ENVIRONMENTAL ASSESSMENT
FOR NON-CAPACITY AMENDMENT TO LICENSE

Clackamas River Hydroelectric Project—FERC Project No. 2195-161

Oregon

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Administration and Compliance
888 First Street, NE
Washington, D.C. 20426

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1.0 INTRODUCTION

Application Type:	Non-capacity related amendment of license
Date Filed:	March 16 and 19, 2018, and supplemented April 4, 18 and May 2, 2018.
Applicant's Name:	Portland General Electric Company (PGE)
Waterbody:	Clackamas River
County and State:	Clackamas County, Oregon
Federal Lands:	There are currently 3,019.9 acres of Lands of the United States within the Clackamas Project (Project) boundary, 2,756.0 acres of which are federal lands within the Mt. Hood National Forest, under the jurisdiction of the U.S. Forest Service (Forest Service) and 263.9 acres administered by the U.S. Department of the Interior's (Interior) Bureau of Land Management (BLM). Under PGE's proposal in this application, the amount of federal land occupied by the Project would not change.

1.1 Purpose of Action

PGE owns and operates the 138.8-megawatt (MW) Clackamas Project. The Project consists of four developments: Oak Grove, including Timothy Lake and Lake Harriet dams; North Fork; Faraday; and River Mill. The Oak Grove development is located on the Oak Grove Fork of the Clackamas River, and the other three developments are located on the mainstem of the Clackamas River. On December 21, 2010, the Federal Energy Regulatory Commission (Commission) issued an Order Issuing New License.[1]

PGE seeks to improve the Faraday development by reconstructing the existing powerhouse to increase its seismic stability, installing flood protection structures to prevent flooding during high flow events, and replacing the five (5) 110-year-old turbines with two (2) modern units, without any change to the authorized installed or hydraulic capacities of the Project.

[1] *Portland General Electric Company*, 133 FERC ¶ 62,281 (2010), *order on reh'g*, 134 FERC ¶ 61,206 (2011).

The Proposed Action would increase turbine efficiency. The proposed rebuild of the powerhouse would increase the likelihood that the powerhouse could remain operational following seismic activity, thereby improving the reliability of generation and PGE's ability to provide power to its customers. The flood-protection measures would reduce the risk of an inadvertent release of lubricants from the powerhouse into the river. Under existing conditions, PGE shuts down the powerhouse and drains equipment when flows are excessive. This is a time-consuming and expensive undertaking Statutory and Regulatory Requirements.

1.1.1. Clean Water Act

Under section 401(a)(1) of the Clean Water Act (CWA)[2], a license applicant is required to obtain certification from the applicable state pollution control agency, in this case the ODEQ, verifying that the proposed amendment would comply with applicable water quality standards of the State of Oregon or a waiver of such certification. A waiver occurs if the state agency does not act on a request for certification within a reasonable period of time, not to exceed one year after receipt of such request.

On March 16, 2018, PGE applied to the Oregon Department of Environmental Quality (ODEQ) for section 401 certification for the proposed action. ODEQ received this request on March 19, 2018.

On July 2, 2018, the ODEQ granted a CWA 401 certification for the proposed amendment to the project. The WQC was filed with the Commission on February 14, 2019. Specific to the proposed amendment, the certification includes 15 conditions; one of which is general (Amendment Certification Condition 15) and are not discussed further.

Amendment Certification Conditions 1 and 2 require the licensee to implement the revised Water Quality Management and Monitoring plan and the Contaminated Media Management Plan, respectively, as cited in the licensee's amendment application.

The remaining Amendment Certification Conditions require: (1) preparation and implementation of an erosion control plan (Condition 3); prohibition from placing biologically harmful materials and construction debris where such materials could enter waters of the state (Condition 4); provide spill prevention for fueling, operating, maintaining and storing vehicles and equipment by maintaining a buffer of at least 150 feet away from any waters of the state (Condition 5); report the discharge of petroleum products, chemicals, or any deleterious materials have been, or have the potential to be, discharged in state waters (Condition 6); provide protection for riparian, wetland and shoreline vegetation in the authorized project area (Condition 7); provide notification to the ODEQ one week prior to the start of construction (Condition 8); implementation of

[2] 33 U.S.C. § 1341(a)(1)

the terms of the post-construction stormwater management plan (Condition 9); implementation of the best management practices (BMP) as proposed in the post-construction stormwater management plan (Condition 10); implementation of the effective operation and maintenance practices for the lifetime of the proposed facilities (Condition 11); performing in-water work only within the Oregon Department of Fish and Wildlife (Oregon DFW) window to protect fish and wildlife resources (Condition 12); provide unobstructed fish passage at all times during any authorized activity (Condition 13); and demolition work below ordinary high water level must be performed behind a temporary cofferdam (Condition 14).

1.1.2. Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species. On May 8, 2017, PGE requested designation as the Commission's non-federal representative for the purpose of informal consultation with the National Marine Fisheries Service (NMFS), pursuant to Section 7 of the ESA. On May 25, 2017, the Commission designated PGE as the Commission's non-federal representative in this proceeding. Since that time, PGE has informally consulted with NMFS regarding the Proposed Action and measures to minimize or avoid adverse effects on ESA listed species. This informal consultation included a meeting between NMFS representatives and PGE representatives on February 2, 2018 in Lacey, Washington.

Based on the analysis in the Biological Assessment adopted and issued by the Commission on June 19, 2018, and the protection and mitigation measures proposed as part of the Proposed Action to minimize and avoid adverse effects, Commission staff concludes that the Proposed Action May Affect but is Not Likely to Adversely Affect Lower Columbia River (LCR) Chinook salmon, Upper Willamette River Chinook salmon, LCR coho salmon, and LCR steelhead. Additionally, staff concludes that the Proposed Action May Affect but is Not Likely to Adversely Affect designated critical habitat for LCR Chinook salmon, UWR Chinook salmon, LCR steelhead, and LCR coho salmon.

In addition, PGE contacted the U.S. Fish and Wildlife Service (USFWS) regarding the presence of ESA-listed species under the jurisdiction of USFWS within the Action Area. In response, in an email dated February 23, 2018, USFWS confirmed that, although there is a potential for ESA-listed bull trout (*Salvelinus confluentus*) to be present within the Action Area, the population in the Clackamas River is a non-essential experimental population, which means it is treated as "proposed" for purposes of ESA Section 7. USFWS also confirmed that there are no additional ESA-listed species under USFWS jurisdiction that are present in the Action Area that would be affected by the Proposed Action.

1.1.3. Magnuson-Stevens Fishery Conservation and Management Act

Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act requires federal agencies to consult with NMFS on all actions that may adversely affect Essential Fish Habitat (EFH).

The Pacific Fisheries Management Council (PFMC) designated EFH for Chinook salmon and coho salmon as part of the *Pacific Salmon Plan*, issued by the PFMC in 1999. The Action Area includes areas designated as EFH for various life-history stages of Chinook salmon and coho salmon. Based on the information provided in the *Biological Assessment* adopted and issued by the Commission on June 19, 2018, the Proposed Action is not expected to have adverse effects on EFH designated to Chinook salmon and coho salmon.

1.1.4. Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 U.S.C. § 1456(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state's CZMA agency concurs with the applicant's certification of consistency with the state's CZMA program. Because the Project is not located within Oregon's Coastal Management Zone, and would not affect coastal resources. Therefore, no consistency certification is needed.

1.1.5. National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA)[3] and its implementing regulations[4] requires that every federal agency "take into account" each of its undertakings as they could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

The approved Historic Properties Management Plan for the Project indicates that the Faraday Powerhouse is considered to be a historic contributing resource. Therefore, the proposed removal of the Faraday Powerhouse would be considered an undertaking pursuant to section 106 of the NHPA. In addition, the Commission has determined that this undertaking would adversely affect the Faraday Powerhouse and many of the associated facilities, which are contributing features to the Clackamas Hydroelectric Project (determined eligible for the National Register in June 2003). Accordingly, on

[3] 54 U.S.C. §§ 306108 et seq. (2016). The National Historic Preservation Act was recodified in Title 54 in December 2014.

[4] 36 C.F.R. Part 800 (2018).

May 25, 2017 the Commission designated PGE as its non-federal representative for the purpose of conducting consultation with the Oregon State Historic Preservation Office (Oregon SHPO) under Section 106 of the NHPA. PGE attended consultation meetings at Oregon SHPO's Salem office on February 16, 2017 and January 11, 2018.

To meet the requirements of section 106, staff executed a Memorandum of Agreement (MOA) to mitigate the adverse effect of removing the Faraday Powerhouse and many of the associated facilities. The terms of the MOA ensure that the PGE addresses and mitigates adverse effects. The Commission signed the MOA on November 14, 2018, and the Oregon SHPO signed the MOA on November 26, 2018. The licensee and the BLM signed the MOA as concurring parties on November 26 and December 3, 2018, subsequently. Commission staff recommend incorporating the executed MOA into any amendment order for the project.

1.2 Pre-Filing Consultation and Public Notice

As required by Commission regulations, this license amendment application has been prepared using a three-stage consultation process with the appropriate resource agencies and other stakeholders. PGE initiated Stage 1 of its three-stage consultation with the distribution, on April 19, 2017, of its proposal to upgrade the Faraday Powerhouse.

A formal meeting and facility tour with stakeholders was held on May 19, 2017 to discuss PGE's Proposed Action and the proposed license amendment application process and schedule. As required by Commission regulations, a meeting transcript was recorded. With concurrence from the primary resource agencies, the comment period for the proposal document ended on June 19, 2017.

Stage-2 consultation began with PGE's issuance to stakeholders of a Draft Application for Non-Capacity Amendment of License on October 3, 2017, which initiated a 90-day comment period that ended on January 3, 2018. PGE incorporated its responses to stakeholder comments and preliminary terms and conditions for the amended license into the Final Application for Non-Capacity Amendment of License, which was filed on March 16, 2018.

On May 9, 2018, the Commission issued a public notice of the PGE's application for amendment soliciting comments, motions to intervene, protests, recommendations, terms and conditions

On May 17, 2018, the Oregon Department of Environmental Quality filed a motion to intervene. On May 24, 2018 the National Marine Fisheries Service and the U.S. Forest Service each filed a notice of intervention. On June 1, the Oregon Water Resources Department filed a notice of intervention. On June 4, 2018, the Oregon Department of Fish and Wildlife filed a motion to intervene and comments on the

application. On June 8, 2018, American Whitewater filed a motion to intervene and comments on the application. On June 15, 2018, the U.S. Environmental Protection Agency filed untimely comments on the application. Comments filed in response to the notice are addressed in the appropriate resource sections of this EA.

2.0 PROPOSED ACTION AND NO-ACTION ALTERNATIVE

2.1 No-Action Alternative

Under the No-Action Alternative (i.e., denial of the amendment by the Commission) Project facilities would remain unchanged, except for any future modifications called for by the existing license and routine maintenance activities. Operation of the Faraday Powerhouse would be less efficient than it would be under the Proposed Action, and reductions of seismic risk associated with the existing powerhouse and flood-protection measures would be foregone (see Section 1.2). In addition, improved survival rates for the low numbers of juvenile salmonids passing through the Faraday Powerhouse, and the benefits associated with proposed coarse sediment augmentation, would not be realized. The Commission uses the No-Action Alternative as the baseline environmental condition for comparison with the Proposed Action.

2.1.1. Existing Faraday Development Facilities

The Faraday Development, located downstream of North Fork Dam on the mainstem Clackamas River and has an installed capacity of 35.92 MW. Water releases from North Fork Dam flow down the Clackamas River approximately 1.6 miles to the Faraday Diversion Dam, which impounds a reservoir with a gross storage capacity of approximately 1,200 acre-feet. A gated intake diverts part of the river's flow through a 0.5-mile-long, 23-foot-diameter tunnel and then through a 0.67-mile-long canal into Faraday Lake, the forebay for the Faraday Powerhouse. Faraday Lake has a gross storage capacity of approximately 484 acre-feet, including the canal and tunnel. A concrete intake structure and an emergency spillway are located at the downstream end of the forebay. Intake gates are provided for each of the six penstocks serving the six turbine-generator units. Four, 8-foot-diameter riveted steel penstocks and one 9-foot-diameter riveted steel penstock lead to the original five-unit powerhouse to operate the five double horizontal Francis-type turbines. A 14-foot-diameter welded steel penstock leads to the newer semi-outdoor portion of the powerhouse to operate a vertical Francis-type turbine. The Faraday Powerhouse discharge joins the Clackamas River's flow from the Faraday bypass reach and then enters Estacada Lake.

2.1.2. Operation of the Existing Faraday Development

PGE operates the Faraday Powerhouse according to criteria defined in the *Clackamas Project Operating Plan*, as revised in 2016[5]. The water level in Faraday Lake is normally maintained near the full pool elevation to maximize head for power generation. The operating limits for the Faraday forebay are shown in Table 1.

Table 1. Faraday Lake (forebay) operating levels.

Date	Forebay Elevation, ft	Notes
Oct 1 – Jun 30	523.5 maximum 511.7 minimum	Limits are shown in PGE Datum, which is 1.5 ft above mean sea level. Lake elevation lowered from July 1 to September 30 to establish channelized flow within berms per CWA Section 401 Certification Condition 8(l)(1).
Jul 1 – Sep 30	520.5 maximum 511.7 minimum	

The Faraday Powerhouse is typically operated to pass inflow, with some re-regulation of flows when the upstream North Fork Powerhouse is operated in a peaking mode. Pursuant to the June 18, 2003, license amendment, 103 FERC ¶62,161, Project hydraulic capacity is 5,704 cfs. The minimum flow through the Faraday Powerhouse is 120 cfs.

Condition 8(l)(1) of the Section 401 water quality certification (Appendix A to the Project License) required PGE to achieve a temperature reduction of approximately 0.5 ˚C during the period July 1 to September 30 at the Faraday powerhouse tailrace. To satisfy this requirement, PGE excavated a channel in the middle of Faraday Lake and confines the majority of flow within this excavated channel by reducing the water surface elevation of the lake by about 2 feet from July 1 through September 30 of every year (Table 1).

2.2 Proposed Action

2.2.1. Proposed New Faraday Powerhouse

Turbine Replacement

PGE plans to replace existing turbine units 1 through 5 with two vertical Kaplan turbines. Unit 6 would remain in place. Each unit would discharge into a draft tube that would exit into the powerhouse tailrace.

[5] The revised Project Operating Plan was approved by the Commission on November 10, 2015, 153 FERC ¶ 62,097.

Intakes and Penstocks

The 8-foot-diameter penstocks for Units 1 through 4 and the 9-foot-diameter penstock for Unit 5 would be removed, and the Units 2, 3, 4, and 5 penstocks would be replaced with two new 9-foot-diameter, welded-steel penstocks. The concrete supports and intermediate concrete retaining walls would be removed along with the five penstocks and replaced with new reinforced concrete supports and retaining structures as required. The new penstocks would utilize the 8-foot diameter intakes for Units 2, 3, 4 and 5. Intake 1 would be capped off and not be used in the future, because flow must make a sharp turn before entering the intake, which results in head loss and flow limitations.

Each penstock would be designed so that flow and water velocity would be nearly identical at the point where the water from the four intakes merges into two penstocks (referred to as reverse bifurcations) that lead to the two new turbine units. The radius of each reverse bifurcation would be designed to minimize flow disturbances, and shear forces are expected to be nominal. The provisional estimate of water velocity at the entrance point of each reverse bifurcation is 9.0 ft/s, and downstream of each reverse bifurcation estimated velocity is 14.1 ft/s.

At the intake, a new steel section would be inserted into the existing steel penstock and seal-welded flush with the steel of the upstream headgate. The annular space between the new steel penstock and the existing penstock would be grouted. This would allow the entire penstock from the intake headgate to the new unit to be made of new steel. The new penstocks would include vents, manholes at the top and bottom for access, and a cathodic protection system to prevent corrosion, if required.

Debris Management

The existing trashracks for intakes 4 and 5 show moderate corrosion and would be replaced. The existing manual trash-rake would be upgraded and replaced with an automated rake and trash conveyance system.

Headgates

Headgates installed in 2012 would be reused. The five rack-and-pinion operators and the associated enclosures would be removed, and new screw-stem actuators would be mounted outdoors on the intake deck. The screw-stem actuators would be capable of driving down the headgates under flow to isolate the penstocks from the forebay. The new units would be designed to accept reasonably long periods of overspeed to allow for headgate closure to stop unit flow if the wicket gates and turbine inlet valves fail to close. The new screw-stem actuators and their anchoring systems would need to be specified to be able to drive the headgates closed under full runaway flow.

Powerhouse

The new powerhouse design would meet current earthquake requirements and desired factors of safety. The design would include measures to ensure that flood protection (see next section) is provided above historic flow levels and provide safer means of performing maintenance resulting from best practices improvements incorporated into the design.

The majority of demolition would occur above the ordinary high waterline. Any work below the waterline would be performed behind a cofferdam (see Cofferdam Construction below), thereby preventing material from entering the river. PGE has performed a hazardous materials survey of the powerhouse site. The plan would be incorporated into the general construction contract implemented by the construction contractor, with oversight provided by PGE. Implementation of the Contaminated Media Plan filed with the application is required by WQC condition 2.

The new vertical turbine units would require significant excavation to accommodate new draft tubes, scroll cases, and embedded penstock sections. A crane would be used to remove the existing units and other equipment. The powerhouse superstructure would then be removed. To make room for installing new embedded parts for the turbines, the substructure concrete and supporting rock would be demolished/excavated by drilling, blasting, and splitting as required.

The new powerhouse would be a reinforced concrete structure with a sidewall elevation set above the flood protection elevation to function as a floodwall. The wall structure would support a new bridge crane and a steel roof. A new Unit 6 access road would be constructed on fill material placed behind the new powerhouse at approximately the same elevation as the existing access bridge.

The Proposed Action would affect approximately 31,000 ft^2 of surface area adjacent to the river, which would include replacing buildings, constructing the floodwall, and paving. The existing powerhouse (occupying an area of 9,970 ft^2) and three small storage and shop outbuildings (occupying an area of about 2,000 ft^2) would be demolished. The new powerhouse would occupy approximately 10,100 ft^2 of land adjacent to the river that is currently occupied by the existing powerhouse. The outbuildings would not be replaced. The land surface area previously occupied by the buildings to be demolished but not occupied by the new powerhouse would be graded and paved.

Deep excavations would be required for the new powerhouse, up to about 20 ft deeper than the existing powerhouse and about 30 ft below normal river water level. It is estimated that 6,000 yd^3 of bedrock would be removed for the new powerhouse

foundation (the bedrock to be removed is not within the river channel; tailrace excavation is addressed in a subsequent section). It is anticipated that a construction ramp would be required to access the powerhouse foundation, and sumps would be installed within the excavated area to collect stormwater and groundwater that enter the excavated area. This water would be observed for turbidity and treated as necessary prior to release to the river.

Flood Protection Improvements

The existing powerhouse for Units 1 through 5 is partially protected from flooding by concrete and wooden floodwalls. The Proposed Action would result in improved flood protection because a concrete floodwall would be constructed around the entire new powerhouse up to the elevation of the deck of the Unit 6 powerhouse. Additionally, a floodwall would extend upstream from the powerhouse to protect the substation and parking area next to the new powerhouse.

Access Improvements to Unit 6

A bridge over the penstocks for Units 1 through 5 currently provides access to Unit 6. As part of the Proposed Action this bridge would be removed to allow installation of the new penstocks, and the area behind the powerhouse would be filled to the elevation of the bridge deck creating a large access road and laydown area. New drainage systems would be installed to manage surface water from the area upstream of the powerhouse (PGE prepared a Post-Construction Stormwater Management Plan, as noted in a subsequent section). The upstream powerhouse wall would be designed to retain the fill material and surcharge loads.

Mechanical and Electrical Auxiliary Systems

New mechanical systems would be installed in the powerhouse for heating, filtered ventilation, air conditioning for the area enclosing the switchgear and control interfaces, draft tube dewatering, sump pumps, oil-water separators, the septic system, service water, and compressed air. A dedicated station service transformer would power these systems and all powerhouse lighting.

Electrical Power and Control Systems

New switchgear, relaying, and protection packages would be supplied with each unit. The new switchgear would be housed in metal enclosures and mounted to the floor of the new powerhouse. The control system for the new units would include a programmable logic controller (PLC) and a dedicated digital governor to control the units.

The new controls would be located within the existing Unit 6 Powerhouse control room. Each turbine would have a hydraulic power unit for gate actuation. The existing Unit 6 battery bank has recently been upgraded and may be used to provide backup control power to the new units' control systems, or a separate DC system for the new units would be installed.

Substation Interconnection

The leads from the switchgear would be routed to the existing 11kV switchyard adjacent to the powerhouse. Existing transmission lines from the 11kV switchyard to the Faraday substation on the north bank of the river would be reused along with their supports. The switchgear leads would run in an underground conduit to the existing 11kV switchyard and would connect to the Faraday Substation at the same point as the existing units 1 through 5. No additional transmission lines would be installed as part of the Proposed Action; the action would only involve installing new medium voltage underground cables and separating the two step-up transformers at the switchyard.

Faraday Lake Drawdown during Forebay Construction

Implementation of the Proposed Action would require an outage of Unit 6, during which time Faraday Lake would be drawn down completely. Drawing down Faraday Lake would require water ordinarily routed to Faraday Lake to instead be passed over the Faraday Diversion Dam and into the Faraday Diversion Reach. Section 2.2.3 provides an explanation of how Faraday Lake would be draw down and refilled to avoid impacts to salmonids.

Tailrace Construction, Cofferdam Installation and Deconstruction, and Temporary Low-Flow Fish Passage Channel

A cofferdam would be required to isolate the tailrace, so that bedrock can be excavated and the new powerhouse installed. The installation and deconstruction of the cofferdam, construction in the powerhouse tailrace, and actions undertaken to provide fish passage during the construction period are described below. Measures proposed to be implemented to avoid adverse effects associated with these activities are described in Section 2.2.3.

Anadromous salmonids migrate upstream to the entrance of the 1.9-mile-long fish North Fork fish ladder extending from the south bank of the river immediately downstream of the Faraday diversion dam to the North Fork reservoir. To provide unimpeded fish passage during construction activities, a temporary low-flow fish passage channel would be excavated upstream of the Faraday Powerhouse tailrace. The first step would be to construct an access road leading from the existing paved surface on the south side of the river. After establishing access, trees and shrubs would be cleared from the

portion of the channel to be excavated. Material excavated from the channel would be used to construct a temporary flow diversion berm to direct flow into the excavated channel. The geometry and placement of the low-flow channel were selected to provide velocities and depths, that were identified in collaboration with the Fish Agencies (i.e., ODFW, NMFS, and USFWS), to be conducive to upstream fish passage. The estimated volume of bed material to be excavated to form the fish channel is 350 yd^3.

A hybrid sheet-pile and cellular, earth-fill cofferdam would be constructed to enclose the powerhouse tailrace so construction activities can be conducted in the dry. The cellular cofferdam would be installed incrementally in a downstream direction using steel members filled with coarse sediment. Coarse sediment would be transported from a PGE-owned mining site located on a terrace adjacent to the lower Clackamas River (i.e., the site where coarse sediment is mined) to PGE's FERC-approved coarse sediment augmentation program for the lower Clackamas River. Coarse sediment particles used to fill the cofferdam units would be sifted and range in size from 0.25 inches to 6.0 inches. The first cellular unit would be placed from the shore, and subsequent units would be placed by equipment perched on previously installed units. The cofferdam units would be put into place primarily in the dry on the mid-channel island. The island is expected to be largely dry given the anticipated flows at the expected time of construction (i.e., May 2019), and because Unit 6 would be operating, most flow would be routed around the installation area.

Following construction of the cellular portion of the cofferdam, the sheet-pile section of the cofferdam would be installed on the west side of the tailrace adjacent to Unit 6. Before installing the sheet-pile section, the west side of the cofferdam area would be left open for at least 12 hours to provide egress for any salmonids in the tailrace area surrounded by the cellular cofferdam. The substrate where the sheet-pile portion of the cofferdam would be installed consists of bedrock. Because of this, piles cannot be driven into the substrate. PGE would use divers or a barge-mounted drill rig to bore into the rock and set the piles with grout. The drill slurry and rock powder would be pumped to the surface and stored in a tank for subsequent disposal. No slurry would be released into the river. Grout would be isolated from the water column until it is cured. When the cofferdam is completed, pumps would be installed on the tailrace side of the cofferdam and used to dewater the tailrace prior to beginning construction activities associated with the new powerhouse. Completing construction would require excavating the tailrace to accommodate the draft tubes associated with the new vertical Kaplan units. The estimated volume of material to be excavated from the tailrace is 4,600 yd^3.

When construction in the tailrace has been completed, the pumps behind the cofferdam would be deactivated and removed, and the area would be allowed to fill with water. The sheet-pile section of the cofferdam would be removed, after which the steel members of the cellular cofferdam would be removed moving in an upstream direction. Coarse sediment would be allowed to exit the cofferdam units when the north-side steel

frames are lifted. The inner wall of the cellular cofferdam would be kept in place while coarse sediment is being manipulated by machinery on the mid-channel island. Because flows would be low in the Faraday diversion reach during late summer/early fall, most of the deconstruction should be completed in the dry. The sediment is expected to move downstream to the channel just upstream of Estacada Lake, where it would combine with existing coarse sediment to improve anadromous salmonid spawning habitat. When the cofferdam is fully removed, coarse sediment from the cofferdam units would be contoured so that it can be recruited to the river during subsequent high flows, the temporary diversion berm would be removed, the low-flow fish passage channel would be filled in (i.e., the channel would be restored to approximately its preexisting condition), and the access road would be decommissioned.

Design of Post-Construction Impervious Area and Surface Drainage

Construction associated with the Proposed Action would involve the installation of a post-construction stormwater collection system, which would collect runoff from pre-existing and newly paved areas. The system would involve passive oil-water separator systems to collect and treat roadway contaminants. The design would accommodate runoff from the roadway to the new powerhouse, enabling it to be treated and discharged, even when the river level is higher than the ground level uphill of the flood wall. PGE filed a proposed Post-Construction Stormwater Management Plan[6] filed with the Commission concurrently with PGE's Request to ODEQ for a Determination Pursuant to ORS 468B.045 (request for § 401 water quality certification). Implementation of the Post-Construction Stormwater Management Plan is required by the ODEQ WQC.

2.2.2. Proposed Faraday Powerhouse Operations

PGE proposes no changes to the operating protocol required by the existing license for the Faraday Development. The Faraday Development would continue to operate according to the requirements of the existing Project license, as identified in Section 2.1.2.

2.2.3. Proposed Environmental Measures

Construction-Related Measures

Water and Aquatic Resources

[6] The proposed Post-Construction Stormwater Management is included with the Water Quality Monitoring Plan filed with the Application for Non-Capacity Related Amendment of License for the Clackamas River Hydroelectric Project No. 2195 (Project) Part 3 of 4: Exhibit E – Appendix 1, dated March 16, 2018.

Low-Flow Fish Passage Channel and Flow Diversion Berm

As noted above, to provide fish passage during the construction of the new powerhouse, PGE would excavate a low-flow, fish passage channel located upstream of the Faraday Powerhouse tailrace and use excavated sediment to construct a temporary flow diversion berm to route water into the excavated channel. Hydraulic modeling was used to design the low-flow channel so that it provides velocities and depths (which were identified in collaboration with the Fish Agencies) that would be conducive to upstream fish passage.

To avoid short-term disturbance to juvenile salmonids potentially occurring in the area to be excavated, PGE biologists would conduct a pre-excavation reconnaissance to evaluate whether fish salvage is warranted. If so, salvage would be conducted using agency-approved and permitted methods (analogous to those described below for the drawing down of Faraday Lake). However, the vast majority of anadromous salmonids from the upper basin are bypassed around this reach of the river because most juvenile fish from upstream are collected by PGE's downstream passage facilities in the North Fork forebay. In addition, most fish produced downstream of the Faraday Diversion Dam originate downstream of Faraday Powerhouse and tend to move into Estacada Lake to find rearing habitat. Also, substrate in the area to be excavated consists primarily of a mid-channel, vegetated bar and in-channel boulders. As a result, salmonid rearing habitat in the area is of marginal quality. To avoid short-term interference with adult salmonid upstream passage, excavation of the low-flow channel and flow diversion berm would be conducted over a short period, expected to be one day. When excavating equipment leaves the river, full fish passage would be in place.

To avoid impacts associated with potential increases in turbidity, PGE would implement an ODEQ-approved Water Quality Monitoring Plan[7], with monitoring protocol and turbidity thresholds at which channel excavation activities would cease and corrective measures would be enacted. The Water Quality Monitoring Plan is required by condition 3 of the WQC.

To avoid short-term impacts due to heavy equipment operating near and within the channel, PGE would employ relevant best management practices (BMPs) identified by NMFS in its Biological Opinion for the Clackamas River Project (NMFS 2010).

[7] The proposed Water Quality Monitoring plan is included in the Application for Non-Capacity Related Amendment of License for the Clackamas River Hydroelectric Project No. 2195 (Project) Part 3 of 4: Exhibit E – Appendix 1, dated March 16, 2018.

Construct Cofferdam around the Faraday Powerhouse Tailrace

To avoid short-term disturbance of juvenile salmonids in the area where the cofferdam would be installed, PGE biologists would conduct reconnaissance to evaluate whether salvage of any juvenile fish is necessary. If so, salvage would be conducted using agency-approved and permitted methods (analogous to those described below for the drawing down of Faraday Lake). As noted above, however, the vast majority of juvenile anadromous salmonids from the upper basin are bypassed around this reach, and most fish produced downstream of the Faraday Diversion Dam originate below the Faraday Powerhouse and tend to move into Estacada Lake to find rearing habitat. Also, the majority of the cellular portion of the cofferdam should be installed in the dry on a mid-channel island, as explained previously, thereby preventing any disturbance of juvenile salmonids.

Cellular cofferdam units would be placed into the channel and onto the mid-channel island incrementally, thereby giving any adult fish in the vicinity ample opportunity for egress, so any short-term impacts would be avoided. To avoid potential disruption of upstream passage through the reach adjacent to the cofferdam, water would be flowing through the excavated, low-flow channel, which would provide an area of suitable depths and velocities for adult fish migration during the cofferdam construction period.

During the construction of the cofferdam, PGE biologists, or a representative trained by PGE biologists, would conduct visual observations each morning to ensure that no fish in the vicinity of the construction area are showing signs of delay. If signs of delay are observed, PGE would notify the Fish Agencies as soon as possible within 24 hours and collaborate with the Fish Agencies to identify appropriate actions to be implemented to minimize the delay.

Installing the cellular portion of the cofferdam would require some leveling of the substrate so that the steel structures containing the coarse sediment would be stable. Noise associated with this action is expected to be well below the 150 dBRMS threshold for fish behavioral effects identified by the Washington State Department of Transportation (WSDOT)[8]. To avoid short-term disturbance to or injury of salmonids resulting from loud noise during installation of the sheet-pile portion of the cofferdam, PGE would use divers or a barge-mounted drill rig to bore into the bedrock and set the piles with grout. The drill slurry and rock powder would be pumped to the surface and

[8] *Biological Assessment Preparation for Transportation Projects - Advanced Training Manual*, Chapter 7, Noise Impact Assessment, January 2018

https://www.wsdot.wa.gov/Environment/Biology/BA/BAguidance.htm#Manual

stored in a tank for subsequent disposal. No slurry would be released into the river. PGE would use a bubble curtain to keep fish out of the area where the drilling is taking place. Grout would be isolated from the water column until it is cured.

Short-term stranding or trapping of fish in the area enclosed by the cofferdam would be avoided. Before the tailrace construction area is fully closed off by the sheet-pile portion of the cofferdam near Unit 6, PGE would allow at least 12 hours for any fish within the tailrace behind the cofferdam to exit the area. After this, PGE biologists would walk/float the tailrace area to induce any remaining fish to leave, although it is unlikely that fish would attempt to hold in the tailrace at this time, because flow into the area would have long been discontinued. When the cofferdam is completed, water would be pumped out of the area surrounded by the cofferdam. To avoid impacts, PGE would screen the intakes of the pumps used to dewater the tailrace so that no fish are entrained. At this time, PGE biologists would conduct reconnaissance to evaluate whether salvage of any juvenile fish is necessary. If so, salvage would be conducted using agency-approved and permitted methods (analogous to those described below for the drawing down of Faraday Lake).

To avoid short-term impacts associated with the operation of heavy equipment, PGE would minimize the amount of time construction equipment enters the river channel. The first cellular unit would be placed from the shore, and subsequent units would be placed by equipment perched on previously installed units. The cofferdam units would be put into place primarily in the dry on the mid-channel island. The island is expected to be largely dry given anticipated flows at the expected time of construction (i.e., May 2019), and because Unit 6 would be operating, which would result in most flow being routed around the installation area. In addition, PGE would employ relevant BMPs identified by NMFS in its Biological Opinion for the Clackamas River Project (NMFS 2010).

To avoid impacts associated with potential increases in turbidity, PGE would implement an ODEQ-approved Water Quality Monitoring Plan, with monitoring protocol and turbidity thresholds at which construction activities would cease and corrective measures would be enacted.

Drawing Down Faraday Lake

To minimize turbidity and fish stranding in Faraday Lake during construction-related drawdown, water surface elevation would be lowered at a rate of approximately 0.1 foot/hour. This drawdown rate is expected to allow fish, including juvenile Pacific lamprey, to follow the declining water level to the downstream end of Faraday Lake, where they would either exit the lake through the powerhouse/spillway or be salvaged by PGE biologists (see description of fish salvage in the next paragraph). Flow increases in the Faraday diversion reach—occurring when water formerly diverted to Faraday Lake is

instead routed to the diversion reach—would be conducted as gradually as possible to minimize disturbance to fish and other aquatic biota in the diversion reach. PGE proposes to monitor water quality variables during the drawing down of the lake, including turbidity, temperature, dissolved oxygen, pH, and algae, according to the methods described in the Water Quality Monitoring Plan. The plan includes thresholds beyond which PGE would take corrective actions, as well as a schedule for the reporting of monitoring results.

Fish salvage would be conducted as Faraday Lake is drawn down according to an agency-approved Fish Salvage Plan.[9] As the water elevation approaches the bottom of the lake, the release of water would switch from the draft tubes to the spill gates, which are at a slightly lower elevation. As the lake bottom becomes exposed, PGE biologists would look for isolated pockets of water where fish could be trapped. PGE would attempt to capture any fish, using methods to maximize capture and minimize fish injury. All staff working as part of the salvage effort would have the skills needed to ensure the safe handling of fish, especially ESA-listed species. Seines could be used to corral fish, but fish would be dip-netted from the water, placed in containers, and transferred to a fish trailer for transport to Estacada Lake. ESA-listed fish would be kept in water to the maximum extent possible throughout the transfer process.

PGE would obtain necessary federal and state authorizations for conducting fish salvage activities. PGE would coordinate with the Fish Agencies so that their representatives can observe salvage activities. A fish salvage report would be provided to the Fish Agencies within 30 days of completing the salvage operation. The report would include the number of fish removed from the lake, by species; fish release location(s); fish condition at the time of release; and a record of any injury or mortality.

Tailrace Construction Period

To avoid disruption of upstream adult fish passage during the tailrace construction period, water would be flowing through the excavated, low-flow channel, which would provide an area of suitable depths and velocities for adult fish migration during most flows. Based on fish migration timing and associated flow exceedance values during migration periods, there should be few days with elevated velocities during the Chinook and early-run coho migration periods, because flows would be contained within the low-flow channel. Because the upstream migration of these two runs occurs in late spring through fall, these fish should rarely experience flows above 3,000 cfs (1% chance).

[9] The proposed Fish Salvage Plan for Faraday Lake Plan is included in the Application for Non-Capacity Related Amendment of License for the Clackamas River Hydroelectric Project No. 2195 (Project) Part 2 of 4: Exhibit E – Appendix 7, dated March 16, 2018.

Late-run coho and winter steelhead migrate upstream in winter, so they would experience a wider range of baseflows and infrequent floods. At moderate winter baseflows (6,500 cfs), velocities with the cofferdam in place would be slightly elevated compared to existing conditions, but adult fish would have many migration paths with suitable depths and velocities. During floods up to 27,000 cfs, the cofferdam constriction would elevate velocities in the center of the channel compared to existing conditions. However, with the cofferdam in place, there would be a 25- to 35-foot-wide corridor along the north bank where adult salmonids would be able to migrate upstream even under high flows. In addition, these larger rainfall and rain-on-snow peak flow events are typically of short duration (hours to a day), so any velocity-induced adult migration delay is expected to be short. Furthermore, Estacada Lake (which is a short distance downstream of the tailrace) provides abundant deep, low-velocity habitat where adult salmonids would be able hold until floods recede, after which they would be able to resume their upstream migration.

During the tailrace construction period (which is expected to last about 1 year), personnel trained by PGE biologists would conduct visual observations on days that construction activities are taking place to ensure that no adult fish in the vicinity of the construction area are showing signs of delay. Observations made by the trained personnel would be corroborated once per week by PGE biologists. If signs of delay are observed, PGE biologists would be notified immediately, and PGE would notify the Fish Agencies as soon as possible within 24 hours and collaborate with the Fish Agencies to identify appropriate actions to be implemented to minimize the delay.

All work within the area enclosed by the cofferdam would be conducted in the dry. During the construction period, PGE would employ relevant BMPs identified by NMFS in its Biological Opinion for the Clackamas River Project (NMFS 2010), which include erosion control measures for the construction site. As noted previously, hazardous materials removal would be conducted in the dry at the existing powerhouse as required by the ODEQ-approved in condition 2 of the WQC

Water pumped from the tailrace during construction would be routed to a settling basin to allow it to clarify before it is released back to the river channel. Turbidity monitoring would be conducted in the Clackamas River upstream and downstream of the powerhouse during the entire period when construction activities are taking place, as described in the Water Quality Monitoring Plan.

Faraday Lake Refill

When flows are redirected to Faraday Lake following the completion of drawdown-related construction activities, the lake would be refilled at a rate of 0.1 foot/hour. Controlling the rate of flow reintroduction to Faraday Lake would reduce the likelihood of disturbing fine sediments in the lake, which could subsequently be passed downstream

and increase turbidity. PGE proposes to monitor water quality variables during reservoir refill, including turbidity, temperature, dissolved oxygen, pH, and algae according to the methods described in the proposed *Water Quality Monitoring Plan*. The plan includes thresholds beyond which PGE would take corrective actions, as well as a schedule for the reporting of monitoring results.

Cofferdam Deconstruction

Deconstruction of the cofferdam would begin with removal of the sheet-pile section. This would be followed by removal of the cellular cofferdam units, beginning downstream and proceeding in an upstream direction. Coarse sediment would be allowed to exit the cellular cofferdam units when the north-side steel frames are lifted. The inner wall of the cellular cofferdam would be kept in place while coarse sediment is being manipulated by machinery on the mid-channel island. Because flows would be low in the Faraday diversion reach during late summer/early fall, most of this work would be completed in the dry. Coarse sediment particles, which would eventually be recruited to the channel, would range in size from 0.25–6.0 inches (i.e., a size that would enhance salmonid spawning/rearing and benthic macroinvertebrate habitat). PGE biologists would conduct weekly reconnaissance to verify that coarse sediment is not impeding upstream adult fish passage. This monitoring would continue until the sediment has been safely mobilized downstream. If passage is impeded, corrective measures would be enacted, in coordination with the Fish Agencies.

To avoid short-term disruption of upstream fish passage during the cofferdam deconstruction period, water would be flowing through the excavated, low-flow channel, which would provide an area of suitable depths and velocities for adult fish. During the deconstruction period, PGE biologists would conduct visual observations each morning to ensure that no fish in the vicinity of the deconstruction area are showing signs of delay. If signs of delay are observed, PGE would notify the Fish Agencies as soon as possible within 24 hours and collaborate with the Fish Agencies to identify appropriate actions to be implemented to minimize the delay.

Because fines would have been removed from the sediment used in the cofferdam units, no significant adverse impacts to downstream water quality are expected when this sediment is released onto the island and subsequently into the channel. PGE would implement an ODEQ-approved Water Quality Monitoring Plan during the deconstruction period, with monitoring protocol and turbidity thresholds at which cofferdam deconstruction would cease and corrective measures would be enacted.

To avoid short-term impacts associated with the operation of heavy equipment, PGE would minimize the amount of time construction equipment enters the river channel. The cellular units would be removed by equipment perched on upstream units. After the coarse sediment is released from the cofferdam units, it would be contoured to

facilitate recruitment of sediment to the channel during subsequent high flows. The island is expected to be largely dry during the deconstruction period given the anticipated flows at the expected time of deconstruction (i.e., September 2020), and because Unit 6 would be operating, which would result in most flow being routed around the installation area. In addition, PGE would employ relevant BMPs identified by NMFS in its Biological Opinion for the Clackamas River Project (NMFS 2010 to avoid any effects associated with operating heavy equipment.

Remove Temporary Flow Diversion Berm and Fill Excavated Low-Flow Channel

Following deconstruction of the cofferdam, the temporary flow diversion berm would be removed and the excavated low-flow channel would be filled. To avoid impacts associated with the potential for increased turbidity, PGE would implement an ODEQ-approved Water Quality Monitoring Plan, with monitoring protocol and turbidity thresholds at which activities in the channel would cease and corrective measures would be enacted.

The Clackamas River channel in the vicinity of the powerhouse would be returned to approximately its pre-construction configuration, so that water in the diversion reach flows past the powerhouse outflow, so that fish passing the powerhouse would readily detect the upstream passage route, as they do under existing conditions.

Wildlife Resources

The Proposed Action involves no measures that are expected to affect the pair of bald eagles that has been nesting adjacent to Faraday Lake in recent years (see Section 3.3.4 for more detail). No pile driving would be conducted during the construction of the cofferdam, as explained in Section 2.2.1. Any replaced transmission lines and their supports would be designed to avian-safe standards, including marking the lines with bird flight diversions to reduce bird collisions. Temporarily draining Faraday Lake would have no effect on the eagles, because there are ample feeding opportunities in the immediate vicinity.

Measures Related to Operation of the New Powerhouse

PGE would monitor water quality after the new powerhouse is installed and compare the monitoring results to equivalent data collected under existing conditions. Water quality variables to be monitored would include turbidity, temperature, dissolved oxygen, pH, algae, and total dissolved gas, according to the methods described in the proposed Water Quality Monitoring Plan.

Project-wide downstream fish passage survival and injury standards are outlined in the Clackamas River Project license, Appendix A Article 8(f), Appendix D, articles 23, 24, and 27-31, and Appendix E articles 23, 24, and 27-31. PGE is required by the license to meet or exceed these standards through the implementation of agreed-upon fish passage and protection measures. Failure to meet the standards under a given set of fish passage measures necessitates the implementation of additional measures, as described in appendices D and E of the license. PGE is working with the Clackamas Fish Committee[10] to implement a rigorous program of empirical data collection and fish survival modeling (i.e., using the Downstream Migrant Mortality [DM3] Model) to assess whether conditions are in compliance with the Project-wide standards.

No changes to juvenile fish passage route selection are expected following implementation of the Proposed Action, because the timing and magnitudes of flows entering and exiting Faraday Lake would remain the same as they are under current conditions. Downstream passage studies would be ongoing during and after the implementation of the Proposed Action and would be used to assess patterns of downstream fish passage. As noted previously, empirical fish passage data would be used as input to the DM3 to evaluate smolt survival to assess whether conditions are in compliance with the Project-wide juvenile salmonid passage standards stipulated by the Project license.

At the maximum flow through the new Kaplan turbines (i.e., 900 cfs) water would exit the draft tube at 6.2 feet per second (fps). If both units are operating at maximum flow (1,800 cfs total), the velocity in the river at the downstream end of the new powerhouse would be about 1.3 fps. To evaluate potential adult salmonid mortality in the Faraday Powerhouse tailrace following implementation of the Proposed Action, PGE would conduct surveys of the tailrace during the first three years following completion of the new powerhouse; methods would be the same as those used in the Project area in

[10] The Fish Committee consists of the Licensee; National Marine Fisheries Service (NOAA Fisheries Service); U.S. Fish and Wildlife Service (USFWS); U.S. Forest Service (USDA-FS); Confederated Tribes of the Warm Springs Reservation of Oregon (CTWS); Confederated Tribes of the Grand Ronde Community of Oregon (CTGR); Confederated Tribes of Siletz Indians of Oregon (CTSI); Oregon Department of Fish and Wildlife (ODFW); Oregon Department of Environmental Quality (ODEQ), Clackamas River Basin Council; Association of Northwest Steelheaders; and one representative of the following non-governmental organizations: Trout Unlimited, American Rivers, Oregon Trout, and the Native Fish Society.

2016 (i.e., sampling with an underwater camera once per month from July through October).[11]

The new powerhouse and its appurtenant facilities would be designed to minimize stormwater runoff into the Clackamas River channel. A Post-Construction Stormwater Management Plan is included in the amendment. A final plan would be developed prior to commissioning the new powerhouse, which would ensure that the design and all procedures associated with stormwater management are acceptable to ODEQ.

Proposed Construction Schedule

Table 2. Target schedule for major milestones associated with the Proposed Action.

Project Milestone	**Completion Date**
□□□□□□□□□ access road to the Clackamas River channel	Apr 2019
Excavate low flow fish passage channel and construct temporary flow diversion berm	May 2019
Construct cofferdam around Faraday Powerhouse tailrace	May 2019
Drawing down of Faraday Lake	Jun 2019
Headworks modifications in Faraday Lake	Jul–Aug 2019
Construction in the tailrace behind the cofferdam	Jul 2019–Aug 2020
Demolition of existing Faraday powerhouse	Aug–Oct 2019
Refill Faraday Lake	Sep 2019
Deconstruct cofferdam around Faraday Powerhouse tailrace	Sep 2020
Remove temporary flow diversion berm and fill in low-flow fish passage channel	Sep 2020
Complete new Faraday Powerhouse structure	Oct 2020
Commission new Faraday Powerhouse	Dec 2020

3.0 ENVIRONMENTAL ANALYSIS

3.1 General Clackamas Project Setting

The Project is located within the Clackamas River Basin, west of the Cascade Range and south of the Columbia River Gorge. The Clackamas River drains more than 940 mi^2 beginning on the slopes of Olallie Butte (elevation 6,000 ft) in the Cascade Mountains, and flows 82.7 miles to its confluence with the Willamette River near

[11] This approach corresponds to that described in the Proposed Study Plan Modification: Plan to Monitor Upstream Fish Passage Effectiveness, approved by FERC on October 22, 2015, 153 FERC ¶ 62,048.

Gladstone and Oregon City. Hydroelectric project operations influence the hydrologic regime of the Clackamas River watershed. Modifications to the natural flow regime include storage in reservoirs, diversions of water from the mainstem, spills over the dams, and powerhouse releases. The Oak Grove Powerhouse, PGE's uppermost development in the basin, discharges into the mainstem Clackamas River, where the combined flow continues downstream to North Fork Reservoir. From there, first North Fork Powerhouse, then Faraday Powerhouse, and lastly River Mill Powerhouse use the combined flow for power generation.

The Clackamas River basin lies within three physiographic regions: High Cascades, Western Cascades, and Willamette Valley. The High Cascades region consists of Quaternary-age (< 2 million year-old) basalt and andesite flows, which have formed the ridges and canyons that confine the Clackamas River. The rivers in this region produce a low sediment yield. Below elevation 3,500 feet to about elevation 300 feet, the Clackamas River runs through the Western Cascades physiographic region. Near the North Fork, Faraday, and River Mill developments, the river has incised into basaltic rocks and created steep canyon walls. The Willamette Valley physiographic region occurs from Estacada to the confluence of the Clackamas and Willamette rivers. This area contains mostly flat-lying sedimentary rocks from as far back as the Pliocene (5.3 - 1.6 million years ago) to as recent as 10,000 years ago.

About 71 percent of the land in the Clackamas River Basin is publicly owned. The upper basin is contained within the Mount Hood National Forest, whereas most of the lands around the lower Clackamas River are privately owned. About 73 percent of the watershed is classified as mature or regrowth forest.

3.2 Scope of Cumulative Effects Analysis

According to the Council on Environmental Quality's regulations for implementing NEPA (40 CFR, section 1508.7), a cumulative effect is the environmental impact that results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time, including generation of hydroelectric power and other land and water development activities. Based on Commission staff's assessment of the Proposed Action, proposed environmental measures, and agency and public comments, Commission staff concludes that there are no cumulatively affected resources.

3.3 Effects of the Proposed Action

The following sections provide an assessment of the potential environmental effects of the Proposed Action. The affected environment (i.e., the baseline against

which the Commission measures effects) is described for each resource area. This is followed by a discussion and analysis of potential resource impacts.

3.3.1. Geology and Soils

Affected Environment

Below elevation 3,500 feet to about elevation 300 feet, the Clackamas River runs through the Western Cascades physiographic region. This region includes an older, inactive volcanic chain with associated deeply weathered rocks that date from 45 to 10 million years ago. It also contains Columbia River Basalt, which originated in lava flows of the Miocene age (16 to 15 million years ago). The river has incised into basaltic rocks and created steep canyon walls near the Faraday Development. The topography is steep in these sections, but has gentler slopes in areas where erosion processes include high sediment-yield earth and debris flows.

Effects of Proposed Action

Excavation and construction associated with the new Faraday Powerhouse would occur within an area composed primarily of engineered fill, although some excavation of bedrock would occur to accommodate the new turbine units. Construction-related BMPs would be implemented to contain all soils and sediments within the construction area. As a result, there would be no significant construction-related impacts on geology and soils due to the Proposed Action.

3.3.2. Water Resources

Affected Environment

The U.S. Geological Survey (USGS) operates the Clackamas River at Estacada gaging station (gage no. 14-210000) located immediately downstream of River Mill Dam. Streamflows at the Estacada gaging station are considered to be representative of those immediately downstream of the Faraday Powerhouse, which is located approximately 2.9 miles upstream of the gaging station. The gage has a drainage area of 681 mi^2 (USGS 2017) and has been operated continuously since 1908. The Faraday Powerhouse has a drainage area of 673 mi^2 (USGS 2017), representing a 1.2 percent difference in total watershed area between the Faraday Powerhouse and the USGS gaging station.

Annual water yield was computed from USGS daily average discharge records at the Estacada gage for the 1908-1999 period, and then classified into five different water-year types based on the frequency distribution of the annual yield. Water yields were ranked and plotted as an exceedance probability, then divided symmetrically into five equally weighted classes separated by annual exceedance probabilities (p) of 0.20, 0.40,

0.60, and 0.80. The five classes were named "Extremely Wet" (p = 0 to 0.20), "Wet" (p = 0.20 to 0.40) "Normal" (p = 0.40 to 0.60), "Dry" (p = 0.60 to 0.80), and "Critically Dry" (p = 0.80 to 1.00). This classification system addresses the range of variability in the annual water yield, assigns water year classes symmetrically around the median water year, and assigns an equal probability for each class that a given water year would fall into that category. Using the entire 91-year period (1908-1999) of USGS daily average streamflow records at the Estacada gage, the following monthly streamflow statistics were computed:

- Highest monthly mean flow: 11,170 cfs; December 1965.
- Highest mean annual flow: 4,407 cfs; 1974.
- Lowest monthly mean flow: 613 cfs; September 1994.
- Lowest mean annual flow: 1,454 cfs; 1977.

PGE completed a water quality assessment of Faraday Lake and the Faraday Diversion Reach, which included both collection of empirical data and water quality modeling using CE-QUAL-W2 (Doughty 2004a; Doughty 2004b; EES Consulting 2004; Battelle 2004). Water quality variables measured or sampled included temperature, dissolved oxygen, pH, hardness, alkalinity, conductivity, nutrients, chlorophyll a, turbidity, total suspended solids, and total dissolved solids. The assessment showed that water quality in these areas complies with ODEQ's surface water criteria throughout the year.

As required by the Project license, PGE completed channelization of Faraday Lake in fall 2012, and 2013 was the first year of the planned seasonal drawdown of Faraday Lake (i.e., the drawdown needed to ensure that flow passes through the channelized portion of the lake). Each year, PGE conducts a required 1.5-foot drawdown of the lake over the last week of June to reach a water surface elevation of 520 feet on July 1. The lake's surface elevation is held between 519 and 520 feet until PGE returns the lake to its normal operating level (about 521.5 feet) on October 1. Because of the short residence time of water in Faraday Lake during summer, the reservoir does not thermally stratify,

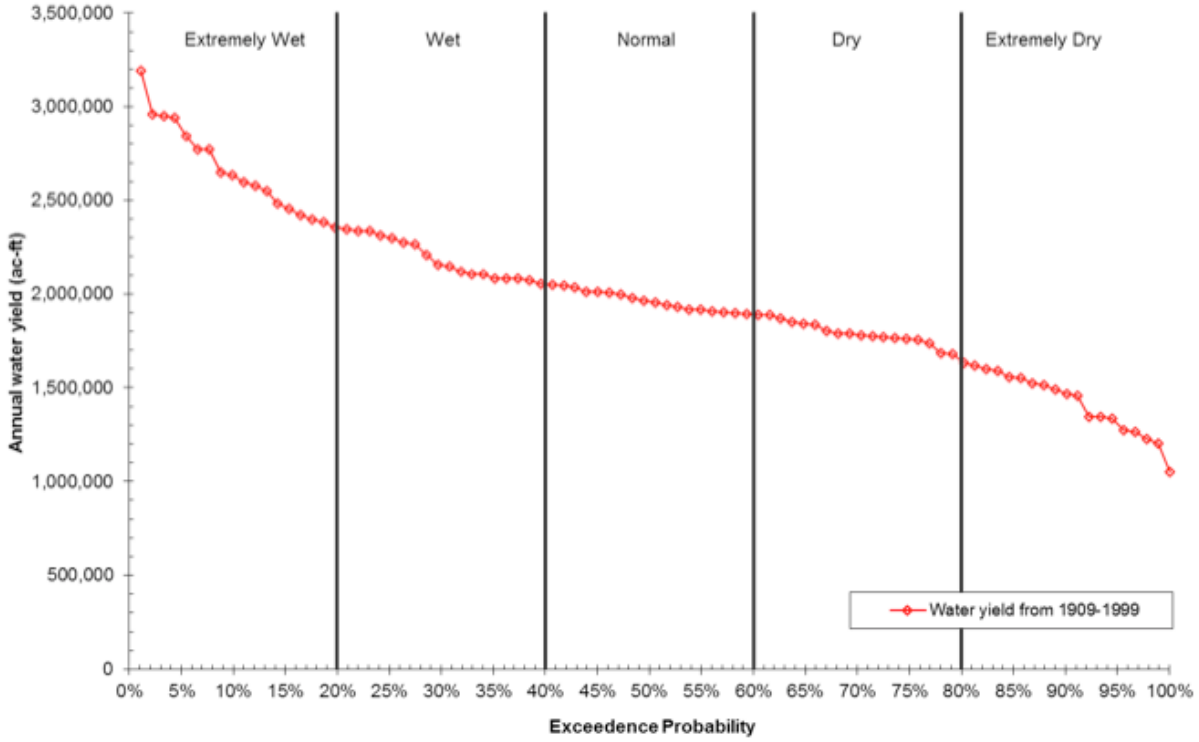

Figure 1. Water yield cumulative distribution curve for the Clackamas River at Estacada gaging station (USGS gage no. 14-210000), 1908-1999.

The berms that contain the channelized portion of the lake are equipped with flow scoops that allow a small volume of water from the channel to enter the impounded sections of the lake on the north and south sides of the channel, which helps maintain water quality in the areas outside the channel.

The results of temperature monitoring conducted during 2016 in Faraday Lake, in the Faraday Diversion Reach upstream of the Faraday Powerhouse, and immediately downstream of the Faraday Powerhouse are shown in Table 3.

Table 3. Monthly averages of daily maximum water temperatures, in Faraday Lake (FAR01), in the Faraday Diversion Reach just upstream of the Faraday Powerhouse (FAR02), and just downstream of the Faraday Powerhouse (FAR03) from June-September 2016.

	Monthly Average of Daily Maximum Temperature (°C)			
Site	**June**	**July**	**August**	**September**
FAR01	14.66	16.47	17.30	13.48
FAR02	15.32	17.44	18.25	--
FAR03	14.68	16.75	17.70	--

-- Average could not be calculated due to malfunction or loss of temperature logger.

Effects of Proposed Action

Construction

Construction of the new Faraday Powerhouse could have minor short-term water quantity effects as a result of the Faraday Lake drawdown and refill. PGE would mitigate potential short-term incremental construction effects on water quality by implementing the construction-related BMPs to control erosion, minimize ground disturbance and prevent effects on aquatic biota. Construction activities would be conducted to meet or exceed all performance standards contained in applicable state and federal permits. When more than one standard applies to the construction action, PGE would adopt the most resource-protective standard.

BMP's to employed during construction are described in detail in Appendix 6 to the application and include: pre-construction measures; erosion control measures such as silt fences, straw bales, and aggregate; avoidance of herbicides unless authorized; minimize disturbance of the streambanks and existing riparian vegetation during construction activities; maintenance of a 150 foot buffer from the edge of the stream bank; measures to be implemented prior to high flow events; treatment of all discharge water created by construction activities; turbidity monitoring; avoidance of pollution discharge within the mean high water mark or 10-year flood plain. The BMP also include measures to avoid or minimize effects for the access road construction, vehicle refueling and maintenance,

As noted previously, the majority of demolition of existing structures would occur above the ordinary high waterline. Any work conducted below the waterline would be performed behind a cofferdam to prevent any material from entering the river. All

hazardous materials removal at the existing powerhouse would be conducted per the ODEQ-approved Contaminated Media Management Plan.[12]

Drawdown of Faraday Lake to enable construction would be conducted at a rate of approximately 0.1 foot/hour (see Section 2.2.3) to minimize the potential for pulses of turbidity to be released from Faraday Lake to the powerhouse tailrace. Water temperature would likely decrease and DO would likely increase downstream of Faraday Powerhouse relative to existing conditions during the period when the lake is fully drawn down. Water passed through the diversion reach would have a slightly shorter residence time than what would occur if water were routed through the lake, thereby resulting in slightly less warming. Similarly, DO in the river would likely increase because the lower water temperatures and increased turbulence in the diversion reach (relative to Faraday Lake) would lead to greater oxygenation. When flows are redirected to Faraday Lake following the completion of construction activities in the Faraday Lake forebay, the lake would be refilled at a rate of 0.1 foot/hour.

Water quality monitoring would be conducted during the drawing down and refill of Faraday Lake and during construction-related activities. PGE would monitor water temperature, dissolved oxygen, pH, turbidity, and algae at designated locations and times, and take corrective actions if water quality impacts surpass identified thresholds, as described in the Water Quality Monitoring Plan.

Operation

Following construction of the new Faraday Powerhouse, PGE would remain in compliance with its approved *Water Quality Management and Monitoring Plan* for the Project (PGE 2015). Faraday Lake water levels and flow requirements downstream of the Faraday Powerhouse would remain as they are under existing conditions (see Section 2.1.2), and as a result there would be no incremental effects on temperature, DO, total dissolved gas, pH, or any other water quality variables. Faraday Lake would continue to be partially drawn down in summer, as it is under current protocol, with water largely contained within the channelized portion of the lake during that period. Water quality monitoring would be conducted when the new powerhouse comes on line (i.e., after all construction-related activities are completed). PGE would monitor water temperature, dissolved oxygen, pH, turbidity, algae, and total dissolved gas and compare monitoring results to baseline data collected prior to the implementation of the Proposed Action, as described in the Water Quality Monitoring Plan. We conclude that there would be little to no long-term effect on water quality in the Clackamas River.

[12] Application for Non-Capacity Related Amendment of License (Application) for the Clackamas River Hydroelectric Project No. 2195 (Project) Part 3 of 4: Exhibit E – Appendix 1, dated March 16, 2018.

3.3.3. Fish and Aquatic Resources

Affected Environment

The Clackamas River Basin is an important producer of anadromous fish within the Mount Hood National Forest, providing 142 miles of anadromous fish habitat (Stillwater Sciences 1999). The basin also supports substantial resident fish populations and is heavily used by recreational anglers targeting both anadromous and resident fish species. The Clackamas River from the Faraday Diversion Dam downstream to the Faraday Powerhouse supports cutthroat trout, rainbow trout, steelhead, coho salmon, spring Chinook salmon, and Pacific lamprey, as well as occasional fall Chinook salmon, bull trout, and other resident species. Coho, Chinook, and steelhead are currently listed as threatened under the Endangered Species Act (ESA) (see Section 3.3.5). The bull trout, which is also a threatened species, belong to a non-essential experimental population first translocated to the Clackamas River basin in 2011.

Faraday Lake contains juvenile anadromous Chinook, steelhead, and coho. These fish have passed over the North Fork Dam spillway or through the North Fork Powerhouse and then subsequently entered Faraday Lake. The overwhelming majority of juvenile anadromous salmonids produced in the upper Clackamas River basin are bypassed around the Project area via two surface collection systems in the North Fork Dam forebay. Faraday Lake is also stocked annually by ODFW with catchable-sized rainbow trout.

Aquatic Biology Associates and Framatome-ANP DE&S (2002) found that river margin habitat in the mainstem dam tailraces and Faraday Diversion Reach supports high densities of benthic macroinvertebrates. Cool-water releases in the Project area appear to extend the distribution of intolerant taxa (i.e., indicators of good water quality) farther downstream through the Project area than would likely occur under natural conditions.

Adult Salmonid Upstream Passage

There is an existing a 1.9-mile-long fish ladder extending from immediately downstream of the Faraday diversion dam upstream to North Fork reservoir.

The best indicator of the number of adult salmon and steelhead passing through the reach adjacent to the Faraday Powerhouse is provided by counts at the North Fork adult sorting facility. Some fish entering the reach near the powerhouse do not arrive at the adult sorting facility; they may spawn in the Faraday Diversion reach, be caught by anglers, or die. However, the number of fish that do not arrive at the sorting facility is relatively small compared to those that do arrive (Ackerman et al. 2015; David et al. 2017), so counts at the sorting facility provide a valuable and reasonably accurate estimate of passage through the reach adjacent to Faraday Powerhouse.

The mean return (2010–2017) of unmarked Chinook to the North Fork adult sorting facility has been 2,210 (range 984–3,586), with an additional 1,755 (range 205–3,503) marked (hatchery) individuals. The unmarked fish represent a mix of UWR Chinook and LCR Chinook. A large majority of the Chinook that pass through the North Fork adult sorting facility each year are UWR Chinook, though it is believed based on external characteristics of the fish, that some Chinook (estimated to typically be <150 per year) are fall run (LCR Chinook). Chinook passage at the adult sorting facility begins in early May and concludes around late October, with a median passage date since 2013 of July 15. Estimated residency times for adult Chinook in the Faraday Powerhouse tailrace area are shown in Table 4.

Since 2010, the mean return of unmarked Lower Columbia River (LCR) coho to the North Fork adult sorting facility has been 3,098 (range = 1,207–8,244). Very few marked coho arrive at the sorting facility, with an annual average return of four hatchery fish since 2010 (maximum = 12). Coho passage at the adult sorting facility begins in late August and concludes in early February, with a median passage date since 2013 of October 1. Estimated residency times for adult LCR coho in the Faraday Powerhouse tailrace area are shown in Table 4.

The mean return of LCR steelhead to the adult sorting facility for the period of 2010-2017 has been 1,475 (range 870–2,311). Marked hatchery fish returns over the same period have averaged 451 fish (range 94–862). Winter steelhead passage at the adult sorting facility begins in December and concludes in mid June, with a median passage date since 2013 of April 6. Estimated residency times for adult LCR steelhead in the Faraday Powerhouse tailrace area are shown in Table 4.

Table 4. Estimated residency times in the Faraday Powerhouse tailrace for radio-tagged adult salmon and steelhead. The tailrace antenna array detects fish approximately 1,000 ft upstream and downstream of the tailrace. Estimates derived from Ackerman et al., 2014; David et al., 2017; and David et al., (in prep.).

			Days			
Species	**Year**	**Count**	**Min**	**Median**	**Mean**	**Max**
Steelhead	2014	41	0.03	0.37	1.34	8.92
	2016	48	0.04	0.84	2.23	16.76
Chinook	2014	51	0.00	1.23	5.80	71.34
	2016	48	0.02	0.56	1.25	7.87
	2017	17	0.03	0.08	1.01	6.35
Coho	2014	48	0.03	0.34	0.90	6.65
	2016	45	0.02	0.40	1.00	7.00

Juvenile Usage

Juvenile Chinook, steelhead, and coho may be present in the reach adjacent to the Faraday Powerhouse during any time of the year. Limited spawning occurs within and just upstream of the area, and some juveniles may also enter the area after passing North Fork Dam via the spillway or through the turbines. However, the vast majority of juvenile anadromous salmonids from the upper basin are collected by PGE's downstream passage facilities in the North Fork forebay and bypassed around the Faraday diversion reach. Also, most fish produced downstream of the Faraday Diversion Dam originate below the Faraday Powerhouse and tend to move into Estacada Lake to find rearing habitat.

The times when juvenile salmonids are most likely to occur in the reach adjacent to the Faraday Powerhouse are coincident with downstream migration periods from the upper Clackamas River basin. This timing is best indexed by fish collection rates in the North Fork juvenile bypass system (Table 5).

Table 5. Timing (percentage) of downstream migrants passing through the North Fork juvenile bypass system, by month and species, for 2011-2017; cells representing > 5% are highlighted.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook	3	3	1	8	12	4	4	3	4	23	29	7
Steelhead	1	1	2	28	52	4	1	0	0	3	5	2
Coho	2	1	2	4	43	25	2	0	0	2	16	3
Avg. Spill Days	4	4	7	3	2	0	0	0	0	1	3	6

Effects of the Proposed Action

Construction

To avoid having impacts on fish and aquatic resources during the construction of the new Faraday Powerhouse, PGE proposes to implement a number of environmental measures, which are described in greater detail in Section 2.2.3. A temporary low-flow fish passage channel would be excavated, and a flow diversion berm would be constructed to direct water into the low-flow channel. Together these features would provide a passage route for fish during the construction period. Hydraulic modeling was used to inform the design of the low-flow channel so that it provides velocities and depths (which were identified in collaboration with the Fish Agencies) that would be conducive to upstream fish passage under a range of common flows. When the construction period comes to an end, the flow diversion berm would be removed, and the low-flow channel would be filled in so that river flow once again passes along the south

side of the channel so that river flow can easily be detected by adult salmonids in the vicinity of the powerhouse.

To avoid short-term impacts due to heavy equipment operating near and within the channel, PGE would employ relevant BMPs identified by NMFS in its Biological Opinion for the Clackamas River Project (NMFS 2010). Moreover, most construction would be conducted in the dry behind a cofferdam (see Sections 2.2.1, 2.2.3). During construction and deconstruction of the cofferdam, equipment would come into minimal contact with the river channel, as much of the work would be accomplished by equipment perched on the top of the cofferdam. As noted previously, hazardous materials removal would be conducted in the dry at the existing powerhouse per condition 2 of the WQC requiring implementation of the Contaminated Media Management Plan filed with the amendment application.

Noise associated with the installation of the cellular cofferdam is expected to be well below the 150 dBRMS threshold for fish behavioral effects identified by the Washington State Department of Transportation (WSDOT)[13]. To avoid short-term disturbance to or injury of salmonids resulting from loud noise during installation of the sheet-pile portion of the cofferdam, PGE would use divers or a barge-mounted drill rig to bore into the bedrock and set the piles with grout. The drill slurry and rock powder would be pumped to the surface and stored in a tank for subsequent disposal. No slurry would be released into the river. PGE would use a bubble curtain to keep fish out of the area where the drilling is taking place. Grout would be isolated from the water column until it is cured.

Deconstruction of the cofferdam would result in liberation of the coarse sediment used to fill the cellular cofferdam units. Sediment particles would range in size from 0.25–6.0 inches, (i.e., a size that would enhance salmonid spawning and rearing habitat and benthic macroinvertebrate habitat). Because fines would have been removed from the sediment, no adverse impacts to downstream water quality are expected when this sediment is released onto the island and into the channel. After the coarse sediment is released from the cofferdam units, it would be spread out on the island, and the sediment pile would be contoured to facilitate recruitment of sediment to the channel during subsequent high flows.

To avoid impacts associated with potential turbidity pulses, PGE would implement an ODEQ-approved Water Quality Monitoring Plan throughout the construction period.

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[13] Biological Assessment Preparation for Transportation Projects - Advanced Training Manual, Chapter 7, Noise Impact Assessment, January 2018

https://www.wsdot.wa.gov/Environment/Biology/BA/BAguidance.htm#Manual

The plan contains monitoring protocol and turbidity thresholds at which excavation activities would cease and corrective measures would be enacted.

Throughout the construction process, PGE biologists would observe fish presence and behavior to avoid impacts on juvenile or adult fish and ensure that fish passage is unimpeded (see Section 2.2.3 for greater detail on when and how observations and protective measures would be implemented). To avoid disruption of upstream adult fish passage during the tailrace construction period, water would be flowing through the excavated, low-flow channel, which would provide an area of suitable depths and velocities for adult fish migration during most flows. Based on the migration timing and associated flow exceedance values during those migration periods, there should be few days with elevated velocities during Chinook and early-run coho migration periods because flows would be contained within the low-flow channel. Because the upstream migration of these two runs occurs in late spring through fall, these fish should rarely experience flows above 3,000 cfs (1% chance). Late-run coho and winter steelhead migrate upstream in winter, so they would experience a wider range of baseflows and infrequent higher magnitude floods. At moderate winter baseflows (6,500 cfs), velocities would be slightly elevated compared to existing conditions, but adult fish would have many migration paths with suitable depths and velocities. During floods up to 27,000 cfs, the cofferdam constriction would elevate velocities in the center of the channel compared to existing conditions. However, with the cofferdam in place, there would be a 25- to 35-foot-wide corridor along the north bank where adult salmonids would be able to migrate upstream. In addition, these larger rainfall and rain-on-snow peak flow events are typically of short duration (hours to a day), so any velocity-induced adult migration delay is expected to be short. Furthermore, Estacada Lake provides abundant deep, low velocity habitat where adult salmonids can hold until the flood peak recedes, after which they would be able to resume their upstream migration.

To minimize fish stranding and turbidity during the draining of Faraday Lake, water surface elevation would be lowered at a rate of approximately 0.1 foot/hour. This drawdown rate is expected to allow fish, including juvenile Pacific lamprey, to follow the declining water level to the downstream end of Faraday Lake, where they would either exit the lake through the powerhouse/spillway or be salvaged by PGE biologists. PGE proposes to monitor water quality variables during reservoir drawdown, including turbidity, temperature, dissolved oxygen, pH, and algae according to the methods described in the proposed Water Quality Monitoring Plan. The plan includes thresholds beyond which PGE would take corrective actions, as well as a schedule for the reporting of monitoring results.

When flows are redirected to Faraday Lake following the completion of construction activities in the forebay, the lake would be refilled at a rate of 0.1 foot/hour. Controlling the rate of flow reintroduction to Faraday Lake would reduce the likelihood of disturbing fine sediments in the lake, which could subsequently be passed downstream

and increase turbidity. PGE proposes to monitor water quality variables during reservoir refill, including turbidity, temperature, dissolved oxygen, pH, and algae according to the methods described in the proposed Water Quality Monitoring Plan. Again, the plan includes thresholds beyond which PGE would take corrective actions, as well as a schedule for the reporting of monitoring results.

Operation

Fish Passage

No false attraction to the existing Faraday Powerhouse has been observed, and no change is expected because the new powerhouse would operate according to the requirements of the existing license. Radio-telemetry and PIT tagging would be used to verify that migration of adult salmonids past the powerhouse has not changed following the implementation of the Proposed Action. To accomplish this, the Upstream Passage Effectiveness Study, which is expected to be completed in 2019, would be extended into 2021 and 2022, with 2021 being a pulse-flow[14] year and 2022 being a non-pulse flow year. Upstream effectiveness tagging scheduled for 2018-2019 would be postponed until after completion of the construction associated with the Proposed Action.

No changes to juvenile fish passage route selection are expected following implementation of the Proposed Action, because the timing and magnitudes of flows entering and exiting Faraday Lake would remain the same as they are under current conditions. Downstream passage studies would be ongoing during and after the implementation of the Proposed Action and would be used to assess patterns of downstream fish passage. As noted previously, empirical fish passage data would be used as input to the DM3 to evaluate smolt survival to assess whether conditions are in compliance with the Project-wide juvenile salmonid passage standards stipulated by the Project license.

At the maximum flow through the new Kaplan turbines (i.e., 900 cfs) water would exit the draft tube at 6.2 fps. If both units are operating at maximum flow (1,800 cfs total), the velocity in the river at the downstream end of the new powerhouse would be about 1.3 fps. To evaluate potential adult salmonid mortality in the Faraday Powerhouse tailrace following implementation of the Proposed Action, PGE would conduct surveys of the tailrace during the first three years following completion of the new powerhouse;

[14] PGE is conducting a FERC-approved series of evaluations to assess the response of spring Chinook to pulsed flows in the mainstem Clackamas River Project area, 139 FERC ¶ 62,267.

methods would be the same as those used in the Project area in 2016 (i.e., sampling with an underwater camera once per month from July through October).[15]

If PGE fails to meet the Project-wide survival standards, more intense scrutiny of individual facilities, including Faraday Lake and Powerhouse, would take place in a manner considered appropriate by the Fish Committee and approved by the Fish Agencies in the context of compliance with the exiting Project license. This could involve juvenile salmonid tagging studies focused solely on the Faraday Development. However, most juvenile salmonids from the upper Clackamas River basin are captured in North Fork Reservoir and passed to the River Mill Dam tailrace through the downstream migrant pipeline. Therefore, it is unlikely that the small number of fish that could pass through Faraday Lake would have a significant effect on the Project-wide survival standard.

Turbine Mortality

The vertical Kaplan turbines selected for the new powerhouse are expected to improve fish survival and reduce fish injury rates when compared to the existing units. Conditions are expected to improve for several reasons. The new units would be more efficient, with tighter clearances and fewer gaps in which fish could become lodged or injured. The new turbine blades have better hydraulic profiles and are smoother, which helps to reduce cavitation and fish mortality. The configuration of the existing duplex horizontal units requires water to follow a convoluted path and involves two opposing runners discharging into a common header. This results in a large amount of churning and turbulence throughout the turbine. The proposed vertical turbines would create a more streamlined flow path, which along with the new draft tube arrangement would produce less turbulence, and as a result less fish disorientation. Replacing the five original units with two physically larger units would result in lower water velocities in the new units. The larger units would also have larger openings (i.e., blade spacing) than the existing turbine runner vents (i.e., spacing between the buckets), which could safely pass larger fish than the existing units.

PGE would continue to use the agreed-upon, existing turbine mortality rate for the DM3. Because the new units would improve passage conditions for juvenile fish, use of the existing turbine mortality rate would be conservative from a resource-protection standpoint (i.e., it would likely overestimate fish mortality associated with operating the new turbines). If in the future it appears that mortality at Faraday Powerhouse is sufficient to influence the Project-wide survival standard (as revealed by application of

[15] This approach corresponds to that described in the Proposed Study Plan Modification: Plan to Monitor Upstream Fish Passage Effectiveness, approved by FERC on October 22, 2015, 153 FERC ¶ 62,048.

the DM3), PGE would consult with the Fish Committee to develop any studies needed to better understand turbine mortality.

3.3.4. Wetland, Wildlife, and Botanical Resources

Affected Environment

The Faraday Powerhouse is located within an existing, disturbed area dedicated primarily to the generation of hydroelectric power. There are no wetlands or significant botanical resources within the proposed footprint for construction activities associated with the Proposed Action. Per email correspondence with PGE on February 23, 2018, the USFWS determined that no species of concern (beside the bull trout addressed in Section 3.3.5) are present in this area.

In recent years, a pair of bald eagles has been nesting adjacent to Faraday Lake upstream of the powerhouse. The nest is located on PGE property on the south shore of Faraday Lake, approximately 0.3 miles (≈ 1,580 ft) from the Faraday Lake Dam intake structure.

Effects of the Proposed Action

To the extent practicable, PGE would minimize loud noises within the 0.5-mile buffer around the nest from January 1 through August 31 (if the eagles do not nest during 2019–2020 noise would not be an issue relative to this species). PGE biologists would brief construction crews on the importance of, and how to go about, minimizing disturbances to the eagles. The temporary drainage of Faraday Lake to accommodate construction in the forebay would have no adverse effect on the eagles, because ample feeding opportunities exist nearby in the mainstem Clackamas River, Estacada Lake, and North Fork Reservoir. Any replaced transmission lines and their supports would be designed to avian-safe standards, including marking the lines with bird flight diversions to reduce bird collisions.

Because operation of the powerhouse following completion of the Proposed Action would be the same as it is under existing conditions, there would be no incremental effects of powerhouse operations on wetlands, wildlife, or plants.

3.3.5. Threatened, Endangered, and Sensitive Species

Affected Environment

ESA-listed species that occur in the vicinity of the Faraday Development are shown in Table 6.

Table 6. Federally listed species that occur in the vicinity of the Faraday Development.

ESU/DPS	Scientific Name	Listing Status
Upper Willamette River Chinook Salmon ESU	*Oncorhynchus tshawytscha*	Threatened
Lower Columbia River Chinook Salmon ESU	*O. tshawytscha*	Threatened
Lower Columbia River Coho Salmon ESU	*O. kisutch*	Threatened
Lower Columbia River Steelhead DPS	*O. mykiss*	Threatened
Bull trout[1]	*Salvelinus confluentus*	Threatened

[1] Bull trout in the Clackamas River basin constitute a Nonessential Experimental Population.

Per email correspondence with PGE dated February 23, 2018, the USFWS determined that no ESA-listed species under USFWS jurisdiction, beside bull trout, are present in the area that would be affected by the Proposed Action. Because of its non-essential experimental population status, no ESA Section 7 consultation is required with the USFWS for bull trout in the Clackamas River basin.

Effects of the Proposed Action

As described in Section 3.3.3, no adverse impacts on threatened fish species are anticipated as the result of the Proposed Action. Short-term potential impacts associated with construction would be mitigated as described in Sections 2.2.3 and 3.3.3, and operation of the new Faraday Powerhouse would be the same as it is under existing conditions, so no long-term impacts would occur. For the same reasons, there would be no adverse effects on bull trout as the result of implementing the Proposed Action.

3.3.6. Recreational Resources and Land Use

PGE owns all the land associated with the Faraday Powerhouse and its access routes. The Faraday Development provides land-based, day-use recreational opportunities, primarily bank fishing at Faraday Lake. No boating or overnight uses occur adjacent to Faraday Lake. The Faraday diversion reach is only accessible from a closed road off Highway 224, which is used primarily by hikers, cyclists, and whitewater boaters, or via a trail from Faraday Lake. One guidebook rates the diversion reach as Class II-III whitewater at relatively low flows, but interviews with paddlers after a flow test several years ago suggested that the reach is Class III-IV at flows in the range of 600 to 1,200 cfs, and probably has Class V rapids at very high flows.

Effects of Proposed Action

Construction

As noted previously, implementation of the Proposed Action would require Faraday Lake to be drained completely. The lake may be dewatered for as long as 3-4 months (i.e., June–September 2019). PGE plans to eliminate access to lands surrounding Faraday Lake during 2019–2020 to ensure the safety of the public. Angling would again be possible after Faraday Lake is refilled and public access is restored, but fish numbers would remain low until ODFW restocks the lake.

Operation

There would be no incremental effects on recreation in Faraday Lake or the Faraday diversion reach as the result of operating the new powerhouse. Faraday Powerhouse would continue to be operated as it is under existing conditions, and access to Faraday Lake would be restored following implementation of the Proposed Action.

In addition, in a January 30, 2019 filing, PGE notified the Commission that it plans to close access to Faraday Lake; including the Faraday Lake Recreation Area, in order to safely manage construction activities. The closure would commence on March 1, 2019 and the licensee expects it to last through the end of 2020. PGE says it has installed a sign at the site to notify the recreating public of the planned closure. In addition, PGE also announced the closure on its website and intends to put an announcement in the local newspaper, the Estacada News. PGE says it would inform the public of alternative locations for nearby hiking and fishing opportunities in the newspaper announcement.

3.3.7. Aesthetic Resources

Affected Environment

The Faraday Development is located in a narrow, forested canyon. The Faraday Diversion Dam is not visible from Highway 224, so relatively few people see this facility. The Faraday diversion reach consists of a winding scenic gorge, which is visible from the bridge (limited to pedestrians and service vehicles) across the Clackamas River that links the parking area with the recreation areas at Faraday Lake. Faraday Lake is set relatively high above the river and constructed with an embankment against a forested hillside. The penstocks, powerhouse, and a substation are located at the toe of the embankment and are not easily visible from the recreation areas above or from Highway 224.

Effects of Proposed Action

There would be no significant effects on aesthetic resources due to implementation of the Proposed Action. Given the already heavily developed nature of the Clackamas River in the vicinity of the Faraday Development, there would be no incremental aesthetic effect associated with the construction or operation of the new powerhouse.

3.3.8. Cultural Resources

Definition of Cultural Resources, Historic Properties, Effects, and Area of Potential Effects

Historic properties are cultural resources listed or eligible for listing in the National Register. Historic properties can be buildings, structures, or objects, districts (a term that includes historic and cultural landscapes), or sites (archaeological sites or locations of important events). Historic properties also may be resources of traditional religious and cultural importance to any living community; such as an Indian tribe or a local ethnic group, that meet the National Register criteria; these properties are known as traditional cultural properties. Cultural resources must possess sufficient physical and contextual integrity to be considered historic properties. For example, dilapidated structures or heavily distributed archaeological sites, although they may retain certain historical or cultural values, may not have enough integrity to be considered eligible.

Section 106 of the NHPA requires the Commission to evaluate potential effects on properties listed or eligible for listing the National Register prior to an undertaking. An undertaking means a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including, among other things, processes requiring a federal permit, license or approval. Advisory Council on Historic Preservation (Advisory Council) regulations implementing section 106 define effects on historic properties as those that change characteristics that qualify those properties for inclusion for the National Register. In this case, the undertaking is the removal of the historic Faraday powerhouse and associated facilities, which are contributing resources to the Clackamas Hydroelectric Project, which is eligible for the National Register.

Determination of effects on historic properties first requires identification of any historic properties in the APE. The Advisory Council's regulations define the APE as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist.[16] For this undertaking, the APE includes lands within the project boundary as well as lands outside of the project boundary where project construction and/or operation may

[16] 36 C.F.R. Section 800.16(d).

affect historic properties. The APE includes all access roads, laydown areas, and other locations required during construction and a 100-foot buffer around these areas.

Effects on cultural resources within the APE can result from project-related activities such as reservoir operations, modifications to project facilities, or project related ground-disturbing activities. Effects also can result from other forces such as wind and water erosion, recreational use (project and non-project related), vandalism, and private and commercial development. In the case of the licensee's proposal to amend the Clackamas Hydroelectric Project's license, PGE consulted with the Oregon State Historic Preservation Office (Oregon SHPO) to develop a Memorandum of Agreement (MOA) that identifies appropriate mitigation measures for these adverse impacts. PGE proposes to implement the following mitigation measures, which are described in detail in the MOA: (1) provide State of Oregon documentation of the Faraday Powerhouse and related resources; (2) publish Faraday/Clackamas Project content using the Next Exit History application; (3) fund the digitization of multiple historic newspapers; (4) identify and interview people familiar with the operation of the Faraday Powerhouse to gather stories and personal histories of the plant; (5) plan and host a social gathering to be held at the powerhouse; (6) install a camera above the powerhouse site to provide time-lapse video of the powerhouse demolition and construction, which would be available on the internet; and (7) to the extent feasible, identify appropriate elements of the Faraday Powerhouse and related buildings for salvage and retention for interpretation/recreational use at the Faraday Dam Recreational Area. To manage potential impacts on cultural resources during the construction period, PGE and its subcontractors would follow PGE's Inadvertent Discovery Protocol. This Protocol is included as Appendix D to the Project's Historic Properties Management Plan. However, given that all work would take place in a previously developed location, it is extremely unlikely that archeological resources would be encountered during construction.

Construction of the Cazadero Diversion Dam (subsequently replaced with the Faraday Diversion Dam) and Faraday Powerhouse began in 1902 and was completed in 1907. The historic built resources of the Faraday Lake Dam and Powerhouse have been determined to be eligible for inclusion in the NRHP. The proposed location of construction was subjected to an intensive, systematic cultural resources survey during the relicensing of the Clackamas River Project, and no archaeological sites were documented within the proposed footprint for the Proposed Action (Oetting 2004). Because the area has been heavily disturbed by previous activities, the inadvertent discovery of cultural material is unlikely.

Effects of Proposed Action

The historic built resources of the Faraday Lake Dam and Powerhouse have been determined to be eligible for inclusion in the NRHP. A finding of effect analysis indicated that implementing the Proposed Action would result in adverse impacts on

historic resources. PGE consulted with the Oregon SHPO to develop a MOA that identifies appropriate mitigation measures for these adverse impacts. PGE proposes to implement the following mitigation measures, which are described in detail in the MOA: (1) provide State of Oregon documentation of the Faraday Powerhouse and related resources; (2) publish Faraday/Clackamas Project content using the Next Exit History application; (3) fund the digitization of multiple historic newspapers; (4) identify and interview people familiar with the operation of the Faraday Powerhouse to gather stories and personal histories of the plant; (5) plan and host a social gathering to be held at the powerhouse; (6) install a camera above the powerhouse site to provide time-lapse video of the powerhouse demolition and construction, which would be available on the internet; and (7) to the extent feasible, identify appropriate elements of the Faraday Powerhouse and related buildings for salvage and retention for interpretation/recreational use at the Faraday Dam Recreational Area.

To manage impacts on cultural resources during the construction period, PGE and its subcontractors would follow PGE's Inadvertent Discovery Protocol. However, because the area has been heavily disturbed by previous activities, the inadvertent discovery of cultural material is unlikely.

Once the Proposed Action has been completed, the Faraday Powerhouse would operate as it does under existing conditions. As a result, there is no potential for any incremental effects on cultural resources associated with operation of the new powerhouse.

3.4 No-Action Alternative

Under the No-Action Alternative, the Faraday Powerhouse would not be replaced. By definition, there would be no changes to resources beyond what would occur under baseline conditions. The Faraday Development would generate electricity under the less efficient existing turbine configuration, and PGE would forego (1) implementation of the proposed flood protection and seismic upgrades, (2) the coarse sediment augmentation (i.e., release of material from the cellular cofferdam units), and (3) improved turbine passage survival for the small number of juvenile salmonids that enter Faraday Lake from upstream.

3.5 Unavoidable Adverse Effects

There would be no unavoidable adverse effects due to the implementation of the Proposed Action. PGE has identified a number of measures (identified and described in Sections 2.2.3 and 3.3) to avoid adverse impacts on resource values.

4.0 COMPREHENSIVE DEVELOPMENT AND STAFF RECOMMENDED MEASURES

Sections 4(e) and 10(a) of the FPA require the Commission to give equal consideration to all uses of the waterway on which a project is located. When we review a hydropower project, we consider the water quality, fish and wildlife, recreation, cultural, and other non-developmental values of the involved waterway equally with its electric energy and other developmental values. In deciding whether, and under what conditions a hydropower project should be licensed, the Commission must determine that the project would be best adapted to a comprehensive plan for improving or developing the waterway. This section contains the basis for, and a summary of, our recommendations for conditions to be included in any amendment to the license to: 1) rebuild the Faraday Powerhouse; 2) remove existing turbine units 1 through 5 and replace them with two efficient units; 3) enhance the seismic stability of the powerhouse; and 4) install structures to prevent the powerhouse from flooding during excessive flows.

Based on our independent review and evaluation of the environmental and economic effects of the proposed action and the no-action alternative, we recommend the proposed action as the preferred alternative. We recommend this alternative because: (1) issuing an amendment of the project license would allow the licensee to continue operating the project as a beneficial and dependable source of electric energy; (2) increase the seismic stability of the Faraday Powerhouse and enhance the ability of the powerhouse to resist flooding during high flow events; and (3) the proposed environmental measures identified below would protect project resources.

We recommend including the following environmental measures proposed by PGE in any amended license issued by the Commission for the Clackamas River Project. These recommendations are consistent with the WQC issued by the ODEQ, and NMFS's Biological Opinion

Construction-Related Measures

Water and Aquatic Resources

- Excavate a low-flow, fish passage channel located upstream of the Faraday Powerhouse tailrace and use excavated sediment to construct a temporary flow diversion berm to route water into the excavated channel to provide fish passage during the construction of the new powerhouse.

- Conduct pre-excavation reconnaissance to evaluate the need for fish salvage efforts. If needed, salvage would be conducted using agency-approved and permitted methods (analogous to those described below for the drawing down of Faraday Lake).

- Excavation of the low-flow channel and flow diversion berm would be conducted over a short period, expected to be one day to avoid short-term interference with adult salmonid upstream passage.

- Implement an ODEQ-approved Water Quality Monitoring Plan, with monitoring protocol and turbidity thresholds at which channel excavation activities would cease and corrective measures would be enacted.

- Use heavy equipment operating near and within the channel, would employ best management practices (BMPs) identified in the NMFS Biological Opinion for the Clackamas River Project (NMFS 2010).[17]

Construction of Cofferdam around the Faraday Powerhouse Tailrace

- Conduct pre-excavation reconnaissance to evaluate the need for fish salvage efforts and monitor for fish migration delay at the start of each workday. Any fish salvage would be conducted using agency-approved and permitted methods (analogous to those described below for the drawing down of Faraday Lake). If signs of fish migration delay are observed, PGE would notify the resources agencies as soon as possible within 24 hours and collaborate with the resource agencies to identify appropriate actions to be implemented to minimize the delay.

- Use divers or a barge-mounted drill rig to bore into the bedrock and set the cofferdam piles with grout. Pump drill slurry and rock powder into storage tanks for subsequent disposal.

- Use a bubble curtain to keep fish out of the construction area where the drilling is taking place. Isolated grout from the water column until cured.

- Allow at least 12 hours for any fish within the tailrace behind the cofferdam to exit the area. In the unlikely event, any fish remain in the tailrace area, they would be induced to leave by walking/floating the tailrace area.

- Upon completion of the cofferdam, water would be pumped out of the area. To avoid entrainment of fish, PGE would screen the intakes of the pumps used to dewater the tailrace. Any fish that remain within the cofferdam area would be salvaged using agency-approved and permitted methods (analogous to those described below for the drawing down of Faraday Lake).

[17] *See*: Appendix F, 133 FERC ¶ 62,281 (2010), order on reh'g, 134 FERC ¶ 61,206 (2011)

- Minimize the amount of time construction equipment enters the river channel and employ relevant BMPs, including erosion control measures identified in the 2010 NMFS Biological Opinion for the Clackamas River Project.

Drawing Down Faraday Lake

- To minimize turbidity and fish stranding in Faraday Lake during the construction-related drawdown, lower the water surface elevation of Faraday Lake at a rate of approximately 0.1 foot/hour while limiting the increase in flow in the Faraday diversion reach as gradually as possible to minimize disturbance to fish and other aquatic biota in the diversion reach.

- Monitor water quality variables during the drawing down of the lake, including turbidity, temperature, dissolved oxygen, pH, and algae, according to the methods described in the proposed Water Quality Monitoring Plan filed with the application and implement corrective action if parameters are exceeded.

- Salvage fish during the lake drawn down according to an agency-approved Fish Salvage Plan. In isolated pools where fish could be trapped fish would be captured using methods to maximize capture and minimize fish injury.

- Train workers in the safe handling of fish, especially ESA-listed species using seines to corral fish and dip-nets to transfer fish to containers and fish trailers for transport to Estacada Lake. ESA-listed fish would be kept in water to the maximum extent possible throughout the transfer process.

- Obtain necessary federal and state authorizations for conducting fish salvage activities and coordinate with the resource agencies so that their representatives can observe salvage activities. A fish salvage report would be provided to the Fish Agencies within 30 days of completing the salvage operation. The report would include the number of fish removed from the lake, by species; fish release location(s); fish condition at the time of release; and a record of any injury or mortality.

Tailrace Construction

- During the tailrace construction period conduct visual observations on days that construction activities take place to ensure that no adult fish in the vicinity of the construction area are showing signs of delay. If signs of delay are observed, notify the resource agencies as soon as possible within 24 hours and collaborate with the agencies to identify appropriate actions to be implemented to minimize the delay.

- Conduct work within the cofferdam in the dry and employ relevant BMPs identified in the 2010 NMFS in its Biological Opinion for the Clackamas River Project.

- Hazardous materials removal would be conducted in the dry at the existing powerhouse according to the proposed Contaminated Media Management Plan.

- Water pumped from the tailrace during construction would be routed to a settling basin to allow it to clarify before it is released back to the river channel.

Faraday Lake Refill

- Following the completion of drawdown-related construction activities, refill Faraday Lake at a rate of 0.1 foot/hour to minimize fine sediment disturbance.

Cofferdam Deconstruction

- Begin deconstruction of the cofferdam by removing the sheet-pile section, followed by removal of the cellular cofferdam units, beginning downstream and proceeding in an upstream direction allowing coarse sediment to exit the cellular cofferdam units when the north-side steel frames are lifted.

- Monitor course sediment movement to verify that coarse sediment is not impeding upstream adult fish passage, and continue until the sediment has been safely mobilized downstream. If passage is impeded, corrective measures would be enacted, in coordination with the resource agencies.

- Monitor upstream fish passage during the cofferdam deconstruction to ensure that no fish in the vicinity of the deconstruction area are showing signs of delay. If signs of delay are observed, notify the resource agencies as soon as possible within 24 hours and collaborate with the resource agencies to identify appropriate actions to be implemented to minimize the delay.

Remove Temporary Flow Diversion Berm and Fill Excavated Low-Flow Channel

- Return the Clackamas river channel in the vicinity of the powerhouse to approximately its pre-construction configuration, so that water in the diversion reach flows past the powerhouse outflow, so that fish passing the powerhouse would readily detect the upstream passage route, as they do under existing conditions.

Wildlife Resources

- Design any transmission lines and supports replacements according to avian-safe standards, including marking the lines with bird flight diversions to reduce bird collisions.

Cultural Resources

- Implement the MOA and mitigation measures: (1) provide State of Oregon documentation of the Faraday Powerhouse and related resources, (2) publish Faraday/Clackamas Project content using the Next Exit History application, (3) fund the digitization of multiple historic newspapers, (4) identify and interview people familiar with the operation of the Faraday Powerhouse to gather stories and personal histories of the plant, (5) plan and host a social gathering to be held at the powerhouse, (6) install a camera above the powerhouse site to provide time-lapse video of the powerhouse demolition and construction, which would be available on the internet, and (7) to the extent feasible, identify appropriate elements of the Faraday Powerhouse and related buildings for salvage and retention for interpretation/recreational use at the Faraday Dam Recreational Area.

- Implement the procedures of the Historic Properties Management Plan approved in the license if any previously undiscovered properties are found during construction.

Measures Related to Operation of the New Powerhouse

- Monitor water quality after the new powerhouse is installed to compare the monitoring results to equivalent data collected under existing conditions. Water quality variables to be monitored would include turbidity, temperature, dissolved oxygen, pH, algae, and total dissolved gas.

- Maintain project-wide downstream fish passage survival and injury standards outlined in the project license and assess whether conditions are in compliance with the project-wide standards.

- To evaluate potential post-construction adult salmonid mortality in the Faraday Powerhouse tailrace conduct surveys of the tailrace during the first three years following completion of the new powerhouse using the same procedure as those used in 2016 (i.e., sampling with an underwater camera once per month from July through October.)

- Develop a final post-Construction Stormwater Management Plan prior to commissioning the new powerhouse and ensure that the design and

procedures associated with stormwater management are acceptable to ODEQ.

5.0 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2)(A) of the FPA requires the Commission to consider whether and to what extent a project action is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project action. Staff identified seven plans (listed below) that had the potential to be relevant to the Proposed Action. Staff found no inconsistencies between the Proposed Action and these plans.

- National Park Service. 2012. The nationwide rivers inventory. Department of the Interior, Washington, D.C. https://www.nps.gov/ncrc/programs/rtca/nri/states/or.html

- Northwest Power and Conservation Council. 2004. Draft Willamette Subbasin Plan. Prepared by D. Primozich and R. Bastasch, Willamette restoration Initiative.

- Oregon Department of Energy. 2015. 2015-2017 State of Oregon Biennial Energy Plan. Oregon Department of Energy, Salem, Oregon.

- Oregon Department of Fish and Wildlife and National Marine Fisheries Service. 2011. Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead.

- Oregon Department of Fish and Wildlife. 2016. Oregon Conservation Strategy. Oregon Department of Fish and Wildlife, Salem, Oregon. http://www.oregonconservationstrategy.org/overview/

- Oregon Water Resources Department. 2012. Oregon's Integrated Water Resources Strategy. Oregon Water Resources Department, Salem, Oregon.

- US Army Corps or Engineers. 2000. Water Resources Development in Oregon. US Army Corps of Engineers, Portland District, Portland, Oregon.

6.0 FINDING OF NO SIGNIFICANT IMPACT

If the proposed amendment to the Clackamas River Hydroelectric Project is approved with PGE's proposed measures, the project would continue to operate while providing protection and enhancements to water quality, aquatic resources, terrestrial resources, recreation, and cultural resources.

Based on our independent analysis, PGE's proposed demolition and re-build of the Faraday Powerhouse would not constitute a major federal action significantly affecting the quality of the human environment.

7.0 LIST OF PREPARERS

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NMFS (National Marine Fisheries Service). 2010. Endangered Species Act Section 7(a)(2) Consultation, Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Consultation for the Operation of Portland General Electric Company's Clackamas River Hydroelectric Project under its New License. Clackamas River Hydroelectric Project, FERC No. 2195, Clackamas River, HUC 17090011, Clackamas County, Oregon. NMFS Log Number: 2006/04980.

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