Revised

Tailrace Slough Instream Flow Study Plan for Energy Northwest's Packwood Lake Hydroelectric Project FERC No. 2244 Lewis County, Washington

Submitted to

ENERGY NORTHWEST
People·Vision·Solutions

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1.0 INTRODUCTION

Energy Northwest's Packwood Lake Hydroelectric Project, FERC No. 2244, received its initial license in 1960. The majority of the Project is located in the Gifford Pinchot National Forest. The Project consists of an intake canal, a concrete drop structure (dam) and intake building on Lake Creek located about 424 feet downstream from the outlet of Packwood Lake, a 21,691-foot system of concrete pipe and tunnels, a 5,621-foot penstock, a surge tank, and powerhouse with a 26,125 kW turbine generator.

The source of water for the Project, Packwood Lake, is a natural lake situated at an elevation of approximately 2,857 feet above mean sea level (MSL), about 1,800 feet above the powerhouse. Water discharged from the Project is released to the Cowlitz River via a tailrace channel. Power from the Project is delivered over an 8,009-foot 69 kV transmission line to the Packwood substation.

Anadromous salmonids are known to spawn in both lower Lake Creek and in the tailrace slough where it adjoins the Cowlitz River. Energy Northwest started spawner surveys in these two areas in 2004 (EES Consulting 2005).

1.1 Study Plan Goals and Objectives

The goals of this study would include conducting an Instream Flow Incremental Methodology (IFIM) study of the tailrace slough; integrating the information gained from spawning surveys, habitat use surveys, and the physical habitat survey to estimate the effects of Project operations on fish and redds within the tailrace slough; and developing alternative operation scenarios to minimize negative effects on fish and redds in the tailrace slough.

2.0 AGENCY AND TRIBE RESOURCE MANAGEMENT GOALS AND OBJECTIVES

NOAA Fisheries requested this study and provided their resource management goals and objectives (NOAA Fisheries 2005). These are listed below.

2.1 NOAA Fisheries Goals

NOAA Fisheries has responsibility and authority under the Federal Power Act, 16 U.S.C. §791 *et seq.,* the Endangered Species Act, 16 U.S.C. §1531 *et seq.,* and the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. §1801 *et seq.*, to manage and protect anadromous salmonid populations.

The Lower Columbia River Salmon Recovery Plan (LCFRB 2004) has identified these specific recovery goals for salmonid populations in the lower Columbia Basin:

2.1.1 Adult Population Productivity and Abundance

1. In general, viable populations should exhibit population growth rate, productivity, and abundance that, in combination, demonstrates an acceptable probability of population persistence. Various approaches for evaluating population productivity and abundance combinations may be acceptable, but must meet reasonable standards of statistical rigor.
2. A population with non-negative growth rate and an average abundance approximately equivalent to estimated historic average abundance should be considered to be in the highest persistence category. To demonstrate this criterion, studies should include a credible estimate of historic abundance, an estimate of current abundance averaged over several generations, and an estimate of growth rate done with adequate statistical confidence.

2.1.2 Juvenile Migrant Production

The abundance of naturally produced juvenile migrants should be stable or increasing as measured by observing a median annual growth rate or trend with an acceptable level of confidence.

2.1.3 Within-Population Spatial Structure

The spatial structure of a population must support the population at the desired productivity, abundance, and diversity levels through short-term environmental perturbations, longer-term environmental oscillations, and natural patterns of disturbance regimes. The metrics and benchmarks for evaluating the adequacy of a population's spatial structure should specifically address:

1. Quantity: Spatial structure should be large enough to support growth, abundance, and diversity.
2. Quality: Underlying habitat spatial structure should be within specified habitat quality limits necessary to support life history activities (spawning, rearing, migration, or a combination) taking place within the patches.
3. Connectivity: Spatial structure should have permanent or appropriate seasonal connectivity to allow adequate migration between spawning, rearing, and migration patches.
4. Dynamics: Changes to the spatial structure should not harm its ability to support the population. The processes creating spatial structure are dynamic, so structure will be created and destroyed, but the rate of flux should not exceed the rate of creation over time.
5. Catastrophic Risk: The spatial structure should be geographically distributed in such a way as to minimize the probability of a significant portion of the structure being lost because of a single catastrophic event, either anthropogenic or natural.

2.1.4 Within-Population Diversity

Sufficient life-history diversity must exist to sustain a population through short-term environmental perturbations and to provide for long-term evolutionary processes. The metrics and benchmarks for evaluating the diversity of a population should be evaluated over multiple generations and should include:

1. Whether substantial proportion of the diversity of a life-history trait(s) existed historically,
2. Whether gene flow and genetic diversity is similar to historic (natural) levels and origins,
3. Whether there is successful utilization of habitats throughout the habitat; and
4. Whether populations show resilience and adaptation to environmental fluctuations.

2.1.5 General Habitat

1. The spatial distribution and productive capacity of freshwater, estuarine, and marine habitats should be sufficient to maintain viable populations identified for recovery.
2. The diversity of habitats for recovered populations should resemble historic conditions given expected natural disturbance regimes (wildfire, flood, volcanic eruptions, etc.). To the extent possible, diversity should be measured against historic conditions. Historic conditions represent a reasonable template for a viable population; the closer the habitat resembles the historic diversity, the greater the likelihood that it will be able to support viable populations.
3. At a large scale, habitats should be protected and restored, with a trend toward an appropriate range of attributes for salmonid viability. Freshwater, estuarine, and marine habitat attributes should be maintained in a non-deteriorating state.

3.0 EXISTING INFORMATION AND NEED FOR ADDITIONAL INFORMATION

3.1 Existing Information

Energy Northwest has been conducting spawning surveys within the tailrace slough since the summer of 2004; the results were reported by EES Consulting (2005). Thirty adult coho salmon were observed in the slough, as well as 12 Chinook redds. Redds were observed in the vicinity of these 30 adult coho, however, it is not known whether all of these fish were actually spawning.

Currently, the Project shuts down for annual maintenance during October. No flows are diverted during this period, so inflow from power production into the slough is reduced or eliminated. In October 2004, (when the Cowlitz River was also low) all flows in the slough came from Project operation. It is probable that redds observed in the area were dewatered because of the lack of flow. Two floods in the winter of 2004/2005 changed the configuration of the tailrace slough; now, a percentage of the flows in the slough are from the Cowlitz River, which has re-occupied a side channel that flowed around an island near the mouth of the slough. The amount of water being contributed to the slough by the Cowlitz River is being determined, but is currently unknown.

3.2 Need for Additional Information

Anadromous fish are being reintroduced into the upper Cowlitz River; Chinook and coho salmon have been observed in the tailrace slough. There is no information currently available that integrates observations of habitat use in the tailrace slough by anadromous salmonids and the effects of Project operations on water levels and habitat within the tailrace slough. This information is necessary to accurately assess Project effects on anadromous salmonids present in the tailrace slough.

4.0 NEXUS BETWEEN PROJECT OPERATIONS AND EFFECTS ON RESOURCES

Flows and water levels in the tailrace slough are affected by water releases from Project operations. Adult spawners and redds have been observed in the tailrace slough. Thus, it is likely that fish utilizing the slough are impacted by Project operations.

Anadromous fish are now being reintroduced to the upper Cowlitz River as part of Tacoma Power's settlement agreement for the relicensing of the Mossyrock and Mayfield Dams. As anadromous fish continue to be reintroduced to the upper Cowlitz River, there is the potential for fry spawned in Lake Creek to imprint on Lake Creek water. However, when these fish return as adults, they may first encounter the confluence of the Cowlitz River and the Project's tailrace. Results from this study would quantify presence, abundance, distribution, and movement of fish species within the tailrace slough.

5.0 STUDY AREA AND METHODS

5.1 Study Area

The study area is the slough immediately downstream of the Project tailrace to its confluence with the Cowlitz River. The configuration of this side channel often changes with flood flows on the Cowlitz. The study area includes the channel configuration at the time of the field data collection. The current configuration of the side channel is shown in Figure 5-1.

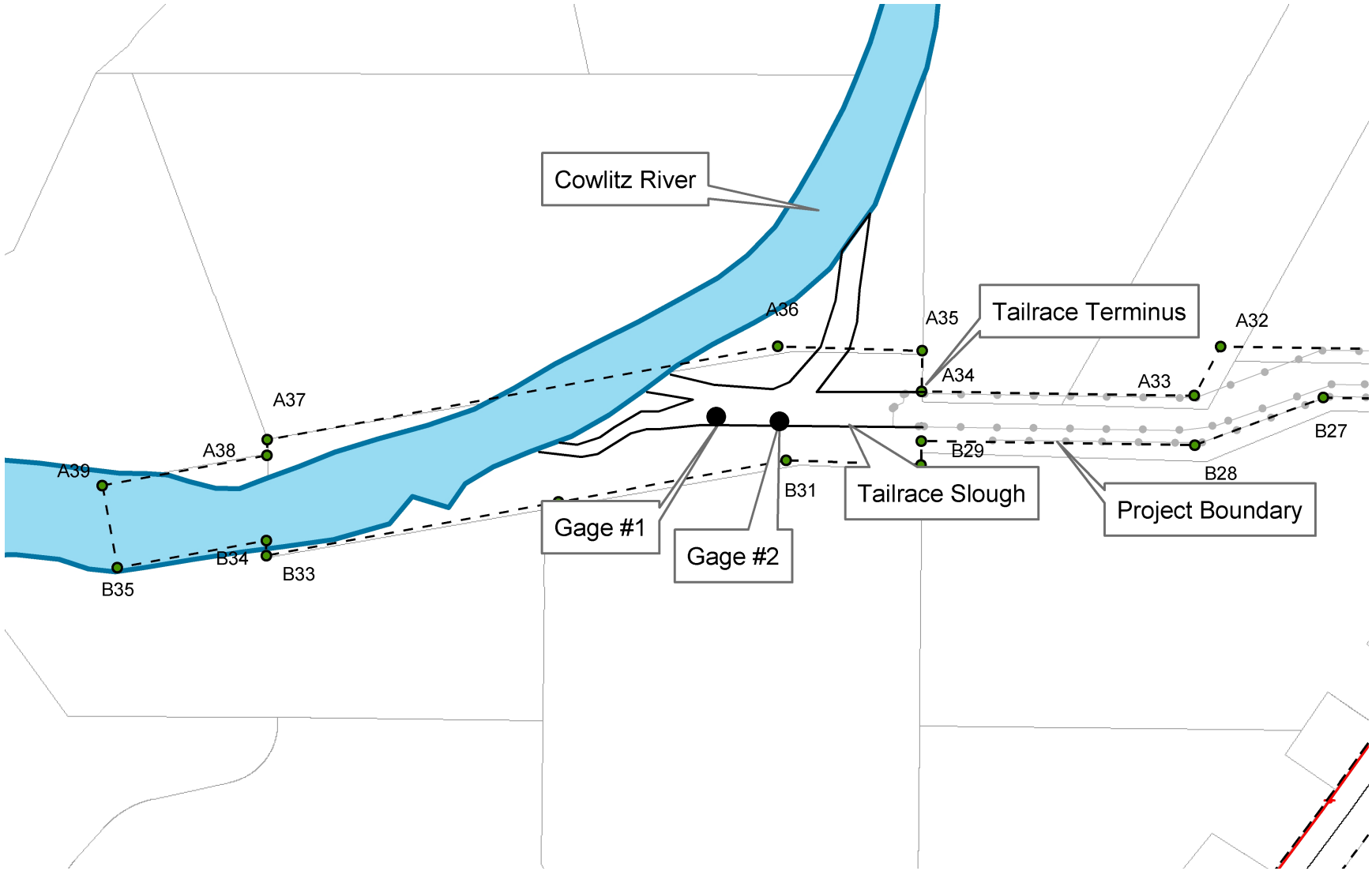

Figure 5-1. Study Area

5.2 Methodology

Energy Northwest will conduct an instream flow study using the Instream Flow Incremental Methodology (IFIM) according to the guidelines as established in the Washington Department of Fish and Wildlife/Washington Department of Ecology Instream Flow Guidelines (2004). An example of the protocol is found in the Lake Creek Instream Flow Study (EES Consulting 2004). The study will employ habitat suitability criteria approved by the State of Washington and use habitat mapping and transect weighting in accordance with habitat distribution.

The results of tailrace spawning surveys, habitat use and presence surveys and tailrace slough IFIM study must be integrated. A model of Project operations and its effects on salmonid habitat within the tailrace will be developed from this data. Once developed, the model can be used to assess the impact of various operating scenarios on anadromous salmonids within the tailrace and the practical aspects and economics of each scenario. These results, as well as those from the Lake Creek instream flow study, will also be combined to examine various means of operating the Project.

5.3 Products

The products of the Tailrace Slough Instream Flow Study will be model calibration reports, Weighted Usable Area calculations for target species and life stages, and draft and final reports. A sub-group of the Water Quality and Aquatic Resources Committee will meet to review calibration details. The draft study plan will be presented to the natural resource agencies and tribes for review and comment. The final report will be provided to the agencies and tribes for their files.

5.4 Consistency with Generally Accepted Scientific Practice

The proposed survey protocol will follow generally accepted practices as stipulated in WDFW/WDOE (2004).

5.5 Relationship with Other Studies

Results from the Tailrace Slough Use by Anadromous Salmonids study, Anadromous Salmonids Habitat and Spawner Survey study, Geomorphology and Habitat of the Tailrace Slough study, Tailrace Slough Instream Flow study, and Water Quality study will be considered in determining Project impacts in the tailrace slough area.

The results from this study, as well as those from the Lake Creek instream flow study, will also be combined to examine various means of operating the Project.

6.0 CONSULTATION WITH AGENCIES, TRIBES AND OTHER STAKEHOLDERS

Energy Northwest initiated agency consultation in December 2003. A Water Quality and Aquatic Resources Committee was formed in March 2004. Representatives include Energy Northwest, EES Consulting, Watershed GeoDynamics, WDFW, USFWS, NOAA-Fisheries,

Department of Ecology, the Forest Service, the Cowlitz tribe, and the Yakama Nation. Spawner surveys have been conducted since July 2004. The integrated licensing process plan provides for numerous meetings with stakeholders to discuss, revise and finalize the proposed study plans. Updates will be provided and preliminary data collected will be reviewed periodically by the agencies and tribes to determine if modifications to the study design are necessary. Draft reports will be provided to the agencies and tribes for review and comments. The final report will be provided to the agencies and tribes.

7.0 PROGRESS REPORTS, INFORMATION SHARING, AND TECHNICAL REVIEW

Technical reports, including the draft and final reports will be shared with stakeholders and will discuss the progress of the studies. Energy Northwest and its consultant will also report on the methods, progress, and results of the Instream Flow study at Water Quality and Aquatic Resources Committee meetings.

Review periods will be 30 days, after which Energy Northwest and its consultant will take review comments into consideration when making revisions and producing a final report.

8.0 SCHEDULE

Streamflow measurements will begin as soon as the revised study plan is approved. In order to minimize the risk of bed shift, calibration measurements will be taken in descending order from high flow to low flow. The study will commence in 2006. The draft report will be issued in 2007, with a final report completed by September 2007.

9.0 LEVEL OF EFFORT AND COST

The instream flow study consists of a number of steps in order to be successfully completed. These tasks, as well as estimated hours, are listed below in Table 9-1.

Table 9-1. Estimated Effort for Instream Flow Study on Tailrace Slough

Task	Hours
Project Management	16
Agency Consultation	24
Protocol Report	28
Transect Selection and Setup	60
Calibration Flow Measurements	180
Data Entry/QA/QC	50
Calibration and Agency Consultation	96
Data Analysis and Reports	68
Total Hours	522

Other expenses include travel and equipment rental/purchase for the Project. It is assumed that other tasks will be incorporated with these visits, so that expenses (mileage, hotel and per diem and travel time) can be shared between the tasks.

The tailrace slough is a dynamic area. Estimates of costs for this study assume that no changes in the geomorphology of the tailrace area will occur between calibration flow measurements so that only three calibration flow measurements will be required.

Anticipated costs for this study are $58,818.

10.0 LITERATURE CITED

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