AFTER THE FACT
BIOLOGICAL ASSESSMENT

RELATED TO

IMPLEMENTATION OF AN INTERIM FISH PASSAGE OPERATION PLAN IN RESPONSE TO WANAPUM DAM FRACTURE AND RESULTING EMERGENCY DRAWDOWN OF WANAPUM RESERVIOR

Grant County, Washington
Upper Columbia Entiat – 17020010 HUC

Spring Chinook Salmon – Upper Columbia River ESU
Steelhead – Upper Columbia River DPS
Bull Trout – Columbia River DPS

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1.0 Introduction

The purpose of this Biological Assessment (BA) is to address the effects of the Wanapum Reservoir drawdown, implemented as a result of the emergency response (response) to the fracture discovered on spillway monolith 4 at Wanapum Dam, on fish species listed as threatened or endangered under the federal Endangered Species Act (ESA) of 1973. This BA also addresses the potential effects of the project on listed fish Critical Habitat and on Essential Fish Habitat (EFH) as designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1996.

This BA, prepared by Public Utility District No. 2 of Grant County, Washington (Grant PUD) addresses the response according to the standards of Section 7(c) of the ESA, as amended, and in compliance with Section 305(b)(2) of the MSA, as amended by Public Law 104-267. Section 7 of the ESA assures that, through consultation (or conferencing for proposed species) with the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) - National Marine Fisheries Service (NMFS), federal actions do not jeopardize the continued existence of threatened, endangered, or proposed species, or result in the destruction or adverse modification of designated or proposed Critical Habitat.

Section 7 consultation is accomplished, in part, through this BA, which evaluates the potential effects that the response had on species listed under the federal ESA. Conservation measures identified in this BA were immediately implemented during the response to avoid or minimize adverse effects of the response on listed or sensitive species and their habitat.

This BA utilized methods outlined in *"Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale"* (NMFS 1996). These methods were used to analyze project effects on bull trout as well, given similarities to the USFWS methods for determinations of effect for bull trout, outlined in *"A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale"*. The method of analysis used in this BA is to determine the environmental baseline for the action area, discuss how the emergency response will affect the environmental baseline, and then use that information to arrive at a determination of effect.

Information contained in this document pertaining to the response and potential impacts was collected through studies and evaluations, field observations, direct interactions with NMFS and USFWS staff, members of the Priest Rapids Coordination Committee[1] (PRCC), interested stakeholders, internal project teams, site visits, telephone calls, and electronic mailings. Existing information on species was reviewed for those species potentially affected by the response.

NMFS, USFWS, the PRCC, and interested stakeholders conducted numerous site visits to the response area during 2014 to determine if the implemented measures to pass adult salmonid, steelhead, bull trout and other fish species through the fish ladders at Wanapum Dam were successful. Grant PUD, Blue Leaf Environmental Inc. (Blue Leaf), Environmental Assessment

[1] Priest Rapid Coordinating Committee members include representative from the National Marine Fisheries Service, United States Fish and Wildlife Service, Washington Department of Fish and Wildlife, Yakama Nation, Confederated Tribes of the Colville, Confederated Tribes of the Umatilla Reservation and the Public Utility District No 2 of Grant County, Washington.

Services (EAS) and others conducted evaluations to determine potential impacts on ESA-listed species and their habitat (water quality, survival evaluations, etc.).

1.1 Project Description and Location

Grant PUD owns and operates two hydroelectric dams on the Columbia River (Figure 1); Wanapum and Priest Rapids, known collectively as the Priest Rapids Project, and is operated under the terms and conditions of the Federal Energy Regulatory Commission (FERC) Hydroelectric Project License No. P-2114 issued by FERC on April 17, 2008.

Grant PUD operates the Project through the coordinated operation of the seven-dam system of the mid-Columbia River and other Columbia Basin entities with current operational agreements with the fishery agencies, tribal representatives and other operators to provide protection and improvement for a range of fisheries and other resources within and downstream of the Project. These agreements include the Hanford Reach Fall Chinook Protection Program Agreement (HRFCPPA), the Hourly Coordination Agreement, and the Priest Rapids Project Salmon and Steelhead Settlement Agreement (SSSA).

The Project is also subject to the requirements of the FERC license and related laws and regulations, as well as to the requirements (incorporated by reference in the license) of the Biological Opinion (BiOp) for the Project issued by the NMFS for its effects on anadromous salmon, the Clean Water Act Section 401 Water Quality Certification (WQC) issued by the Washington State Department of Ecology (WDOE), and the BiOp for the Project issued by the USFWS regarding the effect of the Project on bull trout.

The response occurred within the geographical ranges of the Upper Columbia River (UCR) steelhead (*Oncorhynchus mykiss*) evolutionarily significant unit (ESU) and the UCR spring-run Chinook salmon (*O. tshawytscha*) ESU, along with the Columbia River bull trout (*Salvelinus confluentus*) distinct population segment (DPS). UCR steelhead were listed by the NMFS (now known as NOAA Fisheries) as endangered under the ESA on August 18, 1997 (62 FR 43937), with their status downgraded to threatened on January 5, 2006 (71 FR 834); which was then reinstated to endangered status per a United States District Court decision in June 2007. Critical habitat for this ESU was published on September 2, 2005 (70 FR 52630) with an effective date of January 2, 2006 and includes the project areas. UCR spring-run Chinook salmon were listed as endangered on March 24, 1999 under the ESA (56 FR 14308), with its endangered status reaffirmed on June 28, 2005 (70 FR 37160). Critical habitat for this ESU was published on September 2, 2005 (70 FR 52630) with an effective date of January 2, 2006 and includes the project areas. The USFWS published the final rule in the Federal Register on November 1, 1999 to list the Columbia River bull trout in the coterminous United State as threatened (64 FR 58909). Critical habitat for this DPS was published on October 6, 2004 (69 FR 59995) with an effective date of November 5, 2004, although it did not include the project area.

On January 14, 2010, the USFWS proposed to revise its 2005 designation of critical habitat for bull trout, a threatened species protected under the ESA. In total, the USFWS proposes to designate approximately 22,679 miles of streams and 533,426 acres of lakes and reservoirs in Idaho, Oregon, Washington, Montana and Nevada as critical habitat for this wide-ranging fish. The proposal includes 985 miles of marine shoreline in Washington. The proposed revision is the result of extensive review of the earlier bull trout critical habitat proposals and 2005 designation, public comments and new information. The Service voluntarily embarked on this re-examination of the previous determination to ensure the best science was used to identify the features and

areas essential to the conservation of the species. Bull trout depend on cold, clear water and are excellent indicators of water quality. Protecting and restoring their habitat aids in maintaining the water quality of rivers and lakes throughout the Northwest.

Table 1 Summary of Listed Fish Species Included in this Consultation

Species	Scientific Name	Population(s)	Federal Status	Designated Critical Habitat	Potential Site Use
Spring Chinook salmon	*Oncorhynchus tshawytscha*	Upper Columbia River ESU	Endangered[1]	Columbia River	Rearing and Migration
Summer Steelhead	*Oncorhynchus mykiss*	Upper Columbia River DPS	Threatened[2]	Columbia River	Rearing and Migration
Bull trout	*Salvelinus confluentus*	Columbia River DPS	Threatened[3]	Proposed	Migration, Foraging, Overwintering

Sources: NMFS (2010); StreamNet (2010a,b)
[1]70 FR 37160, [2]74 FR 42605, [3]63 FR 31647

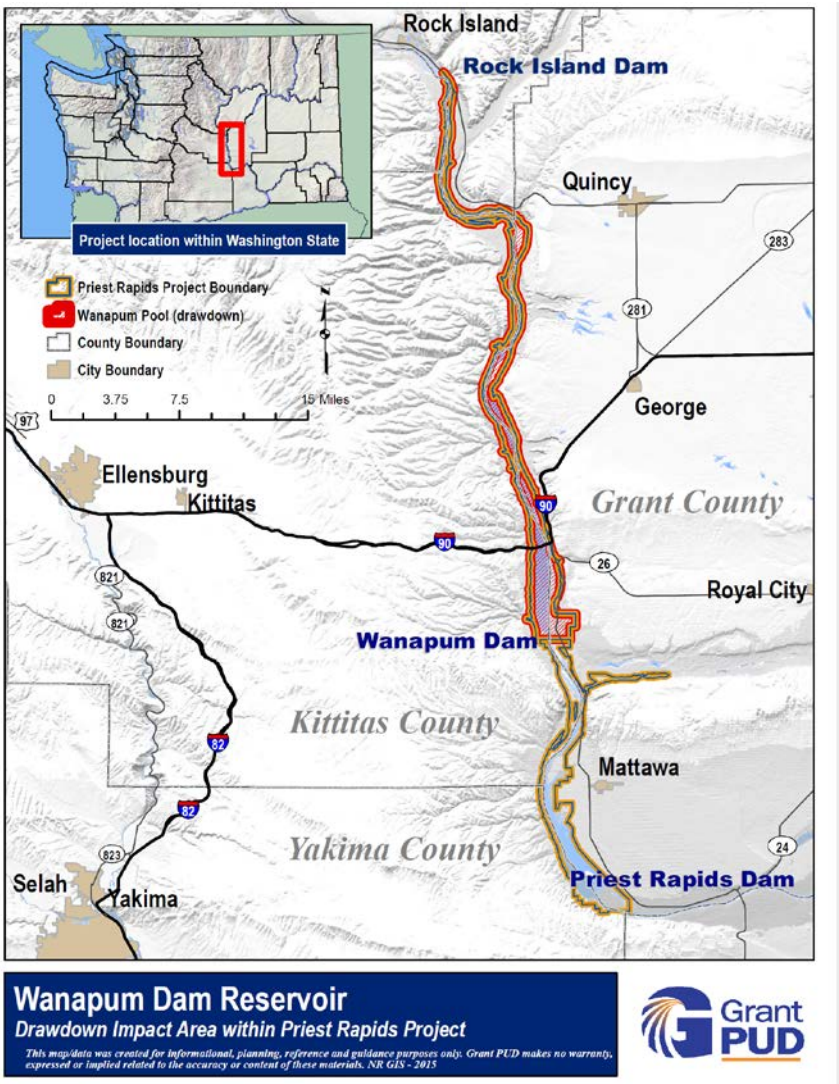

Figure 1 Priest Rapids Project Area

1.1.1 Priest Rapids Development

The Priest Rapids development was completed in 1961 and is located at river mile (RM) 397 of the Columbia River (Figure 2). The dam consists of both earth embankment and concrete sections that span about 10,103 feet across the river channel, and impounds 18 miles of river with a gross reservoir storage capacity of 237,100 acre-feet (48,600 acre feet of active storage) and a surface area of 7,725 acres at a normal maximum pool elevation of 488.0 feet above mean sea level (msl). The forebay has a normal operating range of 7.5 feet (481.5- 488 feet above msl). The powerhouse contains 10, vertical shaft, 6-blade adjustable Kaplan turbines with a total nameplate generation capacity of 955.6 MW. Total powerhouse hydraulic capacity is roughly 175,000 cubic feet per second (cfs). The spillway has a total hydraulic capacity of 1,400,000 cfs and consists of 19 gated (tainter gates) ogee weir spill bays, and a fish bypass (Priest Rapids Fish Bypass; PRFB). The PRFB is designed to operate at a fixed flow volume of 26 kcfs, with exact flow volume determined by forebay elevations.

Adult fish passage at Priest Rapids Dam is provided via two ladders, one on the right bank and one on the left bank. The left bank fishway consists of a powerhouse adult fish collection channel connected to the left main entrance and ladder, and an off-ladder trapping and handling facility. The right bank ladder is located adjacent to the west end of the spillway. Both ladders contain video fish counting facilities and passive integrated transponder (PIT) tag detectors. Downstream migrants (i.e. juveniles, adult fallbacks and steelhead kelts) pass Priest Rapids Dam either through the turbines, PRFB and spillway (including sluiceway); or are collected from the gatewells, transported around the dam and released in the tailrace or via the PRFB.

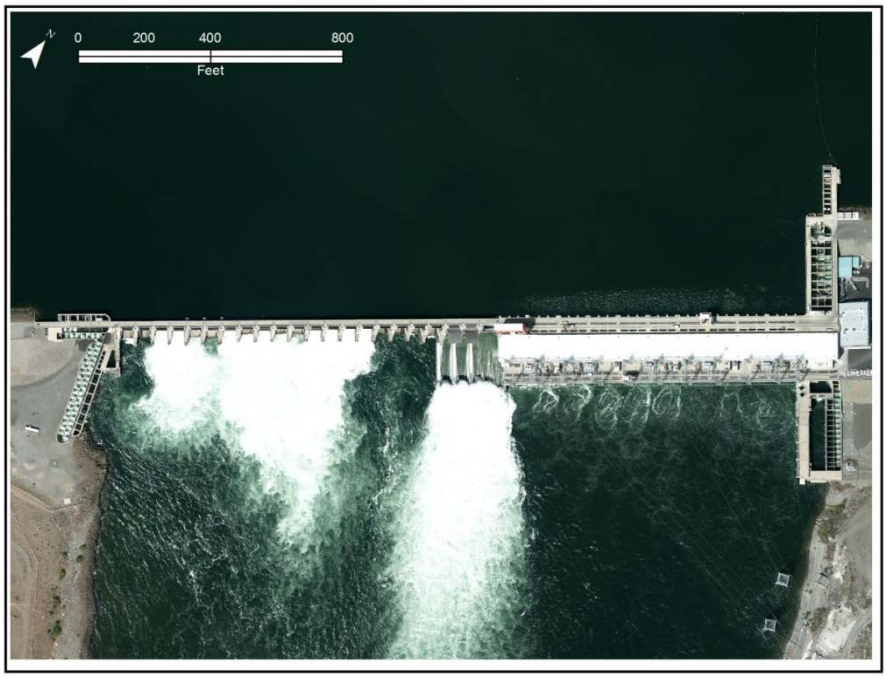

Figure 2 Priest Rapids Dam located on river mile 397 on the mid-Columbia River, owned and operated by Grant PUD.

1.1.2 Wanapum Dam Development

Wanapum Dam was completed in 1964 and is located on the Columbia River at RM 415 (Figure 3). The dam consists of both earth embankment and concrete sections that span about 8,637 feet

across the river channel. The dam impounds 38 river miles, creating a gross reservoir storage capacity of 693,600 acre-feet and a surface area of 14,680 acres at a normal maximum pool elevation of 571.5 feet above msl. The forebay has a normal operating range of 11.5 feet (560-571.5 feet above msl). The powerhouse encloses 10 turbine bays with vertical shaft, 5-blade adjustable Kaplan turbines. However, Grant PUD completed replacement of all 10 turbines with new, 6-blade adjustable advanced turbines in October 2013. The current generation capacity is about 1,038 MW and the total powerhouse hydraulic capacity is around 180,000 cfs. The spillway has a total hydraulic capacity of 1,400,000 cfs and consists of 12, gated ogee weir spill bays, one top-spill sluiceway and fish bypass.

The upstream fish passage facilities at Wanapum Dam consist of two fish ladders (left and right bank), entrance channels, and attraction water facilities. The ladders consist of a series of 10 foot long pools. Each pool is one foot higher than the preceding pool, from tailwater to forebay, yielding a slope of one to ten. The ladders are 16 feet wide with 6 feet high fixed weirs separating the pools. Each fixed weir has two five-foot-wide overflow sections separated by a six-foot-wide non-overflow section and two 18 inch square submerged orifices at the base. Water flow down each ladder is 70 cfs, consisting of 40 cfs over the weirs and 30 cfs through the orifices. Migrating fish may either swim over the top of the weir or through the orifices. Both ladders contain video fish counting facilities and PIT tag detectors (2014 only). Downstream migrants (i.e. juveniles, adult fallbacks and steelhead kelts) pass Wanapum Dam through the turbines, the spillway (including sluiceway), or the Wanapum Fish Bypass.

Figure 3 Wanapum Dam located at river mile 416 on the Mid-Columbia River owned and operated by Grant PUD.

2.0 Emergency Drawdown Background

On February 24, 2014, a Grant PUD employee made an observation that appeared to indicate movement in the area of monolith No. 4 of the spillway of Wanapum Dam. After assessment of the situation, a horizontal fracture was discovered in the spillway monolith No. 4 at Wanapum Dam. Initial calls were made to NMFS and USFWS on February, 28, 2014 informing them of the

developing fish passage issues at Wanapum Dam and concerns related to the developing situation at Wanapum monolith spillway 4.

FERC issued a letter designating Grant PUD as the non-federal representative for ESA purposes. On March 21, 2014, Grant PUD filed an Interim Fish Passage Operations Plan (IFPOP) for the Project to address and provide for upstream passage for adult salmonids, steelhead, bull trout and Pacific lamprey through or around the Project. The IFPOP was developed in consultation with the NOAA Fisheries, USFWS, and the PRCC. FERC issued an order approving the IFPOP on March 26, 2014, and required Grant PUD to file monthly reports that documented its consultation with the PRCC, tribal representatives, resource agencies and actions taken. Grant PUD filed Interim Operation Status reports with FERC on May 1, June 6, September 12, 2014 and November 21, 2014.

Grant PUD, in consultation with NOAA Fisheries and the PRCC, modified planned juvenile steelhead and yearling Chinook survival and behavior evaluations that were scheduled to occur within the Wanapum Reservoir during the spring of 2014. This evaluation modification allowed Grant PUD, NOAA Fisheries and the PRCC to collect information on survival of juvenile steelhead and yearling Chinook migrating through the Wanapum Reservoir and route-specific structures of Wanapum Dam (turbines, bypass and spillway). Grant PUD also collected water quality data and conducted field based surveys to determine the potential of stranded and/or entrapped fauna (Tiller 2015).

Throughout the response, Grant PUD conducted informal and expedited consultation under the emergency provisions of Section 7 of the ESA and adaptively managed the refinement and implementation of the IFPOP in consultation with the NOAA Fisheries, USFWS and the PRCC throughout 2014 and the first quarter of 2015.

Over the course of response, Grant PUD convened and/or hosted approximately 84 site visits, conference calls and/or meetings. Specific details on the consultation record can be reviewed in the status updates that were provided to FERC in accordance with ordering paragraph (B) of the March 26, 2014 Order approving the IFPOP (Appendix E). Details on temporary fish ladder modifications and implementation of the IFPOP and other information necessary to support this BA are included in section 3.1 below.

On November 25, 2014, Grant PUD initiated a partial refill of the Wanapum Reservoir, and reached the target elevation of 562 feet msl on December 1, 2014. The operational range of Wanapum Reservoir at this time was 558-562 feet above msl, while repairs to the Wanapum Spillway continued. In anticipation of the partial refill, Grant PUD removed the temporary Fishway Passage Systems (WFEPS) from both the left bank (LB) and right bank (RB) fish ladders at Wanapum Dam. As of December 1, 2014, normal fish passage was restored at Wanapum Dam. Grant PUD also removed the temporary modifications implemented to support the trap and transport program for adult salmonids, steelhead and bull trout at the Priest Rapids Off Ladder Adult Fish Trap (OLAFT).

On January 30, 2015, Grant PUD filed a letter with FERC indicating it believed the emergency response that occurred throughout 2014 and in the first quarter 2015 will have passed by May 1, 2015, and therefore requested that FERC determine that implementation of the IFPOP be discontinued on May 1, 2015. FERC issued and Order on March 19, 2015 approving Grant PUD's request to discontinue the IFPOP and made it effective immediately.

On March 16, 2015, Grant PUD initiated the final refill of the Wanapum Reservoir, and reached the target elevation of 569 feet above msl on March 21, 2015. Although 569 feet above msl was still 2.5 feet short of the normal operating maximum pool elevation range, it was necessary due to the presence of a caisson along a portion of the spillway. Once the caisson was moved on April 30, 2015, Grant PUD had full use of its full operating range up to 571.5 feet above msl.

2.1 Implemented Actions

On February 24, 2014, a Grant PUD employee made an observation that appeared to indicate movement in the area of monolith No. 4 of the spillway of Wanapum Dam. After assessment of the situation, Grant PUD initiated its Emergency Action Plan (EAP; level B) and began to draw the Wanapum Reservoir down in a steady controlled state. Calls were made to NMFS and USFWS on February 28, 2014 informing them of developing fish passage issues at Wanapum Dam.

On March 2, 2014, Grant PUD fisheries staff conducted fish removal and salvage activities within the Wanapum right bank ladder in anticipation of the ladder becoming inoperable. The Wanapum LB ladder was previously dewatered for routine annual maintenance. By March 4, 2014, the Wanapum Reservoir had been lowered to a safe operating elevation range between 545 feet and 541feet msl. As a result of the drawdown, the fish ladder exits at Wanapum Dam were dewatered, preventing upstream migrating fish from passing Wanapum Dam. Both fish ladders at Priest Rapids Dam were operational and were not impacted as a result of the Wanapum Reservoir drawdown.

Sections 2.1.1 through 2.1.7 below provides a description of the response that Grant PUD implemented in consultation with NOAA Fisheries, USFWS, the PRCC and other stakeholders. Specific responses to facilitate the upstream migration of adult salmonids, steelhead, bull trout and Pacific lamprey include; the monitoring and evaluation of adult salmonid passage measures effectiveness; modifications of the OLAFT; a trap and transport program; juvenile salmonid survival through the Wanapum reservoir and at Wanapum Dam; stranding and entrapment survey; as well as water quality and conservation measures.

2.1.1 Wanapum Fish Exit Passage System

The Wanapum Left-Bank Fishway Exit Passage System (LB-WFEPS) was placed in operation on April 15, 2014, while the right bank ladder was fully operational on April 26, 2014 (Figures 4-6). The modifications made to both the Wanapum left and right bank fishway exits required the installation of weir boxes fabricated from steel plating and members to an overall size of 16 feet x 7 feet x 7.33 feet. The weir boxes were installed near the exit of each ladder and were supplied with approximately 40 cfs of water via four 90 horsepower (hp) electric submersible pumps in the forebay at each ladder (n=8). The weir boxes had a false weir designed to attract fish from the ladder pools, and lamprey passage plates were added on either side of the weir to facilitate adult lamprey passage.

The weirs directed approximately 90% of the flow down the fish ladder (approximately 35 cfs), while the remaining 10% of the flow was used to provide water upstream for the fish exit flume (approximately 5 cfs). An adjustable weir was incorporated into the design to allow for the adjustment of water that was pumped into the fish ladder versus into the forebay flume.

All corners of the weir adjustment were radiused or bull-nosed to limit potential injury to adult fish as a result of sharp edges. Silicone was added to areas that were difficult to radius, or used to

fill in objectionable gaps. The flume was constructed of marine plywood and was surfaced with fiber reinforced plywood to reduce risk of injury. As originally designed, adult salmonids and other species exited the weir and entered the Wanapum forebay from a height of approximately 9–13 feet above water surface, depending on reservoir pool fluctuations (Figure 5).

In the forebay control section of the upper ladder, flow typically passes through two 18 inch x 38 inch orifices. Under the emergency operation both orifices in each weir wall remained in the open position. In the lower section of the ladder only a couple inches of water occurred over each weir, and both weir orifices were in the open position as they would be during normal operations. Historically, most fish have been shown to pass through the orifices in normal passage mode.

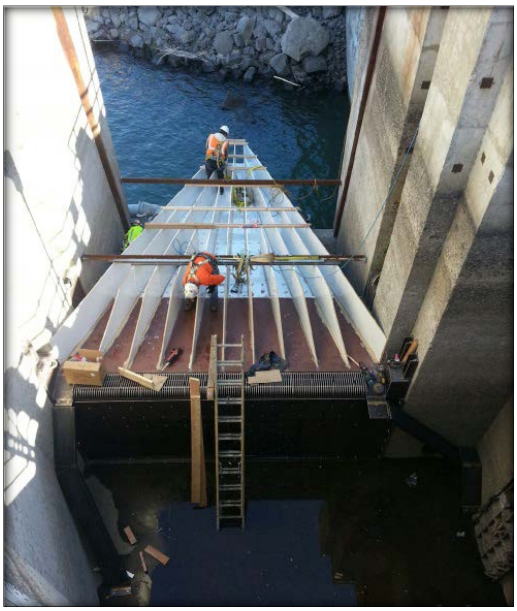

Figure 4 Construction activities related to the installation of the Wanapum Left Bank Fishway Exit Passage System.

Based on the recommendation of NOAA Fisheries, USFWS and the PRCC; Grant PUD installed spiral chutes, protective jump curtains, and lamprey plating at both the LB and RB-WFEPS. Installation of the left and right bank spiral chutes were completed on June 12 and June 19, 2014, respectively. The spiral chutes were installed to deliver fish passing the WFEPS closer to the water surface of the forebay (approximately 2-5 feet; Figure 7).

Protective jump curtains were installed to prevent fish from jumping out of the WFEPS (mainly adult sockeye salmon). The protective jump curtain included the installation of a poly-vinyl-rubberized curtain attached to the concrete at the top end and to the vanes at the bottom end for approximately an 8 foot portion of the WFEPS. The curtain was attached to the human access structure at the top of the handrail and the bottom of the walkway to create an area of fish jumping containment (Figure 8 and Figure 9). NOAA Fisheries, USFWS and the PRCC agreed and approved these modifications on May 19, 2014 (PRCC Meeting Minutes).

An approach ramp was installed at the LB-WFEPS to preclude potential jumping by adult salmonids (such as adult sockeye; Figure 10). The approach/anti-jump ramp was similar to the one that had been installed at the RB-WFEPS (June 12, 2014).

To facilitate adult Pacific lamprey passage at both the Wanapum left and right bank ladders, perforated plating was added to the upper four foot section of the false weir floor adjacent the lamprey plating, and vein walls of the LB and RB WFEPS to preclude adult lamprey from attaching to the top of the false weir and/or vane walls and returning into the false weir pool (Figure 9). Small water pumps, hoses, and nozzles were also installed on the left and right banks to provide a means to dislodge adult lamprey attached on the ramp.

Over the course of the emergency response, short-term outages occurred and were related to requests for modifications to the WFEPS from NOAA-Fisheries, USFWS, PRCC and Grant PUD, pump replacements, and/or cleaning of aquatic vegetation from pump intake screens. During these scheduled and non-scheduled outages, Grant PUD maintained one fishway in operation during these short-term outages.

In regards to the pump replacement, Grant PUD had to replace three (n=3) of the 90 hp electrical pumps over the course of the response (one at the LB-WFEPS and two at the RB-WFEPS). On the evening of July 28, 2014, a single pump at the LB-WFEPS began tripping an electrical breaker. After inspecting, the pump was reset and the system was back on line and continued to operate. After a dive inspection and further inspection (on July 29), it was determined that the pump needed to be replaced. The pump was installed and the LB-WFEPS was brought back into operation on July 31, 2014. Total outage time was approximately 20 hours. On the evening of September 16, 2014, a single pump at the RB-WFEPS failed and was replaced on September 17, 2014. The last pump replacement occurred on November 18, 2014. During both pump replacement activities outages were <20 hours.

Aquatic vegetation was also a major issue over the course of the response, plugging the intake screens on the 90 hp pumps located at the LB and RB-WFEPS (Figure 11). Over the course of the response, the LB-WFEPS had to be taken out of service on 34 separate occasions, while the RB-WFEPS was taken out of service for cleaning on 22 separate occasions. Outages generally lasted for <10 hours, which was the timeframe necessary from pump shutdown to the ladder being fully restored for fish passage.

During the cleaning process, one fish ladder remained in operation and continued to provide fish passage. The large number of outages was the result of an aggressive cleaning schedule implemented by Grant PUD. The LB-WFEPS pump screens were cleaned 3-4 times per week, while the RB-WFEPS pump screens are cleaned 1-3 times weekly. Grant PUD also conducted daily water level inspections and periodic underwater camera inspections to determine if debris buildup was occurring and if divers were necessary.

In preparation of the refill, Grant PUD informed NOAA Fisheries, USFWS, PRCC, Priest Rapids Fish Forum, Fall Chinook Working Group and external stakeholders on the PRCC-HCP biweekly briefings on November 14 and November 17, 2014 (respectively) that it would begin to remove the WFEPS that were installed in both the right bank (RB) and left bank (LB) fishways at Wanapum Dam.

Removal activities began at the RB-WFEPS on November 17, 2014 and consisted of shutting down two of the four of 90 hp pumps to maintain flow down the fish ladder in order not to strand fish and then removing the spiral chute and all supporting structures related to the spiral chute. Once the removal was completed, RB fishway flow was restored to provide fish passage. The work was completed within the same day.

On November 18, 2014, Grant PUD began the removal of the entire LB-WFEPS. All four 90 hp pumps and the auxiliary water supply (AWS) were shut down and biological staff were placed into to the LB fishway to conduct fish “sweeping/removal efforts” from the fishway. After removal of the LB-WFEPS occurred, the Wanapum fishway ladder exit was bulk-headed off and the ladder remained out of service for the regularly scheduled ladder maintenance outage.

When the reservoir reached an elevation of 554 feet above msl, Grant PUD began the process of removing the RB-WFEPS. On December 7, 2014, Grant PUD shut down two of the four 90 hp pumps and the RB AWS system to encourage adult fish to move back down the fish ladder. On December 9, 2014, the remaining two RB-WFEPS 90 hp pumps were shut down and biological staff were placed into to the RB fishway to conduct fish “sweeping/removal efforts”. Dive crews then began the process of removing all four pumps, pump support structures, and water supply pipes. Once the equipment installed on the outside of the fish ladder was removed, the RB fish exit bulkhead was installed to allow the removal of the weir box, lamprey passage measures, etc. in the dry. The RB-WFEPS removal took four days, as a bulk of the work required in-water work (divers). During this removal, there was no fish passage at Wanapum Dam for 6 days. The RB fish ladder was brought back into service on December 12, 2014.

Figure 5 Wanapum Left Bank Fishway Exit Passage System with flume installed.

Figure 6 **Wanapum Left Bank Fishway Exit Passage System completed and operational on April 15, 2014.**

Figure 7 **Photograph of installed chutes at the Left Bank and Right Bank Wanapum Fishway Exit Passage System. The spiral chutes were installed on the left and right bank fishway exit passage systems on June 12 and June 19, 2014, respectively.**

Figure 8 **Photograph of installation of jump curtain at the Left Bank Wanapum Fishway Exit Passage System.**

Figure 9 **Photograph of jump curtain installed at the Left Bank Wanapum Fishway Exit Passage System and the system in operation.**

Figure 10 **Approach ramp/anti-jump ramp and lamprey ramp (upper right hand corner) installed at the Left Bank Wanapum Fishway Exit Passage System. The approach ramp/anti-jump ramp was installed on June 12, 2014.**

Figure 11 **Photograph of typical aquatic vegetation and debris that is removed from the pump intake screens or the auxiliary water supply system.**

2.1.2 Off-Ladder Adult Fish Trap

Temporary modifications to the OLAFT were also made during the first quarter of 2014 to facilitate the collection and transport of adult salmonids, steelhead and bull trout (Figure 12). Modifications included the installation of a PVC transport chute to direct fish from the OLAFT to the transport vehicles to eliminate the need to physically handle fish. Extension of the existing flume downstream of a false weir, transitioning the flume into pipe, and a pipe turn of approximately 150 degrees allowed for direct fish loading. Prior to diversion and loading of fish onto transport vessels, fish were scanned for PIT tags via a detection system located in the OLAFT. The modifications were completed on April 11, 2014 and were put into operation on April 15, 2014.

Additional modifications were made to the OLAFT on May 22, 2014, including the addition of a secondary swing gate, which would allow for multiple truck loading (two truck loading capability), as well as restoring the original truck loading flume to operable status (Figure 13). Multi-truck loading was anticipated to be necessary if a catastrophic failure occurred at both the LB and RB WFEPS during the adult sockeye and summer Chinook migration. Catastrophic failure of the WFEPS did not occur and emergency trap and haul was not required. All temporary modifications that had been implemented at the OLAFT for emergency trap and haul were removed on December 23, 2014.

Figure 12 Modification implemented at the Priest Rapids Off-Ladder Adult Fish Trap, completed and operational on April 11, 2014.

Figure 13 Additional modifications implemented at the Priest Rapids Off-Ladder Adult Fish Trap on May 22, 2014 to allow for multi-truck loading.

2.1.3 Adult Salmonid and Bull Trout Trap and Transport

To ensure that adult salmonid, steelhead and bull trout passage was not impeded as a result of the emergency drawdown of the Wanapum Reservoir, and to ensure a proof of concept (that the installed WFEPS passed fish), Grant PUD, in consultation with NOAA Fisheries, USFWS, the PRCC and other stakeholders, developed a trap-and transport standard operating procedure (SOP) for the OLAFT (Section 2.1.2). Under the trap the transport operation, the OLAFT was operated between the hours of 5 a.m. to 10 p.m., 7 days per week beginning on April 15, 2014, and remained in effect until "proof of concept" of the WFEPS at Wanapum Dam had occurred, which was May 9, 2014.

Under the SOP, all upstream migrating fish ascending the Priest Rapids LB Fishway were diverted through the OLAFT. Salmon and steelhead were diverted to waiting fish-transport trucks and transported to the Rocky Coulee Boat Launch for release in the Wanapum Reservoir, approximately 26 miles upstream from the OLAFT. The only exceptions were hatchery spring Chinook that were intercepted and used to monitor and evaluate passage through the Wanapum and Rock Island fish ladders. Two hundred and fifty (n=250) of the first hatchery Chinook to ascend the Priest Rapids Dam left-bank fish ladder were tagged at the OLAFT then diverted back into the ladder and allowed to migrate upstream. Specific details regarding the trap and transport SOP can be reviewed in Appendix A of the IFPOP submitted to FERC on May 1, 2014 (IFPOP).

The trap and transport of adult spring Chinook and steelhead was suspended indefinitely by the NOAA Fisheries and the PRCC on May 9, 2014, because travel time and conversion rate criteria for spring Chinook migrating from Priest Rapids Dam, through the WFEPS and past Rock Island were met and exceeded. Details on travel time and conversion rate criteria for spring Chinook migrating from Priest Rapids Dam, through the WFEPS and past Rock Island can be reviewed in Section 3.1.4 and in the IFPOP status report provided to FERC on June 6, 2014 (IFPOP Status Reports).

Before the trap and transport program was suspended, a total of 605 adult spring Chinook and 42 steelhead were collected at the OLAFT and placed into a fish truck for transport and release at Rocky Coulee, approximately three miles upstream of Wanapum Dam. No bull trout were observed or transported during the trap and transport program, and all other non-target species were sorted through a swing-gate and diverted back to the left bank ladder.

2.1.4 Rocky Coulee Release Site

All trapped and transported adult spring Chinook and steelhead were released at the Rocky Coulee Boat Launch (Figure 14), located approximately 26 miles upstream of the OLAFT and 5.5 miles upstream of Wanapum Dam. The site is located on the west (right) bank upstream of Vantage, Washington (Figure 15). Construction activities associated with the release site were permitted via a Hydraulic Permit Approval (HPA) issued by Washington Department of Fish and Wildlife (WDFW) on April 7, 2014 (Appendix D).

Figure 14 The Rocky Coulee release site located on the west (right) bank upstream of Vantage, Washington.

Figure 15 Rocky Coulee fish release pipe located upstream of Vantage, Washington.

2.1.5 Adult Spring Chinook Salmon Migration and Metrics Plan

To assess the success of the fishway passage systems installed at Wanapum Dam and the trap and transport program, the NOAA Fisheries, USFWS, the PRCC and Grant PUD agreed to implement an adult spring Chinook salmon migration and metrics plan. The objective of the plan was to inform NOAA Fisheries and the PRCC on whether the fishway passage systems were effective and when the trap and transport would be discontinued.

As discussed in Section 2.1.3 above, implementation of the migration and metrics plan occurred on April 15, in which all migrating adult salmon, steelhead and bull trout ascending the left bank Priest Rapids ladder were diverted into the OLAFT. Based on input of the PRCC, the RB ladder at Priest Rapids Dam was reduced to ladder flow only. At ladder flow, fish may still pass through the right bank fishway, however no additional fish attraction flow was provided. This was done to allay concern over potential delay in adult migration caused through operation of the OLAFT.

Fish entering the OLAFT were diverted to transport trucks or holding tanks. Fish that were diverted to the holding tanks (only hatchery origin) were systematically selected for tagging. All natural-origin (adipose present) fish were directed into transport trucks and transported to the release location approximately 3 miles upstream of Wanapum Dam. This transfer was water-to-water and no supplemental tagging occurred.

Three separate passage criteria were used to evaluate the effectiveness of the Wanapum FWEPS and included the following; (1) Travel time using Passive Integrated Transponders (PIT tags); (2) conversion rates using PIT tags, and (3) direct observations at the Wanapum Dam Fishway exits. Each criterion is discussed briefly below. Further details can be reviewed in the Appendix B of the IFPOP status report submitted to FERC on May 1, 2014 (IFPOP Status Reports).

- Travel Time: Travel time was determined as migration time from the Priest Rapids PIT tag array to the Rock Island Dam PIT tag array. Based on data from a 10 year period (2003-2013), travel time from Priest Rapids Dam to Rock Island Dam was <356 hours for 90% of the fish detected at Priest Rapids Dam and Rock Island Dam. This value represented the highest 90th percentile travel time observed since 2003 when ladders were operating under normal conditions. The majority of observations are <350 hours, however, travel times above 350 hours do occur under normal circumstances.
- Conversion Rates: Conversion rates were based on PIT tag detections from the Priest Rapids Dam and Rock Island Dam PIT tag arrays. The conversion rate from Priest Rapids Dam to Rock Island Dam is greater than 80%, which was the lowest observed annual conversion rate from 2008-2013 when permanent ladders were operating. Conversion rates before 2008 were available; however hatchery transportation studies from Priest Rapids around Rock Island Dam occurred during those years and confounded conversion rate calculations. These conversion rates are ‘uncorrected’, meaning they have not been adjusted for array detection efficiencies and detections upstream of Rock Island Dam. During the passage evaluation, uncorrected conversion rates were available in real-time and therefore were used for the ladder passage criteria. Grant PUD used the criteria of a >80% conversion rate from Priest Rapids Dam to Rock Island Dam with the support of NOAA Fisheries.
- Direct Observation: The objective was to have <5% observed instantaneous mortality.

As reported in the June 6, 2014 IFPOP status update to FERC (IFPOP Status Reports), all passage criteria for adult spring Chinook had been met and exceeded (Table 2). Median travel times (TT) for all acoustic (n=50) and PIT tagged adult spring Chinook (n=200) combined was <356 hours (TT=167 hours) from the Priest Rapids PIT tag array to the Rock Island array, uncorrected conversion rates (CR) were >80%, and no instantaneous mortalities were observed at the flume exits.

Established criteria was also met and exceeded based on individual studies. For example, the TT for the 50 acoustic tagged adult spring Chinook was 212 hours from Priest Rapids Dam to the tailrace of Rock Island Dam. The conversion rate for these fish was 100%. In review of only the PIT tagged fish, the median travel time was 154 hours at a conversion rate of 92%.

Table 2 Travel Time and Uncorrected Conversion Rates for adult spring Chinook tagged with acoustic (n=50) and Passive Integrated Transponder Tags (n=200) to evaluate the effectiveness of the Wanapum Fishway Exit Passage Systems and to determine suspension of the Trap and Transport Program.

Evaluation	Sample Size	Detection Points	Observed Metrics			Achieved Criteria (Yes/No)	
			Median Travel Time (hrs.)	Uncorrected Conversion Rate (%)	Adjusted Conversion Rate (Includes upstream detections) (%)	Median Travel Time (<356 hrs.)	Uncorrected Conversion Rate (>80%)
Acoustic and PIT tag combined	250*	Priest Rapids PIT Tag Array to Rock Island PIT Tag Array	167	94%	99%	Yes	Yes
Acoustic Tag only	50	Priest Rapids to Rock Island Tailrace	212	100%	100%	Yes	Yes
PIT tags only	200*	Priest Rapids PIT Tag Array to Rock Island PIT Tag Array	154	92%	99%	Yes	Yes

*This number includes three adult steelhead that were PIT tagged.

2.1.5.1 Adult Spring Chinook Salmon and Steelhead Conversion Rates Based on PIT tagged fish passing the Priest Rapids Project

Conversion rates for all PIT tagged adult spring Chinook salmon and adult steelhead passing through the Priest Rapids Project was calculated using a Cormac-Jolly-Seber (CJS) survival model (Table 3 and Table 4). Additional years were calculated for comparison (2010-2013). The intent was to provide an estimate of survival for adult spring Chinook and adult steelhead passing through the Priest Rapids Project Area during the response. The estimated survival for

both species was used to provide valuable information on whether or not impacts to adult salmonid and/or steelhead migrating through the Priest Rapids Project had occurred.

CJS models are typically used for estimating juvenile survival through the Columbia River system, but are also useful for estimating adult survival for conversion rates and escapement (Keefer et al. 2005, 2010, and 2014). The method utilized in our analysis followed those used to evaluate conversion rates for salmon from McNary Dam to Lower Granite Dam (Keefer et al. 2014). CJS models estimate both survival and detection efficiency, which is particularly useful for a Priest Rapids-Rock Island conversion rate because the Rock Island PIT-array has had periods of low detection efficiency (as observed in 2014 and other years; Table 3 and Table 4). By using a CJS model, the conversion rate is synonymous with survival rate in our analysis.

The PIT-tag observation data used in the analysis was from the PTAGIS website. The starting point, or source data, for adult spring Chinook and adult steelhead was PIT-tag observations at Priest Rapids Dam from 2010-2014. From there a filter or screening was applied to obtain a dataset for the conversion rate analysis. The filters were intended to eliminate fish that would be inappropriate to use for conversion rate estimates. For example, filters are intended to exclude juveniles descending the adult ladders, mini-jack re-ascensions, out of basin fish, such as Snake or Yakima River overshoots, etc. Applying filters to eliminate sources of noise or error are typical for these types of analyses (Keefer et al. 2014). The following filters were applied to obtain a list of tags used in the analysis:

1). Original release location above Rock Island Dam (Wenatchee, Entiat, Methow, etc.);
2). Observed at PRD ladders between April 1 -June 15 (spring Chinook migration period); and
3). Observed at PRD ladders at least 1 year after release (eliminates mini-jacks).

From this reduced dataset, PTAGIS was queried for detections at Rock Island Dam and at any PIT-tag array above Rock Island Dam subsequent to the detection at Priest Rapids Dam. This provided for a three-part encounter history (Priest Rapids-Rock Island-Above RI) from which survival and detection efficiency at Rock Island Dam could be estimated. The results are provided in Table 3 and 4 below. As stated previously, years 2010–2013 were include for comparison.

Table 3 Conversion rate of adult spring Chinook from Priest Rapids Dam to Rock Island Dam and Rock Island Dam PIT-tag detection efficiency from 2010-2014.

Year	Conversion Rate (± Std Error)	Rock Island Detection Efficiency (± Std Error)	Number of Tags in Evaluation
2010	99.0% (± 0.8)	98.1% (1.0%)	346
2011	100.0% (± 0.0)	80.1% (1.9%)	422
2012	99.4% (± 0.5)	95.8% (1.2%)	289
2013	99.1% (± 0.6)	93.6% (1.5%)	273
2014	100.0% (± 0.0)	70.9% (2.1%)	454

Table 4 Conversion rate of steelhead from Priest Rapids Dam to Rock Island Dam and Rock Island Dam PIT-tag detection efficiency from 2010-2014.

Year	Conversion Rate (± Std Error)	Rock Island Detection Efficiency (± Std Error)	Number of Tags in Evaluation
2010	97.9% (± 0.6)	96.5% (0.7%)	712
2011	98.6% (± 0.4)	92.3% (0.9%)	887
2012	98.7% (± 0.5)	75.8% (1.5%)	805
2013	99.3% (± 0.4)	90.0% (1.3%)	557
2014	98.0% (± 0.6)	66.0% (1.9%)	646

2.1.6 Juvenile Salmonid Survival and Behavior Evaluations

NOAA Fisheries, USFWS, the PRCC and Grant PUD agreed that a Wanapum Reservoir juvenile acoustic tag survival evaluation was necessary to assess the potential impacts on the juvenile salmonid and steelhead run at-large as it relates to the necessary drawdown of Wanapum Reservoir and stabilization of Wanapum Spillway Monolith 4.

To estimate Wanapum Project (dam and reservoir) survival under an emergency drawdown scenario (outside normal operating conditions), a paired-release model, following the methods of Skalski et al. (2005) was employed. The general paired-release methodology implemented under an atypical operating condition was also consistent with previous survival evaluations conducted at Wanapum and Priest Rapids dams and reviewed and approved by the PRCC (Skalski et al. 2011, Skalski et al. 2010, Skalski et al. 2009a, Skalski et al. 2009, Sullivan et al. 2009).

Paired releases of 400 and 700 and 550 run-of-river steelhead and yearling Chinook were tagged with acoustic transmitters (Lotek Model L-AMT-2.1 JSATS tag) and released in the tailraces of Rock Island, Wanapum and Priest Rapids dams, respectively. Acoustic tagged fish were detected at three separate locations within the Wanapum Project (dam and reservoir); Crescent Bar, Sunland Estates (River mile 426; RM 426), and Wanapum Dam (RM 416). Two sites downstream of Wanapum Dam were used to monitor acoustically-tagged fish as they migrated downstream (Mattawa at RM 409 and Priest Rapids Dam at RM 397). Route-specific survival for steelhead and yearling Chinook was collected at Wanapum Dam and is discussed immediately below and is summarized in Table 3.

The survival estimate for yearling Chinook migrating through the Project in 2014 was 90.8%, which is 4.3% above the required juvenile salmon and steelhead project passage survival standard of 86.49% (NOAA Fisheries 2008a). Observed development-level (reservoir and dam) passage survival for yearling Chinook migrating through Wanapum was 94.5%, while survival through Priest Rapids was 96.1%. The Wanapum and Priest Rapids dams ("concrete") passage survival was 98.8% and 97.1%, respectively.

Based on point estimates[2], survival for yearling Chinook utilizing the various passage routes at Wanapum and Priest Rapids dams (bypass, spillway, and powerhouse) was greater than 96%,

[2] Point Estimates are based on proportion of fish that are detected downstream at one or more locations that had been assigned a given passage route at each dam.

with the exception of powerhouse survival at Priest Rapids Dam (92.6%; Table 5). Although the fracture at Wanapum impacted day to day operation of the powerhouse, WFB, and spillway, observed survival at Wanapum Dam exceeded 97.0%. Specific details on the behavior and survival evaluation and can be reviewed in Hatch et al. (2015) and Skalski et al. (2014).

The survival estimate for juvenile steelhead migrating through the Project in 2014 was 89.3%, which is 2.8% above the required juvenile salmonid and steelhead project passage survival standard of 86.49% (NOAA-Fisheries 2008) and 8.25% above the three consecutive year average observed in 2008-2010 (81.05%). Observed development-level (reservoir and dam) passage survival for juvenile steelhead migrating through Wanapum was 92.9%, while survival through Priest Rapids was 96.1%. Passage survival past Wanapum and Priest Rapids dams ("concrete") was 97.8% and 98.5%, respectively.

Based on point estimates, survival for juvenile steelhead utilizing the various passage routes at Wanapum and Priest Rapids dams (bypass, spillway and powerhouse) was greater than 97%, with the exception of powerhouse survival at Wanapum and Priest Rapids Dam (94.1% and 93.8% respectively; Table 6). Although the fracture at Wanapum Dam impacted day to day operation of the powerhouse, WFB, and spillway, observed survival at Wanapum Dam was 97.8%. Specific details on the behavior and survival evaluation and can be reviewed in Hatch et al. (2015) and Skalski et al. (2014).

Table 5 **Route-specific survival estimates for yearling Chinook migrating through Wanapum and Priest Rapids dams in 2014. Survival estimates (point estimates) are based on the proportion of fish that were detected downstream that had been assigned a given passage route.**

	Wanapum Dam		Priest Rapids Dam	
Passage Route	Number Passed	Detected Downstream (%)	Number Passed	Detected Downstream (%)
Wanapum Fish Bypass or Priest Rapids Fish Bypass	27	96.3	415	99.8
Spillway	99	97.0	293	98.0
Powerhouse	225	98.2	352	92.6

Table 6 **Route-specific survival estimates for juvenile steelhead migrating through Wanapum and Priest Rapids dams in 2014. Survival estimates (point estimates) are based on the proportion of fish that were detected downstream that had been assigned a given passage route.**

	Wanapum Dam		Priest Rapids Dam	
Passage Route	Number Passed	Detected Downstream (%)	Number Passed	Detected Downstream (%)
Wanapum Future Unit Bypass or Priest Rapids Top-Spill Bypass	36	100.0	507	99.6
Spillway	164	99.4	236	97.0
Powerhouse	152	94.1	276	93.8

2.1.7 Benthic Fauna Surveys

In an effort to characterize the benthic community impacts on relatively immobile benthic organisms such as freshwater mussels, snails, juvenile lamprey, and other organisms, Grant PUD implemented both land- and water-based surveys between Rock Island and Wanapum dams (Tiller 2015).

Specifically, the field surveys were conducted to help estimate species composition and densities of the stranded freshwater mollusks (mussels, clams, and snails) and provide a more general characterization of other stranded fauna such as fishes (including juvenile lamprey), crayfish, and amphibians. Forty transects (n=40) were stratified at approximately 1.5 kilometer (km) intervals between Wanapum and Rock Island dams. A series of circular plots, each encompassing approximately 50 square meters (m^2), were stratified along the dewatered regions of each transect. Some in-water plot locations were selected to compare on-land versus in-water mussel

densities and compositions. Measurements of aquatic snail species composition and densities found within a subset of the transect plots were also collected. Collected data was summarized by substrate types and by flow bands to help assess the benthic communities that were potentially affected by the water level reduction.

Twelve taxa of snails and seven species of bivalve, including three native freshwater mussels and one non-native clam were found in the study area. No invasive species considered noxious to the native molluscan taxa were encountered. However, some rare indigenous mollusks were found in the study area, signifying the presence of relatively unique and rare riverine molluscan fauna habitat (hard substrates and fast flowing cold water).

These rare species occurrences included the ashy pebblesnail (*Fluminicola fuscus,* formerly *F. columbiana*), floater mussel Clade 1 (*Anodonta* Clade 1, formerly *A. californiensis*), and the western pearlshell mussel (*Margaritifera falcata*). The ashy pebblesnail is a former candidate for federal listing and a special status species in Washington State. The floater mussel Clade 1 is listed by the WDFW as a Candidate for listing as Threatened or Endangered. The western pearlshell is listed by WDFW as a Monitor species.

Until these surveys were conducted, the western pearlshell was suspected to be potentially extinct in the Columbia River system. Overall, freshwater mussel densities within the project area were relatively high compared to other areas reported along the Columbia River. Relatively high densities of freshwater mussels were noted to persist below the drawdown water line to a depth of at least 30 feet (~9 m).

Three juvenile lamprey (all ammocoetes) were collected from one sampling site just upriver of Sunland Estates near RM 431. Other species found stranded along the shorelines at selected sampling sites included redside shiner (*Richardsonius balteatus*) and three-spine stickleback (*Gasterosteus aculeatus*). Various sculpin (Cottidae) and crayfish (Cambaridae) also were observed.

2.1.8 Water Quality Monitoring

Water quality in the Project is monitored by the annual fixed-site water quality monitoring program (FSM) operated by Grant PUD as a requirement of the Clean Water Act 401 Water Quality Certification (WQC; WDOE 2007) for operation of the Project, and the Washington Department of Ecology approved Quality Assurance Project Plan (QAPP; Hendrick 2009). The QAPP provides strict guidelines on methodology, sample locations, and analytical objectives to ensure all data are standardized and comparable each year.

Water quality parameters regularly monitored at FSM sites include: water temperature (^{o}C), dissolved oxygen (DO; mg/L), total dissolved gas (TDG, mm Hg), pH, and turbidity (NTU). The methodology for water quality monitoring and QA/QC protocols are provided in the QAPP (Hendrick 2009). The QAPP also provides provisions for adaptive management of the abovementioned parameters if warranted and outlines provisions for additional sampling.

In 2014, four additional sampling locations were established within the 38 mile Wanapum Reservoir from the Wanapum Dam forebay upstream to the Rock Island Dam tailrace. At these sites, temperature, TDG, DO, pH, and turbidity were collected and compared to Grant PUD FSM data from 2008-2014 to determine whether WDOE standards were met, and if any Wanapum Reservoir drawdown-related water quality anomalies persisted at points downstream. In the Wanapum Reservoir 2014 sampling, DO ranged from 8.43-12.48 mg/L, temperature ranged from

3.85-20.37^{o}C, pH ranged from 7.49- 8.66, turbidity ranged from 0.1-170.22 NTU, and TDG ranged from 96.26-116.69%. As in most years, there were occasional instances of measured parameters being outside the WDOE-accepted range, though seasonal trends in most parameters fell within the 95% CI of the 5-year FSM average at points downstream, indicating that 2014 water quality in the Wanapum Reservoir was not significantly impacted by the drawdown. Further details can be reviewed in Thompson et al. (2014).

2.1.9 Conservation Measures

As part of the consultation process for the March 21, 2014 IFPOP, NOAA Fisheries provided recommended conservation measures as part of the on-going emergency ESA consultation process via email on March 18, 2014. The USFWS provided recommended conservation measures as part of the on-going emergency ESA consultation process via letter on March 28, 2014. Appendix A of this document provides the specific recommended conservation measures received and Grant PUD's response to these recommended measures (e.g. meeting, not meeting, or not applicable with an accompanying comment).

Although only two formal letters were received providing recommended conservation measures, Grant PUD conducted informal and expedited consultation under the emergency provisions of Section 7 of the ESA (typically on a week to week basis) and adaptively managed the refinement and implementation of the IFPOP in consultation with the NOAA Fisheries, USFWS, the PRCC and other stakeholders throughout 2014 and the first quarter of 2015.

Over the course of the fracture response, Grant PUD convened and/or hosted approximately 84 site visits, conference calls and/or meetings (Appendix B). Further details on the consultation record can be reviewed in the status updates that were provided to FERC in accordance with ordering paragraph (B) of the March 26, 2014 Order approving the IFPOP (Appendix E). Details on temporary fish ladder modifications and implementation of the IFPOP and other information necessary to support this BA were included in Section 2.1 above, all of which were reviewed, approved and implemented in consultation with NOAA Fisheries, USFWS, the PRCC and other regional stakeholders.

A key element of the response was the use of the same adaptive management principles that were incorporated into the SSSA. As defined in the SSSA, adaptive management is an active systematic process for continually improving management policies and practices by sequential learning from the outcomes of operational programs. Adaptive management employs management programs that are designed to experimentally compare selective policies or practices by evaluating alternative hypotheses about the system being managed. The sequence of adaptive management steps include: (1) problem assessment, (2) project design, (3) implementation, (4) monitoring, (5) evaluation, and (6) adjustment of future decisions. Adaptive management is not considered complete until the planned management actions have been implemented, measured and evaluated, and the resulting new knowledge has been fed back into the decision-making process to aid in future planning and management. The fundamental objective of adaptive management with respect to IFPOP was to achieve the best possible adult salmonid and bull trout passage based on the emergency situation at hand.

2.2 Action Area

The emergency action area includes the Priest Rapids Project, consisting of the Priest Rapids and Wanapum developments. The Project occupies about 58 miles of the Columbia River in central

Washington in portions of Grant, Yakima, Kittitas, Douglas, Benton, and Chelan Counties (Figure 1). Wanapum Reservoir, which was drawn down as a result of the spillway fracture, covers approximately 38 miles of the 58 miles of the mid-Columbia River extending downstream from Rock Island Dam (RM 452) to Wanapum Dam (RM 416). The area exposed as a result of the drawdown totaled approximately 3,682 acres of aquatic habitat, which is the area that is inundated during at a normal project operation range of 571.5 feet above msl (Appendix C).

Actions or necessary emergency steps implemented by the Public Utility District No 1. of Chelan County, Washington (Chelan PUD) will be addressed separately by Chelan PUD through a separate Biological Assessment. Status of Species and Critical Habitat

2.3 Identification of Listed Species and ESU/DPS

2.3.1 Upper Columbia River (UCR) Steelhead

UCR steelhead were listed by the NMFS as endangered under the ESA on August 18, 1997 (62 FR 43937), with their status downgraded to threatened on January 5, 2006 (71 FR 834); then reinstated to endangered status per United States District Court decision in June 2007.

The DPS includes all naturally spawned anadromous steelhead populations below natural and man-made impassable barriers in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S.-Canada border, as well six artificial propagation programs: the Wenatchee River, Wells Hatchery (in the Methow and Okanogan Rivers), Winthrop National Fish Hatchery, Omak Creek, and the Ringold steelhead hatchery programs. Critical habitat for the UCR steelhead DPS was designated on September 2, 2005 (70 FR 52630) and became effective on January 2, 2006, and includes the mid-Columbia River.

Steelhead adults return to freshwater in the late summer, with most passing Wanapum Dam (RM 415) during August and September (Lukas 1999), to spawn in the spring. Spawning in tributary streams takes place from March through June, but may occur as late as July. The eggs incubate within the spawning gravel for four to seven weeks following spawning, and fry emerge from the gravel about two to three weeks after hatching. For most of the mid-Columbia steelhead streams, emergence occurs during the period from June through September. The young steelhead remain in freshwater while they feed, growing to a smolt size of about 150-200mm before making their spring-time out-migration to the ocean. This may take from one to seven years, depending on growth rate and the productivity of the tributary stream, although the majority of steelhead smolts are two to three years of age. Peak smolt migration past Wanapum Dam occurs during the month of May, although considerable numbers may be observed in late April or early June (Lukas 1999).

For additional information on the general habitat requirements, life history, and limiting factors for recovery of the UCR steelhead trout DPS see the Federal Register published on January 5, 2006 (71 FR 834).

2.3.2 UCR Spring-run Chinook Salmon

Spring-run Chinook salmon of the UCR ESU were originally listed as endangered on March 24, 1999 (64 FR 14308) and reaffirmed as endangered on June 28, 2005 (70 FR 37160). The UCR Chinook salmon ESU includes all naturally spawned populations of spring Chinook salmon in all river reaches accessible to spring Chinook salmon in Columbia River tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam in Washington, as well as six artificial propagation programs: the Twisp River, Chewuch River, Methow Composite, Winthrop NFH,

Chiwawa River, and White River spring-run Chinook hatchery programs. Critical Habitat for the UCR Chinook salmon ESU was designated on September 2, 2005 (70 FR 52630) and became effective on January 2, 2006, and includes the active channel of the mid-Columbia River.

Spring-run Chinook salmon adults return to the Columbia River in April and May with 50% of the run passing Rock Island Dam by mid-May. Spring Chinook spawn from late July to September with peak spawning activity occurring in mid-August. Most fish spend two winters at sea with 20-40% spending three winters at sea. Sex ratios at mid-Columbia hatcheries range from 1.3-1.9 females per male. Fecundities range from 4,200 for age 4 fish to 6,000 for age 5 fish. Spring-run Chinook in the mid-Columbia are genetically distinct from the more abundant summer/fall Chinook run of the mid-Columbia. The two groups belong to a different evolutionary lineage within the Columbia River.

For additional information on the general habitat requirements, life history, and limiting factors for recovery of UCR Chinook salmon ESU see the Federal Register Notice published on June 28, 2005 (70 FR 37160).

2.3.3 Bull Trout

The USFWS published the final rule in the Federal Register on November 1, 1999 to list the Columbia River bull trout in the coterminous United State as threatened (64 FR 58909). The Columbia River population segment is represented by widespread subpopulations that have declined in overall range and numbers of fish. A majority of Columbia River bull trout occur in isolated, fragmented habitats that support low numbers of fish and are inaccessible to migratory bull trout (63 FR 31647). A few remaining bull trout “strongholds” still remain in the Columbia River basin. These populations are found in large areas of contiguous habitats in the Snake River basin of the central Idaho mountains, upper Clark Fork and Flathead Rivers in Montana, and several streams in the Blue Mountains in Washington and Oregon (63 FR 31647). The USFWS considers this DPS threatened because of habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, and the introduction of non-native species.

Critical habitat was originally designated for portions of the Columbia River bull trout DPS on October 6, 2004 (69 FR 59996). On January 14, 2010, the Service proposed to revise its 2005 designation of critical habitat for the bull trout. In total, the Service proposed to designate approximately 22,679 miles of streams and 533,426 acres of lakes and reservoirs in Idaho, Oregon, Washington, Montana and Nevada as critical habitat for this wide-ranging fish. The proposal included 985 miles of marine shoreline in Washington. The proposed revision was the result of extensive review of earlier bull trout critical habitat proposals and 2005 designation, public comments and new information. The Service voluntarily embarked on this re-examination of its previous determination to ensure that the best science was used to identify the features and areas essential to the conservation of the species. Bull trout depend on cold, clear water and are excellent indicators of water quality. Protecting and restoring their habitat aids in maintaining the water quality of rivers and lakes throughout the Northwest. Based upon the 2010 revision, the Priest Rapids project area (and the Action Area of the subject BA) now contain critical habitat for bull trout.

Bull trout require relatively pristine water, low temperatures, clean substrate with loose gravel, and low gradient streams to spawn; hence, spawning areas are often associated with cold water springs, groundwater infiltration, and the coldest reaches of tributary streams in a watershed

(Rieman and McIntyre 1993). Temperatures required to initiate spawning in adults vary from 4°C to 11°C (39°F to 52°F) during late August through October (Fraley and Shepard 1989; Buchanan and Gregory 1997). Optimal temperatures for juvenile rearing range from 4°C to 10°C (39°F to 50°F; Buchanan and Gregory 1997).

In response to a request from the USFWS in 2000, Chelan, Douglas and Grant PUDs co-funded a telemetry evaluation of movement and distribution of bull trout in the mid-Columbia River (BioAnalysts 2003 and 2004). This was a multi-year study to describe the migration patterns and movements past mid-Columbia hydroelectric projects. Because observations of bull trout at the Priest Rapids and Wanapum dams are very rare, all bull trout tagged for this study were trapped at Rock Island, Rocky Reach and Wells dams. During the course of the study, a total of 36 boat and 35 aerial surveys were conducted on the Wanapum Reservoir. BioAnalysts (2004) concluded that based on results of the boat and aerial surveys, of the 79 bull trout radio-tagged during the 2001 and 2002 study periods, only 9 (~11%) were detected within the Wanapum reservoir. Most of these remained within a 10-km reach immediately downstream from Rock Island Dam (approximately 11 km upstream of the Crescent Bar area). Of the 79 tagged bull trout, only one migrated downstream past Wanapum Dam and ultimately Priest Rapids Dam. This observation indicates that few bull trout migrate downstream of Wanapum Dam, and that based on detections within the Wanapum reservoir, it appears the primary area of habitat use is within a 10-km reach immediately downstream of Rock Island Dam (approximately 16 km upstream of the Crescent Bar area). Results from these studies indicate that bull trout resided primarily in areas upstream of Wanapum Dam, predominantly in the tailrace of Rock Island Dam. No bull trout were found in the Priest Rapids Reservoir.

Although bull trout are documented within the Project, their occurrence throughout the Project and at the dams continues to be rare. Over the last 18 years only 5 bull trout have been collected during gatewell dipping, turbine maintenance, fish-ladder maintenance, resident native resident fish surveys, predator sampling, white sturgeon and/or fish survival evaluation. During fish-ladder maintenance at Priest Rapids Dam during 1996-2014, one bull trout (36-cm long) was found and released alive (M. Clement, Grant PUD, pers. comm. December, 2011), two were documented during fish assemblages within the Priest Rapids Reservoir in 1999 (Pfeifer et al. 2001) and two adult bull trout were incidentally collected in traps set while fishing for northern pikeminnow on December 5 and 6, 2010 near Crescent Bar, River Mile 440-441.

2.3.4 Pygmy Rabbit (*Brachylagus idahoenis*)

The proposed project area is located within the ranges of the Columbia Basin DPS of the endangered pygmy rabbit. The pygmy rabbit was initially proposed for listing by the USFWS on November 30, 2001 (66 FR 59769), with a final rule for listing as endangered published on March 5, 2003 (68 FR 10388). The Columbia Basin DPS of the endangered pygmy rabbit is within the ranges of the emergency response.

The pygmy rabbit is the smallest rabbit species in North America. Unlike other rabbit species, the pygmy rabbit digs its own burrows in deep, loose soil (WDFW 1995). Pygmy rabbits are dependent upon sagebrush for food, which comprises 98% of their winter diet and a good portion of their spring and summer diet. Though the historical population and range of the pygmy rabbit is unclear, evidence suggests it was significantly larger than it is presently. This decline is primarily due to habitat loss and fragmentation through development, agricultural conversion, and sagebrush burning to promote grasses for livestock forage. The current population total is

similarly unclear, as some states (such as Washington) have active surveying programs while others have virtually none. In severe danger of extinction, the Washington population has declined from an estimated 250 rabbits in 1995 to a current estimate of zero. Several small populations known to exist six years ago are now extirpated due to wildfire and disease. Recently the WDFW have initiated a captive-breeding program with hopes of revitalizing the population (WDFW 1995).

Grant PUD conducted multi-year (2000-2002) surveys for rare, threatened, or endangered (RTE) species within the Project (FDE&S 2003a, 2003b; DE&S 2000). Based on this information, pygmy rabbits are known not to occur within the Project Area.

2.3.5 Ute ladies'-tresses (*Sprianthes diluvialis*)

Ute ladies'-tresses was initially proposed for listing by the USFWS on November 13, 1990 (55 FR 47347). A final rule for listing as threatened was published on January 17, 1992 (57 FR 2048), with an effective date of February 18, 1992. Ute ladies'-tresses is a white-flowered perennial orchid with stems ranging from 8-20 inches in height (WNHP and BLM 1999). Ute ladies'-tresses habitat is variously described as "periodically flooded alkaline flats" (WNHP and BLM 1999), "moist, alluvial soils, usually on primary and secondary flood plains of perennial rivers" (Sipes and Tepedino 1995), and "low to mid-elevation wetlands and riparian zones…alluvial substrates along perennial streams and rivers" (Moseley 1997).

Ute ladies'-tresses is listed as a federal threatened species by the USFWS (57 FR 2048). In Washington, it is known from two occurrences, one of which is on the Columbia River on Rocky Reach Reservoir, approximately 35 river miles upstream of the Project. There are also scattered occurrences in Nevada, Utah, Colorado, Nebraska, Wyoming, Montana, and the Snake River drainage in eastern Idaho (WNHP and BLM 1999, Moseley 1997).

Rare wetland plant surveys in the Project by Mastrogiuseppe (1991) and Mastrogiuseppe and Gill (1981) did not locate this species or any of its congeners. The potential for Ute ladies'-tresses was a focal point of RTE survey efforts during 2000 and 2001 (DE&S 2000, FDE&S 2003a). Contracted botanists working on the Project visited the Rocky Reach population to ensure an accurate search image and surveys were timed according to its phenology. All high-quality habitats in the Project received intensive surveys. No occurrences of Ute ladies'-tresses were found (DE&S 2001, FDE&S 2003a).

In addition, a habitat survey was conducted in 2011 and no species occurrences were found (Grant PUD 2012). Based on this information, Ute ladies'-tresses are known not to occur within the Project Area.

2.4 Identification of Designated Critical Habitat

Aquatic ESA-listed species and their respective designated critical habitat(s) occur in or in the vicinity of the proposed project area (NOAA Fisheries 2008b, USFWS 2008b). UCR Spring Chinook salmon, UCR steelhead and bull trout and their designated critical habitat, listed under the ESA, are known to occur and/or migrate through the Mid-Columbia River. Some potential impacts related to the emergency response likely included: degraded water quality, passage barrier, stranding and entrapment, handling of fish during trap and transport activities and loss of littoral habitat for rearing and feeding. However, measures implemented in consultation with NOAA Fisheries, USFWS and the PRCC minimized the potential impacts.

Additionally, the Columbia Basin distinct population segment (DPS) of pygmy rabbit and the threatened Ute ladies'-tresses could potentially occur in, or in the vicinity of the Project although no designated critical habitat has been determined for these species.

3.0 Environmental Baseline Conditions

3.1 Columbia River Basin

The Columbia River is approximately 1,214 miles in length, and is one of the largest rivers in North America. The river originates in British Columbia, Canada, and enters the United States in the northeastern corner of Washington State. From there it flows south towards the Snake River confluence near Richland, Washington, where it turns westward, forming the Washington-Oregon border for approximately 320 miles before entering the Pacific Ocean near Astoria, Oregon. In total, the Columbia River Basin drains an area of approximately 260,000 square miles (FERC 2006). The Columbia River Basin is the most hydroelectrically developed river system in the world. More than 400 dams (11 run-of-the-river dams on the mainstem) and hundreds of major and modest structures on tributaries tap a large portion of the Columbia's generating capacity (CCRH 2010).

Much of the Columbia River Basin is located east of the Cascade Mountain Range, in a generally semi-arid region lying between the Cascade Mountains and other mountain ranges to the east. The average annual rainfall in the region varies from a high of about 150 inches on the western slopes of the Cascades to less than 8 inches at the Ephrata Airport, located approximately 30 miles east of the project (FERC 2006). The Columbia Basin physiographic province as defined by Franklin and Dyrness (1973) consists of a mosaic of scattered, arid-land shrubs and perennial bunchgrasses, which is also referred to as the Central Arid Steppe in other reference sources (e.g., Cassidy 1997).. The dominant plant species within undisturbed sites with well-developed soils are big sagebrush (*Artemisia tridentata* ssp. *tridentata*) and bluebunch wheatgrass (*Pseudoroegneria spicata*, previously known as *Agropyron spicatum*).

As stated above, the project action area is located within the middle section of the Columbia River (mid-Columbia River), which stretches approximately 450 miles between Grand Coulee Dam (RM 596) in Washington State, and Bonneville Dam (RM 146) located along the border between Oregon and Washington (EPA 2010). The project site is located along the shorelines of the Wanapum Reservoir of the mid-Columbia River. The general topography of the site ranges from nearly level to moderately sloping with occasional rock outcrops. The shoreline within the site is varied, ranging from a gently sloping unvegetated bank to low, nearly vertical rock outcroppings. Steep slopes with bluffs or cliffs are generally located inland of the project site.

The majority of the action area is sparsely vegetated, as it is comprised primarily of talus slopes, rock and gravel shoreline. Vegetation surrounding the action area is dominated by species typical of the upland sagebrush-steppe vegetation community of eastern Washington. Vegetation within the action area and surrounding hill slopes is dominated by big sagebrush (*Artemisia tridentata*), gray rabbitbrush (Ericameria nauseosa) and cheatgrass (*Bromus tectorum*). Other riparian species observed within and adjacent to the action area and along the shoreline include: black cottonwood (*Populus balsamifera ssp. Tricocarpa*), Siberian elm (*Ulmus pumila*), willows (*Salix spp*.), thinleaf alder (*Alnus incana* var. *occidentalis*), mulberry (*Morus alba*), purple loostrife (Lythrum salicaria), reed canarygrass (*Phalaris arundinacea*), yellow-flag (*Iris pseudacorus*), common spikerush (*Eleocharis palustris)*, Columbia coreopsis (*Coreopsis atkinsoniana*), western mountain aster (*Aster occidentalis*), Baltic rush (*Juncus balticus*), white sweet-clover

(*Melilotus alba*), common rush (*Juncus effuses*), nodding beggar's-tick (*Bidens cernua*) and horsetail (*Equisetum variegatum*). Obligate species make up approximately eight percent of the herb vegetation. Most of the habitats have some limited disturbance or effects from upland activities or shoreline use (recreation, fire, grazing, boating, road, and beach/lawn areas). Grant PUD has a program to control noxious weeds and carries out Purple Loosestrife control efforts and limited Eurasian Water Milfoil (*Myriophyllum spicatum*) using chemical herbicides.

The soils observed within the action area consist primarily of sandy/gravel/cobble deposits. The immediate shorelines of the project site contain sub-angular fractured basalt cobbles, gravels and driftwood deposits. The cobbles and gravels are generally exposed during periods of low water along the river.

3.2 Baseline Condition of Pathways and Indicators

In *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NMFS 1996) NMFS defines properly functioning condition (PFC) as the sustained presence of natural habitat-forming processes (e.g., bedload transport, channel migration, riparian vegetation succession) that are necessary for the long-term survival and recovery of the species (NMFS 1999). Thus PFC constitutes habitat-based biological requirements of the species: the essential physical features that support spawning, incubation, rearing, feeding, sheltering, migration, and other behaviors. Such features include adequate instream flow, appropriate water temperature, loose gravel for spawning, unimpeded fish passage, deep pools, and abundant large tree trunks and root wads.

Grant PUD has assembled a comprehensive database on aquatic and terrestrial resources and water quality for the Project area, which included the preparation and submittal of its Final License Application to FERC (Grant PUD 2003). Information from studies completed by Grant PUD was used to evaluate baseline habitat conditions (Normandeau et al. 2000, Juul 2003, Perkins et al. 2002, Pfiefer et al. 2001, FDE&S 2003a, FDE&S 2003c, Lukas 1999, Grant PUD fixed-site water quality monitors). Additional information was also collected during evaluations implemented during the emergency response (Hatch et al. 2015, Thompson et al. 2015, and Tiller 2015) or collected as part of Grant PUD's regulatory obligations (Keeler 2015). In cases where quantifiable data were not available, conclusions were based on information collected during discussions with Grant PUD biological staff in 2014.

The baseline conditions of important aquatic and riparian pathways and indicators for the mid-Columbia River within the action area are summarized in Table 7. Supporting data and analysis are provided in the text that follows.

Table 7 Checklist for Documenting Environmental Baseline of Emergency Response on Relevant Indicators for the UCR Spring Chinook Salmon ESU, UCR Steelhead DPS, and Columbia River Bull Trout DPS.

PATHWAYS/INDICATORS	ENVIRONMENTAL BASELINE
Water Quality	
Temperature	At Risk
Sediment/Turbidity	Properly Functioning
Chemical Contamination	At Risk
Habitat Access	
Physical Barriers	At Risk
Habitat Elements	
Substrate	At Risk
Large Wood	At Risk
Pool Frequency	Properly Functioning
Pool Quality	Properly Functioning
Off-Channel Habitat	Properly Functioning
Refugia	Properly Functioning
Channel Condition and Dynamics	
Width/Depth Ratio	Properly Functioning
Streambank Condition	Properly Functioning
Floodplain Connectivity	Not Properly Functioning
Flow/Hydrology	
Peak/Base Flows	Not Properly Functioning
Drainage Network Increase	Properly Functioning
Watershed Conditions	
Road Density & Location	At Risk
Disturbance History	Not Properly Functioning
Riparian Reserves	At Risk

3.2.1 Water Quality

3.2.1.1 Temperature

A comprehensive evaluation of water temperature within the Project area has been conducted (Juul 2003, Perkins et al. 2002; Normandeau et al. 2000; Keeler 2010, 2011). Juul (2003) evaluated water temperature data extending back to 1933. This information showed that mean water temperatures were ≤4 degrees Celsius (^{o}C) between late December and early March, >18^{o}C from late July through early September, and peaked in August at close to 19^{o}C. Other long-term databases evaluated by Juul (2003) included information collected by WDOE and U.S. Geological Survey (USGS) at long-term monitoring stations (below Rock Island Dam and Vernita Bridge). The data set collected downstream from Rock Island Dam had a seasonally low mean of 3.6^{o}C in January while the analogous values were close to 3^{o}C in February below Priest Rapids Dam. The highest monthly values consistently occurred in August, when the calculated means were between 19.0 and 19.2^{o}C. Juul (2003) also reviewed water temperature data recorded at Grant PUD's five fixed monitoring sites from 1995-2001 or 1997-2001 depending on the location. These data yielded information that was in many ways similar to the historical analysis, displaying average minimum temperatures in February that ranged from 2.8 to 3.5^{o}C and peaked in August between 18.8 to 19.5^{o}C.

Keeler (2010-2012) evaluated hourly water quality data collected from the Wanapum Dam forebay fixed monitoring site from 2009-2011 which indicated that in general, water

temperatures peaked during the months of July through September with some daily maximum values greater than 20°C. Based on the fixed site monitors (FMS) located throughout the Project in 2014, water temperatures peaked during late August to early September, with some daily maximum values greater than 20°C (Keeler 2015). Details on summary values (mean, standard deviation, minimum, and maximum) for all hourly temperature measurements taken from each FSM station for the 2014 program monitoring season and can be reviewed at (Water Quality).

In addition to the FMS stations, four additional sampling locations were established within the 38 mile Wanapum Reservoir from the Wanapum Dam forebay upstream to the Rock Island Dam tailrace. At these sites, temperature was collected and compared to Grant PUD FSM data from 2008-2014 to determine whether WDOE standards were met, and if any Wanapum Reservoir drawdown-related water quality anomalies persisted at points downstream. In the Wanapum Reservoir 2014 sampling temperature ranged from 3.85-20.37^{o}C. As in most years, there were occasional instances of measured parameters occurring outside the WDOE-accepted range, though seasonal trends in most parameters fell within the 95% CI of the 5-year FSM average at points downstream, indicating that 2014 water quality in the Wanapum Reservoir was not significantly impacted by the drawdown. Further details can be reviewed in Thompson et al. (2014).

WAC 173-201A-602 designates aquatic life uses for the segment of the Columbia River within the Project as salmonid spawning, rearing, and migration; therefore, water temperature must remain below 17.5°C, as measured by the 7-day average of the daily maximum temperatures (7-DADMax). When a water body's temperature is warmer than the criteria (or within 0.3°C of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the 7-DADMax temperature of that water body to increase more than 0.3°C. In addition, WAC 173-201A-602 provides that temperatures below Priest Rapids Dam shall not exceed a maximum daily (1-DMax) of 20.0°C due to human activities. When natural conditions exceed a 1-DMax of 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed $t = 34/(T + 9)$.

Certain sections of the Columbia River within the Project are classified as impaired for temperature under Section 303(d) of the Clean Water Act. Portions of the Columbia River upstream of the Project are also classified as impaired for temperature. WDOE has indicated that a Total Maximum Daily Load (TMDL) for temperature is expected to be developed by the Environmental Protection Agency (EPA) that will establish a final wasteload and load allocation for temperature (WDOE 2007).

The WDOE has listed the Wanapum Reservoir as a Category 5 waters (303[d] listed) for temperature exceedances immediately upstream of the Wanapum Dam (WDOE 2010). As a result of this information, the mid-Columbia River is likely **at risk**.

3.2.1.2 Sediment/Turbidity

Juul (2003) estimated the background turbidity using the 1978 through 2001 WDOE/USGS Vernita Bridge data as 1.7 NTU. Normandeau et al. (2000) indicated that most of the turbidity values for the Project area were <5 NTU. Juul (2003) also reported that annual means for combined turbidity data for years 1999-2001 (at Grant PUD's fixed water quality monitoring sites) was <5 NTU. In recent years, monthly grab-sample data collected from the Wanapum Dam

forebay from 2009-2011 (Keeler 2010-2012) also indicate that turbidity values were less than 5 NTU. Based on the information above, this criterion is **properly functioning.**

3.2.1.3 Chemical Contamination

Normandeau et al. (2000) conducted a chemical contamination and nutrient analysis at various locations throughout the Project area. The majority of the chemical contamination samples were within regional background ranges, with a few exceptions for copper and zinc. However, copper and zinc concentrations were all below no-observable-effect concentrations (NOEC) reported by WDOE (2010). All other heavy metals assessed were within regional backgrounds (Normandeau et al. 2000). The WDOE has listed the Wanapum Reservoir as a Category 5 waters (303[d] listed) for 4,4'-DDD, 4,4'-DDE, and PCB based on tissue samples collected immediately upstream and downstream of the Wanapum Dam (WDOE 2010). Based on this information, the mid-Columbia River is likely **at risk**.

3.2.2 Habitat Access

3.2.2.1 Physical Barriers

Upstream fish passage at Wanapum Dam is provided by two fish ladders (left and right bank), entrance channels, and attraction water facilities. The ladders consist of a series of 10 foot long pools. Each pool is one foot higher than the preceding pool, from tailwater to forebay, yielding a slope of one on ten. The ladders are 16 feet wide with 6 feet high fixed weirs separating the pools. Each fixed weir has two five-foot-wide overflow sections separated by a six-foot-wide non-overflow section and two 18 inch square submerged orifices at the base. Each fixed weir has two five-foot-wide overflow sections separated by a six-foot-wide non-overflow section and two 18 inch square submerged orifices at the base. Water flow down each ladder is 70 cfs, consisting of 40 cfs over the weirs and 30 cfs through the orifices. Migrating fish may either swim over the top of the weir or through the orifices. Specific details on fishway construction and operation can be reviewed in Grant PUD's Final License Application (Grant PUD 2003) and reviewed in the annual progress and implementation report provided to FERC (GCPUD Activities Under PRP for 2014).

Due to the emergency situation at Wanapum Dam as a result of the spillway fracture, the Wanapum Reservoir was lowered to a safe operating elevation range between 545 feet and 541 feet above msl on March 4, 2014. As a result of the drawdown, the fish ladder exits at Wanapum Dam were dewatered, preventing upstream migrating fish from passing Wanapum Dam. In addition, short-term outages due to agency requested modifications, pump replacements, aquatic vegetation cleaning throughout the course of season, and removal of the equipment during refill may have impacted passage of spring Chinook, steelhead, bull trout and others species. This indicator was **at risk**.

3.2.3 Habitat Elements

3.2.3.1 Substrate

Normandeau et al. (2000) reported that sediment particle size was variable on cross-sectional transects with large particles (coarse sand, cobbles, and boulders) predominating. In Wanapum Reservoir cross-channel and deep-water sediments ranged from boulder (>256 mm) to sand (0.0625-2 mm) and silty loam (0.0039-0.625 mm) in particle size. Boulders and cobbles (64-256 mm) predominated in all dredged samples. In the immediate Rock Island tailrace (RM 452) finer sediments (sand and slit) were the dominated particle size in 97.2% of the samples (Normandeau

et al. 2000). At Scammon Landing (RM 428), 91.7% of the samples were composed of sand and silt. Site specific details can be reviewed in Appendix Table H-17 of Normandeau et al (2000). Based on this information the proposed project area is **at risk.**

3.2.3.2 Large Wood

Driftwood deposits are present along the OHWM of the Wanapum Reservoir; however, no large woody debris is present within active channel. This criterion should not generally be used for the mid-Columbia region of the Columbia River since the region is in both the shrub-steppe (semi-desert) zone of eastern Washington, and was historically known to be a region of scouring floods that eliminated most common riparian plant species from establishing (Grant PUD 2003). With the advent of hydroelectric developments through the mid-Columbia River, water level fluctuations have been stabilized resulting in the establishment of a narrow riparian zone. As a result, habitat refugium throughout the mid-Columbia River is maintained and is slowly increasing. All large woody debris must be rafted downriver from sites upriver that are more hospitable to riparian plant growth (Grant PUD 2003). This criterion is **at risk**.

3.2.3.3 Pool Frequency

Based on bathymetry information for the Wanapum Reservoir the mean depth is estimated at 50.1 feet with a maximum depth of 185 feet. Given the width of the river channel, as modified by hydroelectric projects, this indicator likely meets pool frequency standards and appears to be **properly functioning**.

3.2.3.4 Pool Quality

Columbia River off-channel flows measured at depth throughout the Wanapum Reservoir is >1 meter in depth (Grant PUD 2003). This indicator is **properly functioning**.

3.2.3.5 Off Channel Habitat

Although the emergency response resulted in the drawdown of Wanapum reservoir by approximately 26 feet and loss of off-channel habitat; this was replaced with new off-channel habitat that continued to exist, it is determined that this indicator is **properly functioning**.

3.2.3.6 Refugia

Historically, habitat refugia along the mid-Columbia River was likely limited due to flood/scouring events and the environmental elements of the shrub-steppe habitat zone. With the advent of hydroelectric developments through the mid-Columbia River water level fluctuations have been stabilized resulting in the establishment of a narrow riparian zone. As a result, habitat refugia throughout the mid-Columbia River is **maintained and is slowly increasing**.

3.2.3.7 Habitat Refugia

Habitat refugia within the emergency response area is **properly functioning** because stream bank vegetation has slowly been invading the immediate shoreline areas.

3.2.4 Channel Conditions and Dynamics

3.2.4.1 Width/Depth Ratio

Depth transects across Wanapum Reservoir indicated that the mean depth is 50.1 feet with a maximum depth of 185 feet (Grant PUD 2003). Average channel width of the Wanapum Reservoir is approximately 3,200 feet. Although this width/depth ratio exceeds a factor of 10, it

is not a relevant indicator, with respect to the proposed project, in an impoundment as large as Wanapum Reservoir. As such, this indicator is deemed **properly functioning**.

3.2.4.2 Streambank Condition

As discussed above, sediment particle size is variable based on cross-sectional transects with large particles (coarse sand, cobbles, and boulders) predominating. In Wanapum Reservoir cross-channel and deep-water sediments ranged from boulder (>256 mm) to sand (0.0625-2 mm) and silty loam (0.0039-0.625 mm) in particle size. Boulders and cobbles (64-256 mm) predominated in all dredged samples. The streambank along Wanapum appears to be stable and no active erosion is occurring. Judged from this qualitative information, this indicator is **properly functioning.**

3.2.4.3 Floodplain Connectivity

Floodplain connectivity through the mid-Columbia River region has been reduced because of hydroelectric development. Overall, this reach is **not functioning properly.**

3.2.5 Flow/Hydrology

3.2.5.1 Peak/Base Flows

Undoubtedly peak and base flows have changed through the mid-Columbia River region as a result of hydroelectric, residential, and agriculture development. There are four USGS gauging stations that have been used to measure the stretch of river on which the Project is located. These include the Wenatchee site, Trinidad site (USGS Station No. 12464500), Priest Rapids Dam and USGS Station No. 12472800. The long-term average annual flow rate at Priest Rapids Dam is about 120,000 cfs but has varied as much as 50,000 cfs from year to year. The minimum average daily flow during the 47 years between 1913 and 1960 was 38,000 cfs. However, prior to the completion of Grand Coulee Dam (1941), the minimum average daily flow was 29,850 cfs. Due to water management requirements, the system is **not properly functioning**.

3.2.5.2 Drainage Network Increase

The emergency response occurred upstream of Wanapum Dam and the flow regime of the Columbia River in the Project area is controlled primarily by releases at upstream storage reservoirs. This limits the potential for flood damage, and provides a relatively stable seasonal hydrograph. This element is **functioning properly**.

3.2.6 Watershed Conditions

3.2.6.1 Road Density and Location

As stated above, the emergency response occurred upstream of Wanapum Dam. The I-90 corridor and communities of Vantage, Sunland Estates, and Crescent Bar, WA are all located upstream of Wanapum Dam. This element is **at risk.**

3.2.6.2 Disturbance History

The mid-Columbia River region has been disturbed as a result of hydroelectric, residential, and agricultural development. Therefore, this element throughout the mid-Columbia River region is at risk, and is **not properly functioning** at the project level (Grant PUD 2003).

3.2.6.3 Riparian Reserves

Riparian reserves within the Wanapum Reservoir are relatively limited. Riparian vegetation is present but limited within a very near band along the shoreline. Due to the influence of the dams and constant wind and wave erosion, there is very little native plant recruitment along the shorelines of the reservoir. This indicator is **at risk**.

4.0 Analysis of Effect of the Action

This section addresses direct, indirect, and interrelated/interdependent effects on listed fish species and critical salmonid habitat elements that may result from implementation of the proposed project given the conservation measures to be employed. In addition, this section describes anticipated cumulative effects from non-federal actions that may take place in the project action area. Factors considered in the analysis include: proximity of the action, distribution, timing, nature of the effect, duration, and disturbance frequency, intensity, and severity. This effects analysis is based on the best scientific and commercial data available concerning the impact of the proposed project on listed fish species and their critical habitat.

4.1 Direct Effects

This section addresses potential direct effects of the project on listed fish species and critical salmonid habitat elements. Direct effects include all immediate impacts (adverse and beneficial) from the emergency response. Direct effects to listed fish may have occurred during and following the drawdown of the Wanapum Reservoir (stranding and entrapment). Habitat elements potentially affected by the emergency response include degraded water quality, degraded streambank condition, alteration of in-water substrates, loss of refugia and loss of riparian reserves. Potential impacts as a result of the emergency response are considered and presented below.

4.1.1 Water Quality

The condition and quality of the water that salmonids encounter during their rearing and migration is extremely important, and can determine such things as feeding and breeding success rates, disease levels, growth rates, and predation rates. Major elements of water quality critical to salmonids are turbidity/sediment levels, chemical contamination, and temperature. Turbidity and fine sediments can reduce prey detection, reduce oxygen along the substrate, smother redds, damage gills, and cause other deleterious effects. Chemical contamination can alter fecundity and fertility levels, increase disease, shift biotic communities, and reduce the overall health of salmonids (Angermeier et al. 2005). Temperature affects metabolic rates, resistance to disease, oxygen levels available for fish, and other vital factors.

4.1.1.1 Temperature

The emergency response and resulting drawdown is unlikely to affect water temperature based on the analysis of water quality data collected at the four existing FMS and additional sampling locations established within the 38 mile Wanapum Reservoir. At the four additional sites, temperature was collected and compared to Grant PUD's FSM data collected during the years 2008-2014 to determine whether WDOE standards were met, and if any Wanapum Reservoir drawdown-related water quality anomalies persisted at points downstream.

In the Wanapum Reservoir 2014 sampling temperature ranged from 3.85-20.37^{o}C. As in most years, there were occasional instances of measured parameters occurring outside the WDOE-

accepted range, though seasonal trends fell within the 95% CI of the 5-year FSM average at points downstream, indicating that 2014 water quality (temperature) in the Wanapum Reservoir was not significantly impacted by the drawdown. Further details can be reviewed in Thompson et al. (2014). This criterion was **maintained**.

4.1.1.2 Sediment/Turbidity

Based on monthly grab samples, Keeler (2015) reported that turbidity ranged from 0.0 to 21.0 NTUs at all FSM stations within the Project during the 2014 water quality monitoring season (Water Quality Monitoring Data). The greatest deviation in water quality parameters from historical trends in the Wanapum Reservoir in 2014 was turbidity. The minimum turbidity reading was 0.10 NTU while the maximum was 170.2 NTU (Table 8).

Table 8 Summary values of turbidity in the Wanapum Reservoir 2014 for each sampling site.

Site	Date	Minimum	Maximum	Mean	Standard Deviation
WAFB	3/28-10/24	0.1	137	16.14	22.26
SCLA	3/28-10/24	0.2	170.2	20.27	32.27
CBAR	3/28-10/24	0.1	44.5	12.43	10.48
RISL	3/28-10/24	0.1	38.9	14.19	11.11
Notes: WAFB= Wanapum Forebay Site, SCLA= Scammons Landing Site, CBAR= Crescent Bar Site, RISL= Rock Island Tailrace Site. Means are seasonal average of all data.					

Turbidity levels in 2014 at the Wanapum Forebay peaked in early April (Figure 16), which closely following an outflow spike at Rock Island Dam, and then decreased over the course of the monitoring period. Wanapum Reservoir sampling in 2014 below Rock Island captured the tail end of a probable turbidity peak as the monitoring period began, which likely corresponded to an influx of highly turbid water through the system from upstream during the spring freshet (Figure 15). Increased turbidity associated with the spring freshet can result from an influx of particulates entrained in ground and surface water following forest fires such as those that occurred in the Wenatchee River Basin in 2013. The other potential sources of turbidity include entrainment of fine bed material in the Wanapum reservoir not exposed to scouring flow at higher water levels. Generally, spring flows in the mid-Columbia are run-off flows, which are typically characterized with higher turbidity.

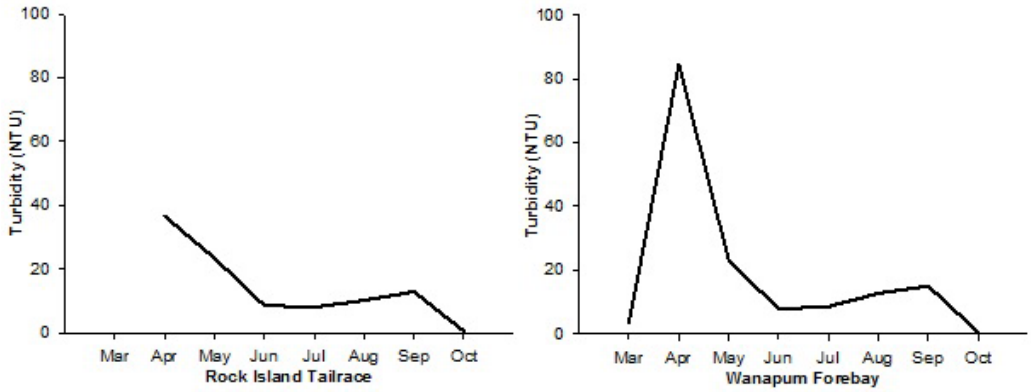

Figure 16 Turbidity levels for Rock Island tailrace and Wanapum Dam forebay grab sampling monitoring sites in the Wanapum Reservoir for 2014. Columbia River, WA.

While it appears that turbidity levels in 2014 were significantly above the 5-year average throughout the Wanapum Reservoir (Figure 17), the downstream 2014 data at Grant PUD FSM sites at the Priest Rapids Forebay and Tailrace were aligned with 5-year averages indicating the anomalous conditions observed in the Wanapum Reservoir were absorbed within the boundary of the Project and did not persist further downstream. Additional fine-scale vertical dynamics of turbidity distribution at in-reservoir monitoring sites is available in Thompson et al. (2014; Appendices A-D).

Short-term increases in turbidity resulting from the emergency drawdown of Wanapum Reservoir are expected to be negligible and are not expected to result in a net change in function of the in-stream habitat. As illustrated by the data collected, the concentration of suspended sediments (turbidity levels) resulting from the emergency response were short in duration, decreased over time and distance downstream, and were in line with the 5-year average later in the season (Figure 16). It is believed that no impacts occurred that would result in significant affects to listed fish or their designated critical habitat.

As discussed above, further supporting evidence comes from the juvenile steelhead and yearling Chinook survival evaluation conducted in 2014. Survival for juvenile steelhead migrating through the Wanapum Reservoir and Dam was 92.9%, while survival for yearling Chinook was 94.5%. Details can be reviewed in Section 2.1.5 above or in Hatch et al. (2015) and Skalski et al. (2014). Therefore this emergency response resulted in this criterion being **at risk** in the short-term, but over the long-term this criterion will be **maintained**.

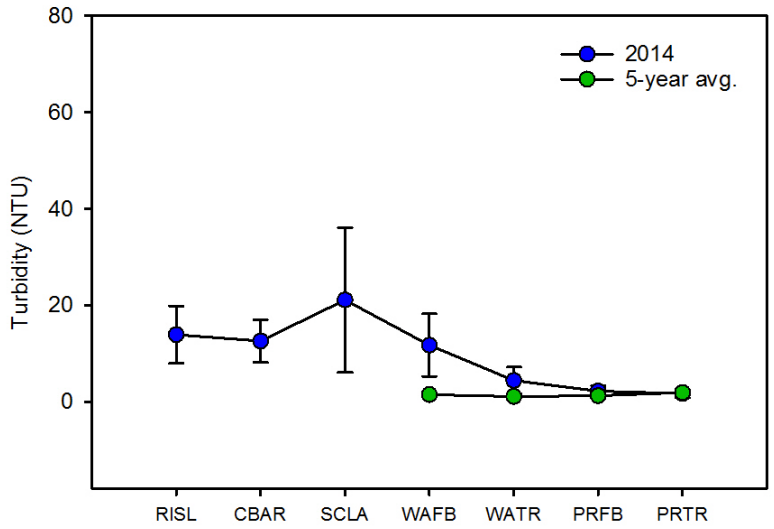

Figure 17 **Turbidity (NTU) for 2014 sampling sites in the Wanapum Reservoir from Rock Island (RISL), Crescent Bar (CBAR), Scammons Landing (SCLA), and the Wanapum forebay (WABR), and from FSM samplings in the Priest Rapids Reservoir at Wanapum tailrace (WATR), Priest Rapids forebay (PRFB), and Priest Rapids tailrace (PRTR) are shown in blue with 95% CI for the average across 2014. Six year averages representing FSM monitoring from 2009-2014 at the Wanapum forebay (WAFB), Wanapum tailrace (WATR), the Priest Rapids forebay (PRFB), and Priest Rapids tailrace (PRTR) are shown in green with 95% CI for average.**

4.1.1.3 Chemical Contamination

Construction of release facilities at Rocky Coulee and the ultimate release of adult spring Chinook and steelhead at this site required access to the shoreline by construction equipment and fish transport vehicles. This access to the shoreline increased the potential for accidental spills of construction materials or petroleum products that could adversely affect water quality. In addition, construction activities conducted on Wanapum Dam to repair the fracture were done under a contractor Spill Prevention and Countermeasure Plan. During the construction of the release facilities and transport and release of spring Chinook and steelhead, and during the repair of the Wanapum Dam fracture, no accidental spills or releases of construction materials or petroleum products occurred. Conditions included in the Hydraulic Project Approval issued by WDFW on April 7, 2014 (Appendix D) were followed. Therefore this criterion was **maintained**.

4.1.2 Habitat Access

4.1.2.1 Physical Barriers

Due to the emergency situation at Wanapum Dam as a result of the spillway fracture, the Wanapum Reservoir was lowered to a safe operating elevation range between 545 and 541 feet above msl on March 4, 2014. As a result of the drawdown, the fish ladder exits at Wanapum Dam were dewatered, preventing upstream migrating fish from passing Wanapum Dam for a period of 46 days.

To restore passage at Wanapum Dam, Grant PUD developed and installed Fishway Exit Passage Systems at both the left and right bank fish ladder exits. The LB-WFEPS was placed in operation on April 15, 2014, while the right bank ladder was fully operational on April 26, 2014. Section 2.1 above provides a detailed description of the measures implemented by Grant PUD to restore fish passage and additional details can be reviewed in the IFPOP status reports (IFPOP Status Reports).

With the installation and operation of the Fishway Exit Passage Systems, passage was restored and over the course of the migration season a total of 803,886 spring, summer and fall Chinook, sockeye, steelhead and coho successfully migrated past Wanapum Dam based on Rock Island fish counts (http://www.cbr.washington.edu/dart/query/adult_daily).

Over the course of the response, short-term outages occurred and were related to requests for modifications to the WFEPS from NOAA-Fisheries, USFWS, PRCC and Grant PUD, pump replacements, and/or cleaning of aquatic vegetation from pump intake screens. During these scheduled and non-scheduled outages, Grant PUD maintained one fishway in operation during the short-term outages.

In regards to the pump replacement, Grant PUD had to replace three (n=3) of the 90 hp electrical pumps over the course of the emergency action (one at the LB-WFEPS and two at the RB-WFEPS). Generally total outage time per pump replacement was approximately 20 hours. During the pump replacement one fishway remained in operation.

Aquatic vegetation was also a major issue over the course of the emergency response, resulting in the plugging of the intake screens on the four 90 hp pumps located at both the LB and RB-WFEPS. Over the course of the emergency response, the LB-WFEPS had to be taken out of service on 34 separate occasions, while the RB-WFEPS was taken out of service for cleaning on 22 separate occasions. Outages generally lasted for <10 hours, which was the timeframe

necessary from pump shutdown to the ladder being fully restored for fish passage. During the cleaning process, one fish ladder remained in operation and continued to provide fish passage.

When the reservoir reached an elevation of 554 feet above msl, Grant PUD began the process of removing the RB-WFEPS. On December 7, 2014, Grant PUD shut down two of the four 90 hp pumps and the RB Axillary Water Supply (AWS) system to encourage adult fish to move back down the fish ladder. On December 9, 2014, the remaining two RB-WFEPS 90 HP pumps were shut down and biological staff were placed into to the RB fishway to conduct fish "sweeping/removal efforts". Dive crews then began the process of removing all four pumps, pump support structures, and water supply pipes. Once the equipment installed on the outside of the fish ladder was removed, the RB fish exit bulkhead was installed to allow the removal of the weir box, lamprey passage measures, etc. in the dry. The RB-WFEPS removal took four days, as a bulk of the work required in-water work (divers). During this removal, there was no fish passage at Wanapum Dam for six days. The RB fish ladder was brought back into service on December 12, 2014.

Passage impacts to ESA-listed fish species and other fish species during the 46 day non-passage period are expected to be minimal as this timeframe was before the start of the upstream migration of adult spring Chinook and steelhead. Based on fish counts beginning on April 15, 2014 at Priest Rapids Dam, adult spring Chinook and steelhead counts averaged 3 and 5 individuals per day, respectively (http://www.grantpud.org/environment/fish-wildlife/fish-counts). It is also anticipated that impacts due to the six day non-passage period during removal of the remaining infrastructure at Wanapum Dam during December were minimal, as this timeframe is well after and before the upstream migration of adult spring Chinook and steelhead.

It is assumed that the steelhead observed were overwintering in the vicinity of Priest Rapids Dam and were not active upstream migrants, as peak migration for adult steelhead past Priest Rapids and Wanapum dams occurred during the month of September. Impacts to adult spring Chinook migration was also minimal, as at least one passage system was in place by April 15, 2014. It is also unlikely that any adult spring Chinook had reached Wanapum Dam prior to April 15, as this is well before the beginning of the migration.

Although bull trout have been documented within the Project, and passage was restricted for 52 days at Wanapum Dam, their occurrence throughout the Project and at the dams continues to be rare. Therefore we expect impacts to bull trout migration were minimal. Based on review of historical fish counts at Wanapum Dam (2007-2013), a total of 36 bull trout have been observed passing the video count system with 92% (n=33) passing Wanapum in the May through July timeframe (http://www.grantpud.org/environment/fish-wildlife/fish-counts). Only one bull trout was observed passing Wanapum Dam during the month of April (April 19, 2013). Further details on bull trout passage at Wanapum and Priest Rapids dams can be reviewed in Grant PUD 2008, 2009, 2010, 2011, 2012 and 2013.

With the installation of the Fishway Exit Passage Systems on April 15 and 26, 2014, and restoration of the Wanapum Reservoir to normal operation level on March 21, 2015, this criterion is **maintained**.

4.1.3 Habitat Elements

4.1.3.1 Substrate

As previously reported in section 5.1.1.2 the greatest deviation in water quality parameters from historical trends in the Wanapum Reservoir in 2014 was turbidity (Figure 16). Increased turbidity was likely the result of erosion of the "new" exposed soft substrates and bank sloughing. Based on turbidity data collected at the FMS (Priest Rapids Project and Rock Island Tailrace) and additional stations in the Wanapum Reservoir, increased turbidity coincided with the freshet in April 2014 and subsequently decreased throughout the season, which was consistent with historical trends. As illustrated by the data collected, the concentration of any suspended sediments (turbidity levels) resulting from the emergency response were short in duration, decreased over time and distance downstream, and were in line with the 5-year average later in the season (Figure 16). Based on the information presented, this criterion was **at risk** immediately following the response and during the refill of the Wanapum Reservoir, but overtime as substrates become saturated this criteria will be **maintained**.

4.1.3.2 Large Wood

As discussed above, driftwood deposits are present along the shoreline of the Wanapum Reservoir; however, no large woody debris is present within active channel. As a result of the emergency response, some material remained deposited at the original OHWM elevation of 571.5 feet above msl, while other material was transported and deposited at lower elevations (545-541feet above msl). Once the reservoir was restored to normal operations (571.5 feet above msl) on March 21, 2015, materials originally deposited lower elevations was either deposited or floated downstream to new locations. As stated above, due to the nature of the mid-Columbia region, all large woody debris must be rafted downriver from sites upriver that are more hospitable to riparian plant growth (Grant PUD 2003). Based on the emergency response, some materials likely floated downstream, however new material from upstream was also rafted downstream. Therefore, this criterion was **maintained.**

4.1.3.3 Pool Frequency and Quality

The emergency response to stabilize the Wanapum spillway resulted in the drawdown of the Wanapum Reservoir by 26 feet, thereby altering the pool frequency in Wanapum Reservoir. However, given the width of the river channel, as modified by hydroelectric projects, this indicator likely continued to meet pool frequency and quality standards and was likely **maintained**.

4.1.3.4 Off-Channel Habitat

The emergency response resulted in the drawdown of Wanapum Reservoir by approximately 26 feet and loss of off-channel habitat; this was replaced with new off-channel habitat that continued to exist. In addition, based on the heavily modified nature of the mid-Columbia River, it is unlikely that the emergency response had a significant effect on this criterion (**maintained**).

4.1.3.5 Refugia

At this time, the potential effect of the emergency response on the riparian zone is unknown in the Wanapum Reservoir. Therefore this indicator is **at risk**.

4.1.4 Channel Conditions and Dynamics

4.1.4.1 Width/Depth Ratio

The emergency response to stabilize the Wanapum spillway resulted in the drawdown of the Wanapum Reservoir by 26 feet, thereby altering the width and depth ratio. However, given the width and depth of the river channel, as modified by hydroelectric projects, this indicator likely continued to be **maintained**.

4.1.4.2 Streambank Condition

The emergency response resulted in a 26 foot drawdown, and degraded stream bank condition along the shoreline in Wanapum Reservoir. The response resulted in bank sloughing, and erosion occurred at various shoreline locations throughout Wanapum Reservoir until the shoreline stabilized due to new vegetation growth and/or saturation of the new shoreline occurred. The shoreline condition was **at risk** throughout the response and will be for a timeframe after refill occurs. With the reservoir elevation restored to the normal operating level (571.5 feet above msl) the stability of the stream banks sediment overtime will move towards a **maintained** condition.

4.1.4.3 Floodplain Connectivity

The emergency response had no effect on floodplain connectivity within the mid-Columbia River watershed (**maintain**).

4.1.5 Flow/Hydrology

4.1.5.1 Peak/Base Flows

The emergency response had no effect on peak or base flows within the response area or within the mid-Columbia River watershed (**maintain**). This is based on information provided by Thompson et al. (2014), who reported that the mean daily outflow at Rock Island Dam closely matched the 10-year average, with slightly elevated outflow rates in March-June corresponding with the spring freshet and drawdown of the Wanapum Reservoir. While 2014 outflow was slightly higher than the 10-year average in the spring, measured outflow was still mostly within the 95% confidence interval for the 10-year average indicating that conditions in 2014 did not have significant impacts at downstream sites (Figure 18).

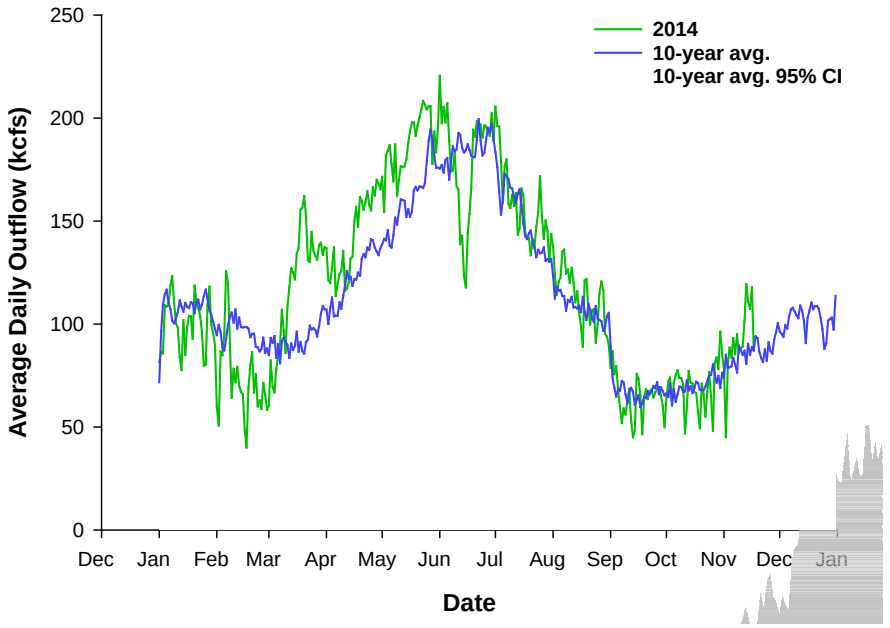

Figure 18 **Daily average outflow (kcfs) at Rock Island Dam (RM 453.4) in 2014 (green line) compared to the ten year average outflow (blud line) and 95% Confidence Interval for the average (shagged area) Data were gathered from DART (http://www.cbr.washington.edu/dart/).**

To put increased 2014 spring outflow at Rock Island Dam in perspective with the outflow patterns measured across the entire mid-Columbia River basin, Rock Island outflow data from 2014 (Figure 18) were compared to both 2014 outflow and 10-year average outflow in the tailraces of: Chief Joseph (RM 545.1), Wells (RM 515.8), Rocky Reach (RM 473.7), Wanapum (RM 415.8), and Priest Rapids (RM 397.1) dams (Figure 19) during three time periods including: pre- fish spill (January 1- March 31), fish spill (April 1- August 31), and post- fish spill (September 1- December 31). The period during 2014 fish spill at all mid-Columbia River dams were very consistent with the 10-year averages, while the outflow pre- fish spill was markedly higher at all dams. This indicates that while Rock Island pre- fish spill outflow was above 10-year average levels, it was consistent with high outflow trends at all other dams in the greater hydropower system between Chief Joseph and Priest Rapids.

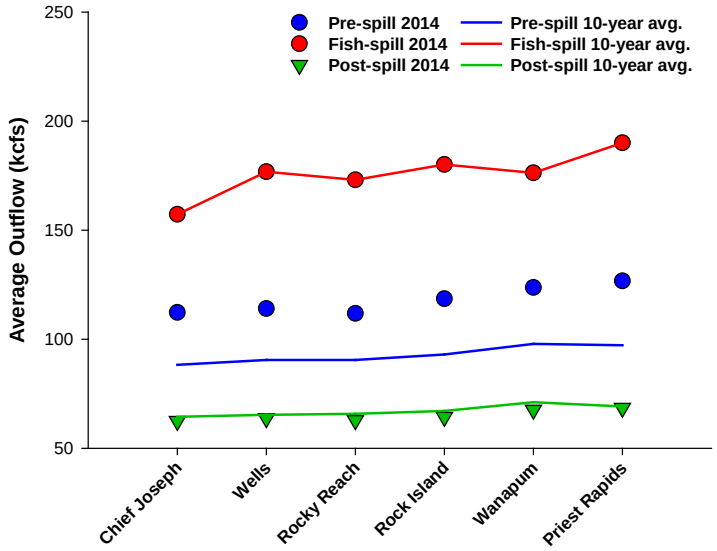

Figure 19: Mean daily outflow at hydropower dams on the mid-Columbia River from Chief Joseph upstream to Priest Rapids Dam downstream during the pre-spill (blue), fish spill (red), and post-spill (green) periods for 2014 (symbols) and the 10-yr ave (line). Data were gathered from DART (http://www.cbr.washington.edu/dart/).

4.1.5.2 Drainage Network Increase

The emergency response had no effect on the drainage network within the action area or within the mid-Columbia watershed (**maintain**).

4.1.6 Watershed Conditions

4.1.6.1 Road Density and Location

The emergency response had no effect on road density within the action area or within the mid-Columbia River watershed (**maintain**).

4.1.6.2 Disturbance History

The emergency response resulted in impacts to riparian and shoreline conditions throughout Wanapum Reservoir. These impacts are expected to be temporary in nature, but it is unknown at this time if long-term effects will exist. Therefore this criterion is **at risk**.

4.1.6.3 Riparian Reserves

It is unknown at this time if the emergency response had long-term impacts on the riparian reserves. Therefore this criterion is **at risk**.

4.2 Estimating Take

The response had the potential to result in the incidental take of juvenile and adult spring Chinook salmon of the UCR ESU, and steelhead of the UCR DPS during the upstream and downstream migration season, trap and transport, and release activities implemented in response to the passage concerns at Wanapum Dam. The emergency response also had the potential to result in incidental take of bull trout. All recommended conservation and adaptive management measures implemented during the emergency were conducted in consultation with NOAA

Fisheries, USFWS and the PRCC, and resulted in minimizing the incidental take for the emergency response as a whole.

The Wanapum spillway fracture and necessary emergency response to stabilize the spillway resulted in increased sedimentation/turbidity, short-term loss of passage for bull trout at Wanapum Dam, loss of refugia, degraded shoreline conditions, an increase in disturbance, and loss of riparian reserves. Habitat modifications that occurred in the short term could have impaired or disrupted behavioral patterns of fish, including feeding and shelter. Based on the best scientific data, take resulting from temporary turbidity, loss of refugia, degraded shoreline conditions, increased disturbance, and loss of riparian reserves associated with the emergency response is largely unquantifiable in the short term and immeasurable in the long term.

4.2.1 Spring Chinook Salmon

During the response, a total of 250 hatchery-origin adult spring Chinook were trapped and tagged with PIT tags and acoustic tags. An additional 605 adult spring chinook were trapped and transported upstream of Wanapum Dam at the Rocky Coulee release location.

Based on the run-at-large for adult spring Chinook counted at Priest Rapids Dam in 2014 (n=23,742), approximately 3.6% of the run was trapped, tagged and released at the OLAFT and allowed to migrate upstream (n=250; hatchery-origin) or trapped and transported upstream to the Rocky Coulee release location (n=605; hatchery and natural origin). No direct or indirect mortality was observed in the trapped and tagged hatchery-origin Chinook (n=250), as all tagged fish successfully migrated upstream past Rock Island Dam and were detected at upstream locations (99-100%; Table 2 - Section 2.1.5). Based on this information, it is also assumed that no direct or indirect mortality occurred to the spring Chinook trapped and transported upstream of Wanapum Dam to the Rocky Coulee release location (n=605).

Further analysis was conducted on the adult spring Chinook run at large to determine if there were potential impacts related to the response. As illustrated in Section 2.1.5.1 above, survival for adult spring Chinook salmon passing through the Priest Rapids Project in 2014 was documented at 100% (Table 3). Also as discussed above in Section 2.1.6, survival for yearling Chinook migrating through the Project was documented at 90.8%.

Using the combined adult and juvenile survival standard of 91% per development (for each dam and reservoir) as defined by NOAA Fisheries (under term and condition 1.1, NOAA Fisheries 2008 BiOp); **the combined adult and juvenile spring Chinook survival standard for the Priest Rapids Project was 90.8%, which was 8.0% above the required standard of 82.8%.**

Two adult hatchery origin spring Chinook mortalities occurred at the OLAFT, when they apparently jumped out of the fishway after support staff had left for the evening. Direct lethal take associated with the emergency response was estimated at 0.008% of the run at large (n=2), **which does not exceed 2 percent per development, or 4 percent combined, for adult UCR spring-run Chinook salmon as required under the 2008 NOAA Fisheries BiOp for the Priest Rapids Project**.

4.2.2 Steelhead

Based on the run-at-large for adult steelhead counted at Priest Rapids Dam in 2014 (n=19,843), approximately 0.2% of the run was trapped and transported upstream (n=42) as it relates to the response. No direct or indirect mortality was observed in the trapped and transported steelhead to

the point of release. Excursions from ladder operating criteria may have resulted in fish stranding and mortality. However, no direct take of steelhead was observed.

Further analysis was conducted on the adult steelhead run at large to determine if there were potential impacts related to the emergency response. As illustrated in Section 2.1.5.1 above, survival for adult steelhead passing through the Priest Rapids Project in 2014 was documented at 98.0% (Table 4). Also as discussed above in Section 2.1.6, survival for juvenile steelhead migrating through the Project was documented at 89.3%.

Using the combined adult and juvenile survival standard of 91% per development (for each dam and reservoir) as defined by NOAA Fisheries (under term and condition 1.1, NOAA Fisheries 2008 BiOp); **the combined adult and juvenile survival steelhead standard for the Priest Rapids Project was 87.5%, which was 4.7% above the required standard of 82.8%.** No adult steelhead mortalities occurred at the OLAFT or during the trap and transport program therefore **direct lethal take associated with the emergency response for steelhead was estimated at 0%.**

4.2.2.1 Spring Chinook and Steelhead Estimated Take Summarized

Based on the information included in Sections 2.1.5.1, 2.1.6, 5.2 above and the information summarized below, **direct and indirect-lethal take on adult and yearling Chinook and juvenile and adult steelhead as a result of the response was unlikely** for the following reasons:

- The survival estimate for yearling Chinook migrating through the Project in 2014 was 90.8%, which is 4.3% above the required juvenile salmon and steelhead project passage survival standard of 86.49% (NOAA Fisheries 2008a) and was in fact better than documented in previous evaluations (Anglea et al. 2003, 2004a, 2004b and 2005);
- The estimated survival for adult spring Chinook migrating through the Project in 2014 was 100%;
- Observed development-level (reservoir and dam) passage survival for yearling Chinook migrating through Wanapum was 94.5%, while survival through Priest Rapids was 96.1%. The Wanapum and Priest Rapids dams ("concrete") passage survival was 98.8% and 97.1%, respectively;
- Based on point estimates[3], survival for yearling Chinook utilizing the various passage routes at Wanapum and Priest Rapids dams (bypass, spillway, and powerhouse) was greater than 96%;
- Although the fracture at Wanapum impacted day to day operation of the powerhouse, WFB, and spillway, observed survival at Wanapum Dam exceeded 97.0%. Specific details on the behavior and survival evaluation and can be reviewed in Hatch et al. (2015) and Skalski et al. (2014);
- The survival estimate for juvenile steelhead migrating through the Project in 2014 was 89.3%, which is 2.8% above the required juvenile salmonid and steelhead project

[3] Point Estimates are based on proportion of fish that are detected downstream at one or more locations that had been assigned a given passage route at each dam.

passage survival standard of 86.49% (NOAA-Fisheries 2008) and 8.25% above the three consecutive year average observed in 2008-2010 (81.05%; Skalski et al. 2009a, 2009b, 2010, and 2011);

- The estimated survival for adult steelhead migrating through the Project in 2014 was 98.0%;
- Observed development-level (reservoir and dam) passage survival for juvenile steelhead migrating through Wanapum was 92.9%, while survival through Priest Rapids was 96.1%;
- Passage survival past Wanapum and Priest Rapids dams ("concrete") was 97.8% and 98.5%, respectively;
- Based on point estimates, survival for juvenile steelhead utilizing the various passage routes at Wanapum and Priest Rapids dams (bypass, spillway and powerhouse) was greater than 97%, with the exception of powerhouse survival at Wanapum and Priest Rapids Dam (94.1% and 93.8% respectively);
- Although the fracture at Wanapum impacted day to day operation of the powerhouse, WFB, and spillway, observed survival for juvenile steelhead at Wanapum Dam was 97.8%.

4.2.3 Bull trout

During the emergency response, no bull trout (juvenile, sub-adult or adult) were encountered during the trap and transport program. It was estimated that **non-lethal and direct-lethal take for adult bull trout over the course of the response was unmeasurable and likely limited.**

It is possible a small level of direct-lethal take of juvenile bull trout potentially occurred when fish were stranded when the reservoir was drawn down 26 feet in response to the emergency. However, due to the rare occurrence of bull trout throughout the Project and at the dams, lethal take of juvenile bull trout was very unlikely. Over the last 18 years only six bull trout have been collected during gatewell dipping, turbine maintenance, fish-ladder maintenance, native resident fish surveys, predator sampling, white sturgeon sampling, and/or during fish survival evaluations. During fish-ladder maintenance at Priest Rapids Dam during 1996-2014, one bull trout (36-cm long) was found and released alive (December, 2011), two were documented during fish assemblage evaluations within the Priest Rapids Reservoir in 1999 (Pfeifer et al. 2001), two adult bull trout were incidentally collected while fishing for northern pikeminnow in December 2010 near Crescent Bar (RM 440-441), and one bull trout was sampled during the native resident fish survey in 2012 (WDFW 2013).

Since 2011, Grant PUD has also conducted resident fish sampling/northern pikeminnow removal efforts within the Priest Rapids Project Area. A majority of this work has been conducted in the Wanapum Reservoir at various water depths using beaching seining, angling, or setlines. As a result of these collection techniques, over 2.1 million resident fishes have been sampled and no juvenile, sub-adult, or adult bull trout have been encountered. Therefore, it is estimated that **non-lethal and direct-lethal take for juvenile bull trout over the course of the response was unmeasurable and likely limited.**

4.3 Indirect Effects

The emergency response did not result in new roadways, facilitate additional development, allow access to an area not previously accessible, or change flow/hydrology. As such, the primary indirect effect resulting from the emergency response included the short term redistribution of sediments and substrates throughout the Wanapum Reservoir, as illustrated by the turbidity data. The other short term indirect effects include loss of refugia and degraded shoreline conditions.

4.4 Interrelated and Interdependent Effects

Interrelated actions are part of a larger action and depend on the larger action for justification. Interdependent actions are defined as actions with no independent utility apart from the emergency response. As such there are no interrelated or interdependent effects.

4.5 Cumulative Effects

Cumulative effects are defined as all "non-federal" actions (i.e., state, local, private, and tribal) reasonably certain to occur in the foreseeable future. Such actions may include, but are not limited to additional road, residential and commercial development, maintenance and upgrading of existing infrastructure, and watershed enhancement. Grant PUD does not anticipate any cumulative effects on Wanapum Reservoir as a result of the emergency response.

4.6 Summary of Effects

The emergency response may result in a more than negligible probability of "take" of UCR spring Chinook salmon and UCR steelhead due to effects associated with efforts to evaluate and operate the implemented fishway passage measures. The emergency response is not anticipated to have quantifiable effects on Columbia River bull trout given the limited occurrence of bull trout within the Wanapum Reservoir. The short-term increase in background turbidity resulting from the drawdown is not expected to result in a net change in the function of the in-stream habitat. The effects of the proposed action on the environmental baseline are summarized below (Table 7).

Table 9 Checklist for Documenting Environmental Baseline and effects of the Emergency Response on Relevant Indicators for the UCR Spring Chinook Salmon ESU, UCR Steelhead DPS, and Columbia River Bull Trout DPS.

PATHWAYS/INDICATORS	ENVIRONMENTAL BASELINE	EFFECTS OF PROPOSED ACTION
Water Quality		
Temperature	At Risk	Maintain
Sediment/Turbidity	Properly Functioning	At Risk (during response) Maintain
Chemical Contamination	At Risk	Maintain
Habitat Access		
Physical Barriers	At Risk	At Risk (prior to passage measures) At Risk (during pump replacement) At Risk (during cleaning) At Risk (during removal) Maintain
Habitat Elements		
Substrate	At Risk	Maintain

PATHWAYS/INDICATORS	ENVIRONMENTAL BASELINE	EFFECTS OF PROPOSED ACTION
Large Wood	At Risk	Maintain
Pool Frequency	Properly Functioning	Maintain
Pool Quality	Properly Functioning	Maintain
Off-Channel Habitat	Properly Functioning	Maintain
Refugia	Properly Functioning	At Risk
Channel Condition and Dynamics		
Width/Depth Ratio	Properly Functioning	Maintain
Streambank Condition	Properly Functioning	At Risk (during response) At Risk (during refill) At Risk (until saturation) Maintain (long-term)
Floodplain Connectivity	Not Properly Functioning	Maintain
Flow/Hydrology		
Peak/Base Flows	Not Properly Functioning	Maintain
Drainage Network Increase	Properly Functioning	Maintain
Watershed Conditions		
Road Density & Location	Properly Functioning	Maintain
Disturbance History	Not Properly Functioning	At Risk
Riparian Reserves	At Risk	At Risk

Restore = system-wide beneficial effect.
Maintain (-) = localized, temporary effect; no system-wide effect.
Maintain (+) = localized benefit; no system-wide effect.
Maintain = no localized, temporary, or system-wide effect.

5.0 Avoidance, Minimization, and Conservation Measures

Avoidance, minimization, and conservation measures are intended to minimize or avoid environmental impacts to listed species and their habitat, and followed practices described below. Additional conservation measures may be agreed upon by state and federal government representatives, as conditions of the resulting federal Biological Opinion.

5.1 Minimization and Avoidance Measures

As part of the consultation process for the March 21, 2014 IFPOP, NOAA Fisheries provided recommended conservation measures as part of the on-going emergency ESA consultation process via email on March 18, 2014. The USFWS provided recommended conservation measures as part of the on-going emergency ESA consultation process via letter on March 28, 2014. Appendix A of this document provides the specific recommended conservation measures received and Grant PUD's response to these recommended measures (e.g. meeting, not meeting, or not applicable with an accompanying comment).

Although only two formal letters were received providing recommended conservation measures, Grant PUD conducted informal and expedited consultation under the emergency provisions of Section 7 of the ESA (typically on a week to week basis), and adaptively managed the refinement and implementation of the IFPOP in consultation with NOAA Fisheries, USFWS, the PRCC and other stakeholders throughout 2014 and the first quarter of 2015. The fundamental objective of adaptive management with respect to IFPOP was to achieve the best possible adult salmonid and bull trout passage based on the emergency situation at hand.

Over the course of response, Grant PUD convened and/or hosted approximately 84 site visits, conference calls and/or meetings (Appendix B). Further details on the consultation record can be

reviewed in the status updates that were provided to FERC in accordance with ordering paragraph (B) of the March 26, 2014 Order approving the IFPOP (Appendix E). Details on temporary fish ladder modifications and implementation of the IFPOP and other information necessary to support this BA were included in Section 2.1 above, all of which were reviewed, approved and implemented in consultation with NOAA Fisheries, USFWS, the PRCC and other regional stakeholders.

6.0 Finding of Effect

6.1 Upper Columbia River Spring Chinook Salmon

Evaluation of the potential effects (Table 7) of the emergency response concludes that the response resulted in a non-lethal "take" of UCR adult spring Chinook salmon due to actions necessary to evaluate the effectiveness of the fishway passage measures implemented at Wanapum Dam, trap and transport program prior to "proof of concept" of the modified fishways and excursions of WEFPS operations from fish passage criteria. Although the emergency response may result in short-term adverse effects within the action area, the project will not "hinder the attainment of relevant functioning indicators" as defined in *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NMFS 1996). In addition, based on information collected during the response, the combined adult and juvenile survival requirements for spring Chinook per the NOAA Fisheries BiOp for the Priest Rapids Project were meet (NOAA Fisheries 2008a). Therefore, we find a determination of **may have affected, but will not to adversely affect** with regard to the UCR spring Chinook salmon.

6.1.1 Designated Critical Habitat

This emergency response **may have affected, but will not adversely modify** designated critical habitat of the UCR spring Chinook salmon ESU. The emergency response resulted in short-term alteration of water quality (turbidity), streambank condition and riparian reserves. However, these actions are not expected to result in long-term negative impacts to substrate or other primary constituent elements.

6.2 Upper Columbia River Steelhead

Evaluation of the potential effects (Table 7) of the emergency response concludes that the response resulted in a non-lethal "take" of UCR adult steelhead due to actions necessary to evaluate the effectiveness of the fishway passage measures implemented at Wanapum Dam and the trap and transport program prior to "proof of concept" of the modified fishways. Although the project may result in short-term adverse effects within the action area, the project will not "hinder the attainment of relevant functioning indicators" as defined in *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NMFS 1996). Based on information collected during the response, the combined adult and juvenile steelhead survival requirements per the NOAA Fisheries BiOp for the Priest Rapids Project were meet (NOAA Fisheries 2008a). Therefore, we find a determination of **may have affected, not likely to adversely affect** with regard to the UCR steelhead.

6.2.1 Designated Critical Habitat

The emergency response **may have affected, but will not adversely modify** designated critical habitat of the UCR steelhead trout DPS. The emergency response resulted in short-term alteration of water quality (turbidity), streambank condition and riparian reserves. However,

these actions are not expected to result in long-term negative impacts to substrate or other primary constituent elements.

6.3 Columbia River Bull Trout

Evaluation of the potential effects (Table 7) of the emergency response concludes that the actions taken did not result in a probability of "take" for Columbia River bull trout. Although the project may result in short-term effects, the effects to Columbia River bull trout will be insignificant and discountable. In addition, the project will not "hinder the attainment of relevant functioning indicators" as defined in *Making Endangered Species Act Determination of Effect for Individual or Grouped Actions at the Watershed Scale* (NMFS 1996). Therefore, we find a determination of **may affect, not likely to adversely affect** with regard to the Columbia River bull trout DPS.

6.3.1 Proposed Critical Habitat

The emergency response **may have affected, but will not adversely modify** proposed critical habitat of the Columbia River bull trout DPS. The emergency response resulted in short-term alteration of water quality (turbidity), streambank condition and riparian reserves. However, these actions are not expected to result in long-term negative impacts to substrate or other primary constituent elements.

6.4 Request for Consultation

Due to the findings of effect, FERC will likely request initiation of informal consultation and conferencing with NOAA Fisheries and informal consultation with USFWS in accordance with Section 7 of the ESA.

7.0 Essential Fish Habitat Consultation

The MSA established procedures designed to identify, conserve, and enhance EFH for those species regulated under a federal fisheries management plan. The MSA requires federal agencies to consult with the NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (MSA Section 305(b)(2)).

Adverse effect means any impact that reduces quality and/or quantity of EFH, and may include direct (*i.e.*, contamination or physical disruption), indirect (*i.e.*, loss of prey or reduction in species fecundity), site-specific, or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

EFH means those waters and substrate necessary for spawning, breeding, feeding, or growth to maturity (MSA Section 3). For the purpose of interpreting this definition of EFH "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.110).

Consultation under Section 305(b) of the MSA (16 U.S.C. 1855(b)) requires that:

1). Federal agencies must consult with NOAA-Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH;

2). NOAA-Fisheries shall provide conservation recommendations for any federal or state activity that may adversely affect EFH;
3). Federal agencies shall, within 30 days after receiving conservation recommendations from NOAA-Fisheries provide a detailed response in writing to NOAA-Fisheries regarding the conservation recommendations. The response shall include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NOAA-Fisheries, the federal agency shall explain its reasons for not following the recommendations.

The MSA requires consultation for all actions that may adversely affect EFH, and does not distinguish between actions within EFH and actions outside EFH. Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities, which may have an adverse effect on EFH. Therefore, EFH consultation with NOAA-Fisheries is required by federal agencies undertaking, permitting, or funding activities that may adversely affect EFH, regardless of its location.

7.1 Identification of Essential Fish Habitat

EFH for the Pacific Coast Salmon fishery means those waters and substrate necessary for salmon production needed to support a long-term sustainable fishery and salmon contributions to a healthy ecosystem (i.e., properly functioning habitat conditions necessary for the long-term survival of the species through the full range of environmental variation). To achieve that level of production, EFH must include all streams, lakes, ponds, wetlands, and other currently viable water bodies and most of the habitat historically accessible to salmon in Washington, Oregon, Idaho, and California, except above the impassable barriers identified by the Pacific Fisheries Management Council (PFMC 1999). Chief Joseph Dam, Dworshak Dam, and the Hells Canyon Complex (Hells Canyon, Oxbow, and Brownlee Dams) are among the listed man-made barriers that represent the upstream extent of the Pacific Coast Salmon fishery EFH. Salmon EFH excludes areas upstream of longstanding naturally impassable barriers (i.e., natural waterfalls in existence for several hundred years). In the estuarine and marine areas, salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (230.2 miles) offshore of Washington, Oregon, and California north of Point Conception (PFMC 1999).

7.2 Analysis of Effects

Section 5 of this BA provides an analysis of effects to habitat elements within the action area that make up EFH for spring Chinook salmon of the UCR ESU.

7.3 Conclusion

The conservation measures recommended by NOAA Fisheries and USFWS (Appendix A) and the near-real-time adaptive management measures implemented and described throughout this BA and in the IFPOP status updates (IFPOP Status Reports) are considered adequate to prevent adverse effects on EFH for Pacific Salmon in this project. Grant PUD believes that the proposed action **will not adversely affect** EFH for Pacific Salmon because many of the potential effects were short-term in nature.

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Appendix A
Conservation Measures

#	Conservation Measure	Agency	Date	Meeting	Not Meeting	N/A	Comments
1	From the Service's perspective, the most important aspect of this emergency response is speed. The faster river levels are returned to normal, the sooner fish passage and normative habitat conditions will exist. In addition, hydrologic impacts to Northern Wormwood will be minimized as compared to this extreme drawdown of the Columbia River. As such, the Service would endorse a 24-hour daily work period if desired by FERC and Grant PUD. However, working at night and over a 24-hour period introduces safety hazards. The Service suggests that FERC and Grant PUD carefully balance these concerns but always air on the side of safety.	USFWS	3/28/2014	X			Grant PUD is working as fast as possible to identify both the root cause and potential repair for the monolith, and when safe is working 24 hours per day, 7 days per week.
2	One adult upstream fishway should remain open during trap and transport operations to facilitate volitional upstream passage.	USFWS	3/28/2014	X			Per a decision by the PRCC, which includes a representative from the USFWS, the right bank fish ladder at Priest Rapids is open and being operated at ladder flow. This means that no fish attraction flow is added to the fishway. The decision to operate the right bank at Priest Rapids at ladder flow was made by the PRCC in an attempt to facilitate fish passage at the left bank of Priest Rapids Dam. This effort is necessary to increase numbers of fish for tagging purposes necessary to evaluate the Wanapum Fishway Exit Passage Systems and agreed upon by the PRCC. The PRCC has agreed to revisit on a weekly basis. This was discussed and agreed upon during the PRCC meeting on 4/4/2014 and 4/14/2014.
3	We recommend volitional passage as the primary method of conveying bull trout through the Project.	USFWS	3/28/2014	X			Grant PUD has installed Fishway Passage Systems at both the left and right bank at Wanapum Dam. To provide volitional passage through the Project. Until “proof of concept” evaluations are complete and/or the PRCC determines that safe and sufficient passage has been achieved through the modified ladders, the trap and transport procedure will be implemented.
4	If volitional upstream fish passage is not successful at Wanapum or Rock Island dams, bull trout incidentally encountered during trap and transport activities should be separated from other fish species at the OLAFT and transported in specialized coolers to minimize impacts during transport and release above the Rock Island Dam. Coolers should be equipped with appropriate temperature regulation (≤ 5°C), aeration, and transport of fish should not exceed 4 hours.	USFWS	3/28/2014		X		Per the trap and transport standard operating protocol (SOP) developed by the Washington Department of Fish and Wildlife and Grant PUD, a SOP has been included specifically related to bull trout (Appendix A; Section 5, Page 4). Once a bull trout is identified from the sorting flume, it would be placed within a self-contained perforated transport tube and placed with the loading fish transport truck. At the release location (Rocky Coulee), the bull trout would be released prior to other target species. This method would allow for isolation from other target species within the fish transport truck. A datasheet has been developed for each bull trout transported, which includes information on DO and water temperature prior to loading, after loading and at release.

5	Numerous bull trout occupy the upper Wanapum Reservoir within close proximity to the tailwater of the Rock Island Dam. For example, approximately 50-120 bull trout pass upstream through the fishways at Rock Island, primarily through the right bank fish ladder (RPE entrance). Please coordinate with Chelan PUD to ensure sufficient tailwater elevations that facilitate the operation of the adult upstream fishways (and their associated modifications) at the Rock Island Dam for bull trout as well as the other fish species contemplated herein.	USFWS	3/28/2014	X			Grant PUD is coordinating with Chelan PUD (minimum once/week); currently the Rock Island upstream fish passage facility is operational given Wanapum Dam's current operation range.
6	Please note condition, length, and life history stage of all bull trout encountered during the proposed modifications and their associated implementation.	USFWS	3/28/2014		X		Per the trap and transport standard operating protocol (SOP) developed by the Washington Department of Fish and Wildlife and Grant PUD, a SOP has been included specifically related to bull trout (Appendix A; Section 5, Page 4). Once a bull trout is identified from the sorting flume, it would be placed within a self-contained perforated transport tube and placed with the loading fish transport truck. At the release location (Rocky Coulee), the bull trout would be released prior to other target species. This method would allow for isolation from other target species within the fish transport truck. A datasheet has been developed for each bull trout transported, which includes information on DO and water temperature prior to loading, after loading and at release. Due to the volume of anticipated returning target species, it is unlikely that this specific data could be collected in a timely manner without disrupting the trap and transport process.
7	Due to the high level of noise emanating from the diesel pumps designed to supply the 40 cfs of water to the false weir, we recommend locating these pumps away from the exits of the adult upstream fishway to minimize auditory impacts to fish species, including bull trout	USFWS	3/28/2014	X			Grant PUD has installed 4 - 90hp electric pumps near each fishway exit. Diesel pumps are not being used.
8	Heavy equipment operating within or adjacent to surface water should replace hydraulic fluid with vegetable oil to minimize the consequence of spills and accidental releases.	USFWS	3/28/2014		X		Given the nature of the emergency, Grant PUD is not able to assess the feasibility of using vegetable oil in the heavy equipment working adjacent to surface water. Currently, the only heavy equipment operating adjacent to surface water are the transport trucks at the release site, and spill clean-up kits are available if needed.
9	All refueling should take place 100 feet away from surface water and wetlands. A spill prevention plan should be in place and all required materials should be on site for immediate deployment.	USFWS	3/28/2014	X			Grant PUD's existing Priest Rapids Dam SPCC Plan covers any potential spills on-site, and spill kits have been placed near re-fueling areas.
10	Utilize wash racks for vehicles entering and leaving the work area to minimize the spread of noxious weeds.	USFWS	3/28/2014			X	Access points are currently paved and thus need for wash racks is not applicable

11	Re-vegetation of the riparian and upland areas should be done to the degree possible to facilitate infiltration, reduce erosion, prevent the spread of noxious weeds, and aid in the restoration of the vegetative community.	USFWS	3/28/2014			X	To date no vegetation is being removed for this work.
12	While we understand that the designs for modifying the off ladder adult fish trap (OLAFT) are preliminary, and expect that you will continue to engage our fish passage engineers and the PRCC to the best of your ability as designs move forward, we suggest that you take care not to drop fish in the transport tanks such that they are slammed into the tank walls. The current design suggests that this may happen.	NOAA	3/18/2014	X			Weekly coordination with the PRCC and NOAA engineers is on-going.
13	We recommend that you limit the amount of time that fish are held in the transport tanks to 4 hours, i.e., 4 hours from the time the last fish is loaded to offloading upstream.	NOAA	3/18/2014	X			Currently, the total length of transport time from the OLAFT to Rocky Coulee release point in the Wanapum Reservoir has averaged less than 4 hrs.
14	The use of an average weight of 10 pounds for adult spring Chinook may be too small for calculation of load densities. We suggest using an average weight of 14 pounds for calculating load density.	NOAA	3/18/2014	X			To calculate fish loading densities, Grant PUD is using an average weight of 14 pounds for spring Chinook. Detailed information on fish loading densities be reviewed in the Section 9 (page 5) of the trap and transport standard operating protocol (SOP). The Trap and Transport SOP can be reviewed in full in Appendix A of the Interim Fish Passage Operation Plan – Status Update dated May 1, 2014.
15	We recommend that, if possible, collection of brood stock or test fish for research purposes be eliminated or limited as much as possible at the OLAFT. We are concerned that activities around the OLAFT could slow or stop adult fish from entering the trap and create significant delay.	NOAA	3/18/2014	X			Comment Noted. Currently activities at the Priest Rapids off-Ladder Adult Fish Trap are limited to the evaluation necessary for “proof of concept” of the Wanapum Fishway Passage Systems and Trap and Transport activities.
16	As previously mentioned, we expect you to continue to engage our fish passage engineers and the PRCC to the best of your ability as designs and plans for modifying the Wanapum Dam fish ladders move forward. We prefer that Grant PUD, as soon as practicable, design and install an extension to the flume leading from the ladder exits down to the Wanapum forebay. As currently designed, a free fall of 9 to 11 feet could result in injury. We suggest that the flume extend to a point where fish are limited to a maximum free fall of 4 feet. This flume should also be designed to handle large numbers of fish as could be expected during the sockeye salmon run.	NOAA	3/18/2014	X			Grant PUD has been communicating at least weekly with the NOAA Fisheries passage engineer assigned to this project. In addition, Grant PUD is conducting weekly briefing conference calls with external interested stakeholders, which has included PRCC members and the NOAA-Fisheries fish passage engineer. In regards to the spiral chute recommended by NOAA-Fisheries, Grant PUD is currently having that manufactured and expects it to be delivered on site approximately mid-May. Once it arrives, Grant PUD will consult with NOAA-Fisheries and the PRCC to determine if installation is still deemed necessary. At this time, no instantaneous mortalities or stunned fish have been observed as a result of exiting the existing flume at 9-13 ft.
17	As a conservative approach, we recommend that the OLAFT modifications remain in place until we are certain that the Wanapum fish ladder modifications are working as designed, and suggest that the trap and haul be conducted on alternate days until we know that fish are safely passing Wanapum Dam and Rock Island Dam.	NOAA	3/18/2014	X			Comment Noted. Currently WDFW and Grant PUD are conducting trap and transport activities on a daily base per the trap and transport SOP (Appendix A). Preliminary information presented to the PRCC on 4/21/2014 in a PowerPoint (Appendix B) indicates that the Fishway passage Systems at Wanapum and Rock Island are passing fish successfully.
18	When it is established that the fish ladders at Wanapum and Rock Island Dams are functioning properly, the trap and haul effort can cease and at that point all fish ladders should remain open.	NOAA	3/18/2014	X			Comment Noted

Appendix B
Consultation Record

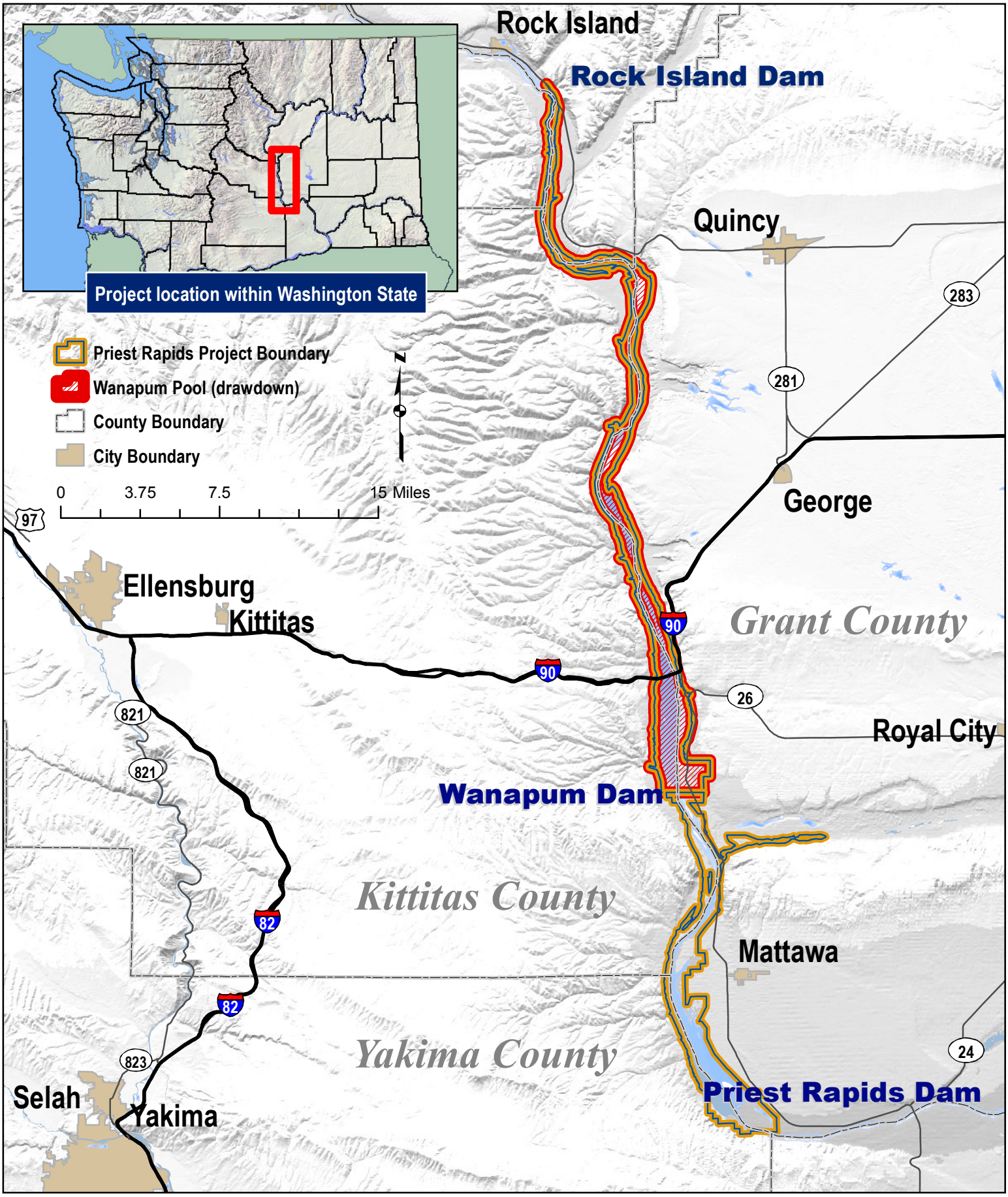
Priest Rapids Coordinating Committee Meetings, Conference Calls and Webex Conferences conducted during 2014.

Date	Communication Type	Topic
1/29/2014	Monthly PRCC Meeting	General Committee Business
2/26/2014	Monthly PRCC Meeting	General Committee Business
3/17/2014	Conference Call	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
3/24/2014	Conference Call	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
3/26/2014	Monthly PRCC Meeting	Status update on progress and implementation of the Wanapum Interim Fish Passage Operations Plan. Discussion of conducting a survival evaluation on Wanapum reservoir to inform the emergency ESA consultation process.
3/31/2014	Conference Call	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
4/3/2014	Conference Calls	Individual calls with members of the PRCC to discuss Statement of Agreement 2014-02 (SOA 2014-02). This SOA documented the evaluations that would be conducted in 2014.
4/4/2014	Conference Call	Review, Discussion and Approval Statement of Agreement 2014-02 (SOA 2014-02). This SOA documented the evaluations that would be conducted in 2014.
4/14/2014	PRCC-HCP Conference Call	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
4/14/2014	Conference Call	Decision on operations of Priest Rapids right-bank ladder operations (ladder flow only) and approval by a majority vote on criteria used to evaluation “proof of concept” of Wanapum Fishway Exit Passage Systems (see Section 5 above and Appendices B, C & D).
4/21/2014	Conference Call/WebEx	Joint PRCC-HCP meeting to provide updates on the Wanapum Fishway Exit Passage System Operations, fish behavior data, travel time and conversion rates.
4/21/2014	Conference Call/WebEx	Status update on progress and implementation of the Wanapum Interim Fish Passage Operations Plan.
4/22/2014	Conference Call	Status update on Wanapum Spillway Monolith No. 4 fracture activities.
4/28/2014	PRCC-HCP Conference Call/WebEx	Joint PRCC-HCP meeting to provide updates on the Wanapum Fishway Exit Passage System Operations, fish behavior data, travel time and conversion rates.
4/28/2014	Conference Call	Status update on progress and implementation of the Wanapum Interim Fish Passage Operations Plan. Discussion on ladder operations at Priest Rapids Dam.
4/28/2014	Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
5/1/2014	Conference Call	PRCC agreed to maintain ladder flows and Priest Rapids Off-Ladder Adult Fish Trap (OLAFT) would remain at status quo until May 5. PRCC also agreed to defer the decision to tag 10-20 spring Chinook with acoustic & PIT-tags to evaluate trap and transport program and that the trap and transport program would continue and be revisited on a weekly basis.
5/5/2014	Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
5/5/2014	Conference Call	PRCC members discussed additional modifications to the Wanapum

		Fishway Exit Passage Systems. This included the addition of spiral chutes on both left and right bank, anti-jump ramp on the left bank and perf plating to on the upper 3-4' of the false weir to preclude adult lamprey of attaching. The PRCC also agreed to shut down the Priest Rapids OLAFT on May 5 through May 7, in order to install a swing gate. This would allow for multiple loading if necessary for the adult sockeye and summer Chinook runs. There was also concern with delay occurring as a result of the OLAFT operations.
5/6//2014	Conference Call	PRCC agreed to suspend trap and transport for spring Chinook and allow volitional passage at all Priest Rapids Project fish ladders.
5/12/2014	Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
5/19/2014	Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
5/19/2014	Conference Call	PRCC agreed to modifications to the Wanapum Fishway Exit Passage Systems discussed on May 5, with the exception of the spiral chute.
5/28/2014	Meeting	Status update on the progress and implementation of the Wanapum Interim Fish Passage Plans.
6/2/2014	PRCC-HCP Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
6/16/2014	Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
6/25/2014	Monthly PRCC Meeting	Status update of fish passage measures implemented at Wanapum Dam and adult lamprey passage plan.
6/30/2014	Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
7/14/2014	Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
7/23/2014	Monthly PRCC Meeting	Status update of fish passage measures implemented at Wanapum Dam and presentation of preliminary yearling Chinook and juvenile steelhead survival estimates.
7/28/2014	Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
8/11/2014	Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
8/25/2014	Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
8/27/2014	Monthly PRCC Meeting	Status update of fish passage measures implemented at Wanapum Dam and adult lamprey passage.
9/8/2014	Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
9/22/2014	Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
9/24/2014	Monthly PRCC Meeting	Status update of fish passage measures implemented at Wanapum Dam.
10/6/2014	Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
10/20/2014	Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
10/29/2014	Monthly PRCC Meeting	Status update of fish passage measures implemented at Wanapum Dam and refill planning.
11/3/2014	Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
11/17/2014	Letter and email	Communication on timing of potential initial pool raise and scheduling of

	Communication	demobilization of Wanapum Fishway Exit Passage Systems and ladder outage timing.
11/17/2014	Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
12/1/2014	Conference Call/WebEx	Joint briefing on the progress and implementation of the Wanapum and Rock Island Interim Fish Passage Plans.
12/16/2014	Monthly PRCC Meeting	Status update of fish passage measures implemented at Wanapum Dam and refill planning.

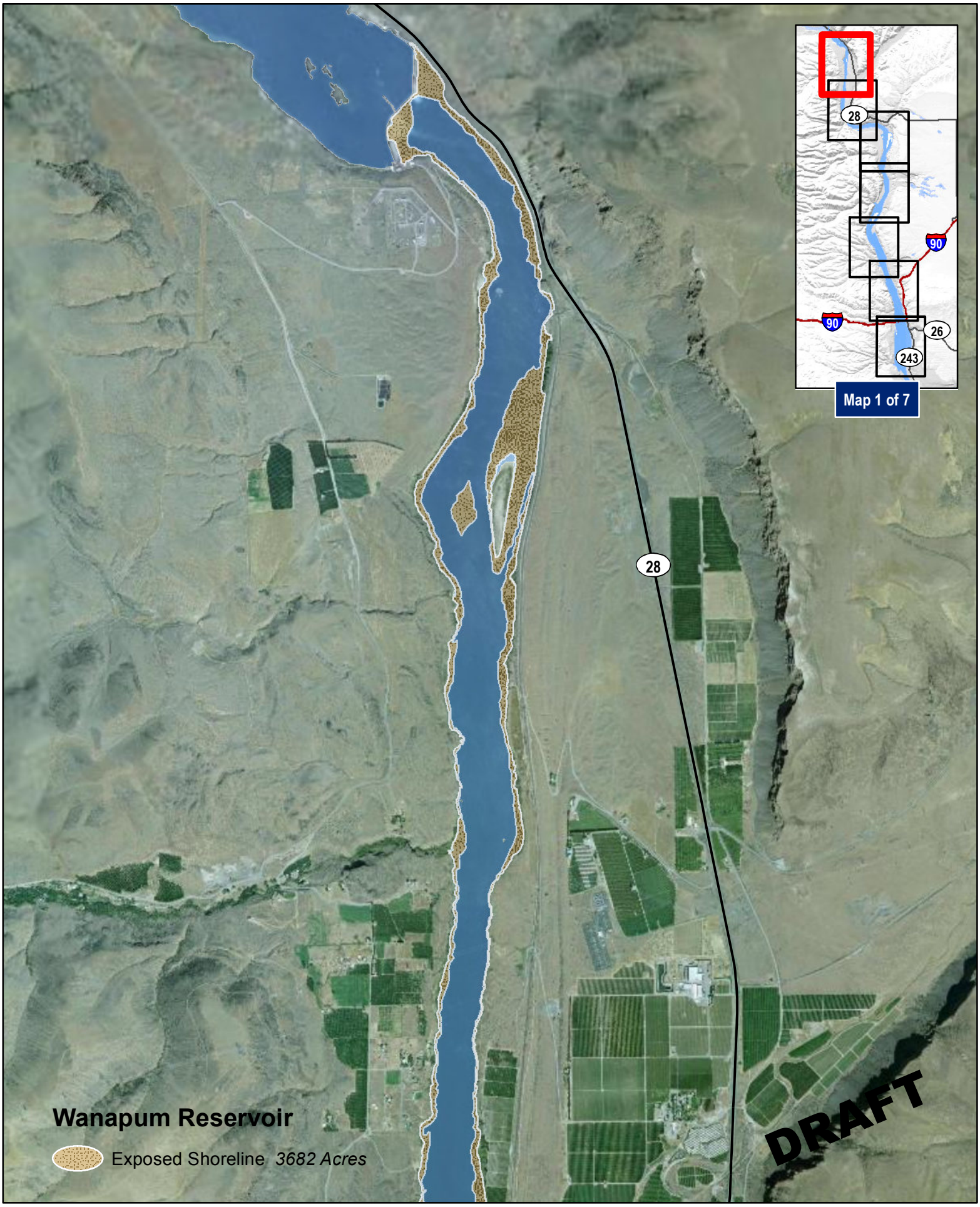
Appendix C
Maps



Wanapum Dam Reservoir

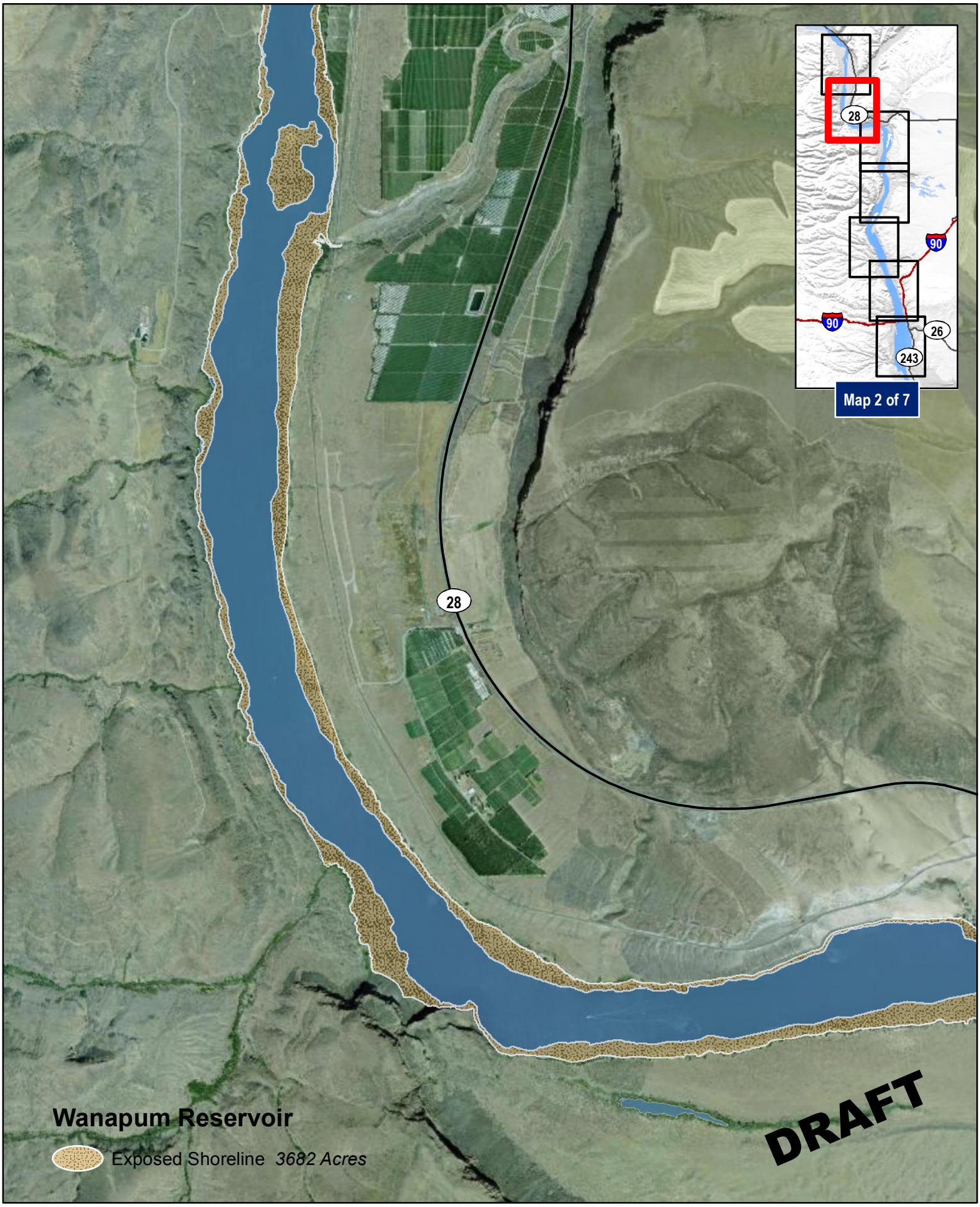
Drawdown Impact Area within Priest Rapids Project

Grant PUD



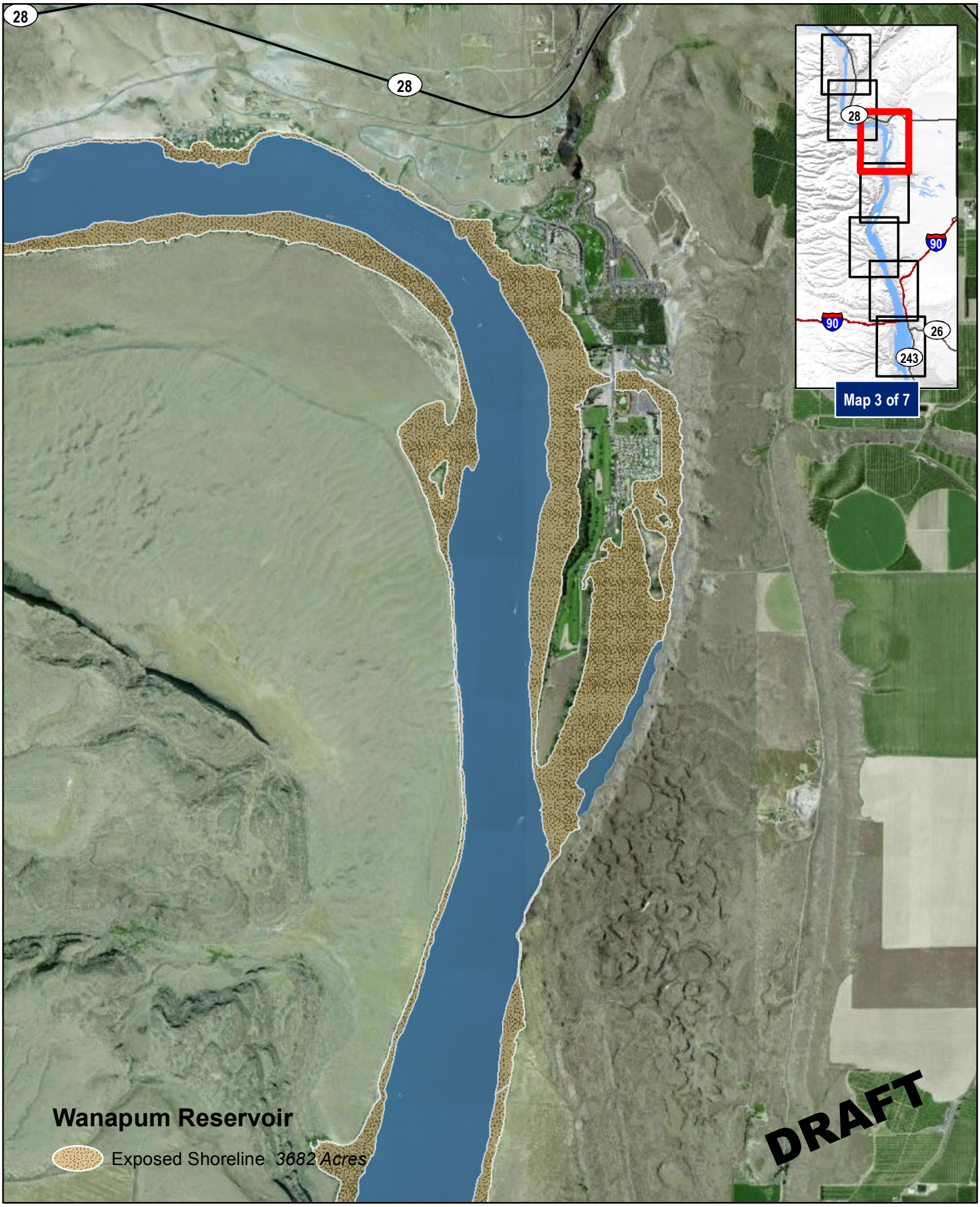
Drawdown Impact Area - Wanapum Dam Reservoir

0 0.25 0.5 1 Miles



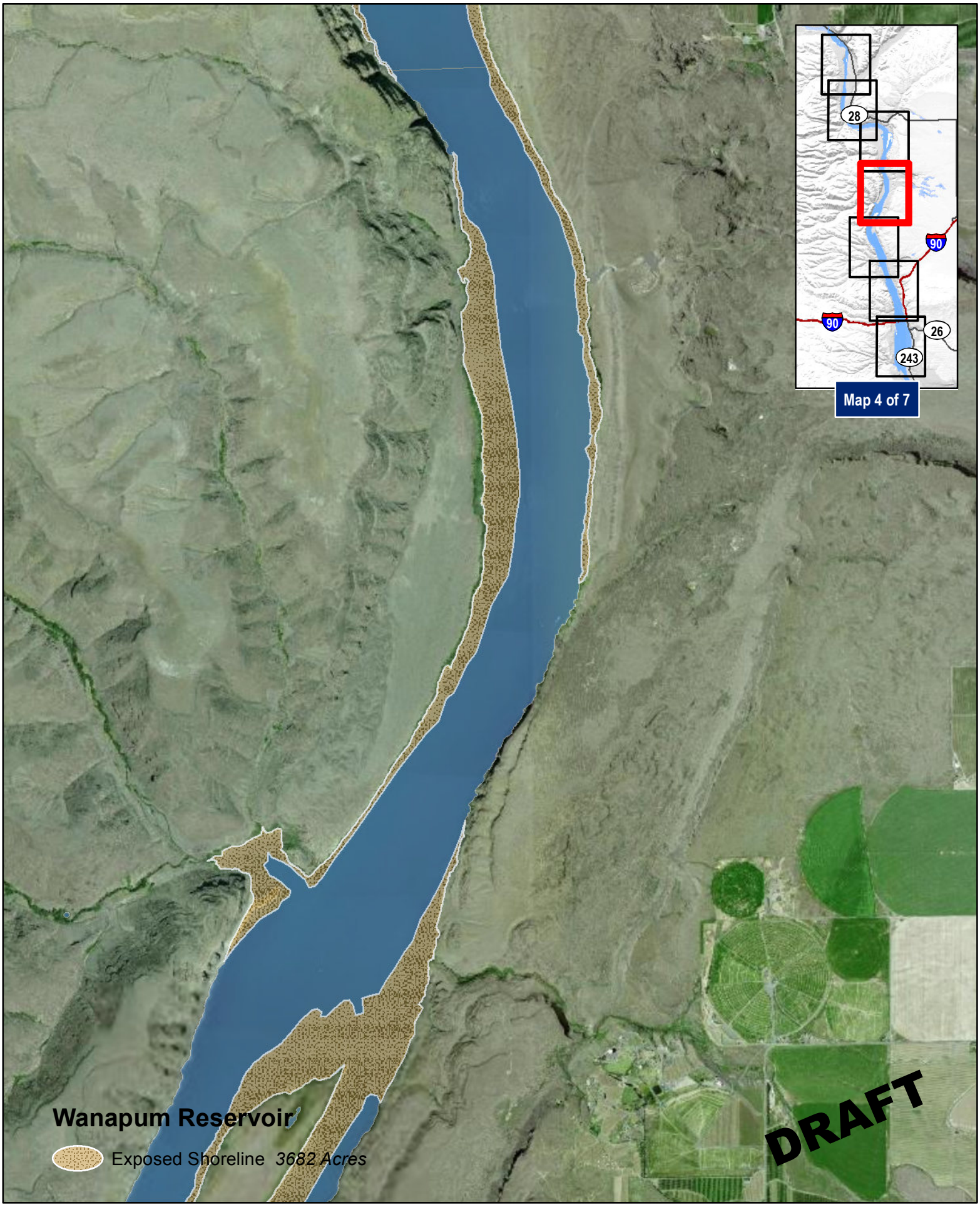
Drawdown Impact Area - Wanapum Dam Reservoir

0 0.25 0.5 1 Miles



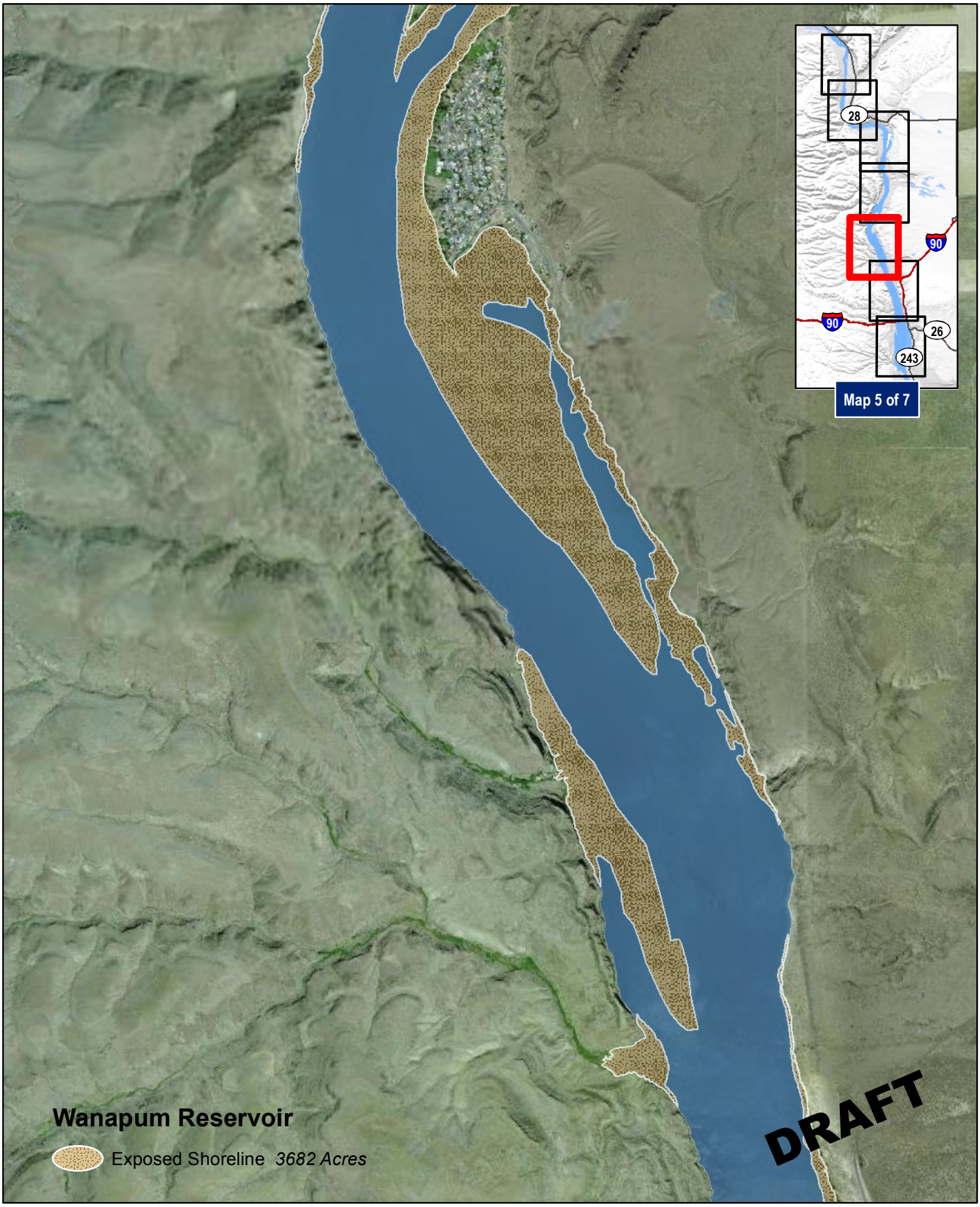
Drawdown Impact Area - Wanapum Dam Reservoir

0 0.25 0.5 1 Miles



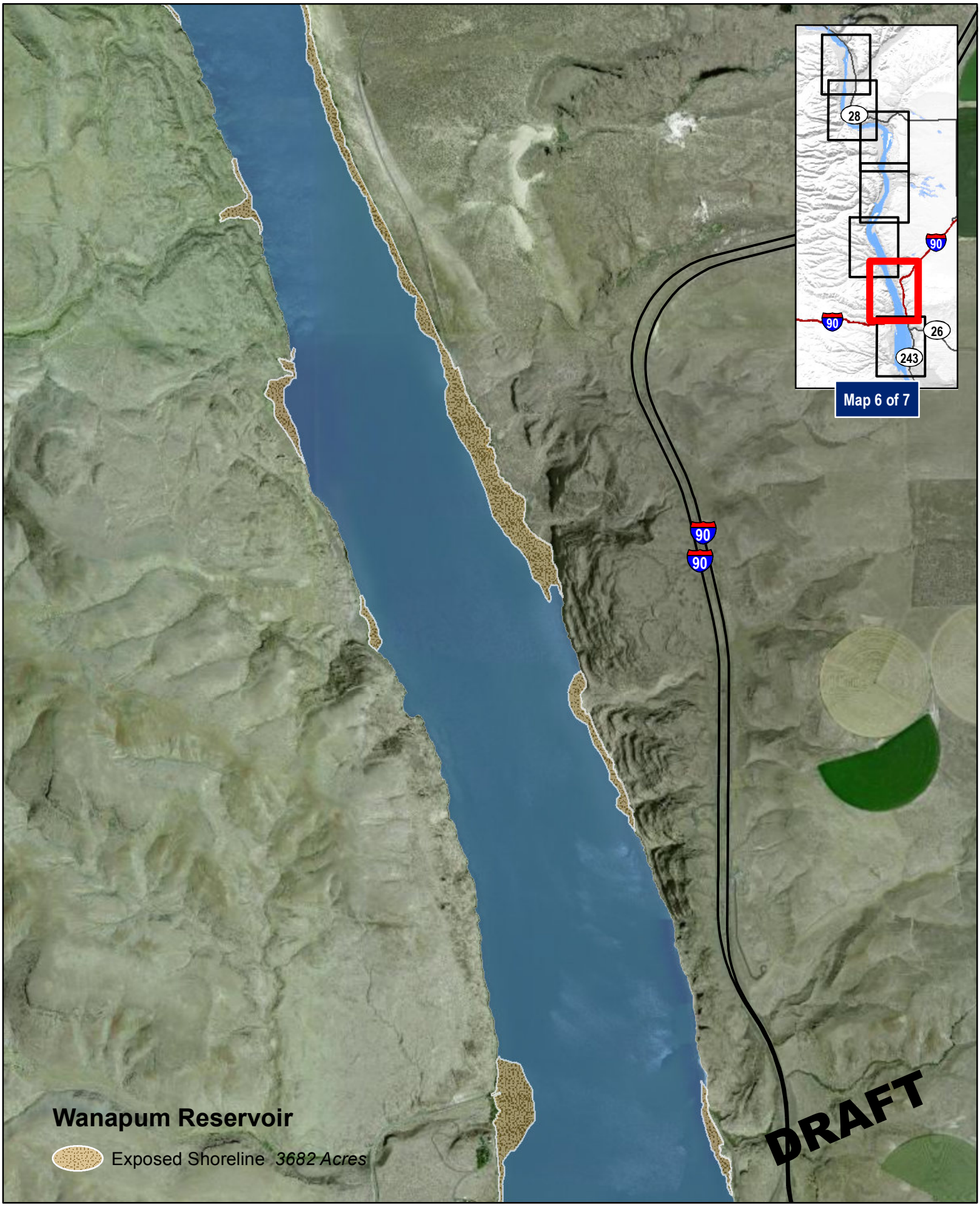
Drawdown Impact Area - Wanapum Dam Reservoir

0 0.25 0.5 1 Miles



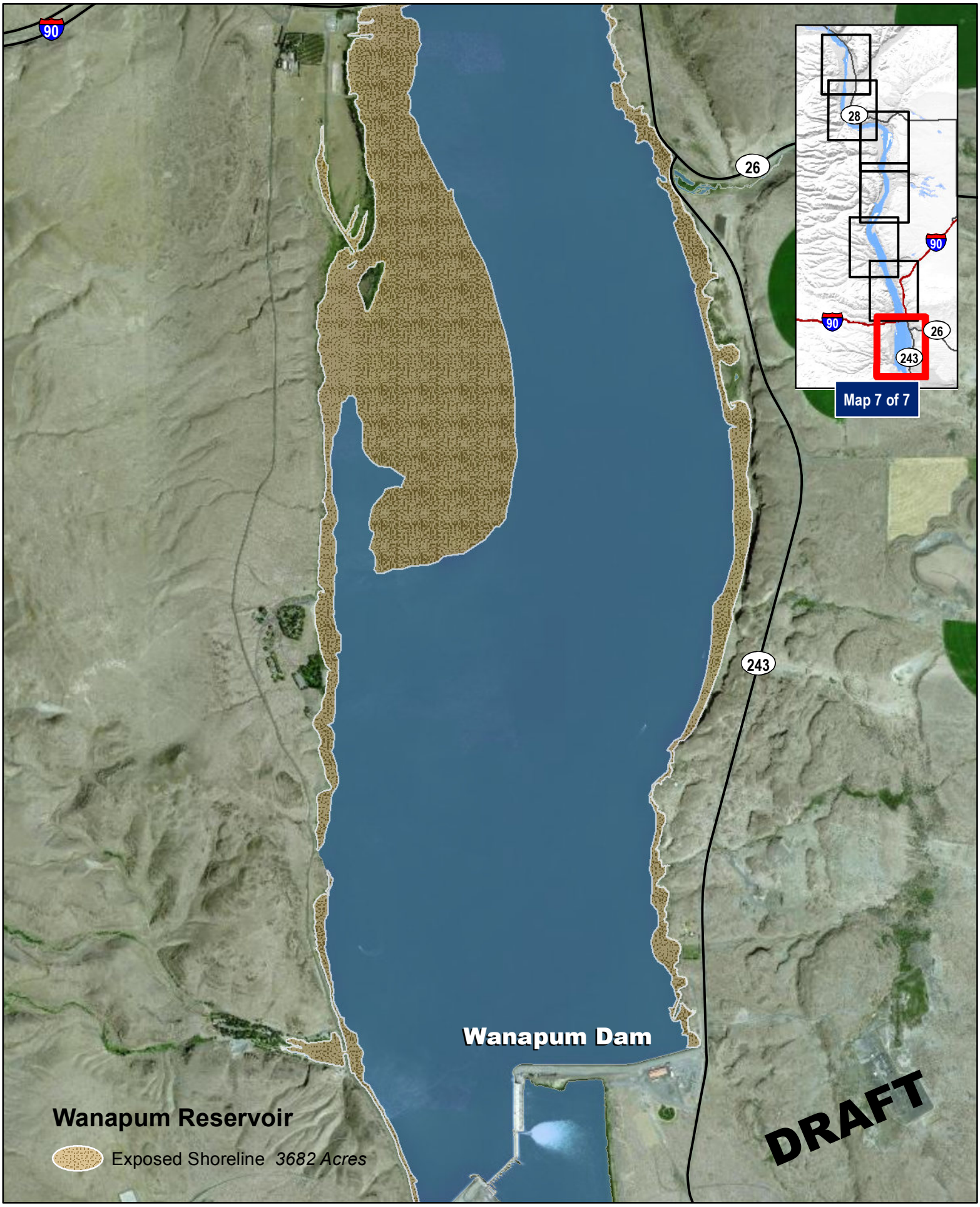
Drawdown Impact Area - Wanapum Dam Reservoir

0 0.25 0.5 1 Miles



Drawdown Impact Area - Wanapum Dam Reservoir

0 0.25 0.5 1 Miles



Drawdown Impact Area - Wanapum Dam Reservoir

0 0.25 0.5 1 Miles

Appendix D
Washington Department of Fish & Wildlife Hydraulic Project Approval

Washington Department of FISH and WILDLIFE

HYDRAULIC PROJECT APPROVAL

RCW 77.55.021 (12) - See appeal process at end of HPA

North Central
1550 Alder Street NW
Ephrata, WA 98823-9699
(509) 754-4624

Issue Date: April 07, 2014
Project Expiration Date: April 30, 2014

Control Number: 133321-2
FPA/Public Notice #: N/A

PERMITTEE	AUTHORIZED AGENT OR CONTRACTOR
Public Utility District No. 2 of Grant County PO Box 878 Ephrata, WA 98823 509-754-5088 Fax: 509-793-1548	

Project Name: Wanapum Dam Emergency Fish Release Structure

Project Description: Modifications at the temportary boat launch site at Rocky Coulee, upstream of Vantage, to prepare for fish release activities which will occur until modifications can be made to the Wanapum Dam fish ladders to accommodate the lowered level of the reservoir.

PROVISIONS

1. The project may begin April 7, 2014 and shall be completed by April 30, 2014.

2. All work shall substantially conform to project plans specifications in the Emergency Rocky Coulee Fish Release - Proposed Modification to the Rocky Coulee temproary boat launch site, upstream of Vantage, to prepare for fish release the week of April 7, 2014 e-mail dated April 7, 2014. A copy of this HPA permit and e-mail shall be provided by the permittee to their project engineer, project manager, project inspector, contractor, and subcontractors.

3. This HPA authorizes the following in-water and shoreline activities including: 1) the placement of 250 to 340 linear feet of 16 inch diameter PVC pipe on the exposed riverbed, extending from the Old Vantage Highway surface to the Columbia River, 2) the placement of ecology blocks or wood cribbing approximately every 20 feet at pipe joints to support and secure the PVC pipeline, 3) the placement of three floating dock sections in the Columbia River to support the fish release pipe, 4) the placement of ecology blocks to anchor one floating dock closest to the dry Columbia River Bed, 5) the installation of mantaray anchors to secure the 2 outer floating dock sections, 6) the excavation of any small berm areas (20 to 40 cubic yards total), located on the dry riverbed between the Old Vantage Highway and the Columbia River, to create a notch for the PVC pipeline to establish the necessary slope, 7) the construction of a temporary concrete pad (6 ft x 6 ft. x 0.5 in.) to support the fish receiving flume/hopper, and 8) the pumping of water from the Columbia River using a suction pump with a screened intake. In addition, this includes work necessary to install appropriate and effective erosion or other water quality control devices (i.e. sealed gravel bags, silt fencing, straw bale check dams, sealed coffer dams, silt curtain/floating boom containment system (if necessary) or other WDFW approved pollutant control devices or containment systems.

4. The permittee's project engineer, project manager, project inspector, or other qualified WDFW personnel, shall be on site at appropriate times to oversee and monitor all aspects and phases of this project, in order to ensure positive quality control, and to ensure that all WDFW approved project design specifications and WDFW HPA permit provisions and requirements are followed and met.

5. There shall be no storage of chemicals, petroleum products (diesel, gasoline, oil) or any other toxic or deleterious substances within or near the OHWL, in order to prevent accidental spills, and to protect water quality and local fish, shellfish and their habitats.

6. As there is the potential for raw soils, silt, sands, sediments, silt or sediment-laden water, petroleum products, machinery fuel, lubricants, cooling agents, chemicals, man-made wastes, construction debris and other toxic or deleterious materials to enter the OHWL or wetted perimeter, appropriate and effective erosion or other water quality control devices (i.e. sealed gravel bags, silt fencing, straw bale check dams, sealed coffer dams, silt curtain/floating boom containment system (if necessary) (including hydro-carbon absorbent pads & booms) or other WDFW approved pollutant control devices or containment systems shall be in place prior to any project work activities.

7. The permittee and/or contractor shall have on-site at all times sufficient quantities of DOE approved petroleum absorbent booms and hydrocarbon absorbent pads, to be utilized in booming off, containing, and absorbing any potential petroleum or other spills resulting from the project or other authorized construction activities.

8. All work within and below the OHWL shall be conducted in the dry, from a work boat or in isolation from the mainstem Columbia River from within a WDFW approved, temporary silt curtain/floating boom containment system that completely surrounds the project area (if necessary to meet the Washington Department of Ecology's Water Quality Standards).

9. All mechanized equipment or other heavy machinery work shall be conducted completely in the dry from atop the Old Vantage Highway or the dry Columbia River bed.

10. Prior to entering the project area and OHWL, all equipment (including booms cranes, tracked and/or wheeled equipment, hydraulic excavators, boats, and other land-based and floating equipment) shall be thoroughly checked for leaks, shall be repaired if necessary, and shall be cleaned completely free of any external petroleum products, hydraulic fluid, machinery coolants, chemicals, and/or any other deleterious materials. Equipment shall be well maintained, shall be repaired as needed, and shall remain free of leaks and of the above mentioned toxic or deleterious substances while working within or adjacent to the Columbia River.

11. Equipment used for this project operating with hydraulic fluid shall only use those fluids certified as non-toxic to aquatic organisms while working in and around the Columbia River.

12. Any device used for pumping water out of the Columbia River shall be equipped with a fish guard to prevent passage of fish into the diversion device pursuant to RCW 77.57.010 and 77.57.070. The pump intake shall be screened by one of the following:
a. Perforated plate: 0.094 inch (maximum opening diameter).
b. Profile bar: 0.069 inch (maximum width opening).
c. Woven wire: 0.087 inch (maximum opening in the narrow direction).

The minimum open area for all types of fish guards is 27%. The screened intake shall consist of a facility with enough surface area to ensure that the velocity through the screen is less than 0.4 feet per second. Screen maintenance shall be adequate to prevent injury or entrapment of juvenile fish and the screen shall remain in place whenever water is withdrawn from the Columbia River through the pump intake.

13. At the first sign of any distressed, dying or dead fish life and/or any equipment leaks or spills within or adjacent the OHWL, the permittee, contractor and/or operator shall immediately cease all work activities, remove the machine from within or adjacent the water if possible, attempt containment of the spill, and shall contact WDFW at (509) 754-4624 and the Washington Military Department Emergency Management Division at 1-800-562-6108 to report the incident. Work shall not resume until further approval is given by WDFW.

14. All excess spoils and project materials shall be completely removed from within the OHWL and not placed again within state waters, once the trap and haul project is complete, and not allowed to reenter state waters or shorelines areas. Effective cleanup of the project work area after project completion is mandatory and shall be thorough and complete.

PROJECT LOCATIONS

Location #1 Rocky Coulee Rec. Site

WORK START: April 07, 2014					WORK END: April 30, 2014	
WRIA:	Waterbody:				Tributary to:	
40.0001	Columbia River				Pacific Ocean	
1/4 SEC:	Section:	Township:	Range:	Latitude:	Longitude:	County:
SE 1/4	18	17 N	23 E	N 46.957723	W 119.986979	Grant

Location #1 Driving Directions

From Vantage Highway, follow Recreation Drive down to the Columbia River.

Issue Date: April 07, 2014
Project Expiration Date: April 30, 2014

Control Number: 133321-2
FPA/Public Notice #: N/A

APPLY TO ALL HYDRAULIC PROJECT APPROVALS

This Hydraulic Project Approval pertains only to those requirements of the Washington State Hydraulic Code, specifically Chapter 77.55 RCW (formerly RCW 77.20). Additional authorization from other public agencies may be necessary for this project. The person(s) to whom this Hydraulic Project Approval is issued is responsible for applying for and obtaining any additional authorization from other public agencies (local, state and/or federal) that may be necessary for this project.

This Hydraulic Project Approval shall be available on the job site at all times and all its provisions followed by the person(s) to whom this Hydraulic Project Approval is issued and operator(s) performing the work.

This Hydraulic Project Approval does not authorize trespass.

The person(s) to whom this Hydraulic Project Approval is issued and operator(s) performing the work may be held liable for any loss or damage to fish life or fish habitat that results from failure to comply with the provisions of this Hydraulic Project Approval.

Failure to comply with the provisions of this Hydraulic Project Approval could result in a civil penalty of up to one hundred dollars per day and/or a gross misdemeanor charge, possibly punishable by fine and/or imprisonment.

All Hydraulic Project Approvals issued under RCW 77.55.021 are subject to additional restrictions, conditions, or revocation if the Department of Fish and Wildlife determines that changed conditions require such action. The person(s) to whom this Hydraulic Project Approval is issued has the right to appeal those decisions. Procedures for filing appeals are listed below.

MINOR MODIFICATIONS TO THIS HPA: You may request approval of minor modifications to the required work timing or to the plans and specifications approved in this HPA. A minor modification to the required work timing means up to a one-week deviation from the timing window in the HPA when there are no spawning or incubating fish present within the vicinity of the project. You may request subsequent minor modifications to the required work timing. A minor modification of the plans and specifications means any changes in the materials, characteristics or construction of your project that does not alter the project's impact to fish life or habitat and does not require a change in the provisions of the HPA to mitigate the impacts of the modification. Minor modifications do not require you to pay additional application fees or be issued a new HPA. To request a minor modification to your HPA, submit a written request that clearly indicates you are requesting a minor modification to an existing HPA. Include the HPA number and a description of the requested change and send by mail to: Washington Department of Fish and Wildlife, PO Box 43234, Olympia, Washington 98504-3234, or by email to HPAapplications@dfw.wa.gov. Do not include payment with your request. You should allow up to 45 days for the department to process your request.

MAJOR MODIFICATIONS TO THIS HPA: You may request approval of major modifications to any aspect of your HPA. Any approved change other than a minor modification to your HPA will require issuance of a new HPA. If you paid an application fee for your original HPA you must include payment of $150 with your written request or request billing to an account previously established with the department. If you did not pay an application fee for the original HPA, no fee is required for a change to it. To request a major modification to your HPA, submit a written request that clearly indicates you are requesting a major modification to an existing HPA. Include the HPA number, check number or billing account number, and a description of the requested change. Send your written request and payment, if applicable, by mail to: Washington Department of Fish and Wildlife, PO Box 43234, Olympia, Washington 98504-3234. If you are charging the fee to a billing account number or you are not subject to the fee, you may email your request to HPAapplications@dfw.wa.gov. You should allow up to 45 days for the department to process your request.

APPEALS INFORMATION

Washington Department of FISH and WILDLIFE

HYDRAULIC PROJECT APPROVAL

RCW 77.55.021 (12) - See appeal process at end of HPA

North Central
1550 Alder Street NW
Ephrata, WA 98823-9699
(509) 754-4624

Issue Date: April 07, 2014
Project Expiration Date: April 30, 2014

Control Number: 133321-2
FPA/Public Notice #: N/A

If you wish to appeal the issuance, denial, conditioning, or modification of a Hydraulic Project Approval (HPA), Washington Department of Fish and Wildlife (WDFW) recommends that you first contact the department employee who issued or denied the HPA to discuss your concerns. Such a discussion may resolve your concerns without the need for further appeal action. If you proceed with an appeal, you may request an informal or formal appeal. WDFW encourages you to take advantage of the informal appeal process before initiating a formal appeal. The informal appeal process includes a review by department management of the HPA or denial and often resolves issues faster and with less legal complexity than the formal appeal process. If the informal appeal process does not resolve your concerns, you may advance your appeal to the formal process. You may contact the HPA Appeals Coordinator at (360) 902-2534 for more information.

A. INFORMAL APPEALS: WAC 220-110-340 is the rule describing how to request an informal appeal of WDFW actions taken under Chapter 77.55 RCW. Please refer to that rule for complete informal appeal procedures. The following information summarizes that rule.

A person who is aggrieved by the issuance, denial, conditioning, or modification of an HPA may request an informal appeal of that action. You must send your request to WDFW by mail to the Washington Department of Fish and Wildlife HPA Appeals Coordinator, 600 Capitol Way North, Olympia, Washington 98501-1091; e-mail to HPAapplications@dfw.wa.gov; fax to (360) 902-2946; or hand-delivery to the Natural Resources Building, 1111 Washington St SE, Habitat Program, Fifth floor. WDFW must receive your request within 30 days from the date you receive notice of the decision. If you agree, and you applied for the HPA, resolution of the appeal may be facilitated through an informal conference with the WDFW employee responsible for the decision and a supervisor. If a resolution is not reached through the informal conference, or you are not the person who applied for the HPA, the HPA Appeals Coordinator or designee will conduct an informal hearing and recommend a decision to the Director or designee. If you are not satisfied with the results of the informal appeal, you may file a request for a formal appeal.

B. FORMAL APPEALS: WAC 220-110-350 is the rule describing how to request a formal appeal of WDFW actions taken under Chapter 77.55 RCW. Please refer to that rule for complete formal appeal procedures. The following information summarizes that rule.

A person who is aggrieved by the issuance, denial, conditioning, or modification of an HPA may request a formal appeal of that action. You must send your request for a formal appeal to the clerk of the Pollution Control Hearings Boards and serve a copy on WDFW within 30 days from the date you receive notice of the decision. You may serve WDFW by mail to the Washington Department of Fish and Wildlife HPA Appeals Coordinator, 600 Capitol Way North, Olympia, Washington 98501-1091; e-mail to HPAapplications@dfw.wa.gov; fax to (360) 902-2946; or hand-delivery to the Natural Resources Building, 1111 Washington St SE, Habitat Program, Fifth floor. The time period for requesting a formal appeal is suspended during consideration of a timely informal appeal. If there has been an informal appeal, you may request a formal appeal within 30 days from the date you receive the Director's or designee's written decision in response to the informal appeal.

C. FAILURE TO APPEAL WITHIN THE REQUIRED TIME PERIODS: If there is no timely request for an appeal, the WDFW action shall be final and unappealable.

ENFORCEMENT: Sergeant Jewell (35) P1

Habitat Biologist Eric Pentico	509-754-4624	Eric D. Pentico	for Director WDFW

CC:

Appendix E
FERC Documents

146 FERC ¶ 62,219
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Public Utility District No. 2 of Grant County, Washington — Project No. 2114-266

ORDER APPROVING INTERIM FISH PASSAGE OPERATIONS PLAN

(Issued March 26, 2014)

1. On March 21, 2014 the Public Utility District No. 2 of Grant County, Washington (licensee) filed an Interim Fish Passage Operations Plan (Interim FPP) for the Priest Rapids Project.[1] The project has two developments, Priest Rapids and Wanapum. The project is located on the mid-Columbia River in portions of Grant, Yakima, Kittitas, Douglas, Benton, and Chelan counties, Washington.

BACKGROUND

2. The normal minimum operating elevation for the Wanapum Reservoir is 560 feet mean sea level (msl). On February 27, 2014, the licensee discovered damage to a spillway monolith at Wanapum Dam. Following consultation with the Commission's Division of Dam Safety and Inspection (D2SI), the licensee lowered Wanapum Reservoir to reduce loading on the spillway. In coordination with D2SI, the licensee is currently maintaining reservoir forebay elevations between 541 and 545 feet msl. At these reduced reservoir elevations, the project's upstream fishways are inoperable.

3. The upstream fishways at Wanapum Dam consist of left and right bank fish ladders, entrance channels, and attraction water facilities. These facilities are operated to primarily pass adult salmon, steelhead trout, bull trout, and Pacific lamprey. A total of about 70 cubic feet per second (cfs) of water flows through each fish ladder consisting of about 40 cfs over the weirs and 30 cfs through the orifices. Migrating fish may swim over the top of the weir or through the orifices.

[1] Order Issuing New License, issued April 17, 2008 (123 FERC ¶ 61,049).

LICENSEE'S INTERIM FISH PASSAGE OPERATIONS PLAN

Upstream Fish Passage and Trap and Transport

4. The licensee proposes to implement the Interim FPP so fish passage can continue while Wanapum Reservoir is lowered. Under the Interim FPP, the licensee would modify the exits of the left and right bank fishways at the dam. Weir boxes 16 feet wide by 7 feet long would be installed near the exit of each fishway and supplied with an about 40 cfs of flow via four electric pumps stationed at each ladder. The weir boxes would have a false weir designed to attract fish from the fishway pools. Fish attracted from the pools would swim past or jump the false weir and enter a flume that would descend to the forebay close to the water surface near the existing fishway exit. About 35 of the 40 cfs of the flow would be used to operate the fishway while the remaining 5 cfs would be used to operate the exit flume. An adjustable weir would be used to change the flow ratio for the fishway and flume if necessary. The lower fishway attraction flow system at each fishway would remain unaltered.

5. If the Wanapum Dam or upstream Rock Island Dam[2] fishways are impassable, the licensee proposes to operate, by April 15, 2014, the Priest Rapids Dam Off-Ladder Adult Fish Trap (fish trap) that is connected to the diversion weir at the left bank fishway to collect and transport adult migrating fish at Priest Rapids Dam, which is located immediately downstream of Wanapum Dam, to locations upstream of Wanapum or Rock Island Dams. The licensee's Interim FPP includes a decision matrix that would be used to determine whether fish trap and transport measures at the Priest Rapids Dam fish trap should be used.

6. All fish entering the fish trap at the left bank ladder would be diverted through the trap facility into trucks with holding tanks designed to transport and release adult fish. Fish would then be transported to pre-determined locations either in the Wanapum or Rock Island reservoirs for release.

7. Proposed design modifications to the fish trap consists of extending the existing flume downstream of a false weir, transitioning the flume into a pipe, and a pipe turn of approximately 150 degrees so fish can be directly loaded. A PVC transport chute at the fish trap would be employed to facilitate a water-to-water transfer of fish from the facility to holding facilities or fish trucks to eliminate the need to physically handle the fish. A second design would also be developed so fish could be routed via a wye gate to an anesthesia tank. This design would not be completed until late June or early July, 2014.

[2] The Rock Island Project is FERC No. 943.

Monitoring

8. The licensee would continue its existing program of monitoring and reporting upstream adult fish passage at the Priest Rapids fish trap and at the two existing adult upstream fish ladders at Priest Rapids Dam. The licensee proposes to install a temporary passive integrated transponder (PIT)-tag array in the left and right banks fishways at Wanapum Dam. Antennas would be constructed of two-inch or four-inch pipe and would be installed on the upstream side of the fishway weir orifice to be sampled. The antennas would be secured to the wall and floor of the fishways using custom lean-in/lead-out ramps that would secure the antennas and also reduce the hydraulic impact of the antennas.

9. Data from upstream migrating salmonids previously implanted with PIT tags would continue to be monitored at interrogation sites along their migration route. As tagged fish move upstream past Priest Rapids and Wanapum Dams, data would be uploaded to the Pacific States Marine Fisheries Commission's centralized database system for PIT-tagged fish in the Columbia River (PTAGIS). Data from the temporary PIT receivers at Wanapum Dam would be collected manually if an automated process for sending the data to PTAGIS cannot be established during the monitoring period.

10. The licensee proposes to evaluate migration delays at Priest Rapids Dam by monitoring the travel time of PIT-tagged fish from the downstream McNary Dam to the fish trap. Travel time of Chinook salmon during any trap and haul activities would be compared with historical migration data. If a ten-fish rolling average travel time exceeds seven days (the historical 75 percent exceedance travel time), the resource agencies would be notified, and alternative trapping operations would be considered. The licensee would also monitor travel times from Priest Rapids Dam to Wanapum Dam and to Rock Island Dam. Results would be provided daily for migration times between the dams and weekly for migration times to upstream tributaries. Travel times would be compared to historical data and more recent data available on PTAGIS to determine if the travel times in 2014 are similar to past years.

11. The licensee would continue to monitor passage of Pacific lamprey to assess factors such as passage efficiency, fallback, and sequence timing at Priest Rapid and Wanapum Dams. Monitoring activities for in-river adult lamprey would begin in May 2014 and would continue until the seasonal migration of lamprey appears to have ceased in approximately mid-November.

Adaptive Management

12. The licensee proposes to adaptively manage implementation of the Interim FPP, as needed, via consultation with the Priest Rapids Coordinating Committee (PRCC) which includes representatives from the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (FWS), Washington Department of Fish and Wildlife (Washington DFW), the Yakama Nation, and the Colville Confederated Tribes. The licensee proposes to implement the Interim FPP using the same adaptive management principles that were incorporated into the Priest Rapids Salmon and Steelhead Settlement Agreement. This agreement includes an active systematic process for continually improving management through problem assessment, project design, implementation, monitoring, evaluation, and adjustment of future decisions.

CONSULTATION

13. The licensee developed its Interim FPP in consultation with the PRCC. A draft copy of the Interim FPP was circulated to the PRCC for comment on March 17, 2014. Comments were received from NMFS, FWS, Washington DFW, the Yakama Nation, and the Colville Confederated Tribes. In its final plan as filed with the Commission, the licensee included a table of comments and recommendations it received on the plan along with its responses. The comments, recommendations, and responses address technical aspects of the proposed modifications to the fish ladders, weir designs, and flows to ensure safe passage of fish; protocols for the fish trap and haul option, monitoring and evaluation methods, and measures necessary to protect different species of fish. The licensee responded to all of the issues raised, and incorporated the majority of the recommendations into the final plan filed with the Commission.

14. On March 19, 2014, Commission staff designated the licensee as its non-federal representative for consultation under section 7 of the Endangered Species Act (ESA) with NMFS and FWS regarding effects to federally-listed species during the drawdown at Wanapum Dam. NMFS provided conservation recommendations which were accommodated in the final plan to the extent possible. For example the licensee adjusted the transport load factor and agreed to use adaptive management for the ongoing implementation of the Interim FPP. FWS indicated that it would provide conservation recommendations at a later date. Consultation under the emergency provisions of section 7 of the ESA will continue as the Interim FPP further developed and implemented.

DISCUSSION

15. Under the proposed Interim FPP the licensee would modify the exit of the left and right bank fishway at Wanapum Dam to allow upstream migrating fish to safely exit the fishways. The licensee would construct a weir box with a false weir to encourage fish to exit the fish ladders and to enter the flume for a safe descent to the lowered elevation of the Wanapum Reservoir. Further modifications would be made to deliver fish close to the water surface to further minimize potential exit injury.

16. The licensee would also make modifications to the Priest Rapids Dam fish trap to provide a trap and transport alternative for moving fish upstream of the Priest Rapids, Wanapum, or Rock Island dams. Modifications to the fish trap would allow the use of properly equipped transport trucks to convey fish to locations upstream in the event fishways at Wanapum or Rock Island Dams are inoperable.

17. We have reviewed the licensee's proposed Interim FPP, its record of consultation with the PRCC and the resource agencies, and its overall efforts to address fish passage at the project given the drawdown to address dam safety concerns. We agree that the proposed interim fish passage measures are reasonable, and may need to be modified in response to circumstances that occur during the repair of Wanapum Dam and changes in reservoir elevations and flows. We note that the licensee will adaptively manage the situation in consultation with the resource agencies.

18. So the Commission remains informed about ongoing efforts to implement the Interim FPP and any needed changes to address fish passage needs, we are requiring the licensee to file a monthly report that documents regular teleconference meetings with the PRCC and the resource agencies, actions taken to implement the Interim FPP, and any needed changes to the Interim FPP under the plan's adaptive management provisions. This plan should be approved and should remain in effect until further order of the Commission.

The Director orders:

(A) The Interim Fish Passage Operations Plan filed by the Public Utility District No. 2 of Grant County, Washington (licensee) on March 21, 2014 is approved, as modified by ordering paragraph (B) below. The approved plan shall remain in effect until further order of the Commission.

(B) The licensee shall file monthly reports with the Commission documenting its consultation with the Priest Rapids Coordinating Committee (PRCC) and resource agencies, actions taken to implement the Interim Fish Passage Operations Plan, and any

needed changes to the plan. Monthly reports shall include meeting minutes, copies of agency correspondence, and any other documentation of consultation. The licensee shall provide copies of the monthly reports to the members of the PRCC at the same time that the reports are filed with the Commission. The licensee shall file the first monthly report by May 1, 2014, and include a schedule for the filing of future monthly reports.

(C) The Commission reserves the right to require changes to the Interim Fish Passage Operations Plan in order to effectively manage fish passage at the project.

(D) This order constitutes final agency action. Any party may file a request for rehearing of this order within 30 days from the date of its issuance, as provided in section 313(a) of the Federal Power Act, 16 U.S.C. § 825*l* (2006), and the Commission's regulations at 18 C.F.R. § 385.713 (2013). The filing of a request for rehearing does not operate as a stay of the effective date of this order, or of any other date specified in this order. The licensee's failure to file a request for rehearing shall constitute acceptance of this order.

Steve Hocking
Chief, Environmental Review Branch
Division of Hydropower Administration
and Compliance