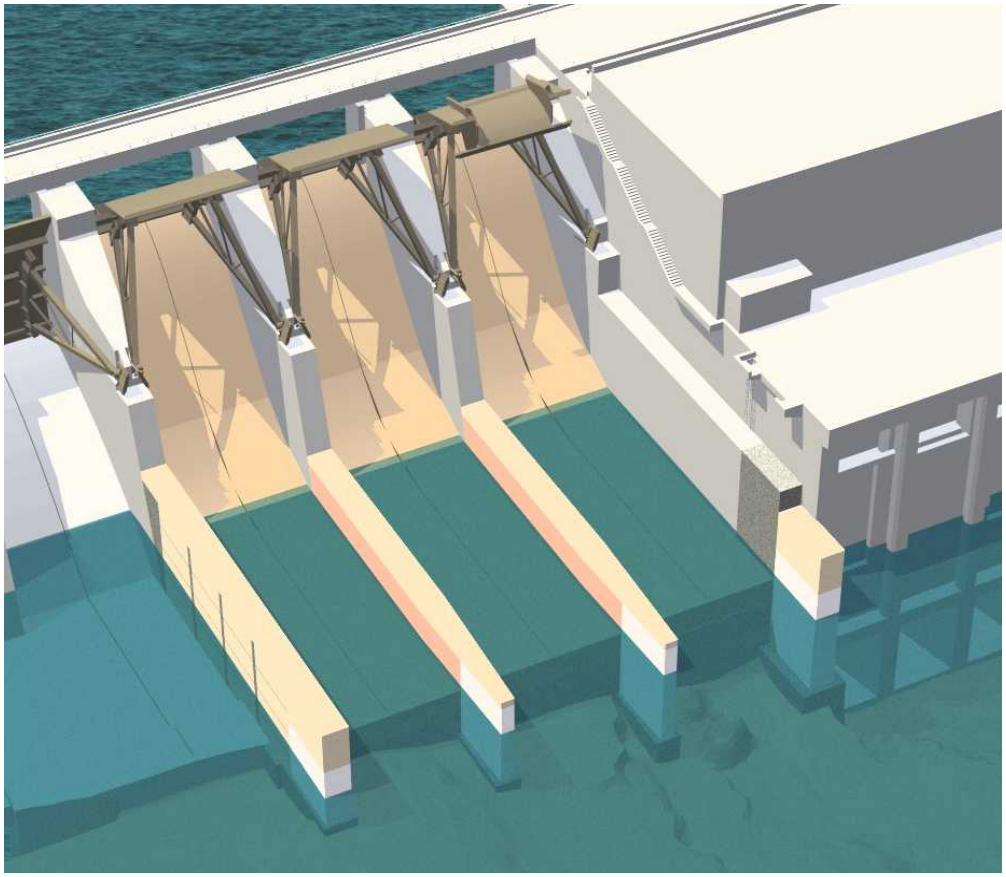

Figure 2. Graphic diagram of the Priest Rapids Fish Bypass (PRFB) showing the three bays (spill bays 20, 21 and 22, from left to right) next to the powerhouse.

4.0 Methods

4.1 Study Design

The acoustic tag study methods used to monitor tagged fish at the various detection sites in 2016 will be near parallel to those employed at Wanapum and Priest Rapids dams in 2014 and 2015 (Hatch et al. 2015), and similar to those employed in previous studies that were conducted in 2004 and 2006-2010 (Robichaud et al. 2005; Timko et al. 2007 and 2008; Sullivan et al. 2009; Timko et al 2010 and 2011). In 2016, minor modifications to detection array sites may occur, such as the addition of a site between White Bluffs and the Hanford Reach 1 site.

4.1.1 Task 1: Estimate Project Survival for Steelhead Smolts

The Priest Rapids Project passage survival will be estimated using the paired-release model, following the methods of Skalski et al. (2005). The general paired-release methodology of this particular study design will estimate Project survival in 2016 is similar to the survival and behavioral studies conducted at both developments in 2008, 2009, 2010, 2014 and 2015 (Skalski et al. 2009, 2010a, 2010b, and 2014). Paired releases of 1,800 run-of-river steelhead smolts will be collected and implanted with acoustic transmitters (JSATS tag, *Biosonics Telemetry Model L-AMT-2.1*) and released in the tailrace of Rock Island Dam (n=1,200) and Priest Rapids Dam (n=600) (Figure 3). There will be up to 28 replicates at each site (Table 1).

Figure 3. A map depicting the locations of Wanapum and Priest Rapids dams, along with each acoustic arrays and release locations in the mid-Columbia River, Washington proposed for 2016 juvenile steelhead acoustic tag study.

Table 1. Estimated number of steelhead smolts to be tagged and released by Grant PUD for the 2016 Wanapum and Priest Rapids dams' acoustic-tag study and tag life test.

Release Location	Steelhead
Rock Island Dam Tailrace	1,200
Priest Rapids Dam Tailrace	600
Tag Life Battery Tests	100
Total Tags	*1,900*

Similar to the 2014 and 2015 studies, the treatment group of study fish (released in the tailrace of Rock Island Dam) will be monitored at Sunland Estates (RM 428), Wanapum Dam (RM 416) and at two sites downstream of Wanapum Dam that were used during the 2014, 2010, 2009, 2008, 2007 and 2006 studies; one of these near Mattawa at RM 408 and the other at Priest Rapids Dam (RM 397) (Figure 3). Additional arrays will be located downstream of Priest Rapids Dam to be used in estimating Project survival.

Consistent with the 2014 and 2015 studies, the Rock Island tailrace release (treatment group) and the Priest Rapids Dam tailrace release (control group) of study fish will be monitored at a number of unique sites downstream of Priest Rapids Dam; at Vernita Bridge (RM 388), White Bluffs (RM 370), Wooded Island (RM 355, new proposed location), Hanford 1 (RM 339) and Hanford 2 (RM 327, adjusted to location below the confluence of the Yakima and Columbia rivers) (Figure 3). The Vernita Bridge array will remain located 9 miles downstream from Priest Rapids Dam, and the White Bluffs site will be 28-30 miles downstream. The furthest downstream arrays, Wooded Island (newly proposed site), Hanford 1 and Hanford 2, will be located at approximately 44, 58, and 70 river miles, respectively, downstream of Priest Rapids Dam, which will be used to monitored paired-release survival of juvenile steelhead at these locations in 2016.

The majority of array configurations in 2016 will be identical to 2014 and 2015 detection site locations, with the exception of the last three (final) detection arrays in the Hanford Reach, specifically Wooded Island and Hanford 2. Detection array adjustments are being made in 2016 to better understand where the handling effects of control fish, which are released in the tailrace of Priest Rapids Dam, are no longer being expressed and both treatment and control fish are experiencing the same paired conditions to evaluate Project survival (Skalski et al. *in progress*). Logger deployment at each in-river locations will consist of four receivers that will be aligned perpendicular to flow in overlapping detection ranges (Hatch et al. 2015). The Wanapum and Priest Rapids dam forebay configurations are the only exceptions; these will be similar to the 2015 array configurations (Hatch et al. *in progress*) (Figure 4).

To verify the operating life of the tags, a battery-life test of approximately 50 tags per tag lot will be conducted; the manufacturer, Biosonics Telemetry, anticipates that there will be two lots and therefore a total of 100 tags will be used in the tag battery life testing. These tags will be held in continuously cycled river water in a holding tank, maintained at ambient river temperatures to simulate environmental conditions consistent with the methods used in 2014 and 2015 (Hatch et al. 2015).

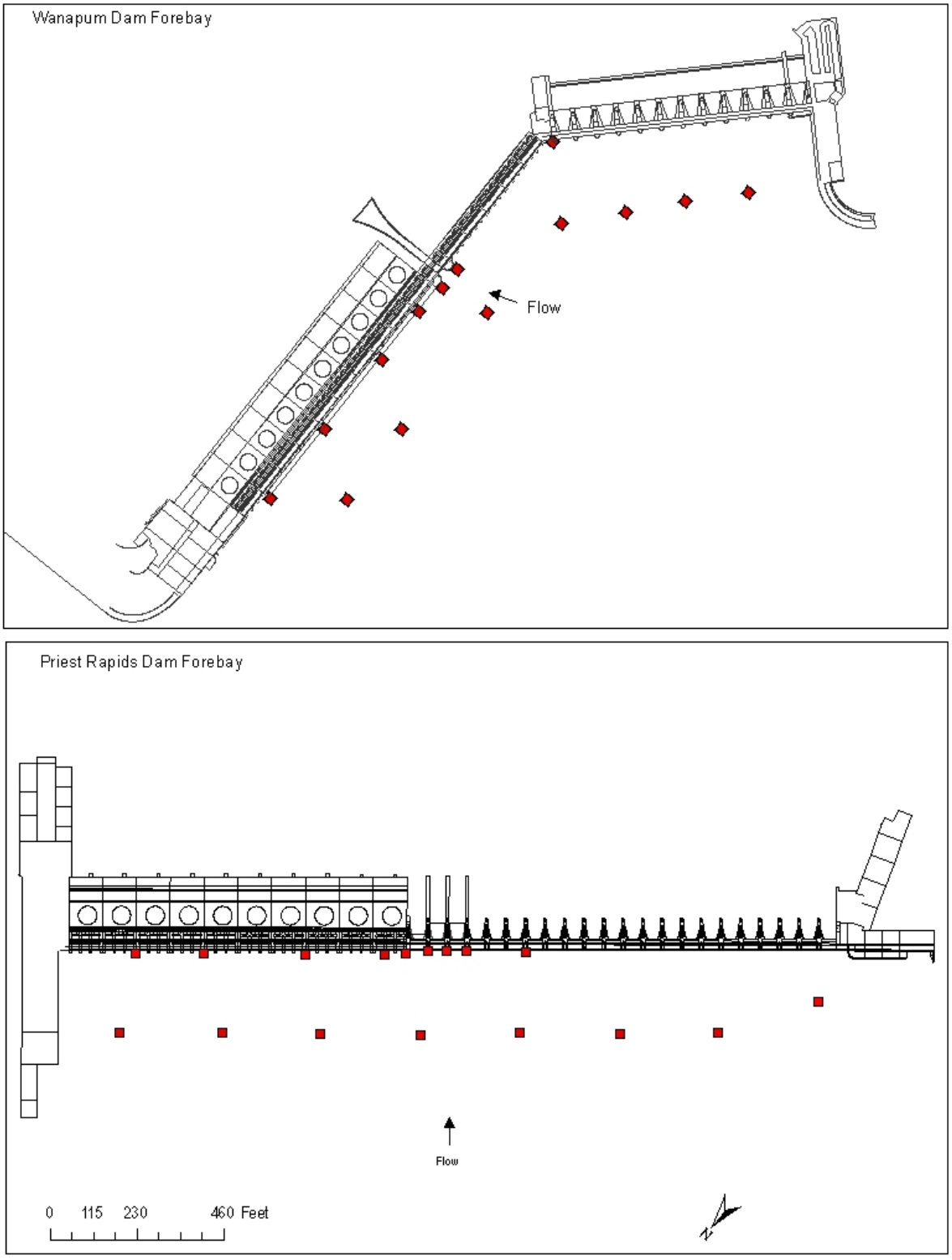

Figure 4. Wanapum (top) and Priest Rapids (bottom) dams with accompanying proposed acoustic receiver (red dot) configurations for 2016 study (images do not include boat restricted zone, BRZ, detection arrays).

4.1.2 Task 2: Estimate fish passage efficiency (FPE) through the bypass and any other non-turbine passage route and route-specific survival for steelhead smolts at Wanapum and Priest Rapids dams

The Fish Passage Efficiency (FPE) at the WFB and PRFB will be determined using the methods employed in 2014 and 2015; following individual route passage assignments, proportions per route can be identified and FPE estimated. Route-specific survival will follow the methods from Skalski et al. (2005), where survival will be individually estimated for the powerhouse, spillway, and surface bypass and associated in a relative comparison (Skalski et al. 2014).

4.1.3 Task 3: Estimate Migration Rate, Detection Efficiency, and Arrival Distribution of Downstream Migrants

The migration rates, detection efficiencies, and arrival distributions of downstream migrating steelhead smolts will be estimated for Wanapum and Priest Rapids dams similar to Hatch et al. (2015) and other previously conducted acoustic telemetry studies.

4.1.4 Task 4: Continue supporting the evaluation of avian predation impacts through the recovery of PIT tags at avian nesting colonies on the Mid-Columbia Plateau with collaborative efforts between Grant PUD and Real Time Research in conjunction with NOAA Fisheries, USGS-Oregon Cooperative Fish and Wildlife Research Unit, and Oregon State University.

All study fish will be double-tagged with an acoustic tag (JSATS) and a passive integrated transponder (PIT) tag. Post-nesting season, Caspian tern colonies at Goose Island (Potholes) and Crescent Island (McNary forebay) and other colonies determined by RTR and OSU will be scanned for PIT tags deposited during the 2016 nesting season. Any detected PIT tags will be compared back to the master list of PIT tags released during this study. Additionally, by using acoustic tag detection histories, a "last detect" will be used to determine the approximate stretch of river within the Project where the predation event likely occurred.

4.2 Acoustic-Tag Receiver System Design

Teknologic Model 10967 Autonomous Receivers will be used to monitor and record the presence of acoustic tagged fish. At each of the dams and 'in-river' arrays, offshore acoustic receivers will be deployed from research boat and anchored to the river bottom with specialized concrete anchors. The anchors will be held by a metal ring to which will serve at the connection/release point for acoustic releases. Acoustic releases (*InterOceans Systems Model 111*) will be positioned between the concrete anchors and the autonomous receivers. Upon completion of the study, or during in-season data collection, a unique acoustic signal will be broadcast (*InterOceans Systems Model 1100E Acoustic Command and Ranging Unit*) to each acoustic release device. This will trigger each device to release from the anchors and float to the surface for recovery. Acoustic receivers will be collected and subsequently downloaded.

4.2.1 Acoustic Transmitters

Consistent with the 2014 and 2015 studies, the same Lotek *Model L-AMT-1.421* JSATS acoustic transmitter (11.1 x 5.5 x 3.7 mm, 0.42 g in air, three second burst), and Biomark 12 mm PIT tag, will be surgically implanted into run-of-river steelhead smolts. After tags are systematically selected from each manufactured tag lot and randomized for the tag life study, the remaining tags will be mixed and randomly selected from for the duration of the study.

4.3 System Deployment

The JSATS Autonomous Receiver systems and equipment require installation and field testing at each site. Contractor will be responsible for these installations with the assistance of Grant PUD personnel. The installation of some of the hydrophones will require Grant PUD mechanics and divers.

4.4 Fish Handling

4.4.1 Fish Collection and Holding

Tagging of the study fish will be conducted by LGL Limited (LGL, a sub-contractor to Blue Leaf); LGL will handle, tag, hold and release all study smolts. Fish collection, handling and tagging will follow the procedures employed during the 2008-2010, 2014 and 2015 acoustic-tag tracking studies conducted at Wanapum and Priest Rapids dams (Sullivan et al. 2009, Timko et al. 2010, Timko et al. 2011, Thompson et al. 2012, Hatch et al. 2015). Each day test fish will be salvaged from the powerhouse gatewell slots through "gatewell dipping" operations conducted by Grant PUD crews. All gatewell dipped fish will then be transported by truck to the west bank of Wanapum Dam for sorting. Individual fish will be accepted for tagging based on a number of pre-determined acceptance/exclusion criteria outlined by the Columbia Basin Surgical Protocol Steering Committee (USACE 2011). These criteria are as follows:

Fish accepted if it:

- Is a steelhead,
- Fork length is between 95 – 210mm fork length,
- Has an intact or clipped adipose fin,
- Is not previously tagged with a coded wire, elastomer, PIT, or acoustic tag, and
- Fish weight >15.6 g (tag to body weight ratio, tag burden, is less than 3%).

Fish excluded if it:

- Is a non-target species
- Has moribund or emaciated
- Shows signs of prior tagging (e.g. radio, acoustic, PIT-tags)
- Indicates a positive reading when read with a PIT-tag reader
- Has malformations such as spinal deformities
- Exhibits descaling >20% on any side of body
- Has physical injuries severe enough to impede performance, such as: opercula damage, exophthalmia, eye hemorrhages (>10% of eye), head or body injuries, or fins torn away from body and/or extreme erosion
- Shows evidence of infections; symptom include: fungal infections on body surface, gill necrosis, open lesions on body or fins, swollen body, ulcers, or copepod parasites on the eyes or gills (>25% coverage)

After initial sorting in a light MS-222 solution by species, size, and physical condition, selected fish will be held in recirculating ambient river water for 24 hour prior to surgery. Fish will not be fed while being held.

4.4.2 Tagging

The surgical implantation procedures used will be based on the methods outlined in Adams et al. (1998) and Liedtke et al. (2012a, 2012b) that were used during the acoustic-tag studies at Wanapum and Priest Rapids dams conducted in 2008-2011, 2014 and 2015 (Sullivan et al. 2009; Timko et al. 2010; Timko et al. 2011; Thompson et al. 2012;

Hatch et al. 2015). LGL Limited, a subcontractor of Blue Leaf, will complete all fish handling, care, and surgical implantation of study fish.

Immediately before surgery, fish will be transferred to an anesthetic bath containing tricaine methanesulfonate (MS-222, 60-80 mg/L) until equilibrium is lost. Anesthetized fish will be measured to the nearest millimeter and weighed to the nearest tenth of a gram before being placed on a Plexiglas surgical table. The surgical table will be soaked with Stress Coat (*Aquarium Pharmaceuticals, Inc. Chalfont, PA*) to minimize scale loss and maintain the exterior mucous coat. Fish will be placed ventral side up on the surgical pad, and their gills will be continuously flushed with anesthetic solution fed through a tube placed in the mouth of the fish. About 1 min prior to completion of surgery, the flow of anesthetic solution will be replaced with fresh river water to start the recovery process. River water supplied from within the fish ladder entrance will serve as the water source during tagging operations.

To implant the transmitter in the fish, an incision will be made 3 mm away from and parallel to the mid-ventral line starting about 3 mm anterior to the pelvic girdle. The incision will be only deep enough to penetrate the peritoneum (Adams et al. 1998). The transmitter will be implanted with the transducer (the ceramic tip of the tags) pointing towards the head of the fish. Tags will be positioned horizontally directly under the incision. The incision will be closed with interrupted, absorbable sutures evenly spaced across the incision. Surgical equipment will be disinfected with a diluted germicidal solution after each fish.

4.4.3 Post-Tagging Recovery

Immediately after surgery, tagged fish (2 fish per bucket) will be moved to 5 gal oxygenated recovery buckets where they will be monitored until they gain equilibrium and begin regular swimming and breathing movements. Recovery buckets will then be placed on shelves in a recovery room, adjacent to the tagging trailer. Each bucket will have an opening in the lid that allowed for continuous water flow, and a PVC overflow spout. Dissolved oxygen and water temperature will be measured twice a day. The recovery room will be supplied with two redundant pumps in case of pipe blockage in one. Water flow to the recovery buckets will be checked at least twice a day.

Approximately 24 hr. after tagging, the tagged fish will be moved into fly tanks supplied with ambient river water. The steelhead will be released via these fly-tanks. There is an external "fin", and the bottom of the tank is sloped towards an outflow hole (in order to ensure that fish slide from the tank upon release). Fish will be held in the fly tanks for several hours, up until their release into the river; when ambient river water is not be circulated through the tanks then supplemental oxygen will be provided.

4.4.4 Release Procedures

Approximately 2 hr. prior to departure from the Wanapum Dam holding site, DO and water temperature will be measured in the fly tanks. Measurements will be taken immediately before and immediately after the tagged fish are transferred into the fly tanks. Acoustic tags in all release groups will also be monitored for failure rates prior to departure for release.

For all releases, water flow to the fly tank will be shut off 10 min prior to departure. An oxygen tank, attached to each fly tank will provide oxygenation to the water during transport. Fly tanks will be attached to a helicopter by a long cable, and will be transported to their release site. The helicopter will lower the fly tank to within about 1 m of the water, and will trigger a release mechanism that will open a valve near the bottom of the fly tank, causing the fish to pour out into the river. It will take approximately 60 sec for the fly tank to be emptied into the river.

4.5 Data Analysis

Upon completion of the study migration period, detection data from recovered receivers will be downloaded via the JSATS vendor's software and be used to create export files which will be uploaded to the Grant PUD project SQL Server database. Once the data is on the SQL Server, duplicate or false records (i.e., acoustic noise) will be filtered

using the methods outlined by Thompson et al. (2012) and the detection data will then be loaded into tables and evaluated for accuracy. Some quality control validations for steelhead smolt positive detections will include multiple data validation procedures based off of the US Army Corps of Engineers protocols used ubiquitously in JSATS research. Quality control will also include evaluating normal downstream movement versus other movement (i.e. upstream movement), and identifying recaptured smolts (fish that were released, traveled through the Priest Rapids Reservoir, and then were recaptured via gatewell dipping at Priest Rapids Dam and transported to back to the Wanapum sorting facility).

4.6 Statistical Analysis

Statistical analysis support will be provided by Dr. John Skalski and will consist of the tasks that are described below. The intent of these tasks is to provide integrated statistical support from study design through data analysis, and interpretation of results. These tasks will be coordinated with the field efforts of consultants and Grant PUD.

The statistician will perform the actual survival analysis using a modified Cormack-Jolly-Seber analysis to estimate project survival using the acoustic-tag data (Cormack 1964, Jolly 1965, Seber 1965). Tests of model assumptions will be performed. Standard errors and confidence intervals will be provided for the estimated parameters. Estimates will be provided for each of the replicate release-pairs along with modeling to identify the most parsimonious (and most precise) model that adequately describes the data. Seasonal average will be computed along with associated standard error. Tests of assumptions will be based on Burnham tests 1-3 (Burnham et al 1987) along with Chi-square tests of mixing. Between year comparisons of survival estimates will be performed.

4.7 Report Preparation

The report based on the study described above will be written for Grant PUD. The report will address steelhead survival and behavior at each of the dams and throughout the Project (Tasks 1-4 above).

5.0 Responsibilities

5.1 Consultant Responsibilities

- Responsibilities will include collection of acoustic-tag data, data processing and analysis, and reporting.
- Direct the installation and retrieval of the autonomous receiver systems.
- Provide primary boat support for offshore receiver interrogations and secondary boat support for offshore receiver deployment and demobilization.

5.2 Grant PUD Responsibilities

- Grant PUD will provide equipment, software, material, services, and other support for the completion of this project to the extent; in a manner similar to provisions made during the course of Grant PUD's spring 2004, 2006–2011, 2014 and 2015 acoustic-tag studies.
- Grant PUD will supply personnel to perform the physical deployment and retrieval of autonomous receiver systems. Grant PUD will supply all divers, cranes, and mechanics required to deploy forebay systems.
- Grant PUD will provide primary boat support for offshore receiver deployment and demobilization.
- Grant PUD will supply office trailers to house JSATS-tag system electronics, computers, and personnel.

- Grant PUD will provide turbine and spill operational data for Wanapum and Priest Rapids dams for the data collection study period to consultant in a timely manner.
- Grant PUD will contract separately with Dr. John Skalski (Columbia Basin Research, University of Washington) for the statistician required for this study.

6.0 Schedule

The study described above will be conducted in the spring of 2016. It is anticipated that system deployment will begin as early as February and will be completed by April 15, 2016.

For the Project survival study, it is anticipated that releases of tagged fish will occur from approximately May 1 to June 1, further refinement of the release schedule is still pending actual run-timing. Data collection will occur until approximately June 25, 2016.

A draft report, including methods and results, is anticipated to be presented to Grant PUD by December 15, 2016. Once comments are received from Grant PUD and the PRCC on the draft report, within 60 days a final report will be provided to Grant PUD.

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