I-5 Corridor Reinforcement Project

Final Environmental Impact Statement

Volume 3G: Comments and Responses (Communications 14828–14843)

DOE/EIS – 0436

Bonneville Power Administration

Cooperating Agencies:
U.S. Army Corps of Engineers, Oregon Energy Facility Siting Council,
Washington Energy Facility Site Evaluation Council, Cowlitz and Clark Counties, Washington

February 2016

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Table of Contents

Volume 1: Chapters 1-13

Volume 2: Chapters 14-33

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Comments and Responses

Volume 3G

Communication Log Numbers 14828 - 14843

Each comment form, email, letter or other type of correspondence (collectively referred to as communications) was given an identifying log number when it was received (e.g., 14100). Breaks in the number sequence are a result of communications logged during the comment period that were not comments on the Draft EIS. In some cases, duplicate communications (such as petitions and form letters) were later combined and assigned the same log number. Each communication is divided by subject or issue into individual comments. For example, 14444-2 is comment number 2 of communication 14444. BPA received 662 communications on the Draft EIS and 2,859 comments were identified in these communications.

All comments received on the Draft EIS and BPA's responses to these comments are provided in their entirety in Volume 3 (Volume 3A through 3H). Each page of comments is followed by a page of BPA responses to the comments. Due to the number of comments received, Volume 3 has been divided into eight parts for the purposes of printing and managing electronic file sizes (Volume 3A through 3H). The range of log numbers and page numbers found in each volume is included in Table 1 - Volume Contents for reference.

How to Review Comments and Responses

Communications are ordered consecutively by log number in the report. Please refer to Table 2 in the Introduction of Volume 3 for a list of all communications submitted by each commenter and the page number where the communication can be found in Volume 3A through 3H. If BPA's response to a comment refers back to an earlier response, use Table 1 to find the referenced log number. An online comment response search tool is also available at http://www.bpa.gov/Projects/Projects/I-5/Pages/Search-Comments.aspx.

Table 1 - Volume Contents

Log Numbers	Volume	Pages
14093 – 14379	3A	1 - 402
14380 – 14600	3B	403 - 808
14601 – 14701	3C	809 - 1222
14702 – 14746	3D	1223 - 1532
14747 – 14798	3E	1533 - 1862
14799 – 14827	3F	1863 - 2262
14828 – 14843	3G	2263 - 2602
14844 – 14919	3H	2603 - 3004

14828

From: noreply@bpa.gov
Sent: Sunday, March 24, 2013 10:31 PM
Subject: 14828: BPA IS Comment Submission Confirmation

Thank you for submitting your comments on the Bonneville Power Administration's draft environmental impact statement (EIS) for the I-5 Corridor Reinforcement Project. All comments submitted between November 13, 2013 and noon on March 25, 2013 will be responded to in the final EIS, which is expected in 2014.

A copy of your information, as submitted using our online form, is included below for your records. If you provided your contact information and submitted a question we can answer at this time, you will receive a response. Your contact information will also be added to our project mailing list. All comments including names will be processed and then posted on BPA's website at www.bpa.gov/goto/i-5

Sincerely,
Bonneville Power Administration

Name: April L Minister
Organization:
E-mail:
Phone:
Address:

Group type: Private citizen

Please ADD me to the mailing list.

Comment:
Mr. Mark Korsness, Project Manager I-5 Corridor Reinforcement Project Bonneville Power Administration P.O. Box 9250 Portland, OR 97207 RE: Bonneville Power Administration I-5 Corridor Reinforcement Project Draft EIS Comments Dear Mr. Korsness: My name is April Minister and I have property on Vinemaple Road along the "P-Line" section of BPA's "Central Alternative", your preferred route for the "I-5 Corridor Reinforcement Project". I have many concerns about this project and how it will affect my family, my property and my way of life. We are considering building a new home on our property. That will not happen if this project is built as currently configured. I am worried about the electromagnetic field (EMF) this project will create and the impact it will have on humans, wildlife and the general environment. I am worried I might be put at risk with such a powerful electric current so close to our property. What guarantees can BPA offer us to ensure there will be no problems if this project is built? Many of us are also concerned about the long term exposure to EMF. Some studies blame EMF for an increased risk of childhood cancer. What concrete steps will BPA take to make sure these risks are minimized? If EMF is safe, why wasn't the existing route, BPA's right of way, selected as the preferred route for this project? I have an electronic nerve stimulator. How will you ensure this project will not have any impact on me? Vinemaple Road is really nothing more than a dirt/gravel road that neighbors pooled their funds together to pay to have paved. If BPA decides to access our roads and properties we want to make sure BPA improves Vinemaple Road so it is left in a better condition than it was found. Heavy equipment and trucks will surely cause damage. It is only fair that BPA spend some money on infrastructure if

14828-1

14828-2

14828-3

1

1 of 34

14828-1 Please see the response to Comment 14097-1.

14828-2 Please see the responses to Comments 14328-6 and 14510-2.

14828-3 Please see the response to Comment 14119-2.

14828-3 BPA is going to use our private roads and driveways. Our neighborhood is beside state Department of Natural Resources land. The state created fish and wildlife buffers in place as part of the Oceanspray Timber Sale, which was completed in 2010. BPA now proposes to destroy that buffer and build these transmission lines practically right on top of some of the homes in our neighborhood. I would like to see BPA find a route that is not in such a sensitive ecological area. BPA needs to do a complete wildlife inventory of this area. Trout swim

14828-4 in this fork of North Lacamas Creek; we also have Bald Eagles and many other migratory birds, bats, deer, salamanders, cougar, bears and a wide variety of other unique wildlife and plants. We want to make sure BPA spares no expense in protecting these sensitive areas if this configuration is chosen. Studies should be conducted which evaluate the danger the transmission lines and lattice towers will have on raptors and bats. Security is also an important issue for us. What steps will BPA be taking to ensure the general public has minimal access to

14828-5 the new transmission corridor? And what programs has BPA created to "hold harmless" property owners whose property or access becomes the focus of a lawsuit by a party injured by BPA infrastructure? Landowners should not be held responsible for anything that happens that might injure somebody if it's related to this project. With a unified voice, our neighborhood opposes the proposed location of this portion of this project. I have attached a review of the Draft Environmental Impact Statement (DEIS); we make comments specifically on BPA's findings, and we offer alternatives that will cause far less damage to the environment of the Vinemaple Road

14828-6 neighborhood. Please take all of our comments seriously. We are confident that if you read them and research our conclusions, you will realize the present configuration of the "P-Line" is catastrophic from an environmental standpoint. You will also see that we are presenting an alternative that does far less environmental damage and has far less impact on human beings. Thank you for your consideration. April Minister

Attachment

14828-4 Please see the response to Comment 14630-5.

14828-5 Please see the responses to Comments 14242-1, 14457-2 and 14532-3.

14828-6 The referenced attachment with specific Draft EIS comments has been processed separately. Please see the responses to Comments 14714-1 through 14714-15.

14628

Mr. Mark Korsness, Project Manager
I-5 Corridor Reinforcement Project
Bonneville Power Administration
P.O. Box 9250
Portland, OR 97207

RE: Bonneville Power Administration I-5 Corridor Reinforcement Project Draft EIS Comments

Dear Mr. Korsness:

We are a group of homeowners who live adjacent to the "P Line" which has been selected by your agency as the preferred alternative for the I-5 Corridor Reinforcement Project. We offer the following comments:

CONCERNS ABOUT THE PROCESS:
As you know, the "P Line" alternative was added in 2010 after the official public scoping period had closed in 2009. We were told on numerous occasions by BPA personnel that although our comments[1] were being submitted after the scoping period ended, they would be treated as if they were submitted during the official scoping period (which of course had closed prior to the addition of this alternative).

A careful examination of the Draft EIS does not show any instances where our specific comments in regards to environmental impacts of the location of the "P Line" within approximately 3000 linear feet of the Riparian Management Zone (RMZ) and Wetland Management Zones (WMZ) of the North Fork of Lacamas Creek, adjacent to our properties were addressed.

Since our comments on this critical environmental issue do not seem to be addressed in the Draft EIS, we are concerned that our comments were not even evaluated. We also question whether we have been treated fairly and equitably in this process considering that the alternative that most impacts us was added after the close of the official scoping period. We believe your agency has made an error in locating a portion of the "P Line" adjacent to our properties and this alignment will result in significant impacts to water quality and wildlife. We have previously submitted most of the information contained herein. We are submitting these comments again as "official" comments to the Draft EIS.

THE "P LINE": LOCATION
The "P Line" adjacent to our property is located along the western boundary of the Department of Natural Resources (DNR) ownership in Section 25, Township 3 North, Range 3 East, Willamette Meridian. The enclosed Exhibit "A" shows proposed towers P/22, P/23 and P/24 along that boundary.

[1] Comment submitted to BPA by Bolton Minister dated May 26, 2011

In 2009 and 2010 the DNR logged a portion of its property in that section under the file name "Oceanspray Timber Sale #84262". Enclosed (as Attachment #1) is a copy of the State SEPA document for that timber sale. According to that document, the DNR conducted a detailed study of the property to make sure that any logging conformed to the Washington State Forest Practices Act (Chapter 76.09RCW). As a result of the study, DNR developed a Forest Practices Habitat Conservation Plan (HCP) that conformed to the Act. DNR determined that the easterly branch of the North Fork of Lacamas Creek adjacent to our property was a "Type 3 Water"(the State's definition of a "Type 3 Water" is enclosed as Attachment #2). The creek is classified as "Type 3 Water" because it provides a significant habitat for fish and wildlife, and is highly significant for protection of downstream water quality.

We have personally observed the presence of cutthroat trout and salamanders in the creek have seen many black tailed deer, black bear, bald eagles, osprey, owls and blue heron in and around this section of Lacamas Creek. The DNR, following the requirements of the Forest Practices Act, established Riparian Management Zones (RMZ) and Wetland Management Zones (WMZ) which range between 175 and 190 feet wide per side for the Type 3 Streams to protect water quality, provide corridors for wildlife and maintain a habitat for fish and amphibians (see Mitigation Measures Attachment #1 SEPA document). These RMZ and WMZ were not logged or disturbed in any way during the Oceanspray timber sale (see Exhibit "A").

The alignment of the proposed "P Line" is almost entirely within the riparian and wetland management zones of this "Type 3" stream along approximately 3,000 linear feet of the western boundary of Section 25 and Section 24 to the north. This alternative would result in the clearing of native vegetation, logging mature trees, and building towers in this riparian and wetland management zone which would be in direct conflict with the Washington State Forest Practices Act and the Forest Practices Act Conservation Plan (HCP) that was established for the Oceanspray Timber Sale. Conducting these activities would significantly impact an ecosystem that was specifically protected by the State of Washington when they logged this area. The problem with this proposal is that the alignment of the "P Line" goes up the creek corridor rather than simply crossing the creek. Not only will this alternative destroy the local eco-system, it will also seriously impact the downstream water quality by increasing turbidity, spreading noxious weeds and invasive species, raising stream temperatures and adding pollutants to the stream system through the use of herbicides that will be used to control vegetation under the transmission lines.

DEIS RESPONSES:
The Draft EIS addresses the impacts of the disturbance of these sensitive areas in several chapters.

CHAPTER 5-FISH:
This chapter addresses the long term impacts to streams. Section 5.3.15.1 states: "There will be long-term impacts to streams temperature caused by continued vegetation removal

maintaining less shade and woody debris." The section also states that elevated temperatures will have high impacts on fish and amphibians.
Comment: The alignment of the "P Line" adjacent to our properties would require the removal of over 10 acres of native vegetation from the RMZ and WMZ zones of the North Fork of Lacamas Creek. This would have a significant impact on local fish and wildlife, particularly amphibians.

Section 5.3.15.2 states: "Adherence to stream buffers would minimize impacts on fish".
Comment: The design of the "P Line" DOES NOT adhere to the avoidance of impacts to stream buffers. The current design would wipe out 10 acres of prime riparian and wetland management buffers.

Section 5.3.15.3 – Impacts Unique to the Central Alternative: This section addresses forested stream crossings and impacts on fish bearing streams for shade and increased temperature.
Comment: This section only addresses the impacts of stream crossings but does not address the construction of the transmission line corridor straight up a stream corridor. The impacts associated with stream crossings would likely be significantly less than the impacts associated with construction up an entire stream corridor.

Chapter 15-Surface Water
In section 15.1.4 of this chapter, it states that portions of Lacamas Creek are 303(d) listed for elevated levels of fecal coliform and low levels of dissolved oxygen and pH. The Washington Department of Ecology began studying water quality in the Lacamas Creek drainage in February of 2011; this study is ongoing. Publication number 11-030102 summarizes the findings to date. Sample site #6 is located in Camp Bonneville downstream of this portion of the North Fork of Lacamas Creek. The study shows that Lacamas Creek, approximately a half mile upstream of sample site #6, is 303(d) listed for elevated levels of dissolved oxygen and pH, elevated temperature and elevated fecal coliform.
Comment: If the "P Line" is constructed in its current location, directly upstream of sample site #6, the removal of over 10 acres of vegetation and woody debris from the riparian buffer zone will impact water quality in this 303(d) stream by elevating water temperature, increasing sediment loading and potentially exacerbating other water quality concerns such as low dissolved oxygen and high fecal coliform.

Section 15.22.2.1 – Construction: This section addresses the impacts to fish bearing streams by removal of vegetation and road construction.
Comment: Proposed access roads to construct and service towers P/22 and P/23 would require four (4) road crossings of Type 3 streams (see Exhibit "A"). These access roads would be built in Section 25, entirely within the RMZ and WMZ zones of the Type 3 streams, requiring additional clearing and logging. This would increase turbidity in the stream during construction. As these road crossings will be permanent they will have long-term, highly negative impacts on water quality and the riparian corridor of these Type 3 fish bearing streams.

The private driveway and private Vinemaple road were not constructed to support heavy construction equipment and would require BPA to completely reconstruct these private accesses.

Section 15.2.8 – Recommended Mitigation Measures: This section lists mitigation measures. One of the mitigation measures stated is: "Avoid or minimize clearing riparian vegetation where possible, especially where it may affect a 303(d) listed water".
Comment: The proposed alignment of the "P-Line" DOES NOT avoid or minimize clearing of riparian vegetation along the North Fork of Lacamas Creek which flows directly into a 303(d) listed water.

Another mitigation measure listed in this section recommends minimization of herbicide applications adjacent to streams.
Comment: We have been told by BPA officials that herbicides cannot be sprayed within the riparian zones. If this is true, this section of the "P Line" would require long term hand removal of more than ten (10) acres of vegetation in the RMZ and WMZ zones along over 1/2 mile of transmission lines.

Chapter 16-Wetlands
Section 16.2.2.1 – Construction: This section states: Towers and roads would be located to avoid wetlands as much as possible. Clearing trees and shrubs from medium-or high-quality forested and scrub/shrub wetlands and wetland buffers along right-of-way and new access roads also would be a long term, high impact. Conversion of medium- or high-quality wetlands and buffers to low- or medium-quality would remove habitat, alter hydrology through a decrease in evapotranspiration or increase in direct precipitation onto soils, increase soil and water temperatures from lack of shading, and possibly introduce weed species. Dense vegetation common in scrub/shrub wetlands, offering cover, breeding habitat, and foraging opportunities would be lost or modified. Vegetation removal would also cause impacts to species diversity and richness and continuity with adjacent habitat.
Comment: The "P line" location along the west line of Section 25 would be built over the RMZ and WMZ zones of the North Fork of Lacamas Creek. Along this Type 3 stream, there are many pockets of forested wetlands associated with the stream. There is also a large pond that was manmade that is partially on Craig Shigeno's property and partially on DNR land. The proposed transmission line would be built right over the top of this pond. The pond has been there for over 35 years and shows up as a wetland on the National Wetland Inventory Maps (See Exhibit "D"). The clearing and construction of the transmission corridor would have a significant impact on the functions and values of these wetlands. Tower P/23 is proposed to be built within the wetland buffer just south of the pond. The proposed access road to maintain the tower would also be built within the wetland and the associated wetland buffer. The pond is home to fish and amphibians. The overhanging vegetation provides shade and cover to these species. The pond is frequently visited by many migratory birds. Ducks mate and hatch young in the vegetation around the pond. Clearing the vegetation within the wetland buffer will raise water

temperatures, impact water quality, and destroy breeding and foraging opportunities for all of these species. The presence of the transmission corridor will have a permanent, highly negative impact on this ecosystem. The transmission lines and towers will create a hazard for migratory birds including, osprey, blue herons, owls and bald eagles flying into and out of this pond.

The access roads to towers P/23 and P/24 would be built partially within the forested wetlands and partially within the RMZ and WMZ zones associated with the Type 3 streams. The four (4) stream crossings would permanently impact the streams and associated wetlands. Water quality in the streams and wetlands would be impacted during construction and long after construction is complete by the loss of riparian vegetation and the runoff from the access roads.

Chapter 17-Vegetation

Section 7.2.2 states: that removal of vegetation in forested wetlands opens up those areas to non-native invasive plant species and the establishment of noxious weeds.

Comment: The removal of 10 acres of native vegetation in the forested wetlands and Riparian Management zones along the north fork of Lacamas Creek between towers P/21, P/22, P/23 and P/24 would open up those areas to non-native invasive species and noxious weeds.

Chapter 18-Wildlife

South of Rawson Road in Section 23 and 24 the "P Line" bisects a designated Washington State Department of Wildlife snag rich area. The area is known as "North Fork Lacamas Snags", a snag rich area for nesting raptors.

Comment: The "P Line" would clear 3 acres of this snag rich area. The Draft EIS lists this as a "high impact". This is discussed in chapter 18 under sections 18.1.2.6 and 18.2.5.2 tables 18-5 and 18-6 and shown on map 18-D.

APPENDIX A – DNR LANDS ANALYSIS

Section A.2.4.2 Best Practices: This section recommends best practices to accomplish the following objectives concerning the I-5 Corridor Reinforcement Project:

- Protect water quality and avoid sediment loading into water bodies.
- Protect sensitive areas and reduce ecosystem impacts.
- Maintain natural channels, natural stream flow and maintain passage for aquatic organisms.

Comment: The proposed alignment of the "P Line" from tower P/21 through tower P/24 is in direct conflict with these objectives and fails to implement any of these identified best management practices.

CAMP BONNEVILLE IMPACTS:

This branch of Lacamas Creek flows directly into Camp Bonneville to the south. Enclosed (as Attachment #3) is a "Site Description" of Camp Bonneville. This is Section 2 of an environmental review that was performed for the U.S. Army Corps of Engineers, Seattle District under Contract No.DACA87-00-D-0038, Task Order #17. Section 2.2.11 lists threatened and endangered species and Federal and State species of concern in Tables 2.1 and 2.2. If these

species exist in Camp Bonneville which is ½ mile to the south, it is logical to assume that these species exist partially or wholly along this branch of Lacamas Creek and could be impacted by the project. Even if the species are not found within the impact area, those species that exist within the boundaries of Camp Bonneville could be indirectly affected by any upstream deterioration of water quality caused by this project.

Camp Bonneville is currently undergoing an extensive environmental clean-up as a Superfund site. The lead agency in this project is the Washington State Department of Ecology (DOE). Any further water quality degradation caused by this BPA project will further aggravate DOE efforts to clean up the Camp Bonneville site.

ALTERNATIVES TO THE CURRENT "P LINE" ALIGNMENT:
We would like BPA to consider three re-alignment alternatives for the "P Line" that would be far less damaging to the ecosystem on the northern forks of Lacamas Creek.

We have prepared Exhibits "B" and "C" for your consideration which shows two potential realignment options.

The first option, as shown in orange on Exhibit "B" and "C", was actually proposed by the DNR in their comments dated May 10, 2011. As shown in attachment #4 as highlighted, this alignment would head north from tower P/27 across DNR land in Section 25, T3N, R3E, and Ek Family Trust timberland in the south half of Section 24 and Longview Timber LLC land in the north ½ of Section 24, then would turn west along the south line of Section 13 on DNR land and intersect the original "P Line" alignment between towers P/17 and P/18. This alignment would for the most part appear to cross streams at or near right angles which would minimize buffer impacts.

There is, however, a Type 5 stream that appears to lie beneath the proposed alignment of this alternative for a short distance. Type 5 streams tend to only have seasonal flow and do not support fish. There is also a potential wetland on a Type 4 stream in the SW ¼ of the NE ¼ of Section 24 along this alignment that shows up on the National Wetlands Inventory mapping (see Exhibit "D", National Wetlands Inventory map). While the towers could be located outside of the wetlands and buffers, the transmission lines would still pass over the wetlands. Vegetation clearing under the transmission lines could have a negative impact on those wetlands. Those impacts would, however, be far less damaging than the stream and wetland impacts along the Type 3 stream along the current alignment of the "P Line "on the west lines of Sections 24 and 25 as discussed previously. This alignment would also avoid impacts to the WDFW designated snag rich area known as the "North Fork Lacamas Snags" in the area of tower P/20.

The second option, as shown in green on Exhibit "B" and "C", would, in our opinion, be a better option to reduce impacts to the Lacamas Creek watershed. That option would head north between Towers P/29 and P/30 along the west lines of Section 30 and 19 of T3N, R4E on DNR land and then head west along the south line of Section 13 of T3N, R3E on DNR land and

intersect the original "P Line" alignment between towers P/17 and P/18. This alignment would cross DNR land in Section 30 and then go along the west boundary of DNR land in Section 19 and along the south boundary of DNR land in Section 13 of T3N, R3E. This alignment would cross several smaller streams at or near right angles. The stream classifications are mostly Type 4 and 5 streams with much narrower riparian buffer widths than the Type 3 streams along the west line of Sections 24 and 25. Type 4 Stream standard buffer widths are 65 feet. Type 5 Stream standard buffer widths are 15 feet (see Attachment #2). This option would not cross any known wetlands. This option would have far less impacts to the Lacamas Creek ecosystem than the original "P Line" alignment or the first option discussed previously. This option would also avoid any impacts to the "North Fork Lacamas Snags Area".

This option would follow the boundaries of DNR land except for the south mile, where it bisects DNR land. It however would eliminate about a mile of the original "P Line" that bisects DNR land on an angle. The option would be entirely on public land.

A third option would be to realign the corridor to the original "32 Line". That option would locate the transmission corridor high up on a ridge and would have minimal impact, if any, on the Lacamas Creek drainage.

We are many neighbors, and we are speaking with one voice when we urge you to consider and specifically respond to these comments on the Draft Environmental Impact Statement for BPA's I-5 Corridor Reinforcement Project.

Sincerely,

Vinemaple Road Neighbors

Bolton C. Minister

Lola Minister

April Minister/Smith

Rod Smith

14623

Bolton R. Minister

Amy Minister

Taylor Smith

Mia Smith

Caleb Nylund

Kari Nylund

John Isaacson

Deanne Isaacson

Craig Shigeno

Kari Shigeno

Michael Larsen

Mary Larsen

14828

Wayne Livick

Judy Livick

Robert O'Leary

Deborah O'Leary

Rob O'Leary

Meaghan O'Leary

Joel Acker

Andrea Acker

Vincent Rosales

Patricia Trobridge

14628

Jerry Klug

Lola Klug

Gordon O'Leary

Clara O'Leary

David Ballard

Gordon O'Leary, Jr.

Rodney Nylund

Julie Nylund

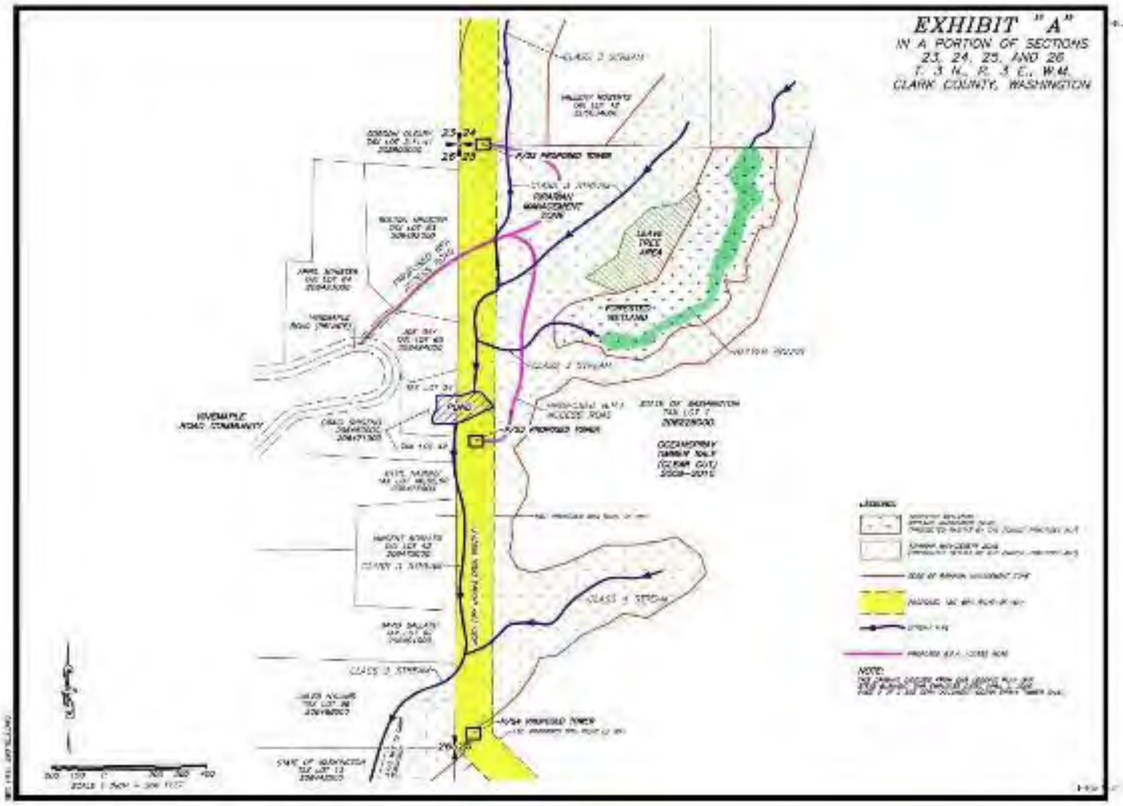


EXHIBIT "A"
IN A PORTION OF SECTIONS
23, 24, 25, AND 26
T. 3 N., R. 3 E., W.M.
CLARK COUNTY, WASHINGTON
CLASS 3 STREAM
FORESTED WETLAND
POND
CLASS 5 STREAM


STATE FOREST BOARD
STATE LAND
WASHINGTON STATE
WASHINGTON STATE
LONGVIEW TIMBER LLC
LONGVIEW TIMBER LLC
WASHINGTON STATE
EK FAMILY TRUST
LEWIS BENEDICT
RONALD MOSS
SUZANNE BENEFIELD
ROBERT A BARKINEN
WASHINGTON STATE
HOWARD EK
EK FAMILY TRUST
EK FAMILY TRUST
WASHINGTON STATE
STATE FOREST BOARD
STATE LAND BOARD
STATE LAND
EXHIBIT "B"
PRESENT BPA "P LINE"
DNR SUGGESTED ALIGNMENT
ALIGNMENT REQUIRING LEAST MITIGATION
WDFW DESIGNATED N. FORK LACAMAS CREEK SNAG AREA
NATIONAL WETLAND INVENTORY
STREAMS AND WATERWAYS
Page 14 of 34

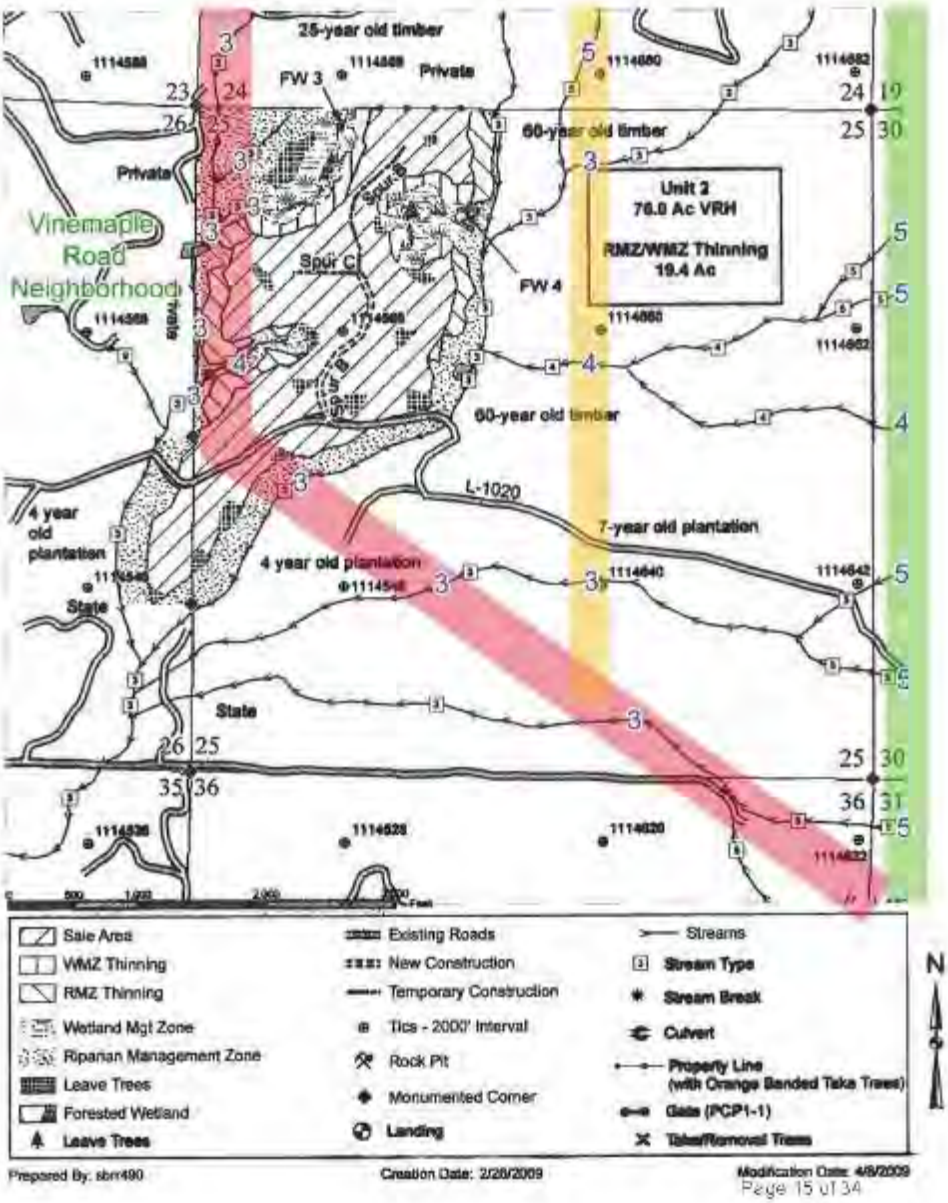
EXHIBIT "C"

14828

FOREST PRACTICES ACTIVITY MAP

SALE NAME: OCEANSPRAY
APPLICATION #: 30-064262

COUNTY(S): CLARK
TOWNSHIP(S): T03R03E, T03R04E



Prepared By: sbm490 Creation Date: 2/26/2009 Modification Date: 4/8/2009

Page 15 of 34


U.S. Fish and Wildlife Service
National Wetlands Inventory
EXHIBIT "D"
Available Layers
Wetlands
Freshwater Emergent
Freshwater Forested/Shrub
Estuarine and Marine Deepwater
Estuarine and Marine
Freshwater Pond
Lake
Riverine
Other
Status
Digital
Scan
Non-Digital
No Data
Riparian
Herbaceous
Forested/Shrub
Riparian Status

ATTACHMENT #1

14838

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark – Commissioner of Public Lands

CARING FOR
Your natural resources

MEMORANDUM

April 30, 2009 File No. 09-043001

TO:
Clark County, Planning Director
Gary Bell / A. Friez, DFW
E. Holman / S. Brummer / L. Renan, DFW
Labor & Industries
Columbia Gorge Audubon Society
Friends of the Columbia Gorge
The Columbian
Yakima Indian Tribe
Jean Tackett / Steve Hartsell, DNR
Environmental Coordinator, DOE
Gretchen Kaehler / Morgan Lee, DAHP
Dept of Revenue
Parks & Recreation
Clark County Natural Resources Council
Clark County ESA Program
Cowlitz Indian Tribe
Lauren Goldberg, Columbia River Keeper

FROM: Elizabeth L O'Neal, SEPA Center

SUBJECT: **SEPA LEAD AGENCY & MITIGATED DETERMINATION OF NONSIGNIFICANCE**

This is to advise you that pursuant to WAC 197-11-900 (922 through 948), the Department of Natural Resources has determined that it is Lead Agency for the following:

Oceanspray Timber Sale #84262 and Forest Practice Application #2919484 is a variable retention harvest of 110 acres in two units riparian management zone thinning of 15 acres and wetland management zone thinning of 8 acres, with 5,368 feet of optional road construction, 7,784 feet of pre-haul maintenance, and 3,968 feet of road abandonment. Located in Section 31, Township 03 North, Range 04 East and Sections 25 and 26, Township 03 North, Range 03 East, W.M., Clark County.

Information about this proposal including the Threshold Determination, SEPA Checklist and Forest Practice Application can be viewed on DNR's website at:

http://www.dnr.wa.gov/ResearchScience/sepa/Pages/Home.aspx

Pursuant to WAC 332-41-504, this proposal was filed in the department's SEPA Center at the Natural Resources Building, , on **April 30, 2009.**
We will consider comments on this proposed DNS received by 4:30 p.m. on **May 14, 2009**. Comments should be submitted to the SEPA Center at,
for distribution to the responsible official. Please include the file number listed above on all comments.

Page 1 of 34

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark - Commissioner of Public Lands

14673
Caring for
your natural resources
now and forever

MITIGATED DETERMINATION OF NONSIGNIFICANCE

Description of proposal: Oceanspray Timber Sale, Agreement No. 30-084262 and Forest Practices Application No. 2919484. This is a variable retention harvest of 110 acres in 2 units, riparian management zone thinning of 15 acres, and wetland management zone thinning of 8 acres, with 5,368 feet of optional road construction, 7,784 feet of required pre-haul maintenance, and 3,968 feet of road abandonment.

Description of mitigation: The following mitigation measures will be implemented with this proposal:

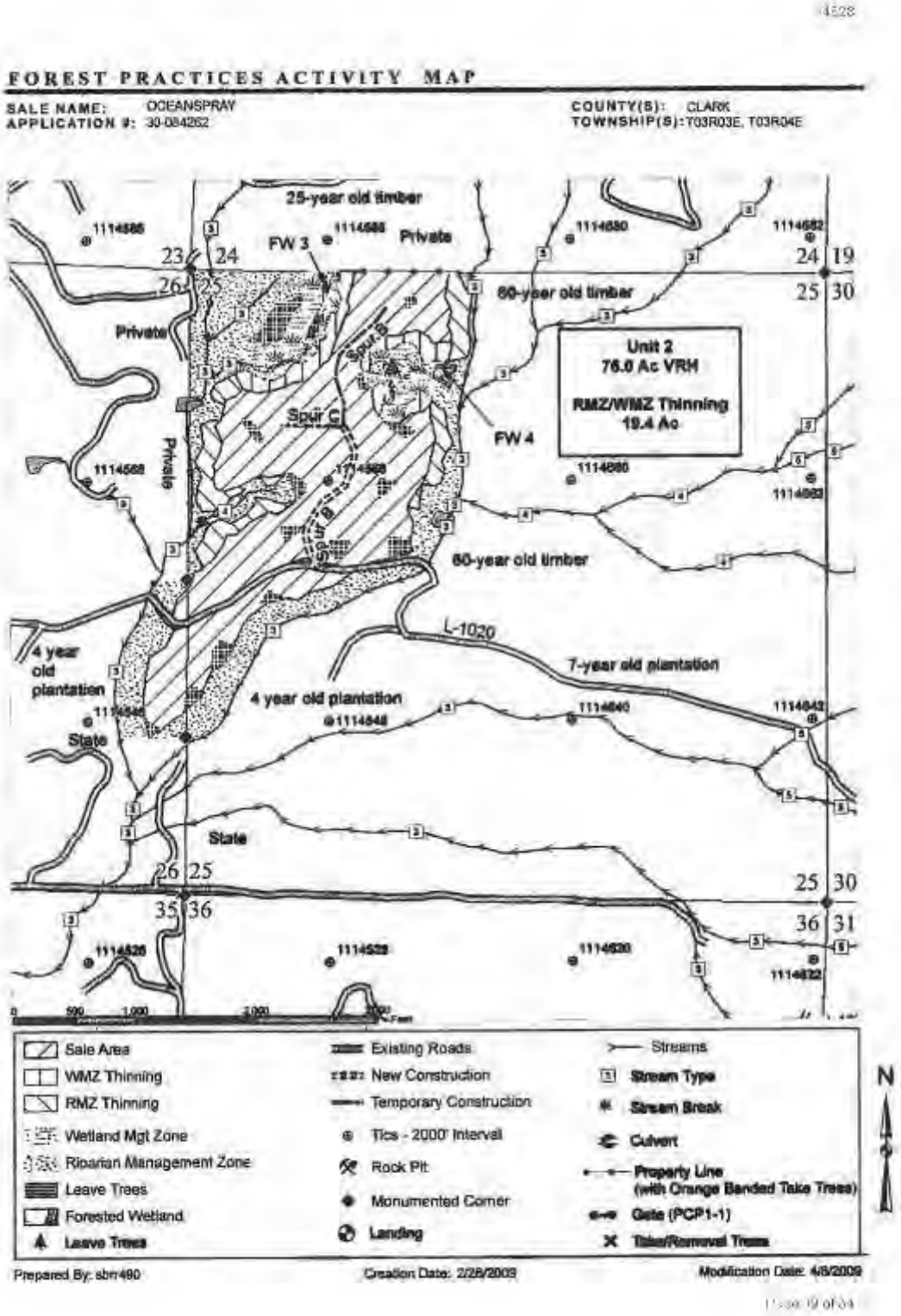
- Riparian Management Zones (RMZ) are between 175 feet and 190 feet wide on type 3 streams and a minimum 100-foot RMZ along type 4 streams have been retained to protect water quality, provide corridors for wildlife, and maintain habitat for fish and amphibians.
- Wetland Management Zones (WMZ) averaging 175 feet wide on wetlands greater than 1-acre and 100' wide on wetlands less than 1-acre and greater than .25-acre have been retained to protect water quality, provide corridors for wildlife, and maintain habitat for fish and amphibians.
- Within the RMZ and WMZ thinnings there will be a minimum of 5 enhancement trees per acre created to contribute toward the down woody debris and snag component.
- Wildlife tree and snag recruitment will be accomplished by retaining a minimum of 8 trees per acre, consisting of conifer and hardwood species.
- The most current design and construction techniques will be used for road construction and maintenance operations to minimize impacts on water quality.
- Rock pit L-1020 Quarry will be expanded and 16 trees will be removed. A 0.5 acre leave tree island has been recognized in the southern end of the historic Latte Timber Sale (Unit 2) and consists of 44 trees to mitigate for the loss of 16 leave trees.
- Neighborhood outreach conducted to solicit input on proposal.
- Avoided road construction through forested wetland by designating harvestable area as a leave tree area to avoid unwanted erosion and hydrological disruption of this sensitive habitat type.

Proponent: **Department of Natural Resources**

Location of proposal: Sections 31, Township 3 North, Range 4 East, W.M., Sections 25 and 26, Township 3 North, Range 3 East, W.M., approximately 8 miles by road, north of Camas, off the L-1020 road systems in Clark County, Washington.

Lead agency: **Department of Natural Resources**

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.


FOREST PRACTICES ACTIVITY MAP
SALE NAME: OCEANSPRAY
APPLICATION #: 30-084262
COUNTY(S): CLARK
TOWNSHIP(S): T03R03E, T03R04E
25-year old timber
FW 3
Private
60-year old timber
Unit 2
76.0 Ac VRH
RMZ/WMZ Thinning
19.4 Ac
FW 4
Spur C
Spur B
Private
State
4 year old plantation
4 year old plantation
7-year old plantation
L-1020
60-year old timber
Sale Area
WMZ Thinning
RMZ Thinning
Wetland Mgt Zone
Riparian Management Zone
Leave Trees
Forested Wetland
Leave Trees
Existing Roads
New Construction
Temporary Construction
Tics - 2000' Interval
Rock Pit
Monumented Corner
Landing
Streams
Stream Type
Stream Break
Culvert
Property Line
(with Orange Banded Take Trees)
Gate (PCP1-1)
Take/Removal Trees
N
Prepared By: sbm480
Creation Date: 2/28/2009
Modification Date: 4/8/2009

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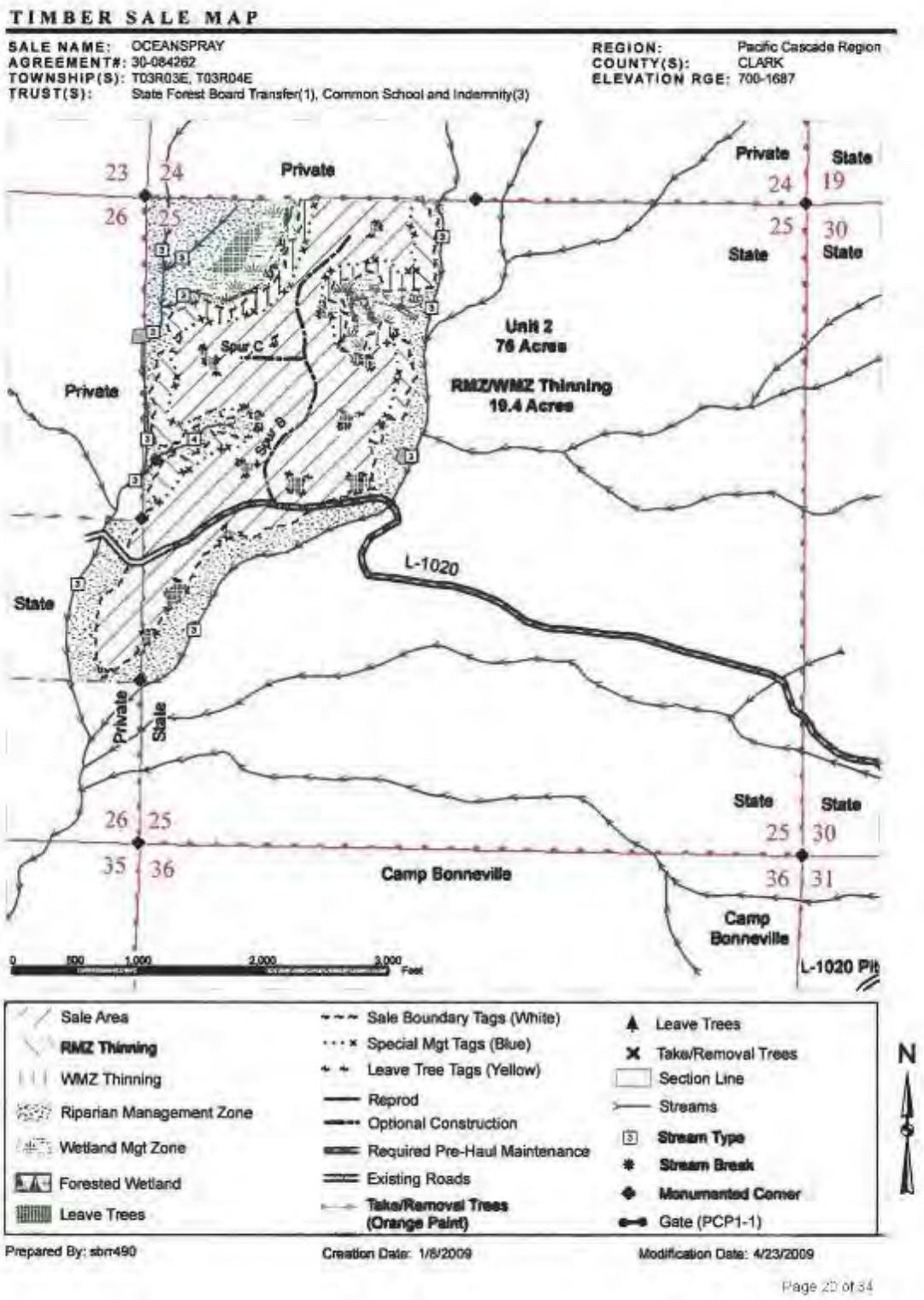

Page 20 of 34

ATTACHMENT #2

Arlington, Washington, Code of Ordinances >> Title 20 - ZONING >> Chapter 20.88 - ENVIRONMENTALLY CRITICAL AREAS >> Article VII. - Streams, Creeks, Rivers, Lakes and Other Surface Water >>

Article VII. - Streams, Creeks, Rivers, Lakes and Other Surface Water

20.88.700 - Classification.

The city hereby adopts the stream classification system of the state, as specified in WAC 222-16-020 and 030, as may be amended. Briefly, these are as follows (see WAC 222-16-020 and 030 for complete definitions of types):

(1) "Type 1 water" means all the waters, within their ordinary high-water mark, as inventoried as "shorelines of the state" under Chapter 90.58 RCW and the rules promulgated pursuant to Chapter 90.58 RCW, but not including those waters' associated wetlands as defined in Chapter 90.58 RCW.

(2) "Type 2 water" shall mean segments of natural waters that are not classified as type 1 water and have a substantial fish, wildlife, or human use. These are segments of natural waters and periodically inundated areas of their associated wetlands, which:

(A) Are diverted for domestic use by more than one hundred residential or camping units or by a public accommodation facility licensed by the state to serve more than one hundred persons, where such diversion is determined by the Washington State department of ecology to be a valid appropriation of water and the only practical water source for such users. Such waters shall be considered to be type 2 water upstream from the point of such diversion for one thousand five hundred feet or until the drainage area is reduced by fifty percent, whichever is less;

(B) Are within a federal, state, local, or private campground having more than thirty camping units: Provided, that the water shall not be considered to enter a campground until it reaches the boundary of the park lands available for public use and comes within one hundred feet of a camping unit, trail or other park improvement;

(C) Are used by substantial numbers of anadromous or resident game fish for spawning, rearing or migration. Waters having the following characteristics are presumed to have highly significant fish populations:

(i) Stream segments having a defined channel twenty feet or greater in width between the ordinary high-water marks and having a gradient of less than four percent.

(ii) Lakes, ponds, or impoundments having a surface area of one acre or greater at seasonal low water; or

(D) Are used by salmonids for off-channel habitat. These areas are critical to the maintenance of optimum survival of juvenile salmonids. This habitat shall be identified based on the following criteria:

(i) The site must be connected to a stream bearing salmonids and accessible during some period of the year; and

(ii) The off-channel water must be accessible to juvenile salmonids through drainage with less than a five percent gradient.

(3) "Type 3 water" shall mean segments of natural waters that are not classified as type 1 or 2 water and have a significant fish, wildlife, or human use. These are segments of natural waters and periodically inundated areas of their associated wetlands which:

(A) Are diverted for domestic use by more than ten residential or camping units or by a public accommodation facility licensed to serve more than ten persons, where such diversion is determined by the Washington State department of ecology to be a valid appropriation of water and the only practical water source for such users. Such waters shall be considered to be type 3 water upstream from the point of such diversion for one thousand five hundred feet or until the drainage area is reduced by fifty percent, whichever is less;

(B) Are used by significant numbers of anadromous fish for spawning, rearing or migration. Waters having the following characteristics are presumed to have significant anadromous fish use:

(i) Stream segments having a defined channel of five feet or greater in width between the ordinary high-water marks; and having a gradient of less than twelve percent and not upstream of a falls of more than ten vertical feet.

(ii) Ponds or impoundments having a surface area of less than one acre at seasonal low water and having an outlet to an anadromous fish stream.

(C) Are used by significant numbers of resident game fish. Waters with the following characteristics are presumed to have significant resident game fish use:

(i) Stream segments having a defined channel of ten feet or greater in width between the ordinary high-water marks; and a summer low flow greater than three tenths cubic feet per second; and a gradient of less than twelve percent.

(ii) Ponds or impoundments having a surface area greater than five tenths acre at seasonal low water; or

(D) Are highly significant for protection of downstream water quality. Tributaries which contribute greater than twenty percent of the flow to a type 1 or 2 water are presumed to be significant for one thousand five hundred feet from their confluence with the type 1 or 2 water or until their drainage area is less than fifty percent of their drainage area at the point of confluence, whichever is less.

(4) "Type 4 water" shall be applied to segments of natural waters which are not classified as type 1, 2 or 3, and for the purpose of protecting water quality downstream are classified as type 4 water upstream until the channel width becomes less than two feet in width between the ordinary high-water marks. Their significance lies in their influence on water quality downstream in type 1, 2, and 3 waters. These may be perennial or intermittent.

(5) "Type 5 water" shall be applied to all natural waters not classified as type 1, 2, 3 or 4; including streams with or without well-defined channels, areas of perennial or intermittent seepage, ponds, natural sinks and drainageways having short periods of spring or storm runoff.

(6) "Type 6 water" means constructed vegetated swales and ditches that are designed and installed for the express purpose of periodically moving storm water.

(Ord. 1309 § 5(part), 2003).

20.88.710 - Determination of boundary.

The planning manager, relying on delineation by a licensed engineer or other comparable expert, shall determine the boundary of the creek, stream, river, lake, or other surface water. For ravines with banks greater than ten feet in depth the boundary shall be contiguous with the top of the bank. Where there is no ravine or the bank is less than ten feet in depth, the boundary shall be contiguous with the ordinary high water mark.

(Ord. 1309 § 5(part), 2003).

20.88.720 - Allowed activities.

Except where regulated by other sections of this or any other title or law (e.g., see Article IV of this chapter, Fish and Wildlife Conservation Areas), the following uses shall be allowed within streams, creeks, rivers, lakes, and other surface waters when the requirements of Section 20.88.730 (Streams, Creeks, Rivers, Lakes and Other Surface Water—Requirements) have been met and mitigation adequate to alleviate any other impacts has been proposed:

(1) Those activities allowed under Section 20.88.220 (General Provisions—Allowed Activities).

(2) Bridges and other crossings for public and private rights-of-way.

(Ord. 1309 § 5(part), 2003).

20.88.730 - Requirements.

(a) To retain the natural functions of streams and stream corridors, and unless modified by Article IV (Fish and Wildlife Habitat), the streamside buffers listed in Table 20.88-11: Non-ESA Stream Buffer Width shall be maintained on both sides of the environmentally critical area. All existing native vegetation within these buffers shall be preserved. (Note also that buffer averaging may be allowed pursuant to Section 20.88.320 (General Provisions—Buffer Width Averaging.)

(b) To protect the natural functions and aesthetic qualities of a stream and stream buffer, a detailed temporary erosion control plan that identifies the specific mitigating measures to be implemented during construction to protect the water from erosion, siltation, landslides and hazardous construction materials shall be required. The city of Arlington shall review and approve the plan with the appropriate state, federal and tribal agencies, and any adjacent jurisdiction.

Table 20.88-11: Non-ESA Stream Buffer Width

Stream Type	Standard Buffer
1	115 feet
2	115 feet
3	100 feet
4	65 feet
5	15 feet
6	None

(c) The applicant shall dedicate to the city an exclusive environmentally critical area easement for the protection of creeks, streams, rivers, lakes, or other surface water over the environmentally critical area and a buffer consistent with the standards listed in subsection (a).

(Ord. 1392 § 15, 2006; Ord. 1309 § 5(part), 2003).

20.88.740 - Mitigation.

(a) In order to avoid significant environmental impacts for those activities allowed pursuant to Section 20.88.720 (Streams, Creeks Rivers, Lakes and Other Surface Water—Allowed Activities), the applicant for a land use or development permit may consider performing the following actions, listed in order of preference. What is considered adequate mitigation will depend on the nature and magnitude of the potential impact.

(1) On-site environmentally critical area restoration/improvement—Restoration or improvement in functional value of degraded on-site waterways and/or their buffers at a two is to one ratio (two square feet for every one square foot impacted).

(2) On-site ECA/creation—Creation of on-site waterways and their buffers at a two is to one ratio (two square feet for every one square foot impacted).

(3) On-site ECA buffer restoration—Restoration or improvement in functional value of degraded on-site waterway buffers at a ratio of six is to one.

(b) All ECA restoration, creation and/or enhancement projects required pursuant to this chapter either as a permit condition or as the result of an enforcement action shall follow a mitigation plan prepared in conformance to the requirements of Section 20.88.390 (Mitigation Plan Requirements).

(Ord. 1309 § 5(part), 2003).

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ATTACHMENT #3

SECTION 2

SITE DESCRIPTION

2.1 FACILITY INFORMATION

Project Name: Camp Bonneville Military Reservation

Project Manager: Mr. Eric Waehling, Base Environmental Coordinator

2.2 SITE DESCRIPTION

2.2.1 Site Location

2.2.1.1 The 3,840-acre Camp Bonneville site is located northeast of Vancouver, Washington, in the southeastern region of Clark County (Figure 2.1). The property is approximately five miles from Vancouver, Washington and approximately seven miles north of the Columbia River. Camp Bonneville is located along the western foothills of the Cascade Mountain Range, with Camp Hill and Little Elkhorn Mountain to the northwest, Munsell Hill to the west, and Little Baldy Mountain to the south.

2.2.1.2 Vehicular access to Camp Bonneville is restricted to a single entrance. The entrance is located on SE 232nd Ave. and enters the site from the west at the Camp Killpack cantonment. The entrance is gated and monitored by the facilities managers.

2.2.2 Climate

2.2.2.1 The Camp Bonneville area has mild, wet winters and moderately warm, dry summers. January is the coldest month, with an average temperature of approximately 38 degrees Fahrenheit (°F). July and August are the warmest months, with an average temperature of approximately 69°F. Typically, only 26 days a year experience temperatures below freezing, and 7 days have temperatures above 90°F.

2.2.2.2 Precipitation in the area is typically caused by the passage of low-pressure zones along a path from the north Pacific Ocean eastward during the winter and spring. The rainy season usually begins in late-September to mid-October and continues through March or April. An average of 154 days a year have measurable amounts of rainfall, with an average annual precipitation of approximately 47 inches. Annual snowfall in the Vancouver area averages about 8.4 inches. The average snow depth is typically only 2 or 3 inches, with continuous snow cover lasting one to three days at a time (USACE, 1999).

threatened and endangered species on Camp Bonneville (USACE, 1997). 14828 Table 2.1 summarizes this information, as well as information on likely habitats for each species.

TABLE 2.1
LIST OF STATE AND FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES LIKELY TO OCCUR ON THE CAMP BONNEVILLE SITE*

Name	Status	Likely Habitat and Occurrence
Bald Eagle (Haliaeetus leucocephalus)	Federal Threatened Species	Occasional visitor through area
Northern Spotted Owl (Strix occidentalis)	Federal Endangered; State Endangered	Throughout site

*Based on Summary of Agency Correspondence provided in USACE Final Archives Search Report, 1997

2.2.11.2 Table 2.2 includes Federal Species of Concern, Federal Candidate Species, and Washington State Monitored Species. A Federal Species of Concern includes those species that were formerly classified as candidate species by the USFWS prior to 1997. A large number of candidate species were delisted in 1997 and reclassified as Species of Concern. Species of Concern are not formally "listed" species. However, these species are considered to be rare and are an important indicator of overall habitat quality of a particular area. The greater the number and diversity of these Federal Species of Concern, as well as their respective populations, reflects positively on the quality and viability of the habitat.

2.2.11.2 Table 2.2 includes Federal Species of Concern, Federal Candidate Species, and Washington State Monitored Species. A Federal Species of Concern includes those species that were formerly classified as candidate species by the USFWS prior to 1997. A large number of candidate species were delisted in 1997 and reclassified as Species of Concern. Species of Concern are not formally "listed" species. However, these species are considered to be rare and are an important indicator of overall habitat quality of a particular area. The greater the number and diversity of these Federal Species of Concern, as well as their respective populations, reflects positively on the quality and viability of the habitat.

2.3 PROPOSED FUTURE LAND USE

2.3.1 The Camp Bonneville closure presents Clark County with the opportunity to transform property allocated as surplus by the BRAC process into publicly available lands that will provide the community with significant educational, environmental, and recreational benefits.

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TABLE 2.2
FEDERAL AND STATE SPECIES OF CONCERN LIKELY TO OCCUR ON THE CAMP BONNEVILLE SITE*

Name	Status	Likely Habitat and Occurrence
Bull Trout (Salvelinus confluents)	Federal Candidate Species	Lacamas Creek and tributaries (Buck Creek, David Creek)
Northwestern Pond Turtle (Clemmys marmorata marmorata)	Federal Species of Concern	Riparian areas along Lacamas Creek; Lacamas Creek
Larch Mountain Salamander (Plethodon larselli)	Federal Species of Concern	Wooded areas; Lacamas Creek
Cascades Frog (Rana cascadae)	Federal Species of Concern	Lacamas Creek and tributaries (Buck Creek, David Creek)
Spotted Frog (Rana pretiosa)	Federal Candidate Species	Lacamas Creek and tributaries (Buck Creek, David Creek)
Pacific Western Big-Eared Bat (Corynorhinus (Plecotus) townsendii townsendii)	Federal Species of Concern	Riparian areas; wooded areas
Long-eared myotis (Myotis evotis)	Federal Species of Concern	Riparian areas; wooded areas
Long-legged myotis (Myotis volans)	Federal Species of Concern	Riparian areas; wooded areas
Northern Goshwak (Accipter gentilis)	Federal Species of Concern	Throughout site
Olive-sided flycatcher (Contopus borealis)	Federal Species of Concern	Throughout site; riparian areas
Clackamas corydalis (Corydalis aquae-gelidae)	Federal Species of Concern	Riparian areas along creeks
Tailed frog (Ascaphus truei)	Federal Species of Concern, State Monitored Species	Moist habitats, wetlands, riparian areas, creeks
Cope's Giant Salamander (Dicamptodon copei)	State Monitored Species	Moist habitats; wetlands, riparian areas, creeks
Cascade Torrent Salamander (Rhyacotriton cascadae)	State Monitored Species	Moist habitats; wetlands, riparian areas, creeks

*Based on Summary of Agency Correspondence provided in USACE Final Archives Search Report, 1997

2.3.1 Camp Bonneville Local Redevelopment Authority

2.3.1.1 The Local Redevelopment Authority (LRA) is responsible for determining cost-effectiveness and feasibility of the land reuse plans for Camp Bonneville. In 1995, the Clark County Board of County Commissioners (BOCC), as a board of the LRA, appointed a five member Reuse Planning Committee (RPC) to oversee the reuse planning

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ATTACHMENT #4

Section 1
Part h
Subsection ii

Segment P could be re-routed to avoid directly overtopping adjacent homes without significant additional negative trust land bifurcation impacts to those already incurred by P. Consider turning north at proposed tower site P/27 instead of at P/24, and turning westward onto the trust land boundary at proposed tower site P/18.

Name: STATE OF WASHINGTON, DEPARTMENT OF NATURAL RESOURCES , LEONARD S YOUNG
Organization:
Attachments: NONE
Comment:
May 10, 2011
Mr. Mark Korsness
Project Manager, I-5 Corridor Reinforcement
Bonneville Power Administration
PO Box 9250 Portland, OR 97207

Dear Mr. Korsness:

This letter is to update Washington State Department of Natural Resources' (DNR) NEPA scoping comments (dated Dec. 10, 2009) in light of additional information BPA has made available to the public, such as removal and addition of proposed line segments. The enclosed document reiterates previously raised issues where applicable as well as new issues; it is intended to provide a quick reference to BPA regarding issues needing consideration throughout the development and implementation of the I-5 Project Draft Environmental Impact Statement. The concerns listed in the enclosure are referenced to the original comments submitted by DNR dated December 10, 2009 whenever the issue originated from those comments.

Sincerely,
Leonard Young
Department Supervisor

ENCLOSURE
Washington DNR Updated Scoping Comments
BPA I-5 Corridor Reinforcement Project

Page 27 of 34

14828

May 10, 2011

Alternatives:

1) DNR appreciates BPA's willingness to propose new line segments, and remove others, in response to issues raised by DNR as well as members of the public. However, we believe additional work is required to ensure that a reasonable range of alternatives are analyzed in the project EIS.

a) No alternative other than the existing right-of-way appears to substantially avoid conflict with DNR state trust land management mandates, or adequately mitigates, minimizes and avoids disproportionate impacts to DNR managed state trust lands.

b) Two items require additional consideration relative to the existing right-of-way in order to be responsive to DNR and public issues raised in scoping:

   i) A full analysis of the Non-Wires Screening Report recommendations is essential to establishing a reasonable range of alternatives that are responsive to the issues.

   ii) In addition and in concert, analyze the extent to which the project's purpose and need could be achieved by replacing conductors and insulators on existing tower structures, within the existing right-of-way, with second-generation high temperature superconductors (G2 HTC) that allow far greater power transmission capacity and far lower line loss.

c) Clearly develop and identify objectives in consultation with DNR to ensure the analyses of an adequate range of impacts and alternatives and future expansion plans. (Young, 12-1009, p.2)

d) Give equal consideration to federal Department of Defense lands, USDA Forest Service lands, county lands, e.g., Camp Bonneville, and Pacific Power and Light Lands in consideration of the expense of near-term and long-term impacts to trust land management and environmental stewardship on DNR managed state trust lands. (Young, 12-10-09, p.2) For example, routes through Camp Bonneville would straighten out segment P and cause significantly less severance to DNR managed trust lands.

   i) DNR has previously requested consideration of a route to the east of DNR's Yacolt Block, along the DNR boundary shared with the Gifford Pinchot National Forest, which would avoid bifurcating DNR managed trust lands. Subsequently, a group of citizens proposed a "gray line" route that would follow a similar path. BPA's rationale in the February, 2011 project update document are insufficient to eliminate these route proposals from further study. The portion of the "gray line" proposal that would affect the Siouxon Block of trust lands located east of Yale Lake would incur negative impacts for federally listed spotted owls and their associated habitat. This should be avoided by a routing alternative that turns west at the southern Siouxon boundary and crosses the Lewis River at or just east of Yale Dam.

   ii) Segment K has been proposed to replace Segments 11, 20, and 21 from early versions of publicly released routing alternative maps, in an effort to avoid PacifiCorp lands. This choice, in turn, has a negative bifurcation impact on DNR managed state trust lands to north of the Lewis River Road. Additional impacts to homes around Yale would be

Page 28 of 34

incurred as well. The environmental, social and economic impacts of this decision have yet to be vetted publicly and should be included in the draft EIS analysis.

e) Analyze and compare the costs of crossing state lands versus federal lands given the October 23, 2009 MOD between multiple federal agencies that expedite the siting and construction of qualified electric transmission infrastructure on federal lands. (DNR NEPA Scoping Comments, p.9, 12-10-09)

f) Consider route (s) that avoid habitat identified specifically for or linked to threatened and endangered species.

g) The Lacamas Prairie Natural Area was designated by the Commissioner of Public Lands to conserve populations of both federal- and state-listed endangered, threatened, and sensitive species, as well as wet prairie and oak woodland habitats that are rare within Washington State, and DNR is near closing on the purchase of the core area. BPA should avoid siting within areas identified as natural areas by the DNR. Proposed line segments 36, 40, and 46 (vicinity of T2N R3E, Sections 18, 20, 39, 50, and 52) cross through approximately 3.5 miles within the approved Lacamas Prairie Natural Area boundary. Construction of the proposed line segments could have direct impacts on these species' populations and high-quality habitats. A large portion of the proposed segments are located within the Lacamas Creek floodplain and associated wetlands that are included in the natural area design. Most of the species and habitats within the natural area are dependent on specific hydrological conditions and would be very sensitive to hydrological changes that may result from construction of new powerline segments. The federally listed Lomatium bradshawii that occurs within the natural area boundary is a wetland species dependent on sufficient water resources and has a fairly narrow hydrological regime tolerance. In addition, access road development and use may further alter hydrology and would present a vector for non-native invasive species that threaten the species and habitats. For additional information, contact the DNR Natural Areas Program.

h) Consider route(s) that avoid transecting the Larch (Yacolt) block and the Yacolt Burn Recreation Area. Define impacts to current and planned DNR- provided recreation opportunities in the Larch (Yacolt) block, as outlined in the Yacolt Burn Recreation Plan. Include a cost projection for re-creating the Yacolt Burn Recreation Plan's implementation schedule to account for BPA's impacts to recreation. (DNR NEPA Scoping Comments, pp.10, 11, 12-10-09)

   i) Segments O and 30 are unresponsive to this issue and should therefore be eliminated from consideration.

   ii) Segment P could be re-routed to avoid directly overtopping adjacent homes without significant additional negative trust land bifurcation impacts to those already incurred by P. Consider turning north at proposed tower site P/27 instead of at P/24, and turning westward onto the trust land boundary at proposed tower site P/18.

i) Consider route(s) that avoid DNR managed trust land transfer parcels or which are identified in potential land transactions.

   i) A trust parcel in T2N, R3E, Section 16 under segment 43 (directly east of Vancouver) has been identified as a potential school site for the Camas School District which could be bifurcated by the power line.

j) Consider route(s) that avoid forest riparian conservation easements held by the state, i.e., DNR currently holds a conservation easement in T07N, R01W, Section 4 lying within the segment 9 route that was purchased 12/23/08 at a value of $118,878.63.

k) Consider route(s) that avoid lands that have medium to high wind power potential, e.g., areas with 6.5 m/s and greater wind speeds at 80m as shown on maps at windpoweringamerica.gov/images/windmaps/wa 80m.jpg) or as designated to have wind power potential by DNR based on site-specific information. The transmission line should be located in

order to supply power from sources such as wind while not eliminating the best possible lands for harnessing wind.

l) Consider route(s) that avoid genetically selected tree areas (Genetic Reserves). (DNR NEPA Scoping Comments, 12-10-09, p.17). There is currently one genetic reserve lying very close to route 30 in T4N, R3E, Sec.23.

2) BPA has added the Casey Roads Substation Site as possibly being located on state trust lands. This may require the sale of state land. The substation proposal requires detailed information for evaluation such as the exact location, the size, impacts outside the area, access to the substation, and others. For substation locations that may affect DNR managed trust lands, the EIS should identify and analyze:

a) Unauthorized public access opportunities and resource damage issues.
b) Land Transactions: easement vs. fee ownership transfer.
c) Consistency with DNR's Road Maintenance and Abandonment Plan (RMAP) for access routes that could potentially be utilized by BPA.
d) Storm water management of potential sites.

3) Disclose the potential environmental, economic and other impacts to DNR managed state lands as well as impacts to all non-federal lands related to DNR's regulatory and other programs, i.e., Geology and Earth Resources, Forest Practices, and Fire Protection. (Young, 12-10-09, p.2; DNR NEPA Scoping Comments, 12-10-09, pp.8,9)

a) Develop and propose mitigation measures for DNR-managed lands that minimize potential short-term and long-term environmental, economic and social impacts of the alternatives through project design and development similar to those agreed upon with King County and documented in the Kangley-Echo Lake Transmission Line Project Record of Decision dated July 21, 2003. (DNR NEPA Scoping Comments, 12-10-09, p.10).

4) Analyze the impacts of the I-5 Corridor Options on the threatened and endangered species that are currently covered under DNR's Incidental Take Permit (ITP) (#PRT-812521 USFWS) and (#1168 NMFS) and Habitat Conservation Plan (HCP). (Also please refer to Mitigation Item 20 later in these comments.)

a) Analyze whether BPA's proposed transmission line use will limit DNR's ability to protect the threatened and endangered species as envisioned in the ITP and HCP and seek DNR's input during any Endangered Species Action consultation between BPA and the National Marine Fisheries Service or the United States Fish and Wildlife Service for any project effects that have the potential to put DNR at risk of noncompliance with its ITP and HCP. b) Include the analysis of impacts on threatened and endangered species for those species that may be adversely affected by the I-5 Corridor Options (and include a draft of the Biological Assessment or Biological Opinion prepared pursuant to ESA consultation in the FEIS) and that are also covered by DNR's ITP and HCP in separate sections of the EIS to enable an efficient analytical structure for assessing project impacts on state owned lands.

5) Work with DNR to determine and confirm state-ownership of aquatic lands; Analyze the impacts on cultural, historic and archaeological resources on all aquatic crossings, preferably in conjunction with consultation pursuant to Section 106 of the National Historic Preservation Act; Identify impacted DNR aquatic licenses, leases, easements and sales; and calculate lost revenue to the state over the next fifty years. (DNR NEPA Scoping Comments, pp. 11,12, December 10,2009.)

6) Consider impacts to land that is subject to forest riparian conservation easements and provide compensation and/or mitigation for the loss of conservation capacity intended by these easements

impacted by the transmission line. Obtain consent from DNR on impacted easements prior to obtaining an easement from the landowner. (Young, 12-10-09, p.3; DNR NEPA Scoping Comments, 12-10-09, p.13) (SEE item 1.k. of this document)

7) Analyze and avoid negative impacts to the current use or reasonably foreseeable future development of any communication site, e.g., existing sites include DNR's Larch Mountain site in T3N, R4E, Sec. 27, SW1/4, NE1/4 and the Casey Road site in T10N, R2W, Sec.18, SE1/4. (DNR NEPA Scoping Comments, p.7,9, 12-10-09)

8) Analyze impacts to the local economy caused by impacts to the timber industry and recreation. (DNR NEPA Scoping Comments, 12-10-09, p.9)

a) Analyze and avoid impacts to the potential future revenue from biomass production, carbon credits and development rights on DNR managed state trust lands. (DNR NEPA Scoping Comments, 12-10-09, p.7)

9) Analyze the effects, restrictions and other threats (negative easements) of BPA's proposed corridors on DNR trust management activities that occur outside of BPA's right-of-way and prevent DNR from fully managing state lands. (DNR NEPA Scoping Comments, 12-10-09, p.6)

a) Define restrictions on current and reasonably foreseeable DNR managed state land activities outside the BPA right-of-way, particularly where the corridor will disallow, limit or increase the cost of timber harvest, timber hauling, wind power production, solar energy development, communication sites and recreation use or eliminate the potential for a special land management option. (DNR NEPA Scoping Comments, 12-10-09, p.9)
b) Develop and model an estimation of the amount and location of current danger trees that would require removal. Identify areas outside of the normal R/W corridor width that would require low-growing vegetation to be maintained and include within the transmission line corridor. This would include areas with trees upslope of the line, diseased areas, areas with undesirable species, and other existing conditions that will be considered a hazard or concern once the transmission line is built.

10) Clearly identify the vegetation management activities that will occur within and outside the right-of-way per BPA's May 2000 Transmission System Vegetation Management Program Final EIS (DOE/EIS-0285) and supplements including those near any DNR-managed natural area or water body where State Owned Aquatic Lands are located. (DNR NEPA Scoping Comments, pp.10,12, 12-10-09)

11) Quantify and analyze the economic impact on long term trust revenue where the corridor will disallow, limit or increase the cost of timber harvest and timber hauling, or managing for other special forest products or agricultural land uses. This should include a mitigation and compensation plan in coordination with DNR for the life of the project. a) Determine the effects on DNR's timber harvest from the removal of lands by each Watershed Analysis Unit (WAU). Work with DNR using DNR's timber harvest modeling software to arrive at these impacts. This includes assessing hydrologic modeling for rain on snow related procedures and potential future DNR harvest limitations due to new corridors. DNR will supply the data. (DNR NEPA Scoping Comments, p. 10, 12-10-09)

12) Describe and analyze the cumulative impacts that may result from unauthorized use and damage to state lands and public resources, e.g., garbage dumping, trail building, ORV use, vandalism and theft. Prepare a sample survey on a given portion of existing power line representative of DNR ownership on the proposed I-5 project and prepare a quantitative prediction of unauthorized use and the cumulative

impacts that may result. Include costs to repair or mitigate predicted damage. (DNR NEPA Scoping Comments, p.11, 12-10-09)

13) Address the potential for geologic hazards (DNR NEPA Scoping Comments, 12-10-09, pp. 13-15):

a) Identify landslide hazards using DNR's GIS Statewide Landslide database and then create a site-specific geologic map.
b) Identify unstable slopes using DNR's Shalstab model or through landforms in the Landslide Hazard Zonation projects where available data exists.
c) Identify slope hazards associated with slope modification or vegetation removal at construction areas. d) Identify seismic shaking potential on the Lacamas Lake Fault as well as movement potential.
d) Reconsider corridor locations in moderate to high liquefaction sensitive areas by using GIS modeling to identify the least sensitive lands.

14) Define impacts to established research plots and propose measures to mitigate impacts. Potential plots of concern in addition to those for genetic reserves identified in l)n) above are listed in DNR NEPA Scoping Comments, 12-10-09, p.17. Mitigation

15) Develop mitigation such as a Statewide Memorandum of Agreement with DNR that addresses existing encumbrances on state land and management of existing, proposed and future corridors such as the I-5 Corridor Reinforcement Project to reduce environmental damage, assures state forest land productivity and ensures appropriate compensation to the legal beneficiaries of state trust lands when lands are used by BPA. Use this broader agreement to form the basis for easements and to establish a Maintenance and Operations Agreement for the I-5 Corridor project. (Young, 12-10-09, p.3) The Statewide Memorandum of Agreement should include the following items:

a) Road design, construction, improvement, maintenance and abandonment best management practices and, separately, develop BPA Road Standards. Road standards should mimic DNR standards, or BPA should accept DNR standards that are acceptable and in accordance with Forest Practices Rules;
b) Managing low growing native vegetation;
c) Identification of adequate crossings for equipment required for hi-lead logging including towers and shovels and wind power related equipment.
d) Unauthorized uses that damage lands and public resources;
e) Removal of danger trees outside the right-of-way and other right-of-way corridor expansions w/o adequate compensation to the state (Also see DNR NEPA Scoping Comments, 12-10-09, p.9); and
f) Conflicts with the state's long-term forest management obligations and in some cases contractual obligations of the DNR's federally approved HCP.

a) Commit to meet the intent of the Forest Practices Act and Rules within BPA's ownership or easement corridors. Evaluating alternatives that mitigate impacts to riparian areas and threatened and endangered species throughout the construction phase and during future maintenance of the project will minimize the need for identifying additional mitigation under SEPA. (Young, 12-10-09, p.3,4; DNR NEPA Scoping Comments, 12-10-09, p.16) The project should incorporate the following considerations, impact analysis and mitigation:
b) Agree to implement the 2002 agreement between DNR and BPA regarding forest practices or Agree to work with the underlying and neighboring landowners to obtain Forest Practices Applications and comply with the Forest Practices Act and rules. Notification should be done

either via coordination at annual meetings or in writing. This should also include maps of activities identifying where work along the line segment will be.

c) Evaluate the project alternatives based on the impacts they will have on threatened and endangered fish species, and water quality concerns.
d) Limit the impacts to potentially unstable slopes as defined in WAC 222-16-050(1)(d)(i).
e) Conduct an environmental analysis of the impacts to unstable slopes, riparian function and water quality for all stream crossings that will be impacted. Provide a mitigation plan for the project to specifically guide the removal and manipulation of vegetation near stream crossings not limited to topping of trees or leaving riparian vegetation where adequate conductor clearance is anticipated.
f) Minimize vegetation and ground disturbance during construction adjacent to streams. Emphasize native vegetation that will provide for riparian function. Where trees must be removed, consider replacing existing tree species within the corridor with a native species that will provide forest vegetation both within and adjacent to the corridor for riparian function while limiting the hazards to the lines and providing reliable service to the customer.
g) Work with landowners(s) in identifying and adhering to any prescriptions/requirements within the Upper Coweeman Watershed Analysis area.
h) Agree to apply only pesticides that are registered for forest use, follow the label requirements and adhere to the Forest Practices Rules relating to pesticide use.

17) Agreement from BPA, in writing or via some other form of agreement, that its actions and those of its contractors will comply with Chapter 76.04 RCW Forest Protection and Chapter 332.24 WAC Forest Protection. (Young, 12-10-09, p.4; DNR NEPA Scoping Comments, p.16, 12-10-09)

a) Work with DNR to mitigate concerns of increased fire susceptibility and safety concerns and limitations they place on firefighting efforts. (Young, 12-10-09, p.4)
b) Take responsibility for extreme fire hazard abatement related to falling of danger trees and follow state extreme fire hazard abatement laws. (Young, 12-10-09, p.4)
c) Reimburse DNR Resource Protection for the full cost of suppressing any wildfires occurring on the BPA right-of-way or as a result of BPA operations in the area, regardless of cause. (DNR NEPA Scoping Comments, p.16, 12-10-09)

18) Identify and map all existing and new roads on state lands that BPA will use and construct, and agree to meet DNR standards for road construction and maintenance. This should include analysis/coordination with developed RMAP plans. (DNR NEPA Scoping Comments, 12-10-09, p.9)

19) Ensure protection to species and special habitats while providing mitigation equal to that required by DNR's Habitat Conservation Plan that will be necessary as a result of:

a) Fragmenting of habitat by corridors and roads;
b) Introducing noxious and invasive weeds;
c) Impacting water quality;
d) Increasing slides on unstable slopes;
e) Creating or failing to remove fish barriers;
f) Inviting unregulated public use,
g) Generally providing a lesser standard of environmental protection. (Young, 12- 10-09, p.3; DNR NEPA Scoping Comments, p.9, 12-10-09); and
h) Threats to cultural resources or significant local Tribal areas.

14828

20) Develop mitigation measures to address impacts on endangered and threatened species on state lands and that are covered by DNR's ITP and HCP.

a) Incorporate any conservation measures or aspects of the proposal that are relied upon to support informal or formal consultation with the National Marine Fisheries Service and the US Fish and Wildlife Service (Federal Services) under the Endangered Species Act and obtain input during consultation from DNR for any project effects that relate to any species covered by DNR's ITP and HCP on state lands (DNR NEPA Scoping Comments, pp.10, 12-10-09):

b) Develop a mitigation plan for new construction and establish a mitigation account for future habitat restoration that may be needed if BPA's proposal results in the removal of Permit Lands (as defined in DNR's ITP) from coverage along the proposed corridors and their buffers or otherwise affects DNR's ability to comply with its ITP and HCP due to impacts associated with BPA's transmission line construction or ongoing operation and maintenance.

c) Develop a mitigation plan in coordination with the Federal Services and DNR that reflects commitments DNR has made in its ITP and requires BPA to incorporate additional measures needed to address project effects to maintain DNR's compliance with its ITP as it relates to BPA's intended use of Permit Lands (as defined in DNR's ITP).

21) Follow the DNR/BPA Appraisal MOU. (DNR NEPA Scoping Comments, p.11, 12-10-09.) DFD

Page 34 of 34

14829

From: noreply@bpa.gov
Sent: Sunday, March 24, 2013 10:14 PM
Subject: 14829: BPA I5 Comment Submission Confirmation

Follow Up Flag: Follow up
Flag Status: Completed

Thank you for submitting your comments on the Bonneville Power Administration's draft environmental impact statement (EIS) for the I-5 Corridor Reinforcement Project. All comments submitted between November 13, 2013 and noon on March 25, 2013 will be responded to in the final EIS, which is expected in 2014.

A copy of your information, as submitted using our online form, is included below for your records. If you provided your contact information and submitted a question we can answer at this time, you will receive a response. Your contact information will also be added to our project mailing list. All comments including names will be processed and then posted on BPA's website at www.bpa.gov/goto/i-5

Sincerely,
Bonneville Power Administration

Name: Rodney L Smith
Organization:
E-mail:
Phone:
Address:

Group type: Private citizen

Please ADD me to the mailing list.

Comment:
14829-1 Enclosed please candidate responses to "A Better Way for BPA" questionnaire regarding private property being used for the I-5 Corridor Reinforcement Project when ample BPA owned land is available: Thank you.

Attachment

1

1 of 4

14829-1 Comments noted.

14829

Select candidate responses to questionnaire regarding private property being used for the I-5 Corridor Reinforcemer
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Response from:
Brandon Vick - Candidate for State Representative 18th Legislative District Position No. 1
I believe that the protection of private property should be a priority for any elected official. While a State Representative may not have the legislative authority to direct BPA on this matter, we can use our soap box and mak
---
Response from:
Ed Orcutt - Candidate for State Representative 20th Legislative District
2) Do you support BPA spending tens of millions more of ratepayer dollars to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines? They should use the Pearl Route
---
Response from:
Stephen Pidgeon - Candidate for Attorney General
2) Do you support BPA spending tens of millions more of ratepayer dollars to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines? No, the BPA should use existing corridors.

Response from:
Steve Rader - Candidate for Cowlitz County Commissioner District 1
I apologize for the time it is taking me to respond to your questionnaire. To answer the survey questions my responses are all no. I do not believe the bpa should proceed with their plan to intrude on private property, furthermore I believe that they should use the existing lines and routes already going through property owners back yards and upgrade them to fit their needs.
thank you for the opportunity to participate in your survey.

Response from:
Don Benton - Candidate for State Senator 17th Legislative District
Attached is your completed survey. I am strongly opposed to BPA creating a new right of way. They should use the or they already own.

Response from:
Pat Campbell - Candidate for Clark County Commissioner District No. 2
I was part of the DNR committee that worked on the Yacolt Burn Recreational Plan. This new line is needed, but near I-5 using current right of way. That is where industry needs the reliable power.

Response from:
Carolyn Crain - Candidate for 49th District Position 2
Eminent domain should only be used for the betterment of the people when absolutely no other alternative can be used. The existance of land already in place for the BPA should mandate the use of their own property not the access to private lands period.

Response from:
2: Do you support BPA spending tens of millions more of ratepayer dollars to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Max Sampson - Candidate for Governor
The constitution of the state of Washington section 16 eminent domain is a law of the state. I feel this protects the land owner but the amount of compensation should be double if the owner is inconvenienced by the state. It is not the states responsibility to kick home owners out into the street. These people lives that is disrupted should not be taken for granted.I will protect the homeowners rights in the state capital.Each case is different sc all cases should be addressed with special attention. A third party for public disclosure should be part of the process so the state does not take advantage of the land owner.max Sampson.

Response from:
John Adams - Candidate for State Insurance Commissioner
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Rick Winsman - Legislative District 19,Legislative District 19 - State Senator
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Julia Anderson-Candidate for Public Utility District No. 1 Of Clark County Commissioner District No. 1
Please note that I live on a 20-acre tree farm on Grinnell Road, not far from the proposed new eastern route. I support my neighbors in opposing this route as more expensive and more disruptive than the long-planned existing route.
Thank you for your interest in my campaign for Clark Public Utilities Commissioner.
If I had been a commissioner when this project first was announced, I would have encouraged the commission to take a stand in favor of the existing route.
Please visit by Web site for a Q&A on energy issues facing our region.

Response from:
John Morgan - Candidate for State Representative 20th Legislative District Position
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than

14829-1

2 of 4

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using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Ronald L. (Ron) Higgins - Candidate for Washington State Superintendent of Public Instruction
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Peter Silliman - Write-in Candidate for 18th District, Position 1
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Jim Malinowski -Candidate for Public Utility District No.1 of Clark County Commissioner District No. 1
My land was never threatened by any of the routes. I am concerned about the impacts to rural property values and scenic values in north Clark County.

Response from:
Debbie Peterson - Candidate for State Representative 49th Legislative District Position No. 1
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Robert (Bob) Freund - Clark County Commissioner District No. 1
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
James White - Candidate for Governor
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Art Coday - Candidate for US Senate for Washington
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

14829-1

Response from:
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Candidate Survey Glen "Stocky" Stockwell for US Senate
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
John Braun - Legislative District 20,Legislative District 20 - State Senator
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Dan Swecker - Incumbent for State Senator 20th Legislative District
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Norma Jean Stevens - Candidate for U.S. Representative 3rd Congressional District
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Jon T. Haugen - Candidate for U.S. Representative, 3rd Congressional District
Hello,
I thank you for the email.
I do not support any of the Bonneville Power Administration's plans to increase movement of electricity by building of a new corridor. I advocate using the current corridor and burying the transmission lines.
Thank you.
Jon Haugen

Response from:
Scott Reilly -Candidate for Insurance Commissioner

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2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Liz Pike - State Representative 18th Legislative District Position No. 2
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Eileen Qutub -Candidate for State Senator 49th Legislative District
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Christian Joubert - Candidate for Governor
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

14829-1

Response from:
Adrian Cortes - Candidate, State Representative, 18th legislative district, position 1
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Paul Spencer - Candidate, State Representative, 14th Legislative District. Position 1
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Tom Mielke - Incumbent, Clark County Commissioner, District No.1
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

Response from:
Paul Spencer - Legislative District 14 - State Representative Pos. 1
2: Do you support BPA spending tens of millions more of ratepayer dollars more to build a new corridor rather than using the existing 70-year old corridor that was designed to accommodate additional transmission lines?
NO

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14830
A BETTER WAY FOR BPA, BRICKLIN & NEWMAN, JULIE K AINSWORTH-TAYLOR, DAVID A BRICKLIN
03/24/2013

14830-1 Bonneville Power Administration: Attached please find A Better Way for BPA's comments on the Draft Environmental Impact Statement for the I-5 Corridor Reinforcement Project. These comments are in regards to BPA's failure to appropriately conduct a cumulative impact analysis. If you should have any problem with opening the attachment or questions about its content, do not hestiate to contact me.

Bricklin & Newman LLP

Seattle Office:
[Address]

Spokane Office:
[Address]

Contact:
Phone: [Phone number]
Toll Free: [Phone number]
Fax: [Fax number]
[Website]

Reply to: Seattle Office

March 24, 2013

Bonneville Power Administration
I-5 Corridor Reinforcement Project
PO Box 9250
Portland, OR 97207
e-mail: I-5@bpa.gov

RE: Comments on the November 2012 Draft Environment Impact Statement

for the I-5 Corridor Reinforcement Project -Cumulative Impacts

Bonneville Power Administration:

14830-2 I write on behalf of A Better Way for BPA and its members to provide comments on the Draft Environment Impact Statement for the I-5 Corridor Reinforcement Project (DEIS) in regard to the DEIS's failure to adequately address the cumulative impacts of this proposed project. Thank you providing the opportunity for the members of the communities impacted by this proposed project to comment.

A Better Way for BPA is a coalition of rural property owners in Cowlitz County and Clark County working together to address concerns over the construction of the Bonneville Power Administration's (BPA) proposed I-5 Corridor Reinforcement Project in southwest Washington. A Better Way for BPA is

14830-1 Thank you for your comments.

14830-2 Thank you for your comments. Specific comments are addressed below.

14830-2 concerned about the impacts - economical, environmental, and aesthetical - that the proposed transmission line will have in their communities. A Better Way for BPA believes that reasonable alternatives are available to BPA that will maintain a healthy and diverse environment in their southwestern Washington community. Specifically, with this comment letter, A Better Way for BPA asserts BPA's failed to adequately disclose, discuss, and analyze the cumulative impacts of the project.

CUMULATIVE IMPACTS

If BPA proceeds with its Preferred Alternative, the Central Alternative, it will be constructing an approximately 70-mile long corridor traversing southwest Washington with additional miles of access road. This corridor will pass through urban, rural, and natural areas impacting a variety of environments. An EIS must discuss cumulative impacts. 40 CPR§ 1508.25(c)(3); Te-Moak Tribe of W. Shoshone of Nev. v. US. Dep't of Interior, 608 F.3d 592, 602 (9th Cir. 2010).

Cumulative impacts are defined by the Council on Environmental Quality as:

[T]he impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taken place over a period of time.

40 CPR§ 1508.7 (Emphasis added).

14830-3 A cumulative impact analysis "must be more than perfunctory; it must provide 'a useful analysis of the cumulative impacts of past, present, and future projects.' " Northern Plains Resource Council v. Surface Transportation Board, 668 F.3d 1067 (9th Cir. 2011) (citing Kern v. US. Bureau of Land Mgmt., 284 F.3d 1062, 1075 (9th Cir. 2002). To serve NEPA's purpose of informed decision-makers and informed public, the cumulative impact analysis must include "some quantified or detailed information; ... general statements about possible effects and some risk do not constitute a hard look absent a justification regarding why more definitive information could not be provided." Northern Plains Resource Council v. Surface Transportation Board, 668 F.3d 1067 (9th Cir. 2011) (citing Ocean Advocates v. US. Army Corps of Eng'rs, 402 F.3d 846, 868 (9th Cir. 2005). In other words, the lack of analysis or the presence of broad, general, conclusory statements results in an EIS failing to meet NEPA's demands in regards to cumulative impacts. See, e.g. Muckelshoot Indian Tribe v. US. Forest Service, 177 F.3d 800 (9th Cir. 1999); Friends of the Earth v. US. Army Corps of Eng'rs, 109 F. Suppl. 2d 30 (DC Cir. 2000). As for all impacts, NEPA demands detail so that the impacts are discussed with sufficient detail to allow the public to participate and to show that BPA has truly taken a hard look at the environmental impacts of its proposal.

14830-4 Cumulative impacts result from the combined effect of multiple activities over both space (here, a 70 mile long corridor of 150 feet in width) and time (here, the operational life of the transmission line). The analysis of these combined effects is an imperative to an informed decision-making process. Since BPA has had major transmission lines transecting states in the Pacific Northwest for decades, it should have a solid understanding as to the impacts of its proposed transmission line and how the lines cumulatively add to the degradation of the natural and built environment they transect. Yet, despite its legacy of

14830-3 Comment noted.

14830-4 Cumulative impacts are addressed in Chapter 26, Cumulative Impacts. In this chapter, BPA identifies past, present, and reasonably foreseeable actions with the potential to contribute to cumulative impacts. This chapter also describes, by resource, the cumulative impact of these actions along with the incremental impact of the proposed I-5 Project. For each resource, the EIS explains the rationale for conclusions drawn regarding the project's potential contribution to cumulative impacts. BPA believes that this approach comports with NEPA requirements for cumulative impact analyses in EISs, and the information that this chapter provides is useful to the public and, ultimately, the decision-maker.

14830-4 transmission lines, BPA presents a perfunctory, conclusory analysis that provides nothing of use to the decision-maker or the public. BPA must provide adequate support for its conclusions that the project alternatives will or will not have a cumulative impact and, the relative level of that impact. A supplemental DEIS should be prepared to provide for this necessary component, with the demanded details, of the NEPA review process.

14830-5 Before A Better Way for BPA cites examples, it must first be noted that we believe BPA's statement that "transmission lines typically have relatively small footprints" and, therefore, the project is not "expected to cumulatively contribute to any changes in existing land use in areas outside the transmission line right-of-way" is misleading. DEIS at 26-30. This transmission line has a 70 mile long by 150 foot wide footprint - encompassing almost 1,300 acres of land. Thousands of parcels of land and thousands of individuals and business will be permanently impacted by this transmission line. While the towers themselves may not have large footprints, the line in totality does. The DEIS should remove such an erroneously contention wherever it occurs (Footnote 1).

14830-6 As for some examples, Table 26-2 provides a listing of what BPA has determined to be "Reasonably Foreseeable Future Actions;" a list that represents a board array of projects for various governmental and tribal entities. For each project, a brief description is provided. BPA provides a map, Map 26-1, which denotes with colored circles where these projects generally are located. However, BPA provides no quantified or detailed analysis as to how the I-5 Corridor Reinforcement Project in combination with these projects would or would not have cumulative impacts.

The proximity of any of these projects to BPA's routing alternatives is unknown. The impacts that may arise from these projects is unknown. The reader is left to wonder if the construction of commercial or residential development project will impact wetlands, modified wildlife habitat, or increase EMF emissions. If those projects impacts are to be combined with the I-5 Corridor Reinforcement Project, then how can a cumulative impact analysis be conducted if quantified, detailed information is not provided? Rather than providing this detail, BPA's analysis contains the very generalized, non-committal statements NEPA prohibits. Much of the Cumulative Impacts Analysis provided in the DEIS simply states that past and present actions have cumulatively increased whatever impact is being addressed; that impacts are location dependent, and that future actions could contribute. With no true detail.

14830-7 For example, the cumulative impact on wetlands within the project area - from complete to partial modification - should be of utmost concern to BPA. As BPA correctly notes, past activities adversely impacted these resources. This is true as decades ago, we simply did not care if a wetland was filled to accommodate the built environment. But Washington has taken steps to protect these resources. But, even today, despite the adoption of policies and regulations that seek to protect these resources from loss, many continue to disappear from the landscape. While the "no net loss" concept serves to reduce the overall cumulative impact, most would concede that it is failing in that regard (Footnote 2). More importantly, just how have past and present actions impact wetlands with the geographical area of the project alternatives? How many acres of wetlands have been lost and what functions were lost? Without the knowledge of past and present loss, the future "cumulative" impact to the areas' wetlands cannot be fully understood.

14830-5 Comment noted. BPA believes the statements from page 26-30 of the Draft EIS that are quoted by the commenter are accurate. The footprint of a transmission line - both as it is commonly understood and as used in the EIS - refers to the area that is actually physically occupied by line facilities. This includes the area physically occupied by transmission towers, substations, access roads, and the like. Because these facilities would occupy a relatively small area, adjacent land uses would be expected to continue largely unchanged from their present uses, even with the presence of the proposed project. While no change thus would be expected, it is acknowledged that impacts to adjacent land uses could occur. These potential impacts are primarily described in Chapter 5 through 11 of the EIS.

14830-6 Comment noted. Given the large scale of the proposed project and geographic area it covers, there are a multitude of reasonably foreseeable future actions identified in Table 26-2, which includes reasonably foreseeable future actions identified at the time that the Draft EIS was published. Additional reasonably foreseeable future actions identified after Draft EIS publication are included in Table 26-3 of the Final EIS. These future actions are in various stages of the proposal phase, are frequently subject to change, and there is often very little specific information about them that is known or available. Given this situation, Section 26.3, Cumulative Impacts Analysis, presents a qualitative analysis of potential cumulative impacts. BPA believes that this approach provides a reasonable evaluation of potential cumulative impacts.

14830-7 Please see the response to Comment 14830-6 regarding quantification of impacts. BPA believes that Chapter 16, Wetlands, which is referenced and relied on in the discussion of cumulative wetland impacts in Chapter 26, Cumulative Impacts, provides reasonable and adequate information about potential project impacts to wetlands. In addition, BPA is continuing to work with the U.S. Army Corps of Engineers through the Clean Water Act Section 404 permitting process to refine information concerning wetlands in the project vicinity and potential project impacts to these wetlands.

(Footnote 1: A Better Way for BPA did not flyspeck the DEIS for each and every occurrence of this phrase. It is contained within the Recreation discussion (DEIS at 26-31)).

(Footnote 2: DEIS at 26-41 states that the "no net loss" approach greatly serves to greatly reduce the overall cumulative impact on wetlands from proposed development. A Better Way for BPA disagrees with this contention).

14830-7 In addition, as was noted by A Better Way for BPA's wetland biologist, Joseph Leyda, BPA has failed to conduct an on-site delineation and classification of impacted wetlands. Thus, the cumulative impact to wetlands within the area is not even ascertainable. While BPA has assumed the size of wetlands directly impacted (e.g., a wetland filled to accommodate a tower footing), it has failed to definitively delineate the true size of that wetland. And, without knowing the functional classification of that wetland, the cumulative impacts of its elimination cannot be known. Will the filling of a specific wetland result in a loss of wildlife habitat or a loss of storage for flood waters? Is the wetland hydrologically linked to another body of water so that its filling may "starve" the related body of its source of water? All these are unknown questions that BPA's cumulative impacts analysis does not disclose or address. Rather than perform the necessary tasks to understand the impacts - which BPA correctly notes are delineations in the field to determine extent, values, and functions - BPA sets forth general, conclusory statements that filling wetlands would have cumulative impacts. DEIS at 26-41 to 26-42.

14830-8 Lastly, while BPA points to mitigation measures it has previously proposed for impacted resources within its discussion of some of the impacted resources (e.g. Vegetation notes mitigation measures would result in the project only contributing in a minor way to cumulative impacts (DEIS at 26-43); in contrast, Wetlands acknowledges that the effectiveness of mitigation to compensate for' impacts is uncertain (DEIS at 26-42)), it fails identify how these measures would or would not address the issue of cumulative impact. In other words, the mitigation BPA is generally proposing for these resources in other chapters of the DEIS may not be effective to address the cumulative impact of past, present, and future actions.

Conclusion

14830-9 Cumulative impacts are an important component in the environmental assessment process. While A Better Way for BPA acknowledges a cumulative impacts analysis is a complex task, NEPA still requires BPA to perform one. And, that analysis must provide useful, detailed, quantitative information to the end user. DEIS Chapter 26 Cumulative Impacts is lacking in this regard. BPA should prepare a Supplemental DEIS that provides a comprehensive disclosure and analysis of the cumulative environmental impacts that would arise from all reasonable alternatives which, necessary, includes those A Better Way for BPA has provided comments in regards to that they were erroneously excluded from DEIS review. The development of southwest Washington and northwest Oregon cannot continue of a piecemeal, permit-by-permit approach - this is why cumulative impacts must be reviewed. BPA's cumulative impact analysis cannot view its corridor as anything other than a single project from mile 1 to mile 70 - the total impact for the life of the project must be considered.

14830-8 Please see the response to Comment 14830-7.

14830-9 Comment noted. Please see the responses to Comments 14830-4 through 14830-7.

14830-9 As BPA is well aware, the placement of its transmission line will impact thousands of individuals and alter southwestern Washington as it traverses the landscape. Careful planning, analysis, and disclosure will ensure that BPA's ultimate choice is the best alternative to achieve the project's purpose and need while respecting the communities and environment of the area. BPA must prepare a supplemental DEIS to address this inadequacy.

Thank you for your consideration of these comments.

Very truly yours,

BRICKLIN & NEWMAN, LLP

David A. Bricklin
Julie K. Ainsworth-Taylor
Attorneys for A Better Way for BPA

cc: Client

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14831

From: noreply@bpa.gov
Sent: Sunday, March 24, 2013 10:46 PM
Subject: BPA I-5 Comment Submission Confirmation

Follow Up Flag: Follow up
Flag Status: Completed

Thank you for submitting your comments on the Bonneville Power Administration's draft environmental impact statement (EIS) for the I-5 Corridor Reinforcement Project. All comments submitted between November 13, 2013 and noon on March 25, 2013 will be responded to in the final EIS, which is expected in 2014.

A copy of your information, as submitted using our online form, is included below for your records. If you provided your contact information and submitted a question we can answer at this time, you will receive a response. Your contact information will also be added to our project mailing list. All comments including names will be processed and then posted on BPA's website at www.bpa.gov/go/i-5

Sincerely,
Bonneville Power Administration

Name: Rodney I. Smith
Organization:
E-mail:
Phone:
Address:

Group type: Private citizen

Please ADD me to the mailing list.

Comment:

14831-1 We agree with the Washington State Department of Natural Resources as far as route adjustments for this project. Specifically: Issue 2: Transmission Line location near property boundaries Summary: The identified alternatives locate the corridor along several DNR managed property lines. Though this is best for DNR management, adjacent homeowners along said line have expressed concern. Moving the line away from the edge for example 300'-500' interior would alleviate some of the landowners concerns. Please note that DNR is not opposed to a route adjustment for any of the alternatives that moves the line interior to state trust land by 300-500' to avoid impacts on adjacent residential properties as long as the impacts to DNR's land use and management are properly mitigated. This will likely require including these additional buffers in the right-of-way and providing compensation for this additional land. If the land is purchased in fee, the title needs to be encumbered by a deed restriction, a conservation easement, or other mechanism to ensure the property remains undeveloped. Reference: Chapter 3 section 3.12 Mitigation Measures; Table 3.2 Mitigation measures as part of the project; Chapter 5 Land; Appendix A- maps A-D; DEIS maps 5-1A, 5-1B, 5-1C, and 5-1D. Recommended mitigation: BPA will mitigate these impacts by compensating DNR for the additional width of land between the

14831-2 edge of the corridor and DNR's property boundary where the transmission line is moved in and away from adjacent existing private homes. Compensation can either be by purchasing the strip in fee or by another

1

1 of 2

14831-1 Please see the response to Comment 14665-10.

14831-2 Please see the response to Comment 14665-10.

14831

14831-2 mechanism. If the land is purchased in fee the title will be encumbered by a deed restriction, a conservation easement, or other mechanism to ensure the property remains undeveloped. Any areas where an alternative location requiring LESS mitigation is a more logical decision. Neighbors and DNR agree that adjustments will better serve private property owners and the state. We urge BPA to recognize this and act responsibly when it comes to protecting the environment. Thank you. Rod Smith

Attachment

2 of 75

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark - Commissioner of Public Lands

14631

Caring for
your natural resources
...now and forever

March 18, 2013

Nancy Wittpenn, Environmental Protection Specialist
Bonneville Power Administration
905 11th Avenue NE
Portland, OR 97208

Subject: DNR Comments on the I-5 Corridor Reinforcement Project DEIS

Dear Ms. Wittpenn:

Thank you for the opportunity to review and comment on Bonneville Power Administration's (BPA) I-5 Corridor Reinforcement Project (I-5 Project) Draft Environmental Impact Statement (DEIS).

Lands managed by the Washington State Department of Natural Resources (DNR) already are encumbered by approximately 600 miles of BPA transmission corridor and 500 miles of access roads. Granting an easement for the I-5 Project would be the fourth BPA easement granted on DNR-managed lands since 2009. Although the National Environmental Policy Act (NEPA) process is project-specific, DNR is concerned with the cumulative and ongoing addition of new lines and expansion of existing lines on DNR-managed lands.

DNR-managed lands are likely to be severely impacted by the I-5 Project. Like many private landowners, DNR has major concerns with the project and is recommending mitigation to offset unavoidable impacts. DNR is also requesting additional analysis. DNR's attached comments focus on the following themes related to DNR's proprietary and regulatory responsibilities:

(1) trust land management and impacts to the use of DNR-managed lands (1a-1j),
(2) geologic hazards,
(3) local economics including timber and recreation,
(4) cultural resources,
(5) forest practices,
(6) forestry riparian easements,
(7) protection from wildfire,
(8) special lands and special status species, and
(9) accuracy of GIS data for Environmental Impact Statement (EIS) analysis.

1-1631

Under each theme you will find a series of issues. If applicable, each issue is broken down into a summary, references to the DEIS, recommended mitigation, recommended additional analysis, and recommended changes. A table is provided in Attachment 2 for quick reference to the themes and issues, and the recommended mitigation and analysis.

Several of the issues identified in the attachment involve "compensatory mitigation" for impacts to DNR's current or future land use, as identified in the DEIS's general approach to mitigating adverse impacts to the human and natural environment (Section 3.12 Mitigation Measures, page 3-17). Others seek commitments from BPA, in the EIS, to processes for analyzing and mitigating impacts as they are identified through ongoing refinements to the proposed transmission line location and related ground- and water-disturbing activities.

DNR's goals are to ensure that: (1) BPA prepares an EIS that can be adopted under the State Environmental Policy Act (SEPA) for use by all state and local agency actions, including the potential granting of an easement on DNR-managed lands and any other DNR actions; and (2) the NEPA process provides a public input opportunity as required under SEPA. Impact analysis and coordination of SEPA and NEPA requirements are tied to SEPA laws and procedures codified in Chapter 43.21C RCW State Environmental Policy Act; Chapter 197-11 WAC SEPA Rules; and NEPA Regulations 40 CFR. The EIS must analyze the significant impacts of the proposal to the SEPA defined natural and built environment (WAC 197-11-444). In some instances, what is required is detailed in substantive standards, policies, or plans. All of DNR's issues must be mitigated or dealt with prior to the granting of an easement.

The project area includes state lands covered by DNR's State Uplands habitat conservation plan (HCP) and related Incidental Take Permits, and non-federal lands covered by DNR's Forest Practices Habitat Conservation Plan. In addition to evaluating impacts on covered species as specified in 1b (DNR managed lands) and Forest Practices (all non-federal lands), BPA should initiate consultation with the U.S. Fish and Wildlife Service and NOAA Fisheries to determine whether the project will adversely affect listed threatened and endangered species covered by the State Uplands HCP and the Forest Practices HCP.

Since BPA initiated scoping on the McNary-John Day project four years ago, DNR has been clear on several principles for granting easements: (1) disclosure of the environmental impacts and recommended mitigation measures in the NEPA and SEPA documents for impacts to the human environment under NEPA, and the "natural" and "built" elements of the environment under SEPA; (2) no net loss of trust land productivity; (3) mitigation for unavoidable impacts;

1 of 15

14831

and (4) minimization of short- and long-term liability and regulatory risk. These principles are reflected in DNR's comments and recommendations.

Over the last four years, DNR and BPA have increased their knowledge of each other's unique responsibilities and have made progress in improving communications and the management of 800 existing BPA easements that traverse 600 miles and impact 10,000 acres of DNR-managed lands. DNR hopes that the positive direction of our working relationship will continue while we work through impacts resulting from the I-5 Corridor Reinforcement Project.

DNR SEPA Specialist Dave Dietzman is available to assist you with additional information regarding SEPA/NEPA coordination and compliance, at your convenience.

Sincerely,

L. S. Young

Leonard Young
Department Supervisor

Enclosures (6)

cc: Stephen Posner, Washington State Energy Facility Site Evaluation Council

5 of 75

Washington State Department of Natural Resources Comments on Bonneville Power Administration's I-5 Draft Environmental Impact Statement - November 2012

Trust land management and impacts to the use of DNR managed lands

1a. Roads

Issue 1: Road standards
Summary: DNR submitted Scoping Comments that requested BPA meet Forest Practice Road Maintenance and Abandonment Plan (RMAP) standards for all new road construction. BPA recommended mitigation measures include meeting Washington's Forest and Fish Law or like standard for new construction (Chapter 15.2.8 page 15-23). However, the Forest and Fish Law is an inaccurate reference (See Recommended Editing Changes, item 1.). BPA's intent is unclear for meeting the requirements of Washington State's Forest Practices Act and Rules.
Reference: Chapter 3 Project Components, and Construction, Operation and Maintenance Activities, pages 3-14 and 3-15; Chapter 15 Water, pages 15-1 through 15-24; Chapter 16 Wetlands, pages 16-1 through 16-19
Recommended mitigation: Based on the recommended analysis below, identify and recommend what additional mitigation should be required for this project to meet the scoping comment request.
Recommended analysis: BPA needs to compare the differences between the Washington Forest Practice RMAP standards and the 1987 BPA access road planning and design manual road standards. The comparison should evaluate if the 1987 standards meet or exceed forest practices standards that serve to mitigate for impacts associated with road construction and maintenance.

Issue 2: Avoid sediment delivery from access road surfaces
Summary: In Western Washington, to avoid delivery of sediment all access roads should have a durable clean lift of aggregate. The DEIS referred to graveling roads "where soil is unstable", which does not ensure that road use will not deliver sediment in a way that impacts water quality.
Reference: Chapter 3 Project Components, and Construction, Operation and Maintenance Activities, pages 3-14 and 3-15; Chapter 15 Water, pages 15-1 through 15-24; Chapter 16 Wetlands, pages 16-1 through 16-19
Recommended mitigation: Based on DNR's experience, at a minimum, to mitigate for the potential for excessive road surface wear that could lead to sediment delivery, a minimum of 40 cubic yards per station (100') of rock will be applied to all new and reconstructed access roads associated with this project on DNR managed trust land. Additional rock will be applied as conditions and anticipated use dictate.

Issue 3: Structures and culverts on stream crossings
Summary: The DEIS states "*Where new roads cross year around, seasonal, or fish streams, open bottomed culverts or bridges would be needed*". Based on DNR's experience open bottom culverts or arches on small order (typically non-fish bearing) streams tend to have more frequent maintenance issues and need for repair than a traditional fully enclosed culvert. The Washington Department of Fish and Wildlife (WDFW) has published guidelines for structures allowing fish passage. *Design of Road Culverts for Fish Passage* (linked below) is a work in progress. It was first published in 1999, and it has been

updated several times since then.
Reference: : Chapter 3 Project Components, and Construction, Operation and Maintenance Activities, pages 3-14, page 3-15 , and page 3-26.
Recommended mitigation: Any structure installed on any stream regardless of fish presence will be appropriately sized based on hydraulic calculations similar to those in the WDFW manual for 100-year flood plus debris events: Design of Road Culverts for Fish Passage http://wdfw.wa.gov/publications/00049/. BPA will use appropriately sized round culverts on non-fish bearing streams and open bottom culverts or bridges for crossings on fish bearing streams.

Issue 4: Drain dips and water bars
Summary: It is unclear on what type of roads and at what road gradients "*drain dips or water bars*" will be installed. Water bars can be an effective Best Management Practice (BMP) or negatively, a drainage structure that increases log and equipment transportation costs due to slower speeds and damage to log trucks. Drain dips do not provide adequate mitigation "*where access roads cross drainages that carry seasonal runoff,*" nor ford crossings which essentially put equipment and the resulting impacts to fish and water quality directly into the stream. Neither are recognized drainage structures in Western Washington that serve to mitigate for impacts in these areas.
Reference: Chapter 3 Project Components, and Construction, Operation and Maintenance Activities, section 3-9 pages 3-14, and 3-15.
Recommended mitigation: Avoid installing drain dips, fords or water bars on access roads. Instead install cross drain culverts and associated ditches at a frequency to outlet water to the forest floor while not increasing erosion. BPA should utilize guidelines in WAC 222-24-040 Water crossing structures (3) and (4): http://apps.leg.wa.gov/wac/default.aspx?cite=222-24-040
If water bars are proposed for installation then BPA needs to compensate for the change in land use from accepted standards and the resulting economic impact due to log transportation costs and the potential damage to log and equipment trucks in comparison to installing culverts.

Issue 5: Roads within the transmission line corridor
Summary: Existing BPA rights-of-way have a large number of roads built within and that run parallel to the right-of-way and transmission line corridor, which facilitates unauthorized use, the spread of noxious weeds, and sediment delivery to streams. Some of these temporary construction roads are kept open, maintained and used for maintenance activities but many of them are not properly maintained nor properly abandoned to prevent use. The building of roads between towers to facilitate construction activities was not mentioned in the DEIS.
Reference: Chapter 3 Project Components, and Construction, Operation and Maintenance Activities page 3-24.
Recommended mitigation: Temporary construction roads that are parallel to and within the right-of-way corridor will be avoided. If temporary roads are needed, then BPA will develop and implement BMPs such as: limit the number to only critical roads; allow roads to be used only during the dry season (generally June-October); require vehicle wheels to be clear of noxious weeds when entering the roads; scarify and re-vegetate the road immediately upon completion of use; and install an access barrier of earth or other natural onsite material to prevent unauthorized use.
Recommended changes: Incorporate a discussion of the building of temporary construction roads and the need to mitigate impacts from temporary construction roads.

Issue 6: Miscellaneous Transportation Comments

14831

Summary: Numerous miles of existing roads on DNR lands will be improved. There are tables and maps that identify the roads and summarize the miles, but not a general discussion of the type of road improvements that are needed and hence there is not a thorough understanding of road improvement impacts associated with the project.
Bridges on private lands and forest land may not have the same load capacity as a County bridge, nor would they have the same frequency of inspection.
Existing and new gates installed with the project will help control unauthorized use, however there may be multiple landowners with legal access who may be affected.
Reference: Chapter 3 Project Components, and Construction, Operation and Maintenance Activities Table 3-2 pages 3-22, 3-23 and 3-24; Chapter 12 Transportation page 12-5.
Recommended mitigation:
(1) Specific minimum road improvement standards will be developed and incorporated as mitigation in the EIS, or in subsequent agreements with landowners such as; clearing limits, brushing limits, aggregate needs, and curve widening requirements.
(2) All bridges on heavy equipment transportation routes will be inspected and certified they have the working load capacity to handle construction equipment and insure the safety of workers and the public. BPA will install new structures if bridges have been compromised or do not meet certification for the anticipated heavy equipment.
(3) BPA will install gates and a lock box that can accommodate the required number of padlocks to meet the access need.
Recommended changes: Provide a general discussion of the type of road improvements that could be needed, an acknowledgement of the potential for road improvement impacts and the need to mitigate.

1b. Socioeconomic and Land Use impacts to DNR trust land management

Issue 1: Quantify and analyze the socioeconomic impact on long term trust revenue due to the proposed changes in land use that will likely interfere with trust management objectives.
Summary: The DEIS provides estimates of the value of timber to be cleared from DNR managed lands in Table 11-5 and from private lands in Table 11-7, for each alternative and option. The DEIS also provides estimates, in net present value terms, of foregone revenue from DNR-managed lands in Table 11-6 and for private lands in Table 11-8, for each alternative and option. However, the assumptions behind these calculations are not explicitly defined. Estimating the revenues realized from the immediate harvest of timber is a function of assumptions about how many thousand board feet (MBF) of merchantable timber (by species and sort) can be harvested from the project area, and how much each MBF of timber is worth (the stumpage price). Estimating the lifetime, foregone revenues from land conversion is a function of these same assumptions, plus how many acres are affected, a rate of inflation, a real growth rate for the stumpage price, a discount rate, the age classes of existing timber, and an assumption about rotation age. Of all of these assumptions, only two are explicitly stated in the DEIS: a discount rate of 4 percent (page 11-19), and estimates of affected acres by alternative and option (Table 5-3). There is not enough information presented or disclosed to determine how the value of the timber cleared from the project area and the net present value of foregone future timber harvests in the project area were calculated. It is also not clear how the value of timber reproduction (trees of age class younger than merchantable timber rotation age) is accounted for and if it is included in either valuation, as would be appropriate.
Reference: Chapter 11, tables 11-2 (page 11-5), 11-5 (page 11-30), 11-6 (page 11-31), 11-7 (page 11-

8 of 75

14831

32), and 11-8 (page 11-33).
Recommended analysis: At a minimum, an analysis of impacts to the local economy caused by impacts to the timber industry should include estimates of: (1) The revenues to be realized in the short-term due to immediate harvesting of timber from the proposed right-of-way; (2) The revenues over the life of the project that will be foregone due to conversion of timberland to non-timber production on the proposed right-of-way.

Issue 2: Transmission Line location near property boundaries
Summary: The identified alternatives locate the corridor along several DNR managed property lines. Though this is best for DNR management, adjacent homeowners along said line have expressed concern. Moving the line away from the edge for example 300'-500' interior would alleviate some of the landowners concerns. Please note that DNR is not opposed to a route adjustment for any of the alternatives that moves the line interior to state trust land by 300-500' to avoid impacts on adjacent residential properties as long as the impacts to DNR's land use and management are properly mitigated. This will likely require including these additional buffers in the right-of-way and providing compensation for this additional land. If the land is purchased in fee, the title needs to be encumbered by a deed restriction, a conservation easement, or other mechanism to ensure the property remains undeveloped.
Reference: Chapter 3 section 3.12 Mitigation Measures; Table 3.2 Mitigation measures as part of the project; Chapter 5 Land; Appendix A- maps A-D; DEIS maps 5-1A, 5-1B, 5-1C, and 5-1D.
Recommended mitigation: BPA will mitigate these impacts by compensating DNR for the additional width of land between the edge of the corridor and DNR's property boundary where the transmission line is moved in and away from adjacent existing private homes. Compensation can either be by purchasing the strip in fee or by another mechanism. If the land is purchased in fee the title will be encumbered by a deed restriction, a conservation easement, or other mechanism to ensure the property remains undeveloped.

1c. Uplands HCP

Issue 1: Uplands Habitat Conservation Plan (HCP) Integrity
Summary: DNR is a unique land manager due to the quantity of acres and diversity of locations and uses, most of which are covered by the DNR Final HCP (1997), HCP Final EIS (1996) and related Incidental Take Permits (ITPs) issued by the Secretary of the Interior and Secretary of Commerce under Section 10 of the Endangered Species Act (ESA). Under the current proposal, vegetation removal will increase within habitat of federal- or state-listed species covered by the Uplands HCP, which poses a risk to DNR with respect to its ITPs. The I-5 project if not adequately mitigated will add to the cumulative impact of similar projects and expansions of BPA transmission lines across DNR managed lands. Removal of acres covered by the Uplands HCP will have a detrimental impact on the species and habitats the conservation strategies are designed to protect. If BPA's proposal increases "incidental take" of covered species, DNR will object to it or require BPA to obtain its own ITP for its activities. The only references to the Department's Uplands HCP are found in Chapter 28 Substantive Standards and in Appendix A. The analysis in the DEIS of impacts on listed species that are covered by DNR's Final HCP is insufficient under NEPA and will not allow DNR to adopt BPA's EIS under SEPA if not substantially improved. BPA should review DNR's Final HCP, Final EIS and related Incidental Take Permits for a complete listing of species that will require additional analysis. It is insufficient to assume that other analysis or proposed mitigations for this project will ensure the integrity of the DNR Uplands

9 of 75

14831

HCP. Mitigation sequencing (Avoid, Minimize, and Compensate) similar to the process cited in Chapter 27.10 "Clean Water Act" could be followed.

Reference: Summary, section S.3.11.2 Impacts Common to Action Alternatives, page S-47; Chapter 15 Water, pages 15-5 through 15-7; Chapter 17 Vegetation page 17-5; Chapter 18 Wildlife section 18.1.2.8 page 18-9; Chapter 18 Wildlife page 18-64; Chapter 27 Consultation, Review and Permit Requirements page 27-1,2; and Chapter 28 State Substantive Standards page 28-1.

Recommended mitigation: Impacts to species listed under DNR's Uplands HCP or to habitat that is currently providing protection per DNR's Uplands HCP commitments will be analyzed by BPA through a formal consultation with the US Fish and Wildlife Service and National Oceanic & Atmospheric Administration/Fisheries (NOAA Fisheries). Mitigation measures will be recommended in BPA's I-5 EIS for the impacts identified through the consultation. DNR believes that impacts should be mitigated at the following **minimum** ratios for replacement acreage (e.g.., if the direct impact is 1 acre of riparian buffer permanently removed, the compensation replacement acreage provided should be 1 acre) provided that the replacement land mitigates for the ecological functions equal to those lost from the removal or deterioration of habitat:

1:1 All permanent impacts

0.5:1 Temporary impacts, e.g., staging or construction areas

In addition to restoration efforts on behalf of BPA, impacts that result from temporary staging and construction areas should also be mitigated at a replacement ratio (0.5:1) that compensates for the short- and long-term impacts to the ecological functions equal to those lost that are currently provided through DNR's Upland HCP conservation measures.

BPA and DNR together will determine the location of replacement land.

Recommended analysis: BPA needs to provide an analysis of the impacts to listed threatened and endangered species and to the integrity of DNR's Uplands HCP. Additionally, DNR believes that BPA is required to initiate consultation under Section 7 of the ESA with U.S. Fish & Wildlife Service and/or National Oceanic & Atmospheric Administration/Fisheries (NOAA Fisheries) to demonstrate and document that the construction of a new transmission line will not adversely affect listed species that are covered under DNR's Uplands HCP. As a part of that consultation, BPA should provide information sufficient for USFWS and NOAA Fisheries to ascertain whether the proposed transmission project will interfere with any of DNR's obligations under its Uplands HCP. The results of the consultation should be published in the FEIS and, if conservation measures are identified as a result of consultation, these measures should be included as mitigation in the FEIS. Additionally, USFWS section 10 representatives and appropriate DNR representatives familiar with the Uplands HCP should be involved in any discussion with USFWS and/or NOAA Fisheries regarding DNR managed lands and recommended mitigation measures.

Recommended changes: Well-functioning riparian ecosystems require retention of riparian buffers. These buffers supply critical function by: intercepting sediments flowing from upland human or natural caused disturbances; stabilizing stream banks, providing for shade to keep water temperatures cool; and contributing down wood for increased stream structure. Impacts to any stream crossing with mature shrubs or trees providing shade should be rated as high due to the removal of vegetation that may affect water quality and ecological function.

Issue 2: The duration of impacts

Summary: BPA states the life of the project is 50 years and all maintenance actions in the future originate from this project; economic analysis is completed for at least 50-year periods; easements may be perpetual in duration and hence indicate BPA acknowledges the project and impacts will extend over the

10 of 75

life of the project. However, the DEIS states in Chapter 3, section 3.12 Mitigation Measures *"All mitigation measures included as part of the project would be implemented prior to, during, or immediately after construction."*. DNR experience with managing for transmission lines demonstrates substantial environmental impact issues for decades beyond construction, especially with respect to unauthorized use, vegetation management including control of noxious weeds, management of danger trees and other potential obstructions and restrictions to the management of DNR managed lands along the transmission line, roads and impacts to water and fish, geologic hazards, and protection from wildfire.
Reference: Chapter 3 Project Components and Construction, Operation, and Maintenance Activities section 3.12 Mitigation Measures, page 3-17; Chapter 26 Cumulative Impacts, pages 26-1 through 26-48.
Recommended mitigation: Mitigation will be applied over the life of the project/easement as appropriate to address impacts that are reasonably likely occur over the life of the project.
Recommended changes: BPA needs to acknowledge the potential for impacts to the human environment under NEPA and the elements of the natural and built environment under SEPA that are reasonably likely to occur into the future for at least a 50-year period by adjusting the language on page 3-17 that limits the duration for implementing the mitigation measures in Table 3-2 to immediately following the construction. Long term mitigation beyond "*immediately after construction*" should apply for any for any operations and maintenance activities that have potential for longer term impacts to the resources analyzed.

Issue 3: Existing legacy and green tree retention
Summary: Transmission corridors do not contribute to the late successional habitats or species that the Uplands HCP and conservation strategies are designed to protect. Ecological functions are disrupted by further fragmenting or severing habitats or permanently removing mature legacy and green tree retention clumps designed to provide transitions between early plantations and late successional stands. The retention clumps and individuals exist post-harvest and are an important part of DNR harvest impact mitigation and are not readily replaceable if permanently removed. The removal of retention clumps and/or legacy trees will have a detrimental impact on the species and habitats the conservation strategies are designed to protect, as well as on the overall integrity of the Uplands HCP.
Reference: Chapter 26 Cumulative Impacts.
Recommended mitigation: Retention clumps and legacy trees permanently removed will be mitigated by compensating DNR for the ecological function and the monetary value of the trees removed. At a minimum, the total of 8 trees per acre (five live trees and 3 snags) should be compensated and should meet the minimum characteristics identified in the DNR's Final HCP 1997 page IV. 157.
Recommended changes: The EIS should incorporate the discussion regarding the mitigation of impacts provided by legacy trees and retention clumps in DNR's Uplands HCP and FEIS and the conservation strategies.(DNR HCP DEIS 1996, pages 4-487-488 and DNR Final HCP 1997, page IV. 157) No additional analysis is required providing the impacts from the removal of legacy trees and retention clumps are acknowledged in the FEIS and mitigation provided as stated above.

1d. Vegetation management (including danger trees)

Issue 1: Danger trees
Summary: DNR requested in the Scoping Comments that BPA develop and model an estimation of the amount and location of danger trees that would require removal; and to identify areas outside of the transmission line corridor width that would require low-growing vegetation to be maintained similar to

within the transmission line corridor. This would include areas with trees upslope of the line, diseased areas, areas with undesirable species, and other existing conditions that will be considered a hazard or concern once the transmission line is built. This was not presented in the DEIS.
Reference: Summary, section S.3.12.2 pages S-11, S-14; table 2-1; Chapter 3 Project Components, and Construction, Operation and Maintenance Activities, section 3.11 pages 3-16; Chapter 5 Land, section 5.2.2.1 page 5-11; section 5.2.2.2 page 5-14; Chapter 11 Socioeconomics, section11.2.2.5 pages 11-21, and 11-22.
Recommended mitigation: See recommended mitigation under 1e. below.
Recommended analysis: See recommended analysis under 1e. below.

Issue 2: Other vegetation management
Summary: The DEIS does not acknowledge the vast majority of BPA's vegetation control is accomplished using herbicides. Based on DNR's experience with similar BPA installations, vegetation control is underfunded and cannot be expected to control vegetation on all lines every year. Control and eradication should be prioritized. The BPA Transmission System Vegetative Management Program Final EIS does not accurately consider these management realities and is therefore unreliable for anticipating or analyzing impacts from the site-specific applications of herbicides.
Reference: Summary, section S.3.6.2 "Impacts common to action alternatives" page S-28.
Recommended mitigation: To avoid colonization of the I-5 corridor by invasive species, BPA will include a mitigation measure to ensure funding of I-5 corridor vegetation control commensurate with the predictable weed problem.
Recommended analysis: Analyze the probable extent of the need for vegetation management and control and eradication of noxious invasive weeds using existing corridors in the area that are similar to and representative of the proposed corridor.

1e. Restrictions, constraints & prohibitions including impacts to current and future allowable uses both inside and outside the right-of-way

Issue 1: Extended right-of-ways/corridors
Summary: DNR's experience has shown that BPA's proposal to clear to a safety backline in some areas creates an unmanageable timber stand and further degrades DNRs ability to manage the stand as part of the Uplands HCP. In order to mitigate these impacts to DNR's land use, BPA needs to be responsible for the management of areas that require and extend the corridor to create a safety backline including those that have naturally occurring stand health issues such as: root rot or animal damage; stands managed primarily for hardwoods; and areas such as wetlands and riparian areas.
Reference: Chapter 3 Project Components, and Construction, Operation and Maintenance Activities, section 3.6 pages 3-10, section 3.10 page 3-15, and 3-16, section 3.11 page 3-16; Chapter 5 Land, section 5.2.2.1 page 5-11; section 5.2.2.2 pages 5-14, 5-22. Chapter 11 Socioeconomics, section 11.2.2.5 page 11-21, 11-22.
Recommended mitigation: In order for mitigation to cover all impacts to DNR's land use for the full corridor width, mitigation needs to include those areas outside the typical 150' width that it will need to control to protect its transmission line including extended distances of clear safe backlines.
Recommended analysis: BPA should analyze the predicted environmental impacts to DNR's land use, forest management, and conservation strategies that will likely result from the need to control the

vegetation within 200' (or tree height) of the transmission line corridor edge.

Issue 2: Impacts to harvest operations not clearly identified in the DEIS
Summary: Section 8.2.2.1 (page 8-4) states "*person should never put themselves or any object higher than 14 feet above the ground*" under a transmission line. The economic impact to DNR for what timber haul roads would be impacted by this requirement was not identified. It is possible that the sag of transmission lines could make some existing timber haul roads unsafe for the operation of log trucks or transport of harvest equipment;
Section 11.2.2.7 (page 11-24) states *"The long-term decreases in revenue derived from timber production would occur in three ways: ...Increased costs of managing private timberland near the new right-of-way, resulting, for example, from project-related restrictions on timber-harvest techniques, such as cable logging, or greater risks to safety from logging near the right-of-way"*. The DEIS has not described in any detail the setback distance or vertical offset distance of guyline cables to the right-of-way corridor. Further there is no mention of a potential of reconstructing existing landings outside of the right of way due to harvest restriction nor the cost associated with such a need.
Reference: Chapter 8 Electric and Magnetic Fields section 8.2.2.1 page 8-4, Chapter 11 Socioeconomics section 11.2.2.7 page 11-24.
Recommended mitigation: Landowners will be compensated for the long-term economic impacts of harvest restrictions from inside or outside of the right-of-way including those involving new timber haul roads, reconstruction of landings and avoiding guyline cables. Compensation should include: cost recovery for staff time; permitting; construction; materials; and abandonment costs.
Recommended analysis: BPA needs to analyze the impacts of harvest restrictions including what the long term economic impacts will be to forest landowners that will have harvest restrictions due to need to construct new timber haul roads, new landings and respecting guyline setbacks. This impact is different than a bifurcation calculation that would be completed in a typical appraisal.
Recommended changes:
(1) Include a discussion of the potential need to reconstruct existing landings outside of the right-of-way, to construct new roads to avoid log truck traffic under transmission lines, and to operate around the setback distance or vertical offset distance of guyline cables to the right-of-way corridor.
(2) BPA should describe in detail or provide a method to determine the setback distance or vertical offset distance of guyline cables to the right-of-way corridor.

Issue 3: Temporary use areas outside the right-of-way
Summary: BPA leaves the location of pulling and tensioning sites and staging areas up to its contractors to define after the easement is signed (Chapter 3, section 3.10 Staging Areas, page 3-15.) Many times these are located on landowner sites outside the right-of-way. All use of state land, temporary and permanent, needs to be defined in order to fully evaluate the impacts of the proposal. This would include pulling and tensioning sites, staging areas, and other temporary use areas including helicopter landings.
Reference: Chapter 3 Project Components and Construction, Operation, and Maintenance Activities, Table 3-2 and sections 3.6 pages 3-10 and 3-11,and section 3.10 pages 3-15and 3-16
Recommended mitigation:
(1) Pulling and tensioning sites, staging areas, and other offsite temporary use and disturbance locations on DNR managed lands will be reviewed and mitigation identified.
(2) Similar to mitigation proposed for cultural resources on Table 3-2*: "Plan for survey and review as needed of additional disturbance areas not identified during the NEPA process (e.g., staging areas*

stringing and pulling sites, guard structure areas, etc.)", BPA will identify and mitigate for impacts to temporary use and disturbance areas on DNR managed lands outside the right-of-way consistent with mitigation measures in the DEIS as a part of this project and the recommended mitigation measures for the resources identified in the DEIS analysis.

1e.i. Wind power

Issue: Potential Wind Power Locations
Summary: There is some limited information about wind power potential in the document and about proposed mitigation for impacts to potential wind power sites. There are a number of high wind energy sites in the area that will be affected by the proposal. However BPA does not analyze impacts to lost wind power opportunities on DNR managed lands in general and the impact of the project to potential wind power in the Yacolt Burn State Forest. This is an unavoidable impact to DNR's land use resulting from certain alternatives that cannot be mitigated apart from DNR seeking monetary compensation for these costs. There is a potential impact to the potential placement of 17 wind tower placements in the East Alternative along segment "O" in Sections 22, 26, 27 & 34, T03N, R04E and Section 2, T02N, R04E. There is a potential impact to the potential placement of 8 wind towers along the Central Alternative near segment "P" in Sections 1, 2, & 13, T03N, R03E. Lastly, there is a potential impact to the potential placement of 7 wind towers in the Central Alternative near segment "30" in Sections 22, 25 & 26, T04N, R03E.
Reference: Chapter 4 Proposed action and alternatives section 4.7.2.2 page 4-24; Chapter 11 Socioeconomics, section 11.2.8 page 11-45.
Recommended mitigation: For all the alternative segments noted in the summary above, commit to mitigation for the impacts to DNR's land use in the form of compensation for increased wind power development costs and for reimbursement for losses of the State's ability to generate revenue from these sites.
Recommended analysis: Include an analysis of the impacts to wind power development that are reasonably likely to occur from locating the transmission line in the areas identified above.

1f. DNR trust land management transfer parcels and transactions

Issue: Land Use impacts to DNR's reasonably foreseeable land transactions.
Summary: The DEIS has not analyzed impacts to DNR's ongoing land transactions necessary to maximize a productive land portfolio that includes the potential redistribution of lands based on current or future opportunities. In addition to a market appraisal, there is little discussion in the DEIS or measures indicating how compensation will be established in cases where the landowner suffers a loss of value due to severance, restricted use or negative impacts of the remaining property. These lost values of ownership and use are not always captured by a "market" appraisal.
The current land use is not always the highest and best use. Due to the nature of DNR's business model, some trust lands, though vacant and growing trees, will convert to other uses such as residential home sites based on zoning, location, and/or other development attributes. A transmission line is incompatible with some other uses. The socioeconomics section in Appendix A omits any discussion regarding loss of revenue from the sale or transfer of trust lands encumbered by or near the BPA right-of-way. In some cases the State's trust land's future marketability will be negatively impacted by the BPA presence.

14831

Reference: Summary, section S.3.7 pages S-30 through S-35; Chapter 3 Project Components and Construction, Operation and Maintenance Activities, Table 3-2 pages 3-22 through 3-28; Chapter 5 Land, section 5.2 pages 5-9 through 5-38; Chapter 11 Socioeconomics, section 11-1 pages 11-1 through 11-46 ; Appendix A, section A.2.1 Land Use, Table A-4 Land Use on WDNR Land in the Project Area (Acres), section A.2.3 Socioeconomics.

Recommended mitigation:

(1) BPA will mitigate the impacts to DNR's future ability to transition lands or compensate loss of reasonably foreseeable future economic opportunities both on and off the right-of-way including where the easement changed other uses of some properties as a result of the transmission lines (See 11.1.5), e.g., creates incompatible uses such as the conversion of rural residential properties to non-residential uses.

(2) BPA will identify mitigation measures for negative socioeconomic impacts due to loss of current land use, for example community values as outlined in section 11.1.8. BPA will identify mitigation measures for negative impacts due to loss of community values as outlined in 11.1.8.

Recommended analysis:

(1) Include information and analysis on zoning and allowable uses, not just current use that will be impacted by the project. Include discussion on impacts to rural residential properties for all categories (5.2.2.1 through 5.2.7.5)

(2) Zoning should be included with an analysis on the impact of the project on residentially developable land.

Recommended changes:

(1) Rural residential should be defined under typical zoning ordinances.

(2) Define categories according to zoning and provide a discussion concerning allowable uses within each zoning category; and a table with acres per zoning category.

1f.i. Potential Camas school site

Issue: Potential Camas school site on DNR managed trust land

Summary: A DNR managed trust parcel in Township 2N, Range 3E, Section 22 under segment 43 (directly east of Vancouver) has been identified as a potential school site for the Camas School District as part of the 2007 Washington State Legislature report "Potential School Site State Trust Land Study: Report to the Legislature". Segment 43 would bifurcate the parcel making it unusable for Camas School District.

Reference: Chapter 5 Land and Chapter 11 Socioeconomics.

Recommended mitigation: If segment 43 is included in a final design, BPA should follow mitigation sequencing (avoid, minimize, compensate) for potential impacts to the parcel. BPA should: Avoid the parcel; minimize by moving tower and corridor locations to the edges of the parcel; replace the parcel for like characteristics suitable for the Camas School District.

1f.ii. Casey Road Substation Site

Issue 1: General comments for the Casey Road property and access roads

Summary: The Casey Road property and access roads are heavily utilized by informal recreation users and local community members. The addition of controlled access points (gates) will impact these uses.

15 of 75

DNR considers the potential paving of the access road a further encumbrance to DNR management. DNR's experience has shown paved roads that are not built to a county road standard typically deteriorate quickly under log haul operations and also are more costly to maintain over time.
Reference: Chapter 5 Land section 5.2 Environmental Consequences, pages 5-9 through 5-16, pages 5-25 through 5-29, and pages 5-37 and 5-38.
Recommended mitigation: **(1)** Mitigation of impacts to informal uses should include a planned investment in formal replacement recreational sites on DNR managed land to offset this loss.
(2) All maintenance and improvement costs associated with a paved access road will be BPAs responsibility and at its sole cost. DNR will retain full and unlimited access to all DNR managed lands accessed by the road.

Issue 2: Road Maintenance and Abandonment Plans (RMAP) Casey Rd. substation site
Summary: BPA should address RMAP issues associated with the access road to the proposed Casey road substation site as requested in the DNR scoping comments. In addition, the DEIS contained a reference within the Summary Chapter Page S-4 Casey Road substation *"About 2.8 miles of existing road would be improved to access the site"*. BPA I-5 project representatives have indicated a need to construct a new access road that will require new construction and right-of-way involving the removal of lands dedicated to timber production, combined with existing road improvements. In Chapter 4 Proposed Action and Alternatives under section 4.3.4.2 Casey Road (page 4-14) Figure 4-5, the proposed Casey Road Substation schematic is not accurate; it does not reflect current BPA proposals, which include new construction and existing road improvements. The proposed new access road will need to include current RMAP scheduling and standards into the designs as requested.
Reference: Summary, section S.2.1.1 "Substations" Casey Road substation page S-4, Chapter 4 Proposed Actions and Alternatives, section 4.3.4.2 Casey Road page 4-14; Figure 4-5 Casey Road Substation, and section 4.3.5 "Access Roads" table 4-4.
Recommended mitigation: Mitigation measures to address RMAP and road design standards will be developed in consultation with DNR and will be incorporated into the EIS or into a subsequent agreement(s) with DNR. Any DNR RMAP scheduled projects will be completed by BPA at its sole cost on any access road to the Casey Road substation site.
Recommended analysis: The EIS needs to reflect changes in proposed access roads to Casey Road substation if inserting additional proposed roads.
Recommended change: The proposed substation access road needs updating to reflect current BPA proposals, which include new construction and existing road improvements to the north of represented schematic in the DEIS.

1g. Communication sites

Issue 1: Electromagnetic Interference
Summary: The DEIS under Chapter 8, Section 8.1.3 discusses the possibility of electromagnetic interference for AM Radio and Television resulting from the presence of the proposed transmission line. DNR does have broadcast television lessees located at two communication sites in the project area. Electromagnetic interference created by the presence of the transmission line may cause a reduction in signal quality. Mitigation measures listed under Public Health and Safety, EMF in Table 3-2, page 3-23 may be sufficient to restore signal quality. If mitigation measures are not successful, lessees may terminate their lease agreements.

Reference: Chapter 8 Electric and Magnetic Fields, section 8.1.3 page 8-3; Table 3-2 page 3-23.
Recommended mitigation: If identified mitigation measures are not successful in avoiding interference, BPA will relocate these communication sites to a location that does not interfere with them or DNR will be compensated for impacts to land use that result in loss of lease revenues for any portions of the new transmission line that cause electromagnetic interference with current or reasonably foreseeable planned sites.

Issue 2: Microwave Beam Paths
Summary: Microwave dish beam paths require line of sight between transmitting and receiving microwave dishes. Of particular concern to the DNR's communication site leasing program are the following communication sites that are less than one mile from at least one of the contemplated transmission line routes:

Bebe	-122° 58' 27.77", 46° 20' 48.34"
Bells Mt	-122° 23' 30.89", 45° 48' 49.15"
MCI Tower	-122° 22' 18.76", 45° 44' 21.22"
Larch Mt	-122° 17' 44.25", 45° 43" 1.07"

(Note: coordinates provided are NAD 83)

If the proposed transmission line interferes with microwave dish beam paths of DNR lessees, it will likely cause the affected lessees to terminate their leases. These land use impacts may result in a reduction in lease revenues for the communications site leasing program.
Reference: : Chapter 4 Proposed Action and Alternatives, section 4.7.2.2 page 4-23; Chapter 8 Electric and Magnetic Fields, section 8.1.3 page 8-3; Table 3-2 page 3-23.
Recommended mitigation: Discuss potential mitigation measures to these land use issues which may be taken to correct this line of site interference of microwave beam paths. Provide compensation for any loss of revenue that result from interference with microwave dish beam paths.
Recommended analysis: Analyze and discuss the possibility of the proposed transmission line interfering with microwave dish beam paths.

1h. Recreation

Issue 1: Existing and planned recreation opportunities in the Yacolt Burn State Forest
Summary: The West Alternative and West Options do not transect portions of the Yacolt Burn State Forest. All other alternatives and options transect portions of the Yacolt Burn State Forest.
The DEIS lists the Planned Recreation Resources and Activities, but has not included those recreational trails and facilities identified in the Western Yacolt Burn State Forest Recreation Plan. In August 2010, DNR published a recreation plan for the Western portion of the Yacolt Burn State Forest identifying proposed trails and facilities for this area. Central Option 1 will transect an area in which motorized and non-motorized trails are planned. Crossover Alternative; Crossover Option 1-3; East Alternative; and East Options 1-3 will all transect portions of the Yacolt Burn State Forest where there are a significant amount of trails existing and planned. The crossing of existing and planned trails within the listed alternatives should be addressed in the FEIS and would cause **moderate to high** impacts to the recreation resources in the proposed tower corridor as identified in criteria under section 6.2.1 Impact Levels (page 6-13).

14831

The DNR Bells Mountain Trail, a DNR-managed recreation trail is missing from the inventory of current recreation resources. The DEIS lists the Bells Mountain Trail as being managed by Vancouver-Clark Parks. This trail runs through the Yacolt Burn State Forest and a portion of the trail is managed by DNR. Central Alternative, Central Options 1 & 2, and East Option 2 directly transect a portion of the Bells Mountain Trail that is on DNR-managed land and the tower corridor will directly impact recreation in this location. Mention of the Bells Mountain Trail and impacts to DNR-managed recreation on and around this area are also missing from the Appendix A. Permanent impacts to the Bells Mountain trail would likely be **moderate to high** at the crossing as well as the vicinity of the crossing by adding additional unauthorized access such as motorized use to a non-motorized designated trail system. This would "alter" recreation opportunities after project construction meeting this **high** impact level by affecting the non-motorized user experience on this trail system.

The DEIS inadequately discusses permanent impacts at locations altered by placement of transmission towers, access roads, and right-of-way restrictions. The DEIS states that most permanent impacts would result from experiential intrusions to the scenic character. Placement of towers, access roads, and right-of-way restrictions are often not compatible with many recreational activities, forcing them to cease and then begin again outside the right-of-way. Or the restrictions can permanently eliminate those lands for recreational use and development, potentially cutting-off and then isolating areas from recreational use including dispersed recreation.

Based upon BPA's pamphlet "Living and Working Safely Around High-voltage Power Lines," restricted activities include irrigation, wind tower replacement, some types of orchards, location of buildings and ***parking lots, recreation facilities, trails and fencing***. DNR considers these restrictions, when applied outside of the right-of-way, as an impact that prevents DNR from providing recreational opportunities such as those identified in the Western Yacolt Burn State Forest recreation plan.

Reference: Chapter 6 Recreation, section 6.1.1 page 6-2, section 6.1.3 page 6-3, Table 6-1 page 6-5, 6-8 and 6-9: Table 6-2, page 6-11, section 6.1.4 page 6-12, section 6.1.8 and section 6.2.1 page 6-13, section 6.2.5.1 and section 6.2.5.2 page 6-20; Table 6-4 page 6-24; Section 6.2.6.2 page 6-24; Table 6-5 page 6-25; Table 6-6 page 6-29 and section 6.2.9 page 6-30.

Recommended mitigation:

(1) BPA in consultation with DNR and users will identify areas within and adjacent to the power line corridor where recreational access would be determined to be compatible or incompatible with power-line corridors and access roads. This information will be used as part of the existing or planned recreational trail systems. Access will be restricted or provided as these locations are identified.

(2) BPA will provide long term funding to DNR for enforcing authorized use (through barriers, signage, education, and enforcement) as well as preventing unauthorized use including by regularly and permanently closing and decommissioning unauthorized trails or access points.

Recommended analysis:

(1) The impacts to current and planned DNR-provided recreation opportunities as outlined in the Western Yacolt Burn State Forest Recreation Plan need to be analyzed in the EIS. The Western Yacolt Burn State Forest Recreation Plan should be read and an analysis completed on the impacts of where the power-line corridor will transect existing or proposed trails and roads or come within 500 feet of existing or planned trails, facilities and roads. The analysis should also include:

(2) The power-line corridor and access road crossing of the Bells Mountain Trail on DNR-managed lands and the impacts of those crossing;.

(3) The locations where recreational facilities and trails may be compatible with power-line corridors and access roads-such as motorized trail use;

18 of 75

(4) Identification of existing recreation uses of state lands and an analysis of the impacts of the proposal on the recreational uses of state lands;
(5) The amount of land that will be permanently removed from inventory for recreational opportunities;
(6) The extent of restrictions outside the easement area particularly in areas where the corridor will disallow, limit or increase recreational use.
Recommended changes: Impacts at locations altered by placement of transmission towers, access roads, and right-of-way restrictions are **moderate to high.**

Issue 2: Impacts to dispersed recreation opportunities
Summary: Central Alternative, Central Options 1-3, Crossover Alternative and Crossover Options 1-3, East Alternative and East Options 1-3 all transect DNR managed lands that support dispersed recreation opportunities (Yacolt Burn State Forest and DNR-managed lands adjacent to segments 10, 12, 15, 23, 18, and K). There is no analysis of the impacts to current and future dispersed recreation if one of those alternatives is chosen. Impacts would be **moderate to high** in areas where the towers would be placed due to altering current or planned recreational use. Impacts would be **high** in areas where the towers would be placed.
Reference: Chapter 6 Recreation pages 6-1 through 6-30, Maps of Alternatives and Options.
Recommended mitigation: BPA in consultation with DNR will identify and implement strategies that mitigate negative impacts to dispersed recreation opportunities, including restoration of impacted areas, relocation to suitable areas, and restrictions to existing areas. BPA will provide long-term funding to ensure access and protect the resources critical to dispersed opportunities as well as provide enforcement.
Recommended analysis: There needs to be an analysis of the impacts to dispersed recreation on all DNR managed lands, including those identified above as a result of constructing any of the alternatives. This analysis should include changes in access for dispersed recreation opportunities, changes in habitat for fish and wildlife, and impacts to activities such as hunting, fishing, geocaching, and forest product gathering.

Issue 3: Impacts during construction
Summary: The DEIS outlines temporary construction impacts that would be throughout the year, **low** in off-season **and moderate** during peak use times. Construction activities would disturb the quiet and scenic landscape, but existing facilities would still be accessible. The DEIS does not discuss impacts to the proposed trails and facilities as outlined in the Western Yacolt Burn State Forest Recreation Plan.
Reference: Chapter 6 Recreation, section 6.2.5.3 pages 6-20 and 6-21.
Recommended mitigation: BPA in consultation with DNR will identify and implement strategies for blocking access to the area during corridor construction. This should include blocking access to unauthorized trails that are within 500 feet of the corridor. BPA will provide funding to defray the enforcement costs of blocking access as well as to defray the costs of maintenance to the redirected areas that see increased use.
Recommended analysis: There needs to be an analysis of specific recreational uses that would be displaced in the Yacolt Burn State Forest from construction, including possible places the users would go and what the impacts to those places would be from the increased use. This includes existing uses as well as planned uses if the construction interferes with plan implementation.

Issue 4: Reduced public support of DNR-managed lands
Summary: If DNR managed trust lands are heavily impacted by the towers and lines, there is a high potential for less visits to the forest from formal and informal users which may lead to a reduction in

purchases of the Discover Pass. This may negatively impact vital recreational support and revenue to DNR as well as WDFW and State Parks. Chapter 11 of the DEIS discusses the changes in the value of recreational opportunities resulting from the project.
Reference: Chapter 6 Recreation pages 6-1 through 6-30; Chapter 11 Socioeconomics, section 11.1.8.3 page 11-8.
Recommended analysis: The socioeconomic impacts to recreational use and to the potential decrease in revenue from reduced Discover Pass sales should be analyzed.

Ii. Control of unauthorized access

Issue 1: Opportunities for unauthorized public access
Summary: Power line corridors and tower access roads create high potential for unauthorized public use, especially by off-road use. The DEIS describes general impacts that result from unauthorized public use, and states that "*the location and frequency of unauthorized access is hard to predict*" and that "*impacts could be **low to high***". There is **high** potential for the tower access roads and the power-line corridor to increase unauthorized use and associated adverse impacts damaging resources such as road surfacing or streams due to off-road access and ORV use, trash dumping, vandalism and theft as experienced on existing BPA transmission corridors. If unaddressed through effective mitigation by BPA, these future impacts to the natural and built environment will require mitigation by DNR and would be uncompensated costs to the DNR.

DNR previously recommended that a sample survey be conducted on a given portion of existing power line representative of other DNR managed lands, and a quantitative prediction of unauthorized public use including the impacts be completed. There is no indication or mention that a sample survey was completed to predict the impacts from unauthorized public use. If BPA has not used that approach to predict the level of unauthorized use and associated impacts, BPA should propose and use another methodology to reasonably predict the level of unauthorized use and resulting adverse impacts on DNR managed lands that would result.

The DEIS states that "*mitigation measures would be completed before, during, or immediately after project construction*". Unauthorized public use will occur over the life of the project. Mitigation is needed for the life of the easement both within and outside the right-of-way on DNR managed lands. Although the majority of the mitigation measures would be implemented around the time of construction, additional monitoring with corrective actions would be necessary for the life of the project (e.g. 50 years).
DNR acknowledges the potential mitigation measures listed in the DEIS and those additional measures that have been incorporated into Appendix A to address the issues of unauthorized access and damage. Appendix A identifies a measure that would address rights-of ways and an MOA/ Easement document to work with DNR to provide various provisions to discourage unauthorized access including periodic inspection and repair of damages. Repairing damages is a form of mitigation, but preventing unauthorized uses and associated damage would be the most effective mitigation and should be the goal. Gating access roads to the right-of-way may not be sufficient to keep unauthorized use out due to off-road vehicles going around gates.
Reference: Chapter 5 Land, section 5.2.2.2 page 5-12; ; Chapter 6 Recreation, section 6.2.8 page 6-30; Appendix A.2.4.2 and Appendix A- Table A-13.
Recommended mitigation:

14831

BPA will provide long term funding and cooperative management with DNR that is outlined in the EIS; or the EIS includes an acknowledgement that subsequent agreements with DNR regarding preventing unauthorized access, providing enforcement, completing unauthorized trail closures, and restoring areas due to unauthorized public access will be created. Agreements with DNR will include resources and funding for preparing and implementing long term plans to help avoid or otherwise mitigate damages from unauthorized use. Plans and funding should include enforcement and posting/maintaining new signs, gates, and other barriers when new/other access points are created that were not considered during the construction phase. BPA will share in the responsibility of enforcement, installation of gates, culvert replacement, access roads, closing and decommissioning unauthorized trails that occur from corridors and access roads, etc., for environmental and resources protection measures into the future. The EIS should also identify mitigation measures that could be taken to curtail these unauthorized public uses. This may include:

(1) Install fencing or blockades in key locations;

(2) Survey existing power lines on DNR-managed lands in the vicinity and document unauthorized use and damage to state lands and public resources. Use this survey to predict damage on proposed lines; Include costs to repair or mitigate predicted damage or identify effective mitigation that could be added that would avoid unauthorized use and damage;

(3) Design the corridor to prevent unauthorized public use;

(4) Develop and implement a cooperative management plan with DNR to reduce unauthorized public access to the corridor;

(5) Regularly inspect for off-road development and damage. Repair damage promptly, especially resource damage;

(6) Maintain signs that discourage unauthorized use of the corridor;

(7) Survey the easement corridor and clearly mark it so that BPA, contractors, adjacent landowners and the public can clearly recognize when they are within the corridor to prevent uncompensated corridor expansion, vegetation management conflicts, and to reduce unauthorized use;

(8) Clarify and disclose the responsibilities, roles, and plans BPA proposes to help prevent and assist grantors in managing these real issues;

(9) Provide a gate and lock box that can accommodate access for multiple landowners on joint use road systems.

Recommended analysis:

(1) Conduct a sample survey on a given portion of at least the preferred alternative power line corridor representative of State ownership on the proposed I-5 project. A quantitative prediction of unauthorized use and the impacts could be applied to the DNR-managed lands crossed by the proposed alternatives and options; **(2)** As a comparison, BPA should conduct an analysis of current power-line corridors that are representative of DNR managed lands for this project, and the unauthorized access by the public and the impacts that have resulted. (i.e., how many unauthorized trails have been created due to the power-line corridors and access roads, and the steps taken to prevent or mitigate unauthorized access?)

Recommended additional discussion: Briefly discuss the long-term impacts, especially unauthorized use and vandalism, over the life of the easement, which adjacent land owners are exposed to because of the right-of-way.

Recommended change: The impacts from unauthorized use are **moderate to high** under all of the alternatives under the current mitigation recommended in the DEIS for the options that cross DNR-managed lands.

21 of 75

14831

1j. Aquatic lands and resources

Issue 1: Identification of State Owned Aquatic Land (SOAL) and DNR provided lists for species and vegetation

Summary: Although there are numerous references to "navigable waters" there is no mention, identification, or analysis of DNR managed SOAL other than the acknowledgement in Chapter 28, "Consistency with State Substantive Standards". DNR provided BPA with a table showing navigable river crossings (page 12, 2009 NEPA Scoping Comments) and a map of "navigable" waters. BPA should be made aware the map is no longer circulated. To determine if a water body is within a SOAL please contact DNR directly. Within the DEIS on page 28-15 there is a reference to two lists, to be provided by DNR. Both are attached. Please incorporate, as appropriate, in the Final EIS. These lists should be reviewed wherever the proposal will potentially impact SOAL.

Reference: Chapter 1 Purpose and Need, section 1.5.1 page 1-11; Summary section S.3.8.2 page 3-37; Chapter 10 Public Health and Safety page 10-11; Chapter 11 Socioeconomics; Chapter 12 Transportation; Chapter 27 Consultation, Review and Permit Requirements section 27.10 Clean Water Act page 27-5 and 27-6; section 27.12 Rivers and Harbors Act page 27-9; Chapter 28 State Substantive Standards section 28.2.10 SOAL page 28-14.

Recommended change: Use the DNR provided lists: DNR Proposed List of Protected Vegetation, Navigable waters table, and DNR Aquatic Lands DRAFT Habitat Conservation Plan Species Considered for surveys to be completed on or adjacent to SOAL

Issue 2: Land Use Impacts to SOAL easements

Summary: DNR requested that BPA identify affected DNR licenses, leases, and easements that may be affected by the project, and to calculate lost revenue to the state that may result. That analysis was not included in the DEIS.

Reference: See citations above under issue 1. Identification of State-owned Aquatic Land (SOAL) for references to "navigable waters".

Recommended mitigation: BPA will coordinate with DNR in determining the exact location of the easement boundaries, and the restrictions on SOAL, prior to the development or amendment of any easement and any final decision by DNR on the issuance of an easement.

Recommended analysis: Once the SOALs are identified, BPA will need to provide further information on crossings over state-owned aquatic lands in order for DNR Aquatic staff to determine environmental impacts to habitat, calculate the length of the crossings, calculate administrative cost recovery, and determine the associated impacts to existing DNR licenses, leases, and agreements.

Issue 3: Suspension tower in the Columbia River

Summary: The DEIS has not provided detail on the exact placement of the tower in the Columbia River or analyzed the impacts to aquatic resources on state-owned aquatic lands. Consistent with the issue noted in 2. Above, BPA has not identified the specific deeds and contracts (signed and dated) that BPA may have with DNR for this location and for the existing right-of-way.

Reference: Chapter 3 Project Components and Construction, Operation, and Maintenance Activities, Section 3.2.4 page 3-6; Chapter 10 Health and Safety pages 10-11 and 10-15; Chapter 12 Transportation page 12-5 and 12-6; Chapter 15 Water page 15-7.

Recommended change: Identify the exact location of the tower in the Columbia River and work with DNR to identify potential mitigation measures for impacts to aquatic resources on state-owned aquatic lands.

22 of 75

14831

Recommended Analysis: Once the exact location of the tower is identified, include an analysis of the impacts to aquatic resources.

Issue 4: Protection of Submerged Native Aquatic Vegetation
Summary: Adequate detail needs to be provided on potential impacts to freshwater vegetation located on SOAL, within, outside and adjacent to the BPA proposed right-of-way. The Chapter on Vegetation identifies aquatic bed land vegetation under the section on wetlands (p. 17-6) but the analysis for special status species references upland plants only.
Reference: Chapter 17 Vegetation page 17-6.
Recommended mitigation: Coordinate with DNR to ensure consistency with the overall statements in the U.S. Corps Permit (U.S. Corps Permit NWS-2011-346-PN dated January 4, 2013) to protect and utilize important resources and consider fish and wildlife values.
Recommended analysis: BPA will analyze the impacts to aquatic freshwater vegetation and will ensure the DNR-provided list of protected vegetation is used during surveys of aquatic plant species, when completing wetland delineations.

Issue 5: Species Work Windows- Consistency with State Standard
Summary: For all water crossings, Washington Department of Fish and Wildlife (WDFW) species work windows should be used for the timing of any construction, operation or maintenance activities, to protect listed and sensitive species and forage fish species in sensitive life history phases. The DEIS does reference in-water work windows in Table 3-2, and should include the reference material in Chapter 19.
Reference: Chapter 19 – Fish page 19-13 through 19-28, Table 19-2 page 19-19 and 19-20; Chapter 3 Project Components, and Construction, Operation and Maintenance Activities Table 3-2 page 3-25 and 3-27.
Recommended mitigation: BPA will operate according to in-water work windows established by the Washington Department of Fish and Wildlife (WDFW) or the U.S. Corps Permit (see page 3-27) for this project. Information regarding WDFW in-water work windows can be obtained by contacting WDFW through their Hydraulic Project Approval website: http://wdfw.wa.gov/licensing/hpa/.

Issue 6: Mitigation projects
Summary: Mitigation projects, particularly offsite mitigation projects located on state-owned aquatic land must involve DNR, and may require a use authorization.
Reference: Chapter 15 Water pages 15-23 and 15-24; Chapter 16 Wetlands page 16-18; and Chapter 19 Fish page 19-28.
Recommended mitigation: BPA will coordinate with DNR on the development of any proposed mitigation projects on SOAL.

Issue 7: Quality of maps / sufficiency of information
Summary: DNR suggests the applicant uses standard survey identifiers in the FEIS to assist DNR in locating the exact placement of the tower – e.g., lat/long and/or TSR, and/or nearby county parcel number or survey marker. These identifying markers will be necessary prior to obtaining or modifying an easement for state-owned aquatic lands.
Reference: Map appendix; maps within document; Washington Department of Natural Resources Requirements for Records of Survey for Leases and Easements (2002)
Recommended change: Incorporate standardized survey identifiers which include the line of ordinary high water, low water, and township-section-range.

23 of 75

14831

Geologic hazards

2a. Geologic hazards on DNR managed lands

Issue 1: Mitigation of landslides
Summary: Recommended mitigation measures in the DEIS do not include mitigation if a landslide occurs related to the construction of the transmission line.
In Chapter 14 Geology and Soils, a list of recommended mitigation measures is provided on pages 14-16 (section 14.2.8) in the form of a bulleted list. The mitigation recommendations include conducting a site-specific geologic evaluation in areas of potential landslides and if they cannot be avoided, site-specific designs will be developed. This addresses the construction, but does not address what will take place if a landslide occurs in the future as a result of development done for the BPA project. BPA will be responsible and fully liable for any damage to property or personal injury resulting from a landslide related to construction of the BPA I-5 corridor project.
Reference: Chapter 14 Geology and Soils, section 14.2.8 page 14-16.
Recommended mitigation: Any landslide and associated damage related to construction of the BPA I-5 corridor project, either during construction or at any point in the future, will be the responsibility of BPA and will be repaired, rehabilitated, and restored by BPA. Repairs, rehabilitation, and restoration can include, but are not limited to, engineered slope stabilization measures, repairs to any damaged infrastructure such as roads, rehabilitation of damaged riparian habitat or other ecological functions, and reconstruction of any damaged or destroyed structures. This responsibility also includes full liability for any damage to property or personal injury resulting from a landslide related to construction of the BPA I-5 corridor project.

Issue 2: Landslide hazard areas are identified primarily from remote screening tools
Summary: Due to the scope of the project, it is reasonable that remote screening tools would be used to get a general idea of potential landslide hazards for all of the alternative routes. However, once a preferred route is identified, the slope stability of the entire route should be evaluated on a site-specific level.
On page 14-16, the current recommended mitigation measure states: *"Conduct additional site-specific evaluations in areas of potential landslides to determine degree of recent activity, likelihood of activation or reactivation, potential setbacks, and site-specific stability as appropriate. Site towers in areas not underlain by landslides. If necessary, design site-specific mitigation measures."*
Reference: Chapter 14 Geology and Soils, section 14.2.8 page 14-16.
Recommended mitigation:
(1) Amend the language to read *"Conduct additional site-specific evaluations in areas of potential landslides identified in Appendix J and by site-specific evaluation of the entire selected route to determine degree of recent activity, likelihood of activation or reactivation, potential setbacks, and site-specific stability as appropriate. Site towers in areas not underlain by landslides. If necessary, design site-specific mitigation measures"*
(2) BPA will coordinate with DNR on design and site-specific slope stability mitigation measures.

24 of 75

14831

Issue 3: DNR review of final tower placement locations on DNR-managed lands
Summary: DNR will need to review tower locations on DNR-managed lands prior to finalizing locations.
Recommended mitigation: A DNR representative will have the opportunity to review/approve tower line locations on DNR managed lands prior to finalizing locations to limit geological impacts.

2b. Geologic hazards on all lands
Issue: Seismic Risk
Summary: In Chapter 14 Geology and Soils section 14.1.1.2 the seismic risks do not include seismically induced landslides for areas of site locations (for example, see papers by Romeo and others, 2009 A methodology for Assessing Earthquake-Induced Landslide Risk - 1st North American Landslide Conference, v.1, p.867-875). This screening tool can help determine areas that would be vulnerable for near earthquakes or regional earthquakes to help assess potential downhill hazards of sites.
For example, in section 14.1.1.2 landslide impacts have been identified; however, there is no written plan on response and/or clean-up, as mitigation for landslides. If a large landslide event occurs, such as the blocking of the Coweeman River, in which downstream hazards include parts of Kelso, a rapid response plan must be implemented to reduce or disband such risk or hazard.
Reference: Chapter 14 Geology and Soils, section 14.1.1.2 page 14-2.
Recommended mitigation: Develop and implement a rapid response plan which includes contacts in case of emergency.

The local economy including timber and recreation

Issue 1: The local economy including timber
Summary: The DEIS mentions an average Pacific Northwest stumpage price of $200/MBF for 2008-2009 (Section 11.1.7), but does not confirm that this price is used in the analysis. Furthermore, this $200/MBF is anomalous due to the effects of the recession. Prior to 2008, stumpage prices from public lands had not approached the low of $200/MBF in over 20 years, and the average price from 2000-2012 was between $300-320/MBF. A stumpage price of $200/MBF grossly underestimates the actual price that timber from these lands is likely to fetch, and is therefore inappropriate to use in calculating timber revenues (realized or foregone) and the resulting impacts to the local economy.
Reference: Chapter 11 Socioeconomics, section 11.1.7 page 11-7.
Recommended change: Use the most up to date stumpage values for any appraisal and calculation.
Recommended analysis: At a minimum, an analysis of impacts to the local economy caused by impacts to the timber industry should include estimates of: the impact of these revenue changes to the employment and income of lumber mills and other timber end users; and the impact of both the short-term timber harvest and the long-term land conversion on employment and income in the local timber industry (including logging companies and mills).

Issue 2: Recreation and the local economy
Summary: Chapter 6, "Recreation", identifies the impacts to specific parks and trails from clearing of the right-of-way, construction of towers, and new and improved access roads. The impacts are described as changing the recreation experience in terms of *"visual and experiential impacts to the recreational user"*. The described impacts are mostly negative.

25 of 75

14831

Chapter 11, "Socioeconomics", contains a very short subsection "Recreation and Tourism" under Section 11.2.2.8 "Community Values". In contrast to the negative impacts to recreation areas and uses detailed in Chapter 6, it describes a balance between people who would experience a long-term permanent increase in the value of recreation activities on affected lands and people who would experience a decrease in recreation values. No attempt is made to qualify or quantify the relative changes in behavior in the two groups both inside and outside the project area. The subsection concludes by observing that *"To the extent that the project's effects on recreation resources lead recreationists to alter their spending patterns, it would affect sales, employment, and earnings in related business"*, but there is no analysis performed to attempt to quantify these local economic impacts. This analysis should be undertaken so the impact can be understood and mitigation can be developed.
Reference: Chapter 6, "Recreation", Chapter 11, "Socioeconomics"
Recommended mitigation: Once the analysis is completed mitigation of impacts should be considered and proposed.
Recommended analysis: In general and for each alternative, the DEIS quantifies the number of impacted acres by landowner and land use, and qualitatively discusses the impacts of construction, maintenance, and the transmission lines on trails, streams, parks, and recreation types (See Chapters 5 and 6 and Appendix A). However, the DEIS fails to synthesize these disparate impacts into an explanation of the trade-offs involved with each alternative compared to the no-action. Such a synthesis is critical to understanding what is at stake in selecting a given alternative and the proper mitigation it would require.

Cultural Resources

Issue 1: Cultural Resources-graves and burial sites
Summary: BPA is subject to the National Historic Preservation Act of 1966 ("NHPA" or "Act"). Section 106 of the Act requires federal agencies to consider the effects of projects they carry out, approve, or fund. BPA is the lead agency for all of its easement activities that may involve cultural resources on State Lands. DNR is subject to chapter 27.44 RCW (Indian graves and records) which may have different requirements for the protection of native Indian burial sites or graves and human remains than federal law. Under the current list of mitigation measures in Table 3-2, pages 3-24, 25, there is no assurance of DNR's protection from potential violations of Chapter 27.44 RCW Indian Graves and Records.
Reference: Chapter 3 Table 3-2 pages 3-24, 25; Chapter 13 Cultural Resources.
Recommended mitigation: BPA shall notify DNR if and when a native Indian burial site, grave or human remains is found on DNR managed lands and cooperate with DNR to ensure DNR compliance with state law.

Issue 2: Impact Levels
Summary: The DEIS proposes a high impact designation for properties eligible to the National Register of Historic Places (NRHP), moderate impact for those properties un-evaluated and low impact to those properties determined ineligible to the NRHP. NRHP eligibility, based on the characteristics, is inherent in the properties whether evaluated or not. This should be changed to High-Low-and Unevaluated.
Reference: Chapter 13 Cultural Resources, section 13.2.1 page 13-5.
Recommended change: Amend the discussion and assignment of impact levels to recognize that an

26 of 75

unevaluated potential NRHP property may be a **high** impact and not assume that a potentially eligible NRHP property is a **moderate** impact.

Forest Practices

Issue 1: Forest Practices applications
Summary: Even though BPA is not required to submit a forest practice application for the removal of standing timber as part of the transmission line corridor clearing, when BPA relinquishes the rights to the timber back to the landowner, the landowner may be required to submit a forest practices application for the removal of the cut timber, as is noted in DNR's scoping comments. The removal of the timber is thereby regulated by the Forest Practice Act and Rules.
Reference: Chapter 28 Consistency with State Substantive Standards, section 28.2.9 page 28-14.
Recommended mitigation: BPA will work with DNR forest practices staff to develop notification and informational materials for forest landowners who wish to harvest (remove) cleared timber generated from the clearing of the transmission line corridor. The informational materials should be designed to inform landowners of their responsibilities to reduce or eliminate impacts covered by DNR's forest practices rules.

Issue 2: Forest Practices Habitat Conservation Plan (FP HCP)
Summary: The Forest Practices HCP represents an incidental take permit issued to the State of Washington by the United States Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA-Fisheries) to provide for long term protections for covered species under the ESA. The Forest Practices HCP and permit provide for the protection of these species during forest practices that take place on non-federal forest lands in the state. Under the current proposal, vegetation removal will increase within habitat of federal- or state-listed species-or lands covered by the Forest Practices HCP and hence may result in increased "take" of these species.
Reference: Chapter 28 Consistency with State Substantive Standards, section 28.2.9 page 28-14.
Recommended analysis: Provide analysis for and initiate consultation under Section 7 of the Act with U.S. Fish & Wildlife Service and/or National Oceanic & Atmospheric Administration/Fisheries (NOAA Fisheries) to demonstrate and document that the construction of a new transmission line, considering appropriate environmental impact mitigation, will not adversely affect the agreement and the commitments made in the Forest Practices HCP. Additionally, USFWS Section 10 representatives familiar with the Forest Practices HCP should be involved in any discussion regarding the Forest Practices HCP.
Recommended changes: A reference to DNR's Forest Practices HCP should be added in Chapter 28, section 28.2.9 page 28-14.

Issue 3: Forest Road Best Management Practices (BMPs) on lands regulated by Forest Practices
Summary: DNR's scoping comments requested that BPA meet Forest Practice RMAP standards for all new road construction. These standards were incorporated with the Forest Practices HCP and enumerated in the Washington Administrative Code forest practices rules. In addition to ESA coverage, the Forest Practices HCP provides a vehicle through which the EPA-delegated state clean water agency (Department of Ecology) may certify and provide assurance that the standards in the Forest Practices HCP and WAC meet the requirements of the federal Clean Water Act. BPA recommended mitigation measures include

meeting Washington's Forest and Fish Law or like standard for new construction (Chapter 15.2.8 page 15-23). However, referencing the Forest and Fish Law itself is inaccurate (See Recommended Editing Changes, item 1.).
Reference: Chapter 15 Water, section 15.2.8 page 15-23; References page 29-2.
Recommended mitigation:
(1) On forest roads where Clean Water Act compliance is implemented by the forest practices rules, BPA should follow the BMPs codified in WAC 222-24.
(2) All access roads should have a minimum of 40 cubic yards per station applied, and adequate drainage structures to minimize sediment delivery to any live water.

Issue 4: Riparian Area Best Management Practices on lands regulated by Forest Practices
Summary: Riparian habitat protections are codified in the Washington State Forest Practices Act and are inclusive in the Forest Practices HCP. As previously stated, these protections are linked to Clean Water Act assurances and Endangered Species Act compliance. Forest landowners are required to retain riparian habitat when harvesting timber under an approved Forest Practices Application.
Reference: Chapters Summary, 15 Water, 16 Wetlands, 17 Vegetation, 18 Wildlife, 19 Fish, 26 Cumulative Impacts and others.
Recommended mitigation: Mitigation sequencing in riparian areas should follow: (1) Avoidance- where practical, BPA should mitigate impacts by raising towers to avoid cutting overstory timber. Understory vegetation should be retained. (2) Mitigation- if avoidance is not possible, timber should be topped and other trees felled only when needed. All felled timber within the riparian core zone (from edge of bank full width or channel migration zone extending perpendicular to fifty (50) horizontal feet should be left as down wood recruitment in the riparian area.

Forestry riparian easements

Issue 1: Location change and impact analysis of the Forestry Riparian Easement
Summary: The location of the one Forestry Riparian Easement that has been identified as being adversely impacted under West and Crossover alternatives is identified in an inaccurate location. A number of references to the location as described in the DEIS indicate the easement is "along Segment 9" found in and "near Tower 9/26". However the discussions of West Option 2 indicate this option would avoid impact to the Forestry Riparian Easement. In fact, all options of the West and Crossover Alternatives would impact the easement because the easement is located in Township 7 North, Range 1 West. In this location all of the options segments for the West and Crossover Alternatives are in the same location. The locations of the different segments in the three options of the West Alternative are all found in Township 2 North, Range 3 East and Township 2 North, Range 4 East which is many miles further to the south and several miles northwest of Camas. For clarification, see Map A of Appendix A in the DEIS.
Prior to any activity affecting the easement, consent from DNR on the scope of compensation and/or mitigation to the impacted easement will need to be given. BPA will only be able to proceed with impacts to a Forestry Riparian Easement after DNR has been compensated using the guidelines of WAC 222-21-080 and/or mitigation work is formally outlined in a binding contract.
References: Summary, section S3.1.3 page S-12, section S.3.13.1 page S-57, and section S.3.13.2 page S-59; Chapter 4 Proposed Actions and Alternatives, section 4.2 page 4-3, Table 4-10 page 4-42; Chapter

14831

5 Land, section 5.1.3 page 5-5, section 5.2.4.2 page 5-24; Chapter 17 Vegetation, section 17.1.2.1 page 17-8, section 17.2.4.4 page 17-24.
Recommended mitigation: Consistent with the general mitigation approach for "compensatory" mitigation stated in section 3.12 Mitigation Measures, page 3-17, add a provision for compensation and/or mitigation for the loss of conservation capacity intended by the Forestry Riparian Easement. Some types of compensation or mitigation DNR might consider are: replacement land, stream enhancement, or other similar actions acceptable to DNR.
Recommended changes: Please refer to the editing changes under Forest Riparian Easements which will correct the location and impact discussions for the Forest Riparian Easement that is impacted by all options of the West and Crossover Alternatives.

Protection from fire

Issue 1: Fire prevention and protection
Summary: As stated throughout the DEIS, it is BPA's intent to follow guidelines, plans and safety requirements developed by the underlying landowner. The statewide operations and maintenance MOA agreed to between DNR and BPA for existing right-of-ways includes the following language under fire prevention:
"Measures include ensuring all vehicles carry a fire extinguisher of at least a 5B/C rating and a serviceable shovel, following BPA safety operating procedures which include compliance with the substantive requirements of the current Washington Administrative Code (WAC) 332-24-301 (industrial restrictions) and WAC 332-24-405 (Spark emitting requirements)…". This commitment should be included in the DEIS for both new construction and maintenance when occurring on forest lands where DNR has fire protection authority.
References: Chapter 10 Health and Safety Page 10-9, page 10-11.
Recommended mitigation:
(1) BPA shall take all reasonable measures to prevent and minimize the start and spread of fire on to adjacent forested areas. Measures should include ensuring all vehicles carry a fire extinguisher of at least a 5 B/C rating and a serviceable shovel, following construction site safety operating procedures which should include compliance with the substantive requirements of the current Washington Administrative Code (WAC) 332-24-301 (Industrial restrictions) and WAC 332-24-405 (Spark emitting requirements).
(2) In addition to the proposed mitigation the DEIS should incorporate language similar to *"follow best practices to address accumulations of slash, logs or trimmings from vegetation removal operations that pose a hazard for wildfire spread or ignition. Best practices include scattering, chipping or the arrangement of concentrations of logs or trimmings in a manner as to not create a continuous extreme hazard fuel bed".*
Recommended change: Chapter 10 includes discussion under the fire section regarding BPA *"following all fire safety requirements that may be in place by large public or private commercial landowners…"* This should be a mitigation measure.

Special lands and special status species including DNR managed lands

29 of 75

14831

8a. See the editing recommendations below for the Lacamas Prairie Natural Resource Conservation Area and Natural Area Preserve

8b. Other special status species

Issue 1: Determination of impact level for special status plant species is unclear
Summary: The document doesn't provide a clear statement regarding the determination of impact level for some of the special- status plant species. For example, from page 17-23: "Impacts to small-flowered trillium, dense sedge, and Nuttall's quillwort would be **moderate-to-high** depending on whether impacts would contribute to the need for federal listing." The definition for the **high** impact level includes situations where project activities would cause "…disturbance …that contributes to the need for federal listing of the species" (page 17-16). These statements seem somewhat circular. The preparers of the document apparently did not actually make a determination as to whether the project would "contribute to the need for federal listing." In the end, it is unclear what impact the project will have on special-status plant species.
Reference: Chapter 17 Vegetation pages 17-1 through 17-34.
Recommended mitigation: BPA will consider and propose any mitigation that is needed to protect the species in addition to that recommended on page 17-33. Similar to mitigation proposed for cultural resources on Table 3-2: *"Plan for survey and review as needed of additional disturbance areas not identified during the NEPA process (e.g., staging areas stringing and pulling sites, guard structure areas, etc.)"*, BPA will identify and mitigate for special-status species not identified during the NEPA process.
Recommended analysis: An analysis of the potential impacts should be done at the time of pre-construction surveys as is recommended on page 17-33 and should include the degree of impacts and how to mitigate.
Recommended changes:
(1) The text in various places should be appended to acknowledge that a complete analysis of impacts to special status plant species was not / has not been completed and that such an analysis cannot be completed at present because adequate on-the-ground surveys have not been undertaken. The revised text should include a commitment to conduct the pre-construction surveys (as indicated in the recommended mitigation measures [17-33]) and to identify appropriate mitigation measures based on a determination of the level of impact. The Natural Heritage Program has developed suggested guidelines for rare plant surveys (http://www1.dnr.wa.gov/nhp/refdesk/pubs/rareplantsurveyguidelines.pdf). The guidelines address surveyor qualifications, appropriate timing and intensity of survey effort, and documentation of survey findings. We recommend that these guidelines be followed for this project.

Accuracy of GIS data for DEIS analysis

Issue 1: GIS data used for analysis
Summary: Generally, GIS is fairly accurate for resource features of a larger scale; roads, rivers, lakes, et cetera. At a micro scale unnamed or located streams, wetlands, and other ecological features may not be correctly identified or displayed in GIS databases. There may be substantive changes in the number and order of wetlands, streams, and other features that could indicate additional impacts and the need for additional mitigation.

30 of 75

14831

Reference: All chapters and sections.
Recommended mitigation: BPA needs to ground verify all GIS data that is being used for the environmental analysis in the EIS and provide additional mitigation measures where additional impacts are indicated.
Recommended analysis: Post ground truthing, BPA should review the GIS data in the FEIS and update the data and the environmental impact analysis where needed especially that which is related to the hydro layers.

Recommended editing changes to the DEIS

The following are editing or factual errors needing to be corrected in the final EIS:

1. The reference to Washington's Forest and Fish laws on page 15-23 is incorrect and should be replaced with the following: *Pursuant to, Washington's Forest Practices Act and Rules bring all existing access roads up to new forest road standards through Road Maintenance and Abandonment Plans (RMAPs) by 2016.*
2. Throughout the DEIS document there are correct references to "State owned trust lands, managed by the WDNR". The document has several locations that refer to the "Washington Department of Natural Resources (WDNR) **owned property**…." or "**WDNR owned**…" and should be corrected to "**DNR managed**"" Summary (page S-4-2nd paragraph) incorrectly states "Washington Department of Natural Resources property…." It is correctly addressed under Summary- Land section S.3.1.1 (page S-8) and Chapter 5 Land section 5.1.1 (page 5-1) where it states "Public agencies that own or manage lands include WDNR, the City of Camas, and Port of Portland". The State of Washington owns the land that DNR manages; RCW 79.02.010 defines lands managed by DNR.
3. Need to change references to the Lacamas Prairie Natural Area throughout the document to reflect our recent purchases, i.e. "lands managed by WDNR as the Lacamas Prairie NAP/NRCA" (e.g. pp. S-12; S-57; 18-7; 17-8; and others).
4. Table 3-2 Mitigation Measures Land and Recreation (page 3-22) "Stay on established access road and designated access roads across agricultural fields during routine operation and maintenance activities". Need to add "forest management roads" to the sentence.
5. Page 5-8 (1st and 4th paragraph) - "**Publicly owned** forest lands are also managed for recreation (trails) and wildlife habitat, including the Yacolt Burn State Forest". Need to correct this sentence to read "**DNR managed trust lands** are also managed for recreation…." in the final EIS.
6. Section 6.2.6.4 East Option 2 page 6-26 incorrectly includes the Bell's Mountain trail, which is not in the vicinity of this option alternative.
7. Appendix A Table A-1 (page A-2 to A-5)Need to add segments 23- towers 1,2,3,4 (Central and Crossover Alternatives); S-towers 1,2,3 (East alternative), T-towers 1,2,3 (Central Option 1 Alternative) to being on State trust lands.
8. Appendix A Section A-2.2 (page A-9 or A-10) Recreation trails impacted needs to mention Bell's Mountain trail which will be crossed in two locations on the Central Option 1 alternative near segment V by a proposed new tower access road and the transmission corridor.
9. Appendix A Table A-5 (page A-10) for the Central Alternative needs to add Bells Mountain trail (crossing near segment V).
10. Appendix A (page A-10) need to include Central Alternative as affecting future trail expansion under the West Yacolt Burn Recreation Plan for segment P. These future trails include 4x4 and/or

31 of 75

ORV trails under phase 3 construction schedule shown in the recreation plan. Need to include this in the paragraph describing potential impacts and in Table A-5.

11. Appendix A (page A-13): there are three bullets that reference private land, but no reference to State trust lands. Need to delete **private** and add reference to **DNR managed trust lands**.

DEIS Maps

12. Map 6-1C Recreation for Inset Map 5- need to add proposed new construction tower access road crossing Bells Mountain trail to V segment tower.
13. Map 6-1E Recreation Inset Maps for Map 6-1C and Map 6-1D- need to add inset map #5 from map 6-1C showing Bells Mountain trail crossing.
14. Map 12-1A: Transportation Resources- Need to include proposed new road and existing access road proposals to the Casey Road substation.

Aquatic Resources

15. Chapter 28 State Substantive Standards, page 28-15 references two lists to be provided by DNR. Both lists **DNR Proposed List of Protected Vegetation** and **DNR Aquatic Lands Habitat Conservation Plan Species Considered** are attached. Please incorporate as needed into the EIS.
16. The following section of Chapter 28 State Substantive Standards, Section 28.2.10 page 28-15 containing DNR Aquatic HCP Conservation Measures has been edited as follows. (please replace the existing language, beginning with the first sentence after the Heading 28.2.10 and ending just before the paragraph "Consistency" with the following language):

28.2.10 State Owned Aquatic Lands

The following conservation measures are implemented on a case-by-case basis as site-specific conditions warrant. DNR is currently in negotiations with US Fish and Wildlife and the National Marine Fisheries Services regarding the development of an Aquatic Lands Habitat Conservation Plan, which will cover aquatic lands under waterbodies in this DEIS (such as the Columbia River).

The final requirements are subject to change once the Aquatic HCP is implemented and the Incidental Take Permit is developed for covered species and vegetation. DNR reserves the right to update the language and will contact BPA to do so, if necessary. The DEIS should indicate that BPA will comply with any conservation requirements required by any Aquatic Lands Habitat Conservation Plan adopted by DNR.

Protection of Submerged Native Aquatic Vegetation

A list of freshwater and marine vegetation species to be protected is attached. New activities must avoid existing freshwater native aquatic vegetation identified in the project area (Appendix D – NEPA Copy of Proposed List of Protected Vegetation DNR Aquatic Lands Habitat Conservation Plan, November 2012).

Species Work Windows

For the crossings listed in the Columbia, Coweeman, Kalama, Lewis, and Washougal Rivers, WDFW species work windows must be used for the timing of any construction, operation or maintenance activities, to protect listed and sensitive species and forage fish species in sensitive live history phases. Please use the attached list for identifying any species in the construction, operation or maintenance footprint (Listed and Sensitive Species provided by DNR Aquatic Lands Habitat Conservation Plan, November 2012).

14831

Maintenance and Decommissioning
Lessees and grantees must remove unused, abandoned structures, and equipment from the lease or easement site. A timeframe for removal will be specified in the authorizing document.

Forestry Riparian Easements

17. Throughout the DEIS the title of this easement is referred to as "Forest Riparian Conservation Easement." The name of the easements that DNR manages and one of which is potentially affected by this proposal should be labeled "Forestry Riparian Easement." This error is understandable as DNR's Scoping Comments referred to these as forest riparian conservation easements. Although this easement is a type of conservation easement, by capitalizing all the words "Forest Riparian Conservation Easement" it incorrectly implies this is the title of the easement, when in fact the correct label is "Forestry Riparian Easement."
18. Section 17.1.2.1 WDNR Protected Areas (Page 17-8) – Change the name of the program referenced in the fifth paragraph of this section from "Riparian Open Space Program" to "Forestry Riparian Easement Program."
19. Section S.3.1.3 Impacts Unique to Action Alternatives (Page S-17) – Need to indicate an impact to the Forestry Riparian Easement in the Open Space category of Vegetation for the Crossover Alternative similar to what is indicated for the West Alternative in Section S.3.1.3 (Page S-12).
20. Section S.3.13.3 Impacts Unique to Action Alternatives (Page S-59) – In the discussion of West Option 2, remove the reference that the Forestry Riparian Easement will be avoided with West Option 2. See Map A in Appendix A of the DEIS for the correct location of the Forest Riparian Easement.
21. Section S.3.13.3 Impacts Unique to Action Alternatives (Page S-61) – Need to include a Vegetation impact to the Crossover Alternative similar to the description on West Alternative in this same Section on page S-59 where the right-of-way would cross the Forest Riparian Easement and require tree removal.
22. Section 4.2 West Alternative (page 4-3) – In the third paragraph of this section, the easement is described as being near Tower 9/26 however DNR GIS information shows Tower 9/26 is located in the southeast corner of Section 5 of Township 7 North, Range 1 West but the Forestry Riparian Easement is in the Southwest corner of Section 4 of Township 7 North, Range 1 West. Tower 9/27 is the closest tower to the easement. See map attached to this document.
23. Table 4-10 Summary of Environmental Impacts by Alternative (Page 4-42) – Two changes need to be made to the chart on this page. First the reference that West Option 2 will "avoid the WDNR Forest Riparian Conservation Easement" needs to be removed (see Map A in Appendix A of the DEIS). Second, add an impact to Vegetation Resource for the Crossover Alternative.
24. Section 5.2.7.2 Land Use (Page 5-35)– Need to include a Vegetation Resource impact to the Crossover Alternative similar to the West Alternative as described in Section 5.2.4.2 where the right-of-way would cross the easement and require tree removal.
25. Section 17.2.4.4 West Option 1, 2, and 3 (Page 17-24) – In the second paragraph remove the reference that the Forestry Riparian Easement will be avoided with both West Option 2 and 3.

Lacamas Prairie Natural Resource Conservation Area (NRCA) and Natural Area Preserve (NAP)

26. p. S-57: "Noxious weeds are those that can damage cultivated or natural vegetation, livestock or other resources. They include Himalayan blackberry, thistles, and scotch broom." The 2nd sentence should be modified to say: "They include *species such as* Himalayan blackberry, *non-native* thistles, and scotch broom."

33 of 75

27. p. S-59: "Right-of-way would cross more (+28 acres) of the Lacamas Prairie Natural Area (and proposed WNHP preserve)…" This should be modified to say: "Right-of-way would cross more (+28 acres) of the Lacamas Prairie Natural Area (including Natural Resources Conservation Area and Natural Area Preserve)…
28. p. 5-5 and 5-6. Change reference to Lacamas Prairie natural area from "recreational area" to "conservation lands."
29. p. 16-4. "camas prairie wetland areas" should be changed to "wet prairie wetland areas". These should also be noted as Category I wetlands under DOE Wetland Rating System.
30. p. S-66. West Option discussions should include impacts to Oregon white oak woodlands within the Lacamas Prairie Natural Area. These woodlands are a key feature of the Natural Area and are used by the slender-billed white-breasted nuthatch.
31. p. 18-6. Slender-billed white-breasted nuthatch (state candidate) is found in the Oregon white oak woodlands in Lacamas Prairie NAP. This should be noted here and incorporated into effects of alternatives.
32. p. 4-4. Under West Alternative, descriptions of segments 36B, 45, and 50 should include reference to crossing the proposed Lacamas Prairie NRCA.
33. p. 4-5. Under West Option 1, descriptions of segments 36, 40, and 46 should include reference to crossing the proposed Lacamas Prairie NRCA (in addition to the reference to crossing the NAP).
34. p. 4-5. Under West Option 2, descriptions of segments 36 and 36A should include reference to crossing the proposed Lacamas Prairie NRCA.
35. p. 4-6. Under West Option 3, descriptions of segments 36 and 36A should include reference to crossing the proposed Lacamas Prairie NRCA.
36. p. 4-18. Under Crossover Option 1, description of segments 50 should include reference to crossing the proposed Lacamas Prairie NRCA.
37. p. 17-5. Description should include state-threatened Hall's aster as one of the special status species found in the wet prairie at Lacamas Prairie.
38. p. 17-6. Description should include "state-threatened" before Halls' aster and "state-endangered" before rose checkermallow.

Other special-status species

39. **Section 17.1.2.2**: **(Page 17-8)** The second sentence should be edited to read: "Prioritization of ecosystems by the Natural Heritage Program is based primarily on ecosystem rarity and the degree of threat to the persistence of the ecosystem type." Ecosystems are not prioritized because of the presence of rare species, nor are they prioritized based on perceived scenic value. In the second paragraph of the same section (i.e., 17.1.2.2 on page 17-8) the 2nd and 3rd sentences should be deleted; they are both misleading.
40. **Section 17.1.3.1**: **(Page 17-11)** – In the third paragraph, second sentence, it states that *"In Washington, special-status species in the project area include those identified as endangered, threatened, sensitive or candidates for listing (WDNR 2010e)."* DNR does not use the term 'candidate' in our process for generating lists of species of conservation concern. DNR does have two 'review' lists, but it isn't clear whether that is what is being referred to here.

Theme/ Subcategory	Issue	Reference	Recommended Mitigation	Recommended Analysis
1a. DNR lands-Roads	Avoid sediment delivery from access road surfaces	Chapter 3 Project Components, and Construction, Operation and Maintenance Activities, pages 3-4 and 3-15, Chapter 15 Water, pages 15-1 through 15-24, Chapter 16 Wetlands, pages 16-1 through 16-19	Based on DNR's experience, at a minimum, to mitigate for the potential for excessive road surface wear that could lead to sediment delivery, a minimum of 40 cubic yards per station (100') of rock will be applied to all new and reconstructed access roads associated with this project on DNR managed trust land. Additional rock will be applied as conditions and anticipated use dictate.	
	Structures and culverts on stream crossings	Chapter 3 Project Components and Construction, Operation and Maintenance Activities, page 3-4, page 3-5, and page 3-26	Any structure installed on any stream regardless of fish presence will be appropriately sized based on hydraulic calculations similar to those in the WDFW manual for 100-year flood plus debris avenue: Design of Road Culverts for Fish Passage http://wdfw.wa.gov/publications/00049/ BPA will use appropriately sized round culverts on non-fish bearing streams and open bottom culverts or bridges for crossings on fish bearing streams.	
	Drain dips and water bars	Chapter 3-9 page 3-14 "Access Roads", Chapter 3-9 page 3-15 "Road Improvements", Chapter 3-9 page 3-15 "New Roads"	Avoid installing drain dips or water bars on access roads. Instead install cross drain culverts and associated ditches at a frequency to direct water to the forest floor while not increasing erosion. BPA should follow guidelines in WAC 222-24-050 Water crossing structures (3) and (4) http://apps.leg.wa.gov/wac/default.aspx?cite=222-24-050 If water bars are proposed for installation then BPA needs to compensate for the change in land use from accepted standards and the resulting operational impacts due to log transportation costs and the potential damage to log and equipment trucks in comparison to installing culverts.	
	Road Standards	Chapter 3 Project Components, and	Based on the recommended analysis below.	BPA needs to compare the differences between the

Theme Subcategory	Issue	Reference	Recommended Mitigation	Recommended Analysis
		Construction, Operation and Maintenance Activities, pages 3-14 and 3-15; Chapter 15 Water, pages 15-1 through 15-24, Chapter 16 Wetlands, pages 16-1 through 16-19	Identify and recommend what additional mitigation should be required for this project to meet the scoping comment request.	Washington Forest Practice RMAP standards and the 1987 BPA access road planning and design manual road standards. The comparison should evaluate if the 1987 standards meet or exceed forest practices standards that serve to mitigate for impacts associated with road construction and maintenance.
	Roads within the transmission line corridor	Chapter 3 Project Components and Construction, Operation and Maintenance Activities page 3-23	Temporary construction roads that are parallel to and within the right-of-way corridor will be avoided. If temporary roads are needed, then BPA will develop and implement BMPs such as: limit the number to only critical roads; allow roads to be used only during the dry season (generally June-October); require vehicle wheels to be clear of noxious weeds when entering the roads; and re-vegetate the road immediately upon completion of use and install an access barrier of earth or other natural media material to prevent unauthorized use.	
	Miscellaneous Transportation Comments	Chapter 3 Project Components and Construction, Operation and Maintenance Activities Table 3-2 pages 3-12, 3-14 and 3-23; Chapter 12 Transportation page 12-5	(1) Specific minimum road improvement standards will be developed and incorporated as mitigation in the FEIS or in subsequent agreements with landowners such as: clearing limits, bearing limits, aggregate needs, and curve widening requirements. (2) All bridges on heavy equipment transportation routes will be inspected and certified they have the operating load capacity to handle construction equipment and insure the safety of workers and the public. BPA will install new structures if bridges have been compromised or do not meet certification for the anticipated heavy equipment. (3) BPA will install gates and a lock box that can	

Theme/ Subcategory	Issue	Reference	Recommended Mitigation	Recommended Analysis
			accommodate the required number of parcels to meet the access need.	
1b. DNR lands: Socioeconomic and Land Use impacts.	Quantify and analyze the socioeconomic impact on long-term trust revenue due to the proposed changes in land use that will likely interfere with trust management objectives.	Chapter 11, tables 11-2 (page 11-5), 11-5 (page 11-30), 11-6 (page 11-31), 11-7 (page 11-32), and 11-8 (page 11-33).		At a minimum, an analysis of impacts to the local economy, caused by impacts to the timber industry should include estimates of: (1) The revenues to be realized in the short-term due to immediate harvesting of timber from the proposed right-of-way; (2) The revenues over the life of the project that will be foregone due to conversion of timberland to non-timber production on the proposed right-of-way.
	Transmission Line location near property boundaries.	Chapter 3 section 3.12 Mitigation Measures; Table 3-[illegible] Mitigation measures as part of the project; Chapter 5 Land; Appendix A: maps [illegible]; DEIS maps 5-1A, 5-1B, 5-1C, and 5-1E	BPA will mitigate these impacts by compensating DNR for the additional width of land between the edge of the corridor and DNR's property boundary where the transmission line is moved in and away from adjacent existing private homes. Compensation can either be by purchasing the strip in fee or by another mechanism. If the land is purchased in fee the title will be encumbered by a deed restriction, a conservation easement, or other mechanism to ensure the property remains undeveloped.	

Theme Subcategory	Issue	Reference	Recommended Mitigation	Recommended Analysis
2c. DNR Lands–Uplands HCP	Uplands Habitat Conservation Plan (HCP) Integrity	Chapter Summary S.3.11.2 Impacts Common to Action Alternatives, page S-47, Chapter 15 Water pages 15-5 through 15-7, Chapter 17 Vegetation page 17-5, Chapter 18 Wildlife section 18.[illegible] page 18-9, Chapter 18 Wildlife page 18-64, Chapter 27 Consultation, Review and Permit Requirements page 27-1,2, and Chapter 28 State Substantive Standards page 28-1	Impacts to species listed under DNR's Uplands HCP or to habitat that is currently providing protection per DNR's Uplands HCP commitments will be analyzed by BPA through a formal consultation with the US Fish and Wildlife Service (USFWS) and National Oceanic & Atmospheric Administration Fisheries (NOAA) Fisheries. Mitigation measures will be recommended in BPA's FEIS for the impacts identified through this consultation. DNR believes that impacts should be mitigated at the following minimum ratios for replacement acreage (e.g., if the direct impact is 1 acre of riparian buffer permanently removed, the compensation replacement acreage provided should be 1 acre) provided that the replacement land mitigates for the ecological functions equal to those lost from the removal or deterioration of habitat: 1:1 All permanent impacts. 0.5:1 Temporary impacts, e.g., staging or construction areas In addition to restoration efforts on behalf of BPA, impacts that result from temporary staging and construction areas should also be mitigated at a replacement ratio (0.5:1) that compensates for the short- and long-term impacts to the ecological functions equal to those lost that are currently provided through DNR's Upland HCP conservation measures. BPA and DNR together will determine the location of replacement land.	BPA needs to provide an analysis of the impacts to listed threatened and endangered species and to the integrity of DNR's Uplands HCP. Additionally, DNR believes that BPA is required to initiate consultation under Section 7 of the ESA with USFWS and/or NOAA Fisheries to determine and document that the construction of a new transmission line will not adversely affect listed species that are covered under DNR's Uplands HCP. As a part of that consultation, BPA should provide information sufficient for USFWS and NOAA Fisheries to ascertain whether the proposed transmission project will interfere with any of DNR's obligations under its Uplands HCP. The results of the consultation should be published in the FEIS and, if conservation measures are identified as a result of consultation, these measures should be included as mitigation in the FEIS. Additionally, USFWS section 10 representatives and appropriate DNR representatives familiar with the Uplands HCP should be involved in any discussion with USFWS and/or NOAA Fisheries regarding DNR-managed lands and recommended mitigation measures.

Theme-Subcategory	Issue	Reference	Recommended Mitigation	Recommended Analysis
	Existing legacy and green tree retention	Chapter 26 Cumulative Impacts	Retention clumps and legacy trees permanently removed will be mitigated by compensating DNR for the ecological function and the monetary value of the trees removed. At a minimum, the total of 8 trees per acre (five legacy trees and 3 snags) should be compensated and should meet the minimum characteristics identified in the DNR's Final HCP 1997 page IV. 157.	
	The duration of impacts	Chapter 3 Project Components and Construction, Operation, and Maintenance Activities section 3.12 Mitigation Measures page 3-17; Chapter 26 Cumulative Impacts, pages 26-1 through 26-48	Mitigation will be applied over the life of the project easement as appropriate to address impacts that are likely occur over the life of the project.	
15. DNR lands-Vegetation Management	Danger Trees	Summary, section S.3.12.2 pages S-11, S-14; table 2-1; Chapter 3 Project Components and Construction, Operation and Maintenance Activities, section 3.1.1 pages 3-16; Chapter 5 Land, section 5.2.2.1 page 5-11, section 5.2.2.2 page 5-14, Chapter 11 Socioeconomics, section 11.2.2.5 pages 11-21 and 11-22	See recommended mitigation under extended right-of-ways corridors	See recommended analysis under extended right-of-ways corridors
	Other Vegetation management	Chapter Summary, section S.3.6.2 Impacts common to action alternatives page S-18	To avoid colonization of the I-5 corridor by invasive species, BPA will include a mitigation measure to ensure funding of I-5 corridor vegetation control commensurate with the predictable weed problem.	Analyze the probable extent of the need for vegetation management, and control and eradication of noxious invasive weeds using existing corridors in the area that are similar to and representative of the proposed corridor.
16. DNR lands-Restrictions, constraints & prohibitions	Extended right-of-ways corridors	Chapter 3 Project Components and Construction, Operation and Maintenance Activities, section 3.6 pages 3-10; section 3.10 page 3-15 and 3-16, section 3.11 page 3-16; Chapter 5 Land, section 5.2.2.1	In order for mitigation to cover all impacts to DNR's land use for the full corridor width, mitigation needs to include those areas outside the typical 150' width that it will need to control to protect its transmission line including extended	BPA should analyze the predicted environmental impacts to DNR's land use, forest management, and conservation strategies that will likely result from the need to control the vegetation within 200' (or the height) of the transmission line corridor edge.

Theme/ Subcategory	Issue	Reference	Recommended Mitigation	Recommended Analysis
		page 5-12, section 5.2.2.2 pages 5-21, 5-22, Chapter 11 Socioeconomics, section 11.2.2.5 page 11-21, 11-22.	distances of clear safe backlines.	
	Impacts to harvest operations not clearly identified in the DEIS	Chapter 8 Electric and Magnetic Fields section 8.2.2.1 page 8-4, Chapter 11 Socioeconomics section 11.2.2.7 page 11-24.	Landowners will be compensated for the long term economic impacts of harvest restrictions from inside or outside of the right-of-way including those involving new timber haul roads; reconstruction of landings and avoiding guyline cables. Compensation should include: cost recovery for staff time; permitting; construction materials; and abandonment costs.	BPA needs to analyze the impacts of harvest restrictions including what the long term economic impacts will be to forest landowners that will have harvest restrictions due to need to construct new timber haul roads, new landings and requiring guyline setbacks. This impact is different than a timber loss calculation that would be completed in a typical appraisal.
	Temporary use areas outside the right-of-way	Chapter 3 Project Components and Construction, Operation, and Maintenance Activities, Table 3-2 and sections 3.6 pages 3-10 and 3-11, and section 3.10 pages 3-15 and 3-16.	(1) Pulling and tensioning sites, staging areas, and other off-site temporary ground disturbance locations on DNR managed lands will be reviewed and mitigation identified. (2) Similar to mitigation proposed for cultural resources on Table 3-2: "*Plan for survey and review, as needed of additional disturbance areas not identified during the NEPA process (e.g., staging areas, stringing/pulling sites, guard structure sites, etc.)*", BPA will identify and mitigate for impacts to temporary use and disturbance areas on DNR managed lands outside the right-of-way consistent with mitigation measures in the DEIS as a part of this project and the recommended mitigation measures for the resources identified in the DEIS analysis.	
(e) DNR lands - Wind Power	Potential Wind Power Locations	Chapter 4 Proposed Action and Alternatives section 4.2.2.5 page 4-24, Chapter 11 Socioeconomics section 11.2.8 page 11-25.	For all the alternative segments noted in the summary above, commit to mitigation for the impacts to DNR's land use in the form of compensation for increased wind power	Include an analysis of the impacts to wind power development that are reasonably likely to occur from locating the transmission line in the areas identified above.

Theme: Subcategory	Issue	Reference	Recommended Mitigation	Recommended Analysis
			development costs and for reimbursement for losses of the State's ability to generate revenue from these sites.	
1[illegible] DNR lands-Transfer parcels and transactions	Land use impacts to DNR's reasonably foreseeable land transactions.	Summary, section S.3.7 pages S-30 through S-35; Chapter 3 Project Components and Construction, Operation and Maintenance Activities, Table 3-2 pages 3-22 through 3-28; Chapter 5 Land, section 5.2 pages 5-9 through 5-38; Chapter 11 Socioeconomics, section 11-1 pages 11-1 through 11-46; Appendix A section A.5.1 Land Use, table A-4 Land Use on WDNR Land in the Project Area [Acres]; section A.2.3 Socioeconomics	(1) BPA will mitigate the impacts to DNR's future ability to transition lands or compensate loss of reasonably foreseeable future economic opportunities both on and off the right-of-way including where the easement [illegible] other uses of state properties as a result of the transmission lines (See 11.1.5), e.g., creates incompatible uses such as the conversion of rural residential properties to non-residential uses. (2) BPA will identify mitigation measures for negative socioeconomic impacts due to loss of current land use, for example community values as outlined in section 11.1.8. BPA will identify mitigation measures for negative impacts due to loss of community values as outlined in 11.1.8.	(1) Include information and analysis on zoning and allowable uses, not just current use that will be impacted by the project. Include discussion on impacts to rural residential properties for all categories (5.2.2.1 through 5.2.3.5). (2) Zoning should be included with an analysis on the impact of the project on residentially developable land.
1[illegible] DNR lands-Camas school site	Potential Camas school site on DNR managed trust land.	Chapter 5 Land and Chapter 11 Socioeconomics.	If segment 45 is included in a final design, BPA should follow mitigation sequencing (avoid, minimize, compensate) for potential impacts to the parcel. BPA should: Avoid the parcel; minimize by moving tower and corridor locations to the edges of the parcel; replace the parcel for like characteristics suitable for the Camas School District.	
1[illegible] DNR lands-Casey Road substation site	General comments for the Casey Road property and access roads.	Chapter 5 Land section 5.2 Environmental Consequences, pages 5-8 through 5-10, pages 5-25 through 5-29, and pages 5-37 and 5-38.	(1) Mitigation of impacts to informal uses should include a planned investment in formal replacement recreational sites on DNR managed land to offset this loss. (2) All maintenance and improvement costs associated with a paved access road will be BPA's	

Theme/ Subcategory	Issue	Reference	Recommended Mitigation	Recommended Analysis
			responsibility and at its sole cost. DNR will retain full and unlimited access to all DNR managed lands accessed by the road.	
	Road Maintenance and Abandonment Plans (RMAP), Casey Road substation site	Summary, section S 2.1.1 "Substations" Casey Road substation page S-4; Chapter 4 Proposed Actions and Alternatives, section 4.3.4.2 Casey Road page 4-14; Figure 4-5 Casey Road Substation, and section 4.5.5 "Access Roads" Table 4-4	Mitigation measures to address RMAP and road design standards will be developed in consultation with DNR and will be incorporated into the EIS or into a subsequent agreement(s) with DNR. Any DNR RMAP scheduled projects will be completed by BPA at its sole cost on any access road to the Casey Road substation site.	The EIS needs to reflect changes in proposed access roads to Casey Road substation if moving additional proposed roads.
1e. DNR lands-Communication sites	Electromagnetic Interference	Chapter 8 Electric and Magnetic Fields, section 8.1.3 page 8-1; Table 8-2 page 8-23.	If identified mitigation measures are not successful in avoiding interference, BPA will relocate these communication sites to a location that does not interfere with them or DNR will be compensated for impacts to land use that result in loss of lease revenues for any portions of the new transmission line that cause electromagnetic interference with current or reasonably foreseeable planned sites.	
	Microwave Beam Paths	Chapter 4 Proposed Action and Alternatives, section 4.7.2.2 page 4-23; Chapter 8 Electric and Magnetic Fields, section 8.1.3 page 8-3; Table 8-2 page 8-23	Discuss potential mitigation measures to these land use issues which may be taken to prevent this type of interference of microwave beam paths. Provide compensation for any loss of revenue that result from interference with microwave dish beam paths.	Analyze and discuss the possibility of the proposed transmission line interfering with microwave dish beam paths.
1f. DNR lands-Recreation	Existing and planned recreation opportunities in the Yacolt Burn State Forest	Chapter 6 Recreation, section 6.1.1 page 6-2, section 6.1.2 page 6-3, Table 6-1 page 6-5, 6-8 and 6-9; Table 6-2, page 6-11, section 6.1.4 page 6-12, section 6.1.5 and section 6.2.1 page 6-13, section 6.2.5.1 and section 6.2.5.2 page 6-20, Table 6-4 page 6-24, Section 6.2.5.2 page 6-24; Table 6-5 page 6-25; Table 6-6 page 6-29 and section	(1) BPA in consultation with DNR and users will identify areas within and adjacent to the power line corridor where recreational access would be determined to be compatible or incompatible with power line corridors and access roads. This information will be used as part of the existing or planned recreational trail systems. Access will be restricted or rerouted as these locations are	(1) The impacts to current and planned DNR-provided recreation opportunities as outlined in the Western Yacolt Burn State Forest Recreation Plan need to be analyzed in the EIS. The Western Yacolt Burn State Forest Recreation Plan should be read and an analysis completed on the impacts of where the power line corridor will transect existing or proposal trails and roads or come within 500 feet of existing or planned

Theme Subcategory	Issue	Reference	Recommended Mitigation	Recommended Analysis
		6.2.9 page 6-30	identified (2) BPA will provide long term funding to DNR for enforcing authorized use (through barriers, signage, education, and enforcement) as well as preventing unauthorized use including by regularly and permanently closing and decommissioning unauthorized access points	trails, facilities and roads. The analysis should also include: (2) The power-line corridor and access road crossing of the Bells Mountain Trail on DNR-managed lands and the impacts of those crossings; (3) The locations where recreational facilities and trails may be compatible with power-line corridors and access roads such as motorized trail use; (4) Identification of existing recreation uses of state lands and an analysis of the impacts of the proposal on the recreational use of state lands; (5) The amount of land that will be permanently removed from inventory for recreational opportunities; and (6) The extent of restrictions outside the easement area particularly in areas where the corridor will overlay limit or increase recreational use.
	Impacts to dispersed recreation opportunities	Chapter 6 Recreation pages 6-1 through 6-30, Maps of Alternatives and Options	BPA in consultation with DNR will identify and implement strategies that mitigate negative impacts to dispersed recreation opportunities, including relocation of impacted trails, relocation to suitable areas, and trailheads to existing areas. BPA will provide long-term funding to ensure access and protect the resources critical to dispersed opportunities as well as provide enforcement	There needs to be an analysis of the impacts to dispersed recreation on all DNR managed lands, including those identified above as a result of constructing any of the alternatives. This analysis should include changes in access for dispersed recreation opportunities, changes in habitat for fish and wildlife, and impacts to activities such as hunting, fishing, geocaching, and forest product gathering.
	Impacts during construction	Chapter 6 Recreation, section 6.2.3.1 pages 6-20 and 6-21	BPA in consultation with DNR will identify and implement strategies for blocking access to the area during corridor construction. This should include blocking access to unauthorized trails that are within 500 feet of the corridor. BPA will provide funding to defray the enforcement costs of	There needs to be an analysis of specific recreational uses that would be displaced in the Yacolt Burn State Forest from construction, including possible places the users would go and what the impacts to those places would be from the increased use. This includes existing uses as well as planned uses if the construction interferes

Theme/ Subtheme	Issue	Reference	Recommended Mitigation	Recommended Analysis
			blocking access as well as to defray the costs of maintenance to the reallocated lands (barrier mechanisms).	with plan implementation.
	Reduced public support of DNR-managed lands	Chapter 6 Recreation pages 6-1 through 6-30, Chapter 11 Socioeconomics, section 11.1.8.4 page 11-8.		The socioeconomic impacts to recreation and tax and to the potential decrease in revenue from reduced Discover Pass sales should be analyzed.
7) DNR lands- Control of unauthorized access	Opportunities for unauthorized public access	Chapter 5 Land, section 5.3.2.2 page 5-12; Chapter 6 Recreation, section 6.2.8 page 6-30; Appendix A 2.4.2 and Appendix A-Table A-13.	BPA will provide long-term funding and cooperative management with DNR that is outlined in the EIS, or the EIS includes an acknowledgement that subsequent agreements with DNR regarding preventing unauthorized access, providing enforcement, completing mitigation trail closures, and preventing increase to unauthorized public access will be drafted. Agreements with DNR will include measures and funding for preparing and implementing long-term plans to help avoid or otherwise mitigate damages from unauthorized use. Plans and funding should address enforcement and posting maintaining new signs, gates and other barriers when new/other access points are used by trespassers that were not considered during the construction phase. BPA will share in the responsibility of enforcement, installation of gates and/or replacement, access roads, closing and decommissioning unauthorized trails that occur from corridors and access roads, etc., for environmental and recreation protection measures for the future. The EIS should also identify mitigation measures that could be taken to control future unauthorized public uses. This may include: (1) Install fencing or block undesirable locations;	(1) Conduct a sample survey on a given portion of or land the preferred alternative power line corridor representative of State ownership in the proposed I-5 project. A quantitative prediction of unauthorized use and the impacts could be applied to the DNR-managed lands crossed by the proposed alternatives and versions; and (2) As a comparison, BPA should conduct an analysis of current power line corridors that are representative of DNR managed lands for this project, and the unauthorized access by the public and the impacts that have resulted. (E.g., how much unauthorized trails have been created due to the power line corridors and access roads, and the steps taken to prevent or mitigate unauthorized access?)

Theme/ Subcategory	Issue	Reference	Recommended Mitigation	Recommended Analysis
			(2) Survey existing power lines on DNR-managed lands in the vicinity and document unauthorized use and damage to state lands and public resources. Use this survey to predict damage on proposed lines. Include costs to repair or mitigate predicted damage or identify effective mitigation that could be added that would avoid unauthorized use and damage; (3) Design the corridor to prevent unauthorized public use; (4) Develop and implement a cooperative management plan with DNR to reduce unauthorized public access to the corridor; (5) Regularly inspect for off-road development and damage. Repair damage promptly, especially resource damage; (6) Maintain signs that discourage unauthorized use of the corridor; (7) Survey the easement corridor and clearly mark it so that BPA, contractors, adjacent landowners and the public can clearly recognize when they are within the corridor to prevent uncompensated corridor expansion, vegetation management conflicts, and to reduce unauthorized use; (8) Clarify and discuss the responsibilities, roles, and plans BPA proposes to help prevent and assist grantors in managing these road issues; and (9) Provide a gate and lock box that can accommodate access for multiple landowners on joint-use road systems.	
1j. DNR	Identification of	Chapter 1 Purpose and Need, section 1.5.1	Recommended Change: Use the DNR potential	

Theme/ Subcategory	Issue	Reference	Recommended Mitigation	Recommended Analysis
Lands: Aquatic lands and resources	State Owned Aquatic Land (SOAL) and DNR provided lists for species and vegetation	page 1-12; Summary section S.3.8.2 page 3-35; Chapter 10 Public Health and safety page 10-31; Chapter 11 Socioeconomics, Chapter 12 Transportation; Chapter 27 Consultation, Review and Permit Requirements section 27.10 Clean Water Act page 27-5 and 27-6; section 27.12 Rivers and Harbors Act page 27-9; Chapter 28 State Substantive Standards section 28.2.10 SOAL page 28-14	lists: DNR Proposed List of Protected Vegetation, Navigable waters table, and DNR Aquatic Lands DRAFT Habitat Conservation Plan Species Considered for surveys to be completed on or adjacent to SOAL	
	Land Use Impacts to SOAL easements	See comments above under issue 1 Identification of State-owned Aquatic Land (SOAL) for "Exercise in "navigable waters"	BPA will coordinate with DNR in determining the exact location of the easement boundaries, the restrictions on SOAL, prior to the development or amendment of any easement and any final decision by DNR on the issuance of an easement.	Once the SOALs are identified, BPA will need to provide further information on crossings over state-owned aquatic lands in order for DNR Aquatic staff to determine environmental impacts to habitat, calculate the length of the crossings, calculate administrative easement values, and determine the associated impacts to existing DNR licenses, leases, and agreements.
	Suspension Lines in the Columbia River	Chapter 3 Project Components and Construction, Operation, and Maintenance Activities, Section 3.2.3 page 3-6; Chapter 6 Health and Safety pages 10-11 and 10-12; Chapter 12 Transportation page 12-2 and 12-6; Chapter 15 Water page 15-7		Once the exact location of the tower is identified, include an analysis of the impacts to aquatic resources.
	Preconstruction/ Submerged /Native Aquatic Vegetation	Chapter 17 Vegetation page 17-6	Coordinate with DNR to ensure consistency with the permit statements in the U.S. Corps Permit (U.S. Corps Permit NWS-20[illegible]-23 dated January 4, 2013) to protect and not compromise resources and consider fish and wildlife values.	BPA will analyze the impacts to aquatic/ freshwater vegetation and will ensure the DNR-provided list of protected vegetation is used during surveys of Category plant species when completing wetland delineations.
	Species Work Windows- Consistency with State Standard	Chapter 19 [illegible]ish page 19-13 through 19-25, Table 19-2 page 19-19 and 19-20; Chapter 3 Project Components and Construction, Operation and Maintenance	BPA will operate according to in-water work windows established by the Washington Department of Fish and Wildlife (WDFW) or the U.S. Corps Permit (see page 3-92) for this project.	

1410

Theme/ Subcategory	Issue	Reference	Recommended Mitigation	Recommended Analysis
		Activities Table 3-2 page 3-15 and 3-27	Information regarding WDFW in-water work windows can be obtained by contacting WDFW through their Hydraulic Project Approval website: http://wdfw.wa.gov/licensing/hpa/	
	Mitigation projects	Chapter 15 Water pages 15-23 and 15-26; Chapter 16 Wetlands page 16-18; and Chapter 19 Fish page 19-28	BPA will coordinate with DNR on the development of any proposed mitigation projects on SOAL	
	Quality of maps/ sufficiency of information	Map appendix: maps within document; Washington Department of Natural Resources Requirements for Records of Survey for Leases and Easements (2002)	Incorporate standardized survey identifiers which include the line of ordinary high water, low water, and township-section-range.	
2a. Geologic hazards on DNR managed lands	Mitigation of landslides	Chapter 14 Geology and Soils, section 14.2.8 page 14-16	Any landslide and associated damage related to construction of the BPA I-5 corridor project, either during construction or at any point in the future, will be the responsibility of BPA and will be repaired, rehabilitated, and restored by BPA. Repair, rehabilitation, and restoration can include but are not limited to, engineered slope stabilization measures, repairs to any damaged infrastructure such as roads, rehabilitation of damaged riparian habitat or other ecological functions, and reconstruction of any damaged or destroyed structures. This responsibility also includes full liability for any damage to property or personal injury resulting from a landslide related to construction of the BPA I-5 corridor project.	
	Landslide hazard areas are identified primarily from remote screening	Chapter 14 Geology and Soils, section 14.2.8 page 14-18	(1) Amend the language to read: "Conduct additional site-specific investigations in areas of potential instability identified in Appendix J and by ongoing geologic assessment of the entire selected route to determine degree of recent activity.	

6 of 10

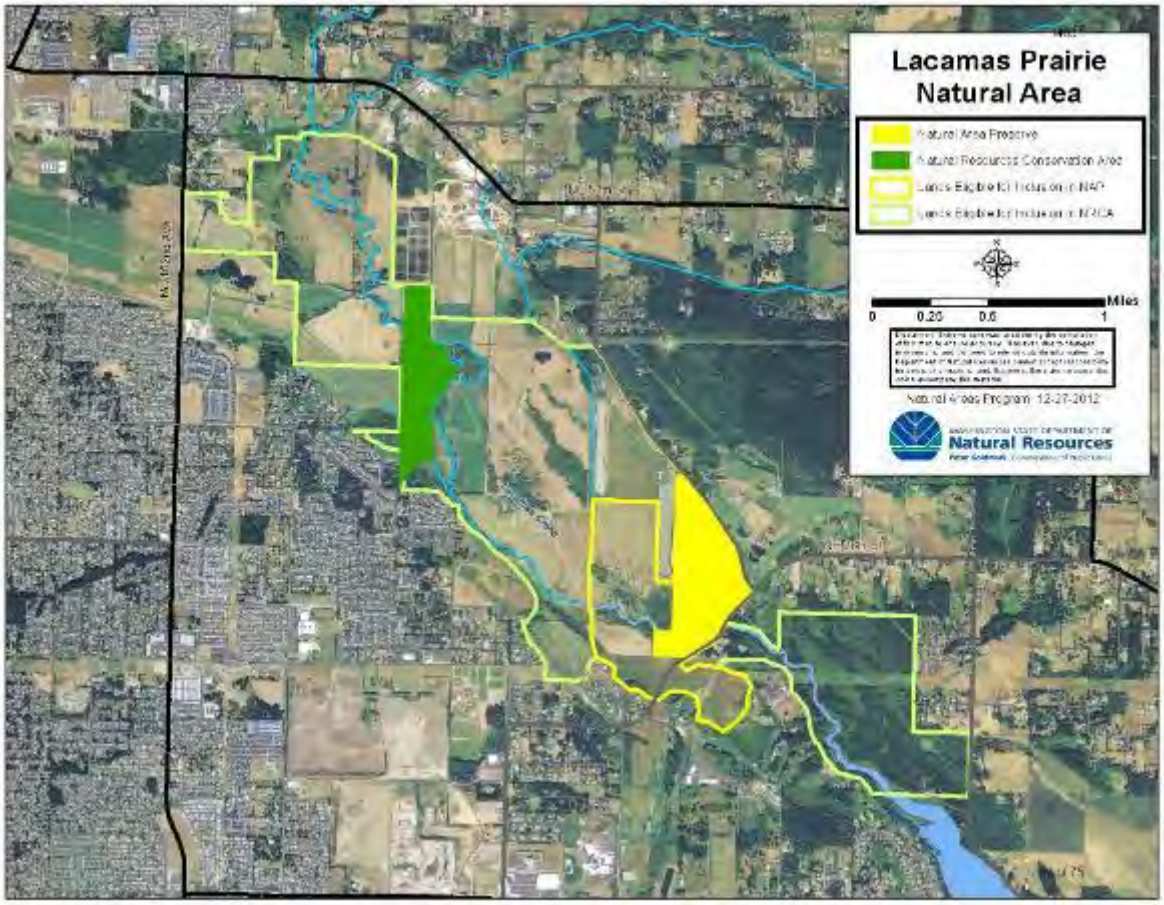
Theme/ Subcategory	Issue	Reference	Recommended Mitigation	Recommended Analysis
	tools		*likelihood of activation or reactivation, potential setbacks, and site specific stability as appropriate. Site towers in areas not susceptible to landslides. If necessary, design site specific mitigation measures"* **(2)** BPA will coordinate with DNR on design and site-specific slope stability mitigation measures.	
	DNR review of final tower placement locations on DNR-managed lands		A DNR representative will have the opportunity to review/approve tower line locations on DNR managed lands prior to finalizing locations to limit geological impacts.	
5b. Geologic Hazards on all lands	Seismic Risk	Chapter 14 Geology and Soils, section 14.1.3.2 page 14-2.	Develop and implement a rapid response plan which includes contacts in case of emergencies.	
The local economy including timber and recreation	The local economy including timber	Chapter 11 Socioeconomics, section 11.1.7 page 11-7.		At a minimum, an analysis of impacts to the local economy caused by impacts to the timber industry should include estimates of the impact of these revenue changes to the employment and income of lumber mills and other timber end users, <u>and</u> the impact of both the short-term timber harvest and the long-term land conversion on employment and income in the local timber industry including logging companies and mills

Theme Subcategory	Issue	Reference	Recommended Mitigation	Recommended Analysis
	Recreation and the local economy	Chapter 6, "Recreation"; Chapter 11 "Socioeconomics"	Once the analysis is completed mitigation(s) (agency) could be considered and proposed	In general and forecast alternative, the DEIS quantifies the number of impacted acres by landowner and land use and qualitatively discusses the impacts of construction, maintenance, and the transmission lines on trails, streams, parks and recreation areas (See Chapters 6 and 8 and Appendix V). However, the DEIS fails to synthesize these disparate impacts into an evaluation of the trade-offs involved with each alternative compared to the no action. Such a synthesis is critical to understanding what is at stake in selecting a route alternative and the proper mitigation it would require.
Cultural Resources	Cultural Resources-graves and burial sites	Chapter 3 Table 3-2 pages 3-24, 25; Chapter 13 Cultural Resources	BPA shall notify DNR if and when a native Indian burial site, grave or human remains is found on DNR managed lands and cooperate with DNR to ensure DNR compliance with state law.	
	Impact Levels	Chapter 13 Cultural Resources, section 13.2.1 page 13-5.		Recommend or change: Amend the discussion and assignment of impact levels to recognize that an excavated or unidentified NRHP property may be a high impact and to assume that a potentially eligible NRHP property is a moderate impact.
Forest Practices	Forest Practices applications	Chapter 28 Consistency with State Substantive Standards, section 28.2.9 page 28-34.	BPA will work with DNR forest practices staff to develop notification and informational materials for forest landowners who wish to harvest (remove) cleared timber generated from the clearing of the transmission line corridor. The informational materials would be designed to inform landowners of their responsibilities to mitigate or eliminate impacts covered by DNR's forest practices rules.	
	Forest Practices Habitat Conservation	Chapter 28 Consistency with State Substantive Standards, section 28.2.9 page 28-34		Provide analysis for and with all coordination under Section 7 of the Act with U.S. Fish & Wildlife Service and the National Oceanic & Atmospheric

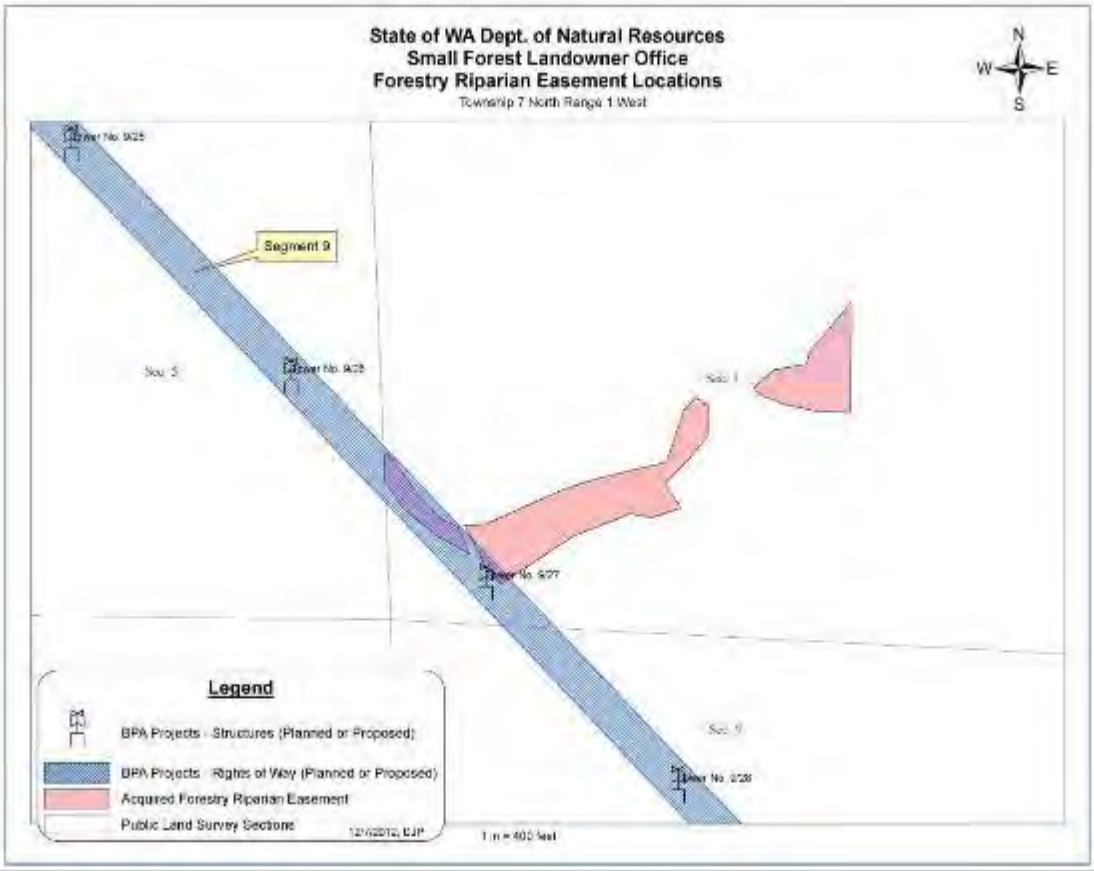
Theme/ Subcategory	Issue	Reference	Recommended Mitigation	Recommended Analysis
	Plan (FPFCP)			Administrative Fisheries (NOAA Fisheries) to demonstrate and document that the construction of a new transmission line, considering appropriate environmental capital investment, will not adversely affect the agreement and the commitments made in the Forest Practices HCP. Additionally, CSPWN Section 10 representatives familiar with the Forest Practices HCP should be involved in any discussion regarding the Forest Practices HCP.
	Forest Road Best Management Practices (BMPs) on lands regulated by Forest Practices	Chapter 13 Water, section 13.2.8 page 13-23, Reference page 29-2	(1) On forest roads where Clean Water Act compliance is implemented by the forest practices rules, BPA should follow the BMPs outlined in WAC 222-24. (2) All access roads should have a minimum of 40 culverts/mile/station applied, and adequate drainage structures to minimize sediment delivery to any live water.	
	Riparian Area Best Management Practices on lands regulated by Forest Practices	Chapters 8 summary, 12 Water, 16 Wetlands, 17 Vegetation, 18 Wildlife, 19 Fish, 26 Cumulative Impacts and others	Mitigation sequencing in riparian areas should follow: (1) Avoidance – where practical, BPA should mitigate impacts by leaving covertrees to avoid creating overstory timber. Understory vegetation should be retained. (2) Mitigation if avoidance is not possible, timber should be topped and other trees felled only when needed. All felled timber within the core zone (from edge of bank full width or channel migration zone extending perpendicularly to fifty (50) horizontal feet should be left as down wood recruitment in the riparian area.	
Forestry Riparian Easement	Location change and impact analysis of the forestry	Summary, section S.3.1.3 page S-12, section S.3.13.1 page S-57, and section S.3.13.2 page S-59; Chapter 3 Proposed Actions and Alternatives, section 4.2 page	Consistent with the general mitigation approach for "compensatory" mitigation stated in section 3.13 Mitigation Measures page 3-17, add a provision for compensation and/or mitigation for	

Theme/ Subcategory	Issue	Reference	Recommended Mitigation	Recommended Analysis
	Riparian easements	4-3, Table 4-10 page 4-42; Chapter 5 Land, section 5.1.3 page 5-5, section 5.2.4.2 page 5-24; Chapter 17 Vegetation, section 17.1.2.1 page 17-8; section 17.2.4.4 page 17-24	the loss of conservation capacity intended by the Forestry Riparian Easement. Some types of compensation or mitigation DNR might consider are replacement land, stream enhancement, or other similar actions acceptable to DNR.	
Protection from Fire	Fire prevention and protection	Chapter 10 Health and Safety Page 10-9, page 10-11.	(1) BPA shall take all reasonable measures to prevent and minimize the start and spread of fire on to adjacent forested areas. Measures should include ensuring all vehicles carry a fire extinguisher of at least a 5 BC rating and a serviceable shovel, following construction site safety operating procedures which should include compliance with the substantive requirements of the current Washington Administrative Code (WAC 332-24-301 (industrial restrictions) and WAC 332-24-405 (Spark emitting requirements). (2) In addition to the proposed mitigation, the DEIS should incorporate language similar to: *"Follow best practices to address the establishment of slash, logs or trees resulting from vegetation removal operations that pose a hazard for wildfire spread or ignition. Best practices include scattering, chipping or the arrangement of concentrations of logs or trees in a manner as to not create a continuous wildfire hazard fuel bed."*	
Special Lands/Species	Determination of impact level for special status plant species is unclear	Within Chapter 17 Vegetation pages 17-1 through 17-34	BPA will consider and propose any mitigation that is needed to protect the species in addition to that recommended on page 17-33. Similar to mitigation proposed for cultural resources on Table 3-[illegible] *"When the survey and review are completed, if additional sensitive areas are identified during the [illegible]*	An analysis of the potential impacts should be done at the time of pre-construction surveys as is recommended on page 17-33 and should include the degree of impacts and how to mitigate.

Theme Subcategory	Issue	Reference	Recommended Mitigation	Recommended Analysis
Accuracy of GIS data for EIS analysis	GIS data used for analysis		and pulling sites, guard structure areas, etc.)? BPA will identify and mitigate for special status species not identified during the NEPA process. BPA needs to ensure we're all GIS data that is being used for the environmental analysis in the EIS and provide adult and mitigation measures where additional impacts are indicated	Post ground truthing, BPA should review the GIS data in the DEIS and update the data and the environmental impact and EIS where needed, especially that which is related to the alternatives.



14831



54 of 75

14831

WDNR Aquatic Lands

Habitat Conservation Plan

Appendix B - Species Considered

Species			Natural Heritage		Potential Effects Analysis			Final Recommendation	
Group	Name	Listing Status	Rank	Spatial Overlap	Screened	Designation	Reasoning		Reasoning
Amphibians & Reptiles	Cascades frog (*Rana cascadae*)	FCo	G3; S4?	Yes	No	Watch	Not listed; Apparently secure; Low potential to affect; Insufficient biological information	Exclude	Apparently secure; Low potential to affect; Insufficient biological information
	Coastal tailed frog (*Ascaphus truei*)	FCo	G4; S4	Yes	Yes	Evaluation	Not listed; Apparently secure	Exclude	Apparently secure
	Columbia spotted frog (*Rana luteiventris*)	FCo; SC	G4; S4	Yes	Yes	Covered	Species of Concern; High potential to affect; Similar habitat requirements to other species	Include in as High Risk Species	High potential to affect; Similar habitat requirements to other amphibians, therefore little to no additional conservation cost/effort
	Northern leopard frog (*Rana pipiens*)	FCo; SE	G5; S1	Yes	Yes	Covered	State listed; Highly dependent upon freshwater wetlands; Extremely rare/critically imperiled in Washington	Include in as High Risk Species	Extremely rare/critically imperiled in Washington; Similar habitat requirements to other amphibians, therefore little to no additional conservation cost/effort
	Northern red-legged frog (*Rana aurora aurora*)	SC	G4; S4	Yes	No	Watch	Not listed; Apparently secure; Insufficient biological information	Exclude	Apparently secure; Insufficient biological information
	Oregon spotted frog (*Rana pretiosa*) (esp. All)	FC; SE	G2G3; S1	Yes	Yes	Evaluation	State listed; Low potential to affect; Little to no overlap with authorized activities	Include in as High Risk Species	Occurs on state lands; Critically imperiled in Washington; Similar habitat requirements to other amphibians, therefore little to no additional conservation cost/effort
	Rocky Mountain tailed frog (*Ascaphus montanus*)	SC	G4; S?	Yes	No	Watch	Not listed; Apparently secure; Low potential to affect; Insufficient biological information	Exclude	Apparently secure; Low potential to affect; Insufficient biological information

Species			Natural Heritage		Potential Effects Analysis			Final Recommendation	
Group	Name	Listing Status	Rank	Spatial Overlap	Screened	Designation	Reasoning		Reasoning
	Western toad (*Bufo boreas (sop. A)*)	FCo; SC	G4; S3S4	Yes	Yes	Covered	Species of Concern; Medium potential to affect; Declining populations; Heightened sensitivity to anthropogenic affects	Include in as High Risk Species	Medium potential to affect; Declining populations; Heightened sensitivity to anthropogenic effects; Similar habitat requirements to other amphibians, therefore little to no additional conservation cost/effort
	Western pond turtle (*Clemmys marmorata*)	FCo; SE	G3G4; S1	Yes	Yes	Covered	State listed; Declining populations; Heightened sensitivity to anthropogenic affects	Include in as High Risk Species	Declining populations; Heightened sensitivity to anthropogenic affects
Birds	American white pelican (*Pelecanus erythrorhynchos*)	SE	G3; S1	Yes	No	Evaluation	Not federally listed; Low potential to affect; Insufficient biological information	Exclude	Low potential to affect; Insufficient biological information
	Bald eagle (*Haliaeetus leucocephalus*)	Delisted	G4; S4	Yes	Yes	Covered	High potential to affect	Include as Species of Concern	Delisted; High potential to affect
	Black tern (*Chlidonias niger*)	FCo	G4; S4	Yes	Yes	Covered	Species of Concern; Low potential to affect; Highly dependent upon freshwater wetlands; Populations decreasing, with non-breeding adults ranked as imperiled with a "high" risk of extirpation.	Include as Species of Concern	Species of Concern; Populations decreasing, with non-breeding adults ranked as imperiled with a "high" risk of extirpation.

Species			Natural Heritage		Potential Effects Analysis			Final Recommendation	
Group	Name	Listing Status	Rank	Spatial Overlap	Screened	Designation	Reasoning		Reasoning
	Brandt's cormorant (*Phalacrocorax penicillatus*)	SC	G5; S3	Yes	No	Watch	Not listed; Low potential for affects; Insufficient biological information	Exclude	Low potential for affects; Insufficient biological information
	Brown pelican (*Pelecanus occidentalis*)	FE; SE	G4; S3	Yes	Yes	Evaluation	Listed; High species/activity overlap rank for non-breeding birds	Include as Species of Concern	High species/activity overlap rank for non-breeding birds
	Cassin's auklet (*Ptychoramphus aleuticus*)	FCo; SC	G4; S3	Yes	No	Evaluation	Not listed; Apparently secure; Low potential to affect; Insufficient population information	Exclude	Apparently secure; Low potential to affect; Insufficient population information
	Clark's grebe (*Aechmophorus clarkii*)	None	G5; S2BS2N	Yes	No	Watch	Not listed; Apparently secure; Low potential to affect; Insufficient population information	Exclude	Apparently secure; Low potential to affect; Insufficient population information
	Common loon (*Gavia immer*)	SC	G5; S2BS4N	Yes	Yes	Covered	Sensitive Species; Medium potential to affect; Populations decreasing globally and breeding adults are listed as imperiled within Washington	Include as Species of Concern	Medium potential to affect; Populations decreasing globally and breeding adults are Listed as imperiled within Washington
	Common murre (*Uria aalge*)	SC	G5; S4	Yes	Yes	Evaluation	Not listed; Species nests on cliff tops; Five of the six murre colonies in Washington are located in marine sanctuaries offering a high level of protection	Exclude	Species nests on cliff tops; Five of the six murre colonies in Washington are located in marine sanctuaries offering a high level of protection

Species Group	Name	Listing Status	Natural Heritage Rank	Spatial Overlap	Potential Effects Analysis			Final Recommendation	Reasoning
					Screened	Designation	Reasoning		
	Eared grebe (*Podiceps nigricollis*)	None	G5; S2breeding, S4Non-breeding	Yes	No	Evaluation	No spatial overlap	Exclude	No spatial overlap with covered activities
	Harlequin duck (*Histrionicus histrionicus*)	None	G4; S2	Yes	Yes	Covered	Not listed; Medium potential to affect; Utilizes most aquatic habitat types in the state of Washington and listed as imperiled due to small populations	Include as Species of Concern	Medium potential to affect; Utilizes most aquatic habitat types in the state of Washington and listed as imperiled due to small populations
	Marbled murrelet (*Brachyramphus marmoratus*)	FT; ST	G3G4; S3	Yes	Yes	Covered	Listed species; High potential to affect	Include as Species of Concern	Forages exclusively in saltwater ecosystems
	Peregrine falcon (*Falco peregrinus*)	FCo; SS	G4; S2	Yes	No	Watch	Not listed; Medium potential to affect	Exclude	
	Purple martin (*Progne subis*)	SC	G5; S3	Yes	No	Watch	Not listed; Apparently secure; Low potential to affect	Exclude	Apparently secure; Low potential to affect
	Tufted puffin (*Fratercula cirrhata*)	FCo; SC	G5; S3S4	Yes	Yes	Evaluation	Not listed; Low potential to affect. Nests on the outer coast or within the Straits and rarely ventures inland; Potential affects primarily involve prey abundance	Exclude	Low potential to affect; Nests on the outer coast or within the Straits and rarely ventures inland. Potential affects primarily involve prey abundance
	Western snowy plover (*Charadrius alexandrinus nivosus*)	FT; SE	G4; S1	Yes	Yes	Covered	Listed; Spatial overlap with authorized activities minimal, but 92 percent of habitat may be affected	Include as High Risk Species	Spatial overlap with authorized activities minimal, but 92 percent of habitat may be affected

Species Group	Name	Listing Status	Natural Heritage Rank	Spatial Overlap	Potential Effects Analysis			Final Recommendation	Reasoning
					Screened	Designation	Reasoning		
Fish	Black rockfish (*Sebastes melanops*)	SC		Yes	No	Evaluation	Not listed; Insufficient biological information	Exclude	Insufficient biological information
	Bocaccio rockfish (*Sebastes paucispinis*)	SC	G5	Yes	No	Evaluation	Not listed; Insufficient biological information	Include as Species of Concern	Proposed for listing. Potential use of eelgrass and kelp by juveniles.
	Brown rockfish (*Sebastes auriculatus*)	FCo; SC		Yes	Yes	Evaluation	Not listed; Little direct take associated with covered activities. Indirect effects encompass a relatively small percentage of available habitat	Exclude	Little direct take associated with covered activities. Indirect effects encompass a relatively small percentage of available habitat
	Bull trout/Dolly Varden (*Salvelinus confluentus*)	FT; SC	G3; S3	Yes	Yes	Covered	Listed; High potential to affect two of three lifestages	Include as High Risk Species	High potential to affect two of three lifestages
	Canary rockfish (*Sebastes pinniger*)	SC		Yes	No	Evaluation	Not listed; Low potential for affects	Include as Species of Concern	Proposed for listing. Potential use of shallow nearshore habitats by juveniles.
	China rockfish (*Sebastes nebulosus*)	SC		Yes	No	Evaluation	Not listed; Insufficient biological information	Exclude	Insufficient biological information
	Chinook salmon (*Oncorhynchus tshawytscha*)	FT/FE; SC	G5; S3S4	Yes	Yes	Covered	Listed; High potential to affect two of three lifestages	Include as High Risk Species	High potential to affect two of three lifestages
	Chum salmon (*Oncorhynchus keta*)	FT; SC	G5; S3	Yes	Yes	Covered	Listed; High potential to affect two of three lifestages	Include as High Risk Species	High potential to affect two of three lifestages

Species			Natural		Potential Effects Analysis			Final	
Group	Name	Listing Status	Heritage Rank	Spatial Overlap	Screened	Designation	Reasoning	Recommendation	Reasoning
	Coastal cutthroat (*Oncorhynchus clarki clarki*)	Delisted - Taxonomic revision (DR)	G4; S3	Yes	Yes	Covered	Not listed; High potential to affect two of three lifestages; Similar habitat requirements to other salmonids; therefore little to no additional conservation cost/effort	Include as Species of Concern	High potential to affect two of three lifestages; Similar habitat requirements to other salmonids; therefore little to no additional conservation cost/effort
	Coho salmon (*Oncorhynchus kisutch*)	FC	G4; S3	Yes	Yes	Covered	Listed; High potential to affect two of three lifestages	Include as High Risk Species	High potential to affect two of three lifestages
	Copper rockfish (*Sebastes caurinus*)	FCo; SC		Yes	Yes	Evaluation	Not listed; Little direct take associated with covered activities; Indirect effects encompass a relatively small percentage of available habitat;	Exclude	Little direct take associated with covered activities; Indirect effects encompass a relatively small percentage of available habitat;
	Eulachon (*Thaleichthys pacificus*)	FC; SC	G3; S1?	Yes	No	Evaluation	Not listed; Insufficient biological information	Include as Species of Concern	Candidate species; Important prey species; Protected under programmatic forage fish strategy
	Green sturgeon (*Acipenser medirostris*)	FT (Southern DPS)	G3; S2N	Yes	No	Evaluation	Not listed; Minimal distribution data	Include as High Risk Species	Southern Distinct Population listed; Forage in Willapa & Grey's Harbor; Potential impacts to prey resources associated with shellfish aquaculture.
	Greenstriped rockfish (*Sebastes elongatus*)	SC	G5; S4	Yes	No	Evaluation	Not listed; Apparently secure; Insufficient biological information	Exclude	Apparently secure; Insufficient biological information

Species			Natural		Potential Effects Analysis			Final	
Group	Name	Listing Status	Heritage Rank	Spatial Overlap	Screened	Designation	Reasoning	Recommendation	Reasoning
	Leopard dace (*Rhinichthys falcatus*)	SC	G4; S2S3	Yes	No	Evaluation	Not listed; Insufficient biological information	Exclude	Insufficient biological information
	Margined sculpin (*Cottus marginatus*)	FCo; SS	G3; S2	Yes	No	Watch	Not listed; Occurs in higher order streams; Low potential to affect	Exclude	Occurs in higher order streams; Low potential to affect
	Olympic mudminnow (*Novumbra hubbsi*)	SS	G3; S2S3	Yes	Yes	Evaluation	Not listed; No spatial overlap	Exclude	No spatial overlap
	Pacific cod (*Gadus macrocephalus*)	FCo; SC	G4; S2S3	Yes	Yes	Evaluation	Not listed; Low potential to affect; Little direct take associated with covered activities; Indirect effects encompass a relatively small percentage of available habitat	Exclude	Low potential to affect; Little direct take associated with covered activities; Indirect effects encompass a relatively small percentage of available habitat
	Pacific hake (*Merluccius productus*)	FCo; SC	G5; S2S3	Yes	Yes	Evaluation	Not listed; Low potential to affect; Little direct take associated with covered activities; Indirect effects encompass a relatively small percentage of available habitat	Exclude	Low potential to affect; Little direct take associated with covered activities; Indirect effects encompass a relatively small percentage of available habitat

Species		Listing Status	Natural Heritage Rank	Spatial Overlap	Potential Effects Analysis			Final Recommendation	Reasoning
Group	Name				Screened	Designation	Reasoning		
	Pacific herring (*Clupea pallasi*)	FC; SC	G3 S2S3	Yes	Yes	Evaluation	Not listed; High potential to affect. Little direct take associated with covered activities; indirect effects encompass a relatively small percentage of available habitat	Include as Species of Concern	High potential to affect. Important prey species; Protected under programmatic forage fish strategy.
	Pacific lamprey (*Lampetra tridentata*)	FCo	G5 S2	Yes	No	Evaluation	Not listed; Insufficient biological information	Exclude	Insufficient biological information
	Pink salmon (*Oncorhynchus gorbuscha*)	None	G5 S2	Yes	Yes	Covered	Not listed; High potential to affect two of three lifestages; Similar habitat requirements to other salmonids, therefore little to no additional conservation cost/effort	Include as Species of Concern	Not listed; High potential to affect two of three lifestages; Similar habitat requirements to other salmonids, therefore little to no additional conservation cost/effort
	Pygmy whitefish (*Prosopium coulteri*)	SS	G5 S2	Yes	Yes	Evaluation	Not listed	Exclude	Not listed
	Quillback rockfish (*Sebastes maliger*)	FCo; SC	G5; S3	Yes	Yes	Evaluation	Not listed	Exclude	Not listed
	Redstripe rockfish (*Sebastes proriger*)	SC	G5 S3S4	Yes	No	Evaluation	Not listed; Apparently secure; Insufficient biological information	Exclude	Not listed; Apparently secure; Insufficient biological information
	River lamprey (*Lampetra ayresi*)	FCo; SC	G5 S1S2	Yes	No	Evaluation	Not listed; Insufficient biological information	Exclude	Not listed; Insufficient biological information

Species		Listing Status	Natural Heritage Rank	Spatial Overlap	Potential Effects Analysis			Final Recommendation	Reasoning
Group	Name				Screened	Designation	Reasoning		
	Sockeye/Kokanee (*Oncorhynchus nerka*)	FT/FE; SC	G5 S2S3	Yes	Yes	Covered	Listed; High potential to affect two of three lifestages	Include as High Risk Species	High potential to affect two of three lifestages
	Steelhead (*Oncorhynchus mykiss*)	FT/FE; SC	G5; S5	Yes	Yes	Covered	Listed; High potential to affect two of three lifestages	Include as High Risk Species	High potential to affect two of three lifestages
	Surf smelt (*Hypomesus pretiosus*)	None		No	No	Watch	Not listed; Insufficient biological information	Include as Species of Concern	Important prey species; Protected under programmatic forage fish strategy.
	Tiger rockfish (*Sebastes nigrocinctus*)	SC	G4; S2	Yes	No	Evaluation	Not listed; Insufficient biological information	Exclude	Not listed; Insufficient biological information
	Umatilla dace (*Rhinichthys umatilla*)	SC	G1; S1	Yes	No	Evaluation	Not listed; Insufficient biological information	Exclude	Not listed; Insufficient biological information
	Vermilion rockfish (*Sebastes miniatus*)	None		No	No	Watch	Not listed; Insufficient biological information	Exclude	Not listed; Insufficient biological information
	Walleye pollock (*Theragra chalcogramma*)	FCo; SC	G5; S2S3	Yes	Yes	Evaluation	Not listed; Little direct take associated with covered activities; Indirect effects encompass a relatively small percentage of available habitat	Exclude	Little direct take associated with covered activities; Indirect effects encompass a relatively small percentage of available habitat
	Westslope cutthroat (*Oncorhynchus clarki lewisi*)	FCo	G4T3; S2	Yes	No	Watch	Not listed; Occurs in higher order streams; Low potential to affect	Exclude	Occurs in higher order streams; Low potential to affect

Species			Natural Heritage		Potential Effects Analysis			Final Recommendation	
Group	Name	Listing Status	Rank	Spatial Overlap	Screened	Designation	Reasoning		Reasoning
	White sturgeon (*Acipenser transmontanus*)	None	G4; S3S4N	Yes	Yes	Evaluation	Not listed	Include as Species of Concern	Similar habitat requirements to green sturgeon, therefore inclusion provides benefit with little to no additional conservation cost/effort
	Widow rockfish (*Sebastes entomelas*)	SC		Yes	No	Evaluation	Not listed; Low potential to affect	Exclude	Low potential to affect
	Yelloweye rockfish (*Sebastes ruberrimus*)	SC	G4; SU	Yes	No	Evaluation	Not listed; Insufficient biological information	Exclude	Insufficient biological information
	Yellowtail rockfish (*Sebastes flavidus*)	SC	G4; S3	Yes	No	Evaluation	Not listed; Apparently secure	Exclude	Apparently secure
Marine Mammals	Blue whale (*Balaenoptera musculus*)	FE; SE	G2; S1 S2	Yes	No	Watch	No spatial overlap with authorized activities; Insufficient biological information	Exclude	No spatial overlap with authorized activities
	Bowhead whale (*Balaena mysticetus*)	FE	G2; S1 S2	Yes	No	Watch	No spatial overlap with authorized activities; Insufficient biological information	Exclude	No spatial overlap with authorized activities
	Gray whale (*Eschrichtius robustus*)	SS	G3G4; S2	Yes	No	Watch	Not listed; Apparently secure	Exclude	Apparently secure
	Humpback whale (*Megaptera novaeangliae*)	FE; SE	G3; S2N	Yes	Yes	Evaluation	Listed; Low potential to affect; Little direct take associated with covered activities; Indirect effects	Exclude	Low potential to affect; Little direct take associated with covered activities; Indirect effects encompass a relatively small

Species			Natural Heritage		Potential Effects Analysis			Final Recommendation	
Group	Name	Listing Status	Rank	Spatial Overlap	Screened	Designation	Reasoning		Reasoning
							encompass a relatively small percentage of available habitat		percentage of available habitat
	Northern sea otter (*Enhydra lutris kenyoni*)	FCo; SE	G3G4; S2S3	Yes	Yes	Evaluation	Not listed; Low potential to affect	Exclude	Low potential to affect
	Right whale (*Balaena glacialis incl. australis*)	FE	G4G5; S1S2	Yes	No	Watch	Listed; No spatial overlap with authorized activities; Insufficient biological information	Exclude	No spatial overlap with authorized activities; Insufficient biological information
	Southern resident orca (*Orcinus orca*)	SE	G3G4; S2	Yes	Yes	Covered	Listed; High potential to affect; Listed species	Include as Species of Concern	Low to trace effects.
	Steller sea-lion (*Eumetopias jubatus*)	FT; ST	G1; SU	Yes	No	Evaluation	Listed; Low potential to affect; Insufficient biological information	Exclude	Low potential to affect; Insufficient biological information
Molluscs	Ashy pebblesnail (*Fluminicola columbiana*)	None		No	No	Evaluation	Not listed; Insufficient biological information	Exclude	Insufficient biological information
	California floater (*Anodonta californiensis*)	FCo; SC	G3; S1S2	Yes	No	Evaluation	Accidental; Insufficient biological information	Exclude	Insufficient biological information
	Giant Columbia spire snail (*Fluminicola columbiana*)	FCo; SC	G3; S1S2	Yes	No	None	Not listed; Insufficient information	Exclude	Insufficient biological information

14851

Species		Listing Status	Natural Heritage Rank	Spatial Overlap	Potential Effects Analysis			Final Recommendation	Reasoning
Group	Name				Screened	Designation	Reasoning		
	Idaho springsnail (*Pyrgulopsis idahoensis*)	None	G1	Yes	No	Watch	Federally listed; Low potential for effects. Insufficient biological information	Exclude	Insufficient biological information
	Lyn's clubtail (*Gomphus lynnae*)	FCo	G2; S1S2	Yes	No	Evaluation	Not listed; Insufficient biological information	Exclude	Insufficient biological information
	Masked duskysnail (*Lyogyrus sp. 2*)	None	G1G2; S1	Yes	No	Evaluation	Not listed; Insufficient biological information	Exclude	Insufficient biological information
	Nerite Rams-Horn (*Vorticifex nerioides*)	None	G1Q; S?	Yes	No	Evaluation	Not listed; Insufficient biological information	Exclude	Insufficient biological information
	Newcomb's littorine snail (*Algamorda subrotundata*)	FCo, SC	G1G2; SNR	Yes	No	Evaluation	Not listed; Insufficient biological information	Exclude	Insufficient biological information
	Olympia Oyster (*Ostrea lurida*)	SC	G2; S2?	Yes	Yes	Evaluation	Not listed; Direct effects unlikely; Indirect effects encompass a relatively small percentage of available habitat	Exclude	Direct effects unlikely; Indirect effects encompass a relatively small percentage of available habitat
	Olympia pebblesnail (*Fluminicola*)	None	G2; S?	Yes	No	Evaluation	Not listed; Insufficient biological information	Exclude	Insufficient biological information
	Pinto (Northern) abalone (*Haliotis kamtschatkana*)	FCo; SC	G3; S2	Yes	Yes	Covered	Not listed; High potential affect from authorized activities	Exclude	Primary threat poaching/overharvest; Minimal spatial overlap with authorized activities

14851

Species		Listing Status	Natural Heritage Rank	Spatial Overlap	Potential Effects Analysis			Final Recommendation	Reasoning
Group	Name				Screened	Designation	Reasoning		
	Shortface Lanx (*Fisherola nuttalli*)	None		No	No	Evaluation	Not listed; Insufficient biological information	Exclude	Insufficient biological information
	Washington duskysnail (*Amnicola sp. 2*)	None	G*; S1	Yes	No	Evaluation	Not listed; Insufficient biological information	Exclude	Insufficient biological information
	Western ridgemussel (*Gonidea angulata*)	None	G3; S1S2	Yes	No	Evaluation	Not listed; Insufficient biological information	Exclude	Insufficient biological information
	Nolin's lobelia (*Lobelia kalmii*)	None	G5; S1	Yes	No	Watch	Not listed; No spatial overlap	Exclude	No spatial overlap
	Persistent-topal yellowcress (*Rorippa calycina*)	None	G3; S2	Yes	Yes	Evaluation	Not listed; Not documented in Washington	Exclude	Not documented in Washington
Flo-ta	Pygmy waterlily (*Nymphaea retrorsa*)	None	G5; SH	Yes	No	Watch	Extirpated; Does not occur on state-owned aquatic land; Insufficient biological information	Exclude	Does not occur on state-owned aquatic land
	Water howellia (*Howellia aquatilis*)	None	G3; S2S3	Yes	Yes	Evaluation	Listed; No spatial overlap with authorized activities	Exclude	No spatial overlap with authorized activities
	Water lobelia (*Lobelia dortmanna*)	None	G4G5; S2	Yes	Yes	Evaluation	Not listed	Exclude	Insufficient biological information

50 of 75

14831

Appendix D – Proposed List of Protected Vegetation

Plant Species Review

The HCP defines potentially protected vegetation as native photosynthetic plants or algae that are either attached to or rooted in the substrate on state owned aquatic lands. Four groups of native aquatic vegetation are included: saltwater plants (seagrass and saltmarsh plants), kelps (algae in the order Laminariales), complex freshwater algae (stoneworts and brittle worts), and rooted freshwater plants (submerged, floating and emergent types). In order to be protected under the HCP, there needs to be evidence that a vegetation type provides important habitat for any of the HCP covered species during a portion of their life history. The following is a list of freshwater and marine/estuarine plant species that will be evaluated on a site by site and situational basis for protection on state owned aquatic lands. While all species within the four groups are potentially protected, the list is limited to species that occur in areas with a high likelihood of receiving project proposals. This list does not warrant protection of the listed plant species but should be used as a tool in a multifaceted review process of applications submitted to use state owned aquatic lands. It is a reference that should be used as a tool to assist with further evaluation and investigation to better determine plant species protection on state owned aquatic lands.

Species	Common Name	Family	General Location	Rationale	Comments
Freshwater Species					
Alisma gramineum	Water Plantain	Alismataceae	Lakes Shoreline (rarely submersed) Throughout WA.	Food and habitat for waterfowl and fish	
Alisma triviale	Water Plantain	Alismataceae	Lakes Shoreline (rarely submersed) Throughout WA.	Food and habitat for waterfowl and fish	
Alopecurus spp. (various)	Foxtails	Poaceae	Lakes, Rivers Shoreline Throughout WA.	Nutritious and palatable for wildlife.	Some non-native sp. in WA. *A. myosuroides* is on the WA noxious weed list.
Brasenia schreberi	Watershield	Cambomaceae	Lakes Floating (rooted 0.5 to 3m deep) Throughout WA.	Habitat for fish and aquatic insects. Seeds eaten by waterfowl Leaves provide roosts for organisms.	
Callitriche spp. (various)	Water Starworts	Callitrichaceae	Lakes, Rivers (margins/slow) Free Floating Throughout WA.	Forage and habitat for aquatic insects and fish. Ducks eat foliage and seeds. Leaves can keep soil moist in a drawdown. Filters and absorbs toxins.	Not required to ID to species level because requires a 10-20x magnification of fruit. Some sp. introduced but similar in rationale.
Carex spp. (various)	Sedges	Cyperaceae	Lakes, Rivers Shoreline Throughout WA.	Seeds eaten by birds. Browsed by deer, elk and moose. Shoreline stabilizer.	Brackish tolerant.
Ceratophyllum	Coontail,	Ceratophyllaceae	Lakes, Rivers	Habitat for juvenile fish,	Common in WA and

69 of 75

14631

demersum	Hornwort		(still/slow) Floating (rootless but modified leaves attach) Throughout WA.	small aquatic animals, and aquatic insects. Waterfowl eat seeds and foliage.	can be seen as a native weed.
Ceratophyllum echinatum	Coontail, Hornwort	Ceratophyllaceae	Lakes, Rivers (still/slow) Floating (rootless but modified leaves attach) Throughout WA.	Habitat for juvenile fish, small aquatic animals, and aquatic insects. Waterfowl eat seeds and foliage.	Rare plant list.
Chara spp.	Stoneworts, Muskgrass, Muskwort	Characeae	Lakes Holdfasts (algae, no roots but attaches) Shoreline to deep (~2in to 20m) Throughout WA	Food source for waterfowl esp. ducks. Protection for juvenile fish and invertebrates.	
Comarum palustre	Marsh Cinquefoil	Rosaceae	Lakes, Rivers (margin) Shoreline Throughout WA.	Leaves and seeds eaten by wildlife, especially waterfowl.	
Cyperus spp. (various)	Flatsedges	Cyperaceae	Lakes, Rivers Shoreline Throughout WA.	Food source for wildlife and birds.	*C. eragrostis* and *C. esculentus* are on the WA noxious weed list.
Dulichium arundinaceum	Threeway Sedge	Cyperaceae	Lakes, Rivers (slow/still) Shoreline (margin) Throughout WA.	Food for waterfowl	
Elatine spp. (various)	Waterworts	Elatinaceae	Lakes, Rivers (slow/still) Shoreline Throughout WA.	Stabilizes the shoreline. Very few known locations in WA.	
Eleocharis spp. (various)	Spike rushes	Cyperaceae	Lakes, Rivers Shoreline Throughout WA.	Shoreline stabilizer if it covers a large area and many present	Brackish tolerant.
Elodea canadensis	Elodeas	Hydrocharitaceae	Lakes, Rivers Shoreline (submersed) Throughout WA.	Food and habitat for fish, waterfowl, and wildlife.	Brackish tolerant.
Elodea nuttallii	Elodeas	Hydrocharitaceae	Lakes, Rivers Shoreline (submersed) Throughout WA.	Food and habitat for fish, waterfowl, and wildlife.	Brackish tolerant.
Fontinalis antipyretica	Aquatic Moss	Fontinalaceae	Lakes, Rivers Attached (rocks or logs in flowing water) Floating (loose or attached to substrate in	Habitat for aquatic insects, larvae, and other microorganisms. Small fish species will nest in it.	

70 of 75

14831

			still water.) Throughout WA.		
Heteranthera dubia	Water Stargrass	Pontederiaceae	Lakes, Rivers Shoreline (up to 3m deep) Throughout WA	Waterfowl eat foliage. Fish cover and habitat for invertebrates. Ducks eat leaves.	
Hippuris montana	Marestail	Hippuridaceae	Lakes, Rivers Shoreline (shallow water/mud up to 2m deep) Throughout WA	Seeds and vegetation eaten by waterfowl and shorebirds. Shelter for small animals. Cover for fish and amphibians.	
Hippuris vulgaris	Marestail	Hippuridaceae	Lakes, Rivers Shoreline (shallow water/mud up to 2m deep) Throughout WA.	Seeds and vegetation eaten by waterfowl and shorebirds. Shelter for small animals. Cover for fish and amphibians.	Easily confused with *Equisetum* spp.
Hydrocotyle ranunculoides	Water Pennywort	Apiaceae	Lakes Shoreline (Floating mat/mud) Western WA.	Habitat for aquatic invertebrates. Rare.	
Isoetes spp. (various)	Quillworts	Isoetaceae	Lakes, Rivers Shoreline/Submersed (shallow to moderate) Throughout WA.	Deer feed on leaves and muskrats and waterfowl eat the fleshy corms. Intolerant of nutrient enrichment and can be an indicator of good water quality.	
Juncus spp. (various)	Rushes	Juncaceae	Lakes, Rivers Shoreline Throughout WA.	Birds use plant material for nests. Food and shelter for insects, birds and small mammals. Wetland plant material contribution. Removes access nutrients and heavy metals. *J. effusus* has been used as habitat during the breeding season for frog *Rana pretiosa*.	ID to sp. level not needed.
Leersia oryzoides	Rice cutgrass	Poaceae	Lakes, Rivers (slow/still) Shoreline (margin/mud) Throughout WA.	Provides food and cover for amphibious organisms and waterfowl.	
Lipocarpha spp. (various)	Halfchaff Sedge	Cyperaceae	Lakes, Rivers Shoreline Uncommon in WA.	*L. aristulata* is state threatened.	
Lobelia dortmanna	Lobelias, Water Dortmann's Cardinalflower	Campanulaceae	Lakes Shoreline (submersed up to 2m deep) Western WA.	Listed as Threatened in WA state.	ID during blooming season, can be confused for more common species.
Marsilea spp. (various)	Waterclover	Marsileaceae	Lakes, Rivers (slow/still) Shoreline (fern) Throughout WA.	Spore cases are eaten by waterfowl, and the plant provides fish shelter.	Some non-native sp. in WA.

71 of 75

14631

Myriophyllum spp. (various)	Watermilfoils	Haloragaceae	Lakes Submersed Throughout WA	Provides habitat for aquatic invertebrates, amphibians, and juvenile fish.	Three species are on the noxious weed list *M. spicatum, M. heterophyllum, and M. aquaticum. M. hippuroides* is a native that can be confused with *M. heterophyllum.*
Najas flexilis	Waternymphs	Najadaceae	Lakes, Rivers Submersed (to 4m depth) Throughout WA.	Entire plant is eaten by waterfowl and considered one of their most important food sources. Provides shelter for small fish and insects.	Brackish tolerant.
Najas guadalupensis	Waternymphs	Najadaceae	Lakes, Rivers Brackish Submersed (to 4m depth) Throughout WA.	Entire plant is eaten by waterfowl and considered one of their most important food sources. Provides shelter for small fish and insects.	Brackish tolerant.
Nitella spp.	Brittleworts	Characeae	Lakes Holdfasts (algae no roots but attaches) Shoreline to deep (~2in -20m) Throughout WA.	Important food source for waterfowl. Cover and food source for fish. Stabilizes soil.	
Nuphar polysepala	Yellow Waterlily	Nymphaceae	Lakes, Rivers (slow/still) Shoreline (up to 4m deep) Throughout WA.	Food source for mammals and waterfowl. Spawning habitat for fish. Floating and emergent veg for adult frogs. Plant eaten by pond turtle post partum.	
Polygonum spp. (various)	Floating Smartweed	Polygonaceae	Lakes, Rivers (slow/still) Shoreline (to deep water) Throughout WA.	Food for birds.	Has been moved to the genus *Fallopia* or *Persicaria*. ID to species level for those on the WA noxious weed list.
Potamogeton spp. (various)	Pondweeds	Potamogetonaceae	Lakes Floating (rooted 0 to 6m deep) Throughout WA.	Seeds, tubers, and vegetation provide food and cover for aquatic animals and waterfowl.	*P. crispus* is on the WA noxious weed list.
Ranunculus aquatilis	Water Buttercup, Spearwort	Ranunculaceae	Lakes, Rivers Submersed Throughout WA.	Fruit eaten by waterfowl.	
Ruppia cirrhosa	Ditchgrass	Ruppiaceae	Lakes, River Submersed Throughout WA	Cover and food for many aquatic species. All plant parts eaten by waterfowl. Used in restoration projects	ID to sp. level not required, debatable if same species as *R. maritima.*
Sagittaria spp. (various)	Arrowheads	Alismataceae	Lakes Shoreline (rarely submersed) Throughout WA.	Eaten by waterfowl, beaver, muskrat, and porcupine.	*S. graminea* and *S. platyphylla* are on the WA noxious weed list.

72 of 75

14831

Scheuchzeria palustris	Rannoch-rush	Scheuchzeriaceae	Lakes Shoreline Uncommon in WA.	Similar in growth and structure to other valuable shoreline species	
Schoenoplectus spp. (various)	Bulrushes	Cyperaceae	Lakes, Rivers Shoreline (up to 1.5m deep) Throughout WA.	Food, cover and nesting habitat for birds. Shoreline stabilizer and used for contaminated water treatment.	*S. mucronatus* is on the WA noxious weed list.
Scirpus spp (various)	Bulrush	Cyperaceae	Lakes Shoreline Throughout WA	Food, cover and nesting habitat for birds. Shoreline stabilizer and used for contaminated water treatment.	Used in habitat restoration projects for stabilization and to increase diversity.
Sparganium spp (various)	Bur-reeds	Scrophulariaceae	Lakes, Rivers Shoreline (1 to 2m deep) Throughout WA.	Food source and habitat for waterfowl and mammals. Known to absorb pollutants	Used in restoration projects.
Spartina gracilis	Prairie Cordgrass	Poaceae	Lakes, Rivers Shoreline Mostly Eastern WA	Wildlife cover, nesting habitat, and hunting area for various birds.	Many invasive *Spartina* species present in WA saltwater areas.
Spartina pectinata	Prairie Cordgrass	Poaceae	Lakes, Rivers Shoreline Mostly Eastern WA.	Wildlife cover, nesting habitat, and hunting area for various birds.	*S. pectinata* is uncommon in WA.
Stuckenia pectinata	Sago Pondweed	Potamogetonaceae	Lakes Shoreline (submersed) Throughout WA.	Food source for ducks. Habitat for invertebrates and young fish.	Three species *S. pectinata*, *S. filiformis*, and *S. vaginatus* are so similar they can be lumped together.
Torreyochloa spp.	Weak Alkaligrass	Poaceae	Lakes, Rivers Shoreline Throughout WA.	Shoreline stabilizer and palatable.	
Typha latifolia	Cattail	Typhaceae	Lakes, Rivers Shoreline Throughout WA.	Filters runoff. Reduces nutrients and sediment loading. Eaten by pond turtles.	*T. angustifolia* is on the WA noxious weed list.
Utricularia spp. (various)	Bladderwort	Lentibulariaceae	Lakes, Rivers (slow/still) Shoreline (no roots but attaches) Throughout WA.	*U. gibba*, *U. intermedia*, and *U. minor* are all rare.	*U. inflata* is on the WA noxious weed list.
Veronica spp. (various)	Speedwells	Scrophulariaceae	Lakes, Rivers (slow/still) Shoreline (1 to 4in deep) Throughout WA.	Typically occurs with sedges and rushes.	
Zannichellia palustris	Horned Pondweed	Zannichelliaceae	Lakes, Rivers Submersed Throughout WA.	Fruit and entire plant eaten by waterfowl and other birds. Habitat for small aquatic animals.	Brackish tolerant.
Marine/Estuarine Species					
Agarum spp.	Sea Colander	Laminariaceae	Marine Subtidal Attaches to rocks, wood and algae Coast, Puget Sound	Used by salmonids, juvenile fish, and forage fish. Nursery habitat for rock fish. Herring spawn on this kelp.	This prostrate kelp is part of a large functional group in the Laminariales order.
Alaria spp.	Ribbon Kelp	Alariaceae	Marine	Used by salmonids,	These prostrate

73 of 75

(various)			Low intertidal/subtidal Coast, Puget Sound	juvenile fish, and forage fish. Nursery habitat for rock fish. Herring spawn on this kelp.	kelps are part of a large functional group in the Laminariales order. They are associated with *Nereocystis* beds.
Carex lyngbei	Lyngby Sedge	Cyperaceae	Estuarine Shoreline Coast	Seeds eaten by birds. Browsed by deer, elk and moose. Shoreline stabilizer.	Used as an indicator in riverine estuaries of the extent of marine influence.
Costaria costata	Five-rib Kelp	Costariaceae	Marine Low intertidal/ shallow subtidal Attaches to rocks. Coast, Puget Sound	Used by salmonids, juvenile fish, and forage fish. Nursery habitat for rock fish. Herring spawn on this kelp.	This prostrate kelp is part of a large functional group in the Laminariales order.
Cymathaere triplicata	Three-ribbed kelp	Laminariaceae	Marine Lower intertidal and shallow subtidal Attaches to rocks up to 30m deep. Coast, Puget Sound	Used by salmonids, juvenile fish, and forage fish. Nursery habitat for rock fish. Herring spawn on this kelp.	These prostrate kelps are part of a large functional group in the Laminariales order. They are commonly associated with other species of kelp.
Distichlis spicata	Saltgrass	Gramineae	Estuarine Shoreline Coast, Puget Sound	Potential salmonid use.	Supports primary productivity of salt marshes.
Egregia menziesii	Feather Boa Kelp	Laminariaceae	Marine Upper subtidal Attaches to rocks up to 30m deep. Fully sheltered to fully exposed. Coast, Puget Sound	Habitat for Salmonids, juvenile rock fish, forage fish, and numerous invertebrates.	This floating kelp is part of a large functional group in the Laminariales order. Often co-occurs with Bull Kelp, Giant Kelp and other floating kelps.
Jaumea carnosa	Jaumea	Compositae	Estuarine Shoreline Coast	Potential salmonid use.	Supports primary productivity of salt marshes.
Laminaria spp. (various)	Brown Kelp	Laminariaceae	Marine/Estuarine Low intertidal/ upper subtidal. Attaches to rocks. Coastal, Puget Sound	Used by salmonids, juvenile fish, and forage fish. Nursery habitat for rock fish. Herring spawn on this kelp.	These prostrate and stipitate kelps are part of a large functional group in the Laminariales order. *L. farlowii, L. longipes, L. ephemera, L. setchellii and L. sinclairii* are uncommon in WA.
Macrocystis pyrifera	Giant Kelp	Laminariaceae	Marine Low intertidal/subtidal Attaches to rocks. Open, Coast and Juan de Fuca	Benefits to numerous fish and invertebrate species. Forage fish eggs attach.	This floating kelp is part of a large functional group in the Laminariales order.
Nereocystis luetkeana	Bull Kelp	Laminariaceae	Marine Upper subtidal	Habitat for Salmonids, juvenile rock	This floating kelp is part of a large

14831

			Attaches to rocks up to 30m deep. Fully sheltered to fully exposed. Coast, Puget Sound	fish, forage fish, and numerous invertebrates.	functional group in the Laminariales order. Restoration methods with this species being researched.
Phyllospadix spp.	Surfgrass	Zosteraceae	Marine Low intertial/subtidal. Attaches to rocky substrates in regions with moderate-to-high wave exposure. Coast, Puget Sound	Small organisms inhabit the canopy and rhizomes. Herring lay their eggs on surfgrass. Juvenile salmon utilize habitat. Nourishment for detritivores, fish and waterfowl	Common in exposed areas along the Strait of Juan de Fuca, western Whidbey Island, and the San Juan Archipelago. Often occurs with *Zostera marina*. Roots often covered by sand.
Pterygophora californica	Woody kelp	Laminariaceae	Marine/Estuarine Low intertidal/ sub tidal Attaches to rocks. Coastal, Puget Sound	Used by salmonids, juvenile fish, and forage fish. Nursery habitat for rock fish.	This stipitate kelp is part of the Laminariales order.
Ruppia maritima	Widgeongrass	Ruppiaceae	Estuarine Submersed Coast	Cover and food for many aquatic species. All plant parts eaten by waterfowl. Used in restoration projects	ID to sp. level not required, debatable if same species as *R. cirrhosa*.
Saccharina spp. (various)	Brown Kelp	Laminariaceae	Marine/Estuarine Low intertidal/ sub tidal Attaches to rocks. Coastal, Puget Sound	Used by salmonids, juvenile fish, and forge fish. Nursery habitat for rock fish. Herring spawn on this kelp.	These floating kelps are part of a large functional group in the Laminariales order.
Salicornia virginica	Pickleweed	Chenopodiaceae	Marine/Estuarine Low Elevation salt marsh, mud flat Western WA	Supports small copepods that salmonids feed on.	
Scirpus maritimus	Seacoast Bulrush	Cyperaceae	Estuarine Shoreline Coast, Puget Sound	Potential salmonid use.	Supports primary productivity of salt marshes.
Triglochin maritimum	Seaside arrowgrass	Juncaginaceae	Estuarine Shoreline Coastal	Potential salmonid use.	Supports primary productivity of salt marshes.
Zostera marina	Eelgrass	Zosteraceae	Marine/Estuarine Intertidal up to 12m deep Western WA	Small organisms inhabit the canopy, including juvenile shellfish. Herring lay eggs on eelgrass. Juvenile salmon utilize habitat. Nourishment for detritivores.	

75 of 75

14832-1 Please find attached comments we are submitting on behalf of A Better Way for BPA concerning wetland impacts of the above-referenced project. Because of the size of the attachments, we are submitting these comments via two e-mails. Thank you for your attention to this matter. 14832

Peggy S. Cahill
Legal Assistant
Bricklin & Newman, LLP

Seattle WA 98154
ph.:
fax:

Spokane Office:

14832-1 Thank you for your comments. BPA received both e-mails successfully.

14832

Bricklin & Newman LLP

Seattle Office: Spokane Office: Contact:

Reply to: Seattle Office

March 24, 2013

Bonneville Power Administration
I-5 Corridor Reinforcement Project
PO Box 9250
Portland, OR 97207
Email: I-5@bpa.gov

RE: Comments on the November 2012 Draft Environment Impact Statement for the I-5 Corridor Reinforcement Project - Dyrland Comments

Bonneville Power Administration:

14832-2

I write on behalf of A Better Way for BPA and its members to provide comments on the Draft Environment Impact Statement for the I-5 Corridor Reinforcement Project (DEIS) in regard to wetland impacts. Thank you providing the opportunity for the members of the communities impacted by this proposed project to comment.

A Better Way for BPA is a coalition of rural property owners in Cowlitz County and Clark County working together to address concerns over the construction of the Bonneville Power Administration's (BPA) proposed I-5 Corridor Reinforcement Project in southwest Washington. A Better Way for BPA is concerned about the impacts - economical, environmental, and aesthetical - that this proposed transmission line will have in their communities. A Better Way for BPA that, upon a more thorough review, BPA will realize that there are reasonable alternatives that will result in the maintenance of a healthy and diverse environment in the southwestern Washington communities of A Better Way for BPA's members.

Given the significance of the I-5 Corridor Reinforcement project to the communities it would impact, A Better Way for BPA retained the services of Richard Dyrland, a resource analysis and supervisory hydrologist. Mr. Dyrland's comments are attached.

While Mr. Dyrland's letter speaks for itself, A Better Way for BPA must emphasize a few key points. As A Better Way for BPA pointed out in their own comments as to the Troutdale Aquifer, Mr. Dyrland similar denotes the risk that comes with this project due to toxic contaminants. Risk to water, fish, and the public, according to Mr. Dyrland, are analyzed in a "light and basically inadequate" manner. Mr. Dyrland further points out the risk related to geological hazards given the presence of landslide and earthquake activity along transmission

2 of 151

14832-2 Thank you for your comments. Specific comments are addressed below.

routes. Based on his thoughtful review of the DEIS, Mr. Dyrland sets forth various recommendations to correct the deficiencies he discovered.

14832-2 BPA should carefully review Mr. Dyrland's analysis and recommendations. As with all of the inadequacies and deficiencies being raised to BPA, this information is essential to understanding the impacts the project will have and will allow the decision-maker and the public to be fully informed prior to making a final determination on the routing alternative. BPA must proceed to prepare a Supplemental DEIS to ensure that this information is fully disclosed and fully analyzed.

Thank you for your consideration of these comments.

Very truly yours,

BRICKLIN & NEWMAN, LLP

David A. Bricklin
Julie K. Ainsworth-Taylor
Attorneys for A Better Way for BPA

Enclosure

cc: Client

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14832

Richard Dyrland
Resource Analyst/Supervisory Hydrologist

March 22, 2013

I-5 Corridor Reinforcement Project
PO Box 9250
Portland, OR 97207

US Army Corp of Engineers, Regulatory Branch
Steve Manlow, Project Manager

Re: Bonneville Power Administration NWS-2011-346
Draft I-5 Corridor Reinforcement Alternatives – Review of Draft EIS Documents

Dear BPA I-5 Corridor Project Team:

14832-3

My qualifications as a reviewer are that I am a semi-retired Federal Office of Management & Budget trained Programs, Policy, and Projects Analyst as well as a Supervisory Regional Hydrologist with more than 35 years of experience over the western United States as well as Washington D.C. I have worked at the local, regional, and national level.

Introduction:

First I want to congratulate the BPA for putting together a very comprehensive document. I have both helped develop as well as review EIS documents of this size and scope in the past and appreciate the amount of effort it takes to do this and also to objectively and effectively involve the public.

Summary of Review Findings:

14832-4

The one area of concern that I have is the rather light, and basically inadequate, treatment of **"risk"** in relation to impacts, cumulative effects, and tradeoffs throughout the documents in regard to four particular evaluation components, which are closely inter-related: specifically—Geology and Soils/Geologic Hazard Assessment, Water, Fish, and Public Health and Safety. Much of the stream-related impacts discussed in the Draft EIS documents are related to change in vegetative cover in terms of the width and number of stream crossings. Although helpful, this indicator of disturbance when viewed in relation to the total length of a given stream and adjusted for actual length of a stream with tree or shaded cover—is relatively small or low for all the route alternatives. Planting of shrubs and bushes can mitigate for some of this type of impact.

14832-3 Comment noted.

14832-4 Please see the response to Comment 14775-2.

14832

A more meaningful indicator of risk to water and fish is—What alternative routes have sites with significant risk to lowering of water quality and to loss of federally listed **Threatened & Endangered (T&E)** fish populations largely due to present or potential disturbance either man-made (anthropogenic) or earthquake/fault generated disturbance on known areas that are chemically contaminated? Two such areas exist and are briefly discussed in Chapter 10 Health and Safety 10-1 through 10-5. The risks these sites pose require a much more in-depth discussion and updated field examination than is done in the current Draft EIS. Pollution from toxic wastes was investigated at the Chelatchie site and concerns expressed as early as 1978 (WA Dept. Ecology, 1978).

14832-4 Toxic wastes are officially designated at the Chelatchie Prairie (Chelatchie Tank Farm, IPC Plywood Mill, IPC Solid Waste) sites (WA DOE Hazardous Site List, 2012). It is known that there was spilling, dumping, burying of toxic materials and liquids done at the Chelatchie sites. The Reynolds Metal site is in Oregon and recognized as an active EPA "Superfund" site. The Reynolds site which is in "active" ongoing cleanup state, apparently also has a known fluoride contamination plume.

Although Volume-1 Chapter 10, Section 10.2.2 discusses Toxic and Hazardous Substances, and appropriate actions to be taken, it overlooks the need to avoid routes that contain potentially "high risk". The impacts of disturbing and releasing toxic wastes that are near a stream are very significant and long-term because they not only destroy the "T&E" listed fish populations and habitat for many miles downstream, but through groundwater contamination it also creates a risk to Public Health and Safety. There is also concern with the location of Alternative routes because they pass through the Troutdale Aquifer, which is a federally designated "Sole Source Aquifer." Any leakage of contaminates into the recharge area of the Troutdale Aquifer would have serious environmental and Public Health and Safety consequences.

14832-5 Cedar Creek and the Chelatchie Creek tributary have had eight fish habitat restoration projects completed in the last 12 years (one of which was about one mile in length) to improve Steelhead, Coho, and Chinook populations which are "T&E" listed. Damaging these streams and fish populations would result in a "Federal TAKE" with serious legal consequences. Cedar Creek/Chelatchie Creek salmonids are also vital to sustaining "T&E" listed fish populations in the North Fork of the Lewis River below the dams.

14832-6 **These kinds of stream and fish impacts cannot be mitigated, some of the groundwater impacts may be partly mitigated but at high economic and social cost. The sites and routes (Central Alternative-Series should be ranked as least desirable).**

Specifics:

14832-7 **Again it needs to be said that the assumption used that all impacts can be "mitigated for" is not valid.**

14832-8 The geologic and fault study reports done in the Chelatchie Creek area along with recent Mt. St. Helens related earthquakes indicate that there is a **high or significant risk** of disturbing contaminants.

14832-9 Tower anchor boring depths that can range from 4 ft. to 16 ft. or more and disturb up to 0.5 acres (Chap. 3-4 Tower Footings 3.2.2), run the risk of disturbing and penetrating contaminated areas or buried containers. The Draft EIS shows two tower sites proposed at the Chelatchie site and six tower sites at Reynolds Metals in Troutdale, which are both toxic waste sites. This, and related parts of the Draft EIS, need to be supplemented with at least **Ground Penetrating Radar (GPR)** studies of these sites and borings taken to do examination and determination kind and degree of contaminate characteristics.

14832-5 Please see the response to Comment 14775-3.

14832-6 Please see the response to Comment 14775-3.

14832-7 Please see the response to Comment 14775-5.

14832-8 Please see the response to Comment 14775-6.

14832-9 Please see the response to Comment 14775-7.

14832

14832-10 Another important risk factor is that of landslides and their effect on transmission towers. The Swift, Yale, Amboy-Chelatchie Prairie, Buncombe Hollow and areas between (all enter and exit points for several alternatives and options) on transmission routes go through numerous zones that have landslide areas. They may be more active due to earthquakes related to Mt. Saint Helens and faults (Evarts R., US Geological Service 2005).

Until those and other discussed further study needs are done, the comparison of the various alternatives and their effects—is incomplete and inadequate even for a Draft EIS.

14832-11 Appendix J: Phase-1 Geologic Hazard summarizes in visual and tabular form identified specific conditions (Example: Segment 28 items 28-01 to 28-12 in the Chelatchie Prairie area), but the Draft EIS document does not have extensive substantive discussion of the type and degree of risk posed by these conditions, particularly in relation to the known toxic hazards officially identified and listed in that area.

14832-12 The economic tables showing value of timber cut to clear right-of-way and associated activities are not clearly defined in footnotes as to what they represent. Example is Appendix 12 Table A-7 is the Net Present Value actually calculated with discounted timber clearing benefits minus discounted forgone future harvest revenue?

This table and other similar tables need to clearly show the net result of subtracting the discounted value of foregone future timber harvest and associated activities from the value of the right-of-way timber cut—if not, the information can be misleading or miss-interpreted in terms of evaluating and comparing Alternatives and Options. A basic table or series of tables **showing the difference or change** from the "No Action" Alternative in quantitative measurement units would be very helpful in evaluating the alternatives. Characteristics that are displayed as differences or changes are more informative than tables that only display totals for a measurement of a given attribute or indicator.

Recommendations To Correct Deficiencies:

14832-13 Give more weight to earthquake and fault interaction information as it relates to short-term and long-term risk factors and impacts on steams, fish, and public health and safety from toxic contaminated and potentially unstable sites.

Better utilize existing, as well as obtain additional information (including GPR investigations) of known chemical pollution and potential pollution exacerbation by disturbance at know pollution hazard sites (Chelatchie Creek – International Paper Company Mill Sites and Solid Waste Site and Reynolds Troutdale Site). In addition, at least one of these sites (Chelatchie Creek Area) is susceptible to both exacerbation by earthquake-fault related events and ground disturbance of polluted areas.

Those kinds of sites need to be further evaluated by information using **portable ground penetrating radar** equipment and other pollution investigation techniques and technology. The risk of severe long-term biological and social-economic impact at these sites is too high to not go back and do additional, more adequate risk investigation and analysis.

Conclusions On The Draft EIS Alternatives:

14832-14 My analysis indicates that the Central Alternatives Series, particularly Option-1 are the least desirable of all the alternatives. And overall, the new "rural alternatives" are all in a least desirable status, or stated in another way—transferring into other new routes in rural areas is not desirable either. The West Alternative (existing transmission corridor) is a better alternative and should be the "Preferred Alternative" for Washington.

14832-10 Please see the response to Comment 14775-8.

14832-11 Please see the response to Comment 14775-9.

14832-12 Please see the response to comments 14793-36 and 14806-10.

14832-13 Please see the responses to Comments 14775-11.

14832-14 Comment noted.

14832-15 However, the Oregon Alternatives, referred to as the "Pearl Alternatives" may be the best of all the potential alternatives and should be brought into an update of the Draft EIS.

Respectfully,

Richard Dyrland

//s//Richard Dyrland
Resource Analyst/Supervisory Hydrologist

cc: A Better Way for BPA

CITATIONS AND REFERENCES:

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WA Dept. Of Ecology, 2012. Hazardous Site List. 32 Pages

WA Dept. of Ecology, 1978. Impact of International Paper Company Wood Products Mill Effluent on Receiving Waters of the Upper Chelatchie Creek Drainages. 14 Pages

14832-15 Please see the response to Comment 14443-1 regarding the elimination of the Pearl routes from detailed study in the EIS.

USGS
science for a changing world

Geologic Map of the Amboy Quadrangle, Clark and Cowlitz Counties, Washington

By Russell C. Evarts

Pamphlet to accompany
Scientific Investigations Map 2885

2005

U.S. Department of the Interior
U.S. Geological Survey

INTRODUCTION

GEOGRAPHIC AND GEOLOGIC SETTING

The Amboy 7.5' quadrangle is situated in the foothills of the western Cascade Range approximately 50 km northeast of Portland, Oregon (fig. 1). Since late Eocene time, the Cascade Range has been the locus of an active volcanic arc associated with underthrusting of oceanic lithosphere beneath the North American continent along the Cascadia Subduction Zone. Volcanic and shallow-level intrusive rocks emplaced early in the history of the arc underlie the Amboy quadrangle, forming a dissected and glaciated terrain with elevations as high as 2050 ft (625 m). The quadrangle is transected by two troughs that roughly parallel the east-west structural grain. The northern trough is occupied by Lake Merwin, an artificial reservoir inundating the valley of the Lewis River. The Lewis drains a large area in the southern Washington Cascade Range, including the southern flank of Mount St. Helens, approximately 20 km upstream from the quadrangle, before joining the Columbia River about 25 km west of the quadrangle (fig. 1). The southern trough, which includes Chelatchie Prairie and the lower stretch of Cedar Creek, probably marks a former course of the Lewis River.

The Amboy quadrangle lies east of the Portland Basin, which separates the Cascade Range from the Oregon Coast Range (fig. 1). The Portland Basin has been interpreted as a pull-apart basin located in the releasing stepover between two en echelon, northwest-striking, right-lateral fault zones (Beeson and others, 1985, 1989; Yelin and Patton, 1991; Blakely and others, 1995). These fault zones are thought to reflect regional transpression and dextral shear within the forearc in response to oblique subduction of the Pacific Plate (Pezzopane and Weldon, 1993; Wells and others, 1998). The southwestern margin of the Portland Basin is a well-defined topographic break along the base of the Tualatin Mountains, an asymmetric anticlinal ridge that is bounded on its northeast flank by the Portland Hills Fault Zone (Balsillie and Benson, 1971; Beeson and others, 1989; Blakely and others, 1995), which is probably an active structure (Wong and others, 2001; Liberty and others, 2003). The nature of the corresponding northeastern margin of the basin is less clear, but a poorly defined and partially buried dextral extensional structure has been inferred from topography, microseismicity, potential field-anomalies, and reconnaissance geologic mapping (Yelin and Patton, 1991; Beeson and others, 1989; Blakely and others, 1995).

This map is a contribution to a U.S. Geological Survey program designed to improve the geologic database for the Portland Basin region of the Pacific Northwest urban corridor, the densely populated forearc region of western Washington and Oregon. Better and more detailed information on the bedrock and surficial geology of the basin and its surrounding area is needed to refine assessments of seismic risk (Yelin and Patton, 1991; Bott and Wong, 1993), ground-failure hazards (Madin and Wang, 1999; Wegmann and Walsh, 2001) and resource availability in this rapidly growing region. The digital database for this publication is available on the World Wide Web at http://pubs.usgs.gov/sim/2005/2885.

PREVIOUS GEOLOGIC INVESTIGATIONS

Previous geologic mapping in the Amboy area, generally carried out as part of broad regional reconnaissance investigations, established the basic stratigraphic framework and distribution of geologic units in the quadrangle. The first systematic geologic work within the Amboy quadrangle was that of Mundorff (1964), who mapped the area south of the Lewis River to evaluate water resources in Clark County. He published a 1:48,000-scale geologic map and provided detailed descriptions of the basin-fill deposits. He later described the Pleistocene glacial deposits in the Lewis River valley, which he named the Amboy Drift (Mundorff, 1984).

Swanson and others (1993) updated Mundorff's (1964) Clark County work as part of an investigation of ground-water resources in the entire Portland Basin. Their work focused on the basin-fill units, and their map shows hydrogeologic rather than lithostratigraphic units, although there is substantial equivalence between the two. They analyzed lithologic logs of 1500 water wells to produce a set of maps that show the elevations and thicknesses of hydrogeologic units throughout the basin, thus constructing 3-dimensional view of the subsurface stratigraphy of the basin fill.

Phillips (1987) compiled a 1:100,000-scale geologic map of the Vancouver 30'x60' quadrangle, which includes the Amboy 7.5' quadrangle, as part of the state geologic map program of the Washington Division of Geology and Earth Resources (Walsh and others, 1987). Although relying heavily on Mundorff's work, he did undertake some original reconnaissance mapping. Phillips was the first to depict the Mount St. Helens-derived deposits in the lower Lewis River valley. He also mapped major stratigraphic units within the Tertiary bedrock sequence and acquired chemical analyses for some of the volcanic rocks of the region as well as a few whole-rock K-Ar age determinations. However, none of these new data were obtained from the Amboy quadrangle.

Topical geologic investigations in the Amboy quadrangle include those of Hyde (1975) and Major and Scott (1988), who described but did not map the Mount St. Helens-related deposits of the Lewis River valley, and Fiksdal (1975), who delineated several areas of potential slope instability in the quadrangle.

ACKNOWLEDGMENTS

Access granted by the many landowners was essential for mapping in the Amboy quadrangle. Robert Ross and Dennis Mohan of the Longview Fibre Company, Ross Graham and Dorothy Yount of Weyerhaeuser Company, and Ann Wikman and Brian Poehlein of the Washington Division of Natural Resources permitted work on their timberlands. Anna King, Richard Barney, and William Fields of PacifiCorp and Danny Walling of Lake Merwin Campers Hideaway permitted work on the lands adjacent to Lake Merwin. Diane M. Johnson of Washington State University performed chemical analyses and Robert Fleck of the U.S. Geological Survey provided $^{40}Ar/^{39}Ar$ ages. Bradley Reid, Zenon Valin, and Philip Dinterman gave able field assistance. Andrei Sarna-Wojcicki, Kenneth Bishop, Judith Fierstein, and Michael Clynne made available essential laboratory facilities. Water-well drillers' logs were examined in the offices of the Washington Department of Ecology Southwest Regional Office in Lacey, Wash., with the assistance of Stephanie Abraham and Tammy Howes. Connie Manson, librarian at the Washington Division of Geology and Earth Resources in Olympia, Wash., aided in obtaining information from that agency's files. I have benefited immensely from discussions on various aspects of the regional stratigraphy, structure, and geologic history of southwestern Washington with Roger Ashley, Michael Clynne, Paul Hammond, Keith Howard, Alan Niem, William Phillips, William Scott, James Smith, Donald Swanson, Karl Wegmann, and Ray Wells. Field and office consultations with Clynne were invaluable for interpreting Mount St. Helens-derived deposits. Detailed technical reviews by Clynne and Robert J. McLaughlin helped correct flaws and oversights in the original manuscript.

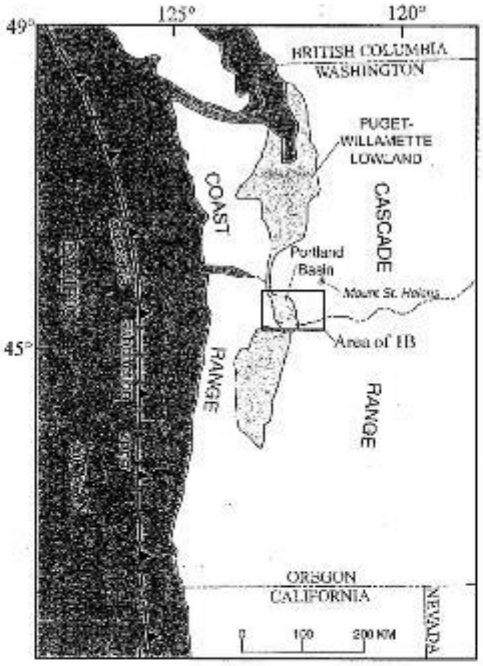

Figure 1A. Regional setting of the Amboy quadrangle showing major tectonic and physiographic features of the Pacific Northwest.

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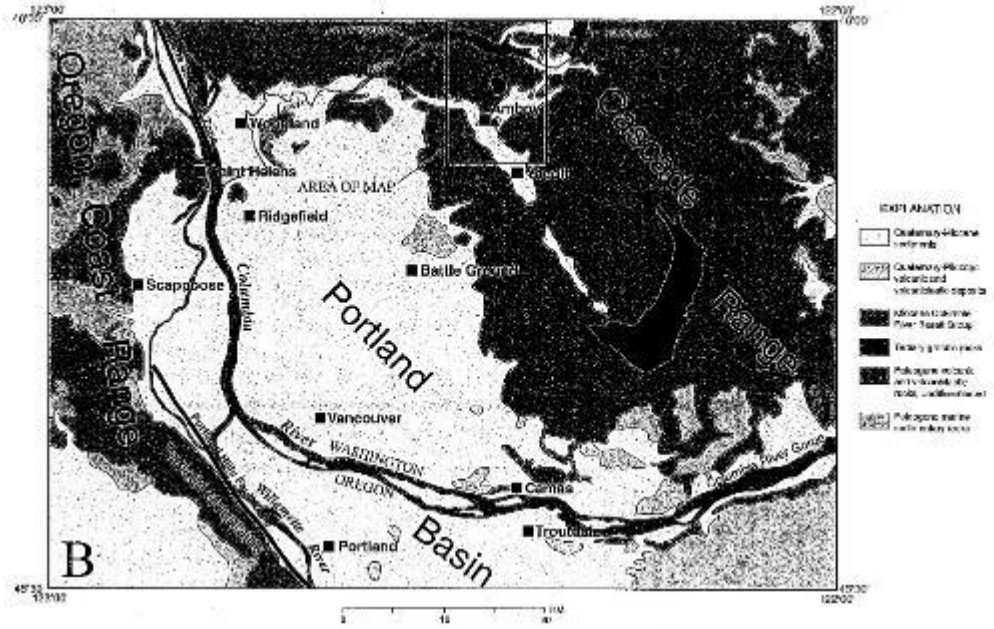

Figure 1B. Simplified geologic map of the Vancouver 30 x 60 quadrangle, modified from Phillips (1987a).

12 of 152

SYNOPSIS OF GEOLOGY

Bedrock of the Amboy quadrangle consists of a diverse assemblage of late Eocene and earliest Oligocene volcanic and volcaniclastic rocks that comprise early products of the Cascade volcanic arc. These strata strike east-west to northeast and dip to the south and southeast at low angles, generally less than 25°; dips generally decrease to the south. They are intruded by several plug-like or sill-like bodies of diorite and quartz diorite. The east-northeast trend of Chelatchie Prairie and the north-northwest-trending reach of Cedar Creek reflect control by fault zones.

During the Pleistocene, mountain glaciers repeatedly formed in the Lewis River valley (Crandell and Miller, 1974; Mundorff, 1984) and exteaded downvalley as far as the map area. The largest glacier(s) covered virtually the entire quadrangle, leaving behind a smoothly sculpted topography of bedrock hills and valleys mantled by variable thicknesses of drift. As the glacier receded, outwash accumulated in the valleys of the Lewis River and Cedar and Chelatchie Creeks. In post-glacial time, eruptions at the Mount St. Helens volcanic center periodically deposited large amounts of volcanic debris into the Lewis River that was transported downstream as lahars and flood deposits (Hyde, 1975; Major and Scott, 1988).

Because of the extensive drift cover and dense vegetation of the region, outcrops of bedrock in the map area are generally limited to steep cliff faces, landslide scarps, and streambeds; many exposures are in roadcuts and quarries. The surface information was supplemented with lithologic data obtained from several hundred water-well reports in the files of the Washington Department of Ecology; well locations were taken as described in the reports and were not field checked, and only wells considered reliably located were used to infer the distribution and thicknesses of units in the subsurface.

PALEOGENE BEDROCK

Bedrock in the Amboy quadrangle consists of a diverse assortment of subaerially erupted lava flows and volcaniclastic rocks that are typical of the strata that underlie much of the western slopes of the southern Washington Cascade Range (Evarts and others, 1987; Smith, 1993; Evarts and Swanson, 1994). Bedrock strata in the quadrangle generally strike east-west to northeast and dip south to southeast low angles, generally less than 25°. They are intruded by several fine- to course-grained intrusions of intermediate composition. A few fine-grained mafic dikes cut the section north of Lake Merwin but are sparse compared to adjacent areas to the west (Evarts, 2004a, b). $^{40}Ar/^{39}Ar$ age determinations (R.J. Fleck, written commun., 2000, 2001, 2002) obtained for extrusive rocks within this and adjacent quadrangles indicate that the bedrock section exposed in the map area is mostly of late Eocene age, between 38 and 33 m.y. old, but the uppermost strata in the southern third of the map area are as young as 27 m.y. old (early Oligocene). Ages of the intrusions are unknown but most are believed to be no younger than early Miocene based on their relatively shallow emplacement depths and on regional magmatic history (Evarts and Swanson, 1994).

Lithostratigraphic nomenclature for the stratigraphically complex Tertiary volcanic rocks of the southern Washington Cascade Range is poorly developed. Formal names have been proposed for Paleogene volcanic strata in several widely scattered locations (Wilkinson and others, 1946; Snavely and others, 1958; Roberts, 1958; Trimble, 1963; Fiske and others, 1963). However, these formations have proven to be only locally important or to be so broadly defined as to be merely synonymous with Tertiary volcanic rocks (Evarts and others, 1987; Smith, 1993). Phillips (1987) assigned the Eocene rocks north of Green Mountain to the Goble Volcanics of Wilkinson and others (1946), but Evarts (2002) showed that the criteria employed by Phillips to correlate these rocks with those of the type area are unreliable. In order to show as much detail as possible without generating a proliferation of local lithostratigraphic units, this map portrays primarily lithologic rather than lithostratigraphic units, although informal lithostratigraphic names are used where appropriate.

VOLCANIC AND VOLCANICLASTIC ROCKS

Basaltic andesite, andesite, and basalt

Mafic to intermediate lava flows and flow breccia are major components of the Paleogene section of the Amboy quadrangle. Most are about 5 to 10 m thick but some are as thick as 70 m. They are characterized by blocky to platy (rarely columnar) jointed interiors that grade into upper and lower flow breccia zones. Abundant zeolite- and clay-filled vesicles and reddish colors owing to oxidation during cooling typify upper flow breccia zones. All flows were apparently emplaced subaerially; many rest on red paleosols developed on interflow sediments and no pillow lavas or other indications of subaqueous environments were observed. The flows range in texture from

aphyric to densely porphyritic. Basaltic andesites (Tba and Tbam) typically contain phenocrysts of plagioclase, olivine, and augite in an intergranular to trachytic groundmass, whereas andesites contain phenocrysts of plagioclase, augite, and (or) hypersthene in an intersertal to pilotaxitic groundmass.

The basaltic andesite flows in the southern part of the map area (Tbam) are at the base of an extensive sequence of tholeiitic flows that extends about 65 km south to Camas (R.C. Evarts, unpub. mapping). This unit, informally named the basaltic andesite of Elkhorn Mountain, consists predominantly of plagioclase + olivine ± augite-phyric lavas; interbedded volcaniclastic rocks are generally sparse. $^{40}Ar/^{39}Ar$ ages of about 27 Ma were obtained from this unit in the Yacolt quadrangle to the south (R.J. Fleck, written commun., 2005). The basaltic andesite of Elkhorn Mountain is interpreted as a large mafic shield volcano, probably centered to the southeast of the map area. If this interpretation is correct, it implies that the base of the unit is an unconformity separating the 27-Ma basaltic andesite of Elkhorn Mountain from underlying strata that are about 33 m.y. old.

Basalt flows are uncommon in the Amboy quadrangle; two types are distinguished on this map. Isolated flows of aphyric and olivine+plagioclase-phyric basalt (Tb) crop out in the northern part of the quadrangle, low in the stratigraphic section. Flows of distinctive feldspar-free olivine-phyric basalt (Tob) are also largely restricted to the lower part of the Paleogene section. The olivine phenocrysts in these flows contain abundant euhedral inclusions of chromian spinel and, unlike those in other mafic rocks, are not completely altered. The lenticular unit, as thick as 150 m, that crops out on the steep north slope of Green Mountain consists largely of poorly sorted, indurated, brick-red scoria and likely represents a slice through the flank of a late Eocene cinder cone.

Dacite

Dacitic flows (Td) are dispersed throughout the upper part of the Paleogene stratigraphic section of the Amboy quadrangle. All are porphyritic pyroxene dacites similar to those found to the west (Evarts, 2004a, b).

Volcaniclastic rocks

Volcaniclastic rocks make up a substantial proportion of the Paleogene bedrock in the Amboy quadrangle. On this map they are divided into a unit of volcaniclastic sedimentary rocks of predominantly epiclastic origin (Tvs) and units comprised of mostly pyroclastic rocks (Tt and Tdpo). In addition, thin unmappable volcaniclastic beds commonly separate lava flows of units Ta, Tba, and Td. The volcaniclastic sedimentary rocks unit (Tvs) includes a diverse assemblage of generally well-bedded, texturally and compositionally immature siltstone, sandstone, conglomerate, and breccia. Fragments of volcanic rocks petrographically similar to interbedded lava flows are the dominant constituents of most beds; less abundant components include plagioclase, Fe-Ti oxides, and pyroxene crystals, pumice, vitric ash, fine-grained dioritic rocks, and plant remains. These beds include thin debris-flow and hyperconcentrated flood-flow (Smith, 1986) deposits as well as finer grained fluvial and lacustrine strata probably deposited beyond the flanks of volcanic edifices. In addition to material eroded from older extrusive rocks, these beds likely contain clasts reworked from unconsolidated penecontemporaneous airfall and ash-flow deposits.

The tuff unit (Tt) consists of andesitic to rhyolitic tuff, pumiceous and lithic lapilli tuff, and lithic tuff breccia that are inferred to be the direct products of explosive eruptions and volcanic debris flows. Most are medium to coarse grained, poorly sorted, matrix supported, and contain abundant originally vitric ash. Pumice-lapilli tuffs were presumably emplaced as pyroclastic flows, whereas more heterolithic, lithic-rich beds were probably deposited by lahars. Pumiceous tuffs north of Cedar Creek and Chelatchie Prairie tend to be weakly welded, sparsely phyric, and orange to brown, whereas those to the south are commonly densely welded and porphyritic. Phenocryst assemblages in most tuffs consist of plagioclase, augite, hypersthene, and Fe-Ti oxide; hornblende is very rare and no quartz or biotite were observed in any tuffs of this quadrangle. A densely welded and locally vitrophyric tuff (Tdpo) that crops out on the south side of Cedar Creek west of Amboy is believed to have been emplaced during a caldera-forming eruption in the Ariel quadrangle at about 35.1 Ma (Evarts, 2004b). Analysis of plagioclase from two welded tuffs at about the same stratigraphic position in the southern part of the map area yielded analytically indistinguishable $^{40}Ar/^{39}Ar$ ages of 33.4±0.4 Ma and 33.0±0.1 Ma (table 2).

INTRUSIVE ROCKS

In contrast to the adjacent Ariel quadrangle (Evarts, 2004b), fine-grained dikes are sparse in the Amboy quadrangle. They are found only in the lower part of the stratigraphic section near Lake Merwin. A 30-m-thick sill of strikingly plagioclase-phyric basalt forms a prominent cliff on the steep valley wall south of Speelyai Creek. This sill is petrographically and chemically similar to some flows in the Paleogene section north of the Amboy quadrangle (Evarts and Ashley, 1991). Several hypabyssal intrusions of mafic to intermediate composition are

present south of Lake Merwin. The largest are sill-like bodies at Dunegan Mountain (Tdid) and north of Buncombe Hollow Creek (Tdib) and a cylindrical body of fine- to medium-grained porphyritic diorite at the southwest end of Chelatchie Prairie (Tdic). The Dunegan Mountain intrusion is composed of relatively uniform medium-grained augite diorite in which feldspar is extensively replaced by stilbite. The long sill that crops out between Lake Merwin and Buncombe Hollow Creek is a composite body comprising several intrusions of porphyritic to seriate pyroxene diorite. Most of the smaller intrusions in the map area are sill-like bodies of relatively fine-grained diorite.

None of the intrusions has been radiometrically dated. The fine-grained dikes (Tib, Tiba, Tia) compositionally and texturally resemble their late Eocene host rocks and are probably not much younger. The coarse grain size of some of the larger intrusions is consistent with slow cooling at depth, which implies that they are considerably younger than the volcanic host rocks.

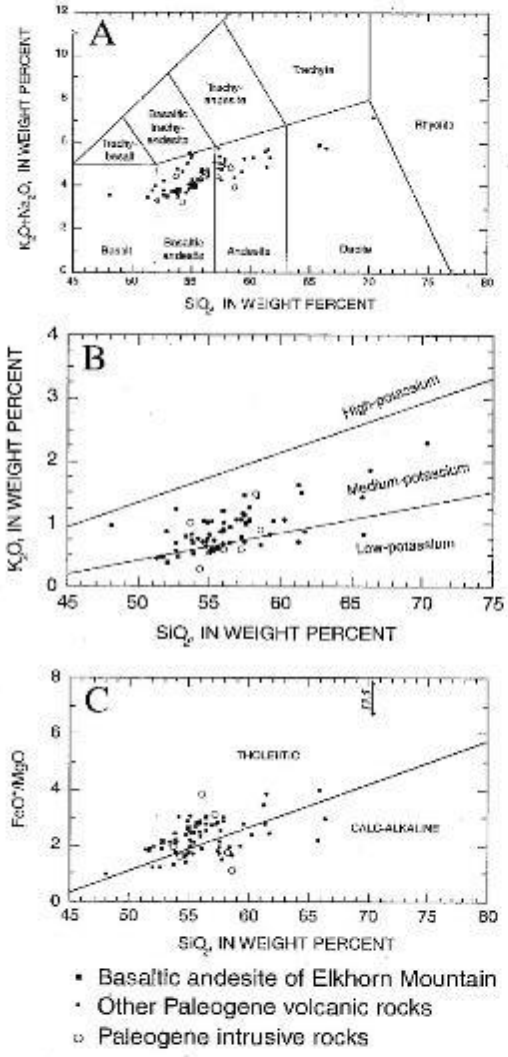

Figure 2. Chemical characteristics of volcanic rocks from the Amboy 7.5' quadrangle (analyses recalculated volatile-free). A, K_2O+Na_2O versus SiO_2 showing IUGS classification (Le Maitre, 2002); B, K_2O versus SiO_2 showing low-, medium-, and high potassium fields extrapolated from Gill (1981, p. 6); C, FeO*/MgO versus SiO_2, showing classification into tholeiitic and calc-alkaline rocks according to Miyashiro (1974). FeO*, total Fe as FeO.

ROCK CHEMISTRY

The chemistry of Paleogene lava flows and intrusive rocks in the Amboy quadrangle (table 1) is generally similar to that of Tertiary igneous rocks sampled elsewhere in the southern Washington Cascade Range (Evarts and Ashley, 1990a,b, 1991, 1992; Evarts and Bishop, 1994; Evarts and Swanson, 1994; Evarts, 2001, 2002, 2004a, b; R.C. Evarts, unpub. data). Compositions of igneous rocks in the quadrangle range from basalt to high-silica dacite and form a low- to medium-potassium suite (fig. 2). Analyses straddle the dividing line between tholeiitic and calc-alkaline compositions using the classification of Miyashiro (1974; fig. 2C). TiO_2 contents of some basaltic andesites and andesites are as high as 2.25 wt percent, commonly greater than in rocks to the west (Evarts, 2004a, b) and somewhat higher than is typical for volcanic-arc magmas (Gill, 1981). Some basalts and a thick sill in the lower part of the section north of Lake Merwin contain relatively low contents of large-ion lithophile elements (K, Ba, Sr) and thus resemble low-potassium tholeiites of the basalt of Kalama River that crop out to the north in the Lakeview Peak quadrangle (Evarts and Ashley, 1991). Flows in the basaltic andesite of Elkhorn Mountain are tholeiitic (fig. 2C) and are generally higher in Fe and lower in K_2O (fig. 2B) than basaltic andesites elsewhere in the map area; most are relatively poor in Sr (table 1 and R.C. Evarts, unpub. data). Many flows in the Elkhorn Mountain unit are abundantly plagioclase-phyric, as reflected in Al_2O_3 contents greater than 19 wt percent (table 1), and probably accumulated excess feldspar in a subvolcanic magma chamber prior to eruption. No consistent

chemical differences between eruptive and hypabyssal intrusive rocks are apparent (fig. 2).

METAMORPHISM AND HYDROTHERMAL ALTERATION

Paleogene rocks in the Amboy quadrangle have been subjected to zeolite-facies regional metamorphism, the general character of which is similar to that described from other areas in the southern Washington Cascade Range (Fiske and others, 1963; Wise, 1970; Evarts and others, 1987; Evarts and Swanson, 1994). This region-wide metamorphism reflects burial of the late Eocene and early Oligocene rocks by younger volcanic rocks within the relatively high-heat-flow environment of an active volcanic arc.

The extent of replacement of igneous minerals by secondary phases ranges from incipient to complete. Permeable, glass-rich, silicic volcaniclastic rocks are the most susceptible to zeolitization, whereas massive lava flows may be only slightly affected. In mafic to intermediate-composition lava flows, the primary effect of very-low-grade metamorphism is the nearly universal development of clay minerals and zeolites that replace labile interstitial glass, fill vesicles, and coat joint surfaces. Feldspar typically displays partial alteration to clay minerals and (or) zeolites. Olivine phenocrysts in most basalts and basaltic andesites are totally replaced by smectite with or without hematite and calcite; however, replacement is incomplete in some olivine-rich flows. Primary augite and Fe-Ti oxides are largely unaffected by the zeolite-facies metamorphism. Hypersthene phenocrysts in pyroxene andesite flows commonly exhibit minor replacement by dark brown smectite. In pervasively altered volcaniclastic rocks and flow breccias, smectitic clay minerals and zeolites pseudomorphically replace most framework grains and fill pore spaces; the development of iron-rich smectites gives these rocks their characteristic green colors. The widespread presence of heulandite and clinoptilolite in the volcaniclastic rocks of the map area indicates that, except for areas near intrusions, metamorphic temperatures did not exceed 180°C (Cho and others, 1987).

QUATERNARY DEPOSITS

The character of Quaternary sedimentation in the Amboy quadrangle has been shaped primarily by two processes: mountain glaciation and eruptions of the Mount St. Helens volcanic center. Alternating episodes of aggradation and incision have produced a complex series of terraces along the Lewis River.

GLACIAL AND RELATED DEPOSITS

Several times during the Pleistocene epoch, icecaps covered the Washington Cascade Range and spawned glaciers that moved down all of the major river valleys. From examinations of glacial deposits near Mount Rainier, Crandell and Miller (1974) inferred four major glacial episodes, each of which apparently consisted of several lesser advances and retreats (Dethier, 1988). The most widespread glacial deposits in the range are those related to the penultimate glaciation, the Hayden Creek Drift of Crandell and Miller (1974). Deeply weathered older deposits are locally preserved in the western Cascade foothills in areas beyond the reach of Hayden Creek glaciers. The last major glaciation in western Washington was the late Wisconsinan Fraser glaciation. Deposits of this age in the Cascade Range, named the Evans Creek Drift, are much less extensive than those of the Hayden Creek age (Crandell and Miller, 1974; Crandell, 1987). Widely distributed till and glaciofluvial sediments in the lower Lewis River valley were named the Amboy Drift by Mundorff (1984), who correlated them with the Hayden Creek Drift of the Mount Rainier region on the basis of similar weathering characteristics. Crandell (1987) noted that some of the till in Mundorff's (1984) Amboy Drift, however, was more deeply weathered than typical Hayden Creek Drift and suggested that the Amboy Drift as mapped by Mundorff (1964, 1984) includes some older drift (Crandell, 1987; see also Howard, 2002 and Evarts, 2004b). Most of the drift in the Amboy quadrangle appears to belong to the less weathered drift. It is therefore mapped as Amboy Drift and considered correlative with the Hayden Creek Drift of Crandell and Miller (1974). Some deposits are more deeply weathered, however, and are probably equivalent to the older drift noted by Crandell (1987).

Intensely weathered bouldery till and gravel (Qmt) are exposed near the southwest corner of the map area. They are correlated with similar deposits in the Ariel quadrangle that Evarts (2004b) mapped and informally named the drift of Mason Creek. These deposits are characterized by soil horizons more than 3 m thick and development of weathering rinds as thick as 1 cm or more on volcanic clasts. The area underlain by this drift is surrounded by the younger Amboy Drift. The younger Amboy-age glacier, which terminated about 3 km west of the quadrangle boundary, must have overridden this area, but it was apparently partially deflected by the bedrock ridge north of Maple Pit and thus unable to remove this patch of older drift. The age of the drift of Mason Creek is unknown.

Crandell (1987) suggested that the till along Mason Creek may be slightly older than the type Wingate Hill Drift of Crandell and Miller (1974), estimated to be from 300 to 600 ka (Colman and Pierce, 1981; Dethier, 1988). To the west, the drift of Mason Creek contains clasts probably eroded from basaltic flows emplaced between 600 ka and 800 ka (Evarts, 2004b).

As described by Mundorff (1964, 1984), the Amboy Drift includes till, stratified drift, outwash, and ice-contact deposits. Excellent exposures are found at many places along the shores of Lake Merwin. An extensive blanket of Amboy Drift till (Qat) covers much of the quadrangle to elevations as high as 1860 ft (565 m). At its maximum extent, Amboy-age ice buried all of the map area except the summit of Green Mountain. The terrain south of Green Mountain exhibits a distinctive topography composed of streamlined bedrock-cored hills (rock drumlins) with thin till mantles. The hills consist of south-dipping lava flows and were sculpted as the ice moved westward, parallel to strike, and preferentially excavated less resistant volcaniclastic interbeds. Some till outcrops in the Lewis River valley contain minor but conspicuous clasts of light-colored, coarsely porphyritic dacite bearing phenocrysts of quartz, cummingtonite, and biotite; such clasts are particularly common in till north of the Lewis River. These rocks have chemical and mineralogical affinities with products of the ancestral volcanic center at Mount St. Helens, which is the only known source in the Lewis River drainage for the distinctive dacite.

Deposits of stratified sand and gravel underlie Chelatchie Prairie and form terrace assemblages in the Lewis River and Cedar Creek valleys. These deposits (Qao) locally overlie till. Clast compositions and weathering characteristics are similar to those of the till, and the sediments are interpreted as glaciofluvial outwash deposited during retreat of Lewis River glacier in late Pleistocene time. The outwash appears to represent at least three aggradational episodes during recession of the Amboy-age glacier. The oldest outwash is that with a surface elevation of about 720 ft (220 m) near the south boundary of the map area. These glaciofluvial deposits are at the north end of a broad, flat-bottomed, gently south-sloping valley, occupied by the town of Yacolt, that was apparently filled with outwash when glacial ice still occupied Chelatchie Prairie and terrain to the north. Chelatchie Prairie declines from about 600 ft (180 m) at its east end to about 400 ft (120 m) near Amboy and is the surface of a valley train, locally as thick as 66 m, that was deposited when the glacier had receded to near the site of Yale Dam east of the Amboy quadrangle. The outwash deposits near the east end of Lake Merwin are probably of the same age. At its western end the surface of Chelatchie Prairie is inset against an older fill with a surface about 12 to 15 m higher. This older fill continues westward as semicontinuous terraces along Cedar Creek all the way to its mouth (Evarts, 2004b); these deposits may be approximately the same age as those beneath Yacolt.

The lake deposits (Ql) near the southwest corner of the quadrangle mark the east end of a proglacial lake impounded by Amboy-age terminal moraines (Grigg and Whitlock, 2002; Evarts, 2004b).

The numerical ages of Hayden Creek Drift and its local equivalent, the Amboy Drift, are poorly known. Estimates range from 60 ka to greater than 300 ka (Crandell and Miller, 1974; Colman and Pierce, 1981; Dethier, 1988). A minimum age comes from evidence in the Fargher Lake area of the adjacent Ariel quadrangle (Grigg and Whitlock, 2002) that suggests ice last covered the map area during marine oxygen-isotope stage (MIS) 4 (74 to 60 ka; Martinson and others, 1987). This is consistent with the lack of Cougar-age (21,000 to 18,000 yrs B.P.; fig. 3) Mount St. Helens rocks in the drift and with the presence of Evans Creek-age moraines about 70 km upriver (Crandell, 1987).

As noted by Mundorff (1984), in many places the Amboy Drift is overlain by as much as 2 m of weathered yellowish-gray tephra. The tephra contains quartz, biotite and cummingtonite, and is mineralogically similar to tephra set C of Mullineaux (1996). Tephra set C was erupted from Mount St. Helens during the volcano's Ape Canyon eruptive stage, which extended from about 36,000 to 50,000 ^{14}C years B.P. (fig. 3); there is no other source known in the Cascade Range for tephra with this mineralogy. Crandell (1987) believed that all activity at the volcanic center postdated the Hayden Creek glaciation, which he correlated with MIS 4. However, clasts of quartz+biotite±cummingtonite-bearing dacite are widespread in the Amboy Drift, documenting preglacial or synglacial eruptive activity at the ancestral volcanic center. Furthermore, data for ash beds in eastern Washington (Berger and Busacca, 1995; Whitlock and others, 2000) as well as recent geochronologic work at Mount St. Helens (Evarts and others, 2003) indicate that eruptive activity at Mount St. Helens probably began well before 100 ka. Thus some of the quartz+biotite+cummingtonite-bearing tephra may be much older than 50 ka, and the underlying till could correlate with MIS 6, about 130 to 190 ka (Martinson and others, 1987), or an even older glacial period. At a locality on the crest of Green Mountain, quartz+biotite±cummingtonite-bearing tephra rests on weathered bedrock and is overlain by till. Plagioclase in this tephra yielded an $^{40}Ar/^{39}Ar$ age of 250±36 ka (table 2), providing a maximum age for the peak of the Amboy/Hayden Creek glaciation. This is similar to the $^{40}Ar/^{39}Ar$ age of 270–20 ka for syneruptive ice-contact deposits in the Ariel quadrangle, which were also deposited when the Amboy-age Lewis River glacier was near its maximum extent (Evarts and others, 2003; Evarts, 2004b). These ages suggest that the Hayden Creek glaciation in the southern Washington Cascade Range corresponds to MIS 8, about 245 to 300? ka

(Martinson and others, 1987). It is possible, perhaps likely, that the deposits mapped here as Amboy Drift are diachronous and were actually deposited during more than one of the three glacial pulses of the Hayden Creek glaciation inferred by Dethier (1988) from an analysis of outwash-terrace deposits in the Cowlitz River valley, about 65 km north of the Amboy quadrangle.

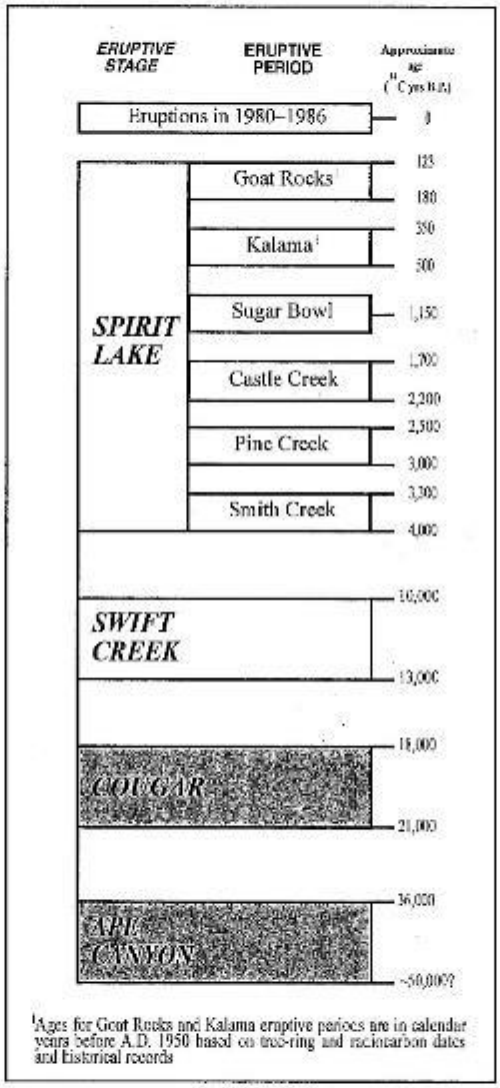

Figure 3. Eruptive stages and eruptive periods of Mount St. Helens volcano, modified from Crandell (1987). Shaded boxes designate stages corresponding to mapped deposits in the Amboy 7.5' quadrangle.

DEPOSITS DERIVED FROM THE MOUNT ST. HELENS VOLCANIC CENTER

The Lewis River drains the southern and eastern slopes of Mount St. Helens. Explosive eruptions at the volcanic center delivered large quantities of dacitic debris in the form of pyroclastic flows and lahars to the river during the late Pleistocene and Holocene (Crandell, 1987; Major and Scott, 1988). In postglacial time, eruptive activity at the volcano has been the dominant influence on sedimentation in the Lewis River valley. The periodic influx of volcaniclastic debris triggered major aggradational episodes downstream, and the deposits of these approximately syneruptive sedimentation events constitute a major part of the late Quaternary record in the lower Lewis River valley. Crandell (1987) showed that eruptive activity at Mount St. Helens was episodic and can be divided into several eruptive stages and periods (fig. 3). Based chiefly on their stratigraphic position and lithologic characteristics, Mount St. Helens-derived deposits in the Amboy quadrangle are assigned to Crandell's Ape Canyon and Cougar eruptive stages (fig. 3).

During the Ape Canyon eruptive stage, the Mount St. Helens volcanic center produced a distinctive white, coarsely porphyritic dacite containing phenocrysts of quartz and biotite (Crandell, 1987; Mullineaux, 1996). Major and Scott (1988) describe stratified, pumice-rich, alluvial sand and pebble gravel composed of this rock type (Qsa) from a narrow terrace along the north shore of Lake Merwin near Woodland Park. To the east, at the mouth of Rock Creek, a diamict that overlies west-dipping glaciofluvial beds contains boulders of quartz- and biotite-phyric dacite and may be a lahar deposit of about the same age as the alluvium. Poorly exposed Ape Canyon-age deposits also appear to underlie the dissected terrace surface at about 400 ft (120 m) elevation directly east of Lake Merwin. Sparse roadcut exposures show that these deposits include several meters of quartz- and biotite-bearing tephra as well as lithologically similar sandy alluvium. The scattered outcrops of Ape Canyon-age deposits indicate that during Ape Canyon time the lower Lewis River valley contained an extensive fill of volcaniclastic debris from the Mount St. Helens volcanic center.

Thick beds of sandy to gravelly alluvium and interbedded debris-flow deposits (Qsc) underlie a terrace surface inset into and about 15 m lower than that underlain by Ape Canyon-age deposits at the east end of Lake Merwin. Similar deposits underlie the valley of Speelyai Creek and form small terraces scattered along both shores of Lake Merwin farther west (Major and Scott, 1988; Evarts, 2004b). In several places these deposits unconformably overlie Amboy Drift. The debris-flow beds are poorly sorted and heterolithologic, composed predominantly of light-colored porphyritic dacites like those erupted from ancestral Mount St. Helens as well as variable proportions of Tertiary volcanics. These deposits probably formed from lahars that incorporated alluvium during transport. Major and Scott (1988) inferred these deposits to be largely of Cougar age (21,000 to 18,000 ^{14}C years B.P.), locally overlain by a few meters of Swift Creek-age (13,000 to 10,000 ^{14}C years B.P.) beds. This inference was based on the degree of soil development, the presence of abundant clasts of dacite similar to that erupted during Crandell's Cougar eruptive stage, and an age of 22,720±1,400 ^{14}C years B.P. that was obtained for charcoal in alluvium from the upper part of the Speelyai fill. Recent work by M.A. Clynne (written commun., 2003, 2004) indicates that clast compositions in the debris-flow beds are generally consistent with a Cougar age although some of these deposits could be older.

Few deposits younger than the Cougar eruptive stage have been identified in the Lewis River valley downstream from Mount St. Helens. A Swift Creek-age lahar is exposed below Merwin Dam in the Ariel quadrangle (Evarts, 2004b) and alluvium with young (<1,000 years B.P.) radiocarbon ages is present near the mouth of the river at Woodland (Major and Scott, 1988). Extensive deposits of the Swift Creek and Spirit Lake eruptive stages (fig. 3) may underlie the submerged Lewis River floodplain beneath Lake Merwin.

LANDSLIDE, TALUS, AND ALLUVIAL DEPOSITS

Landslide (Qls) and talus deposits (Qt) are common beneath cliffs in the Amboy quadrangle. Notable accumulations of talus have formed below the glacially steepened north flanks of the east-west-trending cuestas of Green Mountain and the ridge south of Speelyai Creek and on the east side of Duncan Mountain. Most landslides result from failure of weathered, clayey, Paleogene volcaniclastic rocks (Tvs, Tt, and sedimentary interbeds within flow-dominated units Tba, Tbem, and Ta). Younger poorly lithified deposits are also susceptible to sliding, especially on steeper slopes. Only the larger landslides are shown on this map; many areas underlain by unconsolidated Quaternary units contain small slumps and debris-flow deposits that are too small to portray at 1:24,000 scale.

Unconsolidated alluvium (Qa) forms local and ephemeral accumulations along the active courses of Speelyai and Cedar Creeks and small alluvial cones at the base of steep gullies on the north slope of Green Mountain. Some areas mapped as alluvium, such as along Buncombe Hollow Creek and near the southeast corner of

the quadrangle, are the former channels of glacier-margin streams and these deposits are probably largely of Pleistocene age.

STRUCTURAL FEATURES

The Amboy quadrangle lies a few kilometers east of the northeastern margin of the Portland Basin, part of Puget-Willamette Lowland that separates the Cascade Range to the east from the Oregon and Washington Coast Ranges to the west. In the Cascade Range of southwestern Washington, structural attitudes of Paleogene strata delineate a set of large-wavelength, south- to southeast-plunging folds that are believed to have developed in late early Miocene time (Evarts and Swanson, 1994). The late Eocene and Oligocene section in the northern part of the Amboy quadrangle, which generally strikes approximately east-west and dips south at 15 to 30°, is located on the west limb of one of these folds, the Lakeview Peak anticline of Phillips (1987). A poorly defined synclinal axis lies in the Ariel quadrangle to the west (Evarts, 2004b). The Tertiary section flattens south of Cedar Creek, where dips are generally less than 15°, and is significantly disrupted by faulting near Chelatchie Prairie. In the southern part of the map area and to the south (R.C. Evarts, unpub. mapping) the basaltic andesite of Elkhorn Mountain is nearly flat-lying. This suggests that a slight angular discordance (<10°) exists between this unit and underlying strata, possibly indicating minor folding during the approximately 6 m.y. hiatus represented by the unconformity at its base.

Owing to limited outcrop, compelling evidence for the existence of faults in the Amboy quadrangle is sparse. Some faults shown on this map are projected from structures observed in roadcuts or natural exposures. Others have been inferred from apparent discontinuities in distinctive stratigraphic units, from topographic lineaments, or from abrupt changes in bedding trends. Most appear to be minor high-angle normal and strike-slip or oblique-slip faults of the kind characteristic of southwestern Washington (Wells, 1981; Wells and Coe, 1985; Evarts and Ashley, 1991, 1992; Evarts and Swanson, 1994; Evarts, 2002, 2004a, b; R.C. Evarts, unpub. mapping). Collectively, these structures presumably accommodated the paleomagnetically recorded rotations of small crustal blocks in response to long-term oblique convergence along the Cascadia Subduction Zone throughout Cenozoic time (Wells and Coe, 1985; Wells, 1989, 1990; Beck and Burr, 1979; Bates and others, 1981; Hagstrum and others, 1999).

As suggested by Mundorff (1964), major fault zones appear to be responsible for the northeast-striking basin of Chelatchie Prairie and the north-northwest-trending reach of Cedar Creek. The north-northwest-striking faults in the Cedar Creek area are inferred to be right-lateral structures based on apparent dextral offset of Paleogene strata. South of the map area, these faults exhibit normal offsets that partly define the edges of the basin in which the town of Yacolt is situated. North of these faults, the dominant fault trend in the quadrangle is northeasterly. The most prominent northeast-striking faults are those that control Chelatchie Prairie. Tertiary rocks that form the elongate knobs near Chelatchie strike almost north-south and appear to have been rotated several tens of degrees counterclockwise relative to strata that flank the basin. The knobs are interpreted as small blocks rotated along short subsidiary fault segments between longer left-lateral faults that transect and bound the basin. The basin itself evidently was formed by north-side-down normal offset on the faults that run along its southern boundary. Relief in this area is about 200 m but actual offset is unknown; it may be less than this because the basin was probably deepened by glacial erosion.

The age of the faulting is poorly constrained and movement may have occurred intermittently throughout late Cenozoic time. Zeolite- and quartz-filled fault planes and rusty pyritic rock in Cedar Creek south of Amboy presumably reflect reaction with heated geothermal fluids and indicate that some faulting probably occurred prior to the Miocene cessation of volcanic activity in the area. On the other hand, the major north-northwest and east-southeast striking fault zones are well expressed in the topography, suggesting that they are relatively young, possibly Quaternary structures. The relationship between these faults is unclear, but the north-northwest-striking faults that mark the abrupt west end of Chelatchie Prairie probably truncate the east-northeast faults. Chelatchie Prairie appears to be an oblique extensional feature formed in response to dextral motion on the north-northwest faults and associated clockwise rotation of the terrain to the west.

GEOLOGIC EVOLUTION

The late Eocene and early Oligocene bedrock in the Amboy quadrangle consists of sheetlike mafic to intermediate lava flows interbedded with coarse-grained breccias, pumiceous pyroclastic rocks, and stratified volcaniclastic sedimentary rocks and cut by scattered phaneritic intrusions. These bedrock units are typical of the

southern Washington Cascade Range (Evarts and Swanson, 1994). The dearth of dikes and areas of hydrothermal alteration in the map area suggests deposition largely in medial to distal settings beyond the flanks of large active volcanic edifices (Williams and McBirney, 1979; Vessell and Davies, 1981; Cas and Wright, 1987; Orton, 1996). Small silicic centers, however, may be marked by dacitic flows such as the one at Maple Pit, which are too viscous to flow far from source vents, and the wedge-like deposit of scoriaceous olivine-phyric basalt on the north flank of Green Mountain is probably a cross section through the flank of a small cinder cone. Also, the intrusions of diorite and quartz diorite at Buncombe Hollow, Dunegan Mountain and, elsewhere may represent subvolcanic magma chambers that fed now-eroded volcanoes. Age determinations in this and adjacent quadrangles (Evarts, 2002, 2004b; R.J. Fleck, written commun., 2000, 2001, 2002, 2005) show that the extrusive rocks here were emplaced mainly between 37 and 33 Ma, early in Cascade arc history (Duncan and Kulm, 1989; Evarts and Swanson, 1994). The uppermost unit in the map area, the basaltic andesite of Elkhorn Mountain, unconformably overlies the older strata and is about 27 m.y. old, indicating a hiatus in volcanism lasting perhaps as long as 6 m.y.; minor folding may have occurred during this time. Whether the event recorded by this hiatus was of regional or simply local extent is unknown, but generally the volcanic arc in Washington remained the site of vigorous volcanic activity into early Miocene time (Evarts and others, 1987; Vance and others, 1980; Smith, 1993). A precipitous decline in volcanism after about 17 Ma in southern Washington corresponds to a region-wide episode of uplift, folding, and erosion (Evarts and Swanson, 1994) and southward tilting of strata in the Amboy quadrangle probably occurred at this time.

Regionally distributed minor faults are believed to accommodate the deformation of crustal blocks that is recorded by clockwise-rotated paleomagnetic declinations in Paleogene rocks in southwestern Washington; this deformation is interpreted as a response to oblique convergence along the Cascadia Subduction Zone (Wells and Coe, 1985; Wells, 1989, 1990; Beck and Burr, 1979; Bates and others, 1981; Hagstrum and others, 1999). In the Amboy quadrangle, this deformation appears to have become concentrated along more discrete north-northwest- and east-northeast-trending fault zones. The NNW fault zone is most likely a dextral structure, one of a set along which western Washington has moved northward relative to interior North America (Wells and others, 1998). Chelatchie Prairie appears to be an extensional basin developed between antithetic oblique-slip faults with sinistral offset. It may have formed in a releasing stepover between the right-lateral fault zone near Amboy and a similar structure in the unmapped area east of the Amboy quadrangle; small blocks between the fault strands that bound Chelatchie Prairie have been rotated counterclockwise by left-lateral movement on these structures. The topographic expression of these faults suggests they are relatively young. The north-northwest-striking fault zone is parallel to the St. Helens Seismic Zone (SHZ) of Weaver and others (1987) beneath Mount St. Helens and thus is appropriately oriented for dextral strike-slip motion, as inferred for the SHZ, in the modern regional stress field (Pezzopane and Weldon, 1993; Wells and others, 1998; Miller and others, 2001).

The Quaternary geologic history recorded in the Amboy quadrangle reflects two dominating influences: Pleistocene glaciation and eruptions at the Mount St. Helens volcanic center, both of which caused alternating periods of alluviation and downcutting in the Lewis River valley in response to large variations in sediment load (Mundorff, 1984; Major and Scott, 1988). The modern topography owes much of its character to glacial sculpting.

Several times during the Pleistocene, mountain glaciers moved out of the Cascade Range and into the map area. Evidence for earlier glacial advances was erased by the glaciation that deposited the Amboy Drift, the local equivalent of the Hayden Creek Drift. During Amboy time, a large piedmont glacier issued from the Lewis River valley and spread out to bury the map area (Mundorff, 1984); at the glacier's maximum extent, only the summit of Green Mountain above about 1850 ft (565 m) projected above the ice. Evidence in the Ariel quadrangle (Evarts, 2004b) suggests that the Amboy Drift may include deposits of more than one glacial pulse during the Hayden Creek Stade, with the maximum advance occurring at about 270 ka. The most recent glaciation in the Cascade Range, which culminated about 17,000 ^{14}C years B.P. (Barnosky, 1984), was considerably less extensive than the Hayden Creek (Amboy) advance, and left no identified deposits in the lower Lewis River valley.

The Amboy-age glacier widened the valleys now occupied by Lake Merwin and Speelyai Creek and carved numerous streamlined knobs and ridges (rock drumlins) in the south part of the map area. The orientations of these features reflect the interplay between the west to south-southwest directions of ice movement and attitudes in the Paleogene bedrock; preferential excavation of volcaniclastic beds left elongated ridges upheld by lava flows. Prominent cuestas were produced in the south-dipping strata of Green Mountain and the ridge south of Speelyai Creek, and overdeepened troughs were carved in Chelatchie Prairie, Cedar Creek valley northwest of Amboy, and possibly the Lewis River valley. Glacial retreat was interrupted by multiple partial readvances, and proglacial drainage continually adjusted to changing position of ice margins. The bench now occupied by Buncombe Hollow Creek was probably eroded by a glacier-margin stream, as were several smaller drainages south of Chelatchie Prairie. Underfit streams such as Speelyai Creek, Chelatchie Creek, and Cedar Creek downstream from Amboy imply that significant rearrangements of stream courses took place during deglaciation. Mundorff (1984) suggested

that Canyon Creek, a large tributary that enters the Lewis River east of the map area, flowed approximately along the present course of Chelatchie Creek and westward along the modern Cedar Creek valley in preglacial times. The Lewis River may also have at times spilled into Chelatchie Prairie via the northeast-trending saddles north of Chelatchie. As the Amboy glacier retreated, proglacial outwash was deposited in the deglaciated valleys. Remnants of valley trains deposited when ice occupied Chelatchie Prairie are preserved as terraces along Cedar Creek and as a south-sloping fill in the Yacolt quadrangle to the south. The southwest-trending reach of Cedar Creek in the southeast part of the Amboy quadrangle probably drained southward to join the East Fork Lewis River at this time before being captured by headward erosion of lower Cedar Creek south of Amboy. Chelatchie Prairie itself filled with outwash when the glacier retreated farther upvalley.

The volcanic center at Mount St. Helens first became active at some time before or during the Amboy glaciation and has erupted frequently since (Crandell, 1987). At least one eruption occurred at a time when the Lewis River valley was filled with ice (Evarts, 2004b). Many of these eruptions were explosive, and some dumped huge quantities of pyroclastic debris into the Lewis River system. Evidence for periods of eruption-induced aggradation and subsequent incision is abundant in the Amboy quadrangle (Major and Scott, 1988). Most of the deposits of Mount St. Helens origin preserved within the quadrangle were deposited by lahars or reworked from primary eruptive deposits upstream. They postdate the Amboy Drift, and were largely deposited during the Ape Canyon, Cougar, and Swift Creek eruptive stages of Crandell (1987), between about 50,000 and 10,000 ^{14}C years B.P. (fig. 3) although younger deposits may underlie the submerged floodplain of the river. Thick fills of Mount St. Helens-derived debris in the valley of Speelyai Creek and the Lewis River valley east of Lake Merwin were probably emplaced during a major lahar-induced aggradational episode during the Cougar eruptive stage (Hyde, 1975; Major and Scott, 1988). Prior to Cougar time, the Lewis River may have flowed through the valley now occupied by Speelyai Creek, and was diverted southward to its present course when that valley became choked with volcaniclastic sediment, as suggested by Major and Scott (1988).

GEOLOGIC RESOURCES

Known geologic resources available in the Amboy quadrangle are limited to nonmetallic industrial materials, chiefly aggregate for road construction and similar purposes. Several large quarries in Paleogene volcanic and intrusive bedrock of the map area produce crushed aggregate used primarily as base and surface material for roads. Sand and gravel are locally available from unconsolidated alluvial deposits along the Lewis River but are more abundant and accessible downstream from the map area.

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Table 1. Chemical analyses of volcanic and intrusive rocks, Amboy 7.5' quadrangle

[X-ray fluorescence analyses. Rock-type names assigned in accordance with IUGS system (Le Maitre, 2002) applied to recalculated analyses. FeO*, total iron calculated as FeO. Mg#, atomic ratio 100Mg/(Mg+Fe^{2+}) with Fe^{2+} set to 0.85x Fe^{total}. Modal analyses, secondary minerals counted as primary mineral replaced. -, not present. X-ray fluorescence analyses by D.M. Johnson at GeoAnalytical Laboratory of Washington State University using methods described in Johnson and others (1999)]

Map No.	1	2	3	4	5	6	7	8	9
Field sample No.	02YC-P466	99YC-P68	99YC-P41A	99YC-P58	99YC-P95A	99YC-P59	00YC-P129C	00YC-P210	00YC-P164
Latitude (N)	45°57.94'	45°57.84'	45°59.46'	45°59.10'	45°57.81	45°57.10'	45°53.76'	45°53.52'	45°52.86'
Longitude (W)	122°25.19'	122°27.12'	122°28.02'	122°23.34'	122°27.30'	122°22.80'	122°23.22'	122°23.40'	122°22.86'
Map unit	Tob	Tob	Tb	Tb	Tb	Tpph	Tbam	Tbam	Tbam
Rock type	Basalt	Basaltic andesite	Basalt	Basalt	Basalt	Basalt	Basaltic andesite	Basaltic andesite	Basaltic andesite
Analyses as reported (wt percent)									
SiO_2	47.34	52.62	51.16	51.25	51.71	50.58	52.16	52.46	53.33
TiO_2	1.78	1.28	1.74	1.78	1.53	1.61	1.24	1.39	1.36
Al_2O_3	15.53	16.53	15.35	15.32	17.30	16.35	19.39	17.87	17.25
FeO*	9.95	8.90	10.68	10.85	8.49	10.20	8.63	9.69	9.60
MnO	0.17	0.15	0.19	0.21	0.17	0.18	0.16	0.18	0.17
MgO	9.48	7.11	5.66	5.59	6.62	5.30	4.33	4.42	4.44
CaO	10.38	9.54	10.26	10.09	9.71	10.67	10.74	9.63	9.85
Na_2O	2.59	2.91	3.28	3.29	3.15	3.00	2.91	3.06	2.97
K_2O	0.97	0.70	0.49	0.49	0.88	0.45	0.38	0.48	0.78
P_2O_5	0.47	0.27	0.24	0.25	0.28	0.21	0.16	0.19	0.19
Total	98.56	100.01	99.05	99.11	99.67	98.55	100.10	99.37	99.94
Analyses recalculated volatile-free and normalized to 100% with all Fe as FeO (wt percent)									
SiO_2	48.03	52.61	51.65	51.71	51.91	51.32	52.11	52.79	53.36
TiO_2	1.81	1.28	1.76	1.80	1.53	1.63	1.24	1.40	1.36
Al_2O_3	15.76	16.53	15.50	15.47	17.36	16.59	19.37	17.98	17.26
FeO*	10.09	8.90	10.78	10.93	8.52	10.35	8.62	9.75	9.61
MnO	0.17	0.15	0.19	0.21	0.17	0.18	0.16	0.18	0.17
MgO	9.62	7.11	5.71	5.64	6.64	5.38	4.32	4.45	4.44
CaO	10.45	9.54	10.36	10.18	9.74	10.83	10.73	9.69	9.86
Na_2O	2.63	2.91	3.31	3.32	3.16	3.04	2.91	3.08	2.97
K_2O	0.98	0.70	0.49	0.49	0.88	0.46	0.38	0.48	0.78
P_2O_5	0.48	0.27	0.24	0.25	0.28	0.21	0.16	0.19	0.19
Mg#	66.7	62.6	52.5	52.0	62.1	52.1	51.3	48.9	49.2
Modes (volume percent)									
Plagioclase	-	0.3	-	-	1.1	16.2	26.8	21.9	11.0
Clinopyroxene	-	0.1	-	-	0.2	-	trace	0.3	1.3
Orthopyroxene	-	-	-	-	-	-	-	-	-
Olivine	9.3	7.0	-	-	2.3	0.3	0.1	2.8	0.6
Fe-Ti Oxide	-	-	-	-	trace	-	-	-	-
Hornblende	-	-	-	-	-	-	-	-	-
Quartz	-	-	-	-	-	-	-	-	-
K-feldspar	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Groundmass	90.7	92.6	100.0	100.0	96.4	83.5	72.1	75.0	84.1
No. points counted	788	718			726	750	800	795	766
Texture (rock/groundmass)	porphyritic/ trachytic	porphyritic/ trachytic	aphyric/ intergranular	aphyric/ intergranular	sparsely phyric/ trachytic	porphyritic/ intergranular	porphyritic/ trachytic	seriate/ trachytic	seriate/ microgranular
Trace element analyses (ppm)									
Ba	264	161	125	126	169	102	134	137	173
Rb	23	7	5	5	14	3	4	5	23
Sr	419	455	270	262	431	283	341	312	289
Y	25	22	32	34	25	29	21	25	30
Zr	177	145	123	129	144	113	95	100	132
Nb	6.4	10.7	9.9	10.0	11.7	9.2	5.9	7.1	8.8
Ni	193	149	28	32	97	38	20	11	13
Cu	100	133	151	151	114	141	125	152	165
Zn	80	80	88	98	78	87	73	81	75
Cr	403	258	66	67	155	79	45	48	52

14832

Table 1. Chemical analyses of volcanic and intrusive rocks, Amboy 7.5' quadrangle—Continued

Map No.	10	11	12	13	14	15	16	17	18
Field sample No.	00YC-P128A	00YC-P167	00YC-P98	00YC-P101	00YC-P209	01YC-P230	01YC-P215B	01YC-P225	01YC-P215A
Latitude (N)	45°54.00'	45°52.62'	45°53.10'	45°54.12'	45°52.92'	45°53.10'	45°53.04'	45°52.98'	45°53.10'
Longitude (W)	122°22.50'	122°22.62'	122°27.72'	122°24.30'	122°23.58'	122°26.58'	122°28.74'	122°29.22'	122°28.74'
Map unit	Tbam	Tbam	Tbam	Tbam	Tbam	Tbam	Tbam	Tbam	Tbam
Rock type	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite
Analyses as reported (wt percent)									
SiO_2	53.52	53.72	54.74	54.89	55.43	55.02	55.20	55.23	56.16
TiO_2	1.67	1.67	1.16	1.20	1.22	1.12	1.12	1.18	1.59
Al_2O_3	15.92	16.15	20.12	19.08	17.68	19.53	19.37	19.13	16.37
FeO*	10.33	10.14	7.20	7.87	8.91	7.24	7.49	7.35	9.70
MnO	0.20	0.18	0.15	0.16	0.17	0.16	0.18	0.18	0.21
MgO	4.63	4.58	2.68	3.10	4.16	2.66	2.65	2.58	3.18
CaO	9.42	9.32	9.44	8.79	8.49	8.91	8.76	8.67	7.46
Na_2O	2.97	3.11	3.46	3.44	3.43	3.67	3.65	3.62	4.01
K_2O	0.54	0.60	0.52	0.58	0.54	0.60	0.62	0.65	0.70
P_2O_5	0.24	0.24	0.19	0.19	0.17	0.18	0.18	0.18	0.23
Total	99.44	99.81	99.66	99.30	100.20	99.14	99.23	98.77	99.61
Analyses recalculated volatile-free and normalized to 100% with all Fe as FeO (wt percent)									
SiO_2	53.82	53.83	54.93	55.28	55.32	55.50	55.64	55.92	56.38
TiO_2	1.68	1.67	1.17	1.21	1.22	1.13	1.13	1.19	1.60
Al_2O_3	16.01	16.18	20.19	19.22	17.66	19.75	19.52	19.37	16.43
FeO*	10.29	10.16	7.23	7.93	8.89	7.30	7.55	7.44	9.74
MnO	0.20	0.18	0.15	0.16	0.17	0.16	0.18	0.18	0.21
MgO	4.66	4.59	2.69	3.12	4.15	2.68	2.67	2.61	3.19
CaO	9.47	9.34	9.47	8.85	8.47	8.99	8.83	8.78	7.49
Na_2O	2.98	3.12	3.47	3.46	3.42	3.70	3.68	3.67	4.03
K_2O	0.54	0.60	0.52	0.58	0.54	0.61	0.62	0.66	0.70
P_2O_5	0.24	0.24	0.19	0.19	0.17	0.18	0.18	0.18	0.23
Mg#	48.4	48.6	43.8	45.3	49.5	43.5	42.6	42.4	40.7
Modes (volume percent)									
Plagioclase	3.7	3.5	40.9	44.2	28.3	29.8	28.5	8.5	8.5
Clinopyroxene	-	-	1.1	1.8	0.4	0.9	1.6	1.5	1.5
Orthopyroxene	-	-	-	-	1.5	-	-	-	-
Olivine	0.6	0.5	0.7	2.6	0.2	1.3	1.0	0.6	0.6
Fe-Ti Oxide	-	-	0.1	0.2	trace	0.1	0.4	0.3	0.3
Hornblende	-	-	-	-	-	-	-	-	-
Quartz	-	-	-	-	-	-	-	-	-
K-feldspar	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Groundmass	95.7	96.2	57.2	51.1	69.6	67.9	68.5	89.1	89.1
No. points counted	771	753	736	810	792	775	786	786	786
Texture (rock/groundmass)	seriate/ trachytic	seriate/ trachytic	seriate/ intergranular	porphyritic/ intergranular	seriate/ intergranular	seriate/ intergranular	seriate/ intergranular	seriate/ intergranular	seriate/ intergranular
Trace element analyses (ppm)									
Ba	200	219	143	155	155	151	154	147	147
Rb	8	14	8	11	8	11	14	16	16
Sr	280	275	334	320	326	325	324	272	272
Y	31	31	26	25	23	24	29	33	33
Zr	140	142	108	115	92	112	111	135	135
Nb	8.2	9.0	8.7	8.6	6.8	8.8	8.5	10.5	10.5
Ni	20	16	3	5	12	2	3	3	3
Cu	221	174	49	94	107	114	107	171	171
Zn	90	94	72	79	76	78	75	103	103
Cr	54	55	9	20	36	10	12	10	10

18

27 of 152

14832

Table 1. Chemical analyses of volcanic and intrusive rocks, Amboy 7.5' quadrangle—Continued

Map No.	19	20	21	22	23	24	25	26	27
Field sample No.	00YC-P131A	01YC-P288	99YC-P61	01YC-P293	01YC-P351	99YC-P54	99YC-P19	99YC-P23[1]	99YC-P58
Latitude (N)	45°55.80'	45°58.44'	45°58.02'	45°58.50'	45°52.62'	45°58.92'	45°53.64'	45°59.58'	45°57.06'
Longitude (W)	122°26.40'	122°24.06'	122°29.82'	122°23.88'	122°24.60'	122°25.58'	122°29.76'	122°25.02'	122°27.18'
Map unit	Tbam	Tba	Tba	Tba	Tba	Tba	Tba	Tba	Tba
Rock type	Basaltic andesite	Basaltic andesite	Dacitic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite
Analyses as reported (wt percent)									
SiO_2	52.20	52.27	53.43	53.51	53.46	53.82	54.16	54.05	54.61
TiO_2	1.61	0.98	0.90	2.11	1.09	2.13	0.94	1.70	1.15
Al_2O_3	16.96	20.45	18.99	15.29	18.37	15.51	17.77	16.08	17.38
FeO*	9.16	7.72	7.19	10.47	8.32	11.15	8.09	8.01	7.97
MnO	0.16	0.15	0.14	0.22	0.18	0.17	0.15	0.13	0.30
MgO	4.69	3.60	5.17	4.17	4.53	3.61	4.92	3.28	4.72
CaO	9.86	10.15	9.96	8.12	9.55	8.01	9.44	8.29	9.67
Na_2O	2.98	3.21	3.08	3.93	3.15	3.87	2.97	3.96	3.16
K_2O	1.23	0.57	0.75	0.84	0.52	0.77	0.72	1.04	0.71
P_2O_5	0.30	0.14	0.13	0.37	0.15	0.34	0.14	0.35	0.19
Total	99.15	99.24	99.53	99.53	99.32	99.38	99.29	98.89	99.86
Analyses recalculated volatile-free and normalized to 100% with all Fe as FeO (wt percent)									
SiO_2	52.65	52.67	53.68	53.76	53.82	54.16	54.55	54.66	54.72
TiO_2	1.62	0.99	0.90	2.12	1.10	2.14	0.95	1.72	1.32
Al_2O_3	17.11	20.61	18.88	15.87	18.50	15.61	17.90	18.28	16.96
FeO*	9.24	7.78	7.22	10.52	8.38	11.22	8.15	8.10	8.03
MnO	0.16	0.16	0.14	0.22	0.19	0.17	0.15	0.15	0.15
MgO	4.73	3.63	5.19	4.19	4.56	3.63	4.96	3.32	5.57
CaO	9.94	10.23	10.00	8.16	9.61	8.06	9.51	8.38	8.90
Na_2O	3.01	3.23	3.09	3.95	3.17	2.89	2.99	4.00	3.43
K_2O	1.24	0.57	0.75	0.84	0.52	0.77	0.72	1.05	0.65
P_2O_5	0.30	0.14	0.13	0.37	0.15	0.35	0.14	0.35	0.28
Mg#	51.8	49.4	60.1	45.5	55.3	40.4	56.0	46.2	59.3
Modes (volume percent)									
Plagioclase	14.4	37.6	16.3	-	29.6	-	26.5	38.7	10.1
Clinopyroxene	1.9	-	-	-	0.8	-	4.7	-	0.8
Orthopyroxene	-	-	-	-	0.1	-	0.5	0.3	0.4
Olivine	2.2	0.3	1.6	-	3.6	-	2.8	0.5	1.1
Fe-Ti Oxide	0.1	-	-	-	-	-	-	-	0.4
Hornblende	-	-	-	-	-	-	-	-	-
Quartz	-	-	-	-	-	-	-	-	-
K-feldspar	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Groundmass	81.4	62.1	82.1	100.0	65.9	100.0	65.5	60.5	86.9
No. points counted	742	747	774		753		784	782	760
Texture (rock/groundmass)	porphyritic/ trachytic	porphyritic/ intergranular	seriate/ intergranular	aphyric/ trachytic	seriate/ intergranular	aphyric/ intersertal	seriate/ intergranular	porphyritic/ intergranular	seriate/ intergranular
Trace element analyses (ppm)									
Ba	563	141	139	283	121	194	137	224	212
Sb	18	12	15	12	10	11	15	15	9
Sr	599	312	397	363	292	404	322	404	378
Y	35	20	18	31	22	33	18	32	24
Zr	179	91	111	155	97	156	100	198	167
Nb	10.2	6.1	7.2	13.7	6.6	12.6	5.6	16.5	13.6
Ni	36	14	49	10	16	3	28	35	64
Cu	77	94	43	140	65	39	88	99	100
Zn	85	75	61	98	84	104	73	89	71
Cr	56	20	106	16	35	19	67	49	110

[1] Float

19

28 of 152

Table 1. Chemical analyses of volcanic and intrusive rocks, Amboy 7.5' quadrangle—Continued

Map No.	28	29	30	31	32	33	34	35	36
Field sample No.	98YC-P09	99YC-P35	99YC-P11A	00YC-P171	98YC-P04	83YC-P01E	99YC-P93	99YC-P86	99YC-P82A
Latitude (N)	45°58.98'	45°57.42'	45°55.98'	45°55.08'	45°59.28'	45°59.28'	45°57.90'	45°55.74'	45°56.28'
Longitude (W)	122°26.52'	122°28.68'	122°30.68'	122°32.86'	122°26.16'	122°25.14'	122°28.32'	122°28.74'	122°25.32'
Map unit	Tba	Tba	Tba	Tba	Tba	Tba	Tba	Tba	Tba
Rock type	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite
Analyses as reported (wt percent)									
SiO_2	54.08	54.91	54.66	54.44	54.38	54.63	55.48	55.51	55.47
TiO_2	2.20	1.05	1.31	1.23	2.23	2.01	1.09	1.78	1.60
Al_2O_3	15.63	17.57	17.89	17.71	15.66	15.56	18.07	15.72	16.09
FeO*	10.11	8.01	8.77	8.38	10.30	9.72	7.75	9.91	9.45
MnO	0.20	0.15	0.16	0.16	0.19	0.17	0.15	0.21	0.16
MgO	3.45	4.49	3.46	4.19	3.27	4.32	4.42	3.93	3.96
CaO	6.93	9.42	8.80	8.56	6.85	8.41	9.12	7.57	7.66
Na_2O	4.44	3.34	3.28	3.50	4.35	3.65	3.40	3.79	3.78
K_2O	1.02	0.76	0.83	0.58	1.04	0.59	0.75	0.89	0.88
P_2O_5	0.53	0.16	0.21	0.19	0.53	0.38	0.17	0.26	0.26
Total	98.64	99.66	99.37	98.94	98.80	99.24	100.38	99.56	99.31
Analyses recalculated volatile-free and normalized to 100% with all Fe as FeO (wt percent)									
SiO_2	54.83	54.90	55.01	55.03	55.01	55.05	55.27	55.76	55.86
TiO_2	2.23	1.06	1.32	1.24	2.26	2.03	1.07	1.78	1.61
Al_2O_3	15.90	17.63	18.00	17.90	15.85	15.68	18.00	15.79	16.20
FeO*	10.25	8.04	8.82	8.47	10.43	9.79	7.72	9.95	9.52
MnO	0.21	0.15	0.16	0.16	0.19	0.17	0.15	0.21	0.16
MgO	3.50	4.51	3.48	4.24	3.31	4.35	4.40	3.94	3.99
CaO	7.03	9.45	8.86	8.65	6.93	8.47	9.09	7.60	7.71
Na_2O	4.50	3.35	3.30	3.54	4.40	3.68	3.39	3.81	3.81
K_2O	1.03	0.76	0.84	0.59	1.05	0.59	0.75	0.89	0.89
P_2O_5	0.53	0.16	0.21	0.19	0.54	0.38	0.17	0.26	0.26
Mg#	41.7	54.0	45.3	51.2	40.0	48.3	54.5	45.3	46.8
Modes (volume percent)									
Plagioclase	-	7.6	24.2	31.1	trace	0.6	9.2	1.0	0.2
Clinopyroxene	-	0.3	1.8	1.6	-	trace	0.1	0.1	trace
Orthopyroxene	-	-	-	2.1	-	-	-	-	-
Olivine	-	0.4	1.5	1.3	-	trace	0.3	-	-
Fe-Ti Oxide	-	-	trace	0.4	-	-	-	-	-
Hornblende	-	-	-	-	-	-	-	-	-
Quartz	-	-	-	-	-	-	-	-	-
K-feldspar	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Groundmass	100.0	91.7	72.5	63.5	100.0	99.4	90.4	98.9	99.8
No. points counted		753	792	792		802	802	800	750
Texture (rock/groundmass)	aphyric/ trachytic	seriate/ microgranular	seriate/ intersertal	seriate/ intersertal	aphyric/ trachytic	sparsely phyric/ intersertal	seriate/ intergranular	sparsely phyric/ trachytic	aphyric/ trachytic
Trace element analyses (ppm)									
Ba	231	147	183	156	234	256	145	193	171
Rb	17	14	17	9	17	26	14	17	11
Sr	372	353	276	299	364	332	382	309	327
Y	42	19	30	24	40	36	20	30	29
Zr	159	111	152	118	199	209	117	157	149
Nb	16.0	6.6	11.1	8.5	17.0	17.5	8.0	10.1	9.6
Ni	7	30	7	12	3	40	40	13	6
Cu	16	108	71	95	18	154	110	153	186
Zn	111	66	78	86	114	89	69	94	87
Cr	9	70	32	29	10	76	61	30	29

14832

Table 1. Chemical analyses of volcanic and intrusive rocks, Amboy 7.5' quadrangle—Continued

Map No.	37	38	39	40	41	42	43	44	45
Field sample No.	00YC-P211	00YC-P113	99YC-P77	00YC-P194	00YC-P134A	00YC-P132A	99YC-P24	00YC-P191	99YC-P26
Latitude (N)	45°55.60'	45°56.58'	45°57.84'	45°55.08'	45°55.98'	45°57.50'	45°54.46'	45°55.02'	45°59.70'
Longitude (W)	122°29.36'	122°27.72'	122°26.40'	122°29.70'	122°28.02	122°23.24'	122°22.98'	122°23.34'	122°25.52'
Map unit	Tba	Tba	Tba	Tba	Tba	Tba	Tba	Ta	Tba
Rock type	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Andesite	Andesite	Andesite
Analyses as reported (wt percent)									
SiO_2	55.39	55.54	55.77	55.88	56.39	56.75	56.63	56.87	57.00
TiO_2	1.76	1.92	1.10	1.80	1.76	2.10	2.01	1.29	2.15
Al_2O_3	15.82	15.12	17.95	15.66	15.45	15.77	15.41	18.33	15.30
FeO^*	9.72	10.37	7.53	9.85	9.75	9.24	9.38	7.46	9.13
MnO	0.18	0.19	0.15	0.18	0.19	0.19	0.20	0.16	0.19
MgO	3.81	3.56	3.88	3.44	3.75	3.34	2.94	2.63	3.18
CaO	7.71	7.55	8.51	7.61	7.61	6.91	6.32	7.60	6.69
Na_2O	3.66	3.46	3.40	3.74	3.63	4.03	4.62	4.04	4.22
K_2O	0.85	1.21	1.02	0.69	0.95	1.07	1.07	0.98	1.17
P_2O_5	0.26	0.34	0.18	0.28	0.26	0.33	0.39	0.23	0.45
Total	99.58	98.73	99.15	98.64	98.62	99.73	98.97	99.38	99.46
Analyses recalculated volatile-free and normalized to 100% with all Fe as FeO (wt percent)									
SiO_2	55.93	55.97	56.01	56.37	56.41	56.90	57.22	57.22	57.31
TiO_2	1.77	1.93	1.11	1.82	1.77	2.10	2.03	1.30	2.16
Al_2O_3	15.92	15.24	18.02	15.80	15.54	15.81	15.57	18.44	15.38
FeO^*	9.78	10.45	7.64	9.94	9.80	9.27	9.48	7.51	9.18
MnO	0.18	0.19	0.15	0.18	0.19	0.19	0.20	0.16	0.19
MgO	3.83	3.57	3.90	3.47	3.77	3.35	2.97	2.65	3.20
CaO	7.76	7.61	8.55	7.68	7.65	6.93	6.39	7.65	6.73
Na_2O	3.68	3.49	3.41	3.77	3.65	4.04	4.67	4.06	4.22
K_2O	0.90	1.22	1.02	0.70	0.96	1.07	1.08	0.98	1.18
P_2O_5	0.26	0.34	0.18	0.28	0.26	0.33	0.40	0.23	0.45
Mg#	45.1	41.5	51.7	42.3	46.3	43.1	39.7	42.5	42.2
Modes (volume percent)									
Plagioclase	1.1	0.2	16.4	0.2	2.1	trace	trace	18.3	-
Clinopyroxene	0.1	trace	0.9	trace	0.5	trace	-	trace	-
Orthopyroxene	-	-	-	-	-	-	-	0.3	-
Olivine	0.1	-	1.1	-	0.5	-	-	trace	-
Fe-Ti Oxide	-	-	-	trace	-	trace	-	trace	-
Hornblende	-	-	-	-	-	-	-	-	-
Quartz	-	-	-	-	-	-	-	-	-
K-feldspar	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Groundmass	98.7	99.8	81.6	99.8	96.9	100.0	100.0	81.4	100.0
No. points counted	750	752	750	767	775	-	-	785	-
Texture (rock/ groundmass)	seriate/ trachytic	aphyric/ pilotaxitic	seriate/ intergranular	aphyric/ pilotaxitic	seriate/ trachytic	aphyric/ trachytic	aphyric/ intergranular	porphyritic/ pilotaxitic	aphyric/ intergranular
Trace element analyses (ppm)									
Ba	200	328	180	223	191	204	231	159	261
Rb	16	29	21	25	17	22	20	12	18
Sr	307	295	316	324	304	323	362	315	321
Y	30	35	23	18	34	31	39	31	37
Zr	154	208	126	206	157	176	210	147	224
Nb	10.1	13.5	8.7	11.7	10.2	12.5	18.7	10.0	15.2
Ni	9	12	33	5	11	0	4	2	9
Cu	117	232	80	185	172	20	96	96	125
Zn	85	97	71	34	90	86	135	81	56
Cr	23	19	53	12	26	8	4	6	17

21

30 of 152

14832

Table 1. Chemical analyses of volcanic and intrusive rocks, Amboy 7.5' quadrangle—Continued

Map No.	37	38	39	40	41	42	43	44	45
Field sample No.	00YC-P211	00YC-P113	99YC-P77	00YC-P194	00YC-P134A	00YC-P137A	99YC-P24	00YC-P191	99YC-P25
Latitude (N)	45°55.68'	45°56.58'	45°57.84'	45°55.08'	45°55.98'	45°57.36'	45°59.46'	45°55.02'	45°59.70'
Longitude (W)	122°25.76'	122°27.72'	122°26.40'	122°29.70'	122°28.02'	122°23.34'	122°25.98'	122°23.34'	122°25.32'
Map unit	Tba	Tba	Tba	Tba	Tba	Tba	Tba	Te	Tba
Rock type	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Basaltic andesite	Andesite	Andesite	Andesite
Analyses as reported (wt percent)									
SiO_2	55.59	55.54	55.77	55.88	56.10	56.75	56.63	56.87	57.00
TiO_2	1.76	1.92	1.10	1.80	1.96	2.10	2.01	1.29	2.15
Al_2O_3	15.82	15.12	17.95	15.66	15.45	15.77	15.41	18.33	15.10
FeO*	9.72	10.37	7.61	9.85	9.75	9.24	9.58	7.46	9.23
MnO	0.18	0.19	0.15	0.18	0.19	0.19	0.20	0.16	0.19
MgO	3.81	3.54	3.88	3.44	3.75	3.34	2.94	2.63	3.18
CaO	7.71	7.55	8.51	7.61	7.61	6.91	6.32	7.60	6.69
Na_2O	3.66	3.46	3.40	3.74	3.63	4.03	4.62	4.04	4.20
K_2O	0.89	1.21	1.02	0.69	0.95	1.07	1.07	0.78	1.17
P_2O_5	0.26	0.34	0.18	0.28	0.26	0.33	0.39	0.23	0.45
Total	99.58	98.77	99.13	99.64	99.62	99.73	98.97	99.38	99.46
Analyses recalculated volatile-free and normalized to 100% with all Fe as FeO (wt percent)									
SiO_2	55.92	55.97	56.01	56.37	56.41	56.90	57.22	57.22	57.31
TiO_2	1.77	1.93	1.11	1.82	1.77	2.10	2.03	1.30	2.16
Al_2O_3	15.92	15.24	18.03	15.80	15.54	15.81	15.57	18.44	15.38
FeO*	9.78	10.45	7.64	9.94	9.80	9.27	9.48	7.51	9.18
MnO	0.18	0.19	0.15	0.18	0.19	0.19	0.20	0.16	0.19
MgO	3.83	3.57	3.90	3.47	3.77	3.35	2.97	2.65	3.20
CaO	7.76	7.61	8.55	7.68	7.65	6.93	6.39	7.65	6.75
Na_2O	3.68	3.49	3.41	3.77	3.65	4.04	4.67	4.06	4.22
K_2O	0.90	1.22	1.02	0.70	0.96	1.07	1.08	0.78	1.18
P_2O_5	0.26	0.34	0.18	0.28	0.26	0.33	0.40	0.23	0.45
Mg#	45.1	41.7	51.7	42.3	44.2	43.1	39.7	42.5	42.2
Modes (volume percent)									
Plagioclase	1.1	0.2	16.4	0.2	2.1	trace	trace	18.3	-
Clinopyroxene	0.1	trace	0.9	trace	0.5	trace	-	trace	-
Orthopyroxene	-	-	-	-	-	-	-	0.3	-
Olivine	0.1	-	1.1	-	0.5	-	-	trace	-
Fe-Ti Oxide	-	-	-	trace	-	trace	-	trace	-
Hornblende	-	-	-	-	-	-	-	-	-
Quartz	-	-	-	-	-	-	-	-	-
K-feldspar	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Groundmass	98.7	99.8	81.5	99.8	96.9	100.0	100.0	81.4	100.0
No. points counted	750	750	750	767	770	-	-	785	-
Texture (rock/groundmass)	seriate/ trachytic	aphyric/ pilotaxitic	serial/ intergranular	aphyric/ pilotaxitic	seriate/ trachytic	aphyric/ trachytic	aphyric/ intergranular	porphyritic/ pilotaxitic	aphyric/ intergranular
Trace element analyses (ppm)									
Ba	200	228	180	223	19.	204	251	194	261
Rb	16	29	21	25	17	22	20	12	18
Sr	307	295	376	324	304	323	362	315	323
Y	30	35	23	38	28	34	39	37	37
Zr	154	208	138	206	157	176	210	147	224
Nb	10.4	13.5	8.7	11.7	10.2	12.5	15.7	10.0	19.2
Ni	9	12	33	5	11	0	4	2	9
Cu	317	222	80	185	172	20	96	96	125
Zn	85	97	71	94	90	86	105	81	96
Cr	23	19	53	12	26	8	9	6	17

21

30 of 152

Table 1. Chemical analyses of volcanic and intrusive rocks, Amboy 7.5' quadrangle—Continued

Map No.	55	56	57	58	59	60	61	62	63
Field sample No.	01YC-P284	01YC-P347	99YC-P78	01YC-P381C	00YC-P197	01YC-P380A	00YC-P201	99YC-P17	00YC-P190A
Latitude (N)	45°57.78'	45°53.52'	45°57.78'	45°56.35'	45°54.54'	45°58.59'	45°54.52'	45°52.76'	45°55.14'
Longitude (W)	122°22.86'	122°23.50'	122°26.34'	122°26.72'	122°24.96'	122°27.09'	122°25.32'	122°29.04'	122°27.62'
Map unit	Ta	Ta	Ta	Ta	Ta	Tia	Ta	Td	Td
Rock type	Andesite	Andesite	Andesite	Andesite	Andesite	Andesite	Andesite	Dacite	Dacite
Analyses as reported (wt percent)									
SiO_2	58.31	58.92	59.05	60.03	60.84	60.87	61.10	65.03	65.65
TiO_2	1.34	0.90	1.40	1.48	1.36	1.55	1.31	0.72	0.75
Al_2O_3	16.09	17.38	15.92	15.17	15.72	15.74	16.04	16.72	14.74
FeO*	7.24	6.72	8.19	7.79	7.70	7.38	7.59	4.92	5.53
MnO	0.14	0.15	0.17	0.14	0.17	0.14	0.14	0.15	0.11
MgO	4.20	5.28	2.88	3.20	2.18	2.59	1.95	1.22	1.82
CaO	7.61	7.23	6.26	6.25	5.54	6.41	5.35	4.54	4.53
Na_2O	3.70	3.80	4.20	4.23	3.96	4.16	4.20	5.01	3.84
K_2O	0.66	0.83	1.04	1.08	1.52	0.71	1.50	0.84	1.86
P_2O_5	0.34	0.14	0.18	0.34	0.30	0.37	0.28	0.23	0.16
Total	99.63	99.45	99.29	99.72	99.39	99.32	99.46	98.83	98.99
Analyses recalculated volatile-free and normalized to 100% with all Fe as FeO (wt percent)									
SiO_2	58.53	59.25	59.47	60.20	61.21	61.29	61.43	65.80	66.32
TiO_2	1.34	0.90	1.41	1.49	1.37	1.56	1.32	0.73	0.76
Al_2O_3	16.15	17.48	16.03	15.21	15.82	15.24	16.13	16.31	14.89
FeO*	7.27	6.76	8.25	7.81	7.75	7.43	7.63	5.03	5.58
MnO	0.14	0.15	0.17	0.14	0.17	0.14	0.14	0.15	0.12
MgO	4.22	5.30	2.90	3.21	2.19	2.61	1.96	1.23	1.84
CaO	7.64	7.27	6.30	6.27	5.57	6.45	5.38	4.59	4.55
Na_2O	3.71	3.82	4.23	4.24	3.98	4.19	4.22	5.09	3.88
K_2O	0.66	0.83	1.05	1.08	1.53	0.71	1.51	0.85	1.88
P_2O_5	0.34	0.14	0.18	0.34	0.30	0.37	0.28	0.23	0.16
Mg#	51.1	54.9	50.6	42.4	46.3	37.3	42.4	35.0	40.8
Modes (volume percent)									
Plagioclase	23.6	31.7	3.8	6.1	0.4	1.9	7.5	9.8	5.8
Clinopyroxene	2.8	3.7	0.4	1.0	0.1	0.5	0.8	0.3	0.6
Orthopyroxene	4.8	3.5	0.4	0.2	-	0.2	trace	0.8	0.4
Olivine	-	0.6	-	0.4	-	-	-	-	-
Fe-Ti Oxide	-	0.5	0.1	0.2	trace	trace	0.1	0.2	0.2
Hornblende	-	-	-	-	-	-	-	-	-
Quartz	-	-	-	-	-	-	-	-	-
K-feldspar	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Groundmass	68.8	51.2	95.3	94.1	99.5	97.4	91.6	88.9	93.0
No. points counted	809	775	809	780	800	809	809	789	810
Texture (rock/groundmass)	porphyritic/intersertal	porphyritic/hyalopilitic	sparsely phyric/pilotaxitic	porphyritic/pilotaxitic	sparsely phyric/pilotaxitic	sparsely phyric/intersertal	porphyritic/pilotaxitic	seriate/intersertal	porphyritic/snowflake
Trace element analyses (ppm)									
Ba	254	213	208	306	313	366	316	255	365
Rb	25	18	23	39	43	35	34	36	51
Sr	357	295	337	320	226	362	233	295	198
Y	30	21	37	35	42	38	41	31	36
Zr	247	124	139	276	247	295	219	175	259
Nb	18.9	7.7	8.8	17.7	14.6	19.5	14.2	12.2	13.4
Ni	46	18	6	20	1	9	0	8	10
Cu	139	138	159	140	23	144	26	26	53
Zn	87	76	89	84	89	86	85	84	63
Cr	86	29	13	68	2	8	0	2	16

Table 1. Chemical analyses of volcanic and intrusive rocks, Arnboy 7.5' quadrangle—Continued

Map No.	46	47	48	49	50	51	52	53	54
Field sample No.	99YC-P31	99YC-P66A	99YC-P74	99YC-P95C	01YC-P349	99YC-P89B	99YC-P84	99YC-P59	00YC-P159
Latitude (N)	45°57.66'	45°53.52'	45°57.78'	45°57.84'	45°53.22'	45°57.78'	45°56.76'	45°57.18'	45°57.84'
Longitude (W)	122°28.92'	122°25.14'	122°26.94'	122°27.36'	122°25.20'	122°26.10'	122°26.82'	122°26.34'	122°23.40'
Map unit	Ta	Ta	Ta	Ta	Ta	Ta	Ta	Ta	Ta
Rock type	Andesite	Andesite	Andesite	Andesite	Andesite	Andesite	Andesite	Andesite	Andesite
Analyses as reported (wt percent)									
SiO_2	57.08	57.14	57.09	57.48	57.25	57.58	57.67	57.26	57.97
TiO_2	1.23	0.96	1.14	1.22	1.34	1.20	1.60	1.59	1.32
Al_2O_3	16.72	18.47	16.80	16.66	16.95	16.24	16.93	16.54	15.88
FeO*	7.64	7.01	7.53	7.68	8.29	7.50	8.30	8.45	7.88
MnO	0.16	0.18	0.14	0.17	0.18	0.15	0.17	0.16	0.15
MgO	4.06	3.18	4.26	3.84	3.21	4.77	2.71	2.89	3.95
CaO	7.36	8.13	7.48	7.85	7.09	7.07	6.87	6.78	7.10
Na_2O	3.55	3.56	3.60	3.74	3.97	3.65	4.18	4.08	3.49
K_2O	1.45	0.72	1.14	1.02	1.00	1.26	1.08	1.04	1.43
P_2O_5	0.23	0.13	0.19	0.22	0.22	0.23	0.32	0.32	0.34
Total	99.48	99.48	99.37	99.92	99.48	99.75	99.83	99.11	99.47
Analyses recalculated volatile-free and normalized to 100% with all Fe as FeO (wt percent)									
SiO_2	57.38	57.44	57.45	57.52	57.55	57.72	57.77	57.77	58.28
TiO_2	1.24	0.97	1.15	1.22	1.35	1.20	1.60	1.60	1.33
Al_2O_3	16.81	18.57	16.91	16.67	17.02	16.38	16.96	16.69	15.97
FeO*	7.68	7.05	7.58	7.69	8.35	7.52	8.31	8.53	7.92
MnO	0.16	0.18	0.14	0.17	0.18	0.15	0.17	0.16	0.13
MgO	4.08	3.20	4.29	3.88	3.25	4.78	2.71	2.92	3.95
CaO	7.40	8.17	7.53	7.86	7.15	7.09	6.88	6.84	7.14
Na_2O	3.57	3.58	3.62	3.74	3.99	3.66	4.19	4.12	3.51
K_2O	1.46	0.72	1.15	1.02	1.01	1.26	1.08	1.05	1.44
P_2O_5	0.23	0.15	0.19	0.22	0.22	0.23	0.32	0.32	0.34
Mg#	42.2	52.7	48.8	54.5	51.4	44.8	57.1	40.7	51.1
Modes (volume percent)									
Plagioclase	22.3	24.7	23.1	2.7	19.1	5.0	8.7	9.5	29.2
Clinopyroxene	2.5	3.2	2.9	0.2	1.1	1.1	-	-	2.7
Orthopyroxene	3.9	4.0	3.1	0.5	2.5	1.1	-	-	5.9
Olivine	-	1.4	1.0	-	-	1.8	0.1	0.1	-
Fe-Ti Oxide	0.1	-	0.2	0.2	0.4	-	0.1	0.2	0.2
Hornblende	-	-	-	-	-	-	-	-	-
Quartz	-	-	-	-	-	-	-	-	-
K-feldspar	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Groundmass	70.2	66.7	69.7	96.4	76.9	91.0	91.1	90.2	62.0
No. points counted	790	810	796	810	796	800	784	770	783
Texture (rock/groundmass)	porphyritic/ hyalopilitic	porphyritic/ intergranular	porphyritic/ intergranular	seriate/ intersertal	seriate/ intersertal	seriate/ intergranular	seriate/ intersertal	seriate/ intergranular	porphyritic/ intergranular
Trace element analyses (ppm)									
Ba	341	174	211	196	201	211	214	194	258
Rb	30	15	22	19	26	26	21	18	27
Sr	327	299	331	341	287	305	318	314	317
Y	29	20	25	25	30	29	36	34	29
Zr	198	109	159	155	147	181	193	191	248
Nb	12.4	5.8	9.2	10.5	9.5	11.3	14.3	12.4	18.5
Ni	38	22	38	27	7	75	3	9	44
Cu	160	117	87	131	113	89	99	130	63
Zn	73	70	77	80	97	80	85	87	78
Cr	59	59	74	37	14	180	5	10	77

Table 1. Chemical analyses of volcanic and intrusive rocks, Ambuy 7.5' quadrangle—Continued

Map No.	64	65	66	67	68	69	70	71
Field sample No.	99YC-P65	01YC-P277A	01YC-P282	01YC-P278	00YC-P106	99YC-P64	00YC-P124B	01YC-P239
Latitude (N)	45°55.86'	45°58.80'	45°58.08'	45°58.68	45°56.64'	45°56.70'	45°58.26'	45°54.36'
Longitude (W)	122°23.36'	122°29.34'	122°25.50	122°27.36'	122°24.06'	122°25.68'	122°26.58'	122°25.68'
Map unit	Td	Tdib	Tdib	Tdib	Tci	Tdid	Tdib	Tdic
Rock type	Dacite	Hypersthene microdiorite	Pyroxene diorite	Microdiorite	Pyroxene dacite	Augite diorite	Pyroxene diorite	Hypersthene microdiorite
Analyses as reported (wt percent)								
SiO_2	69.59	53.21	54.20	54.61	54.95	56.42	57.53	58..9
TiO_2	0.61	1.59	1.19	1.15	1.48	1.23	1.30	0.39
Al_2O_3	15.06	16.96	17.50	17.28	16.35	17.76	15.26	20.09
FeO*	3.68	8.93	8.48	7.97	9.58	8.15	7.88	4.32
MnO	0.13	0.15	0.16	0.30	0.20	0.18	0.14	0.09
MgO	0.27	4.68	5.19	4.72	2.42	2.55	4.34	3.63
CaO	2.46	9.14	9.76	9.67	8.57	7.83	7.30	8.61
Na_2O	4.81	3.41	2.97	3.16	3.72	3.82	3.29	3.07
K_2O	2.29	1.03	0.28	0.71	0.59	0.59	1.46	0.90
P_2O_5	0.15	0.28	0.19	0.19	0.22	0.19	0.28	0.10
Total	99.03	99.18	99.92	99.86	98.08	98.72	98.78	99.30
Analyses recalculated volatile-free and normalized to 100% with all Fe as FeO (wt percent)								
SiO_2	70.28	53.65	54.24	54.69	56.02	57.15	58.24	58.55
TiO_2	0.61	1.60	1.19	1.15	1.51	1.25	1.32	0.39
Al_2O_3	15.21	17.10	17.51	17.40	16.67	18.01	15.45	20.21
FeO*	3.72	9.00	8.49	7.98	9.77	8.21	7.98	4.35
MnO	0.13	0.15	0.16	0.30	0.22	0.18	0.15	0.09
MgO	0.27	4.72	5.19	4.73	2.47	2.58	4.39	3.65
CaO	2.46	9.22	9.77	9.68	8.74	7.93	7.39	8.65
Na_2O	4.86	3.44	2.97	3.16	3.79	3.87	3.33	3.09
K_2O	2.31	1.04	0.28	0.71	0.60	0.60	1.48	0.91
P_2O_5	0.15	0.28	0.19	0.19	0.23	0.20	0.28	0.10
Mg#	13.3	51.3	56.2	55.4	30.6	39.7	53.6	63.8
Modes (volume percent)								
Plagioclase	4.3	41.9	58.7	19.5	65.1	62.2	51.5	27.1
Clinopyroxene	-	0.4	17.2	-	8.1	18.1	15.4	0.2
Orthopyroxene	0.9	5.0	5.5	-	3.6	-	3.0	2.2
Olivine	-	0.2	1.0	0.7	-	-	3.1	-
Fe-Ti Oxide	0.3	-	1.5	-	2.8	2.6	2.1	-
Hornblende	-	-	-	-	-	-	-	-
Quartz	-	-	-	-	3.2	2.2	0.4	-
K-feldspar	-	-	-	-	-	-	-	-
Other	-	-	[1]interstit cl: 16.2	-	[1]interstit cl: 17.2	[1]qtz-fsp: 14.9	[1]devit gl: 24.5	-
Groundmass	94.5	52.5	0.0	79.8	0.0	0.0	0.0	70.5
No. points counted	800	785	817	744	786	814	791	780
Texture (rock/groundmass)	porphyritic/ snowflake	seriate/ intergranular	seriate/ intergranular	seriate/ intergranular	aphanitic/ intergranular	hypidiomorphic granular	seriate/ intergranular	seriate/ intergranular
Trace element analyses (ppm)								
Ba	394	718	134	161	169	141	262	151
Rb	56	16	2	11	9	12	28	10
Sr	175	442	362	367	289	300	287	693
Y	44	28	22	20	30	25	29	7
Zr	406	169	133	119	120	112	218	78
Nb	23.7	12.2	9.6	7.9	8.4	7.4	13.4	2.2
Ni	10	56	34	32	6	6	33	24
Cu	38	166	85	100	133	101	124	93
Zn	85	89	76	72	97	88	76	42
Cr	1	67	88	89	6	8	137	16

[1]interstit cl, interstitial clay; qtz-fsp, quartz–feldspar intergrowths; devit gl, devitrified glass

14832

Table 2. Summary of $^{40}Ar/^{39}Ar$ incremental-heating age determinations, Amboy 7.5' quadrangle

Field sample no.	Location Latitude (N)	Longitude (W)	Map unit	Rock type	Material dated	Age (±1σ error)	Source
00YC-P52	45°37.84'	122°29.04'	Qst	Tephra bed beneath till (Qst)	Plagioclase	250±35 ka	R.J. Fleck, written commun., 2003
01YC-P217A	45°53.49'	122°28.74'	Tt	Dacitic welded tuff	Plagioclase	33.0±0.1 Ma	R.J. Fleck, written commun., 2004
00YC-P206	45°54.84'	122°24.18'	Tt	Dacitic welded tuff	Plagioclase	33.4±0.4 Ma	R.J. Fleck, written commun., 2001

25

34 of 152

14832

Funded and Completed Projects

FISH FIRST

RESTORING FISH RUNS

Since 1995

501 (C) 3 Public, Charitable, Nonprofit Organization

35 of 152

Table of Contents

Fish First focuses on Fish Habitat Restoration, Fish Rescue, Nutrient Enhancement, and Remote Site Incubation, as well as sharing their successes with others.

Designed with assistance from
Daina Tekorius-McLean

14832

Fish First Restoring Fish Runs Since 1995

Summary of Projects Completed or In Progress (Funding Complete)

Lewis River Habitat Restoration Project Name	Habitat Restoration (in feet)	Project Cost	Project ETA
Lower East Fork			
Green Fels Creek	300	$20,379	2007
US Forest Service – Project 1, above Sunset Campground		$40,000	2008
Lower East Fork Swanson Side Channel	760	$85,406	2006
Lower East Fork: Swanson Chum Channel	400	$40,000	2002
Lockwood Creek Check Dam Modification for Fish Passage Improvement	20	$0	2002
Lockwood Creek Culvert Removal		$29,268	1998
Manly Road Creek – Ibrahim Phase I	564	$77,570	2007
Manly Road Creek Pond Bypass Project		$3,900	2002
Mason Creek: Lower Mason Creek Rearing Pool	120	$26,005	2006
North Fork			
Willie Culvert Replacement		$66,880	2007-08
Cedar Creek - Bob Edwards Project below Amboy, WA	1,400	$90,882	2007-08
Cedar Creek - Bill Doty Project	4,240	$300,839	2003
Cedar Creek: Charlie Swift Stream Restoration & Side Channels		$128,907	2002
Cedar Creek: Shimano-Carter Phase II Restoration		$82,798	2000
Cedar Creek: Malinowski Stream Restoration and Rearing Pond Phase I		$69,230	1999
Cedar Creek Battleground Railroad Culvert Removal		$217,310	1998
Cedar Creek: Pigeon Springs Bank Stabilization		$52,071	1997
Jackson Creek Culvert Replacement		$109,403	2002
Cedar Creek Tributary - Bill Harteloo Side Channel Project	237	$18,000	2004
North Fork of Chelatchie Creek - Belkoff Property	1,000	$4,126	1998
South Fork Chelatchie Creek - DuPuis Property Habitat Complexity & Stream Stucture Restoration		$34,672	2001
South Fork Chelatchie Creek - Vrieswyk Dairy		$89,092	1999
South Fork Chelatchie Creek - Price Dairy		$104,265	1998
	9,041	$1,691,003	Prior to 2008

Fish First Ongoing Programs		Cost	Season or ETA
Nutrient Enhancement Program			1999
Mill Creek North Fish Rescue Pond Project Phase II		$6,362	2007
Mill Creek North Fish Rescue Pond Project Phase I		$5,560	2006
Lake Merwin Net Pen		$26,820	1999
Remote Site Incubator Project Initiation		$502	1996
Lewis River, Echo Park Cove, Net Pen Construction		$54,019	1996
		$93,263	Prior to 2008

Updated - October, 2007

4

37 of 152

14832

Fish First Restoring Fish Runs Since 1995

North Fork Lewis River and Tributaries Funded and Completed Projects

North Fork

Willie Culvert Replacement – 2007-08 In Progress

Build step-pools to mouth of culvert to allow Coho Salmon access to creek watershed and spawning grounds above.

Project	North Fork Lewis River – Willie Culvert		
Status	Funded	Date	ETA 2007
Cost			($)
			($)
		Total Cost	($66,880)
Grants and Donations	Fish America		$49,100
	Fish First		$17,780
		Total Donations	$66,880
		Funding Required	Funding Complete

Updated - October, 2007

5

36 of 152

14832

Fish First Restoring Fish Runs Since 1995

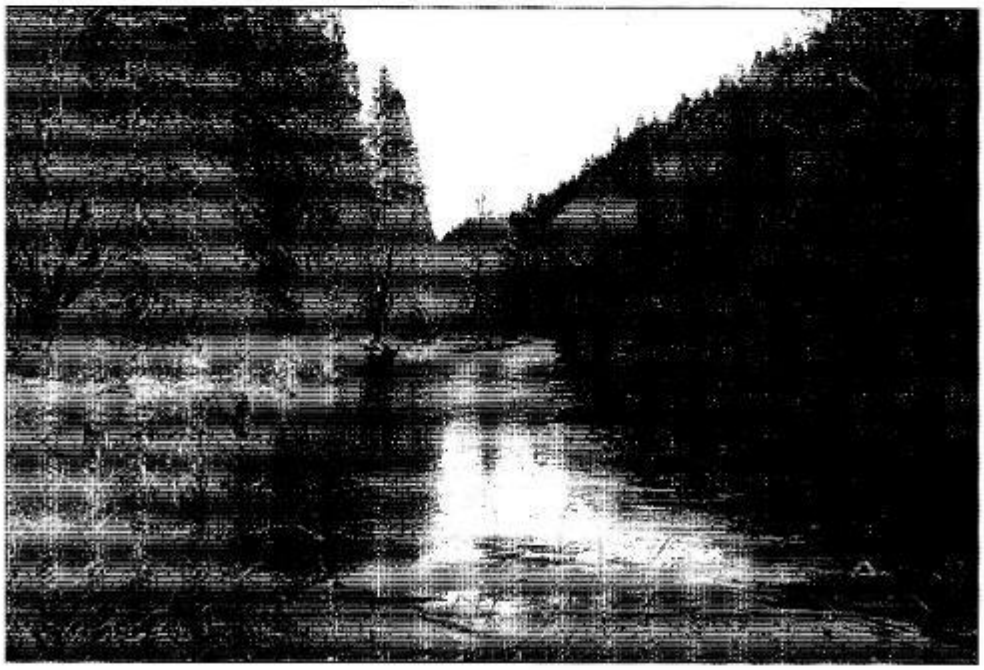
Cedar Creek Restoration

Fish First, with the assistance of its sponsors, government grants, donations, and volunteers, has restored eight miles of Cedar Creek. Visitors are able to see evidence of their work by viewing Periwinkles; evidence of freshwater clams, crawdads, and otters; as well as Salmon spawning on the gravel beds. These projects really impacted not only the fish habitat, but the environment surrounding the fish habitat as well. Please see the monitoring report for additional information.

Cedar Creek – Bob Edwards Project below Amboy, WA – 1,400 feet – 2007-08 In Progress

This project aims to restore the structure and complexity of 1,400 feet of stream channel that, because of anthropogenic activities (splash dams, excessive logging, and grazing), has essentially become one long shallow and unstable "run" with no riffles, pools, or protective cover for all the life stages of salmonid fish (Coho, Chinook, and Steelhead) that once made extensive use of this reach of Cedar Creek, on the North Fork of the Lewis River System. This is one of the few tributaries below the power dams that cut off fish migration on the North Fork. The project components involve adding root wads to provide in-stream LWD, gravel holding cross-vanes to return the pool-to-riffle ratio function and enable eroded banks to re-vegetate, trees and shrubs to provide shading and cover, and re-activation of a small side-channel to furnish rearing and flood protection to fry and juveniles. Results expected are new high quality spawning production and resting pools, cover and protection for adult and parr, rearing habitat for parr, bank re-vegetation, and reduced summer stream temperatures in this reach.

In permitting process for 2008.



 Updated - October, 2007 6

39 of 152

14832

Fish First Restoring Fish Runs Since 1995

Project	North Fork Lewis River: Cedar Creek – Bob Edwards Project, below Amboy, WA		
Status	Funded	Date	ETA 2007
Cost		Project Coordinator (Donated)	($4,000)
		Finance and Accounting (Donated)	($300)
		Volunteer Coordination (Donated)	($400)
		Design (Donated)	($2,000)
		Permitting (Donated)	($480)
		Onsite Installation and Supervision	($8,000)
		Heavy Equipment Rental, Operation, Trucking, and Hauling	($43,300)
		28 Root Wads	($8,400)
		RW Rock and Pins	($7,000)
		Cross-vane Rock	($1,100)
		Spawning Gravel	($400)
		150 Planting Materials (Donated)	($6,000)
		Pre- and Post-Monitoring	($3,000)
		NOAA Monitor Report (Donated)	($1,020)
		Washington State Sales Tax (Donated)	($5,482)
		Total Cost	($90,882)
Grants and Donations	Fish America Foundation and NOAA Restoration Center – Community-Based Habitat Restoration Projects		$71,200
	Fish First		$19,682
		Total Donations	**$90,882**
		Funding Required	**Funding Complete**

 Updated - October, 2007 7

40 of 152

14832

Fish First Restoring Fish Runs Since 1995

Cedar Creek - Bill Doty Project - 2003

This project restored degraded salmonid spawning habitat, improved stream complexity and cover, and restored rearing habitat on 4,240 feet of the Amboy to Pigeon Springs reach of Cedar Creek, a tributary of the North Fork of the Lewis River in Clark County. Two species listed as threatened (Chinook and Steelhead) and one candidate for listing as threatened (Coho) are present in this system. Sea-run Cutthroat Trout are also present. The WRA 27 Watershed Rpt., the EDT Studies of the WA F&W, and the Lower Columbia Steel head Conservation Initiat've both identify the Lewis River System as sanctuary habitat in need of restoration and protection.

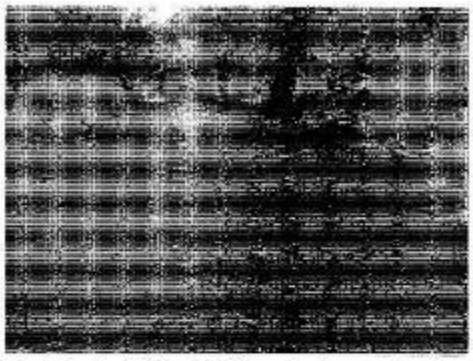


Photo 1: Cedar Creek Before, almost one mile of long, sterile, run.

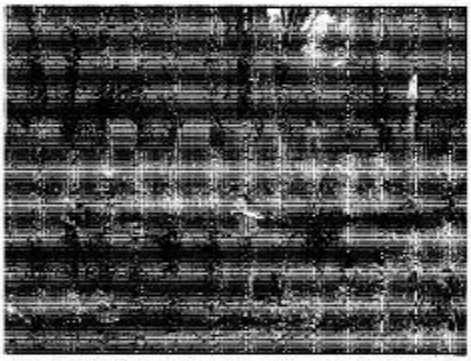


Photo 3: Cedar Creek After construction using root wads, cross veins, and re-created spawning beds and deep pools.

The property historically provided excellent spawning and rearing habitat that had become ser'ously degraded due to past removal of most large woody debris and various land-use activities. That removal has resulted in loss of stream structure and complexity as well as loss of access to high quality roaring habitat. Much of the riparian area was also pastured to the creek banks; this had seriously degraded stream cover. The project restored stream complexity and overall habitat productivity by the installation of rock vanes, associated pools and spawning gravel and placement of over 60 root wads in tho stream bank.

Over 700 feet of old stream channels (side-channels) were re-connected to the stream and developed as year round rearing habitat. Finally, 2,200 feet of riparian area have been restored by tree plantings. Annual salmon carcass placement will provide stream nutrient enhancement. **This was a highly integrated project using advanced technology. The project reach is intensively monitored since it was completed. Spawning & rearing show large increases.**

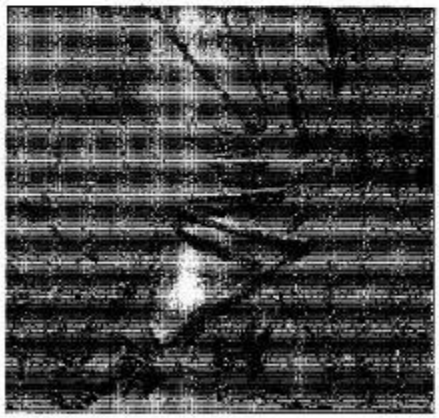


Photo 2: Cedar Creek After one of three re-activated side channels.

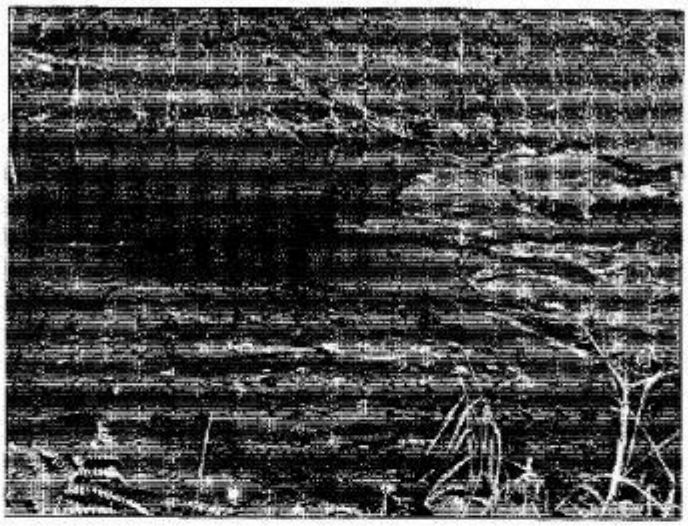
Updated - October, 2007

8

41 of 152

14832

Fish First Restoring Fish Runs Since 1995



Project	Cedar Creek - Bill Doty Project - 2003		
Status	Completed	Date	2003, Fall
Partners	Lower Columbia Fish Recovery Board Clark Conservation Board Washington Department of Fish and Wildlife		
Cost		Total Cost	($300,839)
Grants and Donations	Salmon Recovery Funding Board		$237,129
	Fish First Match		$63,710
		Total Donations	$300,839
		Funding Required	Project Completed

Updated - October, 2007

9

42 of 152

14832

Fish First Restoring Fish Runs Since 1995.

Cedar Creek: Charlie Swift Stream Restoration & Side Channels – 2002

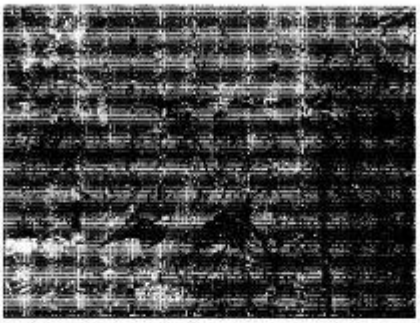


Photo 5: Cedar Creek After newly created deep pool with root wads for cover.

The project objectives are to improve fish production (salmon and steelhead) by rehabilitation of fish habitat, increase the quantity and quality of spawning gravel available, provide more vegetative cover to improve stream bank stability, provide effective large woody debris (LWD), re-open side channels to provide cover and rearing, add compression rocks for improving stream structure, and establish a setting that can provide educational opportunities that promote good land stewardship.

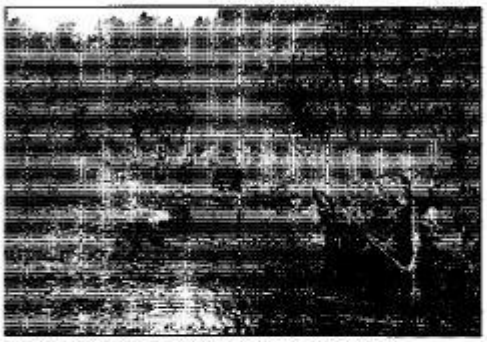


Photo 4: Cedar Creek After root wad series providing fish cover and bank revegetation.

The Cedar Creek watershed and stream channel has been adversely affected by a variety of natural and anthropogenic (people related) activities in the watershed above over the past forty years. This included Yacolt burn and other wildfire impacts, timber harvest splash dams, out-of-date harvesting and land development practices, extensive removal of LWD from the channel, and lack of good land stewardship practices in some areas.

A series of treatments that improve fish habitat and proper functioning of the channel and flood plain have been incorporated into the restoration and rehabilitation design. The treatments include bank vegetation planting (trees) side channel re-activation, root wads to provide LWD, compression rock clusters for riffle structure, and gravel holding and pool enhancement rock cross-vanes. Each individual treatment type is adapted to that specific point in the stream reach or cross section location within the channel, to maximize treatment effectiveness.

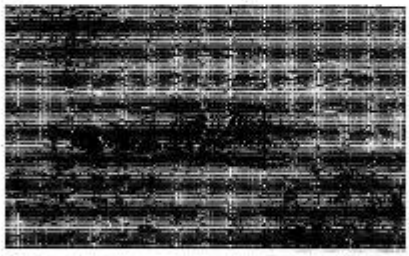


Photo 6: Cedar Creek after restoration, Steelhead pair spawning on new gravel above cross vane.

Project	Cedar Creek: Charlie Swift Stream Restoration & Side Channels		
Status	Completed	Date	2002, Fall
Partners	Washington Department of Fish and Wildlife	US Fish and Wildlife Service	
Cost		Total Cost	($128,907)
Grants and Donations	Salmon Recovery Funding Board		$100,857
	Fish First and In-Kind		$28,050
		Total Donations	$128,907
		Funding Required	Project Completed

Updated - October, 2007

10

43 of 152

Cedar Creek: Shimano-Carter Phase II Restoration - 2000

Stream Restoration and Side Channel Rearing Area, this project is a continuation of the Malinowski Project.

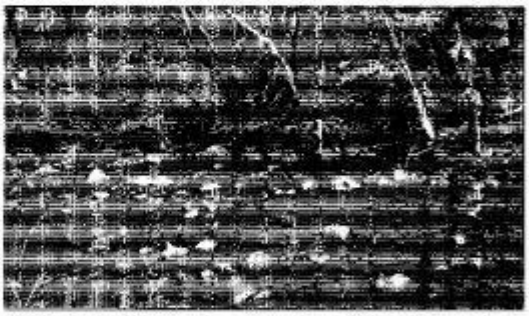


Photo 7: Cedar Creek Before - poor structure and complexity.

Another large section of the creek was improved with cross-vanes and spawning gravel. See the prior description for details.

In addition, a dried up side-channel was developed for rearing small fish and as shelter from high-flow events.

Photo 8: Cedar Creek After - cross vane with deep pool below and spawning gravel at head of vane along with LWD root wads.

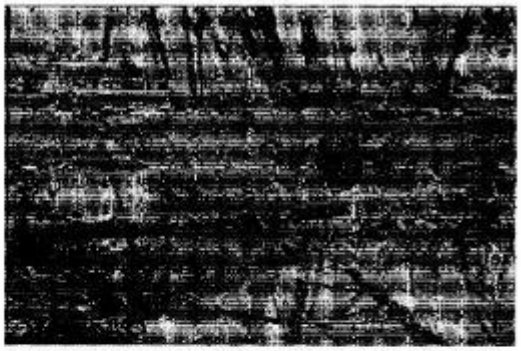


Photo 9: Cedar Creek After - new side channel rearing area with a juvenile fish viewing bridge.

14832

Fish First Restoring Fish Runs Since 1995

Project	Cedar Creek: Malinowski-Shimano-Carter Phase II Restoration - 2000		
Status	Completed	**Date**	2000, Fall
Partners	Washington Department of Fish and Wildlife US Fish and Wildlife Service		
Cost	Carcass Placement (nutrient enhancement)		($690)
	Side Channel Construction		($7,142)
	Project Management		($7,127)
	Permitting Overhead		($2,000)
	Project Monitoring		($10,000)
	Rock Vanes		($14,782)
	Spawning Gravel Placement		($17,409)
	Woody Debris Placement		($9,070)
	Engineering		($10,075)
	Washington State Sales Tax		($4,503)
	Total Cost		($82,798)
Grants and Donations	**SRFB** Funding		$66,421
	Cash Donations		$2,000
	Equipment Donations		$1,000
	Fish First and other Donors		$13,377
	Total Donations		**$82,798**
	Funding Required		**Project Completed)**

14832

Fish First Restoring Fish Runs Since 1995

Cedar Creek: Malinowski Stream Restoration and Rearing Pond Phase I - 1999

This project consists of a stream restoration and a rearing pond enhancement.

Historically, this section of Cedar Creek was highly productive for the spawning and rearing of salmonids. Before the project, there virtually no spawning gravel present and pools had been converted to long shallow runs. There was little structure and complexity in the stream and consequently limited effective habitat.

To restore salmonid habitat in the stream, spawning gravel, gravel-holding cross-vanes, compression rocks, large woody debris, and anchored root wads were placed in the stream. Cross-vanes, as shown above, help balance and restore the hydrology of the stream. They create pools for resting and turbulence for fish passage. They also serve to hold spawning gravel in place above them. In low flows, they provide a channel for fish passage.

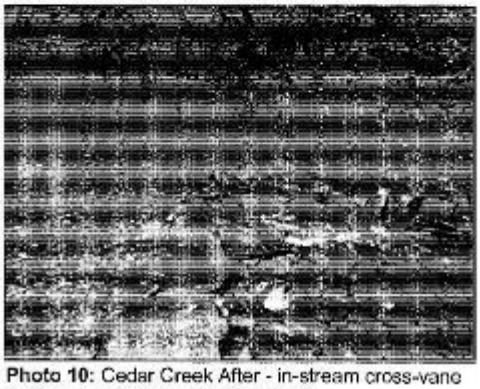


Photo 10: Cedar Creek After - in-stream cross-vane with spawning gravel added above.

Compression rocks are groupings of three or more rocks placed in a certain relationship to on another to produce a seam of fast and slow water for fish feeding and resting. These structures also provide protection from predators.

Large woody debris (LWD) in the form of root wads were also placed in-stream for cover. Root wads provide fish cover and habitat for insects. When anchored and placed properly, they also cause pool formation.

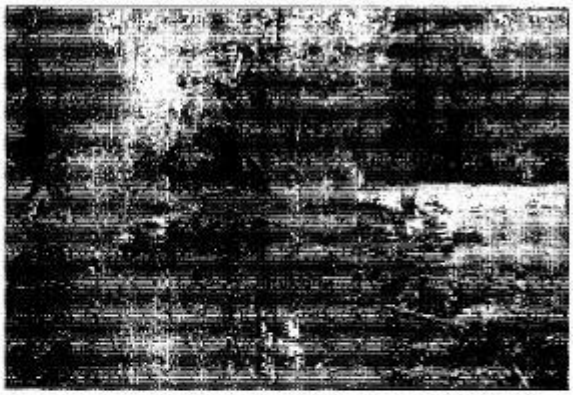


Photo 11: Cedar Creek After - spring fed rearing pond just off stream channel.

The second part of the project was a spring-fed, off-channel rearing system with a step pool that allows juvenile and adult fish passage to and from the pool. The pool is about 175' long with a maximum depth of 8'. Large woody debris was placed for fish cover. A spawning area 6' by 21' was placed in the shallow end of the pool. The step pool system provides a terraced fish waterway connecting the pool and the stream.

This project has been used in the education of community groups, elementary, middle school and high school students.

Updated - October, 2007

13

46 of 152

14832

Fish First Restoring Fish Runs Since 1995

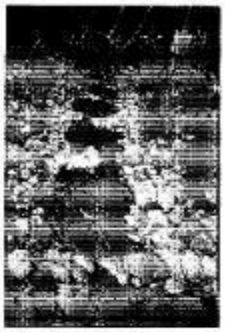


Photo 12: Cedar Creek After - step pools connecting rearing pond and stream.

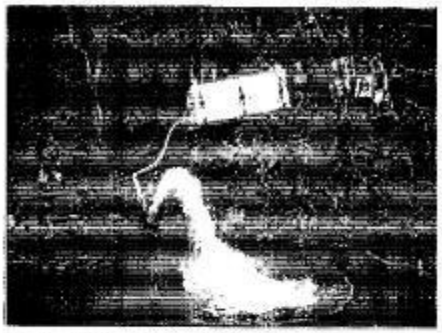


Photo 13: Cedar Creek After - Washington Fish and Wildlife stocking pond with juvenile salmon.

Photo 14: Cedar Creek - community involvement - local school students site visit.

Photo 15: Cedar Creek After – underwater fish feeder system and remote site incubator (egg box).

Project	Cedar Creek: Malinowski Stream Restoration and Rearing Pond Phase I - 1999		
Status	Completed	Date	1999, Fall
Partners	Washington Department of Fish and Wildlife US Fish and Wildlife Service		
Cost		Equipment & Labor	($30,810)
		Materials	($9,119)
		Contractor Overhead	($8,056)
		Engineering	($14,695)
		Signage	($1,000)
		Planting	($3,000)
		Washington State Sales Tax	($2,350)
		Total Cost	($69,230)
Grants and Donations	US Fish and Wildlife Service		$32,110
	Donor		$1,352
	Donor		$9,771
	Donor		$11,895
	Donor - property owners		$11,102
	Fish First		$3,000
		Total Donations	**$69,230**
		Funding Required	**Project Completed**

Updated - October, 2007

14

47 of 152

Cedar Creek Battleground Railroad Culvert Removal - 1998

Photo 16: Cedar Creek Before - undersized and impaired Battleground Railroad culvert.

The culvert under the Battleground Railroad has been a significant obstacle since the mid '50's to adult salmonids trying the access the 27 miles of Cedar Creek above it. Much of this basin is excellent spawning and rearing habitat.

Fish First is jointly funding the removal of the culvert with Clark County. As a separate project, a 25 ft. wide culvert was installed and the railroad tracks replaced. A year later, Clark County replaced the undersized culvert about 600 ft downstream on the Amboy-Yacolt Road.

Photo 18: Cedar Creek In Progress - streambed prior to domed culvert placement.

Photo 17: Cedar Creek After - new culvert in place with "fish friendly" bottom.

Project	Cedar Creek Battleground Railroad Culvert Removal - 1998		
Status	Completed	Date	1998, Fall
Partners	Clark County		
	Washington Department of Fish and Wildlife		
Cost		Culvert Removal	($95,475)
		Bank Restoration	($40,675)
		Culvert Footing Installation	($65,811)
		Washington State Sales Tax	($15,349)
		Total Cost	($217,310)
Grants and Donations	Washington Department of Fish and Wildlife - Project Design & Drawings		$23,248
	Washington Department of Ecology		$50,000
	Clark County		$144,062
	Fish First		
		Total Donations	**$217,311**
		Funding Required	**Project Completed**

 Updated - October, 2007 15

14832

Fish First Restoring Fish Runs Since 1995

Cedar Creek: Pigeon Springs Bank Stabilization – 1997

This project includes the stabilization of badly eroded stream banks and re-establishment of riparian vegetation. The purpose is to enhance fish spawning and rearing habitat by reducing siltation from erosion, shading portions of the stream, adding Large Woody Debris (LWD) and providing bankside cover.

The site is near the intersection of Cedar Creek and Pup Creek upstream from the bridge on Cedar Creek. There are three eroded sections of 100', 200', and 400'. Stabilization is accomplished with large rock toed into the creek bed. The banks are bound in layers of coconut cloth and staked to hold the banks in place until vegetation can establish a foothold.

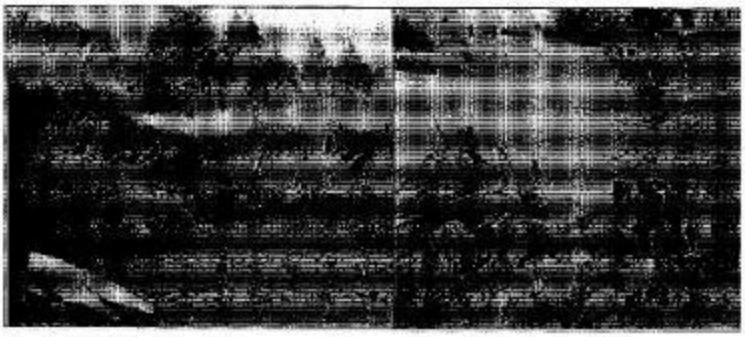


Photo 20: Cedar Creek Before - eroded banks.

Photo 19: Cedar Creek After - stable revegetated banks and root wads.

Project	Cedar Creek: Pigeon Springs Bank Stabilization		
Status	Completed	Date	1997, Fall
Partners	Clark County Conservation District	Washington Department of Fish and Wildlife	
	Habitat Partners	Natural Resources Conservation Services	
	Lower Columbia Fish Enhancement Group		
Cost		Rock 3' & up	($305)
		Pit Run 12", 6", 4" - 157 Ton	($1,571)
		Coconut Cloth	($3,020)
		Trucking for Rock	($2,255)
		2 Site Trucks for 3 Weeks	($13,200)
		416 Person Hours	($4,000)
		EL240 CAT Excavator	($10,800)
		CAT-TD8 International	($6,000)
		Equipment Move In & Out	($750)
		Large Trees and Tree Spade	($1,650)
		Barbed Wire Fencing	($5,000)
		Sign	($195)
		Washington State Sales Tax	($3,325)
		Total Cost	($52,071)
Grants and Donations	Donor		$3,020
	Donor		Hydro Seed
	National Fish Wildlife Foundation		$40,000
	Donor		Rock
	Donor		$401
	Fish First and other donors		$8,650
		Total Donations	**$52,071**
		Funding Required	**Project Completed**

 Updated - October, 2007 16

49 of 152

Jackson Creek Restoration

Creek is a tributary to Cedar Creek which is a tributary to the North Fork of the Lewis River, down to the Columbia and onto the Pacific Ocean.

Jackson Creek Culvert Replacement On Cedar Creek Tributary - 2002

The Jackson Creek Barrier Culvert Replacement was a Clark County project that was transferred to Fish First to complete in 2002. The barrier culvert correction was to replace an undersized culvert under the Cedar Creek Road and to remove a second undersized culvert just upstream under an old abandoned county road just outside of Amboy toward Woodland. The barriers consisted of two undersized culverts 4 feet in diameter. The culverts were inadequate to handle the stream with an average width of 12 to 14 feet and created a velocity barrier for juvenile salmon. The upstream abandoned road culvert outfall was elevated above the stream level, creating a barrier for adults as well.

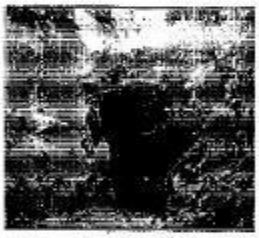


Photo 21: Jackson Creek before culvert replacement.

The project was started at 8:30 am on October 2nd. The culvert was in place and traffic moving by 1am the next morning. The total project time for stream work and construction was 5 days.

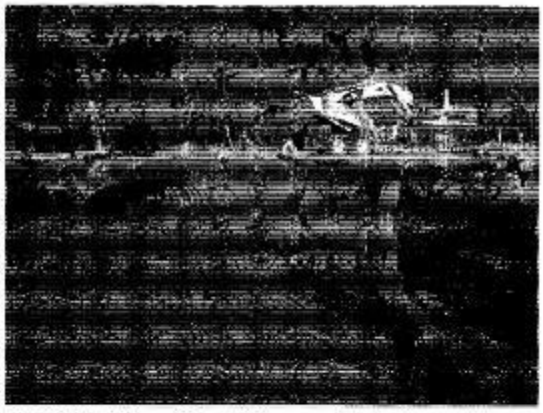


Photo 22: Jackson Creek After new culvert placement.

The County was amazed that a culvert could be installed so quickly and without cutting corners. They were there for almost the entire culvert installation time. Since then Clark County has been in communication with Fish First to cooperate on more fish barrier culvert corrections throughout the entire county. This could be a real benefit to opening fish passage to habitat that is currently blocked because of barrier culverts. It would be a cooperative effort between Fish First, the county, WDFW and the federal regulating agencies and a major step forward in fish recovery for the Lower Columbia Basin.

Project	**Jackson Creek Culvert Replacement On Cedar Creek Tributary**		
Status	Completed	**Date**	2002, October
Partners	Clark County	LWC Consulting (Lonnie Crumley)	
	Washington Department of Fish and Wildlife		
Cost		**Total Cost**	($109,403)
Grants and Donations	Salmon Recovery Funding Board		$82,570
	Clark County		$23,953
	Fish First and In-Kind donations		$2,880
		Total Donations	**$109,403**
		Funding Required	**Project Completed**

Cedar Creek Tributary

Cedar Creek Tributary - Bill Harteloo Side Channel Project - 2004

The site is owned by Fish First member, Bill Harteloo, and utilizes a large spring outflow path that runs into Cedar Creek. The quality of the flow and water is exceptionally good. This reach of Cedar Creek is badly in need of side-channels for rearing of salmonid parr and for their protection and survival during the winter flood flow season.

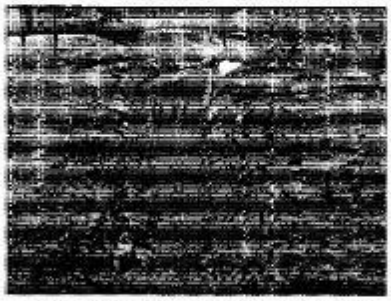


Photo 23: Cedar Creek Tributary After side channel, main pool, and step-pools leading to the spring above.

The side-channel pond (53 ft. long and about 6 ft. deep) was built to provide rearing and flood flow protection. The pool size is restricted by the presence of two culverts and was placed between them. This required the installation of a series of step-pools (34 ft) above the pool to allow movement of fish up the spring outflow path where there is potential for spawning. About 170 ft. of debris filled channel was cleaned out and spawning gravel added.

Near the upper end of the spring near the Amboy-Woodland road, there is a pool below the access road culvert. This pool was cleaned, deepened, enlarged, and rock lined to allow better fish passage through the culvert. Spawning gravel was also added to the flow path below. Native trees and shrubs were added to the step-pool and new pool perimeter on both sides and the entire area was treated with grass seed.

The step-pools were lined with a heavy duty rubber pond liner to prevent leakage and to maximize water flow during summer low flow. Small rock was used on the sides of the step-pools to stabilize the pond liner and facilitate re-vegetation. A light woven fiber cloth was draped over the pond sides to prevent erosion before grasses emerge.

This site offered an exceptional opportunity to combine high quality water supported side-channel benefits as well as providing some additional spawning space in a reach of Cedar Creek that does not have an adequate level of these critical supporting components.

Project	**Cedar Creek Tributary Bill Harteloo Side Channel Project**		
Status	Completed	**Date**	2004, October
Partners	Washington Department of Fish and Wildlife		
Cost		**Total Cost**	($18,000)
Grants and Donations	Fish First		$18,000
		Total Donations	**$18,000**
		Funding Required	**Project Completed**

14832

Fish First Restoring Fish Runs Since 1995

Chelatchie Creek - A Tributary Of Cedar Creek

North Fork of Chelatchie Creek - Belkoff Property - 1998

The purpose of this project is to reforest the riparian zone on a 1000' section of the North Fork of Chelatchie Creek owned by the Belkoff's. Approximately 2,000 alders, willows, cedars, and Red Osier Dogwoods were planted. Seedlings were protected from beaver and deer with wire or plastic netting.

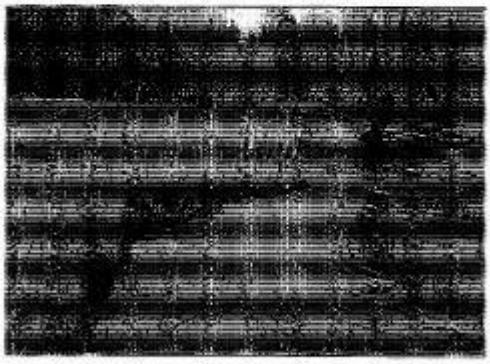


Photo 24: North Fork of Chelatchie Creek after plantings and fencing to protect stream.

Project	North Fork of Chelatchie Creek - Belkoff Property			
Status	Completed	**Date**	1998, February	
Cost		Excavation and Plants		($3,000)
		Plant Protectors		($1,000)
		Labor		($126)
		Total Cost		($4,126)
Grants and Donations	Clark County Conservation District			$1,126
	Fish First			$3,000
		Total Donations		**$4,126**
		Funding Required		**Project Completed**

 Updated - October, 2007 19

52 of 152

14832

Fish First Restoring Fish Runs Since 1995

South Fork Chelatchie Creek - DuPuis Property Habitat Complexity & Stream Stucture Restoration – 2001

The project objectives are to improve fish production (salmon and steelhead) by rehabilitation of fish habitat, restoring sediment filled pools, increase the quantity and quality of spawning gravel available, improve stream bank stability, provide large woody debris, add effective stream cover using root wads and re-vegetating banks and riparian area, while establishing a setting that can provide educational opportunities that promote good land stewardship.

The goal of the project is to clean up the stream, provide Coho spawning habitat, and rearing habitat for Coho and Steelhead.

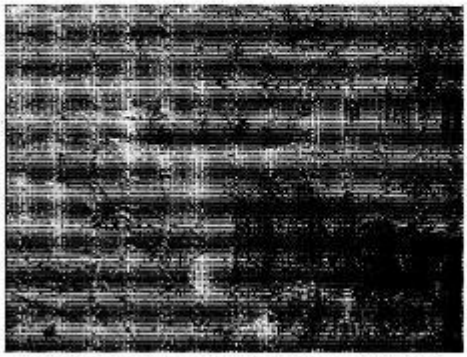


Photo 25: South Fork Chelatchie Creek After two deep new pools with root wads, vanes, and spawning beds.

Project	**Creek Name?? - DuPuis Property Habitat Complexity & Stream Stucture Restoration**		
Status	Completed	**Date**	2001, August
Cost		Project Design	($3,346)
		Equipment Rental	($17,120)
		Labor	($8,400)
		Materials	($3,566)
		Washington State Sales Tax	($2,240)
		Total Cost	($34,672)
Grants and Donations	Donor		$7,940
	Fish First and other donors		$26,732
		Total Donations	**$34,672**
		Funding Required	**Project Completed**

 Updated - October, 2007 20

53 of 152

South Fork Chelatchie Creek - Vrieswyk Dairy – 1999

The existing layout of this dairy farm allows cattle access to the creek. Consequently, waste from the herd enters the stream untreated and the riparian area is badly damaged. Fish First works with the dairy owners to modify the layout of the farm. Fencing will be constructed to keep the herd out of the creek, riparian zone, and adjacent wetlands. The riparian zone will be re-vegetated trees, shrubs, and grasses. A bridge will be put in place so the cattle can have access to pasture on both sides of the stream without walking through it. A watering tank and associated plumbing will be installed to provide livestock with drinking water as an alternative to using the stream

Photo 26: South Fork Chelatchie Creek After plantings and fencing to protect stream.

Photo 27: South Fork Chelatchie Creek After new bridge, expanded grazing area, and stream fencing.

The goal of the project is to clean up the stream, provide Coho spawning habitat, and rearing habitat for Coho and Steelhead.

Project	**South Fork Chelatchie Creek - Vrieswyk Dairy**		
Status	Completed	**Date**	1999, October
Partners	Washington Department of Fish and Wildlife USDA National Resource Conservation Service		
Cost		Bridge	($24,625)
		Land Clearing for Buffer Zone	($6,620)
		Watering Tank	($4,951)
		Riparian Re-Vegetation	($29,034)
		Fencing	($14,707)
		Washington State Sales Tax	($6,155)
		Total Cost	($86,092)
Grants and Donations	National Resource Conservation Service		Cultural Resource Inventory
	US Fish & Wildlife Service		$8,000
	Lower Columbia Fish Recovery Board		$55,936
	US Conservation Service		$22,156
	Fish First		
		Total Donations	**$86,092**
		Funding Required	**Project Completed**

 Updated - October, 2007

14832

Fish First Restoring Fish Runs Since 1995

South Fork Chelatchie Creek - Price Dairy - 1998

The existing layout of this dairy farm allows cattle access to the creek. Consequently, waste from the herd enters the stream untreated and the riparian area is badly damaged. Fish First will work with the dairy owners to modify the layout of the farm. Fencing will be constructed to keep the herd out of the riparian zone, which will be re-vegetated with Red Cedars, Willows, Red Osier Dogwoods and grasses. A 40 foot bridge will be put in place so the cattle can have access to pasture on both sides of the stream without walking through it. A settling pond for organic waste will also be constructed. Swamp areas will be deepened and channeled to provide smolt habitat and bio-filtration for runoff.

The goal of the project is to clean up the stream, provide Coho spawning habitat, and rearing habitat for Coho and Steelhead.

Photo 28: South Fork Chelatchie Creek during construction – cattle bridge, re-vegetation, and stream fencing.

Project	**South Fork Chelatchie Creek - Price Dairy - 1998**		
Status	Completed	**Date**	1998, September
Partners	Washington Department of Fish and Wildlife USDA National Resource Conservation Service	Clark County Conservation District	
Cost		Bridge	($6,994)
		Streambank Repair & Vegetation	($32,847)
		Bridge Installation	($11,888)
		Pasture Reclamation	($31,634)
		Fencing 4,000 feet	($12,629)
		Concrete for Bridge	($3,766)
		Miscellaneous costs	($4,507)
		Total Cost	($104,265)
Grants and Donations	Washington Department of Fish and Wildlife - **Project Design & Drawings**		$20,000
	National Resource Conservation Service		Cultural Resource Inventory
	US Fish & Wildlife Service		$20,000
	Lower Columbia Fish Enhancement Group		$24,000
	Donor		$10, 000
	Washington Department of Ecology		$6,432
	Clark County Conservation Service		$6,500
	Fish First		$27,333
		Total Donations	**$104,265**
		Funding Required	**Project Completed**

 Updated - October, 2007 22

55 of 152

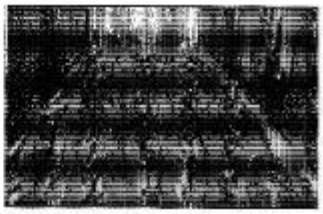
Ongoing Programs

Fish First works on three ongoing programs – nutrient enhancement, fish rescue, and remote site incubators.

North and East Fork of the Lewis River and its Tributaries

Nutrient Enhancement Program – Established 1999

North Fork & East Fork Lewis River Program
Al Fulcer, Program Director



This program imitates the nutrient distribution that used to take place naturally when wild salmonids were abundant. Fish carcasses from the Lewis River Hatchery and the Speelyai Hatchery (Washington Department of Fish and Wildlife) are distributed in the South and North Forks of Chelatchie Creeks, the East Fork of the Lewis River, Green River, Rock Creek and the Lewis River. Members of Fish First, local landowners, cub scouts, members of the Battleground High School Kaycee Center and members of the Clark-Skamania Flyfishers participate in the distribution. The program runs from October through March.

Photo 29: Frozen spawned hatchery salmon carcasses ready for in-river distribution.

Photo 32: Hand distribution of salmon carcasses to key Lewis River locations.

Photo 31: Spawned-out salmon carcasses being put back into stream system to increase nutrient levels.

Photo 30: Nutrient Enhancement - salmon carcasses are also distributed by truck and chute system.

Results

Year	Labor (hrs)	# Carcasses	Weight (lbs)
1999	123	4,959	37,000
2000	312	13,000	85,000
2001	200	11,000	72,000
2002	117	4,000	26,000
2003		5,000	45,000
2004	424	11,613	75,500
2005	488	14,299	93,024
2006	471	14,282	92,913

 Updated - October, 2007

14832

Proceedings

Volume 1

SEVENTH INTERNATIONAL CONFERENCE ON GROUND-PENETRATING RADAR

ay 27–30, 1998 • University of Kansas • Lawrence, Kansas, USA

205

57 of 152

idence for eight great earthquake-subsidence events detected th ground-penetrating radar, Willapa barrier, Washington

rd A. Meyers
d G. Smith } Department of Geography, University of Calgary, Calgary, Alberta T2N 1N4, Canada
y M. Jol Department of Geography, Simon Fraser University, Burnaby, British Columbia V5A 1S6, Canada
t D. Peterson Department of Geology, Portland State University, P.O. Box 751, Portland, Oregon 97207

RACT

k new approach to detect Holocene subduction-zone earthquakes combines the results ground-penetrating radar (GPR), Vibracores, and accelerator mass spectrometry dates from a barrier spit located west of Willapa Bay, southwest Washington. GPR show a 10-m-thick facies of beach sand within which we identify, and Vibracores , beach-parallel, wave-eroded, buried scarps mantled with multiple beds of magn. The eight GPR-detected buried scarps are interpreted to be eroded by minor transs caused by instantaneous barrier subsidence during earthquakes associated with Juan de Fuca plate subducting under the North American plate. Of these scarps, four been AMS dated at 300, 1110, 2540, and 4250 (radiocarbon) yr B.P. No datable rial has yet been found for the other four radar-detected scarps, but we interpolate and polate dates of 1800, 3400, 5000, and 5800 yr B.P.

ODUCTION

e need for new approaches to deter- age and frequency of past coastal subnce and associated great earthquakes , 8.0) is a major problem facing earth ists working along the subduction zone ritish Columbia, Washington, Oregon, California. If we know the age and freuency of subsidence events, the public can made aware that they have occurred in ast and will likely occur in the future. resent, three terrestrial means of identg and dating past earthquakes are ble: (1) paleosols and buried trees in wth position, (2) sand intrusions, and (3) ami-deposited sand. We present a new ach for identifying paleoseismic events h corroborates with and appears to exd beyond the published data.

he Willapa barrier is 38 km long by 2 to km wide and begins from a bedrock sland 6 km north of the Columbia River uth (Fig. 1B). The Columbia River disges on average 5.27 Mt of bed load anly and is the main source of sand for the lapa barrier (Ballard, 1964). The barrier consists of heavy minerals that include ites (magnetite and ilmenite), hyperne, hornblende, and augite; quartz is the inant light mineral (Li and Komar,). The barrier has at least a 60-m-thick h-water aquifer, a necessary component ground-penetrating radar (GPR) surin coastal settings, because saline and fresh ground water causes radar signal (Jol et al., 1996).

he Willapa barrier spit is located near re the Juan de Fuca plate slides, at an ge rate of 4 cm/yr, beneath the North erican plate (Fig. 1A; Atwater, 1987). e subduction is a necessary requirement for sudden episodic coseismic submergence followed by a gradual emergence (Plafker, 1972).

GROUND-PENETRATING RADAR AND VIBRACORING

Ground-penetrating radar (GPR) can image sedimentary structures, grain-size changes, density variations, and some mineralogy types. Therefore, radar reflections can be used to reconstruct ancient depositional and geomorphic processes. GPR transmits a high-frequency electromagnetic (EM) pulse of energy into the ground. The signal radiates downward, and at sediment interfaces some of the energy reflects back to the surface. At the surface, the reflected signal is detected by a receiver, amplified, and digitized, and stored as a function of time elapsed. Several publications summarize GPR principles and theory (Ulriksen, 1982; Davis and Annan, 1989).

We used a pulseEKKO IV radar system. Profiles were processed and plotted (wiggle trace format) using pulseEKKO IV software (version 4.0) with an automatic gain control or constant gain.

Using six nearly complete cross-barrier GPR surveys, we selected specific sites for trenching and Vibracoring. Vibracoring equipment and methodology were explained by Smith (1984).

BURIED EROSIONAL SCARPS AND HEAVY MINERAL BEDS

The cross-barrier GPR profiles show a 6–10-m-thick zone of shingled, westward-dipping (1°–2°), inclined reflections (Fig. 2; Meyers, 1994). The inclined reflections match the dip angle of the beach surface surveyed during the winter storm season; therefore, the reflections are interpreted as paleostorm beach surfaces. On the basis of previous experience, we believe that the GPR is imaging bedding planes of slight variations in grain size, compaction, or mineralogy caused by erosive storm activity.

Within the cross-barrier radar profiles, eight shore-parallel, unique reflection patterns were imaged. Because the unique patterns have concave geometries similar to erosive scarps on active beaches, we call them buried scarps. The buried scarps begin at or near the surface as concave, steeper dipping reflections (as much as 7°) that truncate the 1°–2° beach reflections. Scarp reflections commonly extend to a depth of 6 m, at which point they flatten to 1°–2° slopes, the same angle as the winter beach-face and typical beach-face radar reflections. Reflections commonly continue horizontally 75 m seaward, reaching a final depth of 9 to 10 m.

At sites that contain unique reflections, Vibracores and trenches encountered, at radar-predicted depths, highly concentrated beds of heavy minerals, dominantly magnetite (Fig. 3). Individual magnetite beds have erosional bases, commonly grade upward into typically quartz-rich sand, and vary in thickness from 0.2 to 40 cm. Buried scarp number 4 located on the west side of Loomis Lake has several heavy-mineral beds; one is 25 cm thick (Fig. 4) and consists of 90% heavy minerals and 10% light minerals, in contrast to the present beach sand, which consists of 93% light minerals and 7% heavy minerals (Li and Komar, 1992). When Vibracores were taken where scarp reflections were absent, no magnetite beds were encountered.

INTERPRETATION AND DISCUSSION

Formation of buried scarps and associated heavy mineral beds is most likely a result of erosional events. The most probable geomorphic processes include tsunamis, exceptionally large storm waves, or storm waves impacting a subsided coast.

The possibility of tsunamis impacting the Willapa barrier is plausible, given the proximity of the Cascadia subduction zone, the narrow nature of the continental shelf, and sedimentologic evidence for sites in Willapa Bay (Atwater, 1987, 1992). However, tsunamis generally lack the duration or number of

ogy: February 1996; v. 24; no. 2; p. 99–102; 5 figures; 2 tables.

206

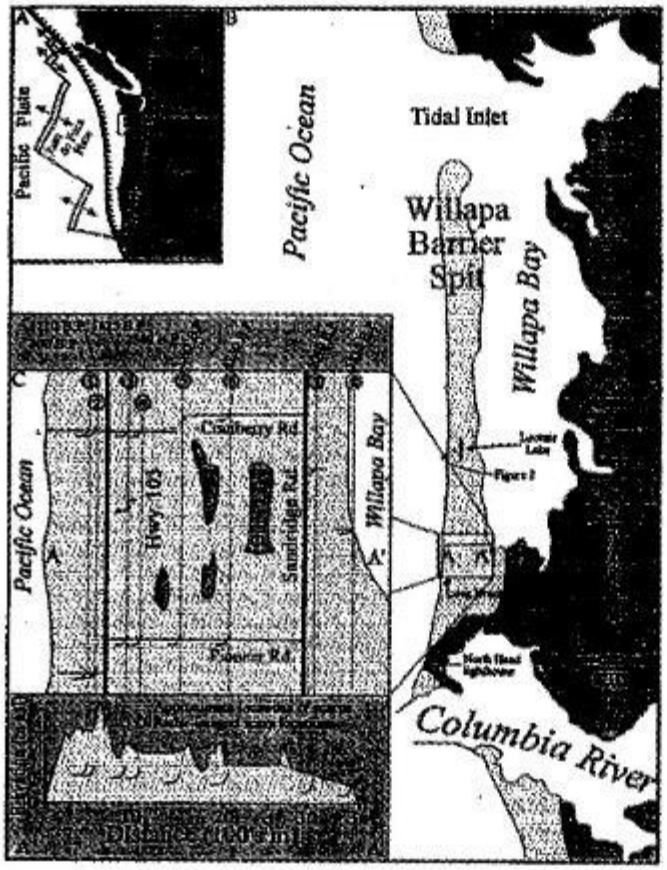


Figure 1. A: Location map of Willapa barrier in southwest Washington State. B: Regional setting. C: Enlarged area and schematic cross section of barrier, showing approximate locations of buried scarps (numbers 1–8).

waves to greatly modify the shoreline, and historic tsunamis appear to have caused minimal geomorphic change to other coasts of the world (Atwater, 1994, personal commun.). Therefore, it is unlikely that the scarps were eroded by tsunamis.

Storm waves have the potential to erode sandy coasts. Though storms occur on the Willapa barrier, we do not believe that such events are the primary cause of the scarps. This conclusion is based on the fact that no scarps younger than 300 yr appear in the beach sediment, though numerous large storms have impacted the beach in this time period.

We hypothesize earthquake-associated land subsidence coupled with normal wave action as the cause of the scarps (Fig. 5). Evidence of subsidence, in the form of buried marshes and drowned forests, has been reported by researchers in coastal British Columbia, Washington, Oregon, and California (Atwater, 1987, 1992; Atwater and Yamaguchi, 1991; Darienzo and Peterson, 1990, 1995). Subsidence occurs in association with great thrust earthquakes along the boundary between the Juan de Fuca and North American crustal plates (the Cascadia subduction zone).

Coastal subsidence was observed in association with the 1946 Nankaido earthquake, Japan (Fitch and Scholz, 1971), the 1960 Chile earthquake (Plafker and Savage, 1970), and the 1964 Alaska earthquake (Savage and Hastie, 1966; Plafker, 1972). Over time, the coasts gradually rebound due to recoupling of the plates. At the Willapa barrier, the scarps are buried and preserved because sediment from the Columbia River, via longshore drift, continues to prograde the beach. Therefore, we suggest that the eight buried, shore-parallel scarps resulted from minor transgressions due to coastal subsidence.

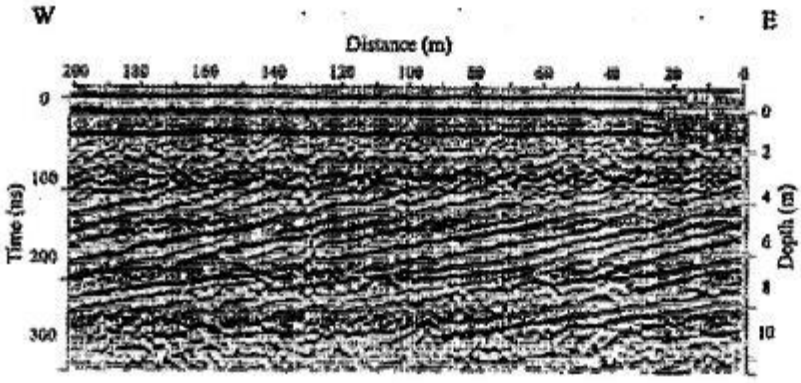


Figure 2. Typical ground-penetrating radar profile showing shinglelike, 1° to 2°, seaward-dipping reflections interpreted to represent paleo-beach surfaces buried as barrier prograded over past 5800 yr.

207

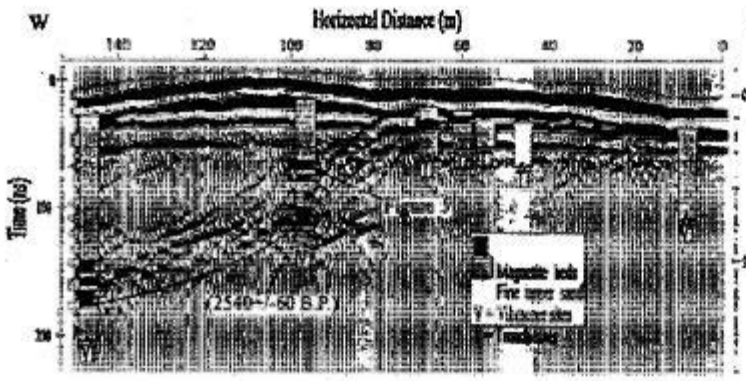


Figure 3. A 100 MHz ground-penetrating radar profile processed with constant gain of 10. Reflections indicate buried scarp mantled with magnetite beds. West shore of Loomis Lake is located at station 0. Lithostratigraphic logs from Vibracores and trenches confirm presence and shape of buried scarp and magnetite beds. Charcoal found within lowest magnetite bed was dated at 2540 yr B.P.

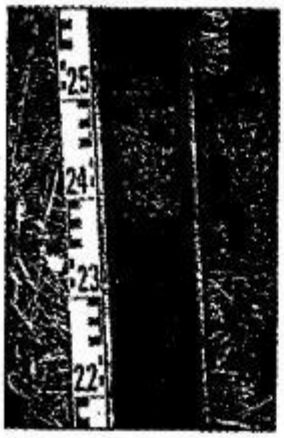


Figure 4. Vibracore from Figure 3 shows dark-colored, highly concentrated magnetite beds. These beds are up to 90% heavy minerals (dominantly magnetite), whereas unconcentrated beach sand is up to 7% heavy minerals.

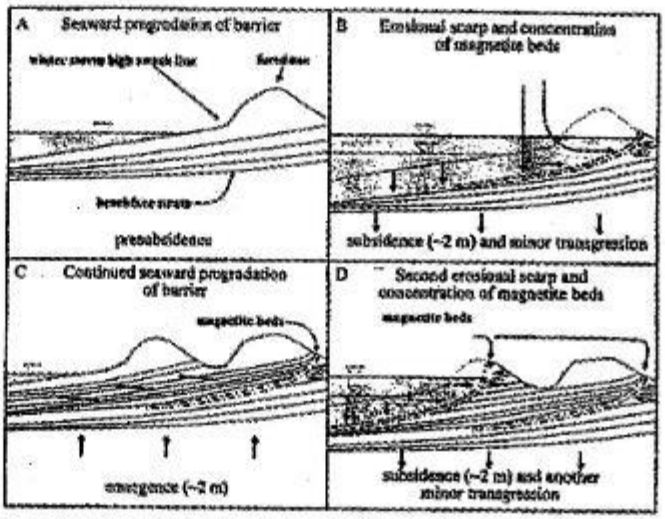


Figure 5. Schematic diagram shows sequence of repetitive land subsidence, caused by subduction earthquakes, and minor transgressive events during progradation of Willapa barrier. A: Presubsidence setting of Willapa barrier. B: Postsubsidence (2 m), showing minor transgression and wave-concentrated magnetite. C: Emergence and continued seaward progradation of barrier. D: Another subsidence event and minor transgression.

OUR DATES COMPARED WITH OTHER PUBLISHED DATES

Four wood fragment and charcoal samples found in Vibracores taken from scarps 1, 2, 4, and 6 (1 is the youngest; Fig. 1) were dated by accelerator mass spectrometry (AMS) at 300, 1110, 2540, and 4250 yr B.P., respectively (Table 1). Unfortunately, we were unable to locate datable material for the subsidence-transgressive events between 1110 and 2540 yr B.P. (scarp 3), 2540 and 4250 yr B.P. (scarp 5), and the two events older than 4250 yr B.P. (scarps 7 and 8). However, given their geographic position, we interpolate and extrapolate dates of 1.8, 3.4, 5.0, and 5.8 ka B.P. Scarps 3 and 5 are mean value interpolations from bracketing dates, whereas scarps 7 and 8 were dated by extrapolating from the previous six events.

A comparison of our dates with other published dates shows nearly perfect agreement for the 300 and 1110 yr B.P. events (Table 2). The dates on the next three older events, both AMS and interpolated, compare closely to the few published dates on older subsidence events from northern Oregon. Finally, we have found three additional older events. Time between our subsidence-transgressive events ranges from 715 to 855 yr, suggesting cycle behavior. However, recurrence intervals of 200–600 yr have been suggested for the north Oregon coast by Darienzo and Peterson (1995). A number of possible explanations for these different recurrence intervals are the fact that the GPR record of beach response to subsidence might fail to show minor subsidence events (<1 m) and would not show events where erosional scarps are themselves entirely eroded by successive retreat events. In addition, the differences that occur may be due to the uncertainties associated with radiocarbon dating. In spite of these uncertainties, our results provide a new approach for coseismic subsidence re-

208

TABLE 1. ACCELERATOR MASS SPECTROMETRY DATING OF CHARCOAL AND WOOD FROM MAGNETITE BEDS AT BURIED SCARPS

Scarp number and location of sample sites	Material dated	Lab no.	Age (Rayr B.P.)	Age (cal. yr. B.P.)	Age range in yrs B.P. 2 error multiplier (cal. age range at 2σ)	Years since last scarp
1. 240 m W of Hwy. 103, alley opposite Loomis Lake Rd	Wood frags.	Beta-79505	300 +/-70	310	20-360	N/A
2. 90 m W of Hwy. 103, alley opposite Loomis Lake Rd	Charcoal	Beta-79503	1130+/-60	990	870-1350	810
3. No datable material found			1825[†]	1730		715
4. Loomis Lake Road, 80 m W of Loomis Lake	Charcoal	Beta-79504	2540+/-60	2720	2360-2780	715
5. Crowley's fiats, S.W. of Cranberry Res. Ctr.*			3395[†]	3630		855
6. Junction of Sandridge and Joe John Rd.	Wood frags.	TO-4131	4250+/-70	4840	3970-4530	855
7. 100 m E of Ocean Spray processing plant*			5040[‡]	5750		790
8. 500 m E of Sandridge Rd. on 113 Place*			5830[‡]	6670		790

[†] Average duration between breaking dead subsidence events.
* Dates pending.
[‡] Extrapolated dates using average duration between previous six events.

TABLE 2. COMPARISON OF AMS DATES

Data source	Ages (yr B.P.) of subsidence events							
	1	2	3	4	5	6	7	8
This Paper	300	1110	1800*	2540	3400*	4250	5000*	5800*
Darienzo and Peterson (1990)	300-500	1000-1300	1400-1800	—	3000-3300	—	—	—
Atwater and Yamaguchi (1991)	300	—	1700	—	3000	—	—	—
Atwater (1992)	300	900-1300	1400-1900	—	—	—	—	—
Ollinway et al. (1992)	300	1270	—	2640	—	—	—	—
Darienzo and Peterson, (1995)	480, 680	800-1370	2000-2200	—	—	—	—	—

* Interpolated from our next younger and older AMS dates and the latter two are extrapolated at 790 year frequency.

search and have detected three coseismic subsidence events older than any previously reported.

CONCLUSIONS

GPR, combined with Vibracoring and AMS dating, can be used to detect and date subsidence-induced wave-eroded buried scarps that consist of beds of highly concentrated magnetite. This new approach provides an alternative method to determine age and frequency of coseismic subsidence associated with subduction earthquakes for the Willapa barrier during the late Holocene. Our results on the five youngest events agree with other published research from nearby. In addition, we have detected three unreported older subsidence events. Subsidence occurred at least eight times in the past 5800 yr (the ages of the last two scarp-forming events are speculative but older than 4250 yr B.P.).

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209

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May 20, 1997

Issue Paper:
Ground Water Recharge Area Protection (Water Quality)

1. Introduction And Background

1.1. Purpose And Scope

This issue paper examines various approaches for protecting aquifer recharge areas from a water quality perspective and recommends an approach for protecting Kitsap County ground water resources. WAC 365-190-080 states "Counties and cities shall classify recharge areas for aquifers according to the vulnerability of the aquifer. Vulnerability is the combined effect of hydrogeological susceptibility to contamination and the contamination loading potential." Other issue papers address factors that affect aquifer recharge from a quantity viewpoint. This paper proposes an approach to aquifer protection that is responsive to the unique circumstances of Kitsap County. The paper will also address well head protection and in particular the State's developing Wellhead Protection Program.

1.2. Background

Ground water aquifers hold nearly 50 times the volume of the Nation's surface waters, constitute approximately 96% of all the fresh water in the United States, and serve as the primary drinking water source for half of the population (nearly 117 million people). In Kitsap County, over 80% of potable water comes from ground water supplies. Every state has documented cases of ground water contamination. Once ground water is contaminated it is difficult, costly, and sometimes impossible to clean up. Preventing ground water contamination avoids the unnecessary costs of remediation and the potential damage to human health and the environment. Unfortunately, ground water contamination has occurred in Kitsap County.

The Kitsap County Historical Record of Ground Water Contamination contains many incidents of contamination. The number of designated and proposed National Priority List hazardous waste sites (NPL sites, frequently called superfund sites) is growing. There are currently seven NPL sites in Kitsap County. The Washington State Department of Ecology (Ecology) records document information on 98 leaking underground storage tanks. The Bremerton-Kitsap County Health District (BKCHD) has records on 46 investigations of significant pollution (Affected Media Contaminants Reports). The above information sources combined suggest the total number of contaminated sites is greater than 120, of which 36 have resulted in confirmed ground water contamination problems. The County's NPL sites, rapid development, and increased knowledge of potential sources of contamination, have caused Kitsap County citizens to be very concerned about protecting aquifer recharge areas. An on-going monitoring program carried out by Kitsap Public Utility District (KPUD), with input from the major water purveyors, has thus far not revealed contamination of the known principal aquifers of the County.

1.3. Approaches to Protecting Ground Water

Communities have used various approaches to protect ground water and associated recharge areas. One approach is to implement land-use controls in areas designated as aquifer recharge areas. Another tactic involves systematically ranking and controlling existing and potential threats to ground water. Other systems use computer generated, ground water models to evaluate the effects various land use management alternatives and other activities could have on ground water resources. Each approach has inherent benefits and disadvantages that limit whether they are appropriate for a particular area. The following is a review of some of the different approaches used to protect ground water. This paper draws extensively on "Ground Water Resource Protection, A Handbook for Local Planners and Decision Makers in Washington State," prepared by the King County Planning Division and Washington State Department of Ecology.

1.3.1. Aquifer Recharge Areas

An aquifer recharge area is defined as the surface area which receives rain and passes a portion downward where it replenishes ground water within an aquifer. The primary aquifer recharge area of a specific aquifer, in particular deep aquifers, may or may not correspond with the surficial area directly above the aquifer. Permeable soils, in particular, provide the potential for precipitation on an area to become ground water recharge. More generally, it is the surficial features, existing land use and ground cover, as well as soil permeability and overlying geologic material which are used to evaluate aquifer recharge areas.

Ground water flow systems in aquifers can be analogous to surface water drainage patterns and, like them, contain smaller local flow systems within larger regional flow systems. Localized flow systems are influenced by aquifer recharge areas. Local flow systems are generally shallower than regional systems. Pollutants introduced to regional flow regimes may travel greater distances, thus contaminating greater volumes of ground water. Regional flow systems can be quite extensive and can encompass many square miles.

Both local and regional flow systems may be present below a given site. Each can have its own recharge area or have combined recharge areas. The recharge areas of shallow aquifers may be relatively large in aerial extent and often have direct surface exposure, thus making them directly susceptible to surficial contaminants. Recharge to deep aquifers is from overlying shallow aquifers or through windows in overlying aquitards. Recharge to deep aquifers can be complicated when intervening aquifers and confining layers exist.

1.3.2. Environmentally Sensitive Areas

Community land use policies and practices include a broad definition of environmentally sensitive areas. The land use definition of ESA incorporates a significant measure of interest in socio-economic matters such as loss of property or

life as the result of utilizing unsafe construction sites (e.g., unstable slopes) in addition to concern for resources (e.g., water, wildlife).

When designating aquifers as being sensitive, it is essential to consider the recharge areas associated with them as being environmentally sensitive areas (ESA). One of the underlying problems of discussing environmentally sensitive areas is in their definition. Geographically identifying the boundaries of an ESA can be difficult even when the definition is clear.

The following comments from the *Bainbridge Island Subarea Plan* are informative:

"Environmental concerns and land use are closely related. When development occurs without careful examination of effects on its surroundings, several undesirable outcomes are possible. Hazards to that development or adjoining properties may be created or increased. Natural resources may be damaged. Governmental costs from environmental degradation may be incurred in the future which a developer may not consider during his / her one-time contact with a project."

"ESA designations are intended to flag concerns in the review process and to make applicants aware of potential hazards or natural resources which may be damaged by unsound development decisions. The designations are not intended, however, to eliminate all development. Compatible development will be allowed which either avoids designated ESA's or mitigates potential problems through engineering, siting, design or other techniques. Proposals are examined on a case-by-case basis to allow for creative solutions (although some mitigative techniques are suggested in the discussions below) and to assure that the special combinations of factors in a particular case are addressed."

1.3.3. Aquifer Recharge Areas as ESAs

Designating an area as an aquifer recharge area can be valuable in protection ground water supplies. In the context of aquifer recharge area protection, ESA's are those areas that have a potentially critical influence on maintaining the quality of water in the aquifer. Jaffe and Dinovo, in applying the ESA concept to ground water suggested that a sensitive area is an area in which ground water can be easily contaminated. They proposed two commonly used approaches to define sensitive areas within a hydrogeologic study area. One approach identifies **recharge areas** where flow has a strong downward component and may potentially carry contaminants into the aquifer. These areas are frequently characterized by very permeable soils or a shallow water table.

The other approach focuses on ground water use, particularly drilled wells. Wells draw water from the surrounding part of the aquifer, called the **area of influence**, whose boundary depends on the hydraulic conductivity, thickness, and lateral

extent of the aquifer and the pumping rate of the well. Areas of influence are sensitive because contaminants introduced into these areas could be drawn into the well.

1.3.4. Classification Of Aquifers

Classification of aquifers can be used to help specify protective measures for ground water and associated recharge areas. Aquifer classification usually includes mapping aquifer boundaries. Classifications are assigned to different aquifer areas, based upon a variety of criteria such as:

- Existing use
- Water quality
- Land use in the recharge area
- Aquifer characteristics, such as soils and geology
- The yield and accessibility of water, regardless of quality
- The ability of an aquifer to attenuate and assimilate wastes
- The existence of multi-aquifer flow systems
- Mineral deposits
- Geothermal sources
- Continuity with surface waters
- Socio-economic factors

Aquifer classifications are often used to set the degree of protection for the aquifer recharge area. Protection may be implemented by establishing ambient ground water quality standards for each aquifer, which are used as standards to control activities above the aquifer. Aquifer classifications may also be used as a basis for land-use controls to directly regulate potential contaminant sources in each area.

Classifying aquifers is a means for establishing which water resources most need to be protected. Ecology is developing an aquifer classification system as part of the State's ground water protection strategy which will classify aquifers based on their existing or potential beneficial uses. In Kitsap County, where ground water is the source for 80% of the potable water, all aquifers will most likely be classified to require a high level of protection.

Aquifer classification may be important in the future because it is a major component of EPA's Ground Water Strategy. Proposed federal classification would recognize three classes of aquifers distinguished by their relative values as sources of drinking water:

- Class I - "Special aquifers", those that are highly vulnerable to contamination and irreplaceable as a water supply.
- Class II - All other aquifers that are current and potential drinking water sources.

- Class III - Aquifers that are not considered to be potential drinking water sources because they are too brackish or have been contaminated.

These classifications are not used to establish the degree of protection for different aquifers, since the EPA guidelines protect all aquifers for their "best and highest use" under current regulations. The classification system is used to set priorities for remedial action where contamination has occurred, but it is not binding on the states.

1.3.5. Aquifer Susceptibility to Contamination

Aquifer classification should establish the susceptibility of an aquifer to contamination. Assessment of the suitability of sites for different land-use activities is based solely on the susceptibility of the aquifer to contamination, regardless of its present condition or use.

It is difficult to identify aquifer recharge areas in locations where the geology is complex. Conservatively enlarging estimated recharge area boundaries can provide a buffer. Expanding the area where site-specific studies are required is prudent. The hydrogeological characteristics of an area, the nature of threats to ground water, the pattern of water use (e.g., discrete public well sites or dispersed private wells), and the general vulnerability of the area under consideration dictate the extent of protective measures required.

1.3.6. Aquifer Recharge Area Protection Methods

Designating an area as an aquifer recharge area, designating aquifer recharge areas as environmentally sensitive, classifying aquifers based on their use or susceptibility to contamination, and restricting land use activities which involve materials that could contaminate an aquifer can be useful in protecting ground water resources. No single approach is best for all areas or for all ground water contamination threats. Communities should work with water resource professionals to determine:

- Which procedures best apply to their specific area;
- On what scale ground water protection must be undertaken (from specific well fields to jurisdiction-wide aquifer protection); and
- What approach is most practical, given the community's ground water protection planning goals and the quality of data available.

Evaluating the various possibilities can be complex. The selection of an appropriate approach to delineating aquifer recharge areas should include the following factors:

- The quantity and quality of available hydrogeological information
- The hydrogeological characteristics of the area , including surface soil types as well as Subsurface geology.
- The identification of specific ground water threats

- The pattern of ground water availability and use (including well concentrations, depths, and capacities, and aquifer locations).
- The community's overall ground water protection objectives

1.3.7. Adopted Approaches To Protecting Ground Water

Generally, communities have adopted one of three approaches to protecting ground water. These have included: (1) Focus on protecting entire aquifers; (2) Focus on protecting the portions of aquifers that supply public drinking water (e.g., a wellhead protection program); and (3) Address specific threats to aquifers. Attachment A provides a proposal for recharge area designation and protection in Kitsap County.

1. Aquifer recharge area protection methods that focus on protecting entire aquifers involve identifying all human activities that could contaminate the aquifer. Methods such as the DRASTIC System (Attachment B) focus on the hydrogeologic conditions between the surface and the water table.

Other methods involve deeper and more complex hydrogeologic investigations. In addition to evaluating hydrogeologic conditions above the water table, these methods examine the aquifer(s) that could be contaminated.

2. Partial aquifer protection (Well head protection methods) focus on protecting the immediate area around wells or springs usually by identifying an area associated with the well's **zone of contribution**. The zone of contribution encompasses the area of an aquifer from which the well draws water.

Regional flow within the aquifer is also taken into consideration in identifying well-head protection areas. This process involves outlining the areas where ground water is flowing towards the well and will be intercepted by its zone of contribution. By accounting for regional flow, the well-head protection areas can include land beyond the wells immediate area of influence. In areas with complex geology like Kitsap County, local flow regimens are more dominant, and more difficult to define.

3. Some sensitive area classification systems assess the impact a specific contamination source could have on ground water. Parameters associated with a potential contamination source, like a petroleum tank farm, are evaluated to project the potential threat to an aquifer or portion of an aquifer such as a well head protection area. They sometimes involve comparing the impact of locating a high risk activity at one site versus another. Such systems determine the level of hazard, evaluate hydrogeologic factors, assess the value of aquifers and wells threatened, and usually consider the relative level of health risk involved.

Two other classification systems, the LeGrand and the Hazard Ranking System(HRS), were developed to identify the potential impact of hazardous waste

generators on ground water. They can also be used to evaluate the impact of other high risk activities. For more information see Attachment B.

1.3.8. Threat Based Aquifer Protection

Kitsap County faces a number of threats to its ground water resources. The following is an attempt to identify those threats and to suggest measures to safeguard water resources. Threats to ground water fall into two categories, quantitative and qualitative.

The amount of ground water available for public use is not easy to determine. Part of the problem centers around the difficulty of estimating the capacity of Kitsap County aquifers and the effectiveness of their associated recharge systems. Quantitative threats include those factors that would reduce the ability of an aquifer to provide a reliable, long-term supply. These threats include: (1) over extraction of ground water (removing ground water at a rate greater than natural recharge can accommodate) and (2) those activities that impede recharge (e.g., grading, paving, building over, changing vegetative cover, or otherwise altering the recharge potential of the soil). Quantitative threats are covered in detail in other issue papers.

Factors which adversely affect the general quality of ground water are usually the result of some form of ground water contamination. Ground water contamination is most often caused by the release of a harmful substance (contaminant) into an aquifer. Contamination of an aquifer by salt water intrusion, for the purposes of the Ground Water Management Plan, is covered under quantitative threats as the intrusion is generally the result of over-withdrawal of water from an aquifer.

Types of contaminants that may be a factor in the qualitative threats to aquifer are of four general types and include microbial pathogens, organic compounds, inorganic minerals and metals, and radionuclides. For more information see Enclosure 5 to Attachment A.

1.3.9. Summary of Protection Approaches

Sensitive recharge area classification systems such as DRASTIC focus on protecting large aquifers and involve regional ground water assessments. They involve identifying which areas provide recharge to critical aquifers and which do not. As a result, they can be used as comprehensive land use planning tools. They can help evaluate the impact of development on ground water and assist in making comprehensive land use and zoning decisions which will protect ground water. Comprehensive impact evaluations can be required for potentially hazardous land use proposals inside sensitive areas such as critical recharge areas.

Sensitive recharge area classification systems that focus on protecting specific water supply sources involve a more limited geographic assessment. They can be useful, on a small scale, in making land use and zoning decisions. More often, however,

these systems are used to restrict development, regulate activities, or identify potential ground water hazards within well-head protection areas. They are not effective in protecting recharge areas associated with untapped aquifers.

Sensitive recharge area classification systems that identify potential contamination source impact on ground water, such as the LeGrand or Hazard Ranking System, also involve limited geographic assessments of ground water. These methods are most often used to select the best location for specific high-risk activities. They can also be used to develop special design and operating standards to mitigate the impact of such activities.

This paper has reviewed definitions, classification systems, and protection strategies for aquifer recharge area protection. In light of the geologic complexity of the county and the high percent of county land that appears to contribute to recharge, **all of Kitsap County should be considered recharge area.**

2. Current Laws, Practices And Procedures

2.1. State Regulations

Despite their diversity, State regulations associated with ground water protection generally fall into three broad categories: those that deal with **controlling sources of contamination,** such as septic systems and waste disposal sites; those that establish and implement **aquifer water quality standards**; and those which promote **land use regulations** in areas overlying critical aquifer recharge zones.

2.1.1. Controlling Sources of Contamination

A great many states are lead agencies under the Resource Conservation and Recovery Act (RCRA) to regulate waste disposal, under the Clean Water Act (CWA) to regulate surface discharges into waterways, and under the Surface Mining Control and Reclamation Act (SMCRA) to regulate coal strip mining activities. In addition, many states have established more restrictive controls on their own initiative. Given the documented gaps in federal programs, state initiatives are essential for insuring more comprehensive protection of ground water.

The characteristics of ground water pollution generally necessitate regulatory efforts that focus on preventing ground water contamination through restrictions on activities that involve use of potential contaminants. Regulations applicable to specific contaminant sources usually require dischargers to obtain a permit from the State's environmental agency. Virtually every state has regulatory program(s) to control certain contaminant sources.

No state government, however, has fully addressed the wide range of sources that can contaminate ground water. Of particular concern are numerous activities that are unrelated to waste disposal, such as leaks from gasoline or solvent storage tanks,

pesticide application, and acid mine drainage. The impact of some of these activities on ground water has not been systematically studied nor extensively regulated.

2.1.2. Aquifer Water Quality Standards

Washington state has primary authority under the Safe Drinking Water Act (SDWA) to regulate potable water quality and control recharge injection. The SDWA provides for ever increasing standards which periodically add new monitoring requirements. The Environmental Protection Agency (EPA) is required to expand the number of contaminants for which limits in drinking water have been set. When contamination limits are reached, the affected water supply must be treated before use. Because contamination can adversely affect health, and treatment can be very expensive, sources of contamination should be identified and eliminated if feasible. The State's drinking water standards are in Chapter 273-300, WAC. Ground water quality standards are in Chapter 173-200, WAC.

2.1.3. Land Use Regulation

Land use regulations which are based on aquifer recharge area identification require a major investment of resources and present many politically difficult decisions. Delineating aquifers and their recharge areas is often the most difficult and time consuming step. Such an approach may be the most sensible for highly developed states where population growth and industrialization are not likely to change drastically for many years.

Land-use options have traditionally been the prerogative of local and state governments. Many towns and counties have adopted ordinances to protect their ground water supplies. State and local authorities can significantly reduce the potential for ground water contamination by adopting wise and far-sighted land-use planning and zoning controls.

Zoning techniques for protecting ground water include regulating minimum lot sizes to prevent intensive residential or commercial development over recharge areas, limiting the location of facilities which involve hazardous materials or disposal of waste, and restricting the density of septic systems within a given area. Even conventional urban zoning, though not primarily designed to protect ground water, may have a beneficial effect by limiting the density of residential development in rural areas, taking development pressure off rural areas through urban concentration, and by channeling industrial activities into specified areas. From a quantity of recharge standpoint, however, it is easier to direct storm water that falls on impervious surfaces in suburban and rural areas to recharge than in Kitsap urban areas where storm drainage systems usually dump to sea.

2.2. Aquifer Recharge Area Regulation

A publication entitled **Minimum Guidelines to Classify Agricultural, Forest, and Mineral Lands and Critical Areas** prepared by the Washington State Department of Community

Development offers relevant guidance and suggestions pertaining to critical areas including aquifer recharge areas. Pertinent portions of this document are paraphrased below.

The quality of ground water in an aquifer is inextricably linked to its recharge area. Few studies have been done in Washington state on aquifers and their recharge areas. In cases where studies of aquifers and their recharge areas have been completed, affected counties and cities should use this information as the basis for classifying and designating these areas.

When no specific studies have been done, counties and cities should use existing soil and appropriate geologic information to characterize recharge areas. To determine the threat to ground water quality, existing and proposed land use activities should be evaluated for their potential to cause ground water contamination. Lack of sufficient ground water data should not serve as an excuse to postpone or ignore resource planning.

Counties and cities shall classify recharge areas for aquifers according to the susceptibility of the aquifer. High susceptibility is indicated by land uses in the aquifer recharge area which are likely to result in contaminants in the ground water. Low susceptibility is indicated by geological characteristics and land uses which are not likely to result in contaminants in the ground water.

To characterize the susceptibility of the recharge area to contamination, counties and cities should consider the following physical characteristics:

- Depth to and extent of ground water
- Aquifer properties such as hydraulic conductivity and gradients
- Soil (texture, permeability and contaminant attenuation properties)
- Characteristics of the vadose zone (unsaturated zone) including permeability and attenuation properties
- Operational well locations and pumping rates.
- Other relevant factors
- Presence and characteristics of confining units
- Recharge rates

The following should be considered to evaluate the potential contaminant loading:

- General land use
- Waste disposal sites
- Agricultural activities
- Well log and water quality test results
  Other information about potential sources of contamination

The management strategies for recharge areas of low susceptibility to contamination should strive to maintain the quality of the ground water. In recharge areas of high susceptibility

to contamination, studies should be initiated to determine if ground water contamination has occurred. Management strategies for these areas should include consideration of the degree to which the aquifer is used as a potable water source, protective measures to preclude degradation, treatment measures to maintain potability if contamination has occurred, and alternative potable water sources if the aquifer becomes unusable.
Critical Aquifer Recharge Areas may include:

- Sole source aquifer recharge areas designated pursuant to the Federal Safe Drinking Water Act where there is evidence the aquifer is vulnerable to contamination that would create a hazard to public health.
- Areas established for special protection pursuant to a Ground Water Management Program, **chapters 90.44 and 90.54 RCW, and chapter 173-100 WAC**.
- Areas designated for well head protection pursuant to the Federal Safe Drinking Water Act.
- Other areas meeting the definition of "areas with a critical recharging effect on aquifers used for potable water" in these guidelines.

2.3. Special Area Designations To Enhance Ground Water Protection

There are a number of special federal, state, and local area designations that may be used to enhance a Ground Water Management Program (GWMP). Incorporating them may offer such benefits as a source of funds to implement ground water protection measures, enhanced eligibility for grant funds, or expanded review of development proposals. Increased public recognition of the value of an aquifer may be another important result of special area designation.

The special area designations include:

- Areas with a critical recharging effect on aquifers used for potable water per **RCW 36.70A** Growth Management;
- Wellhead Protection Areas per the 1986 amendments to the Federal Safe Drinking Water Act;
- Environmentally Sensitive Areas per **WAC 197-11** State Environmental Policy Act Rules;
- Special Protection Areas per **WAC 173-200** Water Quality Standards for Ground Waters of the State of Washington;
- Sole Source Aquifers per the Federal Safe Drinking Water Act of 1974;
- Aquifer Protection Areas per **Chapter 36.36 RCW**;
- Critical area designation under **WAC 365-190-080**.

2.3.1. Areas with a critical recharging effect on aquifers used for potable water per RCW 36.70A Growth Management Act

The Growth Management Act (GMA) of 1990 requires all counties and cities in Washington to plan in order to manage growth. This act, much of which is codified

in **RCW 36.70A**, requires that the largest and fastest growing counties (and the cities within them) plan extensively in keeping with the following goals:

- Conservation of important timber, agricultural and mineral resource lands;
- Protection of critical areas;
- Planning coordination among neighboring jurisdictions;
- Consistency of capital and transportation plans with land use plans;
- Early and continuous public participation in the land use planning process.
- Counties and cities must adopt comprehensive plans and regulations to protect designated critical areas and timber, agricultural and mineral resource lands.

The GMA requires the designation and protection of the following critical areas: wetlands; areas with a critical recharging effect on aquifers used for potable water; fish and wildlife habitat conservation areas; frequently flooded areas; and geologically hazardous areas. The GMA also requires that the comprehensive plans contain land use controls to protect quality and quantity of ground water used for public water supplies (**RCW 36.70A.070(1)**.

The GMA requires that the comprehensive plans of adjacent jurisdictions or those who share related regional issues must be coordinated and consistent, a requirement of utmost importance for effective ground water protection. Meaningful protection of a dynamic resource that is shared by several jurisdictions is impossible without the cooperation of these jurisdictions.

Chapter **365-190 WAC**, Minimum Guidelines to Classify Agriculture, Forest, Mineral Lands, and Critical Areas (Guidelines) were adopted by the Washington Department of Community Development (DCD) pursuant to the GMA. The Guidelines, which are advisory in nature, provide a general framework for classification, designation, and regulation of critical areas.

The Guidelines define "areas with a critical recharging effect upon aquifers used for potable water" as "areas where an aquifer that is a source of drinking water is vulnerable to contamination that would affect the potability of the water." Although this definition is somewhat circular, it is clear that aquifers used for drinking water are deserving of particular attention. In addition, it is suggested that those aquifers that are vulnerable to significant contamination be targeted.

The Guidelines refer frequently to "aquifer recharge areas" without defining the term. The term is used very generally and appears to refer to the portion of the drainage basins from which an aquifer receives water due to infiltration of precipitation, run-off, and other surface water.

Mapping known critical areas is encouraged as the best way to communicate to developers and regulators the location of the protected lands. It is recognized,

however, that mapping wetlands and aquifer recharge areas can be difficult and imprecise. Section 040(2)(g) of the Guidelines recommends that changes in designated areas be allowed as new information is available and errors are found.

The Guidelines suggest that the following be included in local government designation of critical areas that are to receive protection under the GMA:

- Sole Source Aquifer recharge areas designated pursuant to the Federal Safe Drinking Water Act of 1974;
- Special Protection Areas designated pursuant to **Chapter 90.54 RCW**, Water Resources Act of 1971, and **Chapter 90.48 RCW**, Water Pollution Control;
- Wellhead Protection Areas designated pursuant to the 1986 amendments to the Federal Safe Drinking Water Act.

Kitsap County and cities have adopted "strategies for critical area designations and interim development regulations" which address areas with critical recharging affect on aquifers as outlined in the Washington State Department of Community Development minimum guidelines, **Chapter 36 5.190 WAC**. This document regulates development by land use through SEPA in areas located around principle aquifers. Comprehensive inter-jurisdictional coordination envisioned by the GMA should be provided by the "Kitsap County-Wide Planning Policy" developed through the Kitsap Regional Planning Council.

2.3.2. The Wellhead Protection Program under the federal Safe Drinking Water Act

The 1986 amendments to the Safe Drinking Water Act established a Wellhead Protection Program (WHPP) intended to safeguard ground waters that are tapped by public water supply wells. Each state is required to develop and implement a WHPP in accordance with criteria established by the Environmental Protection Agency (EPA).

A state WHPP must:

- Specify the roles and duties of state agencies, local government entities, and public water suppliers for wellhead protection;
- Provide the criteria for delineating the boundaries of Wellhead Protection Areas (WHPAs);
- Establish procedures for identifying sources of contamination within each WHPA;
- Develop management programs to protect ground water supplies within each WHPA from sources of contamination;
- Develop contingency plans and spill response for each public water supply system to respond to well contamination;
- Provide citing criteria for new public water system wells to maximize yield and minimize contamination: and

- Ensure public participation.

A WHPA is defined in the Safe Drinking Water Act as "the surface and subsurface area around a well or well field supplying a public water system through which contaminants are reasonably likely to move toward and reach such water well or well field" (42 U.S.C.A. 300h-7(e)). The first step in the implementation of a WHPP is to delineate the WHPA boundaries.

The Washington Department of Health (DOH) has been designated by the governor as the lead agency for developing and administering the WHPP in this state. Approximately 12,000 public water systems (PWS) in the state will eventually be included in the WHPP. The Drinking Water Regulations (**Chapter 246-290 WAC**) will be revised to contain the WHPP requirements.

Due to the nature of wellhead protection, much of the actual implementation efforts will be done by public water systems, local governments and by those agencies with source-specific jurisdictional responsibilities. For example, the Washington Department of Ecology (Ecology) regulates underground storage tanks while the Washington Department of Agriculture regulates pesticide use. Both agencies will be responsible for protection of the WHPA within their jurisdictional authority.

The following are highlights of the preliminary draft WHPP for Washington:

Delineation of WHPAs primarily based on the area immediately surrounding the well casing and areas describing the 1, 5, and 10 year time of ground water travel (TOT) to the well from the recharge area;

Inventory of potential sources of ground water contamination within the WHPA;

Development of management strategies to eliminate or minimize the possibility that these potential sources contaminate ground water.

PWS purveyors are responsible for delineating the WHPA and inventorying sources of contamination within the WHPA. State agencies are responsible for integrating wellhead protection measures into their existing programs. In many cases, this will primarily be done by requiring existing activities to emphasize protection within the WHPA. Local land use authorities (i.e., cities and counties) are responsible for zoning controls and pollution sources outside the authority of the federal or state government. Local governments, where necessary, may also be responsible for developing more stringent programs than federal and state governments currently provide.

It is clear that a WHPP will be of particular value to municipal water systems whose WHPAs are located completely or primarily within their boundaries. A number of

municipal cities including the City of Renton and the City of Tacoma have already successfully implemented a form of wellhead protection. The effectiveness of these programs was largely predicated on the ability of the municipal well owner to directly regulate land-use in all or a large portion of the zone of contribution. However, where PWSs do not control surrounding land-use, the success of the WHPP will depend on the willingness of city and county governments to impose necessary land-use or other restrictions.

Considering that there are over 1000 large and small public water systems within Kitsap County, individualized land-use controls for each public well or well field in the county would be unworkable. It may be possible to develop a generic, county-wide WHPP under which water purveyors could apply to the county for protection. This type of WHPP could be implemented under the auspices of the aquifer recharge area provisions of the Growth Management Act. The preference towards county-wide requirements is reinforced in situations where well or well field owners lack sufficient resources to develop an individual WHPP. The state Wellhead Protection Program recommends a county-wide approach to wellhead protection although it is not required at present. While a cooperative, multi-jurisdictional program would, by definition, involve compromise, individual PWSs could build upon the basic program at their discretion.

Development of minimum county-wide WHPP strategies involves an investment of time and money by the county, cities, and PWS purveyors. It will be technically demanding and politically challenging to develop a program that both provides necessary protection for WHPAs and complements the GWMP and other existing ground water protection efforts. The way would be made easier, however, by taking advantage of the recent experience gained in many cities and states around the nation. There are now many models for wellhead protection to be studied.

Local jurisdictions in Washington are beginning to develop programs to facilitate the development of individual WHPPs. There are also some efforts to develop coordinated approaches. For example, the adopted Northern Thurston County Ground Water Management Plan (GWMP) contains a provision for joint development of a county-wide WHPP by the County and cities.

2.3.3. Environmentally Sensitive Area Designation Under the State Environmental Policy Act.

The **State Environmental Policy Act (SEPA) (RCW 43.21C)** is intended to provide decision makers and the public with sufficient information to evaluate the environmental consequences of proposed land, air, or water-use activities when those activities involve an action by a governmental agency. Such an action could range from the issuance of a building permit to undertaking a major construction project such as a dam or a highway. The procedural provisions of SEPA attempt to outline a process for distinguishing between actions that are likely to have a

significant adverse environmental impact and those that are not. In cases where significant adverse impacts are anticipated, an environmental impact statement (EIS) must be prepared.

The State Legislature authorized the Department of Ecology to develop rules for the implementation of SEPA. The rules that were subsequently developed and adopted by the Department of Ecology, **WAC 19 7-11 SEPA Rules**, are intended to provide a uniform environmental review process in all political jurisdictions within the state. They are also intended to help define what constitutes a significant, adverse environmental impact and to outline the content of environmental documents prepared under SEPA.

In developing the SEPA rules, the Department of Ecology determined that some classes or types of activities, because of their size or nature, are not likely to represent a significant environmental impact and should, under ordinary circumstances, be exempt from SEPA requirements. **WAC 197-11- 800** (SEPA rules) contains a list of these exempted types of activities, termed categorical exemptions. The categorical exemptions include some activities that could potentially represent a significant adverse environmental impact in areas of unusual ground water sensitivity.

These activities include:

- The installation of underground chemical storage tanks with a capacity of less than 10,000 gallons;
- The construction of commercial buildings of less than 4,000 square feet and associated parking for up to 20 automobiles;
- The construction of parking lots for up to 20 vehicles;
- The construction of agricultural structures of under 10,000 square feet;
- The periodic use of Washington Department of Agriculture approved chemicals to maintain a utility or transportation right-of-way in its design condition;
- The appropriation of less than 2,250 gallons per minute (GPM) of ground water for any purpose.

Local governments have the authority to lower thresholds for requiring environmental review by designating certain portions of their land use jurisdiction as Environmentally Sensitive Areas (ESAs). These areas are generally more vulnerable to the adverse affects of land and water-use activities. The SEPA rules state that ESAs may include "but [are] not limited to areas with unstable soils, steep slopes, unusual or unique plants or animals, wetlands, or areas that lie within flood plains."

In designating a portion of its jurisdictional area to be an ESA, a county or city can eliminate many of the categorical exemptions found in **WAC 197-11-800**, including

all but one of the land and water uses listed above. Categorical exemptions regarding appropriations of ground water cannot be revoked.

An ESA designation may provide several important benefits for an area that is susceptible to ground water contamination. First, it would assist in raising the level of awareness of both the public and governmental agencies regarding the sensitivity of the aquifer system to contamination from overlying land-use activities. Secondly, designation would permit the Kitsap County Commissioners and city councils to eliminate many of the categorical exemptions from environmental review that are currently allowed under the SEPA rules. As a result, certain exempted land-use activities that pose a relatively high risk of contaminating ground water, such as installation of underground chemical storage tanks of under 10,000 gallons, could be required to undergo environmental review.

In determining the number of categorical exemptions to be eliminated, caution should be taken to revoke only those exemptions that bear a direct and significant relationship to ground water quality. A wholesale elimination of categorical exemptions might result in an unfavorable public reaction since many relatively innocuous activities such as adding a recreation room to an existing house or constructing a garage could require environmental review. Not only would such a broad-brush approach add an unnecessary burden on the public, but it would potentially create a glut of environmental checklists that would significantly add to the workload of agencies that must review or process environmental documents without actually affording cost effective ground water protection.

One significant shortcoming of the SEPA process is that while environmental review assists the public and decision makers in identifying the probable adverse environmental impacts of a proposed activity or action, it does not provide basis for mitigation of the adverse impacts. Mitigation measures cannot be imposed unless some legally adopted ordinance, regulation, or policy exists that supports the requirement for mitigation. Adoption of the GWMP will provide the County and cities in the GWMAs legal basis for requiring mitigation because it contains policy for lands within the GWMA. This policy would be in addition to any existing regulations or policies already adopted.

2.3.4. Special Protection Areas Established Under Washington Water Quality Standards for Ground Waters

WAC 173-200-090 outlines procedures for Ecology to designate Special Protection Areas within the State of Washington. The purpose of designating Special Protection Areas is to identify portions of the state with ground waters that require extraordinary consideration or increased protection because of one or more unique characteristics.

Such characteristics include, but are not limited to:

- Recharge areas and wellhead protection areas that are vulnerable to pollution because of hydrologic characteristics
- Ground waters that support a beneficial use or ecological system requiring more stringent ground water quality criteria than those based primarily on drinking water standards
- Sole Source Aquifers

Ecology will grant a Special Protection Area designation if an area contains one or more of the three aforementioned characteristics and such a designation is deemed by Ecology to be in the public interest.

Ecology can designate a Special Protection Area at its own discretion or at the request of a federal agency, another state agency, an Indian tribe, or local government. Requests for designation prepared by entities other than Ecology must provide sufficient information in support of the request to demonstrate that the designation would be appropriate under the conditions set forth in **Chapter 173-200 WAC**. At a minimum the following information is required:

- A rationale for the proposed designation,
- Supporting technical and hydrogeologic data,
- A description of proposed boundaries for the Special Protection Area,
- Documentation of coordination with affected state and local agencies, tribes, and water users.
- Compliance with general procedures for public hearings, public involvement, and notification of affected governments including tribes is required before Ecology renders a decision concerning a request for designation of a Special Protection Area.

Ecology will consider the unique characteristics of a Special Protection Area when developing regulations, guidelines, and policies; when regulating activities; and when prioritizing department resources for ground water quality protection programs. Within Special Protection Areas, Ecology can choose to establish more stringent ground water quality criteria and contaminant enforcement limits.

In addition, Ecology can impose special requirements for permits issued under authority of Ecology administered programs. Examples would be the State Waste Discharge Permit Program (**Chapter 173-216 WAC**) and permits for the withdrawal of ground water (water rights) issued pursuant to **Chapter 90.44 RCW** (Regulation of Public Ground Waters).

2.3.5. Sole Source Aquifer designation under the federal Safe Drinking Water Act

The Sole Source Aquifer Program was established under section 1424 (e) of the Safe Drinking Water Act of 1974 and is administered by the Environmental Protection

Agency (EPA). The primary intent of the program is to prevent projects that receive federal financial assistance from contaminating aquifers representing the sole or principal source of drinking water for an area. Projects that receive a portion, but not 100%, of their funding from the federal government are affected. An example would be a highway construction project funded jointly by the federal and state government. By contrast, a military installation is wholly financed by the federal government and thus is not restricted by the provisions of the Sole Source Aquifer Program.

In order to qualify for Sole Source designation, an aquifer must meet the following basic criteria:

- It must supply 50% or more of the drinking water consumed within the area for which the aquifer is supplying water,
- Alternative sources of drinking water must be of inadequate quantity or not be economically feasible to develop as a replacement for the aquifer.

The EPA is authorized to declare a ground water system to be a Sole Source Aquifer upon receipt of a satisfactory petition requesting such a designation. A petition can be submitted by any individual corporation, company, partnership, municipality, state, or federal agency. The petition must contain sufficient technical documentation to demonstrate that the aquifer meets the criteria for Sole Source designation (US Environmental Protection Agency, February 1987).

There have been no Sole Source Aquifer determinations made in Kitsap County to date.

2.3.6. Aquifer Protection Areas per Chapter 36.36 RCW

The Washington State Legislature passed legislation in 1986 which provided the authority for creation of local Aquifer Protection Areas (APAs). The purpose of an APA is to establish a funding base for ground water protection, preservation, and rehabilitation programs. APAs are established through an election ballot issue requiring approval from a simple majority of voters within the proposed APA. If voters approve the APA, the county can collect modest water user fees. Fees may only be collected from users of water withdrawn from an aquifer as opposed to a surface water source (**RCW 36.36**).

In 1987, voters in a portion of Spokane County established the first APA in Washington State. The water user fees established by the voters of Spokane County amount to $1.25 per month per residential equivalent. Septic tank user fees are also $1.25 per month per residential equivalent.

Until recently, the use of revenues generated from an APA has been limited to ground water protection planning, ground water treatment facilities, and waste

water treatment facilities. As originally adopted, the law did not authorize use of the APA revenues for a full spectrum of ground water protection activities. For example, regulatory programs aimed at controlling pollution from underground storage tanks, hazardous wastes, or on-site sewage disposal systems were not covered.

However, the 1991 Legislature rectified this shortcoming through passage of Substitute House Bill (SHB) 1019. SHB 1019 amends **Chapter 36.36 RCW** to allow APA revenues to be used to fund the following activities in addition to those described above:

- Monitoring of ground water quality and quantity;
- Ongoing implementation of comprehensive plans to protect, preserve, and rehabilitate ground water, including Ground Water Management Programs;
- Enforcing compliance with standards and rules relating to the quality and quantity of ground water;
- Public education related to protecting, preserving, and enhancing ground water.

Thus, with these amendments, APA funding can support virtually all activities associated with the implementation of a Ground Water Management Program.

Potential drawbacks to the use of an APA to fund the implementation of the GWMP include the following:

- Lack of flexibility in use of funds - must describe specific use in ballot measure - changes in specific uses require voter approval;
- Large start-up costs to educate the public regarding ground water protection;
- Difficulty in adjusting fee over time - must be approved by voters;
- Inequities in the fee assessment process include:
- It assumes that septic users are more significant contributor to potential ground water pollution than other sources such as underground chemical storage and hazardous waste;
- It assesses fees only to households; businesses are not assessed;
- The fee is not related to amount of water used.

2.3.7. Critical Area Designation

Chapter 365-190 WAC provides guidelines to the Department of Community Development which include criteria for classifying critical areas. **WAC 365-190-080** covers aquifer recharge areas. It states in part:

Counties and cities shall classify recharge areas for aquifers according to the vulnerability of the aquifer. Vulnerability is the combined effect of hydrogeological susceptibility to contamination and the contamination loading potential. High vulnerability is indicated by land uses that contribute contamination that may

degrade ground water, and hydrogeologic conditions that facilitate degradation. Low vulnerability is indicated by land uses that do not contribute contaminants that will degrade ground water, and by hydrogeologic conditions that do not facilitate degradation.

3. Gaps And Problems

Designation of Critical Recharge Areas in Kitsap County, as required by the Growth Management Act, has been accomplished on a limited basis. Interim regulations and procedures for Critical recharge areas need to be refined.

The existing State Environmental Protection Act (SEPA) evaluation process and the corresponding Kitsap County environmental evaluation process (e.g. Environmental Impact Statements (EIS)) generally do not take into account the accumulative impact of multiple developments or activities. Only the item under study is considered. SEPA is a primary tool for controlling environmental degradation which is key to protecting sensitive areas.

Data is not available on sum total of acreage contaminated in Kitsap County or the extent of contamination involved. Some of the sites are in the process of being cleaned up. Investigation needs to be conducted on the relationship between the 36 confirmed ground water problems, which appear to be related to shallow, unconfined, smaller aquifers and the potential threat to the larger aquifers.

4. RECOMMENDATIONS AND STRATEGIES

4.1. General Principles And Recommendations

A primary goal of the Ground Water Management Plan is to prevent contamination of ground water from point and non-point pollution sources to the maximum extent practical and, if necessary, to restore ground water to a potable state, regardless of its present condition, use, or characteristics. To meet that overall goal, a philosophy based upon several general principles is proposed:

- County and City government officials should recognize that ground water is a precious and vulnerable natural resource, the protection of which is essential to the health, welfare and prosperity of the citizens of this county
- Many human activities have resulted in ground water contamination
- Knowledge of the health effects of contaminants varies greatly, particularly for synthetic organic compounds
- Detectable quantities of a synthetic organic compounds in ground water is unnatural and undesirable
- The movement of contaminants in ground water is often difficult to ascertain and control
- Ground water decontamination and remediation is difficult and expensive

- Kitsap County agencies should prevent further contamination of the ground water from any source to the maximum extent practicable.
- Upon discovery of ground water contamination, appropriate actions by relevant agencies should be taken to prevent further contamination.
- All citizens of Kitsap County have the right to have their lawful use of ground water unimpaired by the activities of others which would render ground water unsafe or non-potable.
- All citizens of Kitsap County have the duty to conduct their activities in such a manner so as to prevent the release of contaminants into the ground water resources of the county.
- Documentation of any contaminants in the ground water which present a significant threat to human health, the environment, or the quality of life, should result in either passive or active cleanup. The best technology available or best management practices, taking cost to benefit considerations into account, should be utilized as appropriate, to meet established standards.

4.2. Specific Recommendations

RP 1. County government should adopt ground water quality standards proposed by the Washington State Department of Ecology (Chapter 173-200 WAC) in order to insure protection of the ground water resources. The existence or lack of such standards should not be construed as, nor utilized in diminishing the basic ground water protection goals stated above.

RP 2. Local jurisdictions should take appropriate actions to promote public awareness of ground water issues. To this end, the appropriate county agencies should communicate to the public the results of ground water investigations and monitoring efforts.

RP 3. Local jurisdictions should acknowledge that education of the public is necessary to preserve and restore ground water quality. Kitsap Public Utility District, water purveyors, and other appropriate agencies should actively undertake public education and information efforts. Educational efforts should encourage each citizen of the county to be responsible for their part of protecting ground water quality.

RP 4. County and City Governments are required to identify critical recharge areas as part of the Growth Management Act process. In developing land use regulations and zoning ordinances, county and city governments should recognize that most of the county is recharge area, but some recharge areas require more protection from potential contamination than others. The program for protecting Kitsap County's ground water resources should specify the criteria for designating various levels of recharge area, in addition to Critical Recharge Areas and should specify the requirements for protecting ground water recharge from a water quality standpoint, within those areas . Attachment A outlines a proposed program.

RP 5. WUCC and WATERPAK should coordinate implementation of the State's Wellhead Protection Program with local jurisdictions.

NOTE: Associated issue papers deal with the specific threats identified above in the Six Basic Threat Groups. The specific recommendations of those papers address actions to counter individual contamination sources and are not repeated in this issue paper.

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May 20, 1997

Ground Water Recharge Area Protection (Water Quality) Attachment A; Recharge Area Designation And Protection

County and City Governments are required to identify Critical Recharge Areas for **protecting water quality** as part of the Growth Management Act process. Most of the county is recharge area, but some recharge areas require more protection than others. Land use regulations and ordinances, should be based on that principle. The program for protecting the quality of Kitsap County's ground water resources should include criteria for designating and mapping critical and other types of recharge area. The map should serve only as a general guide. Criteria for site-specific evaluation must be developed. The program should specify the requirements for protecting ground water recharge quality from activities which involve hazardous materials or increase the vulnerability of aquifers.

Critical Recharge Areas - A recharge area that is associated with an aquifer which is a significant current or potential potable water source, is highly susceptible to the introduction of pollutants, or because of special circumstances, has been designated as a Critical Recharge Area in accordance with WAC 365-190-080 by the County or applicable city. Critical Recharge Areas could be established using general criteria or specifically designated based on a special study, evaluation, or determination. Protection afforded could be tailored to the specific conditions existing in recharge areas designated as Critical because of special circumstances. Land use activities which present a significant threat to ground water because they involve the use of hazardous materials or increase the vulnerability of ground water to contamination, should be prohibited in Critical Recharge Areas. Applications for land use that involve activities which pose a threat to ground water should include a hydrogeologic report which addresses critical recharge area criteria for the parcels involved. The critical recharge area designation should not be used to restrict residential or other users of small quantities of hazardous materials. Any conditional use or waiver should involve a detailed risk-benefit analysis that considers credible, worst case accidents.

The following factors should be used to establish general criteria for designating Critical Recharge Areas:

- Surface soils characteristics- the permeability of the soil and its ability to transmit or retard contaminants
- Wellhead protection zones around Group A Water System supply wells- one year time of contaminant travel
- Areas with high concentration of group B water system and private domestic wells

New factors may be considered, old factors may be deleted, and criteria may be revised as better information becomes available. Consequently, the Critical Recharge Area Map is expected to change.

Naturally Protected Recharge Areas - Areas with types of soils and subsurface geology that can act to protect underlying aquifers. Land use activities which involve hazardous materials could be located in such areas. A naturally protected area might have a thick mantle of glacial till of sufficiently low permeability (e.g., clays or hard pan) to preclude contaminants from reaching ground water below the area. A hydrogeological evaluation effort to identify such areas would be required. The county and cities should identify suitable sites, based on hydrogeological evaluations, where activities which involve hazardous materials can be located with a minimum of restrictions and requirements.

Areas within Group A water system wellhead protection zones (i.e., zone 1, one year travel time), should continue to be Critical Aquifer Recharge Areas even if they are located in a naturally protected recharge area.

Enclosures 1 through 3 provide the detailed criteria for each Critical Recharge Area factor.

Enclosure 4 provides the criteria for Naturally Protected Recharge Areas.

Enclosure 5 outlines the types of contaminants that are a threat to groundwater quality and the six categories of contamination sources from the State's Wellhead Protection Program. Enclosure 6 is a proposed Aquifer Recharge Area Protection Ordinance.

Enclosure 7 is a map of Kitsap County which shows initial Critical Aquifer Recharge areas based on the criteria in Enclosures 1 through 3, and the Hansville Aquifer Recharge area which was specially designated under SEPA.

Ground Water Recharge Area Protection (Water Quality)
Enclosure 1
Surface Soil Criteria for Critical Recharge Areas

Areas where surface soils have high permeability should be designated Aquifer Recharge Areas. The Soil Conservation Service (SCS) has prepared maps of the soil types in Kitsap County. These maps have been compiled to the Kitsap County Geographic Information System. They provide a general guide to an area's soil characteristics. Site reviews are required for accurate determinations of soils on a specific site. If the following SCS soil types make up more than 50% of the surface soil at a location, or the water table is reached in the sample holes, then it should be designated Critical Recharge Area:

Soil Names	SCS Map Unit Symbols *
Grove	11,12,13
Indianola	18,19,20,21
Neilton	34,35,36
Norma	37,38
Poulsbo/Ragnar	41,42,43,44,45,46,47

* Numbers listed are the soil map unit symbols which are used on the detailed soils map for Kitsap County.

A hydrologic report should be required for all land use applications involving activities which pose a threat to ground water. Analysis for specific parcel(s) should be employed to determine if the soils present require a critical recharge area designation. Data collection will include, as a minimum, six soil logs to a depth of 10 feet (or to a depth 4 feet below the lowest proposed excavation point, which ever is greater) for each acre in the parcel(s) being evaluated. The associated data will be analyzed and included in the hydrogeologic report to determine the presence of the above soils. At least one well of sufficient depth and adequate geologic record must be available within one mile of the site, to assess the presence or absence of aquitards and the characteristics of the areas hydrogeology.

Ground Water Recharge Area Protection (Water Quality)
Enclosure 2
Group A Water System Wells, and Zones of Contribution Criteria for Critical Recharge Areas

Group A water systems are the larger of the two classes of water systems and normally use high capacity wells. The State of Washington Wellhead Protection Program requires establishing wellhead protection areas and the calculation of 1-, 5-, and 10- year time-of-travel zones of contribution for each well. The Program allows time of travel zones to be calculated by analytical modeling, numeric modeling, or fixed radius methods. The fixed radius method(an interim method that is easy to use but the least analytical of methods) was used to estimate some Group A wellhead protection zones and this information is currently in the County's Geographic Information System (GIS). (Zones have not yet been officially established.) The area inside the one year time of travel zone for Group A Water System wells should be designated Critical Aquifer Recharge Area. For site specific evaluation, the other methods authorized by the States Wellhead protection program could be used. When the results of more sophisticated evaluations are available, both the shape and size of the wellhead protection areas could change. The more sophisticated calculations of wellhead protection zones will be entered into the County GIS and used for Critical Recharge Area designation, as they become available. **NOTE: Areas within Group A water system wellhead protection zones should be Critical Aquifer Recharge Areas, even if confining layer criteria is met.**

Ground Water Recharge Area Protection (Water Quality)
Enclosure 3
Group B Water System and Small Well Density Criteria for Critical Recharge Areas

Kitsap County is estimated to have approximately 20,000 wells. Owners of single-domestic or small-community-domestic supply wells should be afforded some protection against proposed land uses that pose a risk to ground water quality. While it is impractical to extend Group A well head protection criteria to every individual well, it is prudent to control potentially hazardous land use activities where small well concentrations are high. Locations where the number of wells within a half mile radius is 36 or more should be designated Level 1 Critical Aquifer Recharge Areas. To facilitate computer analysis, the evaluation could be accomplished on a quarter-quarter section basis using the quarter-quarter section in which a parcel of interest is located and all the surrounding quarter-quarter sections, in place of the half mile circle.

Ground Water Recharge Area Protection (Water Quality)
Enclosure 4
Naturally Protected Recharge Area Criteria

If a confining layer exists between surface soils and an underlying shallow aquifer such that it provides protection against water born contaminants, the recharge area could be designated as naturally protected except for Group A Well Head Protection Zones, critical recharge area procedures and restrictions need not be applied, unless, in the judgment of appropriate authorities, other factors make applying the requirements prudent.

Local jurisdictions should conduct hydrogeologic analysis to identify such areas. Designated should be based on sufficient well and core sample data to ensure a minimum one year time of travel before contaminants could penetrate the confining layer or travel horizontally to an area of concern. Identifying areas where potentially hazardous land use activities could best be located should be part of comprehensive plans.

Ground Water Recharge Area Protection (Water Quality)
Enclosure 5
Recharge Area Designation and Protection
Potential Contamination Sources

I Types of Contaminants

There are four general types of contaminants:

* microbial pathogens
* organic compounds
* inorganic compounds
* radionuclides

Microbial contaminants occur naturally in ground water, but usually in small quantities. Soil structure filters out some organisms while others are incapable of surviving once they reach the water table. Some microbial contaminants can cause serious, adverse health effects. Microbial contaminants are either bacteria, viruses, or protozoa. The most common sources of microbial contamination are septic systems, flooding, and farm livestock.

State water quality standards establish a maximum contaminant level for coliform bacteria, and all public water systems must test for their presence. The presence of coliform bacteria can serve as an indicator of the presence of microbial pathogen contamination.

Organic compounds, like lignins and tannins, can occur naturally in ground water while others are chemicals synthesized for industrial or home use. Some organic compounds present a human health hazard. The effects of consuming harmful organic chemicals can include disruption of normal neurological functions, genetic alterations, and even death. It is important to remember that nearly all foods are organic compounds. State water quality standards establish maximum contaminant levels for some organic chemicals.

Common organic compounds can be conveniently classified into five chemical groupings:

* aliphatic hydrocarbons - gasoline paint thinners
* aromatic hydrocarbons - solvents, gasoline, preservatives, lubricants, resins, plastics, and coal tar ingredients

* halogenated hydrocarbons - plastics, refrigerants, wood preservatives, solvents, paint strippers, de-greasers and dry cleaning agents
* pesticides and herbicides
* oxygenated hydrocarbons - dyes, solvents, pharmaceuticals, and fungicides

Inorganic mineral and metal contamination can come from several common sources such as septic systems, animal wastes, and other agricultural activities, sea water intrusion, and industrial wastes. The health effects of inorganic contaminants are varied and similar to those of organic compounds. State water quality standards establish maximum concentration levels of many inorganic minerals and metals, and nutrients such as nitrate. Primary standards relate to health issues, while secondary standards are regulated mainly for aesthetic reasons, such as color, hardness, taste, odor and turbidity. Nitrates, usually associated with fertilizer application, are significant contaminants in some areas.

Radionuclides are radioactive forms of elements like strontium, uranium, or cobalt. These occur naturally at low levels in ground water, but may be present at higher levels due to wastes from nuclear industry as a result of past practices. Health risks associated with these products include radiation sickness, cancer, and mutations. Both federal and state governments have established maximum levels for radionuclide contamination. Because of stringent federal and state controls, contamination of ground water by radionuclides is a relatively small threat within our county.

II. Sources of Contaminants

Many human activities can contaminate ground water. Consequently, there are many sources of contaminants. The State's Wellhead Protection program, which is based on the Environmental Protection Agency's program, groups sources of contaminants into Six categories:

* Group I: Sources designed to **discharge substances** - such as a septic system.
* Group II: Sources designed to **store**, treat, and/or dispose of substances; discharge through unplanned release - such as a land fill.
* Group III Sources designed to **retain substances during transport or transmission** - such as pipelines.
* Group IV: Sources discharging substances as a consequence of **other activities** - such as pesticide application.
* Group V: Sources providing **conduit** or inducing discharge through altered flow patterns - such as a well or a rock quarry.

* Group VI: **Naturally occurring** sources whose discharge is created and/or exacerbated by human activity - salt water intrusion.

Group I sources of contaminants include:
Subsurface percolation (e.g., Septic tanks and cesspools)
Injection wells
- Hazardous waste
- Non-hazardous waste (e.g., brine disposal and drainage)
- Non-waste (e.g., enhanced recovery, artificial recharge solution mining, and in- situ mining)

Land application
- Waste water (e.g., spray irrigation)
- Waste water byproducts (e.g., biosolids)
- Hazardous waste
- Non-hazardous waste

On-site waste disposal methods, primarily septic systems and cesspools, rank highest in the total volume of waste water disposed into the ground. This group is the most frequently cited source of ground water contamination. Contamination can result from both legal and unauthorized facilities.

Land application of waste water is one way of treating wastes. Some municipal waste-water facilities discharge treated waste water or biosolids (sludge) from treatment facilities on land operated as beneficial use (such as forestry).

Treatment of wastes by on-site disposal or land application methods does not always remove potential contaminants. Some contaminants may reach the water table and accumulate over time. Failing septic systems are a frequent source of this type of pollution. Sanitary sewers are often installed to replace failing systems. Leaks in septic systems can create localized areas of extreme contamination.

Disposal of waste-water into deep aquifers by injection wells, though common in some other states, is prohibited in Washington.

Group II sources of contaminants include:

Landfills
- Industrial hazardous waste
- Industrial non-hazardous waste
- Municipal sanitary

Open dumps, including illegal dumping (waste)
Residential (or local) disposal (waste)
Surface impoundments
- Hazardous waste

Non hazardous waste
Waste tailings
Waste piles
Hazardous waste
Non hazardous waste
Materials stockpiles (non-waste)
Graveyards
Animal burial
Aboveground storage tanks
Hazardous waste
Non-hazardous waste
Non-waste
Underground storage tanks
Hazardous waste
Non-hazardous waste
Non-waste
Containers
Hazardous waste
Non-hazardous waste
Non-waste
Open burning sites
Detonation sites
Radioactive disposal sites

Waste storage and the storage of materials containing contaminants represents a serious threat to ground water. Pollution occurs as a result of leaching or leakage of waste or hazardous materials from storage locations or containers. Extensive regulations have recently been established to prevent pollution by leaks from storage tanks. Even though regulations for landfills have been enacted also, old, abandoned dumps are a serious source of ground water contamination.

Group III sources of contaminants include:

Pipelines
Hazardous waste
Non-hazardous waste
Non-waste
Materials transport and transfer operations
Hazardous waste
Non-hazardous waste
Non-waste

The transport of hazardous materials represents a serious threat to ground water when accidental or illegal discharges occur. Numerous accidental spills have

occurred during the transport of potential contaminants by truck or rail causing severe localized pollution. Criminal or negligent dumping is also a problem. High capacity pipe lines are not currently a threat in Kitsap County.

Group IV sources of contaminants include:

Irrigation practices (e.g., return flow)
Pesticide applications
Fertilizer applications
Animal feeding operations
De-icing salts applications
Urban run-off
Percolation of atmospheric pollutants
Mining and mine drainage
    Surface mine-related
    Underground mine - related

Agricultural chemicals, applied usually in the form of pesticides or fertilizers, tend to migrate to the water table. Irrigation can accelerate contaminate migration as well as leach mineral salts and metals from surface soils.

Application of chemicals through an irrigation system by chemical injection can also contaminate the source well or the entire aquifer if the irrigation system lacks back-flow safety devices which prevent transfer of the chemicals back into the source water lines.

Animal feed lots can accumulate high concentrations of animal wastes that can lead to nitrate and / or bacterial contamination. Even small concentrations of livestock grazing near a pond or stream can be a significant source of ground water contamination.

Urban run-off has been widely recognized as a source of pollution. Run-off of rainwater accumulates contaminants from streets, roofs, construction sites, industrial and commercial areas and residential gardens. Toxic and hazardous substances accidentally spilled may also be picked up by the run-off. As a result, run-off can often contain organic and inorganic contaminants as well as microbial pathogens. If allowed to accumulate in retention or holding ponds, polluted run-off can contaminate ground water. It can also pollute the ground water when discharged into dry wells, a common practice in Washington.

Group V contamination sources include:

Production wells
    Oil (and gas) wells

Geothermal and heat recovery wells
Water supply wells
Other wells (non-waste)
Monitoring wells
Exploration wells
Construction excavation
Improperly abandoned wells

Any well or hole represents a possible conduit for ground water contamination. Improper well construction or abandonment can allow contaminated water to migrate from the surface to deeper aquifers. Quarries, particularly ones that contain water (i.e., they have penetrated an aquifer) are direct paths for aquifer contamination. In certain areas, over pumping can cause contamination by inducing salt water intrusion.

Group VI sources of contaminants include:

Ground water - surface water interactions
Natural leaching
Saltwater intrusion/brackish water upconing (or intrusion of other poor-quality natural water)

Large numbers of wells along water front areas which lower the water table to the point that the salt water / fresh water boundary creeps inland, is the most likely example of group VI contamination which could occur in Kitsap County.

Examples of all six groups of contamination threats exist in Kitsap County in varying degrees. Individual issue papers will deal with these contamination threats in detail and propose actions to minimize their impact. Aquifer recharge area protection measures should be a vital component of identifying threats and controlling their impact.

Ground Water Recharge Area Protection (Water Quality)
Enclosure 6
Proposed Aquifer Recharge Area Protection Section for the Kitsap County Critical Areas Ordinance

SECTION 600 CRITICAL AQUIFER RECHARGE AREAS

Section 605

PURPOSE: The Growth Management Act requires Kitsap County to designate and classify Critical Aquifer Recharge Areas. These are areas which recharge ground water aquifers and are highly vulnerable to the introduction of pollutants. This ordinance is intended to provide reasonable protection to the water quality associated with aquifer recharge areas through the regulation of land use activities that provide a potential contaminant source or increase the vulnerability of the aquifer. Operations that pose a potential threat to ground water are listed in Appendix F, Exhibit 1.5-2. This ordinance does not apply to those activities which pose no significant risk, or which are demonstrated by the applicant to pose no risk, or which have potential contaminant sources below threshold amounts as set forth in applicable RCWs, WACs or local regulations.

BACKGROUND: The topography and underlying geology of Kitsap County primarily determine where recharge of our aquifers will occur. The elongated rolling hills and valleys together with either the presence or absence of impervious materials directly beneath their surface are conditions which influence whether recharge will occur or not. Those areas without a glacial hardpan or some other type of impervious lens underlying the top soil, are more favorable to aquifer recharge. At the same time, the lack of this impervious lens makes these areas more vulnerable to pollution, as there is nothing to slow the downward migration of contaminants. Requirements in the more highly vulnerable recharge areas, as described herein, should therefore be more restrictive as to the types of land uses permitted which significantly increase the risk of aquifer contamination.

Risks to ground water quality in recharge areas can be assessed by analysis of conditions such as: depth of groundwater; infiltration rate of soils (permeability); soil types; precipitation; and other relevant factors. Soil types with high infiltration rates are generally associated with areas of high aquifer recharge. The best available information to date regarding infiltration rates and soil types is that described and mapped by the US Department of Agriculture, Soil Conservation Service, in the *Soil Survey of Kitsap County*.

Section 610 CLASSIFICATION AND INVENTORY

A Critical Recharge Area is an area associated with an aquifer which is a current or potential potable water source, is highly susceptible to the introduction of pollutants, or

because of special circumstances, has been designated as a Critical Recharge Area in accordance with WAC 365-190-080 by the County. Critical Recharge Areas under this ordinance may be specifically designated or established based on general criteria as indicated below.

A. **Specific Critical Recharge Areas:**

The County Commissioners may establish Specific Critical Recharge Areas based on special criteria existing in an area. A special study, evaluation, or determination will be the normal source of Specific Critical Recharge Area designations. Protection afforded should be tailored to the specific conditions existing in the designated area that require this special designation. Land use activities which present a significant threat to ground water because they involve the use of hazardous materials or increase the vulnerability of ground water to contamination, are prohibited in all Critical Recharge Areas (See Appendix F, Exhibit 1.5-2). Based on the nature of each Specific Critical Recharge area, exceptions may be granted in the designation. Designated areas may be dropped from the list if the conditions that required the designation change sufficiently to warrant removal. The designation should not be used to restrict residential or other users of small quantities of hazardous materials.

The following area has been designated as a Specific Critical Recharge Area

1. **Hansville Aquifer Recharge Area:** The Hansville Aquifer Recharge Area, has been designated as a Critical Recharge Area under the County's SEPA Ordinance. The Hansville Aquifer Recharge Area is therefore classified a Critical Aquifer Recharge Area under this Section. This area is mapped on the KPUD map called "Aquifer Recharge Areas", in the Kitsap County Comprehensive Plan, 1994, and is available at the Kitsap County Department of Community Development.

B. **General Criteria Critical Recharge Areas:**
Areas that meet any one of the following General Criteria are designated Critical Recharge Areas:

1. Surface soils that permit easy percolation of water and therefore contaminants

A map of surface soils as defined by the Soil Conservation Service (SCS) is available in the Kitsap County Geographic Information System and provides a general guide to the location of highly permeable soils. If the following SCS soil types make up more than 50% of the surface soil or the water table is reached in the sample holes at a proposed land use site , the location will be designated as a Critical Recharge Area:

Soil Names	SCS Map Unit Symbols *
Grove	11,12,13
Indianola	18,19,20,21
Neilton	34,35,36
Norma	37,38
Poulsbo/Ragnar	41,42,43,44,45,46,47

* Numbers listed are the soil map unit symbols which are used on the detailed soils map for Kitsap County.

Analysis for a specific parcel(s), using the criteria outlined below, will be employed to determine if the soils present require a Critical Recharge Area designation. Data collection will include, as a minimum, six soil logs to a depth of 10 feet (or to a depth 4 feet below the lowest proposed excavation point which ever is greater) for each acre in the parcel(s) being evaluated. At least one well of 200 feet or greater with an adequate drilling report must be available within one mile. The associated data will be analyzed and included in the hydrogeologic report to determine the presence of the above soils.

2. **Wellhead protection zones around Group A Water System supply wells**

Areas inside the one year time of travel zone for Group A Water System wells calculated in accordance with the States Well Head Protection Program are designated Critical Aquifer Recharge Areas.

3. **Areas with high concentrations of Group B water system and private domestic wells**

Locations where the number of wells with in a half mile radius is 36 or more, are designated Critical Aquifer Recharge Areas. To facilitate computer analysis, the evaluation may be accomplished on a quarter-quarter section basis using the quarter-quarter section in which a parcel of interest is located and all the surrounding quarter-quarter sections, in place of the half mile circle.

Land use activities which present a significant threat to ground water because they involve the use of hazardous materials or increase the vulnerability of ground water to contamination (See Appendix F, Exhibit 1.5-2), are prohibited in all Critical Recharge Areas.

C. Critical Recharge Area Map

At this time there is insufficient information to comprehensively and accurately delineate all Critical Aquifer Recharge Areas in Kitsap County. This section and Ordinance recognize the geological and hydrogeological complexity of Kitsap County. As Kitsap Public Utility District acquires more information and analysis of the groundwater of the

county, a more accurate and comprehensive Critical Aquifer Recharge area map may be possible. Although an accurate, highly detailed map of Critical Aquifer Recharge Areas does not yet exist, the one Specially Designated Critical Recharge Area (Hansville) and areas which apparently meet the General Criteria have been mapped from information that is currently available.

D. **Potential Critical Aquifer Recharge Area Categories.** The following are general classifications of potential critical aquifer recharge areas:

1. Sole Source Aquifer Recharge Areas: Areas designated pursuant to the Federal Safe Drinking Water Act where there is evidence the aquifer is vulnerable to contamination that would create a hazard to the public health.

2. Areas established for special protection pursuant to a ground water management program, chapters 90.44 and 90.54 RCW, and chapter 173-100 WAC.

Section 615 DEVELOPMENT STANDARDS

Standards for development shall be in accordance with the provisions below and the requirements of the underlying zone.

A. **Critical Aquifer Recharge Areas.**

1. Land uses identified in exhibit titled "Operations with Potential Threat to Ground Water" (Appendix F , Exhibit 1.5-2) are prohibited in Critical Aquifer Recharge Areas. Requests for waivers must include a hydrogeological report which includes a detailed risk-benefit analysis that considers credible, worst case accidents. The report must be submitted to the reviewing authority and address as a minimum those items in Section 700, Special Reports, Hydrogeologic Assessment.

2. Land uses identified in exhibit titled "Operations with Potential Threat to Ground Water" (Appendix F , Exhibit 1.5-2), which are proposed to be located between the one- and five-year time of travel well head protection zones for Group A water system supply wells, shall require a Conditional Use Permit.

APPENDIX F.
EXHIBIT 1.5-2
OPERATIONS WITH POTENTIAL THREAT TO GROUND WATER

Above & Below ground storage tanks
Hazardous and industrial waste treatment
Hazardous and industrial waste storage
Hazardous material storage
Animal feedlots
Commercial operations

1. Gas stations/service stations/truck terminals
2. Petroleum distributors/storage
3. Auto body repairs shops/rust proolers
4. Auto chemical supply storers/retailers
5. Truck, automobile, and combustion engine repair shops
6. Dry cleaners
7. Photo processors
*7. Auto washes
*8. Laundromats
*9. Beauty Salons
10. Research or chemical testing laboratories which handle significant quantities of hazardous materials
11. Food processors/meat packers/ slaughter houses
12. Airport maintenance/fueling operation areas
13. Junk and salvage yards
14. Storing or processing manure, feed, or other agriculture by products by commercially permitted businesses
15. Large scale storage or use of pesticides, insecticides, herbicides, or fertilizer by commercial or agricultural operations.

Deep injection wells
Waste-water disposal wells
Oil and gas activity disposal wells
Mineral extraction disposal wells
De-icing salts storage piles

1. Furniture strippers/painters/finishers
2. Concrete/asphalt/tar/coal companies
3. Industrial manufacturers: chemicals, pesticides/herbicides, paper, leather products, textiles, rubber, plastic/fiberglass, silicone/glass, pharmaceuticals, electrical equipment
4. Metal platers/heat treaters/smelters/ annealers/descalers
5. Wood preserves
6. Chemical reclamation facilities
7. Boat refinishers

Land application
Waste water application (spray irrigation)
Waste-water byproduct (sludge) application
Petroleum refining waste application
Hazardous waste applications
Landfills
Industrial hazardous and non-hazardous landfill
Municipal sanitary landfill
Material transfer operations
Hazardous and industrial waste transfers
Hazardous material transfers
Materials stockpiles
Mining and mine drainage
On-site Septic Systems (LOSS category)
of greater than 14,500 GPD capacity without pre-treatment
Pipelines
Hazardous and industrial waste transfer
Hazardous material transfer

Radioactive disposal sites
Sand and gravel mining operations

* If not on a sewer system with a treatment plant.

Industrial operations

APPENDIX F.
EXHIBIT 1.5-2
OPERATIONS WITH POTENTIAL THREAT TO GROUND WATER

Above & Below ground storage tanks
Hazardous and industrial waste treatment
Hazardous and industrial waste storage
Hazardous material storage
Animal feedlots
Commercial operations

1. Gas stations/service stations/truck terminals
2. Petroleum distributors/storage
3. Auto body repairs shops/rust proofers
4. Auto chemical supply storers/retailers
5. Truck, automobile, and combustion engine repair shops
6. Dry cleaners
7. Photo processors

*7. Auto washes
*8. Laundromats
*9. Beauty Salons

10. Research or chemical testing laboratories which handle significant quantities of hazardous materials
11. Food processors/meat packers/ slaughter houses
12. Airport maintenance/fueling operation areas
13. Junk and salvage yards
14. Storing or processing manure, feed, or other agriculture by products by commercially permitted businesses
15. Large scale storage or use of pesticides, insecticides, herbicides, or fertilizer by commercial or agricultural operations.

Deep injection wells
Waste-water disposal wells
Oil and gas activity disposal wells
Mineral extraction disposal wells
De-icing salts storage piles

1. Furniture strippers/painters/finishers
2. Concrete/asphalt/tar/coal companies
3. Industrial manufacturers: chemicals, pesticides/herbicides, paper, leather products, textiles, rubber, plastic/fiberglass, silicone/glass, pharmaceuticals, electrical equipment
4. Metal platers/heat treaters/smelters/ annealers/descalers
5. Wood preserves
6. Chemical reclamation facilities
7. Boat refinishers

Land application
Waste-water application (spray irrigation)
Waste-water by product (sludge) application
Petroleum refining waste application
Hazardous waste applications
Landfills
Industrial hazardous and non-hazardous landfill
Municipal sanitary landfill
Material transfer operations
Hazardous and industrial waste transfers
Hazardous material transfers
Materials stockpiles
Mining and mine drainage
On-site Septic Systems (LOSS category)
of greater than 14,500 GPD capacity without pre-treatment
Pipelines
Hazardous and industrial waste transfer
Hazardous material transfer

Radioactive disposal sites
Sand and gravel mining operations

* If not on a sewer system with a treatment plant.

Industrial operations

Ground Water Recharge Area Protection (Water Quality) Attachment B; Recharge Area Protection Systems

a. DRASTIC System

The DRASTIC system uses hydrogeologic information to evaluate and rank ground water contamination potential. It begins by identifying key hydrogeologic parameters including:

* Depth to water table
* Recharge (net)
* Aquifer media
* Soil media
* Topography
* Impact of the unsaturated zone
* Conductivity (permeability) of the aquifer

A ranking system is used to assign a numerical value to each parameter. The relative pollution potential is determined by adding these numbers. This information is then used to develop maps showing areas that are most vulnerable to contamination.

The DRASTIC system is a workable method for identifying areas sensitive to contamination. It was developed for use by a wide range of people, including those with limited technical knowledge. It does require a significant amount of information and involves detailed modeling. DRASTIC is intended to be used for the evaluation of areas larger than 100 acres.

b. The Clover/Chambers Creek System

The Clover/Chambers Creek System (Pierce County) uses another hydrogeologic rating system. In the Clover/Chambers Creek area, which is underlain by a thick sequence of inter-bedded glacial and non-glacial sediments, four aquifers and three confining beds have been identified. A study has defined seven degrees of surface sensitivity based upon the presence or absence of the various confining beds. The least sensitive category includes areas capped with confining beds of glacial till; the most sensitive category includes areas where all three confining beds are absent. In the first case, aquifers are protected from contamination by the glacial till cover. In the latter case, the aquifers are evaluated to be open to vertical contamination from

the surface. It should be noted that till layers often are not continuous and sometimes are shaped so as to concentrate percolating fluids.

c. LeGrand System

The LeGrand System assigns numerical values to factors intended to reflect the hydrogeologic vulnerability of an aquifer recharge area to ground water contamination. It also assigns values to parameters intended to reflect the resource value and degree of threat. Factors included in the LeGrand system are:

* Distance between contamination source and water supply
* Depth to water table
* Hydraulic gradient (slope)
* Permeability of the soil
* Degree of confidence in values
* Degree of seriousness which includes contaminant toxicity, importance of aquifer, and general aquifer sensitivity.

d. Hazard Ranking System (HRS)

The EPA Hazardous Waste Site Ranking Model or Hazard Ranking System (HRS) assigns values which represent resource value and degree of threat.

HRS factors are ranked and added to provide an overall risk rating. The factors include:

* Measured level or evidence of contaminants
* Depth to aquifer
* Net precipitation
* Permeability of unsaturated zone
* Method of waste management
* Physical state of wastes
* Contaminant persistence in the environment
* Contaminant toxicity/infectiousness
* Total waste quantity
* Ground water use
* Distance to nearest down-gradient well
* Population served by ground water within a 3 mile radius

Hazardous Sites List

14852

DEPARTMENT OF ECOLOGY
State of Washington

Toxics Cleanup Program | Department of Ecology, PO Box 47600, Olympia, WA 98504-7600 | February 28, 2012

HAZARDOUS SITES LIST & NOTICE OF HAZARD RANKING

This issue is an updated Hazardous Sites List as required by WAC 173-340-330. It includes all sites that have been assessed and ranked using the Washington Ranking Method. Also listed are National Priorities List (NPL) sites. Additions to the list, changes in remedial status of sites on the list, and removals from the list are published twice a year. Placing of a site on the Hazardous Sites List does not, by itself, imply that persons associated with the site are liable under Chapter 70.105D RCW. For additional information about a site on this list, please contact the appropriate indicated person. Please direct questions regarding circulation of the Hazardous Sites List or Site Register to Ted Benson at (360) 407-6683 or tben461@ecy.wa.gov. Ecology is an equal-opportunity employer. If you need this document in a format for the visually impaired, call Toxics Cleanup Program at 360-407-7170. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

HOW A SITE GETS ON THE HAZARDOUS SITES LIST

Sites on the Hazardous Sites List (excluding NPL and TSP sites) have undergone a preliminary study called a Site Hazard Assessment (SHA). An SHA provides Ecology with basic information about a site. Ecology then uses the Washington Ranking Method (WARM) to estimate the potential threat the site poses, if not cleaned up, to human health and the environment. The estimate is based on the amount of contaminants, how toxic they are, and how easily they can come in contact with people and the environment. Sites are ranked relative to each other on a scale of one to five. A rank of one represents the highest level of concern relative to other sites, and a rank of five the lowest. Hazard ranking helps Ecology target where to spend cleanup funds. However, a site's actual impact on human health and the environment, public concern, a need for an immediate response, and available cleanup staff and funding also affect which sites get first priority for cleanup.

HOW A SITE GETS REMOVED FROM THE LIST

A site may be removed from the list only if the site is cleaned up. In some cases, long-term monitoring and periodic reviews may be required to ensure the cleanup is adequate to protect the public and the environment. Ecology will hold a public notice for any site it proposes to remove from the Hazardous Sites List.

HOW TO ACCESS DEPARTMENT OF ECOLOGY SITE FILES

To review a file or record pertaining to a site on the Hazardous Sites List, please contact the Public Disclosure Coordinator listed for the region in which the site resides.

- Central Regional Office: Roger Johnson, 15 W Yakima Ave. Ste. 200, Yakima 98902-3463, (509) 454-7658, rjoh461@ecy.wa.gov
- Eastern Regional Office: Kari Johnson, N 4601 Monroe St., Spokane 99205-1265, (509) 329-34 5,kajo461@ecy.wa.gov
- Industrial Section: Kathy Vermillion, 300 Desmond Dr. SE, Lacey 98503-1274, (360) 407-6916, kver461@ecy.wa.gov
- Northwest Regional Office: Sally Perkins, 3190 160th Ave. SE, Bellevue 98008-5452, (425) 649-7190, spur461@ecy.wa.gov
- Northwest Regional Office: Sally Alexander, 3190 160th Ave. SE, Bellevue 98008-5452, (425) 649-7239, saal461@ecy.wa.gov
- Nuclear Waste Program: Valarie Peery, 3100 Port of Benton Blvd., Richland 99352, (509) 372-7920, vpeu461@ecy.wa.gov
- Site Cleanup/Underground Storage Tank Unit: Carol Dorn, 300 Desmond Dr. SE, Lacey 98503, (360) 407-7224, cdog461@ecy.wa.
- Southwest Regional Office: Debbie Nelson, 300 Desmond Dr. SE, Lacey 98503-1274, (360) 407-6365, dene461@ecy.wa.gov

Ecology provides additional information about each site through its website site lists: http://www.ecy.wa.gov/programs/tcp/sites/sites.htm

Publication 12-09-042A

10/ of 152

Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

SITES REMOVED FROM THE HAZARDOUS SITES LIST

Ecology may remove a site from this list only after determining that all remedial actions except confirmational monitoring have been completed and compliance with the cleanup standards has been achieved at the site, or the listing was erroneous.

COUNTY	FS ID	SITE NAME	ADDRESS	CITY	RANK
Benton	321	PUMP PAK & PATTERY	3 W COLUMBIA DR	KENNEWICK	2
King	7346	BALLARD AUTO WRECKING	1515 NW LEARY WAY	SEATTLE	2
Spokane	53851581	PRUETT PETROLEUM UST 9732	E 130 4TH	SPANGLE	5
Spokane	873	SPOKANE TRANSIT AUTHORITY BUS BARN	W 1230 BOONE	SPOKANE	5

NO FURTHER ACTION SITES AFTER SITE HAZARD ASSESSMENT

Site Hazard Assessments were completed on these sites and Ecology finds no further action is required under the Model Toxics Control Act.

COUNTY	FS ID	SITE NAME	CITY
Chelan	24845688	JERRYS AUTO	WENATCHEE
Kitsap	71818684	KITSAP COUNTY SHERIFF S LVERDALE	SILVERDALE
Stevens	1855810	HUBBARD MINE	

Hazardous Sites List

SITE REGISTER SPECIAL ISSUE – February 28, 2012

Adams

FS ID	SITE NAME	CITY	RANK	STATUS	RU
559	CMC REAL ESTATE OTHELLO	OTHELLO	5	Cleanup Started	EA
564	CROP PRODUCTION SERVICES INC OTHELLO	OTHELLO	6	Awaiting Cleanup	EA
565	PUREGRO RITZVILLE	RITZVILLE	5	Awaiting Cleanup	EA
557	SOIL & CROP	OTHELLO	2	Cleanup Started	EA
563	T 18 RANCH	LIND	6	Awaiting Cleanup	EA
567	WASHTUCNA FERTILIZER PLANT	WASHTUCNA	5	Awaiting Cleanup	EA
570	WASHTUCNA GRANGE SUPPLY	BENGE	5	Awaiting Cleanup	EA
568	WASHTUCNA RAILROAD LEASE SITE	WASHTUCNA	4	Awaiting Cleanup	EA
560	WWT BATUM FACILITY	BATUM	6	Awaiting Cleanup	EA

Asotin

FS ID	SITE NAME	CITY	RANK	STATUS	RU
572	ASOTIN COUNTY LANDFILL	CLARKSTON	5	Awaiting Cleanup	EA

Benton

FS ID	SITE NAME	CITY	RANK	STATUS	RU
302	B & B EQUIPMENT CO INC	PROSSER	5	Awaiting Cleanup	CE
319	BEN FRANKLIN TRANSIT CO	RICHLAND	3	Cleanup Started	CE
999879	CBC WSU NURSE TRAINING FACILITY	RICHLAND	3	Awaiting Cleanup	CE
304	CHEVRON CHEMICAL CO	KENNEWICK	5	Awaiting Cleanup	CE
84244226	COLUMBIA PARK MARINA	RICHLAND	2	Cleanup Started	CE
9799825	CONSOLIDATED FREIGHTWAYS KENNEWICK	KENNEWICK	5	Cleanup Started	CE
312	HANFORD 100 AREA DOE	RICHLAND	0◄	Cleanup Started	HA
313	HANFORD 1100 AREA DOE	RICHLAND	0◄	Cleanup Complete-Active O&M/Monitoring	HA
314	HANFORD 200 AREA DOE	RICHLAND	0◄	Cleanup Started	HA
315	HANFORD 300 AREA DOE	RICHLAND	0◄	Cleanup Started	HA
38214358◆	JACKPOT FOOD MART 056	RICHLAND	2	Awaiting Cleanup	CE
85232259	JERRYS CUSTOM MECHANICS	WEST RICHLAND	3	Awaiting Cleanup	CE
333	KENNEWICK U HAUL	KENNEWICK	3	Cleanup Started	CE
78635792	L & L EXXON	RICHLAND	2	Awaiting Cleanup	CE
327	NEW CITY CLEANERS	RICHLAND	1	Cleanup Started	CE
322	NW PIPELINE ST CHEVRON	FINLEY	2	Awaiting Cleanup	CE
323	NW PIPELINE ST PHILLIPS	FINLEY	3	Awaiting Cleanup	CE
324	NW PIPELINE ST PROSSER	PROSSER	4	Awaiting Cleanup	CE
326	PACIFIC RECYCLING	KENNEWICK	2	Cleanup Started	CE
79167777	TWIN CITY METALS	KENNEWICK	1	Cleanup Started	CE
13386651	UPTOWN SHOPPING CENTER PCE PLUME	RICHLAND	3	Awaiting Cleanup	CE
44976422	US BANK FACILITY	RICHLAND	3	Awaiting Cleanup	CE
2373818	US DOE 100-BC-1	RICHLAND	0◄	Cleanup Started	HA
9703762	US DOE 100-BC-2	RICHLAND	0◄	Cleanup Started	HA
1397649	US DOE 100-BC-5	RICHLAND	0◄	Cleanup Started	HA
383245	US DOE 100-DR-1	RICHLAND	0◄	Cleanup Started	HA
1269682	US DOE 100-DR-2	RICHLAND	0◄	Cleanup Started	HA
6419945	US DOE 100-FR-1	RICHLAND	0◄	Cleanup Started	HA
154273	US DOE 100-FR-2	RICHLAND	0◄	Cleanup Started	HA
7261792	US DOE 100-FR-3	RICHLAND	0◄	Cleanup Started	HA
5266750	US DOE 100-HR-1	RICHLAND	0◄	Cleanup Started	HA
4509018	US DOE 100-HR-2	RICHLAND	0◄	Cleanup Started	HA
6589488	US DOE 100-HR-3	RICHLAND	0◄	Cleanup Started	HA
4098480	US DOE 100-IU-2	RICHLAND	0◄	Cleanup Started	HA
8152746	US DOE 100-IU-6	RICHLAND	0◄	Cleanup Started	HA
227999	US DOE 100-KR-1	RICHLAND	0◄	Cleanup Started	HA
1777961	US DOE 100-KR-2	RICHLAND	0◄	Cleanup Started	HA
6272765	US DOE 100-KR-4	RICHLAND	0◄	Cleanup Started	HA
8629659	US DOE 100-NR-1	RICHLAND	0◄	Cleanup Started	HA
6495974	US DOE 100-NR-2	RICHLAND	0◄	Cleanup Started	HA
7392984	US DOE 200-CW-1	RICHLAND	0◄	Cleanup Started	HA
9613181	US DOE 200-CW-3	RICHLAND	0◄	Cleanup Started	HA
8648138	US DOE 200-CW-5	RICHLAND	0◄	Cleanup Started	HA

Hazard Sites List Legend:

- ◆ New site added to the ranked list
- ● New site added to the National Priorities List (NPL)
- ◆ Site re-ranked
- ▼ Superfund site; State has lead
- ▲ Superfund site; Federal (EPA) has lead
- ► Superfund site; Joint lead
- ◄ Superfund site; Under a Federal Facilities Agreement
- ►◄ Tacoma Smelter Plume (State Lead)

Responsible Unit (RU) Site Contacts

Central Regional Office: Heidi Smith (509) 454-7841/Dan Benson (360) 407-6683
Eastern Regional Office: Patti Carter (509) 329-3522/Ted Benson (360) 407-6683
Northwest Regional Office: Donna Musa (425) 649-7136/Ted Benson (360) 407-6683
Southwest Regional Office: Rebecca Lawson (360) 407-6241/T Benson (360) 407-6683
Headquarters Site Cleanup Section: Barry Rogowski (360) 407-7243/T Benson (360) 407-6683
Industrial Section: Paul Skyllingstad (360) 407-6919/T Benson (360) 407-6683
Nuclear Waste Program: Joan Price (509) 372-7921/Amanda Jonitz (509) 372-7912

Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

Benton

FS ID	SITE NAME	CITY	RANK	STATUS	RU
1503490	US DOE 200-IS-1	RICHLAND	0◄	Cleanup Started	HA
7919861	US DOE 200-PW-1	RICHLAND	0◄	Cleanup Started	HA
1703586	US DOE 200-PW-3	RICHLAND	0◄	Cleanup Started	HA
974879	US DOE 200-PW-6	RICHLAND	0◄	Cleanup Started	HA
1711446	US DOE 200-SW-2	RICHLAND	0◄	Cleanup Started	HA
2504862	US DOE 300-FF-1	RICHLAND	0◄	Cleanup Started	HA
498836	US DOE 300-FF-2	RICHLAND	0◄	Cleanup Started	HA
603076	US DOE 384 POWERHOUSE BUNKER	RICHLAND	0◄	Cleanup Started	HA
311	US ECOLOGY WASHINGTON	RICHLAND	5	Cleanup Started	HA
88241112	USFW WHITCOMB ISLAND FARM	PATERSON	3	Cleanup Started	CE
329	WELLSIAN WAY WELL FIELD	RICHLAND	2	Cleanup Started	CE

Chelan

FS ID	SITE NAME	CITY	RANK	STATUS	RU
18422226	AG SUPPLY COMPANY OF WENATCHEE	WENATCHEE	5	Awaiting Cleanup	CE
34817938	BLUE CHELAN PLANT 1	CHELAN	5	Awaiting Cleanup	CE
28673212	BNSF WENATCHEE RAILYARD	WENATCHEE	5	Awaiting Cleanup	CE
71787374	BUDGET RENT A CAR PERFORMANCE AUTO SOUN	WENATCHEE	5	Awaiting Cleanup	CE
336	CASHMERE LANDFILL	CASHMERE	1	Cleanup Started	CE
77751227	CHELAN CHEVRON	CHELAN	3	Cleanup Started	CE
63286234	CHELAN CNTY FIRE DISTRICT 1	WENATCHEE	5	Awaiting Cleanup	CE
25558862	CHELAN SEWER PUMP STATION NO 1	CHELAN	5	Cleanup Started	CE
62596421	COMMUNITY TECHNOLOGY CENTER	WENATCHEE	5	Cleanup Started	CE
6241274	DELS TRIANGLE TEXACO	WENATCHEE	5	Awaiting Cleanup	CE
336	DRYDEN LANDFILL	DRYDEN	4	Cleanup Complete-Active O&M/Monitoring	CE
812	GLACIER PARK	LEAVENWORTH	1	Cleanup Complete-Active O&M/Monitoring	CE
349	GLACIER PARK BLOCGHT FUEL FAST	LEAVENWORTH	1	Cleanup Complete-Active O&M/Monitoring	CE
47131682	HEADWATERS INN SPORTSMANS PUB	LEAVENWORTH	3	Awaiting Cleanup	CE
338	HOLDEN MINE	HOLDEN	1	Cleanup Started	CE
93262331◆	LAKE CHELAN BOAT CO LADY OF THE LAKE II	CHELAN	5	Awaiting Cleanup	CE
351	MANSON LANDFILL	MANSON	2	Cleanup Started	CE
2014217	OAK HARBOR FREIGHT TERMINAL	WENATCHEE	5	Awaiting Cleanup	CE
357	PACIFIC PRIDE TANKER FIRE	MONITOR	3	Cleanup Started	CE
39541111	PAT & MIKES STORE	CHELAN	4	Cleanup Started	CE
42716969	PEAR BLOSSOM LOT 22	WENATCHEE	4	Awaiting Cleanup	CE
345	UNOCAL BK PLT 0082	CHELAN	1	Cleanup Started	CE
346	UNOCAL BULK PLANT 0853	WENATCHEE	1	Cleanup Started	CE
32898553	VAN WELL NURSERY	WENATCHEE	5	Cleanup Started	CE
69324185	WA WSU RESEARCH PESTICIDE STORAGE BLDG	WENATCHEE	5	Cleanup Started	CE
39838199	WENATCHEE CEMETERY	WENATCHEE	5	Awaiting Cleanup	CE

Clallam

FS ID	SITE NAME	CITY	RANK	STATUS	RU
2995768	331 BUSINESS PARK LOOP	CARLSBORG	5	Cleanup Started	SW
391383	ALPINE REALTY JIFFY CLEANERS SAFEWAY	PORT ANGELES	5	Cleanup Started	SW
1795042	BURNT HILL GRAVEL PIT	SEQUIM	3	Awaiting Cleanup	SW
4080075	CAR CRUSHING HOKO RIVER HWY 112	SEKIU	1	Awaiting Cleanup	SW
8004640	FREDS AUTO WRECKING	PORT ANGELES	1	Awaiting Cleanup	SW
8004606	JONATHAN SHOTWELL CORPORATION	PORT ANGELES	4	Awaiting Cleanup	SW
1002	K PLY	PORT ANGELES	5	Construction Complete-Performance Monitoring	SW
1671323	MIDWAY METALS	PORT ANGELES	1	Cleanup Started	SW
18	NIPPON PAPER INDUSTRIES USA CO	PORT ANGELES	5	Awaiting Cleanup	IN
1673933	PETTIT OIL CO FORKS BULK PLANT	FORKS	5	Cleanup Started	SW
1006	PETTIT OIL COMPANY PORT ANGELES WHS	PORT ANGELES	1	Cleanup Started	SW
8466059	PHILS FREEDOM WELDING	PORT ANGELES	4	Awaiting Cleanup	SW
5690782	PORT ANGELES CITY SENIOR CENTER	PORT ANGELES	5	Cleanup Started	SW
19	PORT ANGELES RAYONIER MILL SITE	PORT ANGELES	2	Cleanup Started	SW
1005	PORT OF PORT ANGELES MARINE TRADES AREA	PORT ANGELES	1	Cleanup Started	SW
1003	QUALITY 4 X 4	PORT ANGELES	3	Awaiting Cleanup	SW

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❖ Site re-ranked
▼ Superfund site; State has lead
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► Superfund site; Joint lead
◄ Superfund site; Under a Federal Facilities Agreement
►◄ Tacoma Smelter Plume (State Lead)

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Nuclear Waste Program: John Price (509) 372-7921/Brenda Jentzen (509) 372-7922

Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

Clallam

FS ID	SITE NAME	CITY	RANK	STATUS	RU
56112752	SEQUIM BAY GENERAL STORE	SEQUIM	3	Cleanup Started	SW
1283686	SUNNYDELL DRYKE SHOOTING RANGE	SEQUIM	1	Cleanup Started	SW
61954937	TRUCK TOWN 1921 HWY 101	PORT ANGELES	2	Cleanup Started	SW
1008	UNOCAL BULK PLANT 0901	PORT ANGELES	1	Cleanup Started	SW
77452558	US DEA CPNTF LAWRENCE RD PT ANGELES	PORT ANGELES	3	Awaiting Cleanup	SW
1139/236	WA DNR CASSIDY ROAD	SEQUIM	5	Awaiting Cleanup	SW
25140851	WA DOC CLALLAM BAY CORRECTIONS CENTER OI	CLALLAM BAY	5	Cleanup Started	SW

Clark

FS ID	SITE NAME	CITY	RANK	STATUS	RU
8223776	400 E MILL PLAIN DRYWELLS	VANCOUVER	3	Awaiting Cleanup	SW
53615456	ALCOA NORTHEAST PARCEL	VANCOUVER	C▼	Cleanup Started	IN
21	ALCOA VANCOUVER	VANCOUVER	C▼	Cleanup Started	IN
25	ALCOA VANCOUVER NPL	VANCOUVER	C▼	Cleanup Complete-Active O&M/Monitoring	IN
22	ALCOA VANCOUVER PCB	VANCOUVER	C▼	Awaiting Cleanup	IN
21	ALCOA VANCOUVER ROD MILL	VANCOUVER	C▼	Cleanup Started	IN
23	ALCOA VANCOUVER TCE	VANCOUVER	C▼	Cleanup Started	IN
90752948	AMERICAN RV STORAGE	VANCOUVER	3	Awaiting Cleanup	SW
1045	BNSF RAILWAY COMPANY VANCOUVER	VANCOUVER	1	Cleanup Started	SW
198	BOOMSNUB AIRCO SUPERFUND SITE	VANCOUVER	C▲	Cleanup Started	CR
1048	BURLINGTON ENVIRONMENTAL LLC WASHOUGAL	WASHOUGAL	1	Cleanup Started	SW
34583842	CARIBOU REALTY GROUP	VANCOUVER	2	Cleanup Started	SW
30204	CHELATCHIE TANK FARM	AMBOY	1	Awaiting Cleanup	SW
1060	CHEVRON BULK PLANT 61001854	VANCOUVER	1	Cleanup Started	SW
1043	CHEVRON BULK PLANT CAMAS	CAMAS	2	Cleanup Started	SW
26	COLUMBIA MARINE LINES	VANCOUVER	1	Cleanup Complete-Active O&M/Monitoring	IN
5016309	COLUMBIA ROCK CONCRETE PRODUCTS INC	CAMAS	2	Awaiting Cleanup	SW
98665473	COMMERCIAL RADIATOR SERVICE	VANCOUVER	4	Awaiting Cleanup	SW
1049	CUSTOM CARE CLEANERS	VANCOUVER	5	Awaiting Cleanup	SW
74748387	ELECTRO TECH METAL FINISHING LLP	VANCOUVER	2	Awaiting Cleanup	SW
1045	FARGHER LAKE GROCERY	YACOLT	3	Awaiting Cleanup	SW
29872132	FRED MEYER INC HAZEL DELL	HAZEL DELL	3	Cleanup Started	SW
197	FRONTIER HARDCHROME	VANCOUVER	0▼	Cleanup Started	SW
1011	GENERAL CHEMICAL CORP VANCOUVER WORKS	VANCOUVER	5	Awaiting Cleanup	SW
81243434	GRAMOR DEVELOPMENT	VANCOUVER	3	Awaiting Cleanup	SW
1019769	HINRICHS PROPERTY	RIDGEFIELD	3	Awaiting Cleanup	SW
1051	IPC PLYWOOD MILL	AMBOY	5	Awaiting Cleanup	SW
1052	IPC SOLID WASTE SITE	AMBOY	2	Awaiting Cleanup	SW
3844822	J & S STEEL	VANCOUVER	2	Awaiting Cleanup	SW
1061	KOCH TRACTOR	RIDGEFIELD	3	Awaiting Cleanup	SW
1754445	KOPPE METALS SOUTH PROPERTY	VANCOUVER	2	Awaiting Cleanup	SW
1035	L & G DELI VANCOUVER	VANCOUVER	4	Cleanup Started	SW
75243248	LARSONS DRY CLEANER	VANCOUVER	2	Cleanup Started	SW
1017	LEICHNER BROTHERS LANDFILL	VANCOUVER	3	Construction Complete-Performance Monitoring	SW
12436967	MALCOLM MONTAGUE	VANCOUVER	2	Cleanup Started	SW
19779	MILTONS DRY CLEANERS	VANCOUVER	2	Cleanup Started	SW
22915	NORTHWEST INVESTMENTS	VANCOUVER	2	Awaiting Cleanup	SW
1026	NUSTAR ENERGY LP	VANCOUVER	1	Cleanup Started	SW
1019	PACIFIC WOOD TREATING CORP	RIDGEFIELD	1	Cleanup Started	SW
8100830	PARK LAUNDRY SITE	RIDGEFIELD	3	Cleanup Started	SW
85381664	PORT OF VANCOUVER-SWANCADET MANUFACTU	VANCOUVER	2	Cleanup Started	SW
30759	PORTCO CORP PENDGO PRODUCTS	VANCOUVER	3	Cleanup Started	SW
1062	RJ FRANK PROPERTY	RIDGEFIELD	1	Awaiting Cleanup	SW
95697738	RONALD BROWN PROPERTY	CAMAS	5	Cleanup Started	SW
1105153	SCHAFFER PROPERTY	RIDGEFIELD	3	Awaiting Cleanup	SW
9157494	SPRAGUE & FJERMESTAD	RIDGEFIELD	3	Awaiting Cleanup	SW
81862781	ST SERVICES NUSTAR ENERGY LP	VANCOUVER	2	Cleanup Started	SW
34822454	TETRA PAK	VANCOUVER	2	Cleanup Started	SW
1063	TIME OIL HANDY ANDY 8	VANCOUVER	1	Construction Complete-Performance Monitoring	SW

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Hazardous Sites List

SITE REGISTER SPECIAL ISSUE – February 28, 2012

Clark

FS ID	SITE NAME	CITY	RANK	STATUS	RU
11251483	TOSCO CORPORATION SITE 257323-31299	VANCOUVER	3	Cleanup Started	SW
69965472	US ARMY CAMP BONNEVILLE	VANCOUVER	1	Cleanup Started	HQ
5093080	US ARMY CAMP BONNEVILLE RAU-1	VANCOUVER	2	Cleanup Started	HQ
5093080	US ARMY CAMP BONNEVILLE RAU-1	PROEBSTEL	2	Cleanup Started	HQ
9420069	US ARMY CAMP BONNEVILLE RAU-2	PROEBSTEL	1	Cleanup Started	HQ
9420069	US ARMY CAMP BONNEVILLE RAU-2	VANCOUVER	1	Cleanup Started	HQ
47197	US ARMY CAMP BONNEVILLE RAU-2A	VANCOUVER	1	Cleanup Started	HQ
47197	US ARMY CAMP BONNEVILLE RAU-2A	PROEBSTEL	1	Cleanup Started	HQ
3184561	US ARMY CAMP BONNEVILLE RAU-2B	PROEBSTEL	1	Cleanup Started	HQ
3184561	US ARMY CAMP BONNEVILLE RAU-2B	VANCOUVER	1	Cleanup Started	HQ
475000	US ARMY CAMP BONNEVILLE RAU-2C	VANCOUVER	1	Cleanup Started	HQ
475000	US ARMY CAMP BONNEVILLE RAU-2C	PROEBSTEL	1	Cleanup Started	HQ
5125990	US ARMY CAMP BONNEVILLE RAU-3	PROEBSTEL	1	Cleanup Started	HQ
5125990	US ARMY CAMP BONNEVILLE RAU-3	VANCOUVER	1	Cleanup Started	HQ
202	VANCOUVER CITY RIANDFORD STATION 4	VANCOUVER	0 ▲	Cleanup Started	EP
1024	WA DNR LARCH MOUNTAIN CORR	YACOLT	2	Cleanup Started	SW
46933033	WA DOT SHELL DENNIS MEADOWS	VANCOUVER	3	Cleanup Started	SW
1050	WA DOT VANCOUVER	VANCOUVER	5	Cleanup Started	SW
3612707	WERTZ PROPERTY	RIDGEFIELD	2	Awaiting Cleanup	SW

Columbia

FS ID	SITE NAME	CITY	RANK	STATUS	RU
41637035	SKYLINE FLUID POWER INC	DAYTON	2	Awaiting Cleanup	EA

Cowlitz

FS ID	SITE NAME	CITY	RANK	STATUS	RU
1101	CHEVRON USA LONGVIEW	LONGVIEW	1	Cleanup Started	SW
1102	CLIFF KOPPE METALS	KELSO	2	Awaiting Cleanup	SW
1092	EMERALD KALAMA CHEMICAL LLC	KALAMA	1	Cleanup Started	IN
810	FUEL PROCESSORS INC	WOODLAND	3	Cleanup Started	SW
1091	GARDNER FOREST PRODUCTS	LONGVIEW	4	Awaiting Cleanup	SW
36354352	GRUAT BROS INC	WOODLAND	1	Cleanup Started	SW
1080	INTERNATIONAL PAPER LONGVIEW	LONGVIEW	1	Cleanup Started	SW
31	LONGVIEW FIBRE PAPER & PACKAGING LONGVIE	LONGVIEW	5	Construction Complete-Performance Monitoring	IN

Cowlitz

1 49

FS ID	SITE NAME	CITY	RANK	STATUS	RU
29	◆ MILLENNIUM BULK TERMINALS LONGVIEW	LONGVIEW	5	Cleanup Started	IN

Cowlitz

FS ID	SITE NAME	CITY	RANK	STATUS	RU
1092	OLYMPIC PIPELINE COMPANY	CASTLE ROCK	1	Construction Complete-Performance Monitoring	SW
1084	OSTRANDER PROPERTY	LONGVIEW	4	Awaiting Cleanup	SW
74598527	TERRYS SALVAGE	KELSO	2	Awaiting Cleanup	SW
1094	UNOCAL BULK PLANT 0321	KELSO	1	Cleanup Started	SW
1111	UNOCAL BULK PLANT 0885	WOODLAND	3	Cleanup Started	SW
1083	WEST COAST MORIL OIL CO	LONGVIEW	1	Construction Complete-Performance Monitoring	SW
28	WEYERHAEUSER CO HG CHLOR ALK	LONGVIEW	1	Cleanup Started	SW
27	WEYERHAEUSER CO LONGVIEW	LONGVIEW	1	Cleanup Started	IN
1106	WEYERHAEUSER HG CAMP	CASTLE ROCK	3	Awaiting Cleanup	SW

Douglas

FS ID	SITE NAME	CITY	RANK	STATUS	RU
813	AMERICAN SILICON TECHNOLOGIES	ROCK ISLAND	4	Cleanup Started	CE
23834782	AUVIL FRUIT COMPANY INC RANCH 1	CRONDO	5	Awaiting Cleanup	CE
22548624	CHIEF JOSEPH DAM	BRIDGEPORT	5	Awaiting Cleanup	CE
95479675	KEYES FIBRE CORPORATION	WENATCHEE	5	Cleanup Started	CE
75378742	NORTH CENTRAL PETROLEUM SPILL	BRIDGEPORT	5	Cleanup Complete-Active O&M/Monitoring	CE
74382127	ROCKY BUTTE SERVICE / G & K COUNTRY STORE	BRIDGEPORT	5	Cleanup Started	CE

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Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

Douglas

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370	SILICON METALTECH LAB SITE	ROCK ISLAND	5	Cleanup Started	CE
369	SILICON METALTECH LAGOON	ROCK ISLAND	4	Cleanup Started	CE
6567855	TAPLETT APPLE ORCHARD	EAST WENATCHEE	4	Awaiting Cleanup	CE

Ferry

322

FS ID	SITE NAME	CITY	RANK	STATUS	RU
78351263◆	ANDERSON GROCERY	REPUBLIC	5	Cleanup Started	EA
574	HECLA KNOB HILL MINE	REPUBLIC	4	Awaiting Cleanup	EA

Franklin

FS ID	SITE NAME	CITY	RANK	STATUS	RU
591	BARR PASCO RAILYARD	PASCO	5	Awaiting Cleanup	EA
64881623	BROADWAY TRUCK SERVICE PASCO	PASCO	3	Awaiting Cleanup	EA
65763896	CHEVRON PIPE LINE COMPANY PASCO BULK TERI	PASCO	3	Cleanup Started	EA
86588161	CHS INC	PASCO	3	Cleanup Started	EA
12832737	CONNELL OIL INC	CONNELL	4	Awaiting Cleanup	EA
578	PASCO BULK FUEL TERMINAL SITE	PASCO	1	Cleanup Started	EA
575	PASCO LANDFILL NPL SITE	PASCO	0▼	Cleanup Started	EA
80275924	RADAR HILLS SEWER SYSTEM	OTHELLO	4	Cleanup Started	HQ
584	SMITH CANYON HAZ WASTE SITE	PASCO	5	Awaiting Cleanup	EA
39378654	TIDEWATER FUEL LINE LEAK	PASCO	3	Cleanup Started	EA
7827434	TIDEWATER TERMINAL PASCO BOILER	PASCO	5	Awaiting Cleanup	EA
32559645	UAP DISTRIBUTION INC PASCO	PASCO	3	Awaiting Cleanup	EA
578	WESTERN FARM SERV PASCO	PASCO	1	Cleanup Complete-Active O&M/Monitoring	EA
58961816◆	WONDRACK DISTRIBUTING INC PASCO	PASCO	5	Cleanup Started	EA

Garfield

FS ID	SITE NAME	CITY	RANK	STATUS	RU
8546	CROP PRODUCTION SERVICES INC POMEROY	POMEROY	3	Awaiting Cleanup	EA

Grant

FS ID	SITE NAME	CITY	RANK	STATUS	RU
604	ARCO 5782 PSI 5215	MOSES LAKE	3	Cleanup Complete-Active O&M/Monitoring	EA
607	CENEX BULK PLANT HARVEST STATES MOSES LK	MOSES LAKE	2	Awaiting Cleanup	EA
36396316	COLUMBIA BASIN HATCHERY	MOSES LAKE	3	Cleanup Started	EA
72858424	COUNTRY STORE	MOSES LAKE	4	Construction Complete-Performance Monitoring	EA
100	ELDS LARSON AFB	MOSES LAKE	0▲	Cleanup Started	HQ
603	FULL CIRCLE EPHRATA	EPHRATA	5	Awaiting Cleanup	EA
613	FULL CIRCLE QUINCY	QUINCY	5	Awaiting Cleanup	EA
592	GRANT CNTY EPHRATA LANDFILL 1	EPHRATA	5	Cleanup Started	EA
610	GRANT CNTY PUD 2 LARSON SUBSTATION	MOSES LAKE	3	Awaiting Cleanup	EA
593	GRANT DANGEROUS WASTE SITE	ROYAL CITY	5	Awaiting Cleanup	EA
8773512	HIGHWAY JUNCTION	QUINCY	5	Awaiting Cleanup	EA
595	INTERNATIONAL TITANIUM	MOSES LAKE	4	Awaiting Cleanup	EA
612	MOSES LAKE PORT PUMPHOUSE 1	MOSES LAKE	2	Cleanup Started	EA
106	MOSES LK WF	MOSES LAKE	0▲	Cleanup Started	EP
107	MOSES LK WF SKYLINE	MOSES LAKE	0▲	Cleanup Started	EP
27743798	NICHOLSON DEVELOPMENT PROPERTIES INC	MOSES LAKE	5	Cleanup Started	EA
605	NORTHWEST PIPELINE MOSES LAKE	MOSES LAKE	3	Awaiting Cleanup	EA
54137311	PARK N PAK MOSES LAKE	MOSES LAKE	3	Awaiting Cleanup	EA
606	PMAG PRODUCTS INC MOSES LAKE	MOSES LAKE	5	Cleanup Started	EA
596	PUREGRO QUINCY	QUINCY	5	Awaiting Cleanup	EA
608	PUREGRO WARDEN	WARDEN	4	Awaiting Cleanup	EA
86515682	QUINCY WATERMASTER CAMP	QUINCY	3	Cleanup Started	EA
11193738	US BUREAU OF RECLAMATION	GRAND COULEE	5	Cleanup Started	FA
2602409	WARDEN CITY WATER SUPPLY WELLS 1 & 5	WARDEN	3	Cleanup Started	EA
52332779	WHITNEY DISTRIBUTING CO	MOSES LAKE	1	Awaiting Cleanup	EA

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Hazardous Sites List

SITE REGISTER SPECIAL ISSUE – February 28, 2012

Grays Harbor

FS ID	SITE NAME	CITY	RANK	STATUS	RU
32016722	ANDERSON & MIDDLETON CO	HOQUIAM	5	Awaiting Cleanup	SW
32041272	APEX ENVIRONMENTAL	HOQUIAM	5	Awaiting Cleanup	SW
1121	BERGS MARINE CONSTRUCTION & REPAIR	HOQUIAM	1	Awaiting Cleanup	SW
94656144	BRUMFIELD TWIDWELL	MONTESANO	2	Cleanup Started	SW
1141	CRYSTAL STEAM BATHS	ABERDEEN	5	Awaiting Cleanup	SW
1150	HOWARD MOE ENTERPRISES	HOQUIAM	3	Awaiting Cleanup	SW
1127	HUNGRY WHALE GROCERY	WESTPORT	2	Awaiting Cleanup	SW
1117	MOST WESTERN LAUNDRY	Hoquiam	1	Cleanup Started	SW
8508672	PEDERSON PROPERTY MONTESANO	MONTESANO	1	Cleanup Started	SW
40611701	RO JERICK TIMBER CO	JUNCTION CITY	1	Cleanup Started	SW
1125	RAGNAW MILL	ABERDEEN	1	Construction Complete-Performance Monitoring	SW
94011122	SHERMAN PROPERTY	ABERDEEN	5	Awaiting Cleanup	SW
97133494	TONYS SHORT STOP	MONTESANO	3	Cleanup Started	SW
1128	VIRGIL FOSTER	MONTESANO	1	Awaiting Cleanup	SW
86612164	WHITNEYS CHEVINC	MONTESANO	3	Cleanup Started	SW

Island

FS ID	SITE NAME	CITY	RANK	STATUS	RU
2010	ADAMSON BUILDING	LANGLEY	5	Cleanup Started	NW
2011	DECEPTION BAY MARINA	OAK HARBOR	5	Cleanup Started	NW
38633533	HARBOR AIRLINES INC	OAK HARBOR	3	Awaiting Cleanup	NW
47866617	HOLMES HARBOR RCD & GUN CLUB	LANGLEY	4	Awaiting Cleanup	NW
1367945	HWY 20 & SLEEPER RD	OAK HARBOR	1	Awaiting Cleanup	NW
2006	MELCO MFG TRACT 4	OAK HARBOR	3	Awaiting Cleanup	NW
2007	OAK HARBOR LOEL	OAK HARBOR	2	Awaiting Cleanup	NW
2008	UNOCAL COUPEVILLE BULK PLANT	COUPEVILLE	1	Cleanup Started	NW
136	US NAVY AIR STATION WHIDBEY S ANT AULT	OAK HARBOR	0▲	Cleanup Started	EP
136	US NAVY WHIDBEY HAYES	OAK HARBOR	0▲	Cleanup Started	EP
137	US NAVY WHIDBEY LAKE HANCOCK	OAK HARBOR	1	Cleanup Started	HQ
131	US NAVY WHIDBEY OU1	OAK HARBOR	0▲	Construction Complete-Performance Monitoring	EP
132	US NAVY WHIDBEY OU2	OAK HARBOR	0▲	Cleanup Started	EP
133	US NAVY WHIDBEY OU3	OAK HARBOR	0▲	Cleanup Started	EP
135	US NAVY WHIDBEY OU5	OAK HARBOR	0▲	Cleanup Started	EP
2015	WHIDBEY OIL	CLINTON	5	Awaiting Cleanup	NW
67449332	WHIDBEY PRESS	OAK HARBOR	5	Cleanup Started	NW

Jefferson

FS ID	SITE NAME	CITY	RANK	STATUS	RU
94/2088	ANDERSON PROPERTY OLD HADLOCK RD	PORT HADLOCK	1	Awaiting Cleanup	SW
96488798	BRINNON GENERAL STORE	BRINNON	1	Awaiting Cleanup	SW
1148	CHEVRON BULK PLANT PORT TOWNSEND 1325	PORT TOWNSEND	1	Cleanup Started	SW
3828620	GLEN NEET BUZZYS PROPERTY SCRAP YARD	PORT TOWNSEND	2	Awaiting Cleanup	SW
95275518	IRONDALE IRON & STEEL PLANT FORMER	PORT HADLOCK	1	Cleanup Started	SW
8531264	MOUNT BAKER BLOCK BUILDING	PORT TOWNSEND	3	Awaiting Cleanup	SW
62223845	OLYMPIC WATER & SEWER INC	PORT LUDLOW	2	Awaiting Cleanup	SW
8838918	PENNY SAVER MART	PORT TOWNSEND	1	Cleanup Started	SW
91762839	PORT LUDLOW GOLF COURSE	PORT LUDLOW	3	Awaiting Cleanup	SW
1079161	ROGER BROWN PROPERTY	CHIMACUM	3	Awaiting Cleanup	SW
58526828	US FS QUILCENE AUTO SHOP	QUILCENE	3	Awaiting Cleanup	SW
233	US NAVY PORT HADLOCK	PORT HADLOCK	0◄	Cleanup Started	HQ
77922123	US NAVY PORT HADLOCK AREA 10	PORT HADLOCK	0◄	Construction Complete-Performance Monitoring	HQ
235	US NAVY PORT HADLOCK AREA 10 & 2'	PORT HADLOCK	0◄	Construction Complete-Performance Monitoring	HQ
236	US NAVY PORT HADLOCK AREA 12	PORT HADLOCK	0◄	Construction Complete-Performance Monitoring	HQ
88622324	US NAVY PORT HADLOCK AREA 21	PORT HADLOCK	0◄	Cleanup Started	HQ

King

FS ID	SITE NAME	CITY	RANK	STATUS	RU
2458	1624 BELLEVUE WY SE PROPERTY	BELLEVUE	1	Awaiting Cleanup	NW
2072	8801 E MARGINAL WAY S	TUKWILA	1	Cleanup Started	NW

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Hazardous Sites List

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King

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2404	A1 BRAKE	SEATTLE	3	Awaiting Cleanup	NW
2077	ACE GALVANIZING INC 95TH	SEATTLE	3	Awaiting Cleanup	NW
2586	ACME INTERCITY FREIGHT	SEATTLE	5	Cleanup Started	NW
2078	ACME PLATING WORKS	SEATTLE	5	Awaiting Cleanup	NW
2079	ADVANCE ELECTROPLATING	SEATTLE	5	Cleanup Started	NW
1207016	AESQUIVEL PROPERTY	SEATTLE	4	Awaiting Cleanup	NW
71 63112	AFFORDABLE AUTO WRECKING	SEATTLE	5	Awaiting Cleanup	NW
19237	ARROW METALS CORPORATION	WOODINVILLE	3	Awaiting Cleanup	NW
2087	ASKO PROCESSING INC	SEATTLE	5	Cleanup Started	NW
2432	ASSOCIATED PETROLEUM PRO ENUMCLAW	ENUMCLAW	1	Cleanup Started	NW
2240	AUBURN ABANDONED FIRE STA	AUBURN	3	Cleanup Started	NW
2226	AUBURN SALVAGE & RECYCLING	AUBURN	1	Awaiting Cleanup	NW
19408	AURORA CLEANING MCABEE PROPERTY	SEATTLE	5	Awaiting Cleanup	NW
21436681	AUTO SERVICE COMPANY	SEATTLE	5	Awaiting Cleanup	NW
39484867	B & B PARTNERSHIP AREA RB5	KENT	5	Awaiting Cleanup	NW
8617/1367	BAKKERS BETTER MOTORS	SEATTLE	4	Awaiting Cleanup	NW
2355	BALLARD RECYCLING	SEATTLE	3	Awaiting Cleanup	NW
2330	BALMER YARD BNR	SEATTLE	5	Awaiting Cleanup	NW
b6099498	BANG PROPERTY	WOODINVILLE	3	Awaiting Cleanup	NW
76716221	BARBEE MILL COMPANY	RENTON	3	Awaiting Cleanup	NW
2308	BARDAHL	SEATTLE	2	Awaiting Cleanup	NW
91759215	BELLEVUE WAY DRY CLEANERS	BELLEVUE	3	Awaiting Cleanup	NW
6241773	BNRR SWITCHING YARD CEDAR FALLS	CEDAR FALLS	5	Awaiting Cleanup	NW
2104	BNSF RAILWAY SKYKOMISH FACILITY	SKYKOMISH	1	Cleanup Started	NW
2018	BOEING FABRICATION DIV	AUBURN	3	Cleanup Started	NW
2218	BOEING ISAACSON THOMPSON	TUKWILA	2	Cleanup Started	NW
2725	BOEING NORTHWARD LOT 4	KENT	4	Cleanup Started	NW
2100	BOEING PLANT 2	SEATTLE	1	Cleanup Started	NW
2097	BOEING RENTON	RENTON	1	Cleanup Started	NW
2102	BORDEN CHEMICAL CO	KENT	1	Cleanup Started	NW
2302	BOTHELL SP OIL STATION 11357	BOTHELL	3	Cleanup Started	NW
73975762	BOTHELL LANDING	BOTHELL	2	Cleanup Started	NW
93536765	BOTHELL PAINT & DECORATING	BOTHELL	1	Cleanup Started	NW
b3579169	BOTHELL RIVERSIDE	BOTHELL	2	Cleanup Started	NW
2024	BP WEST COAST PRODUCTS HARBOR ISLAND TER	SEATTLE	0 ▼	Cleanup Started	NW
2251	BRUNDAGE BONE CONCRETE	KENT	3	Cleanup Started	NW
31119679	BRYS AUTO WRECKING	SEATTLE	3	Cleanup Started	NW
2135	BSB DIVERSIFIED CO INC	KENT	1	Awaiting Cleanup	NW
4321912	BSB HEXCEL	KENT	1	Cleanup Started	NW
82663557	BURDIC FEED INC	KENT	5	Awaiting Cleanup	NW
6341214	BURGER KING ELLIOTT AVE	SEATTLE	5	Awaiting Cleanup	NW
2573	BURLINGTON NORTHERN RR AUBURN	AUBURN	1	Awaiting Cleanup	NW
2288	C & F AUTO WRECKING	DUVALL	1	Awaiting Cleanup	NW
2711	CARLOS UNDERCOATING SANDBLAST	SEATAC	3	Awaiting Cleanup	NW
95499698	CASEYS SHELL	ISSAQUAH	1	Cleanup Started	NW
2185	CENTRAL PAINTING	SEATTLE	2	Cleanup Started	NW
2198	CHAMPION INTL BALLARD SED	SEATTLE	1	Cleanup Started	NW
23332719	CHEMCENTRAL SEATTLE	KENT	1	Cleanup Started	NW
2024	CHEVRON BULK PLANT 61002020	GROTTO	3	Awaiting Cleanup	NW
2487	CHS AUBURN	AUBURN	3	Cleanup Started	NW
2022	CIRCLE K STA 1461	SEATTLE	3	Cleanup Started	NW
26208bn4	CLEANING CENTER OF REDMOND	REDMOND	2	Cleanup Complete-Active O&M/Monitoring	NW
77757426	COLEMAN GREOSOTING WORKS	SEATTLE	5	Cleanup Started	NW
2070	CONOCOPHILLIPS RENTON TERMINAL	RENTON	5	Cleanup Started	NW
2586	COVROX INC	KENT	2	Cleanup Started	NW
1940187	CROWLEY MARINE SERVICES INC 8TH AVE S	SEATTLE	2	Cleanup Started	NW
6258254	D-ARBORN CORPORATION CAMPUS GOODWILL	SEATTLE	2	Awaiting Cleanup	NW
2578	DISCOVERY PARK OLD MAINT YD	SEATTLE	5	Awaiting Cleanup	NW
97573251	DOUGLAS MANAGEMENT DOCK	SEATTLE	5	Cleanup Started	NW

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Industrial Section: Paul Skyllingstad (360) 407-6949/T Benson (360) 407-6683
Nuclear Waste Program: John Price (509) 372-7921/Brenda Jentzen (509) [illegible]

Hazardous Sites List

SITE REGISTER SPECIAL ISSUE – February 28, 2012

King

FS ID	SITE NAME	CITY	RANK	STATUS	RU
4007396	DRIVEWAY 1025 S CENTRAL AVE	KENT	3	Awaiting Cleanup	NW
21945588◆	DUWAMISH MARINE CENTER	SEATTLE	1	Cleanup Started	NW
28660714	DUWAMISH RIVER SUP 4	SEATTLE	0▲	Cleanup Started	NW
2071	DUWAMISH SHIPYARD INC	SEATTLE	2	Cleanup Started	NW
2258	EASTERN SUPPLY CO	SEATTLE	2	Construction Complete-Performance Monitoring	NW
2247	ELECTROFINISHING CO	AUBURN	4	Awaiting Cleanup	NW
2015[illegible]18	ELLIOTT BAY BICYCLES	SEATTLE	5	Awaiting Cleanup	NW
2061	EMERALD STEEL INC	SEATTLE	5	Awaiting Cleanup	NW
[illegible]3814	ENGINEERED COATING SYSTEMS	NORTH BEND	1	Awaiting Cleanup	NW
2068	ER & JR SUTTER LLC	SEATTLE	1	Awaiting Cleanup	NW
2088	FELLIS CORP KENT	KENT	1	Cleanup Started	NW
2201	FIRST AVE BRIDGE LANDFILL	SEATTLE	4	Awaiting Cleanup	NW
9898[illegible]678	FISHER PROPERTY	SEATTLE	5	Awaiting Cleanup	NW
2262	FOX AVE BLDG	SEATTLE	1	Cleanup Started	NW
2402	GAGE WESTERN LLC	TUKWILA	3	Cleanup Started	NW
139	GAS WORKS PARK WA NATURAL GAS	SEATTLE	1	Cleanup Started	NW
2522	GENERAL ELECTRIC AVIATION DIV	SEATTLE	2	Cleanup Started	NW
2035	GENERAL TRANSPORT CO 13TH AVE SW	SEATTLE	0▲	Cleanup Started	EP
2388[illegible]883	GLACIER NORTHWEST INC	SEATTLE	1	Cleanup Started	NW
2127	HARBOR AVE LANDFILL	SEATTLE	0▲	Cleanup Started	EP
2021	HARBOR ISLAND	SEATTLE	0▲	Cleanup Started	EP
959871	HARBOR ISLAND EAST WATERWAY	SEATTLE	0▲	Cleanup Started	NW
6788[illegible]948	HARRINGTON BEA... GREENHOUSES	VASHON	2	Awaiting Cleanup	NW
25793782	HERMAN PROPERTY	FEDERAL WAY	1	Awaiting Cleanup	NW
43891387	HOUSE OF KLEEN INC	SEATTLE	3	Awaiting Cleanup	NW
2358	HYDRAULIC REPAIR & DESIGN INC	KENT	3	Awaiting Cleanup	NW
2334	HYLITE MIRROR	SEATTLE	3	Awaiting Cleanup	NW
2154	INDUSTRIAL CONTAINER SERVICES WA LLC	SEATTLE	4	Cleanup Started	NW
2003	INDUSTRIAL OFFICE BOMPLEX	SEATTLE	0▲	Cleanup Started	EP
2133	INDUSTRIAL PLATING CORP	SEATTLE	4	Awaiting Cleanup	NW

King

FS ID	SITE NAME	CITY	RANK	STATUS	RU
2331	INTERBAY DNR	SEATTLE	1	Cleanup Started	NW

King

FS ID	SITE NAME	CITY	RANK	STATUS	RU
2335	INTERSTATE COATINGS	SEATTLE	2	Awaiting Cleanup	NW
2316	ISLAND AUTO WRECKING I	VASHON	3	Awaiting Cleanup	NW
28199267	ISLAND AUTO WRECKING II	VASHON	5	Awaiting Cleanup	NW
15842983	ISSAQUAH SPORTSMEN CLUB 1	ISSAQUAH	3	Awaiting Cleanup	NW
90853403	ISSAQUAH SPORTSMEN CLUB 2	ISSAQUAH	4	Awaiting Cleanup	NW
2451	JAMES OIL CO INC	ENUMCLAW	1	Cleanup Started	NW
89813848	JAPANESE AUTO WRECKING	KENT	2	Awaiting Cleanup	NW
1859184	JC COMMERCIAL PROPERTIES LLC	SEATTLE	5	Awaiting Cleanup	NW
2446	JOHNNYS WRECKING YARD	WOODINVILLE	2	Awaiting Cleanup	NW
2382	JORGENSEN FORGE CORP	SEATTLE	1	Cleanup Started	NW
2163	KELLY MOORE PAINT CO	SEATTLE	5	Cleanup Started	NW
2346	KENMORE INDUSTRIAL PARK AKA LAKEPOINTE DE	KENMORE	1	Cleanup Started	NW
2042	KENT HIGHLANDS LANDFILL	KENT	0▼	Cleanup Complete-Active O&M/Monitoring	NW
88883226	KENT SEWAGE LAGOONS	KENT	4	Cleanup Started	NW
2467	KEVIK CLEANERS	BELLEVUE	4	Awaiting Cleanup	NW
4706	KEY BANK MCABEE PROPERTY	SEATTLE	5	Cleanup Started	NW
88384c23	KINDER MORGAN LIQUIDS TERMINALS LLC	SEATTLE	3	Cleanup Started	NW
85[illegible]47*6	KING CNTY DOT METRO TRANSIT DIV DEARBORN	SEATTLE	3	Cleanup Started	NW
2020	KING CNTY SOLID WST CEDAR HILLS LANDFILL	MAPLE VALLEY	5	Cleanup Started	NW
28866365	KING COUNTY GARAGE	SEATTLE	5	Cleanup Started	NW
2217	KING COUNTY METRO TRANSIT FACILITIES NORTH	SEATTLE	1	Cleanup Started	NW
24128482	KING COUNTY METRO TRANSIT SOUTH BASE	SEATTLE	1	Cleanup Started	NW

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▼ Superfund site: State has lead
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▶ Superfund site: Joint lead
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Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

King

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98455559	KING COUNTY PARKS SUNSET & TUB LAKE DUMP	SEATAC	3	Cleanup Started	NW
2578	KIRKLAND AVE/K ST TRUNK SEWER	KIRKLAND	5	Awaiting Cleanup	NW
2256	L & F FRENCH CLEANERS	SEATTLE	2	Awaiting Cleanup	NW
2370	LAIDLAW	SEATTLE	4	Cleanup Started	NW
2203	LAKE UNION DRY DOCK CO	SEATTLE	2	Awaiting Cleanup	NW
2250	LAKE UNION STEAM PLANT	SEATTLE	5	Awaiting Cleanup	NW
2139	LANDSBURG MINE	RAVENSDALE	1	Cleanup Started	NW
2265	LAURELHURST CLUB	SEATTLE	4	Awaiting Cleanup	NW
95195341	LEMONBUSTERS	SEATTLE	3	Awaiting Cleanup	NW
39341377	LEWISTON HOTEL	SEATTLE	5	Cleanup Started	NW
2147	LIDCO	KENT	1	Cleanup Started	NW
2423	LITTLE ETHELS AUTO WRECKING	SEATTLE	1	Awaiting Cleanup	NW
2226	LONGVIEW FIBRE PAPER & PACKAGING INC	SEATTLE	5	Awaiting Cleanup	NW
1880??	LORA LAKE APARTMENTS	BURIEN	1	Cleanup Started	NW
34824474	LOUDON REAL ESTATE INC	SEATAC	5	Awaiting Cleanup	NW
42927743	LOWER DUWAMISH WATERWAY	SEATTLE	0►	Cleanup Started	NW
2067	MARALCO	KENT	2	Cleanup Started	NW
2216	MARINE VACUUM SERVICE INC	SEATTLE	3	Cleanup Started	NW
84132951	MARSHALL RESIDENCE	RENTON	4	Awaiting Cleanup	NW
91379915	MASTERCRAFT METAL FINISHING INC	SEATTLE	4	Awaiting Cleanup	NW
87719977	MEEKER CLEANERS	KENT	3	Cleanup Started	NW
2148	METAL LAUNDRY INCORPORATED	SEATTLE	2	Cleanup Started	NW
4769327	MICHAELO ESPRESSO INC	SEATTLE	3	Awaiting Cleanup	NW
84422957	MIDWAY MOTORS	DES MOINES	5	Awaiting Cleanup	NW
2380	MIDWAY SEATAC AUTO WRECKING	FEDERAL WAY	5	Awaiting Cleanup	NW
96584198	MIKES QUALITY AUTOMOTIVE	ENUMCLAW	4	Awaiting Cleanup	NW
5288606	MOBIL STATION 19748	SEATTLE	3	Cleanup Started	NW
45297859	MOBILE SERVICES	SEATTLE	4	Awaiting Cleanup	NW
95231135	MOIMOI PROPERTY	SEATTLE	5	Awaiting Cleanup	NW
2047	MONTEREY APARTMENTS SITE	SEATTLE	3	Construction Complete-Performance Monitoring	NW
49807422	NELSON PROPERTY H & R AUTOMOTIVE	AUBURN	4	Awaiting Cleanup	NW
2371	NIEDERLE PROPERTY	FEDERAL WAY	5	Awaiting Cleanup	NW

King

FS ID	SITE NAME	CITY	RANK	STATUS	RU
2026	NON FERROUS METALS INC	SEATTLE	3▲	Cleanup Started	EP

King

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2050	NORTH BOEING FIELD GEORGETOWN STEAMPLANT	SEATTLE	5	Cleanup Started	NW
23843622	NORTH LAKE SHIPYARD INC	SEATTLE	4	Cleanup Started	NW
2380	NORTHWEST PIPELINE COVINGTON MS	COVINGTON	3	Cleanup Started	NW
2395	NORTHWEST PIPELINE ENUMCLAW BLOCKLEY MS	AUBURN	2	Cleanup Started	NW
2393	NORTHWEST PIPELINE ISSAQUAH	ISSAQUAH	3	Awaiting Cleanup	NW
2382	NORTHWEST PIPELINE SEATTLE	RENTON	3	Cleanup Started	NW
2332	NORTHWEST POWDER COATS	KENT	3	Cleanup Started	NW
2234	NW MARKET ST SITE	SEATTLE	5	Cleanup Started	NW
2261	OLD LAWSON RD	BLACK DIAMOND	1	Awaiting Cleanup	NW
2412	OLYMPIAN APARTMENT BLDG	SEATTLE	4	Awaiting Cleanup	NW
2401	OLYMPIC PIPELINE CO KENT	KENT	2	Awaiting Cleanup	NW
2400	OLYMPIC PIPELINE CO RENTON STATION	RENTON	2	Awaiting Cleanup	NW
2219	OLYMPIC STEAMSHIP CO INC	KENT	3	Cleanup Started	NW
8427	OVERLAKE CLEANERS	REDMOND	1	Cleanup Started	NW
2159	PACE NATIONAL	KIRKLAND	2	Cleanup Started	NW
2085	PACIFIC CAR & FOUNDRY CO	RENTON	0▼	Construction Complete-Performance Monitoring	NW
2023	PACIFIC MOLASSES CO PM AG PRODUCTS SEA	SEATTLE	0▲	Cleanup Started	EP
42788998	PALMER COKING COAL CO MORGAN KAME	BLACK DIAMOND	3	Awaiting Cleanup	NW
2700	PARAMOUNT OF WASHINGTON	SEATTLE	3	Awaiting Cleanup	NW
2591	PEASLEY CANYON OLD GAS STN	AUBURN	4	Awaiting Cleanup	NW

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Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

King

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71868277	PENSKE TRUCK LEASING CO LP SEATTLE 1ST	SEATTLE	5	Cleanup Started	NW
48646653	PIER 1	SEATTLE	2	Awaiting Cleanup	NW
2161	PIONEER ENAMEL MANUFACTURE	SEATTLE	4	Awaiting Cleanup	NW
1948927	PLASTIC SALES & SERVICE	SEATTLE	2	Cleanup Started	NW
11118	PLAZA ONE HOUR CLEANERS MCABEE PROPERTY	SEATTLE	5	Awaiting Cleanup	NW
2177	PORT OF SEATTLE N TERMINAL 115	SEATTLE	5	Cleanup Started	NW
2056	PRECISION ENGINEERING INC	SEATTLE	1	Cleanup Started	NW
46659536	QUEEN ANNE PROPERTIES MERCER ST	SEATTLE	2	Awaiting Cleanup	NW
245	QUEEN CITY FARMS	MAPLE VALLEY	0▲	Cleanup Started	EP
140	QUEEN CITY FARMS A	ISSAQUAH	0▲	Cleanup Started	EP
144	QUEEN CITY FARMS A 4 TEK	ISSAQUAH	0▲	Cleanup Started	EP
143	QUEEN CITY FARMS A BURIED DRUM	ISSAQUAH	0▲	Cleanup Started	EP
142	QUEEN CITY FARMS A IRM	ISSAQUAH	0▲	Cleanup Started	EP
141	QUEEN CITY FARMS B	ISSAQUAH	0▲	Cleanup Started	EP
2045	QUENDALL TERMINALS	RENTON	0▲	Cleanup Started	EP
88987973	RAINIER MALL	SEATTLE	5	Awaiting Cleanup	NW
82838425	RAINIER PRECISION LLC	SEATTLE	5	Awaiting Cleanup	NW
2312	RALPHS CONCRETE PUMPING	SEATTLE	3	Awaiting Cleanup	NW
8964755	RALPHS CONCRETE PUMPING VACANT LOT	SEATTLE	3	Awaiting Cleanup	NW
2188	RAVENNA LANDFILL UNION BAY	SEATTLE	4	Awaiting Cleanup	NW
7706588	RON & JERRYS ICE CREAM FORMER	SEATTLE	5	Awaiting Cleanup	NW
2228	ROSE HILL PLAZA	KIRKLAND	4	Awaiting Cleanup	NW
2502	S & S ENTERPRISES	MAPLE VALLEY	4	Awaiting Cleanup	NW
2333	S 252ND ST PACIFIC HWY S	KENT	4	Awaiting Cleanup	NW
3146354	SAFFORD PROPERTY	RAVENSDALE	4	Awaiting Cleanup	NW
2444	SALMON BAY STEEL BALLARD	SEATTLE	5	Cleanup Started	NW
41667164	SAMIS COMPANY PROPERTY	SEATTLE	4	Cleanup Started	NW
2229	SAMIS LAND CO SITE	SEATTLE	5	Awaiting Cleanup	NW
2038	SEAFAB METAL SURFACE IMPOUNDMENT	SEATTLE	0▲	Cleanup Started	EP
2037	SEAFAB METALS CO	SEATTLE	0▲	Cleanup Started	EP
6495599	SEATAC SWEEPING SERVICES & NOLL MFG	KENT	5	Cleanup Started	NW
2307	SEATTLE BARREL & COOPERAGE	SEATTLE	4	Awaiting Cleanup	NW
16777876	SEATTLE CITY LIGHT 4TH AVE S	SEATTLE	5	Awaiting Cleanup	NW
2171	SEATTLE CITY LIGHT SOUTH SERVICE CENTER	SEATTLE	5	Cleanup Started	NW
2027	SEATTLE IRON & METALS MAIN YRD	SEATTLE	0▲	Cleanup Started	EP
2025	SEATTLE PORT LECKENBY CO	SEATTLE	0▲	Cleanup Started	EP
2202	SEATTLE PORT TERMINAL 117	SEATTLE	1	Cleanup Started	NW
24768	SEATTLE PORT TERMINAL 91	SEATTLE	1	Cleanup Started	NW
2043	SEATTLE PUBLIC UTILITIES MIDWAY LANDFILL	KENT	0▼	Cleanup Started	NW
2376	SEATTLE PUBLIC UTILITIES OPERATIONS CTR	SEATTLE	5	Awaiting Cleanup	NW
2244	SEATTLE STEAM CO POST AV	SEATTLE	5	Awaiting Cleanup	NW
2243	SEATTLE STEAM CO WESTERN AV	SEATTLE	5	Cleanup Started	NW
2110	SEATTLE TECHNICAL FINISHING INC	SEATTLE	5	Awaiting Cleanup	NW
8499	SHELL CHRISTENSEN RAILROAD ST	ENUMCLAW	3	Awaiting Cleanup	NW
2030	SHELL OIL PRODUCTS HARBOR ISLAND TERMINAL	SEATTLE	0▼	Cleanup Started	NW
2028	SHELL OLD TERM 18 PORT OF SEATTLE	SEATTLE	5	Cleanup Started	EP
44228651	SISCHO PROPERTY	MAPLE VALLEY	3	Awaiting Cleanup	NW
69144423	SKIPS TIRE CTR	BOTHELL	5	Awaiting Cleanup	NW
63051958	SKY HARBOR AVIATION	RENTON	5	Awaiting Cleanup	NW
2270	SLAG DISPOSAL BECKWITH PROPRTY	KENT	3	Cleanup Started	NW
74731271	SMI INC TRUST	SEATTLE	4	Awaiting Cleanup	NW
2180	SOUTH PARK LANDFILL	SEATTLE	2	Cleanup Started	NW
36832998	SPARKS TUNEUP	SEATTLE	5	Awaiting Cleanup	NW
2366	SPEAR TRUSTS WHSE	SEATTLE	5	Awaiting Cleanup	NW
2057	STERNOFF METALS	SEATTLE	5	Awaiting Cleanup	NW
2196	STERNOFF METALS CORPORATION	RENTON	1	Cleanup Started	NW
2596	STONE PROPERTY 55TH AV	SEATTLE	5	Awaiting Cleanup	NW
62154765	STOUGHTON ESTATE PROPERTY	SEATTLE	5	Awaiting Cleanup	NW
76131767	SUNSET PARK	SEATAC	3	Cleanup Started	NW

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Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

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2388	SW HARBOR PROJ LOCKHEED YD 2	SEATTLE	1	Cleanup Started	NW
66948686	TACOMA SMELTER PLUME KING COUNTY		0 ▶◀	Cleanup Started	SW
2501	TD AUTO BODY & REPAIR	SEATTLE	3	Awaiting Cleanup	NW
2352	TIKI CAR WASH	BELLEVUE	3	Cleanup Started	NW
2031	TODD PACIFIC SHIPYARDS	SEATTLE	0 ▲	Cleanup Started	EP
2187	TYEE LUMBER & MFG	AUBURN	2	Awaiting Cleanup	NW
2533	UCO CORPORATION	REDMOND	5	Awaiting Cleanup	NW
379891	ULTRA CUSTOM CARE CLEANERS	BOTHELL	3	Awaiting Cleanup	NW
2060	UNION STATION SITE	SEATTLE	3	Construction Complete-Performance Monitoring	NW
2191	UNIVERSAL MFG CORP	WOODINVILLE	3	Cleanup Started	NW
59972834	UNOCAL 306568	Seattle	5	Cleanup Started	NW
2210	UNOCAL SEATTLE MARKET LOWER	SEATTLE	4	Cleanup Started	NW
2208	UNOCAL SEATTLE MARKETING TERM	SEATTLE	4	Cleanup Started	NW
6136999	UPTOWN BAKERY FORMER	SEATTLE	5	Cleanup Started	NW
8775242	USF REDDAWAY INC KENT	KENT	3	Cleanup Started	NW
2032	VALUE PLATING & METAL POL	SEATTLE	0 ▲	Cleanup Started	EP
6319811	VASHON ATHLETIC CLUB	VASHON	3	Cleanup Started	NW
5919773	WA DOT RIGHT OF WAY ISSAQUAH 17TH AVE	ISSAQUAH	2	Awaiting Cleanup	NW
6305156	WA DOT S DEARBORN	SEATTLE	5	Awaiting Cleanup	NW
1491930	WA UW BIOENGINEERING	SEATTLE	5	Awaiting Cleanup	NW
2425	WASTE MANAGEMENT OF SEATTLE	SEATTLE	5	Awaiting Cleanup	NW
2194	WESMAR COMPANY INC	SEATTLE	5	Cleanup Started	NW
12494	WEST COAST EQUIPMENT 2	SEATTLE	3	Cleanup Started	NW
145	WESTERN PROCESSING	KENT	0 ▼	Construction Complete-Performance Monitoring	HQ
2039	WEYERHAEUSER LAB	SEATTLE	0 ▲	Cleanup Started	EP
146	WYCOFF CO WEST SEATTLE	SEATTLE	0 ▲	Cleanup Started	EP
2283	WYMAN PROPERTY	SEATTLE	4	Awaiting Cleanup	NW

Kitsap

FS ID	SITE NAME	CITY	RANK	STATUS	RU
2620	ACE PAVING MAINTENANCE SHOP	SILVERDALE	3	Awaiting Cleanup	NW
2646	AIRPORT AUTO WRECKING I	PORT ORCHARD	2	Awaiting Cleanup	NW
34492328	AIRPORT AUTO WRECKING II	PORT ORCHARD	1	Awaiting Cleanup	NW
2644	ALS AUTO REPAIR	PORT ORCHARD	3	Awaiting Cleanup	NW
15438	BAINBRIDGE ISLAND CITY STRAWBERRY PLANT	BAINBRIDGE ISLANI	2	Cleanup Started	NW
2602	BAINBRIDGE ISLAND LANDFILL	BAINBRIDGE ISLANI	1	Cleanup Complete-Active O&M/Monitoring	NW
28793889	BAYSIDE GROCERY	PORT ORCHARD	3	Cleanup Started	NW
6189085	BODINE PROPERTY	BREMERTON	5	Awaiting Cleanup	NW
85394644	BOWMAN OIL SPILL	PORT ORCHARD	1	Cleanup Started	NW
3812	BREM AIR DISPOSAL INC	BREMERTON	1	Cleanup Started	NW
62752314	BREMERTON AUTO WRECKING LANDFILL	PORT ORCHARD	1	Awaiting Cleanup	NW
2652	BREMERTON SCHOOL DIST HADDON	BREMERTON	5	Awaiting Cleanup	NW
2631	CHEVRON BULK PLANT POULSBO	POULSBO	3	Cleanup Started	NW
82612478◆	**CHEVRON STATION 91253**	**PORT ORCHARD**	**3**	Cleanup Started	**NW**
2618	CHEVRON TANK FARM PORT WA NAR	BREMERTON	2	Cleanup Started	HQ
96325489	CHEVRON USA INC SS 200425	BAINBRIDGE ISLANI	2	Cleanup Started	NW
9475242	CITY HAND LAUNDRY	BREMERTON	5	Cleanup Started	NW
2604	CONSTITUTION AVE LANDFILL	BREMERTON	5	Awaiting Cleanup	NW
2610	COUNTRY JUNCTION STORE	PORT ORCHARD	4	Construction Complete-Performance Monitoring	NW
2611	DAY ROAD INDUSTRIAL PARK	BAINBRIDGE ISLANI	2	Awaiting Cleanup	NW
13984	DENO PROPERTY	BREMERTON	1	Awaiting Cleanup	NW
151	EAGLE HARBOR	BAINBRIDGE ISLANI	0 ▼	Cleanup Started	HQ
153	EAGLE HARBOR E	BAINBRIDGE ISLANI	0 ▼	Construction Complete-Performance Monitoring	HQ
154	EAGLE HARBOR W	BAINBRIDGE ISLANI	0 ▲	Cleanup Started	EP
152	EAGLE HARBOR WYCKOFF	BAINBRIDGE ISLANI	0 ▼	Cleanup Started	HQ
155	EAGLE HARBOR WYCKOFF GW	BAINBRIDGE ISLANI	0 ▼	Cleanup Started	HQ
2645	EVERGREEN PARK BREMERTON	BREMERTON	5	Cleanup Started	HQ
4271824	EYER PROPERTY	KINGSTON	1	Awaiting Cleanup	NW
8553957	FILE PROPERTY	PORT ORCHARD	5	Cleanup Started	NW

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Kitsap

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2614	FRED MEYER STORES INC	PORT ORCHARD	3	Cleanup Started	NW
42271459	GORST GAS MART	BREMERTON	3	Cleanup Started	NW
2621	HANSVILLE GENERAL STORE	HANSVILLE	3	Cleanup Started	NW
2605	HANSVILLE LANDFILL	HANSVILLE	1	Cleanup Started	NW
31393863	HEAD OF BAY	BREMERTON	2	Awaiting Cleanup	NW
43665575	HOLLY DUMP	BREMERTON	5	Awaiting Cleanup	NW
67245984	HOUGHTON PROPERTY	PORT ORCHARD	1	Awaiting Cleanup	NW
25581397	HOWERTON SILVERDALE LANDFILL	SILVERDALE	2	Awaiting Cleanup	NW
41936412	INDIANOLA DUMP	KINGSTON	3	Awaiting Cleanup	NW
15195348	KEYPORT MERCANTILE	KEYPORT	3	Cleanup Started	NW
99437267	KITSAP CO CONSOLIDATED HOUSING AUTHORITY	Bremerton	5	Awaiting Cleanup	NW
50996873	KITSAP COUNTY SILVERDALE LANDFILL	SILVERDALE	3	Awaiting Cleanup	NW
7265377	KITSAP SENIOR CENTER	BREMERTON	5	Cleanup Started	NW
9387868	KITSAP TRANSIT CLOCK TOWER AREA BTC-2	BREMERTON	5	Awaiting Cleanup	NW
7071317	KITSAP TRANSIT GRAINGER FITZ ENETAI	BREMERTON	3	Cleanup Started	NW
1087615	KITSAP TRANSIT TRANSPORTATION CENTER	BREMERTON	5	Cleanup Started	NW
2638	LAMBERTS RADIATOR SHOP	BREMERTON	1	Awaiting Cleanup	NW
2623	LOFTHUS BULK PLANT	BREMERTON	1	Cleanup Complete-Active O&M/Monitoring	NW
3804318	LYNWOOD CENTER CORNER	BAINBRIDGE ISLANI	2	Cleanup Started	NW
44882172	MADISON AVE S & PARFITT WY SW SITE	BAINBRIDGE ISLANI	5	Awaiting Cleanup	NW
7846890	MCINTOSH PROPERTY	PORT ORCHARD	3	Awaiting Cleanup	NW
85668255	MIDAS SILVERDALE	SILVERDALE	5	Cleanup Started	NW
3675862	MITCHELL AVE PROJECT	PORT ORCHARD	3	Awaiting Cleanup	NW
1436359	NEWMANS CHEVRON	BREMERTON	5	Cleanup Started	NW

Kitsap

322

FS ID	SITE NAME	CITY	RANK	STATUS	RU
61317581◆	NORGE EQUIPPED CLEANING VILLAGE STORE	BAINBRIDGE ISLAN	2	Cleanup Started	NW

Kitsap

FS ID	SITE NAME	CITY	RANK	STATUS	RU
7057711	OLALLA LANDFILL	OLALLA	3	Awaiting Cleanup	NW
2641	OLD BREMERTON GASWORKS & SESKO PROPERT	BREMERTON	1	Cleanup Started	EP
79649975	OLYMPIC VIEW SANITARY LANDFILL	PORT ORCHARD	1	Cleanup Started	NW
28884893	PARK AVENUE CLEANERS	BREMERTON	3	Cleanup Started	NW
3122819	PEDERSON OIL SITE	BREMERTON	4	Cleanup Started	NW
7185727	PIDDUCK PROPERTY	BREMERTON	5	Awaiting Cleanup	NW
97682663	PIONEER LANDFILL	GORST	2	Cleanup Started	NW
93937775	POPE & TALBOT INC SAWMILL	PORT GAMBLE	2	Cleanup Started	HQ
18424111	PORT ORCHARD CITY PUBLIC WKS	PORT ORCHARD	3	Cleanup Started	NW
91215766	PORT ORCHARD LANDFILL	PORT ORCHARD	4	Awaiting Cleanup	NW
2634	POULSBO YACHT CLUB	POULSBO	5	Awaiting Cleanup	NW
90875824	RK MART	SILVERDALE	5	Cleanup Started	NW
5011980	ROBINSON PROPERTY	BREMERTON	5	Awaiting Cleanup	NW
2601	RONS AUTO WRECKING	PORT ORCHARD	3	Cleanup Started	NW
549994	ROUSE PROPERTY	KINGSTON	1	Awaiting Cleanup	NW
6865393	SEITZ PROPERTY	SILVERDALE	2	Awaiting Cleanup	NW
7813681	SIEGEL PROPERTY	BREMERTON	3	Awaiting Cleanup	NW
44784977	SKIRVING DUMP	BREMERTON	2	Awaiting Cleanup	NW
9184225	SPAIN PROPERTY	PORT ORCHARD	1	Awaiting Cleanup	NW
4264138	STUTZ FUEL OIL	BREMERTON	2	Awaiting Cleanup	NW
28366276	TEMPLETON CHARLESTON BEACH	BREMERTON	3	Cleanup Started	NW
26595127	TOSCO BAINBRIDGE ISLAND BULK PLANT 1784	BAINBRIDGE ISLANI	2	Awaiting Cleanup	NW
16164764	TRASK PROPERTY	KINGSTON	4	Awaiting Cleanup	NW
83695458	UNOCAL STATION 0606	BREMERTON	3	Cleanup Started	NW
46126151	UNOCAL STATION 4388	BAINBRIDGE ISLANI	2	Cleanup Started	NW
2603	US NAVY CAMP WESLEY HARRIS	WILDCAT LAKE	2	Awaiting Cleanup	NW
172	US NAVY JACKSON PARK	BREMERTON	0◄	Cleanup Started	EP
174	US NAVY JACKSON PARK OU 1	BREMERTON	0◄	Cleanup Started	EP

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Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

Kitsap

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173	US NAVY JACKSON PARK OU 2	BREMERTON	0◄	Cleanup Started	EP
77422856	US NAVY JACKSON PARK OU 3	BREMERTON	0◄	Cleanup Started	EP
157	US NAVY KEYPORT	KEYPORT	0◄	Cleanup Started	HQ
158	US NAVY KEYPORT OU1	KEYPORT	0◄	Construction Complete-Performance Monitoring	HQ
159	US NAVY KEYPORT OU2	KEYPORT	0◄	Construction Complete-Performance Monitoring	HQ
175	US NAVY PSNS	BREMERTON	0◄	Cleanup Started	HQ
182	US NAVY PSNS OU NSC	BREMERTON	0◄	Construction Complete-Performance Monitoring	HQ
176	US NAVY PSNS OUA	BREMERTON	0◄	Construction Complete-Performance Monitoring	HQ
177	US NAVY PSNS OUB	BREMERTON	0◄	Cleanup Started	HQ
179	US NAVY PSNS OUB IA106	BREMERTON	0◄	Cleanup Complete-Active O&M/Monitoring	HQ
178	US NAVY PSNS OUC	BREMERTON	0◄	Construction Complete-Performance Monitoring	HQ
160	US NAVY SUBASE	SILVERDALE	0◄	Cleanup Started	HQ
161	US NAVY SUBASE OU1 ORD DISP	SILVERDALE	0◄	Construction Complete-Performance Monitoring	HQ
162	US NAVY SUBASE OU2	SILVERDALE	0◄	Construction Complete-Performance Monitoring	HQ
163	US NAVY SUBASE OU3	SILVERDALE	0◄	Cleanup Complete-Active O&M/Monitoring	HQ
167	US NAVY SUBASE OU7	SILVERDALE	0◄	Construction Complete-Performance Monitoring	HQ
168	US NAVY SUBASE OU8	SILVERDALE	0◄	Cleanup Started	HQ
2635	VETERANS HOME	RETSIL	5	Cleanup Started	NW
32577956	VICTORY STATION LANDFILL	PORT ORCHARD	4	Awaiting Cleanup	NW
2625	VIKING PLATING	KINGSTON	2	Awaiting Cleanup	NW
95937982	VIP LANDFILL	BREMERTON	3	Cleanup Started	NW
25425751	VOCKRODT DUMP	BREMERTON	4	Cleanup Started	NW
183	WA ECY MANCHESTER LAB	PORT ORCHARD	0◄	Cleanup Started	HQ
26185147	WILKINS DISTRIBUTING CO INC	PORT ORCHARD	4	Cleanup Started	NW
28682498	WINSLOW WAY W & MADISON AVE N SITE	BAINBRIDGE ISLANI	5	Awaiting Cleanup	NW
2628	WOLF PROPERTY	PORT ORCHARD	4	Awaiting Cleanup	NW
12465742	ZINK DUMP	PORT ORCHARD	5	Awaiting Cleanup	NW

Kittitas

FS ID	SITE NAME	CITY	RANK	STATUS	RU
387	115 MINI MART	KITTITAS	3	Awaiting Cleanup	CE
7678948 ❖	B & G SERVICE	CLE ELUM	3	Awaiting Cleanup	CE
386	BIG B MINI MART	ELLENSBURG	3	Awaiting Cleanup	CE
388	BINGO FUEL STOP	THORP	2	Cleanup Complete-Active O&M/Monitoring	CE
64886528	CB GENERAL STORE & SERVICES	EASTON	5	Awaiting Cleanup	CE
390	CLE ELUM CITY	CLE ELUM	3	Awaiting Cleanup	CE
398	DEVERE BULK PLANT	CLE ELUM	5	Cleanup Started	CE
8473478	FALTUS & THOMAS PROPERTIES	ELLENSBURG	5	Awaiting Cleanup	CE
394	FLYING J TRUCK STOP BROADWAY	ELLENSBURG	4	Cleanup Started	CE
3892	KENS AUTO WASH II	ELLENSBURG	2	Cleanup Started	CE

Kittitas

FS ID	SITE NAME	CITY	RANK	STATUS	RU
382	RYEGRASS LANDFILL	ELLENSBURG	4	Cleanup Started	CE

Kittitas

FS ID	SITE NAME	CITY	RANK	STATUS	RU
92387155	SIMPSONS TEXACO	CLE ELUM	5	Cleanup Started	CE
12832256	SMITH KEM ELLENSBURG INC	ELLENSBURG	3	Awaiting Cleanup	CE
77133953❖	SPORTLAND MINI MART	CLE ELUM	3	Awaiting Cleanup	CE
401	STOREY GAS STATION	CLE ELUM	1	Construction Complete-Performance Monitoring	CE
47245321❖	WARD RUGH INC	ELLENSBURG	2	Awaiting Cleanup	CE

Klickitat

FS ID	SITE NAME	CITY	RANK	STATUS	RU
1625461	BNSF TRACK SWITCHING FACILITY	WISHRAM	3	Awaiting Cleanup	CE
81593498	COLUMBUS SQUARE	GOLDENDALE	5	Awaiting Cleanup	CE
25272858	GOLDENDALE GLASS	GOLDENDALE	5	Awaiting Cleanup	CE
28537434	HUNSAKER OIL COMPANY INC BINGEN	BINGEN	5	Awaiting Cleanup	CE

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Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

Klickitat

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14585311	JD HATTENHAUER DISTRIBUTING	GOLDENDALE	5	Awaiting Cleanup	CE
35691825	KLICKITAT CNTY ROAD DEPT	GOLDENDALE	3	Awaiting Cleanup	CE
32313865	KLICKITAT VALLEY SAWMILLS INC	KLICKITAT	2	Cleanup Complete-Active O&M/Monitoring	CE
94186268	RECYCLED ALUMINUM METALS CO	DALLESPORT	2	Cleanup Started	CE
403	TOWN PUMP GAS STATION	WHITE SALMON	1	Cleanup Started	CE
61834259	UNOCAL BULK PLANT 0046	BINGEN	3	Awaiting Cleanup	CE

Lewis

FS ID	SITE NAME	CITY	RANK	STATUS	RU
9756779	119 MAW RD	TOLEDO	5	Awaiting Cleanup	SW
5879082	901 S MAIN ST VADER	VADER	4	Awaiting Cleanup	SW
208	AMERICAN CROSSARM & CONDUIT	CHEHALIS	0	Cleanup Complete-Active O&M/Monitoring	SW
1174	BP SERVICE STATION	CHEHALIS	5	Cleanup Started	SW
1154	CENTRALIA LANDFILL	CENTRALIA	0	Cleanup Complete-Active O&M/Monitoring	SW
1165	CHEHALIS AIRPORT	CHEHALIS	5	Cleanup Started	SW
17551864	CHEVRON 96942	CENTRALIA	3	Cleanup Started	SW
1166	COWLITZ FOOD & FUEL	TOLEDO	2	Cleanup Started	SW
1177	CUMMINGS OIL	CENTRALIA	1	Awaiting Cleanup	SW
1171	EXTINE PETROLEUM	ONALASKA	5	Awaiting Cleanup	SW
1161	GRANGE SUPPLY CHEHALIS CENEX	CHEHALIS	1	Cleanup Started	SW
7504507	GRASSERS AUTO WRECKING	CENTRALIA	5	Awaiting Cleanup	SW
17473	HAMILTON LABREE RD PCE	CHEHALIS	0 ▲	Cleanup Started	EP
1180	JOHN H HARLAND CO	CENTRALIA	5	Cleanup Started	SW
1172	KMART 7331	CHEHALIS	5	Awaiting Cleanup	SW
1307167	LOGSTACKERS UNLIMITED INC	TOLEDO	4	Awaiting Cleanup	SW
1164	MALARZ FARM	WINLOCK	4	Awaiting Cleanup	SW
67518592	MAYFIELD 76	SILVER CREEK	5	Cleanup Started	SW
9207593	NOW TRUCK STOP	CHEHALIS	5	Awaiting Cleanup	SW
8202906	OLD GAS STATION MINERAL WA	MINERAL	3	Awaiting Cleanup	SW
8697809	OLD MINING SITE	TOLEDO	5	Awaiting Cleanup	SW
8736	PACIFIC NORTH EQUIPMENT CO	CHEHALIS	5	Awaiting Cleanup	SW
1156	PACKWOOD LUMBER COMPANY	PACKWOOD	4	Awaiting Cleanup	SW
1168	REA CONSTRUCTION	RANDLE	5	Awaiting Cleanup	SW
5706820	TIM BOWERS PROPERTY	WINLOCK	5	Awaiting Cleanup	SW
1169	TRAILER VILLAGE	CENTRALIA	2	Cleanup Complete-Active O&M/Monitoring	SW
1160	UTILITY TRANSFORMER SERVICE	PE ELL	3	Awaiting Cleanup	SW
608504	WEYERHAEUSER CENTRALIA PROPERTY	CENTRALIA	2	Awaiting Cleanup	SW

Lincoln

FS ID	SITE NAME	CITY	RANK	STATUS	RU
4345215	CROP PRODUCTION SERVICES DAVENPORT	DAVENPORT	3	Cleanup Started	EA
61231494	CROP PRODUCTION SERVICES INC ALMIRA	ALMIRA	5	Awaiting Cleanup	EA
72286338	FUDS FAIRCHILD ATLAS S8	DAVENPORT	5	Cleanup Started	HQ
622	PUREGRO WILBUR	WILBUR	5	Awaiting Cleanup	EA
8112045	REARDAN GAS STATION	REARDAN	4	Awaiting Cleanup	EA
7096	SOUTH WILBUR PETROLEUM SITE	WILBUR	1	Construction Complete-Performance Monitoring	EA
625	VAUGHN DISTRIBUTING	WILBUR	5	Awaiting Cleanup	EA
32966245	WESTERN FARM SERVICE INC REARDAN RR	REARDAN	3	Cleanup Started	EA

Mason

FS ID	SITE NAME	CITY	RANK	STATUS	RU
1185	GOOSE LAKE	SHELTON	2	Cleanup Started	SW
92248581	GRAPEVIEW COUNTRY STORE	GRAPEVIEW	3	Cleanup Started	SW
7638537	MASON CNTY SALVAGE YARD	SHELTON	3	Awaiting Cleanup	SW
1187	PORT OF SHELTON ALL STAR AERO	SHELTON	4	Cleanup Started	SW
65663568	SHELTON LAUNDRY & CLEANERS	SHELTON	2	Cleanup Started	SW
1190	SPIKES HYDRAULIC	SHELTON	3	Awaiting Cleanup	SW

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Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

Okanogan

FS ID	SITE NAME	CITY	RANK	STATUS	RU
412	ALDER MILL	TWISP	1	Cleanup Started	CE
7414013	ALICE MINE	NIGHTHAWK	2	Awaiting Cleanup	CE
1163525	ANTIMONY QUEEN MINE	CARLTON	1	Awaiting Cleanup	CE
419	ARDENS STORE	MALOTT	3	Cleanup Started	CE
3523589	BLACK BEAR MINE	LOOMIS	4	Awaiting Cleanup	CE
421	BRETT PIT	COULEE DAM	2	Cleanup Started	CE
4244872	BROOK MINE	OMAK	2	Awaiting Cleanup	CE
436	COCA COLA DISTRIBUTION CO	OMAK	2	Cleanup Started	CE
54988827	CONCONULLY GENERAL STORE	CONCONULLY	5	Awaiting Cleanup	CE
622966	COPPER WORLD EXTENSION MINE	LOOMIS	3	Awaiting Cleanup	CE
54563171	DALES TEXACO OROVILLE	OROVILLE	3	Awaiting Cleanup	CE
5284346	FOUR METALS MINE	NIGHTHAWK	3	Awaiting Cleanup	CE
8506296	KINGS PACIFIC PRIDE	TWISP	3	Awaiting Cleanup	CE
7873712	LEONARD JUDD PROPERTY	OKANOGAN	5	Awaiting Cleanup	CE
439	LLOYD LOGGING EQUIPMENT YARD	TWISP	5	Awaiting Cleanup	CE
440	LLOYDS LOGGING EXC SOIL	TWISP	5	Awaiting Cleanup	CE
426	MINNIE MINE	CARLTON	2	Cleanup Started	CE
422	MOLSON DUMP	MOLSON	5	Awaiting Cleanup	CE
67329718	MONTANYE PROPERTY	TONASKET	4	Awaiting Cleanup	CE
21391393	OMAK GULL 611	OMAK	2	Awaiting Cleanup	CE
423	QUICK MART	OROVILLE	2	Cleanup Started	CE
55648558	RED SHIRT MILL	TWISP	1	Construction Complete-Performance Monitoring	CE
7470699	RICHARD REED PROPERTY	OROVILLE	5	Awaiting Cleanup	CE
3405693	RUBY MINE	NIGHTHAWK	2	Awaiting Cleanup	CE
5672082	◆ **SHERIDAN MINE**	**WAUCONDA**	**4**	Awaiting Cleanup	**CE**
101	SILVER MOUNTAIN MINE	LOOMIS	0 ▲	Construction Complete-Performance Monitoring	EP
2210257	◆ **SPOKANE MINE**	**OROVILLE**	**4**	Awaiting Cleanup	**CE**
5409	TAPLETT FARMS	Omak	4	Awaiting Cleanup	CE
420	TONASKET POST & RAIL	TONASKET	5	Awaiting Cleanup	CE
1856824	TRIUNE MINE	OROVILLE	1	Awaiting Cleanup	CE
416	US DOI BLM KAABA TEXAS MINE	NIGHTHAWK	1	Cleanup Complete-Active O&M/Monitoring	CE
8523225	VIRGINIA HOUSER PROPERTY	OKANOGAN	5	Awaiting Cleanup	CE

Pacific

FS ID	SITE NAME	CITY	RANK	STATUS	RU
6735391	ANDYS SALMON CHARTERS	ILWACO	4	Awaiting Cleanup	SW
36791325	ILWACO PORT LYLES CANNERY	ILWACO	5	Cleanup Started	SW
6728892	LAIRD PROPERTY	RAYMOND	5	Awaiting Cleanup	SW
3063964	OYSTERVILLE STORE	OYSTERVILLE	4	Awaiting Cleanup	SW
1197	PART TIME AUTO WRECKING	ILWACO	4	Awaiting Cleanup	SW
62771479	TETZ OIL RAYMOND DOT	RAYMOND	5	Cleanup Started	SW
31518862	TETZ OIL SOUTH BEND	SOUTH BEND	5	Awaiting Cleanup	SW
84721374	TOSCO BULK PLANT 0296	ILWACO	5	Cleanup Started	SW
25108	TURNER & SON INC	RAYMOND	3	Cleanup Started	SW
97796553	WA DOT PARCEL 4 02221	SOUTH BEND	5	Awaiting Cleanup	SW
78567384	WA DOT PARCEL 4 02258	RAYMOND	5	Awaiting Cleanup	SW

Pend Oreille

FS ID	SITE NAME	CITY	RANK	STATUS	RU
626	CUSICK SCHOOL DISTRICT	CUSICK	3	Cleanup Started	EA
76475815	USK GENERAL STORE	USK	4	Cleanup Started	EA

Pierce

FS ID	SITE NAME	CITY	RANK	STATUS	RU
84471944	1 2 & 0 CLEANERS	PUYALLUP	3	Cleanup Started	SW
1213	1913 MARINE VIEW DR	TACOMA	2	Cleanup Started	SW
30005	1920 PORT OF TACOMA ROAD TACOMA	TACOMA	5	Cleanup Started	SW
16358	25TH & HOLGATE S TACOMA	TACOMA	3	Cleanup Started	SW
362821	28TH ST CITY OF TACOMA PROPERTY	TACOMA	5	Cleanup Started	SW

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SITE REGISTER SPECIAL ISSUE -- February 28, 2012

Pierce 322

FS ID	SITE NAME	CITY	RANK	STATUS	RU
81194984◆	7-10 GROCERY	TACOMA	2	Awaiting Cleanup	SW
15676562	7614 340TH ST E DRUG LAB	EATONVILLE	2	Cleanup Started	SW
2195676	8007 MCKINLEY AVE E	TACOMA	1	Awaiting Cleanup	SW
95563821	8124 VALLEY AVENUE EAST	PUYALLUP	2	Awaiting Cleanup	SW
1231	AIRO SERVICES INC	TACOMA	3	Awaiting Cleanup	SW
1277	ALADDIN PLATING CO INC	TACOMA	2	Cleanup Started	SW
7515	ALGEO RESIDENTIAL PROPERTY	RUSTON	4	Awaiting Cleanup	SW
1247	ALLIED BATTERY CO INC TACOMA	TACOMA	0	Awaiting Cleanup	SW
1202	AMERICAN PLATING	TACOMA	2	Cleanup Started	SW
66987611	APM TERMINALS PACIFIC LTD	TACOMA	5	Awaiting Cleanup	SW
1284	ARCO 4230	TACOMA	2	Cleanup Started	SW
74439266	ARCO 5877	PUYALLUP	5	Awaiting Cleanup	SW
1220	ARKEMA INC	TACOMA	1	Cleanup Started	SW
14374627	ARLETTA FOODS	GIG HARBOR	2	Awaiting Cleanup	SW
217	ASARCO	TACOMA	0▲	Cleanup Started	HQ
218	ASARCO GROUNDWATER	TACOMA	0▲	Cleanup Started	HQ
216	ASARCO OFFSHORE	TACOMA	0▲	Cleanup Started	HQ
215	ASARCO SMELTER	TACOMA	0▲	Cleanup Started	EP
36651329	ASSOCIATED PETROLEUM PRO EATONVILLE	EATONVILLE	2	Cleanup Started	SW
1219	ATOFINA CHEM 3009 TAYLOR WAY LOG YARD	TACOMA	2	Cleanup Started	SW
97814788	AUTO WAREHOUSING CO TACOMA	TACOMA	3	Awaiting Cleanup	SW
1203	B & L WOODWASTE LANDFILL	TACOMA	1	Cleanup Started	SW
1328	BIRDS EYE FOODS	TACOMA	2	Cleanup Started	SW
24623	BNRR MCCARVER PROJECT	TACOMA	5	Construction Complete-Performance Monitoring	SW
81267111	BNRR TACOMA YARD PARCEL 2071260010	TACOMA	3	Cleanup Started	SW
94957214	BNRR TACOMA YARD PARCEL 2073230010	TACOMA	3	Awaiting Cleanup	SW
3466912	BNRR TACOMA YARD PARCEL 4715023590	TACOMA	3	Awaiting Cleanup	SW
91663719	BNRR TACOMA YARD PARCEL 8950001720	TACOMA	5	Cleanup Started	SW
1267	BNRR TACOMA YARD PARCEL 8950001730	TACOMA	3	Cleanup Started	SW
969	BNSF S HOOD ST RENTAL PROPERTY	TACOMA	4	Awaiting Cleanup	SW
7981609	BNSF TACOMA FUELING FACILITY	TACOMA	5	Awaiting Cleanup	SW
34147781	BOBS TEXACO	TACOMA	2	Awaiting Cleanup	SW
6313940	BOWMAN RESIDENTIAL PROPERTY	TACOMA	5	Awaiting Cleanup	SW
1794148	BREAKWATER MARINA INC	TACOMA	5	Awaiting Cleanup	SW
3427832	BRUCE TITUS CHEVROLET	TACOMA	5	Cleanup Started	SW
1233	BURLINGTON ENVIRONMENTAL LLC TACOMA	TACOMA	2	Cleanup Started	SW
1324	CALHOUNS SERVICE STATION	TACOMA	2	Cleanup Started	SW
33468224	CAMAS PROPERTY	TACOMA	2	Cleanup Started	SW
1242	CASCADE POLE MCF SITCUM	TACOMA	4	Cleanup Started	SW
1206	CASCADE TIMBER 3 POT	TACOMA	0	Cleanup Complete-Active O&M/Monitoring	SW
1234	CHEVRON BULK PLANT USA 1328	TACOMA	1	Cleanup Started	SW
44993787	CHOI PROPERTY	PUYALLUP	3	Awaiting Cleanup	SW
1277004	CITY PROPERTIES CLEANUP	TACOMA	2	Cleanup Started	SW
37982391	CLEAN CARE CORP	TACOMA	3	Cleanup Started	SW
26693246	COAST ENGINE & EQUIPMENT CORP	TACOMA	2	Awaiting Cleanup	SW
42	COMMENCEMENT BAY NEARSHORE TIDEFLATS	TACOMA	0	Cleanup Started	SW
5937369	COMMERCIAL LORY UNIFORM RENT	TACOMA	3	Cleanup Started	SW
1308	CONANS FUEL SERVICE	GIG HARBOR	4	Awaiting Cleanup	SW
22955963	CONNIE J SCANNELL	STEILACOOM	1	Awaiting Cleanup	SW
1235	COSKI INDUSTRIAL DUMP	TACOMA	4	Awaiting Cleanup	SW
3860548	CROWS NEST MARINA	TACOMA	1	Awaiting Cleanup	SW
1207	D ST PETROLEUM	TACOMA	4	Construction Complete-Performance Monitoring	SW
1301959	EDDON BOAT PARK	GIG HARBOR	1	Construction Complete-Performance Monitoring	SW
1360	EDGEWOOD SHOPPING CENTER	MILTON	2	Cleanup Started	SW
26218937	ELBE MALL	ELBE	5	Awaiting Cleanup	SW
1315	ERS TRUCKING TACOMA	TACOMA	2	Cleanup Started	SW
53271341	EZ MINI MART	PUYALLUP	3	Cleanup Started	SW
5074108	FARLEY PROPERTY	GIG HARBOR	4	Awaiting Cleanup	SW
97767789	FRANKLIN SITE	TACOMA	4	Awaiting Cleanup	SW

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Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

Pierce

FS ID	SITE NAME	CITY	RANK	STATUS	RU
1301	FREDERICKSON INDUSTRIAL PARK	PUYALLUP	1	Cleanup Started	SW
1227	GENERAL METALS OF TACOMA	TACOMA	1	Cleanup Started	SW
1342	GIG HARBOR SERVICE INC	GIG HARBOR	1	Cleanup Started	SW
2566095	GIG HARBOR SPORTSMAN CLUB	GIG HARBOR	1	Cleanup Started	SW
11876	GIG HARBOR TRANSMISSION	GIG HARBOR	3	Awaiting Cleanup	SW
1342017	GLASSMAN PROPERTY	PUYALLUP	1	Cleanup Started	SW
1246	GLENN SPRINGS HOLDINGS INC	TACOMA	0	Cleanup Started	SW
5001082	GOTTINGEN PROPERTY	TACOMA	3	Awaiting Cleanup	SW
44479366	GP GYPSUM CORP TACOMA PLANT	TACOMA	5	Awaiting Cleanup	SW
23641	HESSELGRAVE CHARTERS & TOURS	PUYALLUP	2	Awaiting Cleanup	SW
1272	HIDDEN VALLEY LANDFILL THUN FLD	PUYALLUP	0▼	Construction Complete-Performance Monitoring	SW
4556251	HOGHAUG BETTER LATE THAN NEVER HAULING	GIG HARBOR	2	Awaiting Cleanup	SW
6638789	HORSESHOE LAKE WRECKING YARD	GIG HARBOR	1	Awaiting Cleanup	SW
81528198	HYLEBOS WOOD DEBRIS SITE SEDIMENTS	TACOMA	0	Cleanup Started	SW
1362	JOHN WALLERICH PROPERTY	TACOMA	5	Awaiting Cleanup	SW
2220894	JOHNSONS JEWELRY & GIFTS	PUYALLUP	5	Awaiting Cleanup	SW
224	LAKEWOOD PONDERS CORNER	LAKEWOOD	0	Construction Complete-Performance Monitoring	SW
1298	LANDSCAPING BY PAT BORING	TACOMA	4	Awaiting Cleanup	SW
1354	LEONS TRUCKING	BUCKLEY	5	Awaiting Cleanup	SW
1314	LEWIS AUTO WRECKING	PUYALLUP	1	Awaiting Cleanup	SW
1208	LINCOLN AVENUE DITCH	TACOMA	3	Cleanup Started	SW
84811951	LONGBRANCH MERCANTILE	LONGBRANCH	2	Cleanup Started	SW
1283	MANKE LUMBER CO INC SUMNER	SUMNER	5	Awaiting Cleanup	SW
62115212	MARKET PLACE TEXACO	TACOMA	3	Cleanup Started	SW
2968803	MARTIN RESIDENCE	TACOMA	3	Cleanup Started	SW
1222	MCFARLAND CASCADE POLE & LUMBER CO	TACOMA	1	Cleanup Started	SW
7912006	MCMACKEN PROPERTY SOUND TRANSIT TACOMA	TACOMA	2	Cleanup Started	SW
9541966	METRO DASH POINT PARK	TACOMA	3	Awaiting Cleanup	SW
55212794	MIDDLE WATERWAY STEEL SLAG	TACOMA	0	Cleanup Started	SW
1305	MIDDLESEX CORP	MCMILLIN	2	Awaiting Cleanup	SW
1350	MONITOR COMPANY	TACOMA	2	Awaiting Cleanup	SW
18489568	MORRELLS DRY CLEANERS	TACOMA	5	Cleanup Started	SW
1288	NATIONAL OIL DUMP	TACOMA	3	Awaiting Cleanup	SW
93581722	NAVAL RESERVE CENTER TACOMA	TACOMA	3	Awaiting Cleanup	SW
69871828	NEWMAN RECYCLING	TACOMA	4	Awaiting Cleanup	SW
1281	OCCIDENTAL CHEMICAL DAUPHIN	TACOMA	3	Awaiting Cleanup	SW
1381	OLD PIERCE COUNTY COURT HOUSE	TACOMA	5	Cleanup Started	SW
2452753	OLINE STORAGE YARD	TACOMA	1	Cleanup Started	SW
23544	OLYMPIC CHEMICAL CORP	TACOMA	1	Cleanup Started	SW
1239	PACIFIC FUNCTIONAL FLUIDS LLC TACOMA	TACOMA	1	Cleanup Started	IN
9198	PACIFIC PLAZA LLC	TACOMA	5	Awaiting Cleanup	SW
1300	PARKLAND CLEANERS	PARKLAND	3	Cleanup Started	SW
72222742	PAX ASSOCIATES	TACOMA	5	Cleanup Started	SW
2772567	PENINSULA LIGHT TRANSFORMER RAY NASH DR	GIG HARBOR	3	Awaiting Cleanup	SW
1245	PETROLEUM RECLAIMING SERVICE INC	TACOMA	2	Cleanup Started	SW
5011903	PHILLIPS RESIDENTIAL PROPERTY	TACOMA	1	Cleanup Started	SW
6929	PHILLIPS RESIDENTIAL PROPERTY GRAHAM LEAD	GRAHAM	1	Awaiting Cleanup	SW
8632033	PIER 24-25	TACOMA	0▲	Construction Complete-Performance Monitoring	SW
6532302	PIONEER VALLEY ELEMENTARY SCHOOL	SPANAWAY	5	Awaiting Cleanup	SW
1289	PONDERS AUTO PARTS INC	TACOMA	3	Awaiting Cleanup	SW
38	PORT OF TACOMA	TACOMA	4	Cleanup Started	SW
1377	PORT OF TACOMA 721 ALEXANDER	TACOMA	3▲	Awaiting Cleanup	SW
34114562	PORT OF TACOMA PARCEL 88	TACOMA	3	Awaiting Cleanup	SW
1313	PSE PUYALLUP SVC	PUYALLUP	2	Cleanup Started	SW
1275	PUGET POWER ELECTRON POWER	ORTING	2	Awaiting Cleanup	SW
92961499	PUGET SOUND TRUCK LINES INC TAC	TACOMA	5	Cleanup Started	SW
42385149	PUGNETTI PARK	TACOMA	2	Cleanup Started	SW
1806706	PUMP STN 4103 ROW 2222 MARINE VIEW DR	TACOMA	5	Awaiting Cleanup	SW
1290	PURDY TRANSFER STATION	GIG HARBOR	3	Awaiting Cleanup	SW

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Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

Pierce

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1221	RHONE POULENC BASIC CHEMICAL	TACOMA	3	Cleanup Started	SW
9373416	RILEY PARKING LOT	TACOMA	5	Awaiting Cleanup	SW
29954513	RIVER ROAD LANDSCAPING	PUYALLUP	1	Awaiting Cleanup	SW
219	RUSTON N TACOMA	TACOMA	0 ▼	Cleanup Started	HQ
223	S TACOMA FIELD	TACOMA	0 ▲	Cleanup Complete-Active O&M/Monitoring	EP
4339824	SAUROS CLEANERAMA TACOMA	TACOMA	1	Cleanup Started	SW
1228	SEATTLE TRANSFER	TACOMA	3	Awaiting Cleanup	SW
6639255	SEVENCOM	TACOMA	5	Cleanup Started	SW
83113674	SHEAR TRUCKING	BUCKLEY	4	Cleanup Started	SW
1259	SHORE TERMINAL NUSTAR ENERGY LP	TACOMA	0	Cleanup Started	SW
17167958	SMURFIT STONE CONTAINER CORP	TACOMA	5	Cleanup Started	SW
6429953	SOUND MILL INC	TACOMA	3	Cleanup Started	SW
74455879	SOUND TRANSIT DEPOT PARTNERSHIP PROPERT	TACOMA	2	Cleanup Started	SW
8785404	SOUTH SOUND RADIATOR	TACOMA	2	Awaiting Cleanup	SW
41565617	SPADONI BROS INC GIG HARBOR	GIG HARBOR	3	Cleanup Started	SW
91945823	STADIUM HIGH SCHOOL	TACOMA	5	Awaiting Cleanup	SW
85776142	STANDARD CHEMICAL CO SITE	TACOMA	0	Cleanup Started	SW
8942055	STOHL PROPERTY	PUYALLUP	1	Cleanup Started	SW
3782573	STONE PROPERTY TRANSIT SITE	TACOMA	3	Cleanup Started	SW
94883881	STOWE CONSTRUCTION INC	SUMNER	5	Awaiting Cleanup	SW
1334	SUBURBAN REALTY INC	TACOMA	1	Awaiting Cleanup	SW
1304	SUMNER NATIONAL AUTO PARTS	SUMNER	1	Awaiting Cleanup	SW
61656248◆	**SUNNEN CRANE SERVICE**	**TACOMA**	**3**	Cleanup Started	**SW**
2776343	SUPERLON PLASTICS CO INC	TACOMA	1	Cleanup Started	SW
92562654	TACOMA CENTRAL NO 1	TACOMA	3	Cleanup Started	SW
8168704	TACOMA CITY CONVENTION CTR GARAGE	TACOMA	5	Awaiting Cleanup	SW
1249	TACOMA COAL GASIFICATION	TACOMA	0	Cleanup Started	SW
220	TACOMA LANDFILL	TACOMA	0 ▼	Construction Complete-Performance Monitoring	HQ
1257	TACOMA METALS SITE	TACOMA	2	Cleanup Started	SW
9762715	TACOMA PORT EARLEY BUSINESS CENTER	TACOMA	5	Awaiting Cleanup	SW
3831	TACOMA PORT PARCEL 4	TACOMA	0 ▲	Cleanup Started	SW
79844675	TACOMA PORT SLIP 5	TACOMA	2	Awaiting Cleanup	SW
1263	TACOMA REDEVELOPMENT PROP	TACOMA	0	Construction Complete-Performance Monitoring	SW
62855481	TACOMA SMELTER PLUME PIERCE COUNTY		0 ▶◀	Cleanup Started	SW
89267963	TACOMA SMELTER SITE		0 ▶◀	Cleanup Started	SW
221	TACOMA TAR PITS	TACOMA	0 ▲	Construction Complete-Performance Monitoring	EP
1403183	TAYLOR WAY & ALEXANDER AVE FILL AREA	TACOMA	3	Cleanup Started	SW
1260	THERMAFIBER LLC	TACOMA	0	Cleanup Started	SW
1274	TITUS WILL ENTERPRISES INC	TACOMA	1	Cleanup Started	SW
5979	TRIDENT METALS	TACOMA	1	Awaiting Cleanup	SW
1206878	TRUE GRIT ROOFING GRANULES	TACOMA	1	Awaiting Cleanup	SW
75634755◆	**U-HAUL FACILITY #702-56**	**TACOMA**	**3**	Cleanup Started	**SW**
28881	UNION PACIFIC RR FIFE	FIFE	5	Cleanup Started	SW
1292	UNION PACIFIC RR TUNNEL	TACOMA	2	Awaiting Cleanup	SW
38394393	US ARMY FORT LEWIS I5 CORRIDOR	FT LEWIS	2	Cleanup Started	SW
228	US ARMY FORT LEWIS LDFL 4 SRCPP	TACOMA	0 ▲	Cleanup Started	EP
226	US ARMY FORT LEWIS LDFL 5	TACOMA	0 ▲	Construction Complete-Performance Monitoring	EP
227	US ARMY FORT LEWIS LOG CENTER	TACOMA	0 ▲	Construction Complete-Performance Monitoring	EP
54221181	US ARMY WSMC PIER 23	TACOMA	1	Cleanup Started	SW
239	USAF MAFB AMERICAN LK GDN	MCCHORD AFB	0 ◀	Construction Complete-Performance Monitoring	HQ
233	USAF MAFB MTCA WP 34	TACOMA	3	Construction Complete-Performance Monitoring	HQ
234	USAF MAFB MTCA WP 44	MCCHORD AFB	3	Cleanup Complete-Active O&M/Monitoring	HQ
225	USAF MAFB WASHRACK	MCCHORD AFB	0 ◀	Cleanup Started	HQ
99997000	USPS DOWNTOWN TACOMA PARKING LOT	TACOMA	5	Awaiting Cleanup	SW
42252532	VENEER CHIP TRANSPORT	TACOMA	4	Awaiting Cleanup	SW
6260559	WA DOC MCNEIL ISLAND DIESEL SPILL	STEILACOOM	5	Cleanup Started	SW
214923	WA DOT SR16 E & I5 S	TACOMA	4	Awaiting Cleanup	SW
1270	WA NATIONAL GUARD CAMP MURRAY	TACOMA	1	Awaiting Cleanup	SW
1325	WA UW TACOMA BRANCH	TACOMA	3	Cleanup Started	SW

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Pierce

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1323	WA WSU BUCKLEY DAIRY 2	BUCKLEY	1	Cleanup Started	SW
4553045	WASHINGTON STATE HISTORY MUSEUM	TACOMA	4	Awaiting Cleanup	SW
222	WELL 12A	TACOMA	0 ▼	Construction Complete-Performance Monitoring	HQ
1269	WEYERHAEUSER DUPONT 1	DUPONT	2	Cleanup Started	SW
6766480	WOOD CHIP STORAGE YARD	TACOMA	1	Awaiting Cleanup	SW
1372	WOODWORTH & CO INC LAKEVIEW PLANT	TACOMA	2	Cleanup Started	SW

San Juan

FS ID	SITE NAME	CITY	RANK	STATUS	RU
755042	FRIDAY HARBOR FRONT ST ROW	FRIDAY HARBOR	5	Awaiting Cleanup	NW
9710377	OPALCO	FRIDAY HARBOR	5	Awaiting Cleanup	NW
2655	SAN JUAN MARINA	FRIDAY HARBOR	4	Awaiting Cleanup	NW

Skagit

FS ID	SITE NAME	CITY	RANK	STATUS	RU
8079357	ALGER DUMP	ALGER	3	Awaiting Cleanup	NW
16963695	ANACORTES CITY	ANACORTES	4	Awaiting Cleanup	HQ
23953	ANACORTES PORT OF Q AVE & 15TH ST	ANACORTES	2	Cleanup Started	HQ
17559673	ANACORTES SCHOOL DIST BUS GARAGE	ANACORTES	3	Cleanup Started	NW
2693	ANACORTES YACHT SERVICES	ANACORTES	4	Awaiting Cleanup	NW
17866918	ARTS AUTO WRECKING	SEDRO WOOLLEY	3	Awaiting Cleanup	NW
25296975	ASSOCIATED PETROLEUM PRODUCTS INC	SEDRO WOOLLEY	3	Cleanup Started	NW
2674	CHEVRON MT VERNON BULK PLANT	MOUNT VERNON	5	Cleanup Started	NW
2685	CUSTOM PLYWOOD MILL	ANACORTES	1	Cleanup Started	HQ
24441562	DAHLGREN PROPERTY CAR STEREO PLUS	MOUNT VERNON	5	Cleanup Started	NW
190	EDB 2 SKAGIT CNTY	MOUNT VERNON	1	Construction Complete-Performance Monitoring	NW
26541964	GLENNS DIESEL	MOUNT VERNON	3	Awaiting Cleanup	NW
7816417	**◆ GULL STATION 224**	**SEDRO WOOLLEY**	**2**	Awaiting Cleanup	**NW**
8017804	HARRIS PROPERTY AUTO RECYLING	SEDRO WOOLLEY	1	Awaiting Cleanup	NW
60892684	HERBS MUFFLER & TUNE UP CENTER	SEDRO WOOLLEY	3	Cleanup Started	NW
2675	LAKE ERIE TRUCKING	ANACORTES	5	Awaiting Cleanup	NW
7291012	**◆ LEVINA BRYANT PROPERTY**	**BOW**	**5**	Cleanup Started	**NW**
3701538	M JOHNSON PROPERTY	MOUNT VERNON	3	Awaiting Cleanup	NW
2662	MARCH POINT LANDFILL	ANACORTES	2	Cleanup Started	HQ
2690	MJB PROPERTIES	ANACORTES	2	Awaiting Cleanup	HQ
7681	MJB SOUTH HYDRO FILL	ANACORTES	2	Awaiting Cleanup	HQ
92292989	MOUNT VERNON CITY HALL ALLEY	MOUNT VERNON	5	Cleanup Started	NW
2659	MT VERNON GASOLINE SPILL	MOUNT VERNON	3	Cleanup Started	NW
2663	NORTHWEST PETROCHEMICAL CORP ANACORTE	ANACORTES	2	Cleanup Started	NW
2684	NORTHWEST PIPELINE GP MT VERNON C/S	MOUNT VERNON	5	Cleanup Started	NW
2677	NORTHWEST PIPELINE SEDRO WOOLLY	SEDRO WOOLLEY	5	Cleanup Started	NW
2667	OLYMPIC PIPE LINE CO ALLEN STATION	MOUNT VERNON	1	Awaiting Cleanup	NW
2661	OSPREY BOAT COMPANY METCALF ST	SEDRO WOOLLEY	3	Awaiting Cleanup	NW
7443386	PADILLA HEIGHTS RD PROPERTY	ANACORTES	5	Awaiting Cleanup	NW
2670	PORT OF ANACORTES DAKOTA CREEK	ANACORTES	1	Cleanup Started	HQ
86666971	PSE FREDONIA GENERATING FACILITY	MOUNT VERNON	5	Awaiting Cleanup	NW
32313154	PSE SEDRO WOOLLEY	SEDRO WOOLLEY	5	Awaiting Cleanup	NW
2692	PUNKIN CENTER LLC AKA CASCADE TIM	HAMILTON	5	Cleanup Started	NW
91579157	RAINY PASS	ROCKPORT	5	Cleanup Started	NW
49238458	REISNER DISTRIBUTING CO INC 2	ANACORTES	4	Awaiting Cleanup	NW
74257584	SAFEWAY FUEL CENTER 0593	ANACORTES	5	Cleanup Started	NW
22761169	**◆ SCHENK PACKING PLANT**	**MOUNT VERNON**	**3**	Cleanup Started	**NW**
8122259	SCOTT PAPER MILL FORMER	ANACORTES	2	Cleanup Started	HQ
4781157	SHELL OIL TANK FARM FORMER	ANACORTES	3	Cleanup Started	HQ
4755451	SKAGIT FARMERS SUPPLY WOLFKILL YARD	MOUNT VERNON	5	Cleanup Started	NW
1201946	SKAGIT LAUNDRY & DYE WORKS FORMER	MOUNT VERNON	5	Awaiting Cleanup	NW
2689	SKAGIT TRANSPORTATION INC	MOUNT VERNON	5	Cleanup Started	NW
2673	TRUCK CITY TRUCK STOP	MOUNT VERNON	3	Cleanup Complete-Active O&M/Monitoring	NW
64937476	**◆ UPS BURLINGTON**	**BURLINGTON**	**3**	Cleanup Started	**NW**

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Skagit

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21886695	WA DFW MARBLEMOUNT HATCHERY	MARBLEMOUNT	5	Cleanup Started	NW
94385939	WASHINGTON BULB CO PROPERTY	MOUNT VERNON	2	Cleanup Started	NW
2683	WHITMARSH SIDING	ANACORTES	1	Awaiting Cleanup	NW
2821735	WYMANS MARINA & WHOLESALE SUPPLY	ANACORTES	1	Awaiting Cleanup	NW
79838784	ZIMMERMANS SHELL	LA CONNER	3	Cleanup Started	NW

Skamania

FS ID	SITE NAME	CITY	RANK	STATUS	RU
35617784	GARWOOD OIL CO	CARSON	2	Awaiting Cleanup	SW
81274771	STEVENSON CO PLY MILL	STEVENSON	4	Awaiting Cleanup	SW
1382	UNOCAL BULK PLANT 0761	STEVENSON	1	Cleanup Started	SW
4740395	WA DOT FRONTAGE ROAD RIGHT OF WAY	STEVENSON	5	Awaiting Cleanup	SW

Snohomish

FS ID	SITE NAME	CITY	RANK	STATUS	RU
67541366	ALL NIGHT AIR SWEEP	EVERETT	2	Awaiting Cleanup	NW
2701	ARLINGTON MARYSVILLE LDFL	ARLINGTON	5	Awaiting Cleanup	NW
28549	ARNOLDS BODY SHOP & SALES	LAKE STEVENS	5	Awaiting Cleanup	NW
4438651	BAY WOOD PRODUCTS	EVERETT	4	Cleanup Started	HQ
7396092	BEYER PROPERTY	EDMONDS	4	Awaiting Cleanup	NW
2746	BILL PEARSON TIMBER	SULTAN	3	Awaiting Cleanup	NW
6908010	BNSF STANWOOD	STANWOOD	4	Cleanup Started	NW
2703	BOEING EVERETT	EVERETT	2	Cleanup Started	NW
2756	BOEING PAINE FIELD SPORTS CLUB	EVERETT	5	Awaiting Cleanup	NW
2738	BONNEVILLE POWER ADMIN SNOHOMISH	SNOHOMISH	4	Awaiting Cleanup	NW
2797	BRYANT HARDWARE	STANWOOD	5	Awaiting Cleanup	NW
2705	BRYANT LANDFILL	ARLINGTON	5	Awaiting Cleanup	NW
2176234	BRYANT PROPERTY FORMER	ARLINGTON	1	Awaiting Cleanup	NW
34846614	CASCADE CLEANERS SNOHOMISH	SNOHOMISH	5	Awaiting Cleanup	NW
2801	CHAPMAN TRUCK REPAIR DITCH	EVERETT	5	Awaiting Cleanup	NW
2787	CHRISTIANSON CO	ARLINGTON	5	Awaiting Cleanup	NW
2855	COUNTRYSIDE DEVELOPMENT	BRIER	4	Awaiting Cleanup	NW
5125580	DRY CLEAN US	BOTHELL	5	Cleanup Started	NW
14538667	DUFFYS SPEE DEE MART	SNOHOMISH	4	Cleanup Started	NW
2752	DUNKIN DIESEL SERVICE	SNOHOMISH	4	Awaiting Cleanup	NW
2733	EAST WATERWAY	EVERETT	2	Awaiting Cleanup	HQ
34732418	EDMONDS DRY STORAGE PORT OF EDMONDS	EDMONDS	5	Awaiting Cleanup	NW
2796	EDMONDS PORT W DAYTON	EDMONDS	5	Cleanup Started	HQ
2811	EDS TRANSMISSION	MARYSVILLE	3	Awaiting Cleanup	NW
71411797	EVERETT CITY UPPER RIDGE RESERVOIR	EVERETT	5	Awaiting Cleanup	NW
2696	EVERETT LANDFILL TIRE FIRE	EVERETT	1	Cleanup Started	NW
45998439	EVERETT LAUNDRY	EVERETT	5	Awaiting Cleanup	NW
2798	EVERETT PLATING INC	EVERETT	5	Awaiting Cleanup	NW
2794	EVERETT SHIPYARD INC	EVERETT	3	Cleanup Started	HQ
2744	EVERETT SMELTER CLEANUP SITE	EVERETT	1	Cleanup Started	NW
2806	EVERETT STEEL CO QUANTUM WOOD	EVERETT	5	Awaiting Cleanup	NW
2805	EVERETT STEEL COMPANIES	EVERETT	2	Awaiting Cleanup	NW
2728	EXXONMOBIL ADC SITE	EVERETT	2	Cleanup Started	HQ
10248	FLEURY AUTO & TRUCK PARTS	EVERETT	4	Awaiting Cleanup	NW
88593256	GRAND BUILDING VALETOR CLEANERS	EVERETT	5	Cleanup Started	NW
7250260	GREEN CROW PROPERTY	ARLINGTON	3	Awaiting Cleanup	NW
9439375	GRIFFIN PROPERTY	ARLINGTON	4	Awaiting Cleanup	NW
3332049	HOME ACRES RD ROW	SNOHOMISH	5	Awaiting Cleanup	NW
7572498	JAMES AUTO SERVICE	EDMONDS	3	Awaiting Cleanup	NW
2815	JB ASPHALT CO	LYNNWOOD	5	Cleanup Started	NW
2757	JELD WEN	EVERETT	5	Cleanup Started	HQ
2709	JH BAXTER ARLINGTON	ARLINGTON	1	Awaiting Cleanup	EP
5409698	KIMBERLY CLARK OUTFALL	EVERETT	5	Awaiting Cleanup	NW
68851192	KIMS 2	LYNNWOOD	5	Awaiting Cleanup	NW

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Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

Snohomish

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2710	LAKE GOODWIN LANDFILL	STANWOOD	5	Awaiting Cleanup	NW
2824	LES WEAR BACKHOE MACBRYER PROP	LAKE STEVENS	5	Awaiting Cleanup	NW
2712	LYNNWOOD PLATING	LYNNWOOD	4	Awaiting Cleanup	NW
43566392	MARYSVILLE CITY WATERFRONT PARK	MARYSVILLE	4	Cleanup Started	NW
98646924	MASSOUD PROPERTY	LYNNWOOD	2	Awaiting Cleanup	NW
2732	MCCOLLUM PARK	EVERETT	1	Construction Complete-Performance Monitoring	NW
89398652	MID CITY TOWING	EVERETT	5	Awaiting Cleanup	NW
2766	MONROE AUTO SALVAGE 2	SNOHOMISH	5	Awaiting Cleanup	NW
2251399	MONTE CRISTO MINING AREA	SILVERTON	1	Cleanup Started	CE
32245837	MOUNTLAKE TERRACE CITY	MOUNTLAKE TERRA	5	Cleanup Started	NW
2808	NELSON DISTRIBUTING 2	EVERETT	5	Awaiting Cleanup	NW
2737	NIC L SILVER	EDMONDS	5	Awaiting Cleanup	NW
68853261◆	**NORTH MARINA AMERON/HULBERT**	**EVERETT**	**1**	Cleanup Started	**HQ**
3306834	NORTH MARINA WEST END	EVERETT	2	Cleanup Complete-Active O&M/Monitoring	HQ
2777	NORTHWEST PIPELINE N SEATTLE	SNOHOMISH	5	Awaiting Cleanup	NW
2779	NORTHWEST PIPELINE SNO COMPR	SNOHOMISH	5	Cleanup Started	NW
2778	NORTHWEST PIPELINE SNOHOMISH MS	MONROE	5	Construction Complete-Performance Monitoring	NW
2741	OBRIEN TRUCKING	MUKILTEO	5	Awaiting Cleanup	NW
2825	OGDEN PROPERTY	LYNNWOOD	5	Awaiting Cleanup	NW
20511	PACIFIC PLATING AERO FANCY STAMPS	EVERETT	5	Awaiting Cleanup	NW
2734	PACIFIC PRIDE CHENNAULT BEACH	EVERETT	5	Awaiting Cleanup	NW
2723	PALLISTER PAINT	EVERETT	5	Awaiting Cleanup	NW
4196313	PARCEL 6 JENSEN	MONROE	2	Awaiting Cleanup	NW
11747135	PDQ LAUNDRY ROOM	MARYSVILLE	5	Awaiting Cleanup	NW
2742	PIONEER MARINE PLAZA	EVERETT	5	Awaiting Cleanup	NW
2774	PSE EVERETT OPERATING FACILITY	EVERETT	5	Cleanup Started	NW
2760	PUMP CRETE	LYNNWOOD	4	Awaiting Cleanup	NW
43211546	RAILROAD OLD GAS STATION	GRANITE FALLS	4	Awaiting Cleanup	NW
2852	ROTARY PARK	EVERETT	4	Awaiting Cleanup	NW
2781	RUBATINOS TRUCK CARE	EVERETT	5	Awaiting Cleanup	NW
85995713	S & T MINI MART	ARLINGTON	5	Awaiting Cleanup	NW
2886743	SCHLEUTER PROPERTY	BOTHELL	4	Awaiting Cleanup	NW
2754	SHULTZ DISTRIBUTING INC RAILROAD	MONROE	5	Awaiting Cleanup	NW
2699	SISCO LANDFILL	ARLINGTON	2	Cleanup Started	NW
2770	SNOHOMISH CNTY PUD LYNNWOOD STA	LYNNWOOD	2	Awaiting Cleanup	NW
2719	SNOHOMISH LANDFILL	SNOHOMISH	5	Awaiting Cleanup	NW
51136873	SON CEDAR PRODUCTS	DARRINGTON	1	Awaiting Cleanup	NW
85327563	SOUTHLAND 21464	SNOHOMISH	4	Cleanup Started	NW
2785	SPENCER ISLAND MOSER PROPERTY	EVERETT	5	Awaiting Cleanup	NW
2816	STANS RADIATOR	EVERETT	3	Awaiting Cleanup	NW
88877396	STORM LAKE GROCERY	SNOHOMISH	5	Awaiting Cleanup	NW
32829474	SULTAN POST & POLE	SULTAN	2	Awaiting Cleanup	NW
2851	TECT AEROSPACE EVERETT	EVERETT	4	Cleanup Started	NW
61188931	TEXACO STAR MART JOHNSON PROPERTY	SNOHOMISH	3	Awaiting Cleanup	NW
2730	THE ALLEY SHOP	EVERETT	5	Awaiting Cleanup	NW
2850	TRAMCO BF GOODRICH AEROSPACE	EVERETT	5	Awaiting Cleanup	NW
191	TULALIP LANDFILL	MARYSVILLE	0▲	Cleanup Started	EP
2793	TWIN CITY TOWING	STANWOOD	5	Awaiting Cleanup	NW
14133385	UNOCAL 4196	MARYSVILLE	5	Cleanup Started	NW
2810	UNOCAL BULK PLANT ARLINGTON	ARLINGTON	2	Cleanup Started	NW
2720	UNOCAL EDMONDS BULK FUEL TERM 0178	EDMONDS	1	Cleanup Started	NW
5132561	UNOCAL SS 4165	SNOHOMISH	4	Cleanup Started	NW
2881226	UNOCAL SS NO 3604	EVERETT	5	Cleanup Started	NW
2821	URBAN ACCESSORIES	SULTAN	5	Awaiting Cleanup	NW
513712	WA DOT I5 MP 197 MARYSVILLE	MARYSVILLE	4	Awaiting Cleanup	NW
2724	WALLACE RIVER PARK WELL	STARTUP	4	Cleanup Complete-Active O&M/Monitoring	NW
7444412	WEBB PROPERTY AUTO DISMANTLERS	EVERETT	5	Awaiting Cleanup	NW
2763	WELLINGTON HILLS ASSOC	WOODINVILLE	2	Cleanup Started	NW
2775	WESTERN HYDROBLASTER	MUKILTEO	4	Awaiting Cleanup	NW

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Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

Snohomish

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41	WEYERHAEUSER EVERETT	EVERETT	1	Awaiting Cleanup	NW
11	WEYERHAEUSER EVERETT EAST SITE	EVERETT	1	Cleanup Complete-Active O&M/Monitoring	NW
12	WEYERHAEUSER EVERETT MILL E	EVERETT	1	Cleanup Started	NW
10	WEYERHAEUSER EVERETT WEST SITE	EVERETT	1	Construction Complete-Performance Monitoring	NW
2818	WHITESIDE INC	SNOHOMISH	4	Cleanup Started	NW
95547562	WOODYS AUTO WRECKING INC	WOODINVILLE	4	Cleanup Started	NW

Spokane

FS ID	SITE NAME	CITY	RANK	STATUS	RU
670	ALASKA STEEL & SUPPLY	SPOKANE	4	Awaiting Cleanup	EA
627	ALUMINUM RECYCLING CORP	SPOKANE	2	Construction Complete-Performance Monitoring	EA
628	ALUMINUM RECYCLING TRENTWOOD	Spokane Valley	2	Cleanup Started	EA
28314355	APPLEWAY CHEVROLET INC	SPOKANE VALLEY	2	Cleanup Started	EA
629	ARGONNE ROAD	SPOKANE VALLEY	3	Cleanup Started	EA
31739484	AVISTA CORP SPOKANE SERVICE CENTER	SPOKANE	5	Awaiting Cleanup	EA
45389238	BECKS RADIATOR SHOP	SPOKANE	4	Awaiting Cleanup	EA
638	BJ CARNEY & CO	SPOKANE	3	Cleanup Started	EA
20894	BN SF RR BUNKER C SPILL AREA	SPOKANE	5	Awaiting Cleanup	EA
737	BNRR TAYLOR EDWARDS A	SPOKANE	3	Cleanup Started	EA
736	BNRR TAYLOR EDWARDS WHSE	SPOKANE	3	Cleanup Started	EA
960924	BNSF HILLYARD LEAD SOIL SITE	SPOKANE	1	Cleanup Started	EA
676	BNSF PARKWATER RAILYARD	SPOKANE	3	Cleanup Started	EA
98615712	BNSF RAILWAY BLACK TANK PROPERTY	SPOKANE	3	Awaiting Cleanup	EA
639	BURLINGTON NORTHERN HILLYD	SPOKANE	4	Awaiting Cleanup	EA
3	CDC MEAD LLC	MEAD	0▼	Cleanup Started	IN
63162186	CHENEY SUPER STOP LOTS 8 & 9	CHENEY	3	Awaiting Cleanup	EA
723	CITY OPERATIONS COMPLEX	SPOKANE	3	Awaiting Cleanup	EA
650	CITY PARCEL	SPOKANE	2	Cleanup Started	EA
110	COLBERT LANDFILL	SPOKANE	0▼	Construction Complete-Performance Monitoring	HQ
746	**◆ DIVINE 11 MIDCITY**	**SPOKANE**	**5**	Cleanup Started	**EA**
671	FOUR LAKES TIRE FIRE FLTF	FOUR LAKES	5	Awaiting Cleanup	EA
21455	GEIGER HEIGHTS HOUSING AREA	SPOKANE	5	Cleanup Started	EA
630	GENERAL ELECTRIC CO	SPOKANE	0▼	Construction Complete-Performance Monitoring	EA
631	GREENACRES LANDFILL	LIBERTY LAKE	0▼	Construction Complete-Performance Monitoring	EA
84461527	HAMILTON STREET BRIDGE SITE	SPOKANE	3	Construction Complete-Performance Monitoring	EA
645	HEGLAR KRONQUIST	SPOKANE	2	Cleanup Started	EA
88198717	HILLTOP CONOCO & GROCERY	SPOKANE	5	Awaiting Cleanup	EA
52126416	HOLCIM INC	SPOKANE VALLEY	1	Cleanup Started	EA
53481373	KAISER ALUMINUM & CHEMICAL CORPORATION	SPOKANE	2	Cleanup Started	EA
687	KOCH MATERIALS TRENT AVE	SPOKANE	3	Awaiting Cleanup	EA
648	MARSHALL LANDFILL	MARSHALL	4	Awaiting Cleanup	EA
633	MICA LANDFILL	MICA	0▼	Construction Complete-Performance Monitoring	EA
756	MINIT LUBE CESSPOOL	SPOKANE	5	Awaiting Cleanup	EA
667	NORTH MARKET ST	SPOKANE	0▼	Construction Complete-Performance Monitoring	EA
668	NORTH MARKET ST BN	SPOKANE	0▼	Cleanup Started	EA
111	NORTHSIDE LANDFILL	SPOKANE	0▼	Cleanup Started	EA
680	NORTHWEST PIPELINE MEAD	MEAD	3	Awaiting Cleanup	EA
679	NW PIPELINE MEDICAL LAKE	MEDICAL LAKE	3	Cleanup Started	EA
8808522	PLAZA GRANGE SUPPLY	PLAZA	5	Awaiting Cleanup	EA
1740049	PROGRESS ELEMENTARY	VERADALE	3	Cleanup Started	EA
751	ROCKFORD GRAIN GRWRS ROCKFORD	ROCKFORD	5	Awaiting Cleanup	EA
2539137	SALTYS AT THE FALLS FORMER	SPOKANE	5	Awaiting Cleanup	EA
16655424	SEM MATERIALS LP SPOKANE	SPOKANE	3	Cleanup Started	EA
691	SICILIA TRUCKING	SPOKANE	3	Cleanup Started	EA
683	SIRTI	SPOKANE	5	Awaiting Cleanup	EA
19894	SPOKANE ANG STA SWAMP DUMP	SPOKANE	2	Cleanup Started	HQ
4235787	**◆ SPOKANE CITY CENTRAL PARK MAINTENACE PR(**	**SPOKANE**	**5**	Cleanup Started	**EA**
738	SPOKANE CO WATER DIST 3	MEAD	2	Awaiting Cleanup	EA
7114348	SPOKANE COUNTY MOTORSPORT PARK	AIRWAY HEIGHTS	2	Cleanup Started	EA

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Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

Spokane

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674	SPOKANE FIRE DEPT TRAINING FAC	SPOKANE	3	Cleanup Started	EA
9706420	SPOKANE INTL RR MAINTENANCE FAC	SPOKANE	5	Awaiting Cleanup	EA
12835	SPRAGUE PEST CONTROL	SPOKANE	3	Awaiting Cleanup	EA
59798911	SUNSET FOOD MART	SPOKANE	5	Awaiting Cleanup	EA
2	THE COUNTRY MARKET	MEDICAL LAKE	3	Awaiting Cleanup	EA
755	UPRR FANCHER RD E	SPOKANE	3	Awaiting Cleanup	EA
735	UPRR TEKOA LINE SEGMENT 1	LATAH	5	Awaiting Cleanup	EA
702	URM STORES INC	SPOKANE	5	Awaiting Cleanup	EA
112	US AF FAIRCHILD AFB	SPOKANE	0◄	Cleanup Started	HQ
113	US AF FAIRCHILD CRAIG RD LDFL	SPOKANE	0◄	Construction Complete-Performance Monitoring	HQ
654	US DOE BPA BELL MAINTENANCE HQ	MEAD	3	Awaiting Cleanup	EA
661	USAAC GEIGER FIELD GF001	SPOKANE	2	Cleanup Started	EA
663	USAAC GEIGER FIELD GF003	SPOKANE	5	Cleanup Started	EA
664	USAAC GEIGER FIELD GF004	SPOKANE	3	Cleanup Started	EA
665	USAAC GEIGER FIELD GF005	SPOKANE	4	Awaiting Cleanup	EA
666	USAAC GEIGER FIELD GF006	SPOKANE	3	Cleanup Started	EA
114	USAF FAFB PR1	SPOKANE	0◄	Cleanup Started	HQ
122	USAF FAFB PR1 FT 1	SPOKANE	0◄	Construction Complete-Performance Monitoring	HQ
118	USAF FAFB PR1 LTM	SPOKANE	0◄	Cleanup Complete-Active O&M/Monitoring	HQ
120	USAF FAFB PR1 PS 2	SPOKANE	0◄	Construction Complete-Performance Monitoring	HQ
123	USAF FAFB PR1 WW 1	SPOKANE	0◄	Cleanup Complete-Active O&M/Monitoring	HQ
115	USAF FAFB PR2	SPOKANE	0◄	Cleanup Complete-Active O&M/Monitoring	HQ
58757186	USAF FAFB PR2 PS1	SPOKANE	0◄	Construction Complete-Performance Monitoring	HQ
116	USAF FAFB PR3	SPOKANE	0◄	Cleanup Started	HQ
697	VESTAL JOBBER MANUFACTURING CO	SPOKANE	3	Awaiting Cleanup	EA
685	WA AIR NATIONAL GUARD SPOKANE ELECTRIC	SPOKANE	3	Cleanup Started	HQ
26770	WA NATIONAL GUARD FOUR LAKES	FAIRCHILD AFB	5	Cleanup Started	HQ
89233269	WEST PLAINS GROUNDWATER CONTAM AREA	AIRWAY HEIGHTS	3	Awaiting Cleanup	EA
656	WESTERN FARM SERVICE INC LATAH HWY 27	LATAH	5	Cleanup Started	EA
15488433	YELLOWSTONE PIPELINE CO FAIRCHILD DEL FA	SPOKANE	3	Cleanup Started	EA

Stevens

FS ID	SITE NAME	CITY	RANK	STATUS	RU
2082586	BONANZA MINE LOWER MINE	EVANS	4	Awaiting Cleanup	EA
6827492	BONANZA MINE UPPER MINE	EVANS	4	Awaiting Cleanup	EA
768	CARLSON DISTRIBUTING CO	COLVILLE	5	Awaiting Cleanup	EA
9125918	CLAYTON BULK PLANT	CLAYTON	3	Awaiting Cleanup	EA
765	COLVILLE POST & POLES	COLVILLE	3	Cleanup Started	EP

Stevens

322

FS ID	SITE NAME	CITY	RANK	STATUS	RU
2939267◆	**DAWSON TRUCKING INC**	**VALLEY**	**5**	Cleanup Started	**EA**

Stevens

FS ID	SITE NAME	CITY	RANK	STATUS	RU
99472564	GULL INDUSTRIES INC CHEWELAH	CHEWELAH	5	Awaiting Cleanup	EA
98728759	HARTMAN OIL INC	COLVILLE	3	Cleanup Started	EA
762	L BAR SITE NORTHWEST ALLOYS	CHEWELAH	4	Construction Complete-Performance Monitoring	EA
767	LEROI CO SMELTER	NORTHPORT	1	Cleanup Complete-Active O&M/Monitoring	EA
764	**◆ TELEPHONE UTILITIES CORP**	**CHEWELAH**	**5**	Awaiting Cleanup	**EA**
5418085	VAN STONE MINE	COLVILLE	1	Cleanup Started	EA
38465614	WHITTYS MINIMART 2	COLVILLE	3	Construction Complete-Performance Monitoring	EA

Thurston

FS ID	SITE NAME	CITY	RANK	STATUS	RU
7496337	1203 EDISON ST NE	OLYMPIA	5	Cleanup Started	SW
33626892	17936 LITTLEROCK ROAD SE DRUG LAB	ROCHESTER	4	Awaiting Cleanup	SW
4877728	8TH & CAPITOL INVESTIGATION	OLYMPIA	3	Awaiting Cleanup	SW
1851774	ARCO 4435	LACEY	3	Cleanup Started	SW

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95968867	ASTRO WESTERN 617	OLYMPIA	2	Cleanup Started	SW
3995580	BENEDICT PROPERTY	ROCHESTER	5	Cleanup Started	SW
1420	BLACK LAKE GROCERY	OLYMPIA	2	Cleanup Started	SW
69923242	BMT NORTHWEST AKA RELIABLE STEEL	OLYMPIA	1	Cleanup Started	SW
69587682	BP SERVICE STATION 03158	TUMWATER	3	Cleanup Started	SW
35797926	BRIGGS NURSERY	OLYMPIA	2	Cleanup Started	SW
6649361	BUCKEYE COURT GASOLINE SPILL	OLYMPIA	1	Awaiting Cleanup	SW
1158414	CAPITAL CITY STUDIOS	OLYMPIA	3	Awaiting Cleanup	SW
1385	CASCADE POLE INC MCFARLAND	OLYMPIA	1	Construction Complete-Performance Monitoring	SW
1388	CEDAR CREEK CORRECTIONS DNR	LITTLEROCK	2	Awaiting Cleanup	SW
1391	CITIFOR INC	OLYMPIA	2	Cleanup Started	SW
87114236◆	**CITY OF OLYMPIA-MILLER CENTRAL**	**OLYMPIA**	**3**	Awaiting Cleanup	**SW**
9488181	CLARION HOTEL	OLYMPIA	5	Awaiting Cleanup	SW
4081	CLARKE RESIDENCE	OLYMPIA	5	Awaiting Cleanup	SW
5717399	DIAMOND PARKING LOT-CHEVRON 9-0292	OLYMPIA	3	Cleanup Started	SW
6105358	DOWNTOWN SAFEWAY	OLYMPIA	3	Cleanup Started	SW
5785176	EAST BAY REDEVELOPMENT	OLYMPIA	2	Cleanup Started	SW
14214153	EASTSIDE LAUNDRY ALLISONS NORGE VILLAGE	OLYMPIA	3	Cleanup Started	SW
243	EDB 1 THURSTON CNTY	OLYMPIA	2	Awaiting Cleanup	SW
58655568	EVERGREEN SHORES GROCERY	OLYMPIA	2	Cleanup Started	SW
4470 ◆	**FORMER MERVYNS WESTIFELD CAPITAL MALL**	**OLYMPIA**	**5**	Awaiting Cleanup	**SW**
75128579	HARDEL MUTUAL PLYWOOD	OLYMPIA	5	Cleanup Started	SW
19341958	HOWARDS CLEANERS	LACEY	1	Awaiting Cleanup	SW
1407	HYTEC LITTLEROCK	OLYMPIA	4	Cleanup Started	SW
1436	INDUSTRIAL PETROLEUM DISTRIBUTORS	OLYMPIA	1	Cleanup Started	SW

322

Thurston

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79261422◆	**JACK WILMARTH TRIANGLE GENERAL STORE**	**ROCHESTER**	**2**	Awaiting Cleanup	**SW**
32538917◆	**JACKPOT STATION #371**	**OLYMPIA**	**3**	Cleanup Started	**SW**

Thurston

FS ID	SITE NAME	CITY	RANK	STATUS	RU
81599862	JIFFY LUBE 2071	LACEY	3	Cleanup Started	SW
57665495	JOHNS AUTO WRECKING	OLYMPIA	1	Cleanup Started	SW
51544116◆	**KENS TIRE**	**OLYMPIA**	**3**	Cleanup Started	**SW**
54596735	LACEY FOOD MART	LACEY	3	Cleanup Started	SW
1416	LACEY LAUNDROMAT	LACEY	1	Cleanup Started	SW
1411	LACEY VALVE GRINDING	LACEY	3	Awaiting Cleanup	SW
66969124◆	**MCMAHANS FURNITURE**	**OLYMPIA**	**3**	Awaiting Cleanup	**SW**
25489377	MJMG GROUP LLC	OLYMPIA	3	Cleanup Started	SW
69859371	MOS MINI MART	CENTRALIA	2	Cleanup Started	SW
61129672	OLYMPIA CITY PUBLIC WORKS 7TH AVE	OLYMPIA	5	Awaiting Cleanup	SW
31651436	OLYMPIA CITY SEWER PUMP STATION	OLYMPIA	5	Cleanup Started	SW
1446	OLYMPIA DRY CLEANERS	OLYMPIA	2	Cleanup Started	SW
25276751	OLYMPIC PIPE LINE CO OLYMPIA STATION	RAINIER	2	Cleanup Started	SW
11334	PACIFIC PRIDE MARVIN RD	OLYMPIA	2	Awaiting Cleanup	SW
55237647	PALERMO WELLFIELD	TUMWATER	0	Construction Complete-Performance Monitoring	SW
1404	PATTISON LAKE EDB	LACEY	2	Cleanup Started	SW
39211944	PERFORMANCE CORNER	OLYMPIA	2	Cleanup Started	SW
62357433	PHO OLYMPIA RESTAURANT UTILITY POLE	OLYMPIA	5	Awaiting Cleanup	SW
69986581	PIT STOP OLYMPIA	OLYMPIA	2	Cleanup Started	SW
38982928	PREMIER AUTO DETAIL	OLYMPIA	3	Cleanup Started	SW
6413759	PSE BLUMAER SUBSTATION	TENINO	5	Awaiting Cleanup	SW
1443	PUGET POWER ELD INLET SUBSTATION	OLYMPIA	3	Awaiting Cleanup	SW
1394	PUGET SOUND POWER & LIGHT	OLYMPIA	5	Awaiting Cleanup	SW
70971197	PUGET SOUND POWER & LIGHT (TENINO BLUMEAI	TENINO	3	Awaiting Cleanup	SW
244	RESTOVER TRUCK STOP	OLYMPIA	3	Cleanup Complete-Active O&M/Monitoring	HQ
1401	RHODES CHEMICAL CO	ROCHESTER	3	Awaiting Cleanup	SW

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Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

Thurston

FS ID	SITE NAME	CITY	RANK	STATUS	RU
1402	RHODES CHEMICAL CO BARN	ROCHESTER	3	Awaiting Cleanup	SW
1418	SHELL OIL PRODUCTS US TUMWATER TERM	TUMWATER	2	Cleanup Started	SW
94656838	SOLID WOOD INC	OLYMPIA	2	Cleanup Started	SW
38893366	STOP N GO	OLYMPIA	3	Cleanup Started	SW
37814287◆	**SUMMIT LAKE BP**	**OLYMPIA**	**2**	Cleanup Started	**SW**
24971643	TACOMA SMELTER PLUME THURSTON COUNTY		0 ▶◀	Cleanup Started	SW
74873833	TENINO CORNER GROCERY	TENINO	2	Cleanup Started	SW
1386	THE OSTROM CO	LACEY	1	Awaiting Cleanup	SW
58484616	UNOCAL HULCO BULK PLANT FORMER	OLYMPIA	4	Cleanup Started	SW
1439	UNOCAL SERVICE STATION 0266	OLYMPIA	3	Cleanup Started	SW
1437	US WEST CAPITOL PEAK	OLYMPIA	5	Awaiting Cleanup	SW
6802078	VALENTINE FYRST PROPERTY	YELM	5	Awaiting Cleanup	SW
6280479	WA DNR TRIANGLE PIT	ROCHESTER	4	Awaiting Cleanup	SW
8786341	WA DNR WEBSTER NURSERY	TUMWATER	3	Construction Complete-Performance Monitoring	SW
12971522	WA GRANGE PARKING LOT CHEVRON	OLYMPIA	3	Cleanup Started	SW

322

Thurston

FS ID	SITE NAME	CITY	RANK	STATUS	RU
46541472◆	**WA ST CB&G STEAMPLANT**	**OLYMPIA**	**5**	Cleanup Started	**SW**

Thurston

FS ID	SITE NAME	CITY	RANK	STATUS	RU
1429	WAREHOUSE ONE PORT	OLYMPIA	5	Awaiting Cleanup	SW
1425	WEST OLYMPIA LANDFILL FORMER	OLYMPIA	4	Cleanup Started	SW
1387	WEYERHAEUSER CO BOX PLANT	OLYMPIA	4	Cleanup Started	SW

Walla Walla

FS ID	SITE NAME	CITY	RANK	STATUS	RU
7848414	MUIRHEAD SALVAGE YARD	WALLA WALLA	4	Awaiting Cleanup	EA
4853	PACIFICORP DELL AVE	WALLA WALLA	5	Awaiting Cleanup	EA
11293827	SCHWERIN CONCAVES WALLA WALLA	WALLA WALLA	2	Cleanup Started	EA
1367331	STUBBLEFIELD SALVAGE YARD	WALLA WALLA	1	Awaiting Cleanup	EA
779	WA DOC WASHINGTON STATE PENITENTIARY	WALLA WALLA	3	Cleanup Started	EA
769	WALLA WALLA FARMERS COOP	WALLA WALLA	1	Cleanup Complete-Active O&M/Monitoring	EA
775	WHITMAN COLLEGE	WALLA WALLA	5	Awaiting Cleanup	EA

Whatcom

FS ID	SITE NAME	CITY	RANK	STATUS	RU
1476961	ALS SALVAGE	BELLINGHAM	2	Cleanup Started	HQ
36261687	AMERICAN RECYCLING & MANUFACTURING	FERNDALE	3	Awaiting Cleanup	NW
68458243	AMERICAN WOOD TREATERS INC USA	SUMAS	4	Cleanup Started	NW
2920	B & B PAINT BENNETT DRIVE	BELLINGHAM	5	Awaiting Cleanup	NW
2903	BARLEAN PROPERTY	NOOKSACK	5	Awaiting Cleanup	NW
7791293	BC CORP	BELLINGHAM	3	Awaiting Cleanup	NW
2900	BEACON BATTERY	CUSTER	5	Awaiting Cleanup	NW
2922	BELLINGHAM PORT HARRIS AVE SHIPYARD	BELLINGHAM	2	Cleanup Started	NW
29583133	BELLINGHAM PORT WELDCRAFT	BELLINGHAM	1	Cleanup Started	NW
2888	BLAINE MARINA INC	BLAINE	3	Awaiting Cleanup	NW
1579941	BLAINE SHIPYARD	BLAINE	3	Awaiting Cleanup	HQ
2866	BROOKS MANUFACTURING CO	BELLINGHAM	5	Cleanup Started	NW
71836357	BURLINGTON NORTHERN RR ACME	ACME	4	Awaiting Cleanup	NW
43966326	BURLINGTON NORTHERN RR BELLINGHAM NORTH	BELLINGHAM	5	Awaiting Cleanup	NW
2864	CENTRAL WATERFRONT	BELLINGHAM	2	Cleanup Started	NW
2892	CHEVRON BELLINGHAM TERMINAL 100-1350	BELLINGHAM	2	Cleanup Started	NW
2911	CHRIS V 8 SHOP	CUSTER	1	Awaiting Cleanup	NW
64254993	COCA COLA BOTTLING CO OF WASH BELLINGHAM	BELLINGHAM	3	Cleanup Started	NW
2927	COLONY WHARF	BELLINGHAM	4	Cleanup Started	NW
2913	CORNWALL AVENUE LANDFILL	BELLINGHAM	2	Cleanup Started	NW
49669467	DIABLO DAM	DIABLO	5	Awaiting Cleanup	NW

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Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

Whatcom

FS ID	SITE NAME	CITY	RANK	STATUS	RU
193	EDB 3 WHATCOM CNTY AREA A	LYNDEN	3	Construction Complete-Performance Monitoring	NW
15	GEORGIA PAC BIO TREATMENT LGN	BELLINGHAM	2	Awaiting Cleanup	NW
2898	GEORGIA PACIFIC AIRPORT LANDFILL	BELLINGHAM	4	Awaiting Cleanup	NW
14	GEORGIA PACIFIC WEST BELLINGHAM	BELLINGHAM	5	Cleanup Started	NW
6331242	GIBSON PROPERTY	LUMMI ISLAND	5	Cleanup Started	NW
2925	HOLLY ST LANDFILL	BELLINGHAM	2	Cleanup Started	NW
2880472	LAKE TERRELL WILDLIFE AREA	FERNDALE	5	Cleanup Started	NW
7551533	LITTLE SQUALICUM PARK	BELLINGHAM	1 ▲	Cleanup Started	NW
95219425	MANJITS MINI MART	BELLINGHAM	5	Cleanup Started	NW
74391823	MIDWAY CHEVRON & MINI MART	LYNDEN	3	Cleanup Started	NW
7738468	MONTGOMERYS AUTO WRECKING	BELLINGHAM	2	Awaiting Cleanup	NW
9961698	MT BAKER PRODUCTS INC	BELLINGHAM	4	Awaiting Cleanup	NW
31548623	NORTHWEST FUEL CO	BELLINGHAM	3	Cleanup Started	NW
2906	NORTHWEST PIPELINE BELLINGHAM	BELLINGHAM	5	Cleanup Started	NW
2917	NORTHWEST PIPELINE BELLINGHAM2	SUMAS	5	Awaiting Cleanup	NW
2878	NORTHWEST PIPELINE GP SUMAS C/S	SUMAS	3	Cleanup Started	NW
195	NW TRANSFORMER HARKNESS	EVERSON	0 ▲	Cleanup Started	NW
194	NW TRANSFORMER MISSION POLE	EVERSON	0 ▲	Construction Complete-Performance Monitoring	EP
2861	OESER CO	BELLINGHAM	0 ▲	Cleanup Started	EP
2879	OLIVINE CORP	BELLINGHAM	3	Awaiting Cleanup	NW
2928	OLIVINE CORP HILTON AVE	BELLINGHAM	3	Cleanup Started	NW
21797146	ONEIL PROPERTY	BLAINE	3	Awaiting Cleanup	NW
63414232	PAISANO PIZZA	DEMING	5	Cleanup Started	NW
2102240	PRICE CUTTER CLEANERS	BELLINGHAM	5	Cleanup Started	NW
67117233	RESIDENCE COCKRELL	BELLINGHAM	3	Awaiting Cleanup	NW
2870	RG HALEY INTL CORP	BELLINGHAM	3	Cleanup Started	NW
2103926	ROEDER AVE INACTIVE TANK FARM	BELLINGHAM	3	Awaiting Cleanup	NW
2865	S STATE STREET MANUFACTURED GAS PLANT	BELLINGHAM	1	Cleanup Started	NW
3217596	SEATTLE CITY LIGHT LINE SHACK	NEWHALEM	5	Awaiting Cleanup	NW
19292573	SLATER ROAD CAR CRUSHING SITE	BELLINGHAM	3	Awaiting Cleanup	NW
7083381	STAR RD PROPERTY	FERNDALE	3	Awaiting Cleanup	NW
47652753	SUDDEN VALLEY RESORT	BELLINGHAM	5	Cleanup Started	NW
2897	SUNSHINE CLEANERS	BELLINGHAM	2	Cleanup Started	NW
23391	SWIFT BUILDING	BELLINGHAM	5	Cleanup Started	NW
98716497	TANK N TOTE	BLAINE	5	Awaiting Cleanup	NW
2885	THOMPSON PROPERTY	BELLINGHAM	5	Awaiting Cleanup	NW
2877	TOLLYCRAFT YACHTS CORP	BELLINGHAM	2	Awaiting Cleanup	NW
2893	TRANS MOUNTAIN OIL PIPE LINE	BELLINGHAM	1	Cleanup Started	NW
2919	TREOIL INDUSTRIES	FERNDALE	2	Awaiting Cleanup	NW
5738775	WA DOT PARCEL 1-14702	BELLINGHAM	2	Awaiting Cleanup	NW
66519819	WESTMAN MARINE INC	BLAINE	1	Awaiting Cleanup	NW
2891	WHATCOM COUNTY PUBLIC WORKS G1 YARD	BELLINGHAM	3	Cleanup Started	NW
2899	WHATCOM WATERWAY	BELLINGHAM	1	Cleanup Started	NW
2901	WILDER LANDFILL	FERNDALE	1	Cleanup Started	NW
94899685	Y ROAD LANDFILLS 1 & 2	BELLINGHAM	3	Awaiting Cleanup	NW
54298892	YORKSTON OIL CO INC BELLINGHAM	BELLINGHAM	5	Awaiting Cleanup	NW

Whitman

FS ID	SITE NAME	CITY	RANK	STATUS	RU
798	BNRR BRIDGE 270/4 REPLACEMENT	PULLMAN	3	Awaiting Cleanup	EA
21984243	COLFAX GRANGE SUPPLY INC MAIN & TYLER	COLFAX	3	Cleanup Started	EA
9768	CROP PRODUCTION SERVICES INC ST JOHN	SAINT JOHN	3	Awaiting Cleanup	EA
2932388	DUSTY FARM COOPERATIVE	DUSTY	3	Cleanup Started	EA
789	ENDICOTT SCHOOL DIST	ENDICOTT	4	Cleanup Started	EA
788	GARFIELD SCHOOL DIST	GARFIELD	3	Cleanup Complete-Active O&M/Monitoring	EA
807	INLAND POWER & LIGHT SPILL	COLFAX	3	Awaiting Cleanup	EA
791	NORTHWEST PIPELINE PULLMAN	PULLMAN	5	Awaiting Cleanup	EA
787	PALOUSE PRODUCERS	PALOUSE	1	Cleanup Started	EA
96954884	PETROSUN 1041	COLFAX	3	Cleanup Started	EA

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Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

Whitman

FS ID	SITE NAME	CITY	RANK	STATUS	RU
801	UPRR TEKOA LINE SEGMENT 2	TEKOA	4	Awaiting Cleanup	EA
802	UPRR TEKOA LINE SEGMENT 3	TEKOA	5	Awaiting Cleanup	EA
803	UPRR TEKOA LINE SEGMENT 4	GARFIELD	5	Awaiting Cleanup	EA
804	UPRR TEKOA LINE SEGMENT 5	GARFIELD	4	Awaiting Cleanup	EA
805	UPRR TEKOA LINE SEGMENT 6	COLFAX	4	Awaiting Cleanup	EA
808	WA WSU FULMER HALL CRAWLSPACE	PULLMAN	5	Awaiting Cleanup	EA
786	WA WSU LANDFILL	PULLMAN	4	Awaiting Cleanup	EA
797	WA WSU POWER PLANT OIL BULKING	PULLMAN	2	Awaiting Cleanup	EA
809	WA WSU ROAD PAINT SHOP	PULLMAN	3	Cleanup Started	EA
793	WA WSU SCRAP METAL YARD	PULLMAN	2	Awaiting Cleanup	EA

Yakima

FS ID	SITE NAME	CITY	RANK	STATUS	RU
22625296	201 W YAKIMA AVE	YAKIMA	5	Awaiting Cleanup	CE
479	AGRI-TECH YAKIMA STEEL FABRICATORS	YAKIMA	2	Cleanup Started	CE
511	ALDERS CHEVRON	YAKIMA	2	Cleanup Started	CE
51712731	AMERICAN RED CROSS YAKIMA	YAKIMA	5	Awaiting Cleanup	CE
3464749	APPLE VALLEY ELEMENTARY SCHOOL	YAKIMA	3	Awaiting Cleanup	CE
5075703	BARGE LINCOLN ELEMENTARY SCHOOL	YAKIMA	3	Construction Complete-Performance Monitoring	CE
476	BAY CHEMICAL	YAKIMA	2	Construction Complete-Performance Monitoring	CE
17964725	BAY ZINC CO INC	MOXEE	2	Cleanup Complete-Active O&M/Monitoring	CE
504	BEE JAY SCALES	SUNNYSIDE	1	Cleanup Started	CE
92688321	BISSELL DISTRIBUTING	YAKIMA	5	Cleanup Started	CE
56531667	BLEYHL FARM SERVICE SUNNYSIDE	SUNNYSIDE	3	Cleanup Complete-Active O&M/Monitoring	CE
522	BUENA LUST	BUENA	2	Awaiting Cleanup	CE
522	BUENA LUST	BUENA	2	Awaiting Cleanup	CE
522	BUENA LUST	BUENA	2	Awaiting Cleanup	CE
522	BUENA LUST	BUENA	2	Awaiting Cleanup	CE
4275364	BUSH PROPERTY	YAKIMA	5	Cleanup Started	CE
458	CAMERON YAKIMA INC	YAKIMA	1	Cleanup Complete-Active O&M/Monitoring	CE
492	CASCADE NATURAL GAS	SUNNYSIDE	1	Cleanup Started	CE
526	CIRCLE L	SUNNYSIDE	1	Cleanup Started	CE
451	CLIFFS BATTERY SERVICE	SUNNYSIDE	4	Awaiting Cleanup	CE
459	CMX CORP	YAKIMA	3	Construction Complete-Performance Monitoring	CE
503	COMET TRAILER CORP	SELAH	1	Cleanup Started	CE
498	CONSOLIDATED FREIGHTWAYS	YAKIMA	4	Awaiting Cleanup	CE
46552166❖	CREAM WINE	SUNNYSIDE	2	Awaiting Cleanup	CE
460	CROP KING / WOODS INDUSTRIES	YAKIMA	1	Cleanup Started	CE
10045	EGLET SURPLUS	ZILLAH	4	Awaiting Cleanup	CE
554	FIFTH WHEEL TRUCK REPAIR	YAKIMA	3	Cleanup Complete-Active O&M/Monitoring	CE
102	FMC YAKIMA	YAKIMA	0▲	Construction Complete-Performance Monitoring	EP
444	FRANK WEAR CLEANERS	YAKIMA	1	Cleanup Started	CE
25977617	FRY BUILDING	SUNNYSIDE	3	Awaiting Cleanup	CE
26981244	GEARJAMMER TRUCK PLAZA	UNION GAP	5	Cleanup Complete-Active O&M/Monitoring	CE
28575673	GOLD NUGGET MARKET	BUENA	5	Awaiting Cleanup	CE
510	HAAS FRUIT WHSE	YAKIMA	5	Awaiting Cleanup	CE
502	HAHN MOTOR COMPANY	YAKIMA	3	Cleanup Started	CE
9465028	HOOVER ELEMENTARY SCHOOL	YAKIMA	3	Construction Complete-Performance Monitoring	CE
1927	INTERSTATE 82 EXIT 33A	YAKIMA	5	Awaiting Cleanup	CE
468	JOHNNYS TEXACO	SUNNYSIDE	4	Cleanup Started	CE
473	KELLOGGS KORNER	SUNNYSIDE	1	Cleanup Complete-Active O&M/Monitoring	CE
535	KELLY OIL	YAKIMA	3	Awaiting Cleanup	CE
533	KERSHAW ORCHARD	GLEED/YAKIMA	5	Awaiting Cleanup	CE
491	LA ROSITA BAKERY	SUNNYSIDE	2	Awaiting Cleanup	CE
4171173	LABAMBA RESTAURANT	UNION GAP	2	Awaiting Cleanup	CE
470	MANHOLE 34	SUNNYSIDE	1	Construction Complete-Performance Monitoring	CE
16374394	MEDIC 1 FACILITY	YAKIMA	5	Awaiting Cleanup	CE
39563633	NOLAND DECOTO FLYING SER INC	YAKIMA	5	Awaiting Cleanup	CE
523	NORTHWEST EQUIPMENT	UNION GAP	3	Awaiting Cleanup	CE

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Hazardous Sites List

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Yakima

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494	NORTHWEST TRUCK REPAIR & SALVAGE INC	UNION GAP	3	Cleanup Started	CE
54181479	NORTHWESTERN FRUIT & PRODUCE	SELAH	5	Awaiting Cleanup	CE
484	NU WAY CLEANERS YAKIMA	YAKIMA	1	Cleanup Complete-Active O&M/Monitoring	CE
512	NW PIPELINE ST GRANDVIEW	GRANDVIEW	3	Awaiting Cleanup	CE
513	NW PIPELINE ST SUNNYSIDE	SUNNYSIDE	3	Awaiting Cleanup	CE
516	NW PIPELINE ST YAKIMA	YAKIMA	3	Cleanup Started	CE
520	PIK A POP 11	SUNNYSIDE	3	Awaiting Cleanup	CE
506	PIK A POP 15	YAKIMA	2	Cleanup Started	CE
505	PIT STOP NACHES	NACHES	3	Cleanup Started	CE
455	RAINIER PLASTICS CO	YAKIMA	3	Awaiting Cleanup	CE
529	RESIDENCE CHAMBERS	YAKIMA	3	Awaiting Cleanup	CE
534	ROZA IRRIGATION DISTRICT	SUNNYSIDE	3	Cleanup Started	CE
497	SELAH DUMP	SELAH	3	Awaiting Cleanup	CE
501	SNIPES MOUNTAIN LANDFILL	SUNNYSIDE	4	Cleanup Started	CE
482	SOUTHGATE LAUNDRY	YAKIMA	3	Cleanup Complete-Active O&M/Monitoring	CE
465	SUNNYSIDE MUNICIPAL WELL	SUNNYSIDE	3	Awaiting Cleanup	CE
221207	TERRACE HEIGHTS ELEMENTARY SCHOOL	YAKIMA	5	Awaiting Cleanup	CE
457	TERRACE HTS LANDFILL PESTICIDE	YAKIMA	4	Awaiting Cleanup	CE
514	TEXACO BULK PLANT	GRANDVIEW	2	Cleanup Started	CE
543	TIDRICKS QUALITY TRANSMISSION INC	YAKIMA	1	Awaiting Cleanup	CE
528	TIGER OIL 16TH ST & E NOB HILL	YAKIMA	1	Cleanup Started	CE
469	TIGER OIL 24TH AVE & W NOB HILL	YAKIMA	1	Cleanup Started	CE
477	TIGER OIL N 1ST ST FMR 6013	YAKIMA	3	Awaiting Cleanup	CE
548	TONYS AUTO REPAIR	YAKIMA	1	Awaiting Cleanup	CE
53365837	UNOCAL 76	YAKIMA	2	Cleanup Started	CE
539	UNOCAL BULK PLANT 0766	SUNNYSIDE	1	Cleanup Started	CE
105	US ARMY YAKIMA TRAINING CENTER	YAKIMA	2	Construction Complete-Performance Monitoring	CE
499	VALLEY DRY CLEANERS	SUNNYSIDE	2	Awaiting Cleanup	CE
95421291	VALLEY JUNK	YAKIMA	3	Awaiting Cleanup	CE
478	VANCLEAVE BODY SHOP	YAKIMA	1	Awaiting Cleanup	CE
540	WA DOT RIMROCK MAINTENANCE SITE 1	NACHES	3	Cleanup Started	CE
541	WA DOT UNION GAP DISTRICT SITE	UNION GAP	3	Cleanup Started	CE
545	WASHINGTON CENTRAL RAILROAD ROUNDHOUSE	YAKIMA	1	Cleanup Started	CE
569290	WHITNEY ELEMENTARY SCHOOL	YAKIMA	3	Awaiting Cleanup	CE
3227646	WILSON MIDDLE SCHOOL	YAKIMA	3	Awaiting Cleanup	CE
54517643	YAKIMA CITY FIRE DEPARTMENT	YAKIMA	5	Cleanup Started	CE
38245986	YAKIMA GULL 1614	YAKIMA	3	Awaiting Cleanup	CE
463	YAKIMA OLD CITY LANDFILL	YAKIMA	5	Awaiting Cleanup	CE
445	YAKIMA VALLEY SPRAY	YAKIMA	1	Cleanup Complete-Active O&M/Monitoring	CE
464	ZWIGHT LOGGING	YAKIMA	3	Awaiting Cleanup	CE

Hazard Sites List Legend:

- ◆ New site added to the ranked list
- ● New site added to the National Priorities List (NPL)
- ❖ Site re-ranked
- ▼ Superfund site; State has lead
- ▲ Superfund site; Federal (EPA) has lead
- ▶ Superfund site; Joint lead
- ◀ Superfund site; Under a Federal Facilities Agreement
- ▶◀ Tacoma Smelter Plume (State Lead)

Responsible Unit (RU) Site Contacts

Central Regional Office: Frosti Smith (509) 454-7841/Ted Benson (360) 407-6683
Eastern Regional Office: Patti Carter (509) 329-3522/Ted Benson (360) 407-6683
Northwest Regional Office: Donna Musa (425 649-7136/Ted Benson (360) 407-6683
Southwest Regional Office: Rebecca Lawson (360) 407-6241/T Benson (360) 407-6683
Headquarters Site Cleanup Section: Barry Rogowski (360) 407-7243/T Benson (360) 407-6683
Industrial Section: Paul Skyllingstad (360) 407-6949/T Benson (360) 407-6683
Nuclear Waste Program: John Price (509) 372-7921/Brenda Jentzen (509) 372-7912

Hazardous Sites List

SITE REGISTER SPECIAL ISSUE -- February 28, 2012

Awaiting Further Remedial Action:
Only a Site hazardous Assessment has been completed at the site.

Remedial Action in Progress:
Ecology has oversight. This can include sites undergoing: 1) Remedial Investigation/Feasibility Study; 2) Interim Action (any remedial action that partially addresses the cleanup of a site); 3) Cleanup Action (active construction).

Construction Complete:
This category includes sites where all major cleanup construction has been completed, but various levels of operation/maintenance/monitoring may continue to be performed at the site.

Site Hazard Assessment (SHA):
An process to confirm the presence of hazardous substances and to determine the relative risk the site poses to human health and the environment. If more action is needed, a Remedial Investigation/Feasibility Study is started.

Interim Action:
Any remedial action that partially addresses the cleanup of a site.

Remedial Action:
Any action to identify, eliminate, or minimize any threat posed by hazardous substances to human health or the environment, including any investigative and monitoring activities of any release or threatened release of a hazardous substance and any health assessments or health effects studies.

State Remedial Investigation/Feasibility Study (RI/FS):
An in-depth study conducted to:

-Determine detailed site characteristics and define the extent and magnitude of contamination at a site;
-Evaluate potential impacts on human health and the environment and establish cleanup criteria; and
-Evaluate cleanup alternatives.

The RI/FS may be conducted as two separate steps, but is usually combined into one study. A draft of the RI/FS report is made available for public review and comment before finalizing.

Independent Remedial Action:
This category includes all sites with independent remedial actions currently underway or completed, but work not verified by Ecology, or sites that have entered Ecology's Voluntary Cleanup Program.

Washington Ranking Method (WARM):
The results of the Site Hazard Assessment step are used in the Washington Ranking Method (WARM) to yield a WARM score--a number between 1 and 5. A score of 1 represents the highest level of risk and 5 the lowest. Generally, federal Superfund sites and sites ranked 1 or 2 are higher priority for cleanup. Factors that enter into site hazard ranking include: the amount and type of contaminants present, how easily contaminants could come into contact with people and the environment, and the level of public concern.

National Priorities List (NPL):
Environmental Protection Agency (EPA) list of hazardous waste sites identified for possible long-term response. These sites are managed by the State under the Model Toxics Control Act (MTCA), managed by EPA under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements, managed by both (co-lead), or under a Federal Facilities Tri-Party Agreement.

Tacoma Smelter Site (TSP):
For almost 100 years, Asarco operated a copper smelter in North Tacoma (Ruston). The pollution from the smelter is being addressed by both EPA and Ecology. In 1983, EPA listed the Commencement Bay Nearshore/Tideflats (CB/NT) Superfund Site on the NPL. The CB/NT Superfund Site includes four operable units associated with the Asarco smelter: Asarco Tacoma Smelter (OU 02), Asarco Off-Property (OU 04), Asarco Sediments (OU 06), and Asarco Demolition (OU 07). The Asarco Superfund sites are focused on the highest contamination close in to the smelter. In late 1990, Ecology expanded the investigation of the extent of contamination from the smelter. The extent of contamination is over 1,000 square miles and called the Tacoma Smelter Plume. Contamination decreases with distance from the smelter, and the levels outside of the Superfund operable units are generally moderate. For information, go to http://www.ecy.wa.

14832

WASHINGTON STATE DEPARTMENT OF ECOLOGY
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OLYMPIA WA 98504-7600

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138 of 152

Publication No. 78-e23
WA-27-2010

STATE OF WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY

MEMORANDUM

February 14, 1978

To: Doug Houck

From: Bill Yake

Re: Impact of International Paper Company's wood products mill effluent on the receiving waters of the Upper Chelatchie Creek Drainages

Introduction:

The purpose of this study was to characterize the effect of a wood products mill on the upper drainage waters of the South Fork of Chelatchie Creek under high flow conditions. The mill, owned by International Paper Company (IPCO), continuously discharges steam vat effluent, boiler blowdown, and sawmill cooling waters. In addition, intermittent discharges of oil from machinery and phenol from phenol holding tanks have been reported.

The effect of these effluents on an unnamed tributary bordering the mill premises and on the South Fork of Chelatchie Creek were studied under low flow conditions during the summer of 1977 (Paveza, 1977). During this period, no overland flow was reaching the South Fork of Chelatchie Creek. In addition, yard runoff and leachate flows from substantial woodwaste fills and a dump operated on IPCO property were minimal.

It was anticipated that this study would clarify impacts on receiving waters and provide data which would be considered closely when amendments to the present NPDES permit are considered and drafted.

Methods

The Class II inspection and receiving waters survey were conducted on January 10 and 11, 1978. Receiving water and effluent composite sample collection, as well as field analyses were conducted by Mike Morhous and Bill Yake (Ambient and Effluent Monitoring Staff). Collection of samples at stations #1A, #4A and #4B; as well as inspection of facility premises were conducted by Gerry Calkins and Doug Houck (Southwest Regional Staff).

This memorandum reports the results of field and laboratory analyses of effluent and receiving water samples. Flow was measured at the lagoon outfall using measurements taken at the outfall weir. All other flows were obtained from stream velocity profiles which were measured using a

magnetic flowmeter. Temperature, conductivity and dissolved oxygen (Winkler Method) were measured in the field. Composite samplers were installed at the lagoon outfall and station #3. These samplers were left in place for 24 hours and sampled 250 ml every 30 minutes. Composite samples were continuously iced. These samples were split with mill personnel for independent analyses. Grab samples were taken at each of the other locations, iced and transported to the Department of Ecology Analytical Laboratory in Tumwater for analysis. These analyses were conducted in accordance with Standard Methods (American Health Association; et al., 1976). The portion of composite samples transferred to mill personnel were analyzed by Mogul Laboratories in Portland, Oregon. These samples were not iced, but were delivered to this laboratory approximately two hours after the cessation of composite sampling.

Macroinvertebrate samples were taken at stations #1, #2, #6 and #7. Three to six rocks were removed from stream riffles. All visible macroinvertebrates were removed and placed in 90% ethyl alcohol. The dimensions of the rocks were estimated by measuring the longest two right angle lengths of each rock. The invertebrates were keyed and counted by Greg Cloud (Ambient and Effluent Monitoring Staff).

Results

Figure 1 depicts the study area and locates sampling points. Tables 1, 2 and 3 report the results of field and laboratory analyses of samples taken at each of the sampling locations. Care should be exercised in interpreting the nutrient data as nutrient samples were inadvertantly discarded and nutrient analyses were performed on samples which were neither acidified nor continually iced. The daily loadings of major parameters at each of the stations are summarized in Table 4. The mass balances, based on these loadings, are presented in Table 5 and give some indication of the precision of technique. The results of analyses performed on the mill's portion of the composite sample are reported in Table 6. Sampling times are summarized in Table 7.

The lagoon, which receives the steam vat discharge and a quantity of runoff and leachate, produces a black, turbid, anaerobic effluent. Effluent flow was approximately 0.6 cfs; and, as noted in the data summary, was high in BOD_5, COD, phosphorus and solids. The daily lagoon discharge of BOD_5 was 476 lbs/day. Flow measurement at the outfall weir was hampered because the weir is neither level nor sharp-crested. Flows reported from the lagoon effluent are based on conservative flow calculations. Total phosphate levels reported can be used with some confidence. Reported nitrate levels should be treated with more caution although it is likely that the anaerobic environment in the wastewater lagoon results in rapid denitrification, which is probably responsible for the nearly complete removal of nitrate and nitrite. The nitrogen deficient quality of the lagoon waters is further supported by the detection of substantial populations of Klebsiella which can fix nitrogen and therefore compete successfully in nitrogen deficient waters.

14832

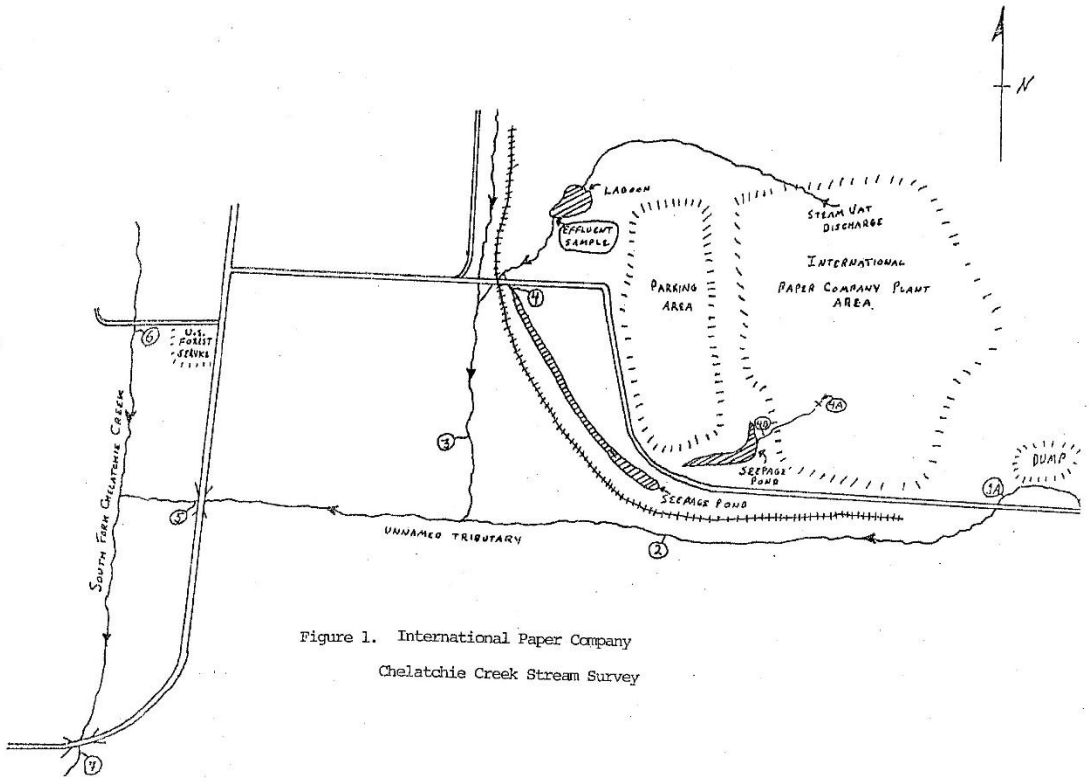


Figure 1. International Paper Company
Chelatchie Creek Stream Survey

141 of 152

14832

TABLE 1 WATER QUALITY DATA

Parameter	Station #1		Station #2		Lagoon Eff.		Station #3		Station #4		Station #5		Station #6		Station #7	
	10 Jan	11 Jan	10 Jan	11 Jan	10 Jan	11 Jan	10 Jan	11 Jan	10 Jan	11 Jan	10 Jan	11 Jan	10 Jan	11 Jan	10 Jan	11 Jan
Flow (cfs)	4.71				0.54	0.52	13.0				17.7[3]			8.54	29.2[3]	
pH	7.1	7.2	7.1	7.3	6.2	6.2[1]	6.9	6.9[1]		6.9	6.7	6.8	6.9	7.0	6.9	6.9
Specific Conductance (umhos/cm)	50	49	56	57	225	216[1]		70[1]		94	66	65	48	48	60	59
Temperature (°C.)	7.0	6.5	7.5	7.0	9.0	8.0	9.0	8.0			8.0	7.0	8.0	7.0	8.0	8.2
Dissolved Oxygen (mg/l)	11.8	12.0	11.8	11.9	-0-	-0-	9.5	9.9		7.4	10.0	10.3	10.6	11.0	10.4	10.6
Turbidity (JTU)	1	1	4	5		80[1]		15[1]		2	11	7	2	3	8	5
COD (mg/l)						352[1]		31[1]	15							
BOD (mg/l)						152[1]		10[1]	2							
Total Coliform (col./100 ml)	5[2]	4[2]	< 20	20[2]	> 1300	> 1600	> 40	> 290			> 30	200[2]	500[2]	1500	> 30	170[2]
Fecal Coliform (col./100 ml)	< 2	< 1	< 4	< 2	1000[2]	1600	40[2]	290[2]		2	30	200[2]	96	600	30	160
KLEBSIELLIA (% of fecal coliform colonies)					50%	60%	~0-	33%				55%				

1) 24 hour Composit Sample (Lagoon Eff. 1/10/78 (1030) to 1/11/78 (1035) (Station #3: 1/10/78 ((1115) to 1/11/78 (1120)
2) Estimated count
3) Flow based on Mass Balance, not measured.

142 of 152

14832

TABLE 2 WATER QUALITY DATA

Parameter	Station #1		Station #2		Lagoon Eff.[1]		Station #3[1]		Station #4		Station #5		Station #6		Station #7	
	10 Jan	11 Jan	10 Jan	11 Jan	10 Jan	11 Jan	10 Jan	11 Jan	10 Jan	11 Jan	10 Jan	11 Jan	10 Jan	11 Jan	10 Jan	11 Jan
*Orthophos.-P, filtered (mg/l	<.02	.06	<.02	<.02	0.15		<.02			<.02	<.02	<.02	<.02	<.02	<.02	<.02
*Total Phos.-P, unfiltered (mg/l)	<.02	.07	.02	<.02	0.16		.05			<.02	<.02	<.02	<.02	<.02	.02	.02
*Nitrate-N, filtered (mg/l)	1.26	1.26	1.22	1.24	<0.1		0.25			.70	.65	.66	.72	.70	.65	.59
*Nitrite-N, filtered (mg/l)	<.02	<.02	<.02	<.02	<.02		<.02			<.02	<.02	<.02	<.02	<.02	<.02	<.02
*Ammonia-N, filtered (mg/l)	.09	<.02	<.02	<.02	<.02		.07			<.02	<.02	<.02	<.02	<.02	<.02	<.02
Total Solids (mg/l)	50	48	51	54	424		74			71	63	54	44	44	65	74
Total Nonvolatile Solids (mg/l)	21	32	41	35	237		45			44	50	37	22	38	46	58
Total Suspended Solids (mg/l)	2	1	5	8	144		14			2	12	7	3	5	8	3
Total Nonvolatile Suspended Solids (mg/l)	2	1	4	7	104		11			2	10	6	2	5	7	3

1) Data from 24-hour Composite: Lagoon Eff.: 1/10/78 (1030) to 1/11/78 (1035)
Station #3: 1/10/78 (1115) to 1/11/78 (1120)

*Lab error - samples not continuously refrigerated nor preserved.

TABLE 3 WATER QUALITY DATA

Parameter	Station 1A 10 Jan	Station 4A 10 Jan	Station 4B 10 Jan
pH	6.9		
Specific Conductance (µmho/cm)	82		
COD (mg/l)	4		
*Orthophosphate-P, filtered (mg/l)	< .02		
*Total Phosphate-P, unfiltered (mg/l)	< .02		
*Nitrate-N, filtered (mg/l)	1.12		
*Nitrite-N, filtered (mg/l)	< .02		
*Ammonia-N, unfiltered (mg/l)	< .02		
Chromium (µg/l)	< 20		
Copper (µg/l)	< 20		
Cadmium (µg/l)	< 20		
Lead (µg/l)	< 20		
Zinc (µg/l)	40		
Iron (µg/l)	900		
Phenols (mg/l)		0.22	0.022

*Lab Error: Samples not continuously preserved.

14832

-7-

Table 4. Total Loadings (lbs/day)

Parameter	Station #1 10 Jan.	Station #2 10 Jan.	Lagoon Eff. 10,11 Jan.	Station #3 10,11 Jan.	Station #5 10 Jan.	Station #6 11 Jan.	Station #7 10 Jan.
Total Solids	1270	1300	1330	5200	6020	3410	9200
Total Suspended Solids	50.9	127	451	983	1150	138	1132
Total Nitrogen-N	34.3	31.2	< 0.31	22.5	63.1	32.3	94.8
Total Phosphate-P	- -	0.51	0.50	3.51	- -	- -	- -
Dissolved Oxygen	300	300	0	667	956	507	1470
COD			1100	2180			
BOD_5			476	702			

Table 5. Mass Balance Closure (lbs/day)

Parameter	Station #2 & #3	Station #5	% Closure	Station #5 & #6	Station #7	% Closure
Total Solids	6490	6022	+ 7.8%	9434	9196	+ 2.6%
Total Suspended Solids	1100	1147	- 4.3%	1285	1132	+ 13.5%
*Total Nitrogen	53.7	63.08	- 17.5%	95.4	94.8	+ 0.6%
Dissolved Oxygen	967	956	+ 1.2%	1463	1471	- 0.5%

* $(NH_3\text{-}N) + (NO_2\text{-}N) + (NO_3\text{-}N)$

145 of 152

Table 6. IPCO Analyses of Lagoon Effluent

Parameter and Units	Lagoon Effluent (24 hr. composite)
BOD_5 (mg/l)	165
Total Suspended Solids (mg/l)	156
Oil and Grease (mg/l)	3
Phenol (mg/l)	0.106
Total Coliforms (MPN/100 ml)	46,000 *
Fecal Coliforms (MPN/100 ml)	4,600 *

* Sample collection not aseptic. These data, therefore, highly questionable.

Table 7. Sampling Times

Location	Grab Samples and Field Analyses		Composite Samples		
	1-10-78	1-11-78	1-10-78	to	1-11-78
Station #1	1255	0930			
Station #1A	1240				
Station #2	1345	0945			
Lagoon Effluent	1635	1035	1030		1035
Station #3	1605	1120	1115		1120
Station #4		1145			
Station #4A	1310				
Station #4B	1320				
Station #5	1550	1010			
Station #6	1450	0900			
Station #7	1525	1000			

The lagoon effluent is almost certainly the source of the black sludge found at downstream locations by Paveza (1977). It should be noted that in a drainage such as this one, with considerable fluctuations in flow, solids will accumulate near the outfall in periods of low flow and be intermittently flushed to downstream reaches during periods of higher flow. This could lead to the clogging of spawning gravels as well as deposition of oxygen-demanding sediments at downstream locations.

Flow at station #3 includes the discharge from the settling lagoon, seepage pond #2, and a substantial flow from a drainage ditch which borders plant property on the west and north. Flow to this drainage ditch is comprised primarily of yard runoff. The flow at station #3 was approximately 13 cfs during the study period. This represents about 50% of the total flow of the South Fork of Chelatchie Creek below its confluence with the unnamed tributary.

Table 8 compares measured flows and loadings with current NPDES permit limitations.

Table 8. Flows and Loadings at International Paper Company Mill, Amboy

	NPDES Permit Limitations		24 Hour Composite Samples		
	Daily Average	Daily Maximum	Lagoon Eff. Mogul Labs	Lagoon Eff. DOE Labs	Station #3 DOE Labs
Flow (gpd)	331,600	400,000	374,700	8,400,000	
BOD_5 (lbs/day)	173	520	517	476	702
COD (lbs/day)	- -	- -		1100	2180
pH	6 - 9	6 - 9		6.2	6.9

Although present BOD_5 limitations address steam vat discharges specifically, it is apparent that organic loadings in the mill's discharge are substantial. The effect of these organic loadings is visually apparent in the unnamed tributary and the South Fork of the Chelatchie Creek below the confluence with the unnamed tributary. Solids deposition and heavy Sphaerotolis-like growths mark channels below the lagoon discharge.

Above the mill and associated landfill, the unnamed tributary has the appearance of a small, clean stream with a well balanced benthic community including stoneflies, mayflies, and caddisflies (See Table 9). The only unusual characteristic detected in the analyses of these waters was a rather high nitrate concentration. The very low phosphate levels, however, appear to result in a phosphate-limited, oligotrophic stream with a diverse benthic community primarily limited to residence in occasional aquatic moss growths.

Table 9. Benthic Invertebrates in Study Area

14832

Phylum Family Genus Species	Station 1		Station 2		Station 6		Station 7	
	Count	d *	Count	d	Count	d	Count	d
Diptera								
unidentified species 1.	6+	8.0						
unidentified species 2.							7	21
Simuliidae								
unidentified species	6	8.0						
Trichoptera								
Hydropsychidae								
Smicridea sp.	1	1.3						
Rhyacophilidae								
Glossoma sp.					27	25	2	5.9
Plecoptera								
unidentified species 1.	1	1.3						
unidentified species 2.							1	2.9
Perlodidae								
unidentified species	1	1.3						
Nemouridae								
Brachyptera sp.							1.	2.9
Ephemeroptera								
Ephemerellinae								
unidentified species	4	5.3						
Ephemerella doddsi	1	1.3						
Heptageniidae								
Rhithrogena decora	4	5.3			8	7.3		
Baetidae								
Baetis sp.	2	2.7					5	15
Mollusca								
Gastropoda								
Pleuroceridae								
Goniobasis silicula					1	0.9	1	2.9
Pelecypoda								
Margaritiferidae								
Margaritifera falcata					1 **	0.9 **		

* density per sq. ft.
** shell only

At station #2, there were neither macrophytes nor benthic invertebrates. The responsible agent for this lack of aquatic life was not isolated by the water analyses. The stream-bed stones were, however, covered with an oil-like substance. Paveza (1978, personal communication) noted numerous small fish in this stretch of stream during his summer 1977 study.

The visual character of the unnamed tributary below its confluence with mill effluent changes radically. The stream-bed profile deepens and Sphaerotolis-like growth covers most available substrate. The introduction of phosphate from the lagoon effluent may well increase the trophic status of the stream. Paveza (1977) reported that under low flow conditions this stretch of stream-bed was covered with a black deposition.

Above its confluence with the unnamed tributary, the South Fork of the Chelatchie Creek has the appearance of a relatively clean stream. The benthic community consisted primarily of larvae and pupae of the genus Glossoma and the mayfly Rhithrogena decora. Both of these taxa are specifically adapted to high velocity flows. Invertebrate sampling was done just below a culvert and this location probably biased the sample in favor of these two organisms. No Sphaerotolis-like growths were noted near station #6. The relatively high fecal counts at this station indicate that there are probably unidentified fecal coliform sources upstream.

Figure 2 is a photograph of Sphaerotolis-like growths at station #7. Similar growths were noted on many of the invertebrates collected at this site. Although a relatively diverse community of benthic invertebrates was collected at this station, Sphaerotolis-like growths have a deleterious effect on fish propogation (Hynes, 1960). Discharge of low nutrient organic wastes (i.e. silage effluent, pulp mill effluent, wood-waste effluent, etc.) has often been implicated in the growth of sewage fungus (Sphaerotolis), (Hynes, 1960; Funk, 1977, personal communication).

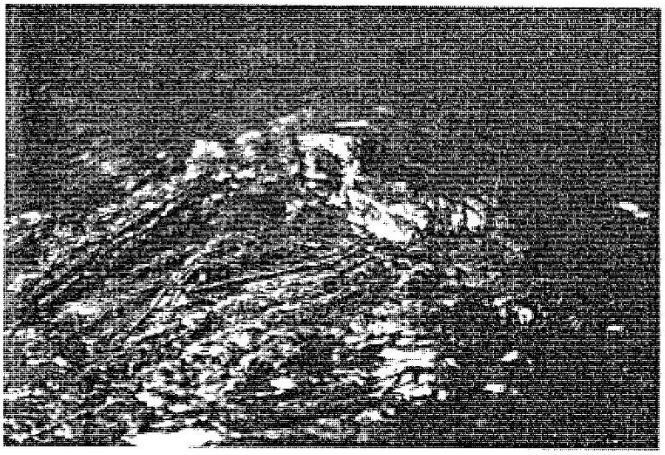
Conclusions

The primary deleterious effects of the IPCO mill effluent on the upper drainage waters of the South Fork of Chelatchie Creek under high flow conditions appear to be linked to:

1) Substantial organic loadings.
2) Total suspended solids loadings.
3) Intermittent phenol and oil discharges.

Organic loadings are probably responsible for substantial Sphaerotolis-like growths at points below the lagoon discharge. These growths, along with deposition of solids, are potentially deleterious to fish propogation and certainly have an adverse aesthetic impact on the stream.

Figure 2. Sphaerotolis-like growths at station #7



Suggestions

The design of future studies in this drainage might note the following suggestions:

1) The flow measuring weir at the lagoon outfall should be improved to provide accurate discharge flows. A sharp-edged, V-notch weir with an automatic flow recorder at this point would be very helpful.

2) Installation of a similar device at the steam vat discharge would be helpful in quantifying flows from this major source.

3) Collection of COD and nutrient samples at each of the stations would allow better interpretation of data reported here. In conjunction with flow measurements, the COD data would allow more precise inferences about organic loading and the specific sources of the responsible discharges.

4) The location of a new station to characterize lagoon influent would allow determination of the treatment efficiency of the present lagoon.

5) An expanded macroinvertebrate sampling program would improve the reliability of these data. Collection of at least 100 individuals at each station sampled in this study would allow use of species diversity indices. Adding a macroinvertebrate station at the mouth of the unnamed tributary would provide additional useful data.

Bibliography

Hynes, H. B. N., 1960. The Biology of Polluted Waters. Liverpool University Press.
Paveza, J., 1977. Memorandum to Howard Steeley: International Paper Company. Chelatchie Prairie.

14833

Sierra Pacific Industries

Land Investment & Development Division

March 25, 2013

Nancy Wittpenn
Environmental Protection Specialist
Bonneville Power Administration

RE: DNR Comments on the I-5 Corridor Reinforcement Project Draft Environmental Impact Statement

Dear Ms. Wittpenn,

14833-1 The following letter is intended to clarify Sierra Pacific Industries concerns regarding the I-5 Reinforcement Project (I-5 Transmission Corridor) proposed by the Bonneville Power Administration (BPA). These concerns are being raised to ensure that the BPA understands, plans, and adopts mitigation measures, which fully address Sierra Pacific Industries concerns.

14833-2 Sierra Pacific Industries first concern is that the I-5 Transmission Corridor will impact some of its most productive timberlands in perpetuity. These lands can and do produce a commercial crop of trees every 25-40 years. The timber yield from these properties is partly what our manufacturing facilities rely on to stay in business. Manufacturing jobs are essential to the stability and economic well-being of Washington State residents. These forests also provide public benefits in the form of wildlife habitat and watershed processes. In addition these forests sequester carbon, which is recognized as useful for the fight against global climate change. Forests ability to sequester and store carbon through photosynthesis and then later when mature, be harvested and manufactured into a multitude of low energy embodied and long lived wood products means their value in our fight against climate change will be higher in the future than they are today. The monetization of that sequestered carbon will be realized when the carbon market develops and matures. Therefore, Sierra Pacific Industries expects to

14833-3 be fully compensated for the value of the land impacted by the I-5 Transmission Corridor, the trees removed, and for the opportunity costs of lost carbon revenues these lands could provide in the future.

14833-4 Sierra Pacific Industries second concern is that the I-5 Transmission Corridor does not fully consider how it will impact the timber harvesting of the adjacent lands. Because timber harvesting requires removal of trees that are approximately 60-120' in height and requires using large, tall metal equipment timber harvesting around a high voltage electric transmission line can be extremely dangerous. Timber harvesting is constrained by numerous variables such as streams, the steepness of terrain, soil characteristics, inclement weather and access roads.

14833-1 Thank you for your comments. Specific comments are addressed below.

14833-2 The EIS addresses the project's long-term impacts to revenue derived from timber production in Section 11.2.2.4, Government Revenues (for public land) and in Section 11.2.2.7, Private Timber Production (for private land). These sections recognize three categories of impacts: reduction of timber production in and adjacent to the right-of-way, substations, and access roads; increased costs of managing timberland near the project; and reduction in non-harvest related revenue from lands near the project, including payments for ecosystem services, such as carbon sequestration or habitat protection. The analysis quantifies the loss of future revenue from reduced timber production (see Sections 11.2.3 through 11.2.7). Section 11.2.2.2, Employment and Income, addresses the project's potential impacts on employment arising from impacts on the flow of timber.

Quantification of the revenue associated with the other impact categories would be dependent on site-specific, time-specific, and situation-specific data that are not available at this time. These impacts would be discussed on a case-by-case basis with individual landowners during easement negotiations.

14833-3 Please see the response to Comment 14566-9.

14833-4 BPA recognizes the potential constraints that can occur between high voltage power lines and timber harvest activities. BPA has worked closely with Sierra Pacific during the planning phase of this project to site the transmission line and access roads across their property to try and minimize impacts to timber operations.

Please see Chapter 5, Land and Chapter 11, Socioeconomics for discussion of timber resources and BPA compensation for affected properties.

14833

14833-4 Power lines can also be a constraint depending on their alignment on the landscape. Careful planning can help alleviate and possibly eliminate those constraints; however the cost of working around power lines, due to the risks involved, will be a burden for as long as the power line occupies that location.

14833-5 Sierra Pacific Industries requests that the proposed BPA I-5 Transmission Corridor be located immediately adjacent to the existing BPA transmission corridor where it crosses Sierra Pacific Industries property. By locating the I-5 Transmission Corridor immediately adjacent to the existing transmission right of way the impact of restricting timber harvest access is minimized.

14833-6 Should BPA choose to ignore this request, Sierra Pacific Industries expects to be compensated for the long-term economic impacts of harvest restrictions from inside or outside of the right-of-way including those involving new timber haul roads, reconstruction of landings, and avoiding guyline cables. Compensation will include: cost recovery for staff time; permitting; construction; materials; and abandonment costs of infrastructure made unnecessary due to the new transmission line occupying the property.

14833-7 Sierra Pacific Industries third concern is that the I-5 Transmission Corridor does not consider how its alignment can increase public trespass onto its timberlands. Because a power line right of way is relatively free of vegetation and may have an access road, each place where it intersects a public road, becomes a potential access route for unwanted vehicle access onto the right of way and then onto Sierra Pacific Industries timberland. This unwanted vehicle access (trespass) can be by motorcycle, all-terrain vehicle or 4wd truck. Vehicular trespass can cause damage to Sierra Pacific Industries timberlands in several ways. Vehicular trespass can crush newly planted trees; damage its road surfaces, drainage structures, lead to additional trash dumping, and increase timber and firewood theft. In order to combat the potential increase in trespass, Sierra Pacific Industries will have to spend money on new gate installations, barricades and also increase the level of forest patrol in those areas. Careful planning can help alleviate trespass problems at the intersection of transmission lines and public roads, but it is likely Sierra Pacific Industries will be burdened with additional trespass costs as a result of the proposed I-5 Transmission Corridor.

Sierra Pacific Industries is currently encumbered by approximately 10 miles of BPA transmission corridors. By placing the new I-5 Transmission Corridor adjacent to the existing right of way, trespass problems can be addressed along a single access corridor and any existing trespass issues can be addressed at the time the new power lines are constructed.

14833-8 Regarding the ongoing cost of patrolling, repairing roads, gates, and the construction of new barriers to control trespass, Sierra Pacific Industries requests that a Road System Security, in the amount of $100,000, be available to implement corrective work on Sierra Pacific Industries lands where those lands have been damaged as a result of the trespass through any BPA transmission corridor, for the life of the easement. The Road System Security will be drawn upon as necessary to patrol, plan and complete corrective work, including staff time on issues relating to trespass across the BPA transmission corridor system. The Road System Security will not be allowed to be depleted below $100,000 for more than one fiscal year.

14833-9 The need for the Road System Security is in response to the Draft Environmental Impact statement in Chapter 3,

2 of 4

14833-5 Please see the response to Comment 14097-1.

14833-6 Please see the response to Comment 14566-9.

14833-7 Comment noted. Please see the response to 14457-2 regarding unauthorized access. If BPA decides to build the proposed project, BPA would continue to work with Sierra Pacific during easement negotiations to address concerns for any portion of the proposed project that would cross Sierra Pacific property.

14833-8 Please see the response to Comment 14306-4.

14833-9 Please see the response to Comment 14306-4.

14833

14833-9 section 3.12, Mitigation Measures, which states; *"All mitigation measures included as part of the project would be implemented prior to, during, or immediately after construction."*. This mitigation fails to acknowledge the long-term annual commitment necessary to correct and/or minimize damage that can occur during maintenance activities, facility upgrades, and by public trespass that results from the presence of these electrical transmission facilities on the land. The proposed Road System Security is a substantive mitigation that addresses the long-term impacts of these facilities and should be adopted as part of the I-5 Transmission Corridor.

14833-10 Sierra Pacific Industries fourth concern is that additional access roads will be constructed which would eliminate additional land from producing timber. Sierra Pacific Industries requests that access to the I-5 Transmission Corridor, where it cannot be feasibly placed in the transmission easement, be provided across existing roads to the maximum extent possible. As part of that

14833-11 road use, Sierra Pacific Industries expects that the BPA will "buy-in" to the road system, at a level which reflects BPA's avoided costs of building new roads at these locations. Because year round access is a necessity for maintaining an electrical transmission system, Sierra Pacific Industries expects that existing and new roads used to access the I-5 Transmission Corridor, will be rocked at a minimum rate of 40 cubic yards per 100' station. Sierra Pacific Industries expects

14833-12 BPA to contribute annually to the maintenance of those encumbered road systems. Maintenance contributions may be in the form of materials, equipment time, or funding from the proposed Road System Security. Sierra Pacific Industries also expects that clearing limits, brushing limits, and curve widening requirements are all agreed upon in advance by each party.

14833-13 Sierra Pacific Industries fifth concern is that new road construction will be done in a manner that does not consider ongoing timber management activities. New road alignments and gradients need to be designed so that they function as useful infrastructure for ongoing timber harvest operations. Sierra Pacific Industries expects to be consulted regarding the alignment of any new roads on Sierra Pacific Industries and that the BPA adopt the Washington State Forest Road Best Management Practices as a guide for design and construction of new forest roads.

14833-14 Sierra Pacific Industries expects to be fully compensated for the fee land value, mature timber removed, the opportunity costs of sub-merchantable trees removed, and also the abandonment and reforestation costs of infrastructure made unnecessary due to new road construction. Sierra Pacific Industries expects to receive a full easement to utilize any newly constructed roads that cross its property, which supports the BPA I-5 transmission project.

14833-15 Sierra Pacific Industries sixth concern is that pulling and tensioning sites, staging areas, and other offsite temporary use and disturbance locations are identified and reviewed with Sierra Pacific Industries prior to the commencement of construction activities. Sierra Pacific Industries

14833-16 expects to be fully compensated for trees damaged at pulling and tensioning sites, staging areas, and other offsite temporary use areas. Sierra Pacific Industries expects that all disturbed ground associated with such activities will be ripped and replanted with a commercial conifer species of its choosing. Sierra Pacific Industries expects to administer the tree planting and release treatments that will occur in these areas, and be compensated for its time and materials for those reforestation efforts.

3 of 4

14833-10 Please see the response to Comment 14119-2. BPA plans to use existing roads to access the transmission line on Sierra Pacific property.

14833-11 Please see the responses to Comments 14566-9 and 14833-11.

14833-12 Please see the response to Comment 14806-29.

14833-13 Please see the response to Comment 14806-29.

14833-14 Please see the response to Comment 14566-9.

14833-15 BPA will continue to coordinate with Sierra Pacific on these and other design and construction activities.

14833-16 Please see the response to Comment 14566-9.

If BPA decides to build this project, BPA would work with Sierra Pacific in the restoration of lands directly impacted by the activities of this project.

14833

14833-17 Sierra Pacific Industries seventh concern is that hazard trees outside of the transmission corridor will be cut without coordinating with Sierra Pacific Industries. Sierra Pacific Industries expects that BPA will coordinate all hazard tree removals that are necessary outside of the transmission corridor in a manner that allows Sierra Pacific Industries, whenever feasible, to recover those trees for manufacturing. Whether the removal of the hazard trees is feasible or

14833-18 not, BPA will compensate Sierra Pacific Industries for their current market value.

14833-19 Sierra Pacific Industries seventh concern is that BPA 's procedures for fire prevention and fuels treatments will not utilize best practices to address accumulations of slash, logs or trimmings from vegetation removal operations that pose a hazard for wildfire spread or ignition. Best practices include scattering, chipping or the arrangement of concentrations of logs or trimmings in a manner as to not create a continuous extreme hazard fuel bed. Sierra Pacific industries request that on its timberlands BPA adherers to Sierra Pacific Industries fire prevention and fuels management policies.

14833-20 Thank you for the opportunity to review and comment on the I-5 Corridor Reinforcement Project Draft Environmental Impact Statement (DEIS). Sierra Pacific Industries looks forward to seeing the Final EIS reflect our concerns about this project in the Final Environmental Impact Statement.

Sincerely,

Gary Blanc
Lands Division Manager
Sierra Pacific Industries

4 of 4

14833-17 Comment noted. If BPA decides to build the proposed project, BPA would determine the amount and location of danger trees that would actually require removal when the selected route is surveyed and marked in the field. BPA would coordinate this effort with Sierra Pacific. As indicated in Section 11.2.2.5 of the EIS, compensation for removing danger trees would be determined through appraisals as part of the negotiation process for easements for the transmission corridor.

14833-18 Please see the response to Comment 14566-9.

14833-19 BPA and its contractors would create a fire safety plan before construction and would include the underlying landowner's guidelines.

14833-20 Thank you for your comments.

Chair Luce,

14835

There are troubling methods of evaluating alternatives by BPA that we want to bring to your attention.

14835-1 BPA did not perform a "feet on the ground" study of wetlands on their Preferred Alternative (or any alternative), as per their Draft EIS. BPA only used maps and geographical data. Using those methods would not find all areas encumbered by wetlands. How could they choose a preferred alternative if they haven't even been on the ground delineating wetlands?

14835-2 We have no proof that the West Alternative is a route the Army Corps of Engineers cannot permit. When we submitted a FOIA asking for BPA's study on double circuiting on wetlands along the West Alternative the response was "No responsive documents."

We demand that Bonneville Power Administration requests a permit from the Army Corps of Engineers for their West Alternative using double- or triple-circuit towers in wetlands or for the entire length of the project.

14835-3 BPA did not perform in depth studies on their Preferred Alternative of known DOE Hazardous Sites and threaten to disturb these sites by digging footings for the transmission towers sometimes deeper than 80 feet (Reynolds fluoride plume at the Oregon southern end of the project).

Also of concern for the nearby shallow private water wells, Clark County's Sole Source Aquifer, and local creeks that flow into the North Fork of the Lewis River is the old International Paper Mill site, where known PCB barrels are buried in the same locations tower footings are planned.

WA DOE Hazard site list FS ID Clark County:
30204: Chelatchie Tank Farm (Rank 4)
1031: IPC Plywood Mill (Rank 5)
1032: IPC Solid Waste Site (Rank 2)

2

1 of 2

14835-1 Please see the response to Comment 14753-1.

14835-2 Please see the response to Comment 14596-5.

14835-3 Please see the responses to Comments 14827-48, 14683-9, 14775-11, 14775-2, 14791-21 and 14791-22.

14835

14835-4 We've worked closely with the people impacted by this project and listened to their concerns about the impact this project will have on their lives. On their behalf, would you please take a look at the attachment and comment to BPA and the Army Corps of Engineers on these issues. **The deadline to comment is noon, March 25, 2013.**

Thank you in advance

Cheryl Brantley

A Better Way for BPA
http://abetterway4bpa.org

3

2 of 2

14835-4 Comment noted.

14837

Ms. Talburt & BPA,
Attached are Ecology's comments for I-5 Corridor Reinforcement project (Ecology SEPA No. 12-5474). Comments are due today 3/25/13.

14837-1

Attached is the original final copy.

Please reply to this message for confirmation. Thank you.

Sonia Mendoza
Department of Ecology-SWRO
SEPA Coordinator

Please consider the environment before printing this e-mail

1 of 7

14837-1 Thank you for your comments. Specific comments are addressed below.

14837

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

March 25, 2013

Ms. Tammy Talburt
Energy Facility Site evaluation Council

Bonneville Power Administration

Dear Ms. Talburt & BPA:

Thank you for the opportunity to comment on the draft environmental impact statement for the I-5 Corridor Reinforcement project located in Clark and Cowlitz Counties Washington and Multnomah County Oregon. The Department of Ecology (Ecology) reviewed the information provided and has the following comment(s):

AIR QUALITY/GREENHOUSE GAS (GHG): Gail Sandlin (360) 407-6860

14837-2 Although this would not change the EIS recommendations, various sections such as Summary S.3.18.2 and Chapter 22 discuss US EPA ghg reporting requirements but fail to mention WA State ghg reporting requirements under WAC 173-441. Nevertheless, based on ECY GHG SEPA policy, the estimated annual GHG emissions during the construction phase suggests a qualitative analysis of ghg emissions is adequate and the GHG information in this EIS more than meets that objective.

WATER QUALITY: Sheila Pendleton-Orme (360) 690-4787

Chapter 90.48 RCW prohibits the discharge of polluting matter to water. Discharges must not cause or contribute to a violation of surface or ground water quality standards (Chapter 173-201A-200 WAC).

14837-3 Erosion and sediment control measures must be in place prior to any clearing, grading, or construction. These control measures must be effective to prevent stormwater runoff from carrying soil and other pollutants into surface water or storm drains, conveyance systems that lead to waters of the state. Sand, silt, clay particles, and soils will damage aquatic habitat and are considered to be pollutants.

To prevent impacts to water quality during construction activities a Stormwater Pollution Prevention Plan (SWPPP) needs to be developed to serve as a guidance document for the contractor. The SWPPP should outline Best Management Practices (BMPs) to be

2317

14837-2 Comment noted.

14837-3 Please see the response to Comment 14827-48.

implemented during all phases of construction. The SWPPP must include a narrative and drawings.

The following twelve elements must be considered when developing the SWPPP. BMPs must be consistent with Stormwater Management Manual for Western Washington http://www.ecy.wa.gov/programs/wq/stormwater/manual.html.

1. Mark clearing limits
2. Establish construction accesses
3. Control flow rates
4. Install sediment controls
5. Stabilize soils
6. Protect drain inlets
7. Stabilize channels and outlets
8. Control pollutants
9. Control de-watering
10. Maintaining BMPs
11. Manage the project

14837-3 Factors to consider will be soil characteristics, vegetative cover, topography and climate. Due to the significant diversity of site characteristics throughout the project the SWPPP will need to be adapted when needed with alternative BMPs to select from.

Proper disposal of construction debris must be on land in such a manner that debris cannot enter water of the state (e.g., wetland and their buffers) stormdrains and conveyance systems draining to water of the state or cause water quality degradation.

Prohibited discharges include but not all conclusive are:

1. Concrete waste water.
2. Wastewater from washout and clean-up of paint, form release oils, curing compounds and other construction material.
3. Process wastewater.
4. Slurry materials.
5. Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance.

Staff knowledgeable in the principles and practices of erosion and sediment control needs to be on site. They need to assess site conditions and construction activities that could impact the quality of stormwater and the effectiveness of erosion and sediment control measures to protect water quality. Regular visual inspections need to be conducted and recorded with sampling and monitoring to ensure water quality standards are being met.

SHORELANDS & ENVIRONMENTAL ASSISTANCE:
Rebecca Schroeder (360) 407-7273

1. Activities Within Shoreline Jurisdiction per Washington's Shoreline Management Act

14837-4 The final EIS should describe all activities anticipated to occur within shoreline jurisdiction. Per RCW 90.58.030(2)(d), "'Shorelands' or "shoreland areas" means those lands extending

14837-4 A summary of impacts to Shorelines of the State in Washington for the Preferred Alternative is included in the Final EIS as Appendix O.

landward for two hundred feet in all directions as measured on a horizontal plane from the ordinary high water mark; floodways and contiguous floodplain areas landward two hundred feet from such floodways; and all wetlands and river deltas associated with the streams, lakes, and tidal waters which are subject to the provisions of this chapter; the same to be designated as to location by Ecology." Include, at a minimum, the following information for each activity:

14837-4
- County or city in which the activity is proposed to occur.
- Water body name and specific location of activity/crossing.
- Whether the water body is a shoreline of statewide significance.
- Shoreline environment designation (e.g., rural, conservancy, etc.) according to the local shoreline master program.
- Type of activity (access road, overhead lines, tower, staging area, other)
- Describe in detail how the activity or use will be consistent with the local Shoreline Master Program and the State Shoreline Management Act.
- Site plans. Show existing and proposed activities accurately, to scale, and in relation to the Ordinary High Water Mark (OHWM).

II. Activities Affecting Wetlands

Describe all activities anticipated to occur within or adjacent to wetlands. Include, at a minimum, the following for each activity:

- Delineation report, including data sheets. Use the 1987 federal wetlands delineation manual, along with the 2010 Western Mountains, Valleys, and Coast Regional Supplement Version 2.0, to conduct all wetland delineations.
- Wetland rating per the *Washington State Wetland Rating System For Western Washington*, Revised Annotated Version, August 2006, Ecology Publication #04-06-025.
- Information on the existing wetland buffers (e.g., buffer width, vegetative cover, etc.) and adjacent land uses.
- Impact avoidance measures.
- Type of activity or use (access road, overhead lines, tower, staging area, other)
- Size and type of impact (e.g., fill, grading, vegetation removal).
- Best management practices (BMPs) for sediment and erosion control that will be implemented (e.g., silt fences, immediate revegetation, mulching).

14837-5
- Measures to protect nearby wetlands from construction impacts (e.g. vegetation damage, runoff, etc.) An example of protective measures would be flagging the wetland buffer of a wetland close to the work site to clearly define the area in which no work should occur.
- Proposed mitigation measures to compensate for unavoidable impacts.
    - If use of wetland mitigation bank credits is proposed to compensate for wetland impacts within a certified bank's service area, a bank use plan should be completed to support the rationale for bank use.
    - Plans for concurrent mitigation need to follow Interagency Wetland Mitigation Guidance found at: http://www.ecy.wa.gov/programs/sea/wetlands/mitigation/guidance/index.html.
- How a watershed approach was used to determine appropriate mitigation locations and types.
- How mitigation measures will compensate for functions and acreage lost at each impact site.

14837-5 BPA has coordinated with Ecology and the Corps through the Section 404 permit process. This information is included in the permit application.

- Means for permanent protection of wetland mitigation areas (e.g., conservation covenant).

14837-5

If any of the information requested in this section is unavailable at the time the FEIS is prepared, please note that Ecology will require this information during the permitting process or as soon thereafter as it becomes available.

14837-6

Ecology requires complete on-the-ground wetland delineations for all wetlands proposed to be impacted. If it is not possible to complete a delineation on any property within the project area because the condemnation process has not been completed, Ecology will assume the highest wetland category and highest level of functioning for wetlands within these properties according to all site information available at the time of permitting (e.g., using methods described in Appendix L). Mitigation proposed must be commensurate with these assumptions. If, after all delineations are completed, it turns out that any such wetland is of a higher category and/or level of functioning than previously presumed, Ecology may amend the 401 water quality certification to require mitigation commensurate with the level of impacts. All delineations of wetlands within the project area must be completed and submitted to Ecology for review prior to impacting wetlands.

III. All Water-Body Crossings

14837-7

For water bodies that will be crossed by overhead lines, where the vegetation within the ROW will be cleared or otherwise altered, describe in detail the following:

- Clearing or vegetation alteration methods, including equipment to be used.
- BMPs and other methods that will be used to minimize impacts to water quality and soil compaction.
- Mitigation measures proposed that were not included in section II above. For impacted wetlands, one option is to use mitigation ratios that pertain to permanent conversion of Cowardin classes. For shorelines, mitigation measures need to compensate for effects of reduction in riparian vegetation (e.g., increase in water temperature due to loss of shading, decrease in dissolved oxygen, etc.).

IV. Castle Rock Substations

14837-8

The DEIS states that the Casey Road substation would be built over two intermittent, non-fish bearing streams. It is unclear from the DEIS why this would be necessary and how this would be accomplished. In the final EIS, provide detailed information, including a site diagram that shows how this substation is proposed to be built in relation to the streams. Include all possible alternatives to building over the streams.

14837-9

The DEIS states that the Baxter Road site is on forest land surrounded by forested wetlands. In the final EIS, describe in detail how construction of a substation at this site would impact nearby wetlands, either directly or indirectly.

V. Specific Comments the DEIS

Ch. 16, Wetlands

14837-6 Field work including on-the-ground wetland delineations have been done within the Preferred Alternative right-of-way and access roads where permission to access properties has been granted. BPA understands that there is uncertainty with property access and field work cannot be completed on properties where access is denied. In such cases, a "desk-top" evaluation and an analysis of current aerial photographs has been done in order to approximately delineate the boundaries of the wetlands. If there is legal access to adjacent properties, observations will be made from off-site to determine the type and nature of wetlands. If no access is possible and the area is forested, then BPA understands Ecology will consider the wetland to be of the highest category and level of function. Mitigation provided will be commensurate with wetland type and project impacts.

14837-7 Please see the response to Comment 14837-6. Field work has been done including identifying water bodies, streams, and rivers to be crossed by overhead lines along the Preferred Alternative.

14837-8 The substation has been located to take advantage of being reasonably close to existing access roads for construction and a location under and adjacent to the existing right-of-way and transmission lines. Also considered during siting of the substation was avoidance of Rock Creek, an unnamed perennial stream to the north, Category I wetlands to the south and east, and a perennial stream to the east that flows through the Category I wetlands.

Between the Draft and Final EIS, additional stream and wetland surveys were done on the revised project design. One of the intermittent streams described in the Draft and Final EISs originates west of the stockpile area and flows north to a perennial stream. There would be no direct impact to this stream although indirect impacts may occur. During 2011 stream and wetland surveys, the intermittent, non-fishbearing stream originating within the substation site flowed east to join the perennial stream east of the substation site. Since that time, the substation site has been cleared of trees and during additional stream and wetland surveys conducted in 2014 evidence of the stream was not visible. Although direct impacts on the intermittent stream would occur from substation construction, subsurface water would likely continue to flow to nearby streams. BPA would confirm presence of the intermittent stream prior to Section 404 permitting because the 2011 delineation would likely expire in 2016.

14837-9 Chapter 16 discusses potential impacts to wetlands at the Baxter Road substation site. BPA believes this analysis provides a reasonable evaluation of these potential impacts and provides sufficient information to allow the public and decision makers to understand and compare these impacts for alternatives. In addition, while BPA is still in the process of considering all alternatives with a routing decision to be made in the Record of Decision, BPA notes that the Baxter Road site is not part of BPA's Preferred Alternative, which has been identified in Chapter 4 as Central Alternative using Central Option 1.

14837-10 The second paragraph of page 16-1 states that "The Shoreline Management Act gives the State of Washington the authority to regulate wetlands (see Section 27.24.1.2, Shoreline Management Act)." It is true that the Shoreline Management Act (SMA) is the regulatory authority for associated wetlands within shoreline jurisdiction. However, Washington State has additional regulatory authority to regulate wetlands, including wetlands that are not associated with shorelands. This comes from RCW 90.48, the Water Pollution Control Act, and Section 401 of the federal Clean Water Act. RCW.90.48 grants Ecology the authority to regulate non-federal ("isolated") wetlands that are not regulated under the CWA. Section 401 of the CWA directs Ecology to regulate wetland impacts that are permitted through Section 404 of the CWA. These should also be discussed and clarified in this paragraph.

14837-11 The third paragraph of page 16-1 states that "Wetland soils have formed in glacial materials developing characteristics influenced by coniferous forest vegetation." This should be clarified to say "Some wetland soils have formed in glacial materials . . ." as not all wetland soils develop in this manner.

14837-12 The fourth paragraph of page 16-1 states that "Wetlands are within rural areas, on lands managed for timber harvest and agriculture, and land within suburban and urban development primarily on the north and south sides of the Columbia River . . ." While this may be true, it seems to imply that wetlands may be scarce outside of these areas. The reality is that wetlands may exist in areas throughout southwest Washington within the proposed project area, not just primarily on the north and south sides of the Columbia.

14837-13 The final paragraph on page 16-1, which continues on page 16-2, states "The study area was extended beyond the specific proposed locations of project facilities to understand and consider potential connectivity of existing wetlands to larger wetland complexes in adjacent areas." Ecology strongly supports this type of analysis in order to account for all potential project-related impacts to wetlands.

This same paragraph states that wetland mapping was done using various resources, including the National Wetland Inventory. While it may not need to be stated explicitly in the EIS, BPA should nevertheless understand that NWI maps are not always reliable or accurate. Wetlands may exist where there are no mapping indicators in NWI. Conversely, NWI maps may show a wetland where none exists on the ground. On-the-ground verification is essential for determining the accurate location and extent of all wetlands within the analysis area.

14837-14 The first full paragraph on page 16-2 discusses Cowardin classes. Please clarify that each class must have at least 30% vegetative cover of the type of vegetation that defines its class as the uppermost stratum of vegetation.

14837-15 The blue box on page 16-3 states that "Delineations were not available for the transmission line or access roads." Once these delineations are performed, BPA will need to submit to Ecology wetland delineation reports and wetland ratings for each wetland.

14837-16 The final paragraph on page 16-3 states that "Ecology's wetland rating system also includes recommended buffer widths to protect wetlands functions, depending on the intensity of the surrounding land uses." Ecology's recommendations on buffers are actually found in Wetlands in Washington State Volume 2: Guidance for Protecting and Managing Wetlands, publication #05-06-008.

14837-10 BPA recognizes that Ecology retains authority for the regulation of wetlands through both the CWA Section 401 and the state's Water Pollution Control Act. Chapter 16, Wetlands, has been updated to more clearly reflect these authorities.

14837-11 Comment noted. Text has been changed as requested.

14837-12 Comment noted.

14837-13 Comment noted.

14837-14 Chapter 16, Wetlands, has been updated to clarify the Cowardin wetland classification definition.

14837-15 Comment noted.

14837-16 Chapter 16, Wetlands, has been updated to reflect this correction.

Chapters 27 and 28

14837-17

The last paragraph of page 28-18 states that "The SMP for Clark County, adopted in 1974, and Cowlitz County, adopted in 1977 regulates land uses affecting shorelines of the state." Clark County recently adopted an updated version of its SMP. The effective date was September 12, 2012. This newly revised Shoreline Master Program (SMP) is the one that should be used for this project and in development of the final EIS.

The old Clark County SMP is also mentioned in Chapter 27, and page 27-17 lists specifics from the old SMP. These should be updated per the new SMP. Chapter 27 also discusses Kelso, Vancouver, Camas, and Washougal SMPs. Vancouver and Camas have recently adopted updated versions of their SMPs (both on 9-24-12). Information from these new SMPs should be used in development of the final EIS.

Appendix L

14837-18

On page 9, under "Automated GIS Processes," I assume the word "riparian" is meant to be "riverine."

VI. Additional Comments

14837-19

It is evident that numerous trees will be cleared to construct this project. Large trees, stumps, and root wads are frequently used in mitigation projects for wetland and stream impacts. We recommend that BPA salvage large trees, stumps, and root wads for this purpose. Donating large trees or root wads for use in unrelated mitigation projects is also worth considering.

14837-20

Ecology will be requesting a meeting with BPA prior to submittal of the 401 application package to discuss the level of detail that will need to be provided in the application package.

14837-21

Ecology's comments are based upon information provided by the lead agency. As such, they may not constitute an exhaustive list of the various authorizations that must be obtained or legal requirements that must be fulfilled in order to carry out the proposed action.

If you have any questions or would like to respond to these comments, please contact the appropriate reviewing staff listed above.

Department of Ecology
Southwest Regional Office

(SM:12-5474)

cc: Perry Lund, SEA
Lori Ochoa, SEA
Sheila Pendleton-Orme, VFO/WQ
Gail Sandlin, AQP
Rebecca Schroeder, SEA
Joyce Smith, HQ/WQ

14837-17 Revisions to reflect the updated Shoreline Master Plans (SMPs) for Clark County, the City of Vancouver, and the City of Camas have been made to Section 27.26.1.2, Washington State Shoreline Management Act, and Section 28.4.1, Shorelines and Wetlands.

14837-18 The commenter is correct. Since this is a final report submitted to BPA from Herrera Environmental Consultants, Inc., no corrections have been made.

14837-19 Comment noted. BPA is considering use of large trees, stumps, and root wads as mitigation for impacts to aquatic resources.

14837-20 Comment noted. BPA has been meeting regularly with Ecology.

14837-21 Comment noted.

14838

From: Asgharian, Maryam A (BPA) - DKE-7 [maasgharian@bpa.gov]
Sent: Monday, March 25, 2013 8:12 AM
To: BPAIS
Subject: FW: 18 & 28 relocate request
Attachments: Comment-relocate 18 & 28.pdf; 18-19_reroute.pdf; 18-22_reroute.pdf; 18-25_reroute.pdf; 18-28_reroute.pdf; 18-31_reroute.pdf; 28-4_reroute.pdf; 28-6_reroute.pdf; Chelatchie Prairie signatures0001.pdf; Fern Drive0001.pdf

Maryam Asgharian
Public Affairs Specialist
Office: 503-230-4411
Cell: 503-754-8505

From: Korsness,Mark A (BPA) - TEP-TPP-3
Sent: Friday, March 22, 2013 2:23 PM
To: Asgharian,Maryam A (BPA) - DKE-7
Subject: Fw: 18 & 28 relocate request

Also official comment

From: Ray Richards
Sent: Friday, March 22, 2013 02:14 PM
To: Korsness,Mark A (BPA) - TEP-TPP-3
Subject: 18 & 28 relocate request

Mark,

See attachments (11).

Thanks,
Ray

Ray Richards

1 of 2

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14838

I-5 Corridor Reinforcement Project
PO Box 9250
Portland, OR 97207

March 22, 2013

Regarding Bonneville Power Administration's I-5 Corridor Reinforcement Project, we request that the following changes be made to the location of route segments 18 and 28. **Please use this corrected version of a previous request dated March 20, 2013.**

14838-1

1. At tower 18/19 divert line 18 to the south to avoid the properties of Easter, Burns, Edwards and Aho. The line must be located so that no trees will be removed from private property.
2. The relocated line segment 18 continues eastward on state land, located far enough south of all private land so that no trees are removed from these properties.
3. Tower 18/29 is a dead-end tower and is relocated onto state land.
4. Line 18 proceeds south on state land.
5. The line turns eastward and proceeds inside the south property lines of Haslinger/Francar and Mount Angel Abbey.
6. The line continues following the inside edges of property lines, as indicated on the enclosed maps, of Waranke, Sutton, McNeal and Fleming.

See enclosed maps (7) for details. See enclosed signature pages (3).

Sincerely,

Ray Richards
A Better Way for BPA

cc: US Army Corps of Engineers

Page 22b612

14838-1 Please see the response to Comment 14097-1.


Satellite
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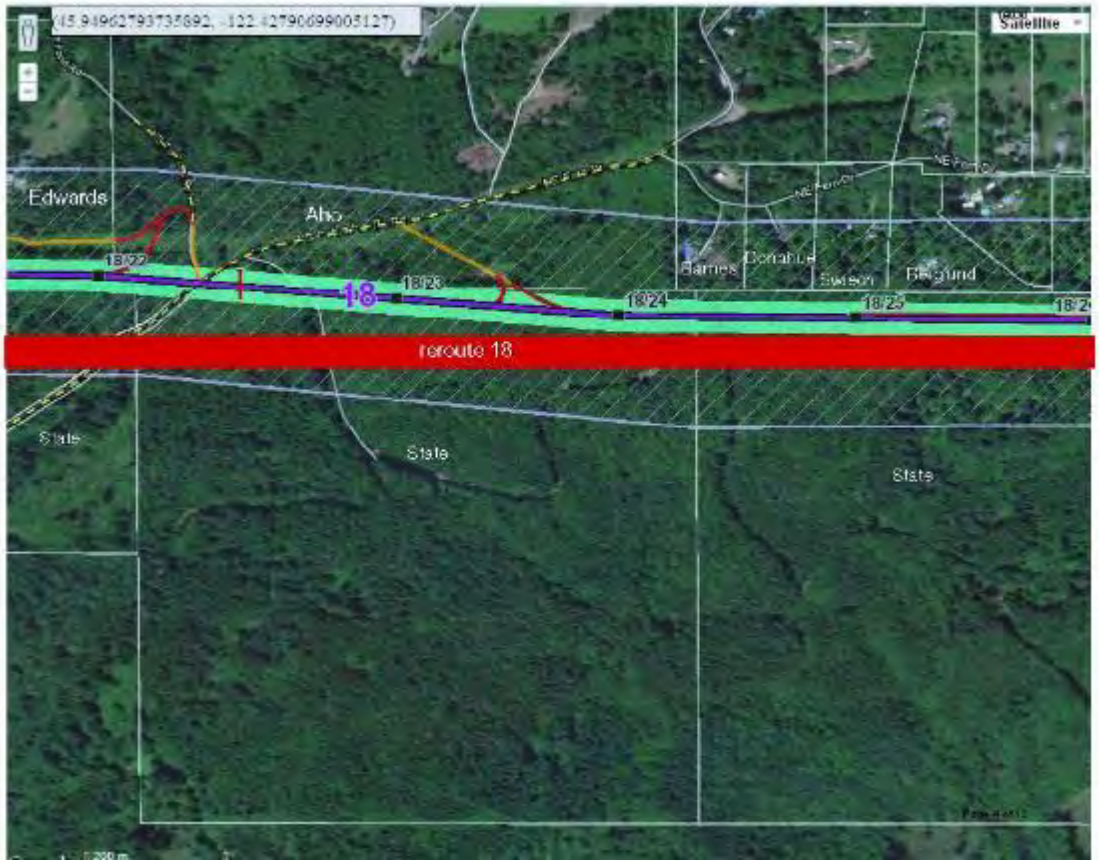
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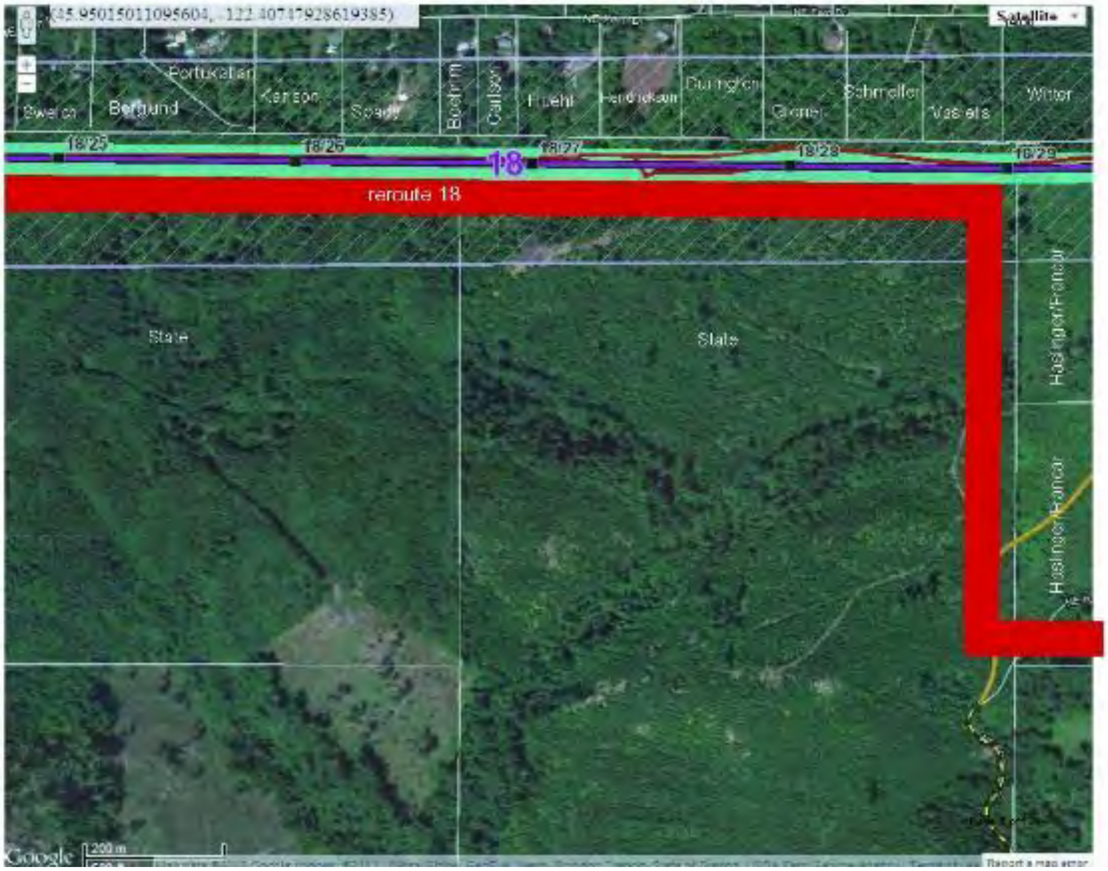
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Schmeller
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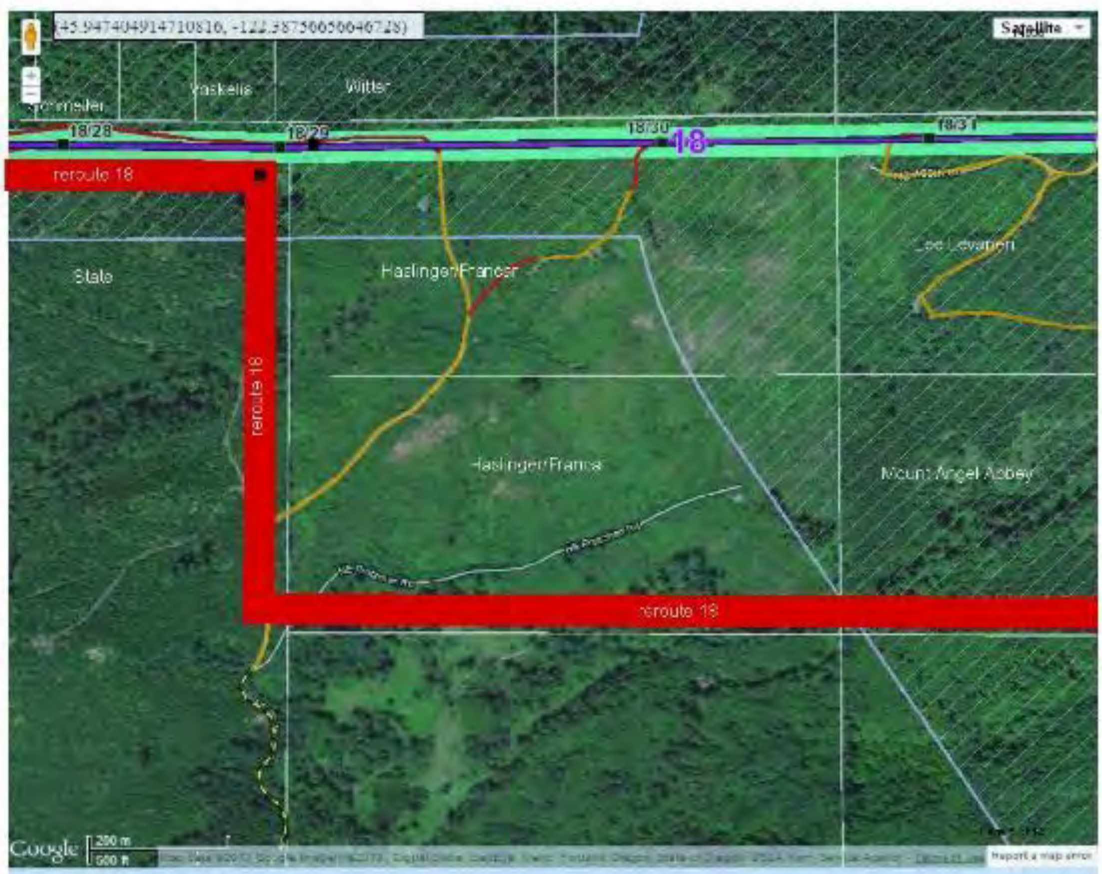
Haslinger/Francar
Google
200 m
Report a map error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State
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Haslinger/Francar
Haslinger/Franca
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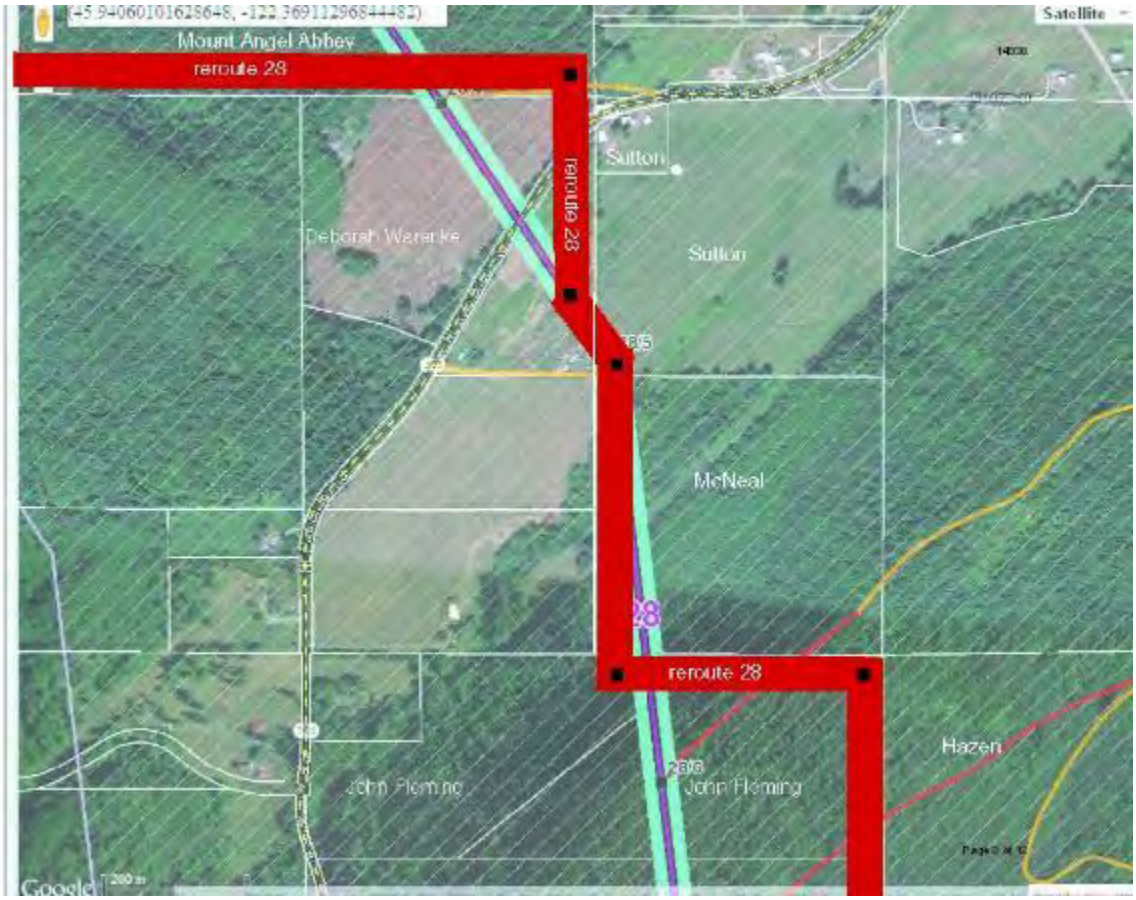
Google
200 m
500 ft
Report a map error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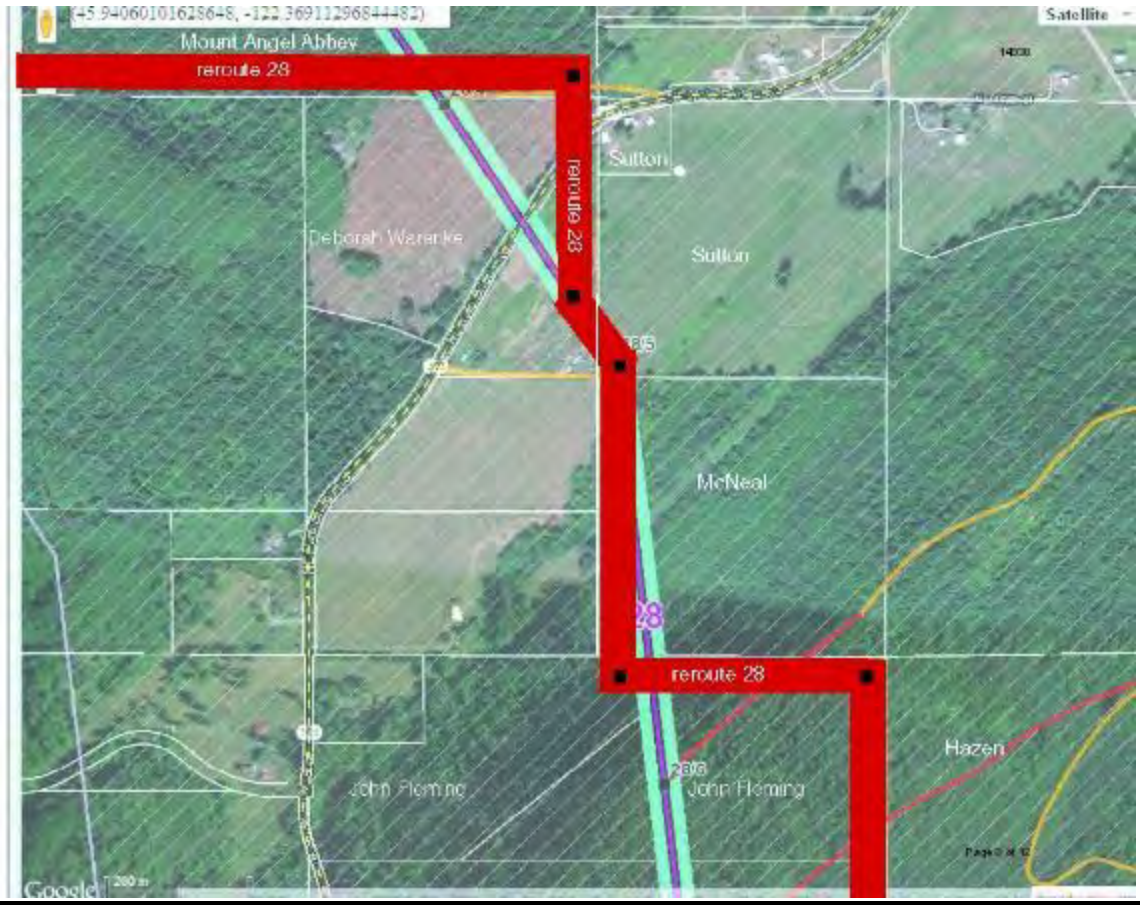
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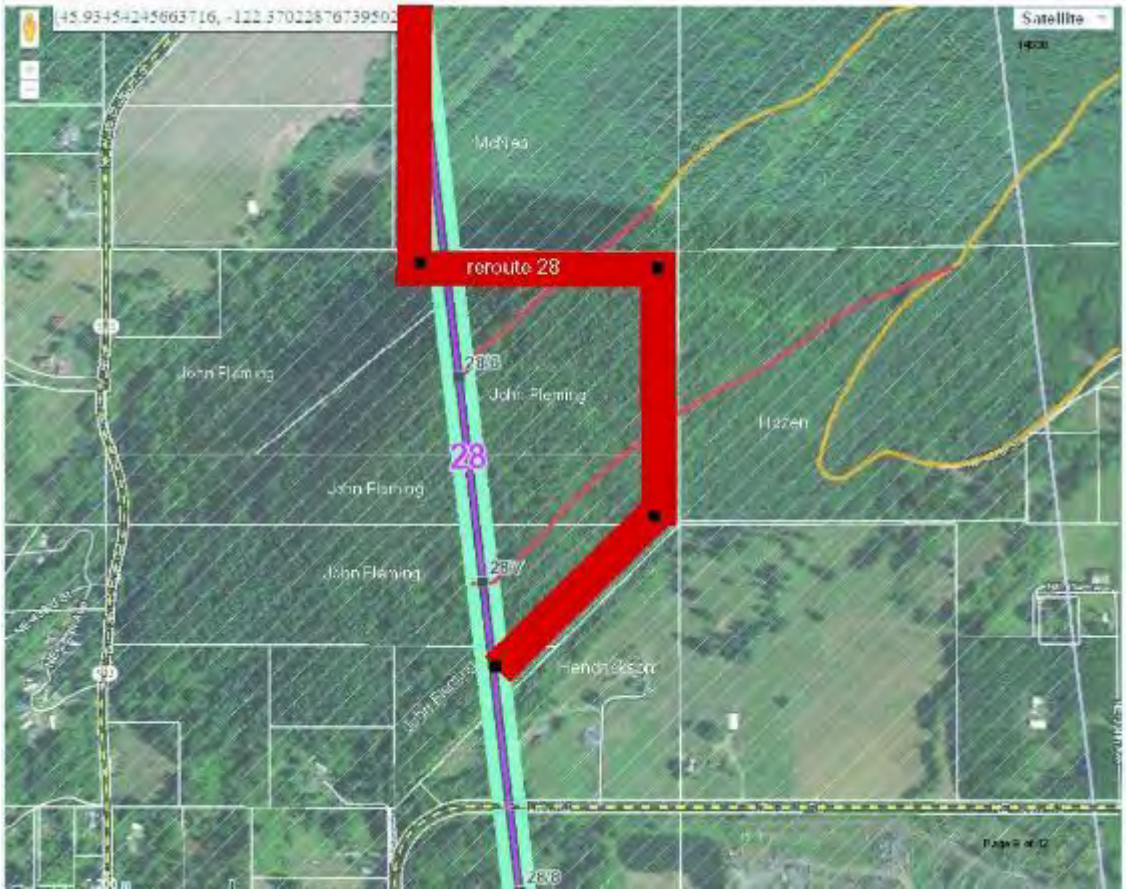
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28
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John Fleming
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McNeal
Hazen
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14838

Feb. 9, 2013

Meeting regarding tower location changes affecting Chelatchie area property-owners: Towers between #1831 and #28/7 moved so that they cause lines to be built through edges of property, not through the middle or too close to our homes.

14838-2

Meeting attendees who agree with moving these towers:

Deborah Wash Deborah Warnke

LEE JEVANEN

TOM FLEMING

Page 10 of 12

14838-2 Please see the response to Comment 14097-1.

P 1 of 2

14838

14838-2 As Fern Drive and Tie Pond Road Property Owners; we propose that towers ~~1823~~ 1819 to 1829 be moved 800' to the south.

1-26-13

Curt Hurell

Karen Baden

Kent Burns

Doug Zott

Debra Zott

Pete Lewis

Vic Vaskelis

over

Page 11 of 12

Pg 2 of 2

14038

Cheryl Carlson

Richard Davis

Ben & Cathy Kandell

Darryl & Kathleen Groner

Kathleen Groner

Kim Spady

Harriet Ushuli

M Bartlett

Jeff Vesley

Sue Donahue

Page 12 of 12

From: Darleen Keatley
Sent: Monday, March 25, 2013 11:14 AM
To: BPA I-5 Corridor Reinforcement Project
Subject: BPA Comment to D. E.I.S.

Public comment to the I-5 Corridor Reinforment Project is attached.
Darleen Keatley

14839

March 23, 2013

People need and want to have reliable electrical service available at their homes and businesses. People are accustomed to and rely on this service at all times of day and night for a multitude of uses ... at the flip of a switch.

14839-1 As an arm of our Federal Government, the Bonneville Power Administration is charged with providing this vital service to people. People are now learning about a new effort by the B.P.A. to provide a more reliable electrical supply for homes and businesses in Vancouver Washington, Oregon, California, and Nevada. This effort is called the I-5 Corridor Reinforcement Project. I personally became aware of this project in 2010 and now in 2013 have been reviewing B.P.A.'s Draft E.I.S. Summary of the

14839-2 preferred alternative route for this project.

The B.P.A., while producing their Draft Environmental Impact Statement, with its many pages of thoughtful considerations, did not include the economic impact to county, city government agencies, and minor taxing districts; as well as small private land and timber owners. The location of B.P.A.'s preferred route alternative will devalue the private lands B.P.A. proposes to take for R.O.W. as well as

14839-3 abutting properties. When forcing raised taxes on people to compensate for a lowered tax base per devaluation; or if no higher taxing comes to pass, i.e. local school levy, fire, PUD, port and other taxes ... less tax revenues for cities, counties and local entities result. These two choices are not a plus for Southwest Washington State. This action would be an example of our government inflicting added economical decline to already financially struggling communities. Not good public policy.

14839-4 In addition, the crossing of the Cowlitz River Valley and "threading" the B.P. A.'s proposed 500KV power line through a building site (well and power ready) just barely large enough to satisfy right of way requirements will provide no room for future expansion. This is a serious flaw in your route choice. Not good planning.

14839-5 I am requesting the B.P.A. to stop this present Preferred Alternative Route process going

14839-6 forward. Reopen the scoping process and extend the time period. Use generation redispatch, D.E.I.S. Summary p.2, to create any additional time needed to look for a better route to provide for peoples' electrical needs. Providing people and communities with a needed service at the economic expense of a different set of people and communities... not receiving the said services... is not the answer.

14839-7 I am hopeful that B.P.A. can do much better in their decision making and route choices. When B.P.A. built the existing power transmission lines to this area in the 40's they were very cognitive to place them far, far away from people. Evan so, as the years passed, we have seen build out of our communities to properties abutting the R.O.W. This will surely occur again as time passes and communities expand. Use the example of the past B.P.A. plan and build far, far away from people; leaving room for future expansion.

Please reopen the scoping process; evaluate better alternatives; choose a better alternative with less impact to people than the current preferred alternative. Better public policy can be obtained.

14839-8 Thank you for this opportunity to comment on the I-5 Corridor Reinforcement Project.

14839

Darleen Keatley

14839-1 Comment noted.

14839-2 Comment noted.

14839-3 Please see the response to Comment 14291-3.

14839-4 Please see the response to Comment 14097-1.

14839-5 Please see the response to Comment 14800-5.

14839-6 Section 1.1.2.3, Feasibility Assessment of Other Non-Wires Measures, explains how BPA is evaluating the operational feasibility of generation redispatch, which, if feasible and cost effective, could maintain system reliability in the I-5 project area for 2 to 6 years.

14839-7 Please see the response to Comment 14800-5.

14839-8 Thank you for your comments.

14840

Hi Nancy

14840-1 Attached are UTC Pipeline Safety Program comments to the DEIS for the proposed BPA project.

1 of 2

14840

UTC BPA Environmental Impact Statement Comments

UTC comments regarding Draft Environmental Impact Statement for the I-5 Corridor Reinforcement Project by Bonneville Power Administration.

For the F section of the Eastern Alternative, Option 1 between tower F/23 to F/38 our concern is that damage that could result from a landslide that could impact or damage a major Natural Gas (Williams Pipeline) and Hazardous Liquid (BP Pipeline) that are located only 500 -1000 feet downslope from the proposed towers F/23-F/27. In this one section there are four small landslides (F-20 through F-24) between the proposed towers and the two Natural Gas and Hazardous Liquid Pipelines.

The section from F/27 to F/31 crosses multiple areas that contain DNR noted landslide features including steep areas that may be interpreted as headscarps of larger slides. See Geological hazards F-28 to F-35. Geological Hazard F-28 is a good example of section F,
14840-2 *"F-28 Extensive steep slopes ranging from 40 to greater than 70 percent upslope of mapped deep seated landslide. Steep areas may be interpreted as head scarps of larger slides."*

The areas between these towers have multiple geological hazards that would make this option difficult and expensive to construct due to the need for engineering controls to build and maintain access roads. Especially the area between F/27 to F/31 would possibly lead to landslides downslope of the towers and access roads.

The area that is used for this section is hill with slopes in the area of 40 to 70 degrees with multiple historical landslides. The soils from the soil map Map 14-2A show a severe soil erosion hazard.

Landslides are common in hilly and steep areas and along cliffs in Southwest Washington and can occur at slopes as gentle as 11% (6 degrees)

14840-1 Thank you for your comments. Specific comments are addressed below.

14840-2 BPA has met with representatives of Williams Pipeline on-site to share information and discuss potential impacts. Chapter 14, Geology and Soils, notes that site-specific investigations would be done at potential landslide prone areas to evaluate the potential for these areas to experience landslides. To the extent possible, towers and access roads would be sited to avoid potentially landslide prone areas. If needed, mitigation measures to reduce the risk of landslides to the project, other utilities, and the public would be implemented (e.g., developing a landslide monitoring plan).

Please see also the response to Comment 14665-40.

14841

14841-1 We are homeowners in the Kaskillah neighborhood of Clark County. Many of us have advocated over this long process with BPA that there be no towers in occupied areas. Our preference would be to have the towers on unoccupied lands to the east. If that is not

14841-2 possible, we strongly urge BPA to move Towers V/27P/1, P/2, P/3, and P/4 to the east approximately 990 feet to run due south of Tower V/26. One tower, in particular, V/27P/1, would be located 150 feet from an existing home and 300 feet from another. It is totally unacceptable to us that you would, so callously, put such a financial burden on homeowners who would see their home values plummet.

14841-3 Yes we love trees, but we would remind our state officials, that they belong to all of us not simply to the Department of Natural Resources and they are not more valuable than the families whose lives will be impacted by this decision. Move the towers!

Name	Address
Barbara F McDonald	
Walter McDonald	
Kathleen M. Warren	
Derrick Roche [illegible]	
[illegible]	
[illegible]	
[illegible]	" " " "
Marta Hat	" " " "
Paula Mat	
[illegible]	
[illegible]	
Tricia Weike	
Carla Garner	
Lisa Rushing	
John [illegible]	

1 of 2

14841-1 Comment noted.

14841-2 Please see the response to Comment 14097-1.

14841-3 Comment noted.

14841

Name	Address
TAMARA DUNKIN	
Ron	" " " " "
Montie & Sonja Elford	
Richard Ken Krauser	
Connie Griffith	

2 of 2

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14842-1 Please publish as general comment to the I-5 Corridor Reinforcement Project website and records: 14842

Tum Tum Mountain Area Landowners Coalition
In conjunction with A Better Way for BPA says

BPA build on the land where you already own rights to build—your existing right of way!

14842-2 Bonneville Power Administration has proposed building a 500-kilovolt power line between Castle Rock, Washington and Troutdale, Oregon the proposed route "28" would pass through or near all of our members' properties, invading private land, restricting landowner rights and rendering some parcels useless. This route would intersect with the Cedar Creek watershed and the Tum Tum mountain fault

14842-3 line. As it proceeds south into section "V" it would cross the East Fork of the Lewis River one of the last remaining free flowing rivers in the state of Washington. The least expensive alternative and the one with the least impact on property rights and the environment would be to use the West Alternative where BPA already has towers and lines. Any of the new routes that BPA has proposed would cut a 70-mile long swath through the countryside of Clark and Cowlitz counties. BPA tells us there is enough room on its current right-of-way for this project. We say BPA should use the land it already owns the rights to build on—the existing right-of-way. It just makes the most sense!

14842-4
- The existing right-of-way has 70 years of proven reliability, stability and security.
- Placing the new lines on the existing right-of-way is the least expensive alternative and would be the best use of ratepayer's money.
- There is minimal impact to private property owners from adding lines on a corridor where towers and lines already exist.
- Using any route other than the existing right-of-way would cost landowners in two counties an estimated 1300 acres.

We, the undersigned, ask BPA to not violate our property rights. We ask BPA to use our ratepayer dollars wisely and efficiently by placing the new line on its own land, the existing right-of-way of routes West Alternative, where it has had lines and towers for the past 70 years.

Name	Address	Date
Sign: [signature] Print: AARON P GIESE		02-04 2012
Sign: [signature] Print: NOELLE I GIESE		2/04/12
Sign: [signature] Print: Charlie Dombrowski		3-10-2012
Sign: Print:		
Sign: Print:		
Sign: Print:		
Sign: Print:		

1 of 7

14842-1 The comment has been posted on the project website and included in the comment record.

14842-2 Please see the response to Comment 14097-1.

14842-3 Comment noted.

14842-4 Comment noted. Although it is possible to use our existing right-of-way, it is not our preferred alternative for reasons stated in the Issue Brief: Why BPA prefers Central Alternative Option 1. This Issue Brief is posted on the project website at http://www.bpa.gov/Projects/Projects/I-5/Documents/BPA-I-5-Issue-Brief-Preferred-Alternative-Nov2012.pdf

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Name	Address	Date
Sign: [signature] Print: [illegible]		5/4/12
Sign: Print:		
Sign: Print:		
Sign: Print:		
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Sign: Print:		
Sign: Print:		

2 of 7

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Name	Address	Date
Sign: Kenneth E Clark Print: Kenneth E Clark		18 Feb 2012
Sign: Jeannette M. Clark Print: Jeannetta M. CLARK		2/18/2012
Sign: Alice M Giese Print: Alice M Giese		2/18/12
Sign: Krysti Shandy Print: Krysti Shandy		2/19/12
Sign: Anthony Shandy Print: Anthony Shandy		2/19/12
Sign: Jesse Giese Print: Jesse Giese		2.24.12
Sign: April Giese Print: April Giese		2/24/12

3 of 7

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Name	Address	Date
Sign: [signature] Print: Donald W. Harrington		2-26-12
Sign: [signature] Print: Becky Harrington		2-26-12
Sign: [signature] Print: Jacob Harrington		2-26-12
Sign: [signature] Print: Jennifer Harrington		2/26/12
Sign: [signature] Print: Wayne A. Harrington		2-26-12
Sign: [signature] Print: Aubrey Dobson		3.2.12
Sign: [signature] Print: Crystal Dobson		3-2-12

4 of 7

Please publish as general comment to the I-5 Corridor Reinforcement Project website and records: 14842

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Name	Address	Date
Sign: Amber C Print: Amber Carpenter		2/05/12
Sign: Brent Carpenter Print: Brent Carpenter		2/25/12
Sign: Park Johnson Print: Park Johnson		2-25-12
Sign: Print: Rae E Henderson		2-25-12
Sign: Print: Mark Scott		2-25-12
Sign: Wendy A Johnson Print: Wendy A Johnson		2-25-12
Sign: Christopher W Giese Print: Christopher W Giese		3-26-12

5 of 7

Please publish as general comment to the I-5 Corridor Reinforcement Project website and records: 14342

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Name	Address	Date
Sign: Lee Witter Print: LEE WITTER		4-28-12
Sign: Steve Krueger Print: Steve Krueger		4-28-12
Sign: Sandra Reesz Print: Sandra Reesz		4/28/12
Sign: James H Malinowski Print: James H Malinowski		4/28/12
Sign: Peter J Reesz Print: Peter J Reesz		4/28/12
Sign: Jane M. Reesz Print: Jane M. Reesz		4/28/12
Sign: Carla M Hammer Print: Carla M Hammer		4/28/12

6 of 7

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Name	Address	Date
Sign: Lucy Shafie Print: Lucy Shafie		4/28/12
Sign: Mary Dunn Print: Mary Dunn		4/28/12
Sign: Raymond J Quilty Print: Raymond J Quilty		4/28/2012
Sign: Maura Quilty Print: Maura Quilty		4/28/12
Sign: Tristan Colcord Print: Tristan Colcord		4/28/12
Sign: Marie-France Grenier Print: Marie-France Grenier		4/28/12
Sign: Annette Sprenkel Print: Annette Sprenkel		4/28/12

7 of 7

Bonneville Power Administration
Stephen J. Wright, Administrator

14843

Mr. Wright:

14843-1 As you know, your agency has proposed building a 500 kilovolt power line between Castle Rock, Washington and Troutdale, Oregon. Your stated objectives are to provide a substantial increase in transmission capacity which will satisfy the projected growth in demand while minimizing impacts to the natural and human environment and minimizing costs.

The alternative having the lowest overall cost and dramatically less human and environmental impact would be routes 9 and 25 where your easements, towers and lines already exist. Land acquisition costs would be negligible. Construction costs and environmental impact costs would be minimized.

14843-2 Any of the new corridors that have been proposed would cut a swath 70-miles long and 150-feet wide, consuming 1,273 acres in two counties. The required access roads would be another invasion taking additional acreage. All of these proposed rural routes would decrease home and land values; destroy farms, businesses and hard-earned retirement equity.

14843-3 These routes would also degrade the rivers, streams and wetlands that provide fish and wildlife habitat.

14843-4 If a rural route is chosen, your agency promises to cut a 150-foot-wide swath through private landowners' properties for your towers and lines. In addition, your agency tells us you will also need to remove any tall trees adjacent to your new right of way that would threaten to fall into the towers and lines. In the proposed rural routes a Douglas fir tree can grow up to 200 feet tall. This could mean in addition to the 150-foot wide corridor, your agency could clear-cut an additional 200 feet on either side of the new right of way, *creating a 550-foot clear-cut through the rural private landowner's property!*.

I have learned from your agency staff that the existing right of way along routes 9 and 25 was specifically planned and designed for expansion. I have been assured by your agency staff that there is enough room to add 500 kV lines and that no homes would be taken. I argue that using these routes would result in negligible land acquisition costs, lower environmental impact and less litigation costs. Maintenance costs would be reduced due to substantially less vulnerability to damage from weather (ice storms, wind storms, etc.) and wildfire compared to the heavily timbered portions of the easterly routes.

Here is a summary of my position:

14843-5
(a.) Using the existing right-of-way would be the least expensive option and therefore the best use of ratepayers' money and taxpayers' federal stimulus dollars loaned to your agency.
(b.) There is minimal impact from adding capacity where towers and lines already exist. Owners along routes 9 and 25 bought those properties fully aware of the lines and towers along the EDGES of their land.
(c.) Using the existing corridor would save rural landowners from a new 70-mile long clear-cut bulldozed THROUGH their land, consuming an estimated 1300 acres for the corridor and access roads, compared to a few hundred square feet in four locations your agency may need to purchase on YOUR right-of-way.
(d.) The existing corridor has 70 years of proven reliability, stability and security.

The existing corridor has a proven security history by virtue of the lines being located in a more urban environment where any suspicious activity has a high probability of being reported. In contrast, a 70-mile run of new lines through isolated and rural areas would create new opportunities for trespassing and vandalism.

I ask you to ensure that your agency does not bisect any rural private landowner's properties with a new 70-mile long clear-cut and access roads. I ask your agency to use my ratepayer and taxpayer dollars wisely and efficiently by placing your new lines and towers in the safe, stable, and reliable corridor that was specifically designed for expansion many years ago, and which has been in use for 70 years, on routes 9 and 25.

Sincerely,

Signed: Debbie Peterson Printed Name: Debbie Peterson Date: 7-1-2011

Address:

Your comments about this project

1 of 1

14843-1 Comment noted.

14843-2 Please see the responses to Comments 14291-3, 14328-5, and 14674-1.

14843-3 Comment noted. Impacts to water, wetlands, vegetation, wildlife and fish are discussed in Chapters 15 through 19.

14843-4 Generally, the right-of-way is managed for low-growing shrubs and herbaceous cover. Some taller vegetation may be allowed to remain in some areas of the corridor depending on site conditions and terrain. Full clearing of the 200-foot safety back line is not one of BPA's preferred options for danger tree control. For new transmission line easements, BPA would acquire rights to cut vegetation outside the easement in areas where vegetation presents a real or potential hazard to the transmission line's reliability. Criteria for these conditions would include but not be limited to vegetation exhibiting characteristics of failure such as trees on unstable slopes, isolated tree or tree fringes exposed to adverse winds, diseased trees or communities of diseased trees, damaged trees and defective trees. Healthy, stable trees outside the easement that exhibit no potential hazard to the transmission line would not be cut.

14843-5 Comment noted.

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