April 20, 2006
PKWD-06-022

Ms. Magalie R. Salas
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20427

Dear Secretary Salas:

Subject: PACKWOOD LAKE HYDROELECTRIC PROJECT
FERC DOCKET NO. 2244-012
STATUS REPORT FOR FISH RESCUE PLAN AND TAILRACE BARRIER


On October 28, 2005 Energy Northwest filed a report with the Federal Energy Regulatory Commission (FERC) regarding the development of a fish rescue plan and the feasibility of installing a temporary barrier on the Packwood Lake Hydroelectric Project’s tailrace. This letter provides a status report on the fish rescue plan and installation of a permanent barrier on the Project’s tailrace.

Attachment A contains information related to the fish rescue program. Energy Northwest provided the agencies and tribes a revised fish rescue plan in December 2005 (Attachment A, Item 1). Based upon comments received (Attachment A, Items 2 and 3), Energy Northwest developed a revised draft fish rescue plan (Attachment A, Items 4 and 5), which is currently being reviewed by the agencies and tribes. Highlights of the revised draft include:

- Providing supplemental flows as necessary to maintain water in the tailrace until fish rescue can occur during planned and forced outages;
- Snorkeling the stilling basin during twice-monthly spawner surveys through July 2006;
- If during snorkeling the counts of listed species exceed 50 individuals, one seining of the stilling basin will be conducted during the July–August 2006 period, timed to minimize injury or mortality to juveniles;
- Installing a temporary exclusionary seine net in the tailrace near the location where it empties into the Cowlitz River side channel in July or August 2006.
Attachment B contains information related to installation of a permanent barrier, including comment letters received from the agencies on criteria to use in designing a permanent barrier. Energy Northwest is currently preparing a Request for Proposal with award of the design contract currently scheduled for July 2006. Installation of the permanent barrier is currently scheduled for fall of 2007, provided that appropriate approvals and permits have been received from the resource agencies and the FERC.

If you have any questions or require additional information regarding this matter, please contact Ms. Laura Schinnell at (509) 372-5123.

Respectfully,

J.W. Baker, Vice President
Energy/Business Services

Attachments: A) Documentation Related to Fish Rescue Program
B) Documentation Related to Barrier Replacement
ATTACHMENT A

DOCUMENTATION RELATED TO FISH RESCUE PROGRAM
## ATTACHMENT A
### DOCUMENTATION RELATED TO FISH RESCUE PROGRAM

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<td>Electronic correspondence dated December 22, 2005, Laura Schinnell to Blane Bellurud et. al., “Packwood Lake Hydroelectric Project – Revised Redline Draft Fish Rescue Plan”</td>
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<tr>
<td>3</td>
<td>Electronic correspondence dated February 8, 2006, Brian Peck to Laura Schinnell, “RE: Packwood Lake Hydroelectric Project – Revised Redline Draft Fish Rescue Plan”</td>
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<tr>
<td>4</td>
<td>Electronic correspondence dated March 27, 2006, Laura Schinnell to Blane Bellurud et. al., “Packwood Lake Hydroelectric Project – Revised Fish Rescue Plan”</td>
</tr>
<tr>
<td>5</td>
<td>Revised Draft, Fish Rescue Plan, Project Tailrace and Stilling Basin, March 27, 2006</td>
</tr>
</tbody>
</table>
Attached is the revised redline Draft Fish Rescue Plan for your review and input. This revision includes changes we had provided to FERC in our October 28 letter and changes based upon the discussions from our December 16 Water Quality and Aquatic Resources Committee meeting. We have inserted a place-holder for periodic setting of the stilling basin. We would appreciate receiving your input and comments by January 31, 2006. Thanks.

Laura Schinnell
Energy Northwest Licensing Project Manager
Richland Office: 509-372-5123
Satsop Office: 360-480-1566
Cell: 360-402-6649
E-mail: lschinnell@energy.northwest.com
Hi Laura-

John Serl provided comments (attached).

Lauri

Lauri Vigue
Fish and Wildlife Biologist
Major Projects Division/ Habitat Program
Washington Dept. Fish and Wildlife
600 Capitol Way North
Olympia, WA 98501-1091
(360) 902-2425
Fax: (360) 902-2046
viguelav@dfw.wa.gov
Hi Lauri,

Sorry this is so late. My slow time of the year is not. I only have a few comments on the fish rescue plan.

Section 3.1.2. I thought that NWE was going to investigate bypassing flow during planned and unplanned outages to see enough leaking flow could be augmented to avoid the need for fish rescue needs. When the peristocks are full, there appears to be enough water leaking through that with some supplementation, there would be not risk of loosing juveniles and probably little risk to adults. At the next outage where supplemental water is routed into the stilling basin, the effect on fish rescue procedures should be assessed by the agencies.

See 3.1.3. The purpose of walking downstream is to encourage fish to leave the tailrace without handling.

See 3.1.4. Suggested addition: Vehicle transport of collected fish from tailrace bridge crossings could be used if large numbers of fish are collected.

See 3.2. Suggested language: Supplemental water will be provided to the stilling basin for forced outages lasting longer than three hours.

See 3.3. I would like the idea of getting data on adult use of the tailrace before they start spawning, but am a little leery of scaring actively spawning fish. Perhaps one scaring at the beginning of each major spawning season would be appropriate to remove any fish that were stuck in the stilling basin.

See 3.5. Suggested additions:

- 5 gallon buckets and cooler, along with wheeled cart to transport equipment in tailrace.
- Personal equipment for those involved in the fish rescue should include felt soles hipboots or waders and polarized glasses.

3.7. Is the permanent barrier still planned to be installed in 2007? BPA’s commitment for my time ends in 2007. After construction of the barrier, both the stilling basin and tailrace need to be evacuated. Is there any plan to study the effectiveness of the barrier and will juveniles still be subject to stranding at outages?

----- Original Message -----
From: Lauri Vigue
To: serli@city.wa.gov
Sent: Friday, January 06, 2006 6:32 AM
Subject: Fwd: Packwood Lake Hydroelectric Project - Revised Redline Draft Fish Rescue Plan

Happy New Year John!!

Please send me any comments you may have on this document. Comments are due January 31, 2006.

Thank you!
Lauri
I apologize for missing your requested comment deadline. Briefly, I have these comments to offer:

1) Considering that the visibility in the stilling basin is often poor, I recommend seining of the stilling basin on a monthly basis. If snorkel surveys (with good visibility - i.e. can see the bottom at the deepest point) indicate that there are no adult salmonids present, then the seining for that month would not be necessary.

2) It is stated that after the tailrace barrier is installed there will be one last seining of the stilling basin. After that, the fish rescue program would be terminated. I recommend that seining of the stilling basin continue once each year, during the project shutdown. This would be an efficient way to monitor the effectiveness of the tailrace barrier at excluding fish - particularly juvenile salmonids and smaller non-salmonid sub-adults and adults. I would be willing to place this monitoring program into an adaptive management context - that is, if the first few years (3) results show no, or very few fish (less than 50), then the program could go to a every few years (3rd) sampling.

Thanks for the opportunity to comment,
Brian Peck
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
510 Desmond Drive SE Suite 102
Lacey, WA 98503-1263
360-751-9560 (phone)
360-751-9565 (fax)
SCHINNELL, LAURA

From: SCHINNELL, LAURA
Sent: Monday, March 27, 2006 10:08 AM
To: 'Elaine.Bellendirn@noaa.gov'; 'Bran Peck (brian_peck@fws.gov)'; 'Bryan.Nordlund@noaa.gov'; 'cwashmes@yakama.com'; 'DCOP461@ECY.WA.GOV'; 'gtd@yakama.com'; 'BEECHHAB@dew.wa.gov'; 'blum@eesconsulting.com'; 'jeen_ell@louiscounty.com'; 'karasmith@fws.fed.us'; 'kwierman@fws.fed.us'; 'doughty@eesconsulting.com'; 'vagelav@dew.wa.gov'; 'mpliner@concord.net'; 'Paul Dicken (ppdicke1@ecy.wa.gov)'; 'tracy@fws.fed.us'; 'Curt Leigh (leighc@dew.wa.gov)'; 'James Michaels (James_Michaels@fws.gov)'; 'Don Jarrett'; 'KIEL, WILLIAM A.'; 'KASKO, BERNICE F.'; 'COLEMAN, DOUGLAS W. '; 'CRAWFORD, RANDY G.'; 'ROSS, DAN L.'; 'WOTRUBA, STEVE T.'
Cc: 'ann-arielvecchio@ferc.gov'; 'Carolyn.Holsopple (carolyn.holsopple@ferc.gov)'; 'frank.winchei@ferc.gov'; 'KSUS481@ECY.WA.GOV'; 'kenneth.hogan@ferc.gov'; 'Kristie Miller (kmiller@fws.fed.us)'; 'Diana Shannon (Diana.Shannon@ferc.gov)'; 'Philip Riguier (priguier@yakama.com)
Subject: Packwood Lake Hydroelectric Project - Revised Fish Rescue Plan

Attachments: Revised Fish Rescue Plan 032706.doc

Energy Northwest and EES Consulting have revised the Fish Rescue Plan to incorporate comments received on the December 2005 draft. We accepted the changes that were in the December draft and show additional changes in redline form. We have greatly expanded the additional seeding efforts section, and are proposing use of a temporary exclusionary seine net in the fallace.

Please provide your comments on the revised draft to me by April 27, 2006. If we have not heard from you before then, we will assume you have no comments. Thanks.

Laura Schinnell
Energy Northwest Licensing Project Manager
Richland Office: 509-372-5123
Satsop Office: 360-482-1896
Cell: 360-482-5649
E-mail: lschinnell@energy.northwest.com
Fish Rescue Plan
Project Tallrace and Still Basin

for
Energy Northwest's
Packwood Lake Hydroelectric Project
FERC No. 2244
Lewis County, Washington

Submitted to

ENERGY NORTHWEST
P.O. Box 968
Richland, Washington 99352-0968

Submitted by

EES Consulting
1155 North State Street, Suite 700
Bellingham, Washington 98225
360.734.5915 phone, 360.734.5918 fax

March 27, 2006
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, a powerhouse with a 26,125 kW turbine generator, a 8,009-foot 69 kV transmission line, and a 6,690-foot tailrace canal.

Anadromous salmonids are known to spawn in both lower Lake Creek and in the tailrace slough where it adjoins the Cowlitz River. A tailrace barrier previously existed at the terminus of the tailrace before being washed out by a flood in the 1970’s. The Washington Department of Fish and Wildlife (WDFW) agreed that the barrier did not need to be replaced; however, WDFW reserved the right to require replacement if anadromous fish were reintroduced to the upper Cowlitz basin (Sandison and Larson 1978). Reintroduction of anadromous salmonids began in 1994. Both anadromous and resident fish have access up the tailrace to the stilling basin (pool) below the powerhouse.

The Project experiences both planned and unplanned shutdowns and outages. During these outages, depending upon initial flow and the length of the outage, there is the potential for fish to be stranded in the stilling basin or the tailrace. Energy Northwest has agreed to install a permanent barrier to fish migration in the tailrace as part of the relicensing of the hydroelectric project and is investigating the feasibility of a temporary barrier prior to relicensing (see Revised Engineering Study Related to Barrier Replacement on the Project Tailrace, Energy Northwest and EES Consulting, 2005).

Energy Northwest agreed to develop a fish rescue program that was implemented in the fall of 2005. This program will continue until either a temporary or permanent fish exclusion barrier is constructed in the tailrace. This document is the third draft and incorporates comments from the natural resource agencies and tribes.

1.1 Fish Rescue Plan Goals and Objectives

This Draft Fish Rescue Plan will provide a basis for removing fish from the Project tailrace, and if necessary, the stilling basin during Project outages. The objective of the plan is to remove fish in danger of being stranded in the tailrace and stilling basin in a manner that will be of least impact to the fish and to maximize protection of fish, including federally-listed species.

2.0 METHODS

Energy Northwest determined the rate of drawdown in the Project tailrace during an outage which occurred on August 31, 2005. The Project was generating 5 MW (with an approximate flow of 42 cfs) until shutdown at 7 am on that date. Energy Northwest staff then measured the depth of the water in the tailrace at three locations:
1. Bridge just downstream of the Project stilling basin
2. Riffle Bridge
3. Bridge over tailrace approximately 516 ft above the cascade at the terminus of the tailrace.

Measurements were taken at the following times on August 31, 2005:

<table>
<thead>
<tr>
<th>Time</th>
<th>Stilling Basin</th>
<th>Riffle Bridge</th>
<th>Tailrace Bridge</th>
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<tbody>
<tr>
<td>7:00 am</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(Project Shutdown)</td>
<td>08:15</td>
<td>08:20</td>
<td>08:25</td>
</tr>
<tr>
<td>10:05</td>
<td>10:10</td>
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<tr>
<td>13:00</td>
<td>13:05</td>
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</tr>
<tr>
<td>19:05</td>
<td>19:10</td>
<td>19:15</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1 shows the relative water depths found at each of the sites per time interval. Although there was adequate depth at the stilling basin for several hours, there is a high spot in the tailrace at the Riffle Bridge, and water depths decreased from 0.5 ft one hour after shutdown to only 0.16 ft three hours after shutdown.

Measurements were not taken prior to shutdown; however, Energy Northwest did measure the relative depth of water at the three bridge sites at a project flow of 39 cfs (4 MW). These values at 39 cfs have been inserted in Figure 1 below.
3.0 Draft Fish Rescue Plan

3.1 Planned Outages

When a planned outage occurs, the following procedures will be implemented:

1. The natural resource agencies and tribes will be informed of the planned annual outage by email one month in advance, if possible. In other instances when shutdowns are determined necessary (e.g., to maintain lake level), the natural resource agencies and tribes will be notified by email within 24 hours of the decision to shutdown the Project.

2. Personnel knowledgeable in fish handling techniques will implement the fish rescue plan and the rescue will commence within 3 hours of planned project shutdowns. If the planned shutdown occurs at night, fish rescue efforts will commence at first light. All attempts will be made to schedule planned outages during daylight hours to facilitate fish rescue. If the outage occurs at night, supplemental flow to the stilling basin will be provided as necessary to maintain water in the tailrace until the fish rescue can occur the following morning.

3. Within three hours of project shutdown for planned outages, rescuers will walk the tailrace. One pass will be made downstream, starting at the stilling basin and working to the end of the tailrace.

4. Fish will be collected in dip nets and transferred to a cooler filled with water and provided with aeration from a portable aquarium pump, if necessary. If low numbers of small fish are observed, the use of 5 gallon buckets will be used to transport the fish. Fish will be handled as little as possible in order to minimize chance of injury or descaling. Information will be collected and recorded related to species, approximate age, and length.

5. Immediately upon completing the survey of the tailrace, fish will be transported to quiet waters of the Cowitz River side channel near the tailrace.

6. Following the first pass, an additional pass downstream will be made, using a backpack electrofisher to capture any remaining fish and transport them to the river in accordance with paragraphs 4 and 5.

7. If the planned outage will last for more than five days, personnel knowledgeable in fish handling techniques will use a seine to remove fish from the stilling basin. A block net will be placed in the upper tailrace immediately downstream of the oil containment sea curtain. As feasible, all fish will be removed from the stilling basin. Information will be collected and recorded related to species and approximate age so that a table listing species with Zippin population and standard error estimates can be generated for the stilling basin.
8. Immediately upon completion of the seining effort, fish will be placed in coolers with aeration provided and then transported to quiet waters of the Cowhitz River near the tailrace.

3.2 Forced Outages

Forced outages (e.g., equipment failure) are of unknown frequency and duration. For short duration outages (less than 3 hours), fish rescues will not be conducted; for these outages, commencement of project operations will effectively rewater the tailrace. If the outage occurs at night and lasts more than 3 hours, fish rescue will occur the following morning, unless the project operations have resumed. For long forced outages (greater than 3 hours), supplemental flows will be provided as necessary to the stilling basin to maintain water in the tailrace until project operations resume or fish rescue operation can begin. Energy Northwest will notify the natural resource agencies and tribes of forced outages that result in a fish rescue by email within 24 hours.

3.3 Ongoing Seining Efforts

Discussion with the natural resource agencies and tribes have included the need for seining the stilling basin independent of outages. Energy Northwest proposes the following protocol in an effort to address the issue of removing listed fish from the stilling basin and preventing access to the tailrace and basin for adult listed salmonids during the interim period prior to installation of a permanent barrier.

EES Consulting will continue to snorkel the stilling basin during twice-monthly spawning surveys for anadromous salmonids in the project area. If counts of listed species exceed 50 individuals during snorkeling efforts, Energy Northwest will contact the agencies and schedule a seining event. Considering the results of the seining efforts in October, 2005, it is likely that any listed fish populations found in the stilling basin will consist primarily of juvenile coho salmon. Salmon fry emergence will occur in the spring of the year; at that time, yolk sac fry will stay hidden within the substrate and will remain there until their yolk sacs are absorbed and the fry will migrate to the shallow, low velocity area. Fish at this time are small, tend to associate with bottom substrates, would be difficult to capture, and susceptible to injury.

If listed fish are present within the stilling basin at numbers exceeding the desired threshold levels (50 listed fish), Energy Northwest proposes seining once during the July – August period to remove the juveniles from the stilling basin. The number of passes will be dictated by the number of individuals captured during the seining events. The timing of the seining will ensure that the juveniles are of sufficient size and disposition to minimize injury or mortality; it will also be scheduled to occur over a weekend when firm power demands are less and the required outage could be of short duration and minimal economic impact to the Project.

Concurrent with the seining event in the stilling basin, Energy Northwest proposes to install a temporary exclusionary seine net in the tailrace in the vicinity of the lower bridge (near where the tailrace discharges to the side channel). This seine would consist of a 1½ inch stretched mesh seine that would span the tailrace channel. The net would be checked by the Packwood
Lake Hydroelectric Project staff to clear debris and remove any fish that might be caught in the net. The seine net would remain in place to exclude adult salmonids until the permanent barrier is installed.

3.4 Fish Handling Techniques

Energy Northwest has reached agreement whereby Mr. John Serl, WDFW fish biologist at the Cowlitz Falls Fish Facility, may conduct up to three days of fish rescue. Mr. Serl's efforts will be supplemented by EES Consulting biologists and Energy Northwest staff as needed. Per NOAA Fisheries requirements, staff will handle listed fish with extreme care and keep them in cold water to the maximum extent possible during processing procedures. When fish are transferred or held, a healthy environment will be provided; e.g., the holding units must contain adequate amounts of cool, well-circulated or oxygenated water. When using gear that captures a mix of species, Energy Northwest will process listed fish first to minimize handling stress.

3.5 Fish Handling Equipment

The following equipment will be available:

- Dip nets
- 5 gallon buckets or larger tank (approximately 160 gallons)
- Aquarium air bubbler
- Battery and/or inverter for air bubbler
- Sene net
- Block net
- DO/temperature meter

3.6 Permits

WDFW has asked that the fish rescue program be included on their existing 4(d) ESA permit for the Cowlitz Falls Anadromous Fish Reintroduction Project. The permit request included addition of EES Consulting and Energy Northwest staff to those personnel authorized to handle fish.

3.7 Length of Program

The fish rescue plan will remain in place until a temporary or permanent fish barrier is installed in the Project tailrace. After the permanent barrier is in place, the stilling basin will be seeded one more if needed to ensure no adults remain and to remove listed juvenile salmonids that may be present. At that point, the fish rescue plan will be terminated.

Deleted: The fish rescue program will be put into place prior to the annual Project shutdown during the fall 2005.
4.0 References


ATTACHMENT B

DOCUMENTATION RELATED TO BARRIER REPLACEMENT
## DOCUMENTATION RELATED TO BARRIER REPLACEMENT

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<td>Letter dated January 30, 2006, Keith Kirkendall to Laura Schinnell, “Request for comments on the criteria to use for a permanent barrier for the Packwood Lake Hydroelectric Project (FERC No. 2244-012)”</td>
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<td>3</td>
<td>Proposed Exclusion Barrier Criteria</td>
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<td>5</td>
<td>Letter dated February 10, 2006, Lauri Vigue to Laura Schinnell, “Packwood Lake Hydroelectric Project Feasibility Study for a Temporary Barrier and Proposed Exclusion Barrier Criteria (FERC NO. 2244-012)”</td>
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</table>
SCHINNELL, LAURA

From: SCHINNELL, LAURA
Sent: Tuesday, March 14, 2006 10:29 AM
To: ‘blane.bellerud@noaa.gov’; ‘bilan.peck@fws.gov’; ‘bryan.nordlund@noaa.gov’; ‘cwashines@yakama.com’; ‘DOOR461@ECY.WA.GOV’; ‘gdi@yakama.com’; ‘BEECHHB@dfw.wa.gov’; ‘bryan@esconsulting.com’; ‘josef.off@lewiscounty.com’; ‘karin.thompson@fs.fed.us’; ‘kwieran@fs.fed.us’; ‘loughsey@esconsulting.com’; ‘vtquesa@dfw.wa.gov’; ‘miller@comcast.net’; ‘paul.pickett (poc461@ecy.wa.gov’; ‘tracyfs.fed.us’; ‘curt.leigh@leighson@dfw.wa.gov’; ‘james.michaels@fws.gov’; ‘don.amett’; ‘kiel.william.a’; ‘kasko.bernice.f’; ‘coleman.douglas.w’; ‘crawford.randu.g’; ‘ross.dan.l’; ‘wotruba.steven.t’
Cc: ‘ann.ariel.vechio@ferc.gov’; ‘carolyn.holsopple@ferc.gov’; ‘frank.winche@ferc.gov’; ‘KSUS451@ECY.WA.GOV’; ‘kenneth.hogan@ferc.gov’; ‘kristie.miller@fws.fed.us’; ‘diana.shannon (diana.shannon@ferc.gov’; ‘Philip.Figdon (philfigdon@yakama.com’
Subject: Packwood Lake Hydroelectric Project - Exclusion Barrier
Attachments: USFWSBarrierc.pdf; WDFWBarrierresponse.pdf; Packwood fish screen comments.pdf

Attached are the letters Energy Northwest received related to criteria for the permanent exclusion barrier on the Project’s tailrace. Based upon the comments received, Energy Northwest will proceed using the criteria proposed by NMFS, as modified by the USFWS. WDFW concurred with use of USFWS design requirements. Bryan Nordlund with NMFS was consulted and stated that the design requirements proposed by USFWS would not have a significant effect on the hydraulics, backwater effects or overall design of the barrier.

If you have any concerns about our use of these design requirements, please let me know by March 29, 2006. Thank you.

Laura Schinnell
Energy Northwest Licensing Project Manager
Richland Office: 509-372-6123
Satsop Office: 360-492-1586
Cell: 360-492-0649
E-mail: schinnell@energy-northwest.com
Laura Schimmell, Licensing Project Manager  
Energy Northwest  
PO Box 968  
Richland, WA 99352-0968

Re: Request for comments on the criteria to use for a permanent tailrace barrier for the Packwood Lake Project (FERC No. 2244-012)

Dear Ms. Schimmell:

The National Marine Fisheries Service (NMFS) has met with Energy Northwest and provided a copy of our standards for the construction of the permanent fish screen at the Packwood Lake Project tailrace. We expect Energy Northwest to adhere to those standards in designing the tailrace barrier. Any design that deviates from NMFS standards must be reviewed and approved by NMFS in order for it to meet the requirements of the Endangered Species Act (ESA).

The construction of the tailrace barrier is an action that will require the Federal Energy Regulatory Commission to conduct an ESA consultation with NMFS. At that time we will review the proposed design and determine if its design will safely and effectively exclude ESA-listed salmonids from the tailrace and stilling pool. By providing Energy Northwest with a copy of NMFS design standards and providing a NMFS fish passage engineer for consultations, NMFS seeks to facilitate the process of developing an effective, safe fish screen and help Energy Northwest to avoid spending money on screen designs which do not meet NMFS criteria.

The reintroduction of Chinook salmon to the Upper Cowlitz Basin has been identified as a significant factor in the recovery of the ESA-listed Lower Columbia Chinook salmon evolutionarily significant unit. Providing a safe and effective means of excluding these fish from the project tailrace and stilling pond will make a significant contribution to the reintroduction effort. We look forward to continuing the development process with Energy Northwest.

Sincerely,

Keith Kirkendall, Chief  
Chief, FERC & Water Diversions Branch  
Hydropower Division

cc: Carolyn Holzopple, FERC; Brian Peck, USFWS; Lauri Vigue, WDFW
PROPOSED EXCLUSION BARRIER CRITERIA
(Excerpt from Draft Anadromous Salmonid Passage Facility Guidelines)

Section 6. Exclusion Barriers

6.1 Description, purpose and rationale: Exclusion barriers are designed to minimize the attraction and stop the migration of upstream migrating fish into an area where there is no upstream egress or suitable spawning area, and to guide fish to an area where upstream migration can continue. Exclusion Barriers can also be used to restrict movement of undesirable species into habitat. Exclusion barriers are designed to minimize the potential for injury of fish that are attracted to impassable routes.

Some examples of the use of exclusion barriers include:
- preventing fish from entering return flow from an irrigation ditch
- preventing fish from entering the tailrace of a power plant
- guiding fish to a trap facility for upstream transport, research or broodstock collection
- guiding fish to a counting facility
- preventing fish from entering a channel subject to sudden flow changes
- preventing fish from entering turbine draft tubes
- preventing fish from entering channels with poor spawning gravels, poor water quality or insufficient water quantity.

The two primary categories of exclusion barriers are picket barriers and velocity barriers. Another type of exclusion barrier is a vertical drop structure, which provides a jump height that exceeds the vertical leaping ability of fish. Other types of barriers, such as electric and acoustic fields, have very limited application because of inconsistent results most often attributed to varying water quality (turbidity, specific conductance).

Criteria are design, maintenance or operational standards that cannot be changed without a written waiver from NOAA Fisheries. For the purposes of this document, a criterion is preceded by the word “must”. A guideline is a recommended design, maintenance or operational feature that will generally result in safe and efficient fishway facility design, and for the purposes of this document are preceded by the word “should”. It is the responsibility of the applicant to provide compelling evidence in support of any proposed waiver of criteria or modification of a guideline for NOAA approval, well in advance of a proposed Federal action.

6.2 Picket Barrier - Description: Picket barriers diffuse nearly the entire streamflow through pickets extending the entire width of the impassable route, sufficiently spaced to provide a physical barrier to upstream migrant fish. This category of exclusion barrier includes a fixed bar rack and a variety of hinged floating picket weir designs. Picket barriers usually require removal for high flow events, increasing the potential to allow passage into undesirable areas. In general, since the likelihood of impinging fish is very high, these types of barriers cannot be used in waters containing species listed under the ESA, unless they are continually monitored by personnel on-site, and have a sufficient operational plan and facility design in place to allow for
timely removal of impinged or stranded fish prior to the occurrence of injury. Since debris and downstream migrant fish must pass through the pickets, sites for these types of exclusion barriers must be carefully chosen. Picket barriers must be continually monitored for debris accumulations, and debris must be removed before it concentrates flow and violates the criteria established below. As debris accumulates, the potential for the impingement of downstream migrants (e.g., juvenile salmonids, keels, adult salmon that have overshot their destination, or resident fish) increases to unacceptable levels. Debris accumulations will also concentrate flow through the remainder of the open picket area, increasing the attraction of upstream migrants to these areas and thereby increasing the potential for jumping injury or successful passage into areas without egress.

Picket barrier design criteria include the following:

6.2.1 The maximum clear opening between pickets and between pickets and abutments is one inch. A tighter opening may be required if resident species are also to be excluded by the design.

6.2.2 Pickets must be comprised of flat bars aligned with flow, or round columns of steel, aluminum or durable plastic.

6.2.3 The picket array must have a minimum 40% open area.

6.2.4 Picket barriers should be sited where there is a relatively constant depth over the entire stream width.

6.2.5 The average design river velocity through pickets should be less than 1.0 ft/s for all design flows, with maximum velocity less than 1.25 ft/s, or half the velocity of adjacent river flows whichever is lower. The average design velocity is calculated by dividing the flow by the total submerged picket area over the design range of stream flows. When river velocities exceed these criteria, the picket barrier must be removed.

6.2.6 The maximum head differential across the pickets must never exceed 0.3 feet over the clean picket condition. If this differential is exceeded, the pickets must be cleaned as soon as possible.

6.2.7 A debris and sediment removal plan is required that anticipates the entire range of conditions expected at the site. Debris must be removed before accumulations develop that violate the criteria specified in 6.2.5 and 6.2.6.

6.2.8 The minimum picket extension above the water surface at high fish passage design flow is two feet.
6.2.9 The minimum submerged depth at the picket barrier at low design discharge must be two feet for at least 10% of the river cross section at the barrier.

6.2.10 Pickets barriers must be designed to lead fish to a safe passage route. This can be achieved by angling the picket barrier toward a safe passage route, providing nearly uniform velocities through the entire length of pickets, and providing sufficient attraction flows from a safe passage route that minimizes the potential for false attraction to the picket barrier flows.

6.2.11 A uniform concrete sill, or an alternative approved by NOAA Fisheries Hydropower Division staff, should be provided to ensure that fish do not pass under the picket barrier.

6.2.12 Picket panels should be of sufficient structural integrity to withstand high streamflows.

6.3 Velocity Barrier - Description: A velocity barrier consists of a weir and concrete apron combination that prevents upstream passage by producing a shallow flow depth and high velocity on the apron, followed by an impassable vertical jump over the weir. A velocity barrier does not have the fore-mentioned problems of a picketed weir barrier, since flow passes freely over a weir, allowing the passage of debris and downstream migrant fish. However, since this type of barrier creates an upstream impoundment, the designer must consider backwater effects that may induce loss of power generation or property inundation upstream of the velocity barrier.

Velocity barrier design criteria include the following:

6.3.1 The minimum weir height relative to the maximum apron elevation is 3.5 feet.

6.3.2 The minimum apron length (extending downstream from base of weir) is 16 feet.

6.3.3 The minimum apron downstream slope is 16:1 (horizontal:vertical).

6.3.4 The maximum head over the weir crest is two feet.

6.3.5 The elevation of the downstream end of the apron must be greater than the tailrace water surface elevation corresponding to the high design flow.

6.3.6 Other combinations of weir height (6.3.1) and weir crest head (6.3.4) may be approved by NOAA Fisheries Hydropower Division staff on a site-specific basis.

6.3.7 The flow over the weir must be fully and continuously vented along the entire length, to allow a fully aerated flow nappe to develop between the weir crest and the
apron. Full aeration of the flow nappe prevents an increase in water surface behind the nappe, which could allow fish to stage and jump the weir.

6.4 Vertical Drop Structures - Description: A vertical drop structure can function as an exclusion barrier by providing total project head in excess of the leaping ability of the target fish species. These can be a concrete monolith, rubber dam, or approved alternative.

Vertical drop structure criteria include the following:

6.4.1 The minimum height for vertical drop structure must be 10 feet relative to the tailrace high design flow elevation.

6.4.2 If the potential for leaping injury exists, a minimum of two feet of cantilevered ledge must be provided over the pool described in section 6.4.3.

6.4.3 Provision must be made to ensure that fish jumping at the drop structure flow will land in a minimum five foot deep pool, without contacting any solid surface.

6.5 Bottom Hinged Leaf Gates - Description: A bottom-hinged leaf gate is a device that can be elevated to provide an exclusion barrier by providing total project head in excess of the leaping ability of the target fish species. These can be mounted on a concrete base, where the leaf gate is raised into position by a hydraulic cylinder, pneumatic bladders, or other means.

Bottom-hinged leaf gate criteria include the following:

6.5.1 The minimum vertical head drop (forebay to tailwater) must be 10 feet at fish passage design high flow.

6.5.2 Provision must be made to ensure that fish jumping at flow over the structure will land in a minimum five foot deep pool, without contacting any solid surface.
Re: U.S. Fish and Wildlife Service Comments on the Packwood Lake Hydroelectric Project Feasibility Study for a Temporary Barrier and Proposed Exclusion Barrier Criteria

Dear Mr. Coleman:


After discussions with Kim Slow, our regional engineer, and Bryan Nordlund of the National Marine Fisheries Service, the FWS recommends a 3/4 inch maximum clear opening between pickets and between pickets and abutments. This opening will be more protective of adult cutthroat trout than a one inch opening would be. We also recommend installing flat bar pickets versus round column pickets. This is to minimize gilling of fish between the pickets, as it is more difficult for a fish to wedge its head between flat bars than round columns. According to Bryan Nordlund, these design requirements will not have a significant effect on the hydraulics, backwater effects, or overall design of the structure. There may be an increased need to clean debris from the screen face; however, debris is not that much of an issue in the tailrace.

Monitoring this barrier structure will be essential in determining the effectiveness of the design at safely preventing upstream migration of fish. In particular, the bars should be inspected for gilled fish and for fish approaching or attempting to pass the barrier.

The FWS appreciates the opportunity to comment during this stage of the Project. If you have any questions regarding this response, please contact Brian Peck at the above address.
D. W. Coleman

Mr. Peck may be reached by telephone at (360) 753-9560, by fax at (360) 753-9407, or by email at brian_peck@fws.gov.

Sincerely,

[Signature]

Ken S. Berg, Manager
Western Washington Fish and Wildlife Office

cc:
NOAA Fisheries, Portland, OR (B. Bellurud)
USFWS, Portland, OR (E. Mead)
OEPC, Portland, OR (P. Sleeper)
WDFW, Olympia, WA (L. Vigue)
WDOE, Lacey, WA (D. Cornett)
Cowlitz Tribe, Lacey, WA (M. Iyall)
Yakama Nation, Toppenish, WA (C. Casseseka)
Yakama Nation, Toppenish, WA (G. Lee)
Energy Northwest, Richland, WA (L. Schinell)
February 10, 2006

Ms. Laura Schinnell
Energy Northwest Licensing Project Manager
P.O. Box 968
Ricland, WA 99352-0968

Dear Ms. Schinnell:

SUBJECT: PACKWOOD LAKE HYDROELECTRIC PROJECT FEASIBILITY STUDY FOR A TEMPORARY BARRIER AND PROPOSED EXCLUSION BARRIER CRITERIA (FERC NO. 2244-012).


The WDFW endorses the criteria selected by U.S. Fish and Wildlife Service as recommended in their letter to Energy Northwest dated February 3, 2006. These criteria will provide protection for Endangered Species Act listed Chinook salmon and additional protection for cutthroat trout. According to Bryan Nordlund, National Marine Fisheries, these design requirements will not have a significant effect on the hydraulics, backwater effects or overall design of the barrier.
Laura Schinnell  
February 10, 2006  
Page 2

We appreciate the opportunity to comment on the exclusion barrier design. If you have any further question I may be reached at (360) 902-2425 or vign-lev@dfw.wa.gov.

Thank you

Sincerely,

Laure Vigne  
Fish and Wildlife Biologist

Cc: Bob Barnard, WDFW  
Gary Sprague, WDFW  
Brian Peck, USFWS  
Blaine Bellerud, NOAA