Lewis River Hydroelectric Projects
Supplemental
Preliminary Draft Environmental Assessment

Merwin Hydroelectric Project, FERC No. 935
Yale Hydroelectric Project, FERC No. 2071
Swift No. 1 Hydroelectric Project, FERC No. 2111

PacifiCorp

November 30, 2004

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EXECUTIVE SUMMARY

PURPOSE OF THE SUPPLEMENTAL PDEA

This Supplemental Preliminary Draft Environmental Assessment ("SPDEA") amends and supplements the PDEAs filed by PacifiCorp and Public Utility District No. 1 of Cowlitz County ("Cowlitz PUD") with the Federal Energy Regulatory Commission ("FERC") in April 2004. The PDEAs analyzed the effects of three alternatives (known as Alternatives A, B and C) for relicensing the Swift No. 1 (Project No. 2111), Swift No. 2 (Project No. 2213), Yale (Project No. 2071) and Merwin (Project No. 935) hydroelectric projects (collectively, the "Lewis River Projects"). This SPDEA analyzes the effects of a fourth alternative, referred to herein as Alternative D, which is the result of a Settlement Agreement entered into by the Licensees and other parties and which all of the parties request FERC incorporate in its environmental analysis as the preferred alternative. The Settlement Agreement specifies protection, mitigation, and enhancement measures for the environmental effects of the Lewis River Projects.

The comprehensive package of environmental measures contained in the Settlement Agreement is summarized and analyzed in this SPDEA. The signed Settlement Agreement and a Joint Explanatory Statement prepared by the parties to the Settlement Agreement is being filed with FERC along with this SPDEA. The Settlement Agreement provides the best and most accurate description of the proposed action, and should be relied upon in the event of any discrepancy in presenting the measures and terms of the Settlement Agreement.

This SPDEA is intended to be read in tandem with the PDEAs filed with FERC by PacifiCorp and Cowlitz PUD in April 2004 (PacifiCorp 2004 and Cowlitz PUD 2004). As with the PDEAs, the SPDEA has been produced in two versions, one submitted by PacifiCorp and the other by Cowlitz PUD, which are identical in all respects except for Section 4, Developmental Analysis. Other sections of the PDEAs are unchanged by Alternative D and are not reproduced in this SPDEA. These sections include Section 1.0, Purpose and Need for Power, the Existing Conditions components of Section 3.0, Environmental Consequences; and portions of Section 5.0, Comprehensive Development Analysis.

BACKGROUND

PacifiCorp and Cowlitz PUD have undertaken a collaborative FERC relicensing process for the Yale, Swift No. 1, Swift No. 2, and Merwin hydroelectric projects located on the Lewis River, Washington. The Yale, Swift No. 1, and Merwin Hydroelectric Projects are owned and operated by PacifiCorp. The Swift No. 2 Hydroelectric Project is owned by Cowlitz PUD and currently operated by PacifiCorp under a contract with Cowlitz PUD. PacifiCorp and Cowlitz PUD initiated the collaborative relicensing process in response to comments from resource agencies and other parties that all four projects should be relicensed concurrently to better evaluate cumulative project effects in because the projects are operationally linked.

In January 1999, PacifiCorp and Cowlitz PUD requested approval from FERC to use the alternative licensing procedures (ALP) and for the simultaneous and coordinated processing of the license applications for all four projects. On April 1, 1999, FERC approved the use of the ALP and issued an order accelerating the expiration of the Merwin license to coincide with the other projects (letter from J. Mark Robinson, Director of Licensing and Compliance, FERC to Dave Leonhardt, PacifiCorp and Dennis Robinson, Cowlitz PUD; Order Accelerating License Expiration Date, issued April 8, 1999).

PacifiCorp and Cowlitz PUD initiated the collaborative process in April 1999. Initially, a series of public meetings were held to establish the structure and ground rules of the process, and goals and objectives of the participants. Through these meetings, the participants established the Lewis River Hydroelectric Project Relicensing Steering Committee and Resource Workgroups. In March 2002, a Negotiating Group was formed, primarily from Steering Committee members. The goal of this group was to identify a package of long-term conservation measures for the Projects. This group did not reach a comprehensive agreement at the time the license applications were required to be filed with the FERC in April 2004. Absent a settlement agreement, PacifiCorp and Cowlitz PUD submitted PDEAs that analyzed three alternatives for relicensing the Lewis River Projects, two action alternatives and the no action alternative. The Negotiating Group reached a comprehensive settlement agreement in November 2004 and signed the *Settlement Agreement Concerning the Relicensing of the Lewis River Hydroelectric Projects FERC Project Nos. 935, 2071, 2111, 2213 Cowlitz, Clark and Skamania Counties, Washington* (PacifiCorp and Cowlitz PUD et al. 2004).

SUMMARY OF THE PREFERRED ALTERNATIVE (ALTERNATIVE D)

Alternative D consists of a comprehensive package of protection, mitigation and enhancement measures that PacifiCorp and Cowlitz PUD have agreed to implement in operating their four hydropower facilities. These measures are listed in Table 2.5-1 of the SPDEA and their effect on each key resource area is summarized below and analyzed in more detail in Section 3.

Geology and Soils

Under Alternative D, the continued slow erosion of reservoir shorelines, consequent loss of upland habitat, and the addition of sediment to the reservoirs would occur as under existing conditions. Construction of new facilities could contribute to sedimentation in project waters. The majority of construction would be related to either upstream and downstream fish passage facilities (3.75 acres), an improved channel in the Lewis River bypass reach (approximately 1,200 linear feet), and recreation facilities (25.4 acres). Properly implemented erosion control measures should be effective at minimizing the amount of erosion and soil loss during construction.

Water Quantity

The effect of Alternative D on reservoir water surface levels is similar to that analyzed for Alternative B, with slightly lower levels expected in spring and fall to provide additional storage for flood management. Greater flows would be provided to the Lewis River bypass reach than under Alternative A, ranging from 60 to 100 cfs, beneficially affecting aquatic and terrestrial resources. These flows would decrease generation at Swift No. 2.

There would be minimal change in the average daily flow releases in the Lewis River downstream of Merwin Dam, although slightly different downramping rates and spring operations would be implemented. Below the critical flow level of 8,000 cfs, specific release restrictions are defined to prevent the stranding of outmigrating fish and dewatering of salmonid redds.

Water Quality

Water quality in the Lewis River basin is good and Alternative D is not expected to result in measurable changes. Introduction of anadromous fish would contribute marine-derived nutrients to the reservoirs and upper watershed, positively influencing the structure of phytoplankton communities. Water quality standards are expected to continue to be met.

Aquatic Resources

Alternative D would greatly improve anadromous fish distribution and abundance compared to Alternative A, providing access to all potential habitat upstream of Merwin Dam using adult trap-and-transport facilities at the Merwin, Yale and the Swift projects and juvenile (downstream) collection facilities at Swift, Yale and Merwin dams. Alternative D minimizes juvenile fish passage mortality by collecting and directly transporting fish to a release pond below Merwin Dam. As a result, substantially more adult anadromous fish would be produced than Alternatives B and C. If some or all of the fish passage facilities are not constructed under the direction of the USFWS or NOAA Fisheries, PacifiCorp would establish an In Lieu Fund to enhance fish habitat.

The overall benefit to aquatic resources in the Lewis River bypass reach under Alternative D would be greater than that realized under Alternatives A and B and similar to that of Alternative C. Flow releases would range from 60 to 100 cfs, proving habitat connectivity with Yale Lake. An improved side channel would be created in the bypass reach, extending downstream from the existing Swift No. 2 canal drain, and providing additional higher quality fish habitat.

The hatchery program under Alternative D would be similar to Alternative B; however, the hatcheries would not be retired after natural production targets are met, although production may be consolidated. Instead, these facilities would continue to produce a defined number of locally adapted brood stock for use if the natural population suffers a catastrophic loss. Because initial hatchery production under Alternative D would be

reduced on a fish for fish (1:1) basis as natural populations are established in the basin, adverse hatchery effects such as increased predation, disease, and competition would be a concern only in the short term, and would be similar to those in Alternative A. However, in Alternative D, these effects would be greatly reduced as wild production replaces hatchery production. Under Alternative D, the Swift Creek Reservoir rainbow trout program and Lake Merwin kokanee program would continue at the same level as current conditions.

Alternative D includes ramping rate restrictions below Merwin Dam, and improvements in minimum flow conditions below Merwin Dam through reductions in the difference between spawning to incubation flows, thereby reducing redd dewatering and improving egg and alevin survival.

Alternative D would benefit bull trout by investigating and implementing strategies to reduce entrainment; facilitating upstream and downstream migration at all Projects; conducting a limiting factors study and predation study; and monitoring bull trout populations over the long term. In addition, the anadromous fish introduction program under Alternative D would provide increased forage for bull trout when compared to Alternatives A and B, and a level similar to Alternative C.

Alternative D would also provide substantially more habitat enhancement and protection opportunities than all other alternatives by funding habitat enhancement; transporting LWD and funding LWD projects; and implementing the gravel monitoring and potential augmentation program.

Botanical Resources

Alternatives B, C, and D would benefit botanical resources more than Alternative A by managing recreation growth. Alternative D has substantial beneficial effects on botanical resources. In addition to providing most of the measures included in Alternative C, Alternative D would greatly increase the amount of protected land in the Lewis River basin. The acquisition of additional interests in land would reduce the effects of large-scale timber harvest and development on vegetation communities, ultimately increasing the amount of old-growth and mature forest in the basin and perhaps improving plant species diversity in some areas. Overall, Alternative D provides considerably more opportunities to protect and improve botanical resources compared to baseline conditions than Alternatives B or C.

Wildlife Resources

Wildlife measures proposed under Alternative D would include all of the actions described under Alternative C, including the PacifiCorp's Wildlife Habitat Management Plan and would add Cowlitz PUD's Wildlife Habitat Management Plan. Recreation would be managed to reduce the effects of human disturbance on plant and animal communities and habitat. In addition, Alternative D establishes three separate habitat acquisition funds: (1) a $7.5 million fund to acquire habitat in the Swift project areas; (2) a $2.5 million fund to acquire and protect habitat in the vicinity of the Yale Project;

and (3) a $2.2 million fund to acquire and enhance habitat throughout the Lewis River basin. Alternative D would have significant beneficial effects on wildlife resources.

Cultural Resources

Alternative D would enhance anadromous fish runs, a goal important to tribal stakeholders. National Register eligible historic districts would be protected under PacifiCorp's Historic Properties Management Plan (HPMP). Alternative D also includes partial funding for the construction of a curation and interpretation center for artifacts found in the project area, a facility whose design may specifically take into account this purpose. This alternative provides significant benefits and improvements over Alternative A.

Recreation

Alternative D would improve and enhance recreation opportunities in the project area through the term of the new licenses. Measures would help reduce existing and future capacity and displacement concerns, although with slight impacts to terrestrial resources due to the increased area of disturbance. As a result of improved recreation facilities, this alternative likely would require some expanded law enforcement and other emergency services, along with more operations and maintenance staff during the peak summer season. Swift Creek Reservoir recreational facilities would be retained in a less developed condition than the other reservoirs but some recreation facilities would be provided to partially meet anticipated needs during the license term. The proposed recreation measures under Alternative D would have no impact on the generation capacity of the projects. Overall, compared to existing conditions, the improvements and enhancements would have beneficial effects on recreation in the Lewis River basin.

Land Management and Use

Land uses would not be altered significantly by the measures proposed under Alternative D. Expansion of PacifiCorp's recreation facilities under Alternative D would reduce encroachment on adjacent federal, state, and private lands by meeting a portion of the expected demand for water-based recreation. This represents a moderate land management improvement over existing conditions. Construction-related traffic associated with fish passage and recreation temporarily would occur under Alternative D.

Aesthetic / Visual Resources

There are no specific aesthetic-related actions proposed under any of the alternatives. Fish passage facilities under Alternative D would affect the aesthetic/visual quality of the project area.

Socioeconomics

Alternative D would not have significant adverse effects on local social and economic conditions. Measures are included to enhance the local economy by expanding recreation opportunities that would attract visitors and by constructing fish passage and recreation

facilities that would provide additional construction and operations employment to the area. Local fire and emergency services would be supported through increased tax revenues related to project improvements.

Developmental Analysis

The developmental analysis in Section 4 provides the estimated cost of the environmental measures and the net power benefits of the projects. As indicated previously, each Licensee has presented its own net benefit analysis.

For the Swift No. 1, Yale and Merwin projects, PacifiCorp estimated the total capital costs of protection, mitigation and enhancement measures as $259,728,000. Ongoing annual maintenance and operations costs for Alternative D are $6,176,000.

For the Swift No. 2 Project, Cowlitz PUD estimated the total capital costs of protection, mitigation and enhancement measures as $19,344,500. Ongoing annual maintenance and operations costs for Alternative D are $303,740.

1.0 PURPOSE OF ACTION AND NEED FOR POWER

The purpose of the proposed action and the need for power presented in the April 2004 Preliminary Draft Environmental Assessments (PDEAs) (PacifiCorp 2004 and Cowlitz PUD 2004) is unchanged by the addition of the settlement alternative. Therefore, Section 1.0 is not reproduced here.

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2.0 PROPOSED ACTION AND ALTERNATIVES

This section describes protection, mitigation and enhancement measures, identified as Alternative D, that reflect the preferred alternative of PacifiCorp in its application for new license for the Merwin, Yale, and Swift No. 1 projects and by Cowlitz PUD in its application for new license for Swift No. 2. This alternative reflects the measures agreed upon by parties to the Lewis River Settlement Agreement (PacifiCorp and Cowlitz PUD et al. 2004), and replaces Alternative B in the April 2004 PDEAs (PacifiCorp 2004 and Cowlitz PUD 2004) as the Applicants' preferred alternative.

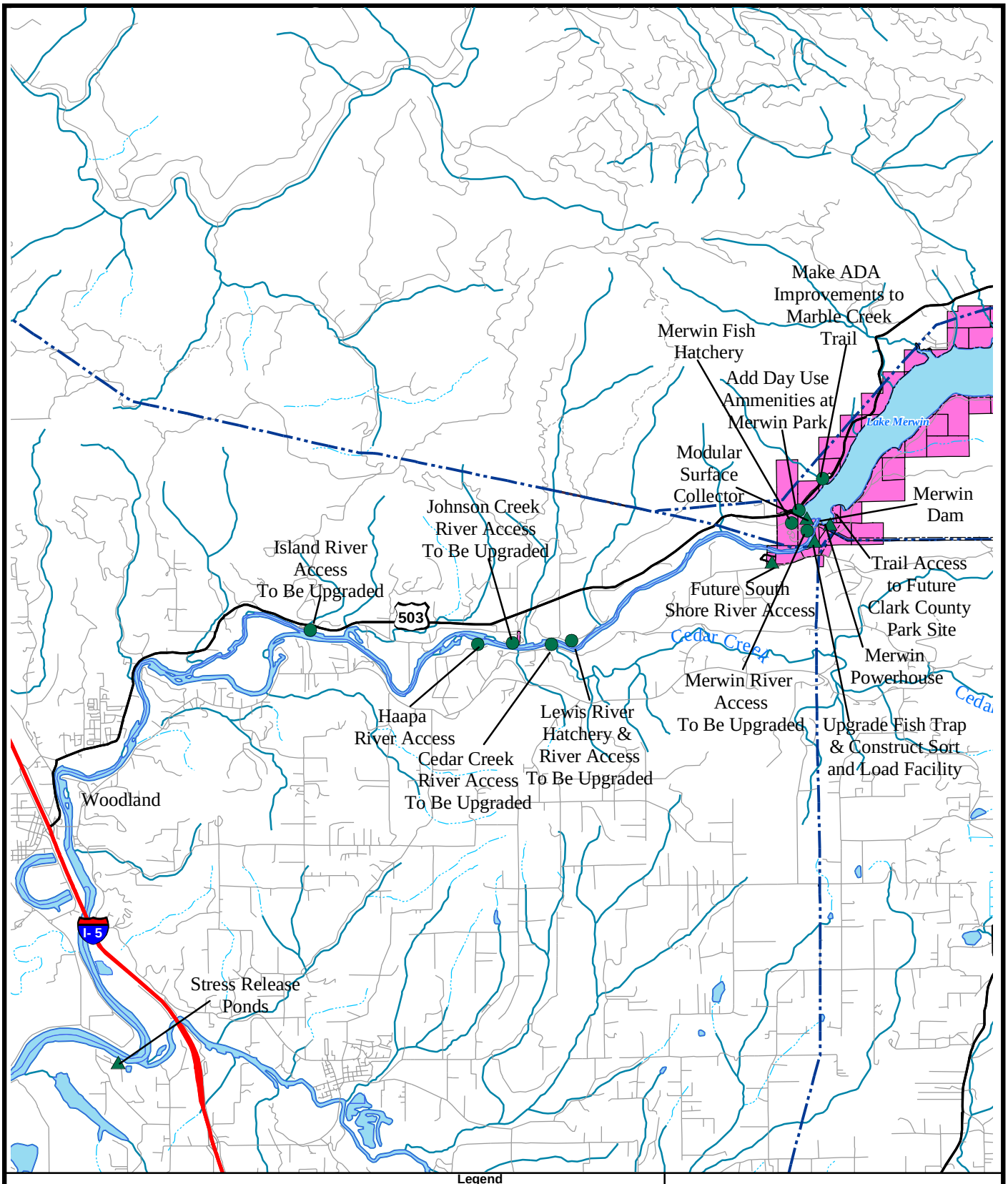
Protection, mitigation and enhancement measures are described below and summarized in Table 2.5-1. The effects of implementing each of these measures are analyzed in Section 3, cost estimates are presented in Section 4, and an analysis of the consistency of the alternatives with comprehensive plans is provided in Section 5.

Sections 2.1 through 2.4 of the April 2004 PDEAs described the general locale and measures proposed to be implemented under Alternatives A, B and C. The following subsection, describing Alternative D, begins with Section 2.5 and is numbered to correspond to the numbering in the PDEAs to facilitate cross referencing each of the alternative descriptions.

2.5 ALTERNATIVE D: SETTLEMENT ALTERNATIVE

Under Alternative D, the Applicants propose protection, mitigation and enhancements to the existing baseline conditions (identified as Alternative A) to address resource measures agreed upon as part of the comprehensive Settlement Agreement. This section summarizes the facility and operational changes proposed under Alternative D and the associated environmental enhancement measures. Facilities proposed to be modified or constructed are identified on Figure 2.5-1 and all proposed enhancement measures are listed by resource category in Table 2.5-1. This table includes continuing measures that are part of Alternative A, plus additional measures specific to Alternative D.

Alternative D includes phased introduction of anadromous species above Merwin Dam and phased construction of fish passage facilities as described herein. Anadromous fish would initially be introduced to the watershed above Swift Dam, where over 80 percent of the available habitat exists. Upstream migrants would be trapped at Merwin Dam and transported to Swift Creek Reservoir. Bull trout would be trapped and transported to Yale Lake. A new trap and transport facility would be completed at Merwin following the fourth anniversary of the new Merwin license. By the 17th anniversary of the new Swift and Yale licenses, new upstream trap and transport facilities would be completed at Yale Dam and at the upper end of Yale Lake, unless determined unnecessary based on additional studies to be performed. These facilities would transport anadromous fish to the water body immediately upstream, or as directed by resource management agencies. Downstream collection facilities also would be in place at Swift Dam following the fourth anniversary of the new licenses. A modular surface collector and transport facility



PACIFICORP

Public Utility District No. 1 of Cowlitz County

Legend

- PacifiCorp Ownership
- CCPUD Ownership
- PacifiCorp FERC Boundary
- CCPUD FERC Boundary
- Transmission Lines

Project Facilities

- New
- Existing

Lewis River Hydroelectric Projects

Alternative D

FERC No. 935, 2071, 2111, 2213

Sheet 1 of 4

Figure 2.5-1

0 1 2 Miles

0 1 2 Kilometers

N

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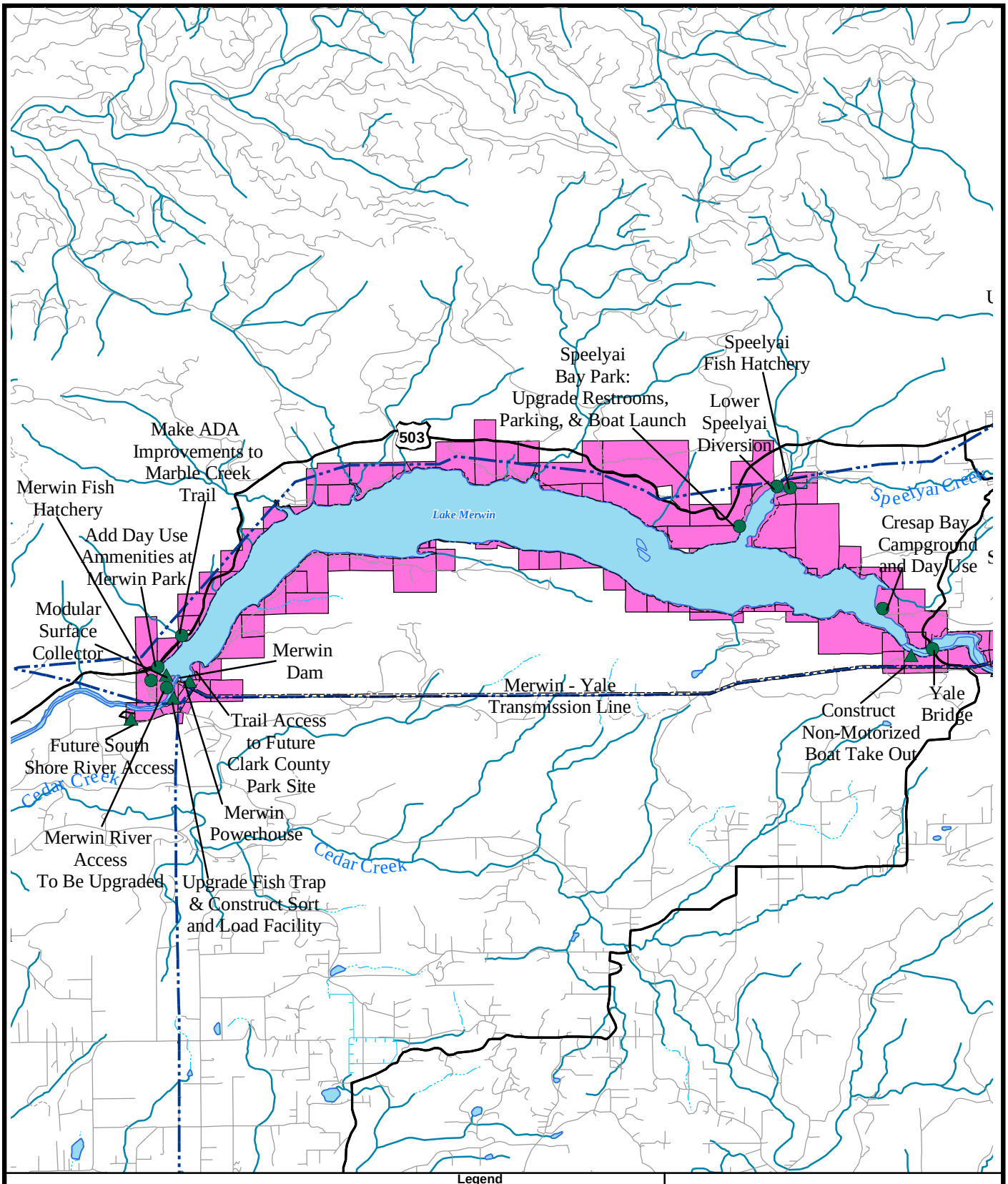

PACIFICORP

Public Utility District No. 1 of Cowlitz County

Legend

- PacifiCorp Ownership
- CCPUD Ownership
- PacifiCorp FERC Boundary
- CCPUD FERC Boundary
- Transmission Lines

Project Facilities

- New
- Existing

Lewis River Hydroelectric Projects

Alternative D

FERC No. 935, 2071, 2111, 2213

Sheet 2 of 4

Figure 2.5-1

0 1 2 Miles

0 1 2 Kilometers

N

January 23, 2004

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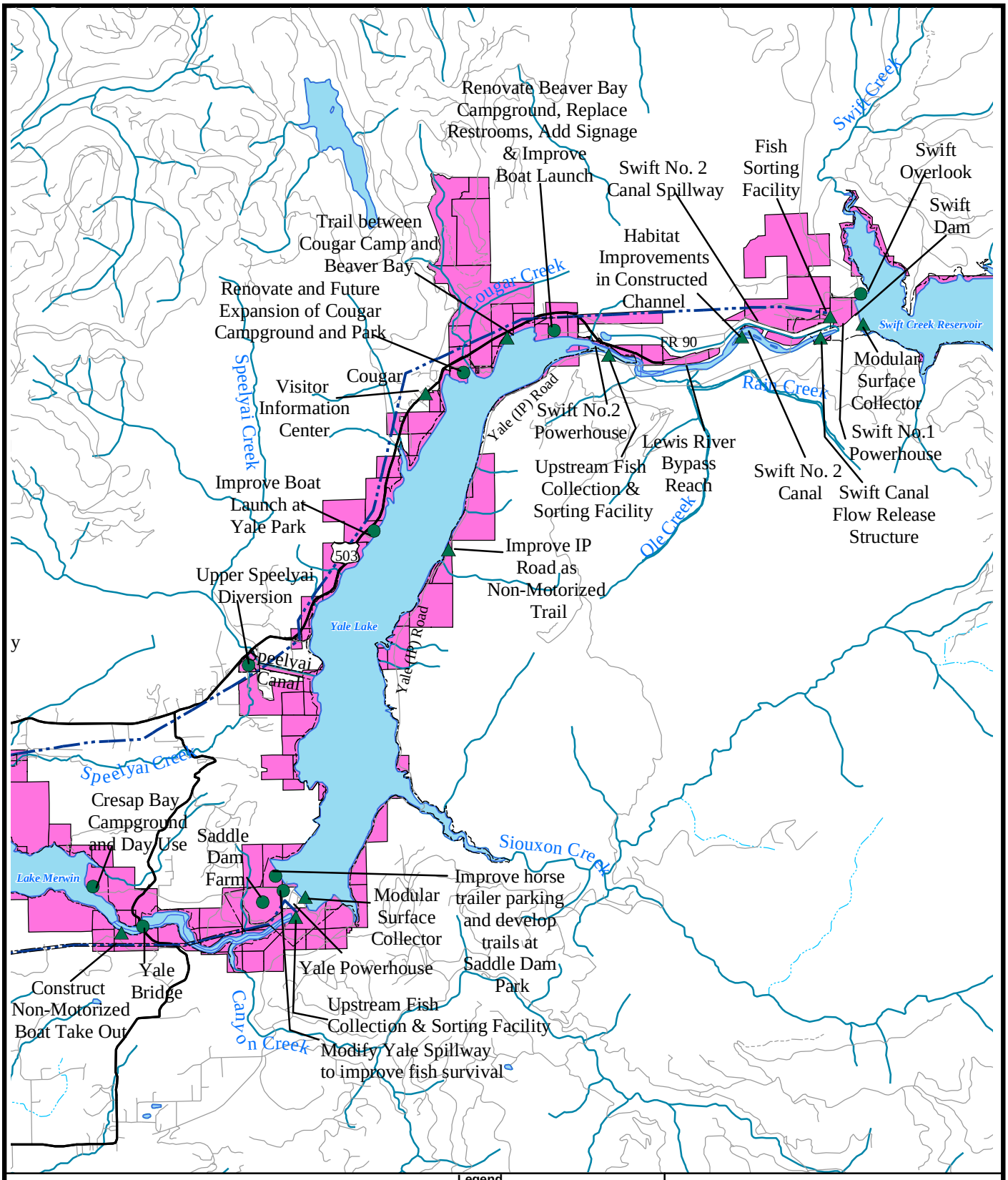

PACIFICORP

Public Utility District No. 1 of Cowlitz County

Legend

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- CCPUD Ownership
- PacifiCorp FERC Boundary
- CCPUD FERC Boundary
- Transmission Lines

Project Facilities

- New
- Existing

Lewis River Hydroelectric Projects

Alternative D

FERC No. 935, 2071, 2111, 2213

Sheet 3 of 4

Figure 2.5-1

0 1 2 Miles

0 1 2 Kilometers

N

January 23, 2004

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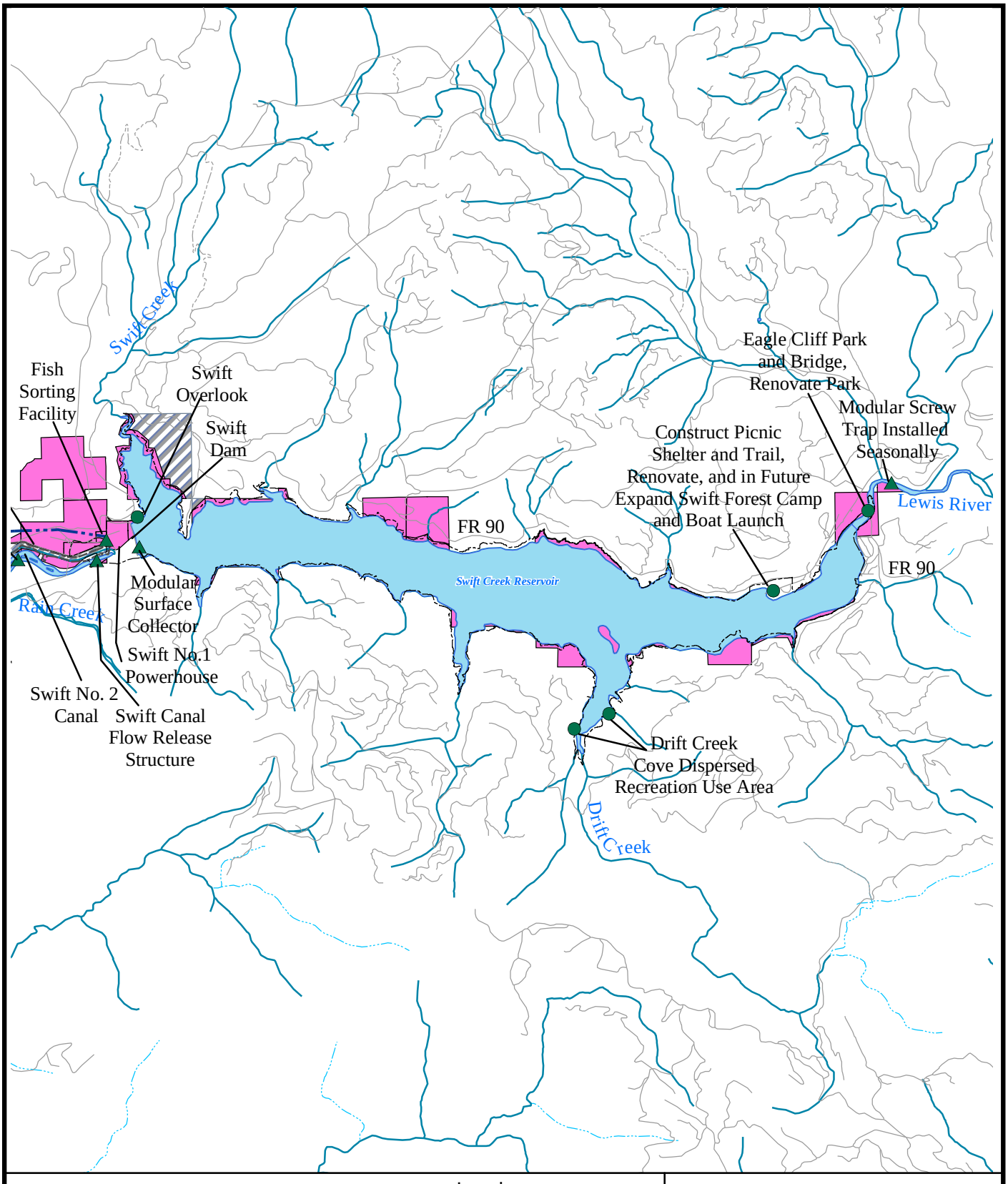

PACIFICORP

Public Utility District No. 1 of Cowlitz County

Legend

- PacifiCorp Ownership
- CCPUD Ownership
- PacifiCorp FERC Boundary
- CCPUD FERC Boundary
- Transmission Lines

Project Facilities

- New
- Existing

Lewis River Hydroelectric Projects

Alternative D

FERC No. 935, 2071, 2111, 2213

Sheet 4 of 4

Figure 2.5-1

0 1 2 Miles

0 1 2 Kilometers

N

January 23, 2004

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would gather outmigrants and truck them to a release pond constructed downstream of Merwin Dam near a site known as Pekins Ferry (Figure 2.5-1). By the 13th anniversary of the Yale license, a modular surface collector and transport facilities would be installed at Yale Dam, and at Merwin Dam by the 17th anniversary of its license. Additionally, devices would be installed in the Yale and Merwin forebays to reduce entrainment of outmigrants. Monitoring measures would track the success of these actions.

Anadromous salmonid production at the existing hatcheries would target production levels to achieve 12,800 spring Chinook, 13,200 steelhead, and 60,000 coho adult pre-harvest ocean recruits. Production would be reduced as natural runs of anadromous fish are established. In addition, supplementation within the basin would occur as follows:

- Transport juvenile spring Chinook and steelhead above Swift Creek Reservoir for 10 years beginning six months after the fourth anniversary of the Merwin license.

- Transport juvenile coho above Swift Creek Reservoir for 6 years beginning 6 months after the fourth anniversary of the Merwin license.

- Transport juvenile spring Chinook and steelhead to Yale Lake and Lake Merwin for 10 years after completion of downstream collection/transport facilities at each of these dams.

- Transport juvenile coho to Yale Lake and Lake Merwin for 6 years after completion of downstream collection/transport facilities at each of these dams.

- Transport supplemental spring Chinook, steelhead and coho adults to Swift Creek Reservoir beginning one year prior to completion of the Swift downstream facility and to Yale Lake and Lake Merwin as directed by the Aquatics Coordination Committee (ACC).

- Develop juvenile acclimation sites in Swift Creek Reservoir by the fourth anniversary of the Swift licenses, and in tributaries to Yale Lake and Lake Merwin after completion of downstream collection facilities.

At the end of these time periods, the Aquatics Coordinating Committee (ACC) would assess on a year-by-year basis whether to extend the transportation of juvenile salmon.

Resident fish production would be capped at 20,000 pounds of rainbow trout annually and 12,500 pounds of kokanee annually. Rainbow trout would be placed in Swift Creek Reservoir and kokanee in Lake Merwin. Production levels and other hatchery management considerations would be reviewed every 5 years following introduction into each reservoir, and every tenth year thereafter.

Operational changes would include continuously releasing from 60 to 100 cfs to the Lewis River bypass reach from Swift No. 2 Canal. These flows would be contributed from two release structures in the canal. Habitat would be improved in a channel segment downstream of the lower canal release structure to maximize the benefit of these

flow releases. Other habitat measures include contributing large woody debris and funding for habitat improvement in the basin; placing spawning gravel in the reach downstream of Merwin Dam; contributing $5.72 million to an aquatic habitat enhancement fund; and establishing a fund potentially totaling up to $30 million if downstream passage facilities at Yale and Merwin and upstream passage facilities at Yale and Swift are not constructed.

Flood management would be enhanced by implementing new high runoff procedures and providing financial support to authorities responsible for public notification. Terrestrial measures would reduce visitor impacts in riparian and shoreline habitats through dispersed campsite closure, monitoring, and public education. Wildlife Habitat Management Plans would be developed and implemented on Project lands. In addition, PacifiCorp would establish the following funds: $7.5 million to acquire habitat in the Swift project areas, $2.5 million to acquire and enhance habitat in the Yale area, and $2.2 million to acquire and enhance habitat in the remainder of the Lewis River basin.

Improvements to existing recreation facilities would be extensive, with emphasis placed on improving or expanding day use sites, campgrounds, fishing and boating access sites, as well as providing funding to manage dispersed camping on adjacent non-Project lands and partially funding a potential new visitor information center in Cougar. These measures, as well as development of Water Quality Management Plans, would be the same as described in the PDEAs (PacifiCorp 2004 and Cowlitz PUD 2004). Socioeconomic measures include financial contributions to (1) an emergency telephone system for lower basin flood notification; (2) a NOAA weather transmitter; (3) three law enforcement officers; and (4) maintenance of Forest Road (FR) 90.

2.5.1 Project Facilities, Operations, and Environmental Measures

This section describes modifications that would occur under Alternative D to project facilities or alterations to the way the projects are operated compared to current conditions. Environmental and social enhancement measures that would be implemented under Alternative D also are described and summarized. Measures that would be implemented in addition to Alternative A measures are presented in italics in Table 2.5-1; continuing measures are in a standard font. This section also describes measures proposed to reduce possible adverse effects during implementation of these actions.

Table 2.5-1. Measures proposed under Alternative D.

Resource Area	Resource Component	Proposed Measure	S1[1]	S2[1]	Y[1]	M[1]	Timing
Water Quality/Quantity	Water Quality	*Develop a Water Quality Management Plans to monitor compliance with state criteria.*	X	X	X	X	As required by Section 401 certifications.
	Water Quantity	*Continuously release flow to the upper Lewis River bypass reach through the existing flow release device in Swift No. 2 canal.*	X	X			Upon completion of Swift No. 2 reconstruction.
		Design & construct a new flow release structure from Swift No. 2 canal to upper Lewis River bypass reach. Interim release schedule, when combined with the 47 cfs from the above measure: *7/1 – 10/31: 60 cfs* *11/1 – 1/31: 100 cfs* *2/1 – 6/30: 75 cfs* *Negotiate combined release schedule.*	X	X			By 1st anniversary of Swift No. 1 or 2 license issuance.
		Maintain downramping rates at Merwin of 2 inches/hour except as follows: *no downramping 2/16 – 6/15 one hr. before and after sunrise & one hr. before and after sunset. Limit upramping to 1.5 ft/hr.*				X	Upon issuance of Merwin license.
		Follow plateau operation procedures between 2/16 and 8/15. Changes in flow to be consistent with ramping restrictions at or below flows of 8,000 cfs, and flow changes limited to no more than one change in any 24-hr period, 4 times in any 7-day period, or 6 times per month.				X	Upon issuance of Merwin license.
		Flows below Merwin: minimum range from 4,200 cfs (Nov 1 to Dec 15) to 1,200 cfs (July 31 to Oct 12).				X	Upon issuance of Merwin license.
Flood Management		Maintain 17 feet of flood management storage.	X		X	X	Upon issuance of new licenses.
		Develop and implement a forecast-based high runoff procedure.	X		X	X	By 1st anniversary of Merwin license
		Reduce flood management season by 2 weeks.	X		X	X	By 1st anniversary of Merwin license
		Provide funding to authorities responsible for flood notification, including an emergency phone system and weather radio transmitter.	X		X	X	Annually to counties and NOAA. Upon request to USGS.
Aquatics	Upstream Fish Passage	*Improve efficiency and safety of existing Merwin trap and add a new sorting and truck loading facility.*				X	By 2nd anniversary of Merwin license.

Table 2.5-1. Measures proposed under Alternative D (cont.).

Resource Area	Resource Component	Proposed Measure	S1[1]	S2[1]	Y[1]	M[1]	Timing
		Transport spring Chinook, coho & steelhead from the Merwin sorting facility to Swift Creek Reservoir. Transport bull trout to a location in Yale Lake or as directed by the USFWS.				X	By 6 months after 4th anniversary of Merwin license.
		Net bull trout in Yale tailrace and transport to Cougar Creek 2X/week when migratory. *Investigate alternative trapping methods for bull trout.*			X		Ongoing measure.
		Develop trap, transport, and sorting facility at Yale.			X		By 17th anniversary of Yale license.
		Net bull trout from Swift No. 2 tailrace and transport to a location defined by USFWS.	X	X			Ongoing measure.
		Develop trap and transport facility above Yale Lake (for analysis, assumed to be at Swift No. 2 tailrace).	X	X			By 17th anniversary of Swift licenses.
	Downstream Fish Passage	*Install a modular surface collector system with guide walls and nets at Swift Dam. Collect fish, sort, mark a sub-sample, and truck to a release pond near Pekins Ferry below Merwin Dam. Release bull trout (if they reach a defined smolt-like development phase) to Yale or lower river.*	X	X			6 months after 4th anniversary of licenses.
		If directed by NOAA Fisheries, seasonally install spring Chinook satellite collection facility (modular screw trap) upstream of Swift Creek Reservoir.	X				If required.
		Construct modular surface collector & transport facilities at Yale Dam.			X		By 13th anniversary of Yale license.
		Modify Yale spillway to improve downstream resident fish survival (including bull trout) during spill events.			X		6 months after 4th anniversary of Yale license.
		Install barrier nets in Yale and Merwin forebays to reduce bull trout entrainment up to and until the modular surface collector is installed.			X	X	1 year after issuance of Yale license, and when directed by USFWS at Merwin.
		Construct modular surface collector & transport facilities at Merwin Dam.				X	By 17th anniversary of Merwin license.

Table 2.5-1. Measures proposed under Alternative D (cont.).

Resource Area	Resource Component	Proposed Measure	S1[1]	S2[1]	Y[1]	M[1]	Timing
		Construct a release pond downstream of Merwin Dam near Pekins Ferry.	X		X	X	6 months after 4th anniversary of Swift 1 or 2 license orders.
		Construct bull trout collection facilities at Yale and Merwin if anadromous facilities are not constructed.			X	X	By 13th anniversary of Yale license, and 17th anniversary of Merwin license, if required.
	Hatcheries: Anadromous Fish	*Develop and implement a hatchery supplementation plan for spring Chinook, steelhead and coho. Target production to return 12,800 spring Chinook, 13,200 steelhead, and 60,000 coho pre-harvest ocean recruits. Reduce production on a 1:1 basis when natural production exceeds settlement threshold levels.*	X	X	X	X	Develop plan within 4 months after 1st anniversary of licenses.
		Production of anadromous juveniles will be as identified in Section 8.3.1 of the Settlement Agreement.	X	X	X	X	Develop plan by 1st anniversary of licenses.
		Transport supplementation spring Chinook and steelhead juveniles above Swift.	X	X			Supplement for 10 years after completion of the Swift downstream collection facility (beginning 6 months after 4th anniversary of Swift license).
		Transport supplementation coho juveniles above Swift for 6 years after completion of the Swift downstream collection facility.	X	X			Supplement for 6 years after completing Swift downstream facility.
		Transport supplementation spring Chinook and steelhead juveniles to Yale Lake and Lake Merwin.			X	X	Supplement for 10 years after completion of the Yale anadromous downstream collection facility and for 10 years after completion of the Merwin downstream collection facility.

Table 2.5-1. Measures proposed under Alternative D (cont.).

Resource Area	Resource Component	Proposed Measure	S1[1]	S2[1]	Y[1]	M[1]	Timing
		Transport supplementation coho juveniles to Yale Lake and to Lake Merwin.			X	X	Supplement for 6 years after completion of the Yale anadromous downstream collection facility and for 10 years after completion of the Merwin downstream collection facility.
		Transport supplementation adult spring Chinook, coho and steelhead above Swift through term of the new license and as directed to Yale Lake and Lake Merwin.			X	X	3rd year after license issuance.
		Fund upgrades and maintenance to all three hatcheries.	X	X	X	X	Per plan to be complete 4 months after 1st anniversary of licenses.
		Place juvenile acclimation sites above Swift Cr. Reservoir if there are suitable and accessible sites.	X	X			4th anniversary of license issuance.
		Place temporary juvenile acclimation sites in tributaries to Yale Lake and Lake Merwin.			X	X	After completion of Yale and Merwin downstream facilities.
	Hatcheries: Resident Fish	*Update Hatchery and Supplementation Plan.*	X	X	X	X	Revise 5 years following introduction into each reservoir and every 10 yrs thereafter.
		Fund production of no more than 20,000 lbs. of rainbow trout annually for placement in Swift Creek Reservoir.	X	X	X	X	Annually.
		Fund production of no more than 12,500 lbs. of kokanee annually for placement in Lake Merwin.				X	Annually.
	Habitat Measures	Manage conservation covenants for bull trout.	X	X	X	X	Ongoing.
		Implement Habitat Preparation Plan, releasing hatchery salmonids into each reservoir to prepare habitat for 4 years prior to anadromous collection facilities being constructed.	X		X	X	6 months after license issuance.

Table 2.5-1. Measures proposed under Alternative D (cont.).

Resource Area	Resource Component	Proposed Measure	S1[1]	S2[1]	Y[1]	M[1]	Timing
		Construct channel in Lewis River bypass reach to maximize benefits of releases from the existing release device in Swift No. 2 canal.	X	X			Upon completion of upper bypass reach release structure.
		PacifiCorp to store LWD for habitat improvement projects and contribute funds annually for such projects.	X				After license issuance.
		Conduct a LWD study downstream of Merwin Dam.				X	Initiate study within 9 months of license issuance.
		Assess spawning gravel and develop a trigger for implementing an augmentation program below Merwin Dam.				X	Initiate within 6 months of license issuance.
		Establish Aquatic Enhancement Fund by April 2005. Total combined contribution $5.72 million by the Applicants.	X	X	X	X	PacifiCorp contributions start 4/30/05. Cowlitz contributions start after 1st anniversary of Swift No. 2 license.
		PacifiCorp establishes "In Lieu" fund in Years 11 – 17 if fish passage facilities not constructed. Potential commitment of up to $30 million.			X	X	Contributions on anniversary dates of license issuance as follows: Yale contributions in years 11-13 and 14-17; Merwin contributions in years 14-17; Swift No. 1 contributions in years 14-17.
	Fish Monitoring	Support WDFW annual evaluation of fall Chinook and chum in lower Lewis River.				X	Ongoing.
		Develop monitoring and evaluation plans for aquatic measures.	X	X	X	X	By 2nd anniversary of first license issued.
		Monitor performance of upstream and downstream passage facilities.	X	X	X	X	To be defined in monitoring plans.
		Monitor bull trout collection.	X	X	X		Annually.
		Monitor adult salmonid migration and spawning below Merwin.				X	Annually.

Table 2.5-1. Measures proposed under Alternative D (cont.).

Resource Area	Resource Component	Proposed Measure	S1[1]	S2[1]	Y[1]	M[1]	Timing
		Subsample and tag outmigrants from each downstream transport facility.	X	X	X	X	After Year 4.5 at Swift; after Year 13 at Yale; and after Year 17 at Merwin.
		Monitor anadromous hatchery returns.	X	X	X	X	Monitor daily; report periodically.
		Complete limiting factors analysis for bull trout in Lake Merwin and Swift Creek Reservoir.	X			X	By 2nd anniversary of licenses.
		Conduct stranding study below Merwin Dam.				X	By 3rd anniversary of license.
		Monitor kokanee populations in Yale Lake each fall.			X		Annually.
		Evaluate status of ESA-listed anadromous species and bull trout.	X	X	X	X	Annually.
		Conduct study of effects of predation on introduced salmonids in Lake Merwin.				X	By 10th anniversary of license issuance.
Terrestrial	Habitat Management	*Develop and implement Wildlife Habitat Management Plans on Project lands using HEP as baseline.*	X	X	X	X	Prior to issuance of new licenses.
		PacifiCorp commits $2.5 million to fund habitat acquisition in the Yale Project area.			X		Within 1st and 2nd year of date of Settlement Agreement.
		PacifiCorp establishes a $7.5 million habitat acquisition and protection fund for the Swift Projects.	X				Within 9 months of license issuance and per settlement schedule thereafter.
		PacifiCorp establishes a $2.2 million habitat acquisition and enhancement fund for the Lewis River Basin area.	X		X	X	Establish 6 months after 4th anniversary of Yale license issuance.
		Buffer sensitive habitat from ground-disturbing activities (timber harvest, construction, etc.).	X	X	X	X	Post license issuance.
		Reduce dispersed campsites in shoreline and riparian areas and post visitor use rules.	X	X	X	X	As defined in WHMPs.
		Monitor the effectiveness of the WHMP in improving wildlife habitat using the HEP.	X	X	X	X	17 years after issuance of all licenses.

Table 2.5-1. Measures proposed under Alternative D (cont.).

Resource Area	Resource Component	Proposed Measure	S1[1]	S2[1]	Y[1]	M[1]	Timing
		Maintain existing road closures through sensitive habitat areas by installing and maintaining gates and *identify additional areas for access control on PacifiCorp lands.*	X		X	X	Ongoing, and as defined in WHMPs.
	Timber Management	Implement a timber management program on PacifiCorp lands, if applicable under the WHMP.	X		X		To be defined in PacifiCorp's WHMP.
		Continue to manage roads on project lands to control runoff and erosion. *Develop a culvert replacement plan and schedule to reduce barriers to wildlife and improve aquatic and riparian habitat connectivity at select streams through PacifiCorp lands.*	X		X	X	Ongoing, and as defined in WHMPs.
		Develop and implement measures to maintain existing aquatic connectivity and control runoff and erosion from roads through Cowlitz PUD lands on Devil's Backbone.		X			To be defined in WHMP.
	Monitoring	Continue annual raptor surveys on PacifiCorp lands.	X		X	X	Ongoing.
		Monitor dispersed camping and day use on PacifiCorp lands.	X		X	X	To be defined in WHMP.
		Implement BMPs to protect sensitive species and habitats during construction activities.	X	X	X	X	Coordinate with construction schedules.
Recreation	Visitor Management	*Finalize the RRMP as directed by FERC and implement the recreation measures described therein.*	X		X	X	After issuance of new licenses.
		Increase visitor management controls, such as additional signs, barriers and enforcement.	X		X	X	Upon issuance of new licenses.
		Allow managed recreational access to project lands except where conditions are unsafe.	X	X	X	X	Ongoing.
		Develop and implement an Interpretation and Education program, including information about protecting bull trout.	X	X	X	X	By 1st anniversary of new licenses.
		Install interpretive signs at the Beaver Bay wetland.			X		By 13th anniversary of Yale license.
		Seasonally install portable restrooms at Swift No. 2 canal.		X			By 9/30/05.
		Provide earlier public notice that project recreation sites are full.	X		X	X	Upon issuance of new licenses.
		Dispersed upland camping and motorized use would be discouraged on project lands.	X		X	X	After issuance of licenses.

Table 2.5-1. Measures proposed under Alternative D (cont.).

Resource Area	Resource Component	Proposed Measure	S1[1]	S2[1]	Y[1]	M[1]	Timing
		Manage parking at Swift No. 2 canal fishing facility		X			After 9/30/05 installation.
		PacifiCorp provides $5,220/yr and Cowlitz provides $780/yr to the US Forest Service to manage dispersed camping on its land in the project vicinity.	X	X			Upon issuance of new licenses.
	Camp-grounds	*Shoreline camping would be prohibited at Lake Merwin.*				X	By 4th anniversary of Merwin license.
		Some shoreline campsites at Yale and along Swift Creek Reservoir would be hardened, some eliminated, others managed.	X		X		Per schedules in the RRMP: within first 3 years after of issuance of licenses.
		Expand Swift Camp and Cougar Camp when monitoring establishes a sustained need. At Cougar, accomplish this by closing the boat ramp and converting parking areas to campsites.	X	X	X		When needed, based on demand.
		Renovate Cougar Camp.			X		By 14th anniversary of Yale license.
		Redesign Beaver Bay Campground and replace older restrooms.			X		By 13th anniversary of Yale license.
		Allow public use of RV holding tank dump sites in PacifiCorp campgrounds for a fee.	X		X	X	Post license issuance.
	Day Use Facilities	*Provide more day use opportunities and sanitation facilities at five river access sites below Merwin Dam. Negotiating maintenance agreements with WDFW and WDNR.*				X	At 4 sites by 1st anniversary. At Island River Access by 4/30/07. Picnic tables by 11th anniversary.
		Provide two new picnic shelters at Merwin Park, one at Swift Camp and four additional sites on Yale Lake.	X	X	X	X	By 5th and 11th anniversary of Swift No. 1 license, and by 7th anniversary of Yale license.
		Renovate Eagle Cliff Park.	X	X			By 11th anniversary of Swift No. 1 license.
		Upgrade restrooms and parking at Speelyai Bay Park (made ADA-compliant). Keep Cresap Bay Park open through September.				X	By 6th anniversary of Merwin license. Add parking by 12th anniversary.

Table 2.5-1. Measures proposed under Alternative D (cont.).

Resource Area	Resource Component	Proposed Measure	S1[1]	S2[1]	Y[1]	M[1]	Timing
		Provide volleyball courts, horseshoe pits and children's play structure at Merwin Park.				X	By 4th anniversary of Merwin license.
		Increase separation between wetland and day use parking area at the Beaver Bay Day Use Area.			X		By 4th anniversary of Yale license issuance.
		Construct ADA-accessible concrete fishing pier at Swift No. 2 Canal.		X			By 9/30/05.
	Trails	*Bring Marble Creek trail up to ADA-accessibility standards.*				X	By 4th anniversary of Merwin license.
		Evaluate feasibility of trail easement to Lake Merwin for Clark County.				X	After license issuance.
		Formalize Saddle Dam trailhead parking for horse trailers.			X		By 5th anniversary of license issuance.
		Develop non-motorized trail from Eagle Cliff to USFS boundary.	X	X			By 4th anniversary of Swift No. 1 license issuance.
		Develop non-motorized trail link from Saddle Dam Park to existing Saddle Dam area trails.			X		By 5th anniversary of license issuance.
		Develop a shoreline trail from Cougar Camp to Beaver Bay Campground.			X		By 5th anniversary of license issuance.
		If feasible, improve the Yale-IP Road as a non-motorized recreation trail.			X		Beginning after license issuance.
	Access	*Boat launch facilities improved at Speelyai Bay, Yale Park, and Beaver Bay.*			X	X	By 4th anniversary of license issuance. Speelyai by 11/30/04.
		Develop a primitive take-out site at Yale Bridge for non-motorized watercraft.				X	By 6th anniversary of Merwin license.
		Develop river access at the "Switchback" property when use levels reach capacity below Merwin Dam.				X	When capacity is reached.
		Improve ADA-accessibility at upgraded facilities.	X		X	X	Assess after license issuance and implement per Settlement schedule.
Cultural	Resource Management	*Implement Historic Properties Management Plan for Merwin, Yale and Swift No. 1.*	X		X	X	Upon license issuance.
		Protect integrity of properties listed in the National Register of Historic Places (NRHP).	X		X	X	Upon license issuance.

Table 2.5-1. Measures proposed under Alternative D (cont.).

Resource Area	Resource Component	Proposed Measure	S1[1]	S2[1]	Y[1]	M[1]	Timing
		Preserve tribal access for traditional uses.	X	X	X	X	Ongoing.
	Interpreta-tion & Education	*Contribute information to an Interpretation and Education (I&E) program.*	X		X	X	By 1st anniversary of new licenses.
		Curate artifacts at a secure location in the basin.	X		X	X	By 1st anniversary of new licenses.
Socioeconomics		*Fund 3 FTE law enforcement (marine and land-based) positions.*	X		X	X	Within 6 months of license issuance.
		Contribute to County-developed installation and maintenance of emergency phone system for flood notification.	X		X	X	Annual contribution.
		Fund NOAA weather radio transmitter installation.	X		X	X	Annual contribution.
		Partially fund development of the Visitor Information Center (either $75,000 or enter into maintenance agreement).	X	X	X	X	When development is initiated by non-licensees.
		Contribute funds to maintain FR 90 as follows: one-time payment of $10,100 for bridge repair, and annual payment of $ 27,000.	X	X			One-time payments within 6 months of Settlement. Annual payments begin in April 2005.
		Continue to support Pine Creek Work Center communication link.	X				Ongoing.
		PacifiCorp contributes $20,000 to Cowlitz-Skamania Fire Protection District No. 7.	X		X	X	Annual contribution.

[1] S1 = Swift No. 1; S2 = Swift No. 2; Y = Yale; M = Merwin

2.5.1.1 Swift No. 1 and Swift No. 2

Swift No. 1 Facilities

Under Alternative D, PacifiCorp and Cowlitz PUD would install a modular surface collector at Swift Dam to enable migratory fish to be collected for transportation downstream. These facilities would be the same as those described for Alternative B. If directed by NOAA Fisheries, a second collection device would be positioned upstream of Swift Creek Reservoir seasonally to collect downstream migrants.

Swift No. 2 Facilities

An upstream fish collection facility would be constructed by the 17th anniversary of the Swift licenses at a presently undefined location between Yale Lake and Swift Dam. For

analysis purposes, a location adjacent to the Swift No. 2 tailrace is assumed. This facility would enable adult migratory fish to be collected, sorted and transported from upper Yale Lake to Swift Creek Reservoir, as analyzed in Alternative C. Under Alternative D, a new water release device would be constructed at the Swift No. 2 Canal approximately 2,000 feet downstream of Swift Dam, a location selected to prevent damage from Swift No. 1 spillway discharges. This new device, in combination with releases from the existing canal drain, would continuously release a total of between 60 and 100 cfs to the Lewis River bypass reach. The flow from the existing canal drain would enter an improved side channel in the bypass reach, helping to maintain the hydraulic connection between the side channel, the bypass reach, and Yale Lake.

Swift No. 1 and Swift No. 2 Operations

The Applicants would implement operational modifications to continuously release flow from Swift No. 2 Canal to the Lewis River bypass reach. These modifications could occur in two ways: (1) by reducing flows from power generation in order to meet the bypass reach objectives and retain the Swift Creek Reservoir water surface level; or (2) by maintaining flows for power generation and meeting bypass reach objectives by drafting Swift Creek Reservoir. While the second option is attractive from a power generation perspective, it would not meet various environmental resource objectives. Under Option 2, if Swift No. 1 and Swift No. 2 operated according to current practices (with no reduction in generation) and continuous flow was provided to the bypass reach, water surface levels in Swift Creek Reservoir would drop approximately 3.5 feet during the summer low flow season. In this circumstance, bypass reach releases combined with power generation requirements could exceed reservoir inflow, affecting reservoir management and access, aquatic habitat, archaeological resources, and recreation. The Applicants determined that this option could only be achieved at the expense of these resource values; therefore, Option (1) described above is included in Alternative D and analyzed in Section 3. Analysis of reservoir operations shows relatively little change in the seasonal reservoir levels (see Section 3.2.3.1). While meeting the bypass reach release objectives, this occurs at the expense of generation at Swift No. 1 and Swift No. 2 (see Section 3.2.3.6). Under Alternative D, Swift Creek Reservoir levels in winter and spring would average about four feet lower than under Alternative A, while average water levels in summer essentially would be unchanged.

Other than the modifications described above, the Swift No. 2 Project would operate in the same manner described for Alternative A. Generating capacity would be reduced as a result of releases to the bypass reach.

Releases from Swift Creek Reservoir would be modified under high runoff procedures adopted by PacifiCorp as part of the new flood management protocol (Section 2.5.3). These modifications would be coordinated with operation of the two downstream reservoirs.

2.5.1.2 Yale

PacifiCorp would modify the Yale spillway to improve conditions for resident fish passing downstream during spill events, as analyzed in Alternative B. A trap-and-transport facility would be constructed at Yale Dam to collect, sort, and relocate upstream migrating fish. Downstream migrants would be trapped at Yale Dam in a modular surface collector and transported downstream. Until this structure is installed, barrier nets would be positioned in the forebay to reduce bull trout entrainment. Minor modifications to seasonal reservoir operations would occur as new high runoff procedures are adopted as part of the flood management protocol (Section 2.5.3). Analysis of reservoir operations (described in Section 3.2.3) shows little change in the seasonal levels of Yale Lake.

2.5.1.3 Merwin

PacifiCorp would modify the upstream fish collection facility, as described in Section 2.5.6. Downstream migrants would be trapped at Merwin Dam in a modular surface collector and transported downstream. Until this structure is installed, barrier nets would be positioned in the forebay to reduce bull trout entrainment. In addition, PacifiCorp would modify seasonal reservoir operations under the flood management protocol (Section 2.5.3). Analysis of reservoir operations (described in Section 3.2.3) shows essentially no change in the seasonal levels of Lake Merwin. Changes in hourly releases from Lake Merwin from mid-February until mid-August would be more limited than under current conditions with adoption of a longer term plateau operations procedure.

2.5.2 Water Quantity

Under Alternative D, PacifiCorp and Cowlitz PUD would provide a continuous flow of between 60 and 100 cfs to the Lewis River bypass reach downstream of Swift Dam. Releases would occur from two locations in the Swift No. 2 Canal.

PacifiCorp's flow releases from Merwin Dam would range from 1,200 to 4,200 cfs, with a 2-inch/hour downramping rate and no ramping permitted during the period from one hour before and after sunrise and one hour before and after sunset. Below the critical flow level of 8,000 cfs, plateau changes would be limited to not more than one change in 24 hours, 4 changes in a 7-day period, or 6 changes per month in order to protect salmonid redds during spawning and fry emergence. Downramping rates would be limited to 2 inches per hour, except when flows are greater than 8,000 cfs.

During dry years, PacifiCorp would convene a Flow Coordination Committee (FCC) in order to develop adaptive management measures for the particular circumstance. The FCC would consider fish needs (priority on ESA-listed species), flood management needs, and reservoir recreational pool levels when developing adaptive management measures.

2.5.3 Flood Management

Under Alternative D, PacifiCorp would retain the amount of dependable flood control storage during the flood management season at the current 70,000 acre-foot level (17 feet of storage, or "hole"). Various operational changes would be implemented to make the most effective use of that storage, and improvements would be made in flood notification systems and procedures.

Flood management changes under Alternative D would involve improved forecasting for both weather and project inflows. Forecasts of high flow events would trigger pre-releases from the projects (i.e., releases in excess of those required for power generation in order to maintain or increase storage capacity). Pre-releases from Merwin Dam normally would be at rates of up to 25,000 cfs. In certain circumstances where severe floods are forecast, pre-releases from Merwin Dam would be increased to a maximum of 40,000 cfs. Should forecasts be found to be sufficiently reliable, they would also be used to improve project operations near the peak of flood events by allowing storage of additional flood flows and reduction in peak project discharges. Other aspects of the existing high runoff procedures would remain unchanged.

Analysis of flow records shows that flood risk on the Lewis River drops significantly after March 1. The length of the flood management season under Alternative D would be reduced by two weeks in years with below average March runoff forecasts. Project refill under these conditions would start on March 15 instead of April 1. This action would reduce the risk of failing to achieve project refill in dry years.

Under Alternative D, PacifiCorp would contribute to a package of measures to improve flood notification systems and procedures, as follows:

- Provide financial support to Clark County Regional Emergency Services Agency and Cowlitz County Department of Emergency Management for the acquisition and maintenance of a new emergency telephone notification service for areas affected by high runoff from the projects.

- Contribute funding to the National Oceanic and Atmospheric Administration (NOAA) for certain specified costs associated with the operation of a weather radio transmitter that will improve NOAA's ability to transmit to residents of the Lewis River valley.

- Contribute funding to the USGS to provide public dial-in access to real-time flow information on the Lewis River below Merwin Dam.

- Improve coordination between PacifiCorp and emergency management officials and personnel.

Coupled with improved flood forecasting and high flow pre-releases, these measures would increase public access to information on project storage, flows, and weather conditions, and would improve notification procedures in the event of severe floods.

2.5.4 Water Quality

Water quality standards are being met at each project. Continued compliance with Washington Department of Ecology (WDOE) 2003 draft standards would be assured by development of a water quality management plan for each facility. The objective of these plans would be to provide WDOE with a clear understanding of the proposed monitoring program, QA/QC measures, and protocols for reporting data. Each utility would apply for Section 401 Water Quality Certification for their projects within 60 days of FERC's notice that the projects are ready for environmental analysis.

PacifiCorp and Cowlitz PUD would implement erosion control measures to reduce erosion during construction of the canal water outlet structure, fish passage and recreation facilities. These measures would protect soil and geologic resources from erosion as well as protecting water quality and aquatic habitat from degradation.

2.5.5 Aquatics

One of the primary objectives of Alternative D is to establish anadromous fish production in the upper Lewis River basin. This is proposed to be accomplished using adult trap-and-transport facilities at the Merwin, Yale and Swift projects and juvenile (downstream) collection facilities at Swift, Yale and Merwin dams. PacifiCorp and Cowlitz PUD would gradually reduce production (on a 1:1 basis) of anadromous species at the existing hatcheries as natural runs are established. Specific measures proposed as part of Alternative D to benefit the fishery resources of the Lewis River basin are described in Sections 2.5.6 through 2.5.8. Measures to mitigate the effects of construction activities on aquatic resources, such as construction timing restrictions and other Best Management Practices (BMPs), would be developed in consultation with the appropriate resource agencies. These BMPs may include, but would not be limited to, the following:

- Implementing measures to reduce construction-related adverse effects (i.e., turbidity and the introduction of potentially hazardous materials) on aquatic resources during construction activities;
- Limiting in-channel work to periods that are not critical to the spawning and incubation of resident and anadromous salmonids; and
- Minimizing the removal of existing vegetative cover in the riparian zone.

2.5.6 Fish Passage

Merwin Trap Upgrades – PacifiCorp would modify the existing fish trap located at the base of Merwin Dam to improve worker safety and increase fish handling efficiency. Until construction of the Merwin Upstream Collection and Transport Facility is complete, the upgraded Merwin Trap would be operated to collect hatchery fish returning from the ocean and to transport any bull trout to Yale Lake. Fish other than hatchery fish and bull trout would be returned to the river below Merwin Dam.

Introduction Above Swift Dam – By the third anniversary of the issuance of new licenses, the licensees would begin a supplementation program to introduce adult salmon and steelhead into the basin upstream of Swift Dam. This early supplementation effort provides natural progeny to initiate the introduction effort, which is aimed at reestablishing natural runs. Collection and transport of natural juvenile outmigrants would coincide with completion of downstream collection facilities at Swift Dam. An added benefit of these measures is the addition of marine-derived nutrients into the system and preparation of habitat for future spawning.

Concurrent with implementing the supplementation program, PacifiCorp would begin a design, permitting and construction phase for upstream passage at Merwin Dam and downstream passage at Swift Dam. By six months after the fourth anniversary of the issuance of new licenses, PacifiCorp would construct and begin operating an upstream trapping, sorting and transport facility at Merwin Dam, and PacifiCorp and Cowlitz PUD would construct and begin operating a downstream modular surface fish collector at Swift Dam with sorting and transport capabilities. PacifiCorp would also construct a release pond below Merwin Dam, and all downstream migrating anadromous salmonids would be transported to that release pond. These facilities would result in up and downstream passage of spring Chinook, winter steelhead, late-run coho, bull trout and sea-run cutthroat to and from natural spawning and rearing habitat above the Lewis River Projects. Also beginning on the fourth anniversary of the issuance of new licenses, the adult supplementation program described above would be expanded to include juvenile salmon and steelhead and would continue for a minimum of 10 years for spring Chinook and winter steelhead and 6 years for late-run coho.

Introduction Above Yale Dam – By the eighth anniversary of the issuance of new licenses, in addition to transporting adult salmon and steelhead collected below Merwin Dam to above Swift Dam, PacifiCorp would also begin transporting a portion of collected fish to Yale Lake to prepare the habitat for future fish and to seed the tributaries to Yale Lake. On the thirteenth anniversary of the issuance of new licenses, PacifiCorp would begin operating a Yale downstream collection facility that would include sorting and transport capabilities. All downstream migrating anadromous salmonids would be transported to the release pond. Also upon the thirteenth anniversary of the issuance of new licenses, the adult supplementation program would be expanded to include juvenile salmon and steelhead and would continue for a minimum of 10 years for spring Chinook and winter steelhead and 6 years for late-run coho.

Full Introduction and Connectivity Throughout the Lewis River Projects – By the twelfth anniversary of the issuance of new licenses, PacifiCorp would begin transporting adult salmon and steelhead to Lake Merwin to prepare the habitat for future fish and to seed the tributaries. On the seventeenth anniversary the issuance of new licenses, PacifiCorp would begin operating a Merwin downstream collection facility (which would include sorting and transport capabilities) and the Yale upstream passage facility. PacifiCorp and Cowlitz PUD would construct and begin operating the Swift upstream passage facility. All downstream migrating anadromous salmonids would be transported to the release pond. Adding these facilities to the existing upstream facility at Merwin Dam and downstream facilities at the Swift Projects and Yale Dam would result in up and

downstream passage of spring Chinook, winter steelhead, late-run coho, bull trout and sea-run cutthroat to and from natural spawning and rearing habitat throughout and above the Lewis River Projects. Also beginning upon the seventeenth anniversary of the issuance of new licenses, the supplementation program would be expanded to Lake Merwin to include juvenile salmon and steelhead and would continue for a minimum of 10 years for spring Chinook and winter steelhead and 6 years for late-run coho.

Continuation of Existing Bull Trout Trap-and-Transport Programs – Until the Yale upstream facility and the Swift upstream facility become operational or until alternative measures are implemented, and unless otherwise directed by USFWS, the bull trout collect-and-transport programs would continue at the Yale tailrace and below Swift No. 2.

Yale and Merwin Bull Trout Entrainment Reduction – Immediately following the issuance of new licenses, PacifiCorp would develop an entrainment reduction study designed to evaluate bull trout entrainment reduction methods at Yale and Merwin dams.

Yale and Merwin Downstream Bull Trout Facility – If PacifiCorp does not build the Yale downstream facility, then PacifiCorp would, on or before the thirteenth year of the issuance of new licenses, construct and begin operating a downstream bull trout collection and transport facility in the Yale forebay. If PacifiCorp does not build the Merwin Downstream Facility, when bull trout populations have increased sufficiently in Lake Merwin, but not sooner than the seventeenth year from the issuance of the new licenses, it would construct a fish passage facility similar to the Yale downstream bull trout facility at Merwin Dam.

Yale and Swift Upstream Bull Trout Facilities – If PacifiCorp does not build the Yale upstream facility and PacifiCorp and Cowlitz PUD does not build the Swift upstream facility, then on or before the seventeenth year of the issuance of new licenses, PacifiCorp and Cowlitz PUD would either (i) continue existing upstream transport measures described above for the remaining term of the new licenses or (ii) complete construction of and begin operating alternate passage facilities.

Juvenile Salmonids above Swift Dam, in Lake Merwin and in Yale Lake – The licensees would, for the purposes of supplementation, transport juvenile salmonids to release sites above Swift Dam and in Lake Merwin and in Yale Lake for the times specified in the Settlement Agreement (PacifiCorp and Cowlitz PUD et al. 2004).

Adult Anadromous Salmonids above Merwin Dam – PacifiCorp and Cowlitz PUD would commence the supplementation of adult fish during the third year after issuance of the new licenses, would transport and release supplementation stocks of adult spring Chinook, coho, and steelhead above Swift No. 1, and into Yale Lake and Lake Merwin as directed by the ACC. The ACC shall determine the timing for initiating supplementation into Yale Lake and Lake Merwin. The ACC, subject to the approval of NOAA Fisheries, may recommend discontinuing or recommencing the transportation of such supplementation stocks provided that any such recommendations are biologically based, and not contrary to the goals of the ESA.

In Lieu Fund – The Licensees would construct and operate the Yale and Merwin downstream facilities and the Yale and Swift upstream facilities unless the USFWS and NOAA Fisheries determine at least four and a half years prior to the operation date for a passage facility that the facility should not be constructed. In lieu of construction of a passage facility, PacifiCorp would contribute to an In Lieu Fund as follows: $10 million in lieu of a juvenile surface collector at Yale Dam; $10 million in lieu of a juvenile surface collector at Merwin Dam; and $5 million in lieu of an upstream adult fish passage facility at Yale Dam and $5 million in lieu of an upstream adult fish passage facility in the vicinity of the Swift Projects. The In Lieu Fund would be used for mitigation measures that collectively contribute to meeting the objective of achieving equivalent or greater benefits to anadromous fish populations as would have occurred if passage through Yale Lake and/or Lake Merwin had been provided.

2.5.7 Aquatic Habitat Enhancement Measures

Stranding Study and Habitat Evaluation – By the end of year three after the issuance of new licenses, PacifiCorp would complete a stranding study and a habitat evaluation study below Merwin Dam to Eagle Island to assess the potential effects of project operations on steelhead, coho, Chinook, and chum salmon, and their habitats. The ACC may recommend measures to minimize stranding or enhance habitat based on study results.

Constructed Channel – An existing, protected channel that runs parallel to the Swift No. 2 canal and receives water from an existing canal drain would be enhanced with instream structure and channel changes to create quality habitat that is matched to the available flows.

Large Woody Debris –PacifiCorp would stockpile LWD collected from Swift Creek Reservoir for use by other entities for LWD projects.

LWD Funding –PacifiCorp would provide $2,000 annually, which may be disbursed to qualified entities for costs of LWD transportation and placement. PacifiCorp would also contribute $10,000 per year to the Aquatic Enhancement Fund earmarked for LWD projects in mainstem of the Lewis River below Merwin Dam to benefit anadromous fish.

LWD Study – PacifiCorp would sponsor a LWD study to identify and assess the potential benefits of LWD projects below Merwin Dam.

Spawning Gravel Program –PacifiCorp would sponsor a spawning gravel study and, based on the study results, develop a gravel monitoring and augmentation plan.

Predator Study – Within ten years of the issuance of new licenses, PacifiCorp would conduct a one-time study of whether predation in Lake Merwin is likely to be a limiting factor to the success of the anadromous salmonid introduction.

Habitat Preparation Plan – Within six months after the issuance of new licenses, PacifiCorp would develop the “Habitat Preparation Plan” to release live adult hatchery anadromous salmonids to "fertilize" the stream habitat in preparation for the introduction

of anadromous salmonids. Fish will be released for 5 years in each reservoir commencing five years prior to expected completion of the downstream fish passage facility from that reservoir.

Aquatic Enhancement Fund – PacifiCorp and Cowlitz PUD would establish the Lewis River Aquatic Enhancement Fund to support resource protection measures and habitat projects. PacifiCorp would provide $5.2 million and Cowlitz PUD would provide $520,000. PacifiCorp's contribution would be spread over 14 years starting in 2005 and Cowlitz PUD's contribution would be spread over 21 years starting after the first year of the new license.

Monitoring and Evaluation Plans –PacifiCorp and Cowlitz PUD would monitor and evaluate the effectiveness of various aquatic measures including fish passage; adult anadromous salmonid migration, spawning, distribution, and abundance; water quality; hatchery supplementation programs; bull trout populations; cutthroat trout (if anadromous form is present); and resident fish species.

2.5.8 Hatchery Facilities and Operations

Under Alternative D, the Lewis River, Merwin and Speelyai hatchery facilities would be upgraded, although not expanded beyond their current physical capacity, to meet defined production targets (see Sections 8.3 and 8.4 of the Settlement Agreement). The anadromous fish program would include spring Chinook, steelhead and coho. Juvenile production goals under Alternative D range from 3,425,000 to 3,625,000 smolts, including 1,350,000 spring Chinook, from 1,800,000 to 2,000,000 coho and 275,000 steelhead. This production level is expected to result in 86,000 pre-harvest ocean recruits (12,800 adult spring Chinook; 60,000 adult coho; and 13,200 adult winter steelhead), representing an approximately 7 percent reduction from the adult anadromous fish production goal in Alternative A. Under Alternative D, production of anadromous salmonids would decrease on a one-to-one basis coinciding with increases in pre-harvest ocean recruit numbers.

Resident fish production would include rainbow trout and kokanee to support the recreational fishery in the river and reservoirs.

2.5.9 Terrestrial Resources

Terrestrial measures proposed under Alternative D would include all of the actions described under Alternative C, including the Wildlife Habitat Management Plans. In addition, Alternative D establishes three separate habitat acquisition funds: (1) a $7.5 million fund to acquire habitat in the Swift project areas; (2) a $2.5 million fund to acquire and protect habitat in the vicinity of the Yale Project; and (3) a $2.2 million fund to acquire and enhance habitat throughout the Lewis River basin.

2.5.10 Cultural Resources

Cultural resource measures proposed under Alternative D would be the same as those described under Alternatives B and C.

2.5.11 Recreation Facilities

Recreation resource measures proposed under Alternative D would be the same as those described under Alternatives B and C. In addition, Cowlitz PUD would maintain its bank fishing facility at the Swift No. 2 canal bridge, provide portable toilets at the fish facility on a seasonal basis and manage recreational parking for anglers at the fishing facility. Implementation timing, identified in Table 2.5-1, reflects terms of the Settlement Agreement (PacifiCorp and Cowlitz PUD et al. 2004).

2.5.12 Socioeconomics

Law Enforcement – PacifiCorp would provide funding for three full-time-equivalent law enforcement officers to augment land and marine-based traditional law enforcement activities and patrols in the North Fork Lewis River basin, provided by state and local government, as part of the agencies' responsibility to protect public health, safety and welfare in the North Fork Lewis River basin.

Forest Road 90 – PacifiCorp would pay $7,474 and Cowlitz PUD would pay $2,626 to the USDA-FS to assist in the repair of the Canal Bridge on Forest Road 90. PacifiCorp would pay $19,980 and Cowlitz PUD would pay $7,020 per year beginning in April 2005 to the USDA-FS for the maintenance of Forest Road 90. Each Licensee would pay appropriate use fees to the USDA-FS for hauling heavy loads on Forest Road 90 on a case-by-case basis.

Visitor Information Facility – PacifiCorp would allow construction of a 1,000 to 1,200-square-foot Visitor Information Facility on its property in Cougar, and would provide matching funds, or the licensees would perform periodic maintenance of the facility for the term of the licenses. PacifiCorp's portion of matching contribution would be $65,250 and Cowlitz PUD's portion would be $9,750.

Pine Creek Communication Works Center Link – Continued support would be provided for the USDA-FS radio-telephone link between Swift Dam and the Pine Creek Work Center.

3.0 ENVIRONMENTAL CONSEQUENCES

3.1 GEOLOGY AND SOILS

3.1.1 Resource Issues

The primary project impact on geology and soils is erosion, which can affect water quality, aquatic habitat, and in some cases, terrestrial resources. No issues specific to geology and soil resources were raised during the NEPA scoping process.

3.1.2 Affected Environment

Existing geologic and soil conditions are described in Section 3.1 of the April 2004 PDEAs submitted by PacifiCorp and Cowlitz PUD (PacifiCorp 2004 and Cowlitz PUD 2004).

3.1.3 Effects of Alterative D

Effects of Alternative D on reservoir shoreline erosion would be the same as those of Alternative A, with continued slow erosion of reservoir shorelines, consequent loss of upland habitat, and the addition of sediment to the reservoirs.

Construction of new project facilities is proposed under Alternative D. The majority of construction would be related to either upstream and downstream fish passage facilities (3.75 acres), an improved channel in the Lewis River bypass reach (approximately 1,200 linear feet), and recreation facilities (25.4 acres). Erosion control plans would be developed for each facility prior to construction, and measures to minimize and contain eroded soil would be implemented during all construction. In addition, disturbed areas would be revegetated and/or stabilized following construction. It is anticipated that there would only be minor amounts of erosion during and following construction if adequate protective measures are implemented.

3.1.4 Conclusion

Under Alternative D, additional erosion could occur during construction of new facilities, resulting in minor adverse effects. Properly implemented erosion control measures should be effective at minimizing the amount of erosion and soil loss during construction of these new facilities.

The slow erosion of reservoir shorelines under all alternatives would result in the slow loss of upland terrestrial habitat, addition of sediment to the reservoirs and possible very minor, localized, and short-term increases in turbidity in the reservoirs. Erosion during construction of new facilities under Alternative D could result in minor increases in turbidity in nearby waters if adequate erosion control measures are not implemented.

3.2 WATER QUANTITY

3.2.1 Resource Issues

During the NEPA scoping process, three project-related water quantity issues were identified:

- Effects of managed water releases on aquatic and riparian habitat downstream of the projects, and on hatchery operations.
- Influence of the Speelyai diversion and hatchery on flow regimes in Speelyai Creek.
- Effects of project operation on downstream flood management.

This section discusses the effects of Alternative D on reservoir water level and flow regimes in river reaches affected by project facilities and operations. The effects of these changes on aquatic habitat, riparian habitat, hatcheries, and other resources are discussed in subsequent sections.

3.2.2 Affected Environment

Existing water quantity conditions are described in Section 3.2 of the April 2004 PDEAs submitted by PacifiCorp and Cowlitz PUD (PacifiCorp 2004 and Cowlitz PUD 2004).

3.2.3 Effects of Alternative D

3.2.3.1 Reservoir Levels

Water levels in Swift Creek Reservoir under Alternative D would average about four feet lower than under Alternative A in the winter and early spring months, while average water levels in the summer would see little change (Table 3.2-1). There would be minor changes in water levels in Yale Lake, with fall and winter levels averaging about two feet lower than under Alternative A, while summer levels would experience little change. Lake Merwin levels would be very similar under all four alternatives. These differences are due to a variety of factors including adoption of minimum releases to the Lewis River bypass reach under Alternative D, and the effects of optimizing power generation while meeting the modified flow requirements. Compared with normal seasonal and year-to-year fluctuations under baseline conditions, the effect of Alternative D would be relatively small, and is not expected to have any significant impact on recreational users or other resources.

3.2.3.2 Lewis River Bypass Reach

Under Alternative D, a constant flow of 60 to 100 cfs would be released into the Lewis River bypass reach that parallels Swift No. 2 canal. The flows would vary seasonally as determined by the Aquatics Coordination Committee (ACC) but would not exceed 55,200 acre-feet (55,349 acre-feet in a leap year) and (1) no more than 17,078 acre-feet (average of 70 cfs, not to exceed 80 cfs in any month) between July 1 and October 1; and

Table 3.2-1. Alternative D reservoir operations summary.

Alternative Reservoir: D **Swift**

	Reservoir Elevations - feet MSL					Releases into the bypass reach - cfs				
	50%	Minimum		Maximum		50%	Minimum		Maximum	Turbine
Month	exceedence	Actual	Available	Actual	Available	exceedence	Actual	Available	Actual	Capacity
Jan	972.09	923.14	878.00	998.83	1000.00	50	50	50	31,014	9,120
Feb	967.30	912.45	878.00	998.83	1000.00	50	50	50	53,371	9,120
Mar	968.22	929.35	878.00	991.08	1000.00	50	50	50	8,345	9,120
Apr	984.41	950.75	878.00	999.79	1000.00	50	50	50	11,522	9,120
May	987.02	964.48	878.00	999.74	1000.00	50	50	50	7,761	9,120
Jun	997.28	977.91	878.00	999.94	1000.00	50	50	50	11,618	9,120
Jul	996.37	974.26	878.00	999.89	1000.00	50	50	50	4,599	9,120
Aug	997.54	971.98	878.00	999.77	1000.00	50	50	50	4,067	9,120
Sep	996.12	968.17	878.00	999.73	1000.00	50	50	50	4,830	9,120
Oct	980.00	941.50	878.00	999.80	1000.00	50	50	50	9,126	9,120
Nov	965.79	909.37	878.00	997.15	1000.00	50	50	50	32,415	9,120
Dec	970.39	908.67	878.00	998.99	1000.00	50	50	50	23,942	9,120

Alternative Reservoir: D **Yale**

	Reservoir Elevations - feet MSL					Outflow - cfs				
	50%	Minimum		Maximum		50%	Minimum		Maximum	Turbine
Month	exceedence	Actual	Available	Actual	Available	exceedence	Actual	Available	Actual	Capacity
Jan	472.36	449.89	430.00	488.16	490.00	6,009	-	-	32,150	9,760
Feb	474.86	449.82	430.00	489.35	490.00	6,051	-	-	47,474	9,760
Mar	478.25	457.79	430.00	488.76	490.00	5,774	-	-	9,829	9,760
Apr	480.42	452.54	430.00	489.79	490.00	4,076	-	-	14,658	9,760
May	489.97	463.65	430.00	490.00	490.00	3,879	-	-	9,323	9,760
Jun	488.47	481.80	430.00	489.96	490.00	2,568	-	-	12,772	9,760
Jul	490.00	484.42	430.00	490.00	490.00	1,657	-	-	5,180	9,760
Aug	486.06	484.58	430.00	489.87	490.00	1,328	-	-	4,615	9,760
Sep	480.53	465.90	430.00	489.56	490.00	1,846	-	-	6,255	9,760
Oct	469.47	462.17	430.00	489.77	490.00	2,848	-	-	8,153	9,760
Nov	475.24	462.02	430.00	489.58	490.00	4,675	-	-	33,488	9,760
Dec	473.14	459.66	430.00	489.24	490.00	6,512	-	-	33,031	9,760

Alternative Reservoir: D **Merwin**

	Reservoir Elevations - feet MSL					Outflow - cfs				
	50%	Minimum		Maximum		50%	Minimum		Maximum	Turbine
Month	exceedence	Actual	Available	Actual	Available	exceedence	Actual	Available	Actual	Capacity
Jan	234.46	224.72	165.00	238.91	239.60	7,450	1,510	1,500	40,353	11,470
Feb	234.53	224.15	165.00	239.06	239.60	6,950	1,329	1,500	61,730	11,470
Mar	234.70	221.46	165.00	239.20	239.60	6,250	1,023	2,000	12,526	11,470
Apr	235.81	224.69	165.00	239.24	239.60	4,229	1,356	2,700	16,103	11,470
May	236.80	227.02	165.00	239.47	239.60	4,077	1,712	2,700	11,446	11,470
Jun	238.00	233.63	165.00	239.58	239.60	2,767	1,560	2,700	17,900	11,470
Jul	237.40	233.95	165.00	239.49	239.60	1,638	1,130	1,500	4,876	11,470
Aug	236.39	233.90	165.00	239.60	239.60	1,252	622	1,200	2,724	11,470
Sep	235.70	201.45	165.00	239.26	239.60	1,955	869	1,200	9,574	11,470
Oct	235.35	201.16	165.00	239.05	239.60	2,932	905	1,200	11,537	11,470
Nov	235.03	202.20	165.00	239.34	239.60	5,793	1,986	4,200	44,491	11,470
Dec	234.80	226.66	165.00	239.10	239.60	8,048	1,510	1,500	44,066	11,470

Notes: Column heading definitions are provided in Section 3.2.3.1 of the PDEAs (PacifiCorp 2004 and Cowlitz PUD 2004).
All data (both reservoir elevations and outflows) are daily averages.

(2) no more than 100 cfs per month between November 1 and June 30. For analysis purposes, the flows were modeled as follows: 60 cfs from July 1 though October 30; 100 cfs from November 1 through January 31; and 75 cfs from February 1 through June 30.

The water would be released from the Swift No. 2 canal into the bypass reach at two different points. The newly constructed upper release structure would be located approximately 2,000 feet downstream from Swift Dam while the lower release point would use the existing canal drain structure. A final combined release schedule would be negotiated within one year of construction of the new flow release structure, although maximum flows from the lower outlet would be 47 cfs. Flows from the lower release point would be directed into an approximately 1,200-foot-long improved side channel that is described in Section 3.4.3.2. The water in the improved side channel then would join with the main bypass reach channel.

Flows in the bypass reach would increase above the released 60 to100 cfs as a result of local inflows and canal seepage. As under Alternative A, during peak flows, releases from Swift No. 2 canal or the Swift Dam spillway would continue to pass through the bypass reach. High runoff operating procedures under Alternative D would be similar to those described under Alternative B, and are expected to result in high flows as in Alternative A, with possibly slightly smaller mid-range peak flows.

3.2.3.3 Flows in Speelyai Creek

The effects of Alternative D on flows in Speelyai Creek would be the same as Alternative A because no new measures are proposed.

3.2.3.4 Lewis River Downstream of Merwin Dam

Releases from Merwin Dam would range from 1,200 to 4,200 cfs, with a 2-inch per hour downramping rate. No ramping would be permitted from one hour before and after sunrise or from one hour before and after sunset to protect aquatic species. Daily fluctuations would be restricted from February 16 through August 15 by maintaining flow plateaus (periods of near steady discharge). Below the critical flow level of 8,000 cfs, these plateau changes would be limited to not more than one change in 24 hours, 4 changes in a 24-hour period, or 6 changes per month in order to protect salmonid redds during spawning and fry emergence.

3.2.3.5 Flood Management

Flood management under Alternative D would be the same as described under Alternative B.

3.2.3.6 Power Generation

Generation losses under Alternative D are primarily a result of the increased flows directed to the Lewis River bypass reach, as discussed above. Under Alternative D, there would be a reduction in annual generation (relative to Alternative A) from the Swift projects during an average water year of about 5,235 MWh. In addition to power

generation losses, increased flows in the bypass reach reduce operational flexibility and other ancillary benefits.

3.2.4 Conclusion

Under Alternatives B, C and D, changes in reservoir levels would be minor because the projects would be operated to maintain reservoir levels rather than to achieve current generation levels.

Flow releases would be 50 cfs under Alternative B; range from 100 and 400 cfs under Alternative C; and range from 60 to 100 cfs under Alternative D. Each action alternative would provide greater flow in the reach than under Alternative A and would beneficially affect water quantity, water quality, aquatic and terrestrial resources, aesthetics, and recreation. The overall benefit to aquatic resources in the bypass reach under Alternative D would be greater than that realized under Alternatives A and B and similar to that that realized under Alternative C. The slightly lower flow releases in Alternative D compared to Alternative C may also minimize the potential to attract migrating anadromous fish that are bound for higher quality habitat located above Swift Dam. The increased flows under Alternatives B, C and D would result in decreased generation at Swift No. 1 and Swift No. 2. During flood conditions, spill from Swift Creek Reservoir into the bypass reach would be similar to or slightly lower than spills under Alternative A.

No changes to flows in lower Speelyai Creek are proposed under any alternative so there are no new effects.

There would be minimal changes to average daily flow releases in the Lewis River downstream of Merwin Dam under each of the alternatives, with minor differences in ramping rates and slightly different spring operations. Under Alternative D, ramping rate restrictions would be supplemented by plateau operating procedures, restricting the number of flow release changes from mid-February through mid-August. This would increase protection of fish habitat compared to Alternatives A, B and C.

Under Alternative D, as in Alternatives B and C, notification efforts would be enhanced and high runoff operating procedures modified to incorporate improved flow forecasts. These alternatives have an identical package of measures to facilitate improvements to flood notification and warning procedures that would reduce flood hazard to life and property in the Lewis River valley. Modified high runoff procedures would reduce the magnitude of floods ranging from about the 5-year to the 50-year flood, and hence would further reduce flood hazard and flood damage relative to Alternative A. Alternatives B, C and D would retain the existing 70,000 acre-feet of flood control storage. None of the alternatives would affect the magnitude of the 100-year flood. Flood management effects under Alternative A are expected to be neutral or slightly adverse, while effects associated with Alternatives B, C and D are likely to be moderately beneficial.

3.3 WATER QUALITY

3.3.1 Resource Issues

The assessment of project alternatives on water quality is driven by two key questions:

- What are the current water quality conditions and trends in the basin?
- Are state water quality standards being met?

In addition, several specific issues were raised during the NEPA scoping process that helped to focus study objectives. Water quality issues identified included:

- Effects of continued operations on water quality;
- Effects of boating and other recreation uses on reservoir water quality;
- Speelyai Creek diversion and hatchery effects on water quality and flow regimes;
- Effects of Merwin and Lewis River hatcheries on water quality in the Lewis River; and
- Effects on the upper Lewis River basin from lack of trace elements and nutrients.

3.3.2 Affected Environment

Existing water quality conditions are described in Section 3.3 of the April 2004 PDEAs submitted by PacifiCorp and Cowlitz PUD (PacifiCorp 2004 and Cowlitz PUD 2004).

3.3.3 Effects of Alternative D

This section relies on data and analyses presented in the Applicants' Technical Studies Report (PacifiCorp and Cowlitz PUD 2004), and in particular on the following studies: Water Quality Studies (WAQ) 1 through 4; the Swift Bypass Reach Synthesis Study (AQU 2), and the Speelyai Creek Connectivity and Hatchery Protection Study (AQU 9).

Measurable changes in reservoir water temperature would not be expected under Alternative D. Actions that have potential to change water temperatures include attraction flows for upstream fish passage and flows required to facilitate downstream passage via floating surface collectors. Upstream attraction flows are unlikely to have a measurable effect on water temperature because the volume would be significantly less than tailrace discharges. Flows required to operate downstream passage facilities would be minimal in comparison to turbine flows and therefore are not expected to alter the temperature of reservoir releases. With the exception of temporarily holding downstream migrants in a release pond near Pekins Ferry, these actions are the same as those described under Alternatives B and C, and are not expected to influence water quality and temperature.

The aforementioned release pond would be an approximately 10-foot-wide by 100-foot-long raceway, 4 feet in depth, constructed off-channel near Pekins Ferry downstream of Woodland. Fish would be held in this pond for approximately 24 hours without being fed. Re-entry to the Lewis River would be either volitional or fish would be flushed to the river with a crowding device. Flow through the pond would be continuous. Based on these conceptual design elements, no impacts to water quality or temperature are anticipated from the holding pond or as a result of upstream or downstream fish passage under Alternative D.

Flows downstream of Merwin Dam would be the same under Alternative D as assessed under Alternatives B and C, although changes in release levels between mid-February and mid-August would be restricted to limit flow fluctuations on a daily and weekly basis. Pre-releases (turbine flows plus spill) would be made in advance of high flow events about once a year on average from Merwin Dam, based on flow forecasts. Assuming these releases would occur during periods of minimal thermal stratification, effects on water temperature would not be expected.

Under Alternative D, flow would be released continuously from the Swift No. 2 canal to the Lewis River bypass reach through two release devices. As discussed in Section 3.2.3.2, augmentation levels would range from 60 to 100 cfs.

Predicted average monthly temperatures at the downstream end of the bypass reach (modeled using the U.S. Fish and Wildlife Service's SSTEMP model) with flows of 50 cfs are between 4°C and 14°C, depending upon the month and the starting water temperature (Figure 3.3-1). These results suggest that the flow regime proposed under Alternative D (minimum of 60 cfs) would result in water temperatures at the downstream end of the bypass reach well under the State of Washington non-core rearing standard of 17.5°C (measured as 7DADMax), as well as the former state Class A standard of 18°C.

Assuming flows in the Lewis River bypass reach would originate near the intake depth in Swift Creek Reservoir, turbidity levels in the bypass reach would more closely mirror those at depth in the reservoir—increasing during the winter months to between 5 and 10 NTUs, and decreasing to 1-2 NTUs during the summer and fall.

Management of Speelyai Creek flows would be the same under Alternative D as under Alternatives B and C. Upper Speelyai Creek would continue to be diverted into the Speelyai Canal and Yale Lake. Flows downstream of the upper diversion would come solely from groundwater and tributary inflow, thus temperatures would remain cooler than those upstream of the diversion during the summer months.

To the extent that proposed recreational enhancements bring greater numbers of visitors to the project area, and a corresponding increase in use of personal watercraft, there may be an increase in levels of PAH compounds in the reservoirs for which no State water quality standards exist.

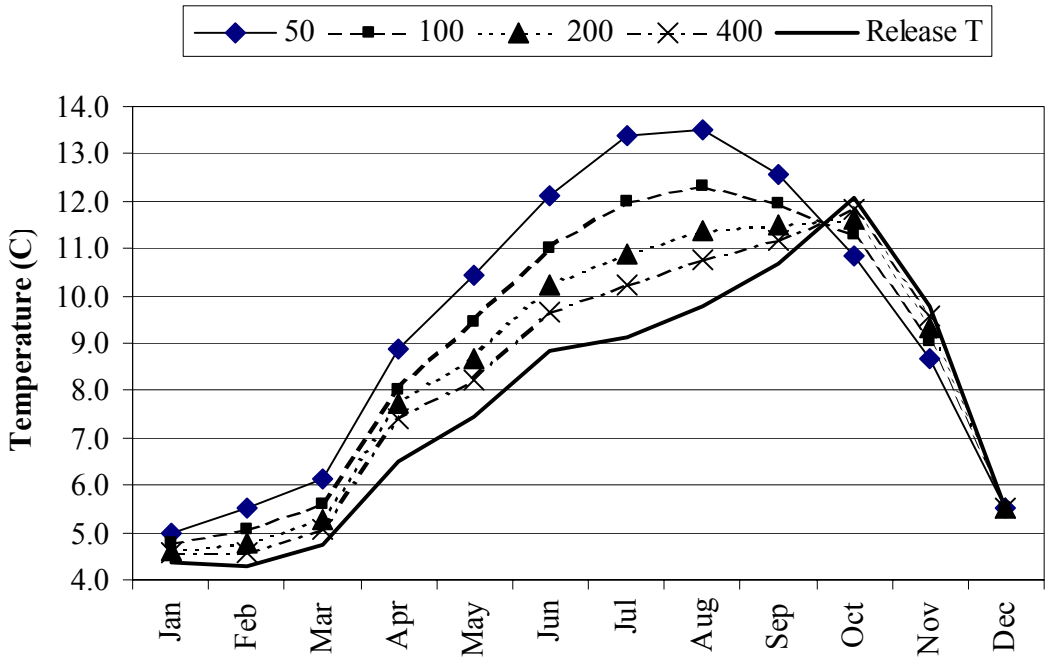

Figure 3.3-1. Observed Swift Dam release temperature and modeled water temperature at downstream end of Lewis River bypass reach for four release flows under average temperature conditions.

Introduction of anadromous fish under Alternative D provides a mechanism by which marine-derived nutrients (MDN) would be transported to reservoir tributaries capable of supporting spawning fish, offsetting the absence of trace elements and nutrients to these streams in comparison to Alternative A. Consistent with elements of the salmonid habitat preparation plan, introduction of anadromous fish to Swift Creek Reservoir tributaries may increase reservoir nutrient levels, possibly shifting phytoplankton species composition and trophic status. These changes may be ecologically positive, providing greater diversity and reduced dominance of nitrogen fixing blue-green algae during the summer months.

Flood management pre-releases would occur in anticipation of forecast high flow events. Because these would consist of surface flows, little, if any, increase in turbidity would be expected during these pre-release flows. Other constituents (e.g., dissolved oxygen, nutrients, pH) would be expected to be fairly uniform throughout the water column during late fall and winter; thus, effects of pre-releases on other indices of water quality also would be minimal. Similarly, pre-release flows are unlikely to increase TDG relative to levels that would naturally occur during spill events.

Pre-release flows could affect zooplankton populations in Lake Merwin, and to a lesser extent (depending on magnitude of spill) at Yale Lake. Zooplankton are a critical source of food for kokanee in the project reservoirs, and pre-release spills for flood management could reduce prey availability.

Additionally, PacifiCorp would develop a Water Quality Management Plan to address TDG and to define a monitoring program to ensure compliance with other WDOE water quality criteria at Merwin, Yale, and Swift No. 1. Cowlitz PUD would develop a Water Quality Management Plan to define a monitoring program to ensure compliance with state standards at Swift No. 2.

3.3.4 Conclusion

Water quality standards are expected to be met in all alternatives. Measures are being undertaken to reduce TDG effects (see Section 3.3.3.1 of the April 2004 PDEAs [PacifiCorp 2004 and Cowlitz PUD 2004]). In cooperation with WDOE, these measures will continue to be refined under Alternative D as an element of PacifiCorp's Water Quality Management Plan.

Alternatives B, C and D are not expected to result in measurable changes to water quality or water temperature in project reservoirs relative to currently licensed conditions. Measurable changes in trophic status and nutrient levels are unlikely, although introduction of anadromous fish and associated inputs of MDN may positively influence the structure of reservoir phytoplankton populations. Changes in water quality or water temperature downstream of Merwin Dam are not expected, with the exception of minor increases in turbidity during pulsed and/or pre-release flows. Under all three action alternatives, the Applicants would develop Water Quality Management Plans to define a monitoring program to ensure compliance with WDOE water quality criteria.

3.4 AQUATIC RESOURCES

3.4.1 Resource Issues

Operation of the Lewis River Projects has the potential to affect aquatic resources in the mainstem Lewis River and its tributaries. During the NEPA scoping process, federal, state, and local resource agencies; Indian tribes; non-governmental organizations; and other interested parties identified 11 primary aquatic resource issues. These issues are grouped into the six categories listed below, and the effects of Alternative D on each of these categories are analyzed in Section 3.4.3.

- Effects of the projects on fish distribution, abundance, and movement through the project area.
- Effects of the projects on stream morphology, sediment transport, aquatic and riparian habitat, and large woody debris movement.
- Effects of the projects on instream flows and aquatic habitat connectivity.
- Effects of the projects on resident and anadromous fish distribution in the Lewis River basin above Merwin Dam.
- Effects of hatchery operations and management practices on native resident and anadromous species in the Lewis River.

- Effects of the projects on threatened and endangered fish species.

3.4.2 Affected Environment

Existing aquatic resource conditions are described in Section 3.4 of the April 2004 PDEAs submitted by PacifiCorp and Cowlitz PUD (PacifiCorp 2004 and Cowlitz PUD 2004).

3.4.3 Effects of Alternative D

3.4.3.1 Fish Distribution and Abundance

Under Alternative D, Chinook, coho, and steelhead would be introduced to the Lewis River upstream of Merwin Dam. The goal of the introduction program is to achieve "genetically viable, self-sustaining, naturally reproducing, harvestable populations above Merwin Dam that are greater than minimum viable populations." Adult and juvenile Chinook, coho and steelhead would be transported and released above the dams, with the adults spawning and the juveniles rearing in these upstream areas. Upstream fish passage would be provided above Merwin, Yale, and Swift dams via trap-and-transport facilities. Downstream passage would be via floating surface collectors (see Section 3.4.3.4). The anadromous fish introduction program would follow a phased approach, where Chinook, coho, and steelhead would first be introduced into habitat above Swift Dam (within 6 months of the 4th anniversary of Merwin license issuance), and then potentially introduced into the habitat between Merwin and Swift dams (following the 13th and 17th anniversaries of the new licenses), unless otherwise directed by the USFWS and NOAA Fisheries (see Section 3.4.3.4). Downstream migrating Chinook, coho, steelhead, and sea-run cutthroat trout would be transported from Swift Creek Reservoir, and potentially from Yale Lake and Lake Merwin, directly to a release pond near Pekins Ferry (downstream of Woodland) before release into the lower Lewis River. Upstream passage for resident fish species, such as bull trout, would be provided by net-and-haul or trap-and-transport, and downstream passage would be provided by the floating surface collectors. Kokanee would continue to be planted in Lake Merwin and rainbow trout would continue to be planted in Swift Creek Reservoir at the same level that occurs under existing conditions (Alternative A).

Under Alternative D, the distribution of Chinook, coho, and steelhead would be greatly expanded compared to Alternative A, providing access to an estimated 174 miles of potential habitat (100 percent of the potential habitat above Merwin, Yale, and Swift dams) (Table 3.4-1). Bull trout distribution would not be expanded, as they are present in all Project reservoirs and have been documented downstream of Merwin Dam; however, connectivity between these currently isolated habitats would be established, allowing for both upstream and downstream migration. Distribution of all other fish species under Alternative D would be unaltered compared to Alternative A.

Table 3.4-1. Length of potentially accessible anadromous fish habitat and the percent of total accessible habitat in the three reaches of the Lewis River upstream of Merwin Dam.

Reach Name*	Length of Potentially Accessible Habitat (miles)	Percent of Total Accessible Habitat (by length)
Lake Merwin	29.4	17%
Yale Lake	27.4	16%
Swift Creek Reservoir	117.1	67%
Grand Total	173.9	100%

* The Lake Merwin reach extends from Merwin Dam to the base of Yale Dam; the Yale Lake reach extends from Yale Dam to the base of Swift Dam; and the Swift Creek Reservoir reach extends from Swift Dam to the lower falls on the North Fork Lewis River.

Source: Based on estimates developed for the EDT analysis (Mobrand Biometrics, Inc. 2003).

Under Alternative D, the abundance of Chinook, coho, and steelhead would also increase in the Lewis River basin. During project relicensing, PacifiCorp and Cowlitz PUD used Ecosystem Diagnosis and Treatment (EDT) modeling to estimate anadromous fish production potential above Merwin, Yale, and Swift dams (Mobrand Biometrics, Inc. 2003). Results of EDT modeling predict that together, all three Lewis River reaches (Lake Merwin, Yale Lake, and Swift Creek Reservoir) are currently capable of producing 2,014 adult spring Chinook, 12,253 adult coho, and 2,005 adult steelhead (assuming 100 percent survival past the dams and no harvest) (Table 3.4-2). The EDT estimates predict that the majority of fish (76 percent) would be produced upstream of Swift Dam.

Table 3.4-2. EDT estimates of adult abundance under current habitat conditions for spring Chinook, coho, and steelhead by geographic area (introduction reach).[1]

Species/Stock	Adult Abundance by Introduction Reach			Total Abundance
	Swift	Yale	Merwin	
Spring Chinook	1,893	121	0	2,014
Coho	8,866	2,500	887	12,253
Steelhead	1,680	154	171	2,005
Percent of Total Adult Abundance by Introduction Reach	76 percent	17 percent	7 percent	

[1] Adult abundance is the number of adults entering the mouth of the Lewis River.

According to the Lewis River fish passage model[1], Alternative D would produce (on average) substantially more adult coho than Alternatives B and C (Table 3.4-3); however, prior to construction of downstream fish passage facilities at Yale and Merwin dams, production under Alternative D would be similar to that of Alternative B. The reason Alternative D has the highest production level of all three action alternatives (Alternatives B, C, and D) is that it eventually allows anadromous fish access to all available habitat above Merwin Dam. Unlike Alternative C, Alternative D would also minimize juvenile fish passage facility and reservoir migration-related mortality by

[1] Developed during project relicensing by the Lewis River Aquatic Resources Group (ARG).

collecting juveniles at Swift, Yale and Merwin dams and directly transporting them to release ponds below Merwin Dam (i.e., fish collected at Swift Dam would not pass through Yale Lake and Lake Merwin). In Alternative C, Swift-origin juveniles must pass through two additional projects (Yale and Merwin) and Yale-origin fish must pass one additional project (Merwin) as they migrate downstream to the lower river. In Alternative C, passing through Yale Lake and Lake Merwin would subject Swift and Yale-origin juveniles to additional juvenile fish passage facility and reservoir migration mortality as they move through each additional reservoir and fish passage facility. As coho production from the Swift Creek Reservoir tributaries accounts for 76 percent of the total production from the upper basin, any increase in mortality to the Swift reach population would have a dramatic effect on adult abundance.

Table 3.4-3. Lewis River fish passage model estimates of adult coho production for Alternatives B, C, and D.[1,2]

		Number of Coho		
		Alternative B	**Alternative C**	**Alternative D**
Total	**Average**	**6,169**	**6,160**	**8,637**
	Max	**15,723**	**17,079**	**22,472**
	Min	**1,772**	**1,709**	**2,457**
	No. <50 fish[3]	**0**	**0**	**0**
Swift	Average	6,169	3,061	5,178
	Max	15,723	9,001	13,626
	Min	1,772	827	1,466
	No. <50 fish[3]	0	0	0
Yale	Average	NA	1,669	2,070
	Max	NA	4,480	5,333
	Min	NA	468	592
	No. <50 fish[3]	NA	0	0
Merwin	Average	NA	1,430	1,389
	Max	NA	3,598	3,512
	Min	NA	413	400
	No. <50 fish[3]	NA	0	0

Summary results for Inter-Annual Variation Analysis, summary of spawner and smolt abundance over 100 generations.

Smolt to adult survival (SAR) – Variable; Smolts/Female – Fixed

1 The coho data was generated using the Lewis River fish passage model. Model settings were selected based on ARG agreed upon inputs for factors such as transport, reservoir and bypass survival. This run assumes that the proposed juvenile collection facilities under each alternative have a fish collection efficiency of 95 percent.

2 Values presented in this figure are lower than EDT estimates as they were produced in a model that varies SAR from 1 percent to 13 percent. In contrast, EDT uses a static SAR of 5 percent.

3 Number of generations when spawner abundance is less than 50 fish.

It should be noted that the above outcome would be even more evident for spring Chinook and steelhead, as the Swift components make up 94 percent and 84 percent of the total production of these species, respectively.

As in Alternatives B and C, introduction of Chinook, coho and steelhead above Merwin Dam under Alternative D may displace resident rainbow and coastal cutthroat trout from preferred habitats that have been colonized in the absence of anadromous species; however, these impacts are expected to be minimal (PacifiCorp and Cowlitz PUD 2004: AQU 16). All of these species co-existed in the upper Lewis River basin prior to the construction of Merwin Dam and currently co-exist in downstream reaches.

The introduction of anadromous salmonids may also benefit bull trout, cutthroat trout, and other aquatic species by increasing primary productivity through the addition of marine derived nutrients (MDN). The addition of MDN likely would increase the aquatic invertebrate biomass, which would increase the forage base for juvenile and adult trout. In addition, the production of juvenile salmon would increase the forage base for adult and subadult bull trout.

Negative effects associated with the introduction of anadromous salmonids into areas currently occupied by bull trout may include interspecific competition for food and space, competition for spawning sites, and redd super-imposition. Coho juveniles also rear in similar habitats to juvenile bull trout, and are considered to be aggressive and territorial (Chapman 1962). If bull trout have been ecologically released due to the absence of anadromous salmonids in the upper basin and are now spawning and rearing in areas historically used by the anadromous species, then these interactions could adversely affect bull trout (PacifiCorp and Cowlitz PUD 2004: AQU 16). Bull trout monitoring included in Alternative D would be implemented to determine the potential impacts of anadromous fish introduction on bull trout and would provide a mechanism to implement adaptive management as new information arises to limit impacts to bull trout.

3.4.3.2 Aquatic Habitat

Lewis River Bypass Reach

Under Alternative D, minimum flows would be continuously provided to the Lewis River bypass reach (ranging from 60 to 100 cfs) through two release structures (Section 3.2.3.2). One of these, the existing Swift No. 2 canal drain, would release water into an improved habitat channel, increasing the amount of available habitat for aquatic species such as Chinook, coho, steelhead (once fish passage is implemented), cutthroat trout, rainbow trout, kokanee, brook trout, and mountain whitefish. Conceptual design of this approximately 1,200-foot-long channel incorporates placement of large woody debris (LWD) and boulders to increase velocity and depth. Boulder riffle structures would provide stable grade elevation drops, and gravel contributions would improve substrate.

The proposed minimum flow release through the bypass reach also would create additional foraging habitat for bull trout during the winter and spring; however, summer and fall water temperatures (greater than 9ºC) would preclude successful bull trout spawning (Pratt 2003, published as AQU 20 in PacifiCorp and Cowlitz PUD 2004). It should be noted that this temperature limitation for bull trout would exist at all proposed flow releases (Pratt 2003). The overall level of benefit to aquatic resources in the Lewis River bypass reach under Alternative D would be greater than that realized under

Alternative B and slightly less than that realized in Alternative C. Periodic spill events still would continue to transport wood and gravel from the reach, limiting the amount of spawning habitat and instream cover, except in the improved habitat channel where no effects from spill are expected.

Lower Speelyai Creek

Under Alternative D, conditions in lower Speelyai Creek would be the same as existing conditions (Alternative A).

Gravel Augmentation Downstream from Merwin Dam

Under Alternative D, PacifiCorp would develop and implement a spawning gravel study downstream from Merwin Dam[2]. If a depletion of gravel or a reduction in gravel recruitment is found to be a limiting factor for anadromous fish, PacifiCorp would develop and implement a spawning gravel augmentation plan. If a lack of gravel is found to be a limiting factor in the future, this measure would enhance spawning opportunities in the Lewis River. As a result, the gravel monitoring and augmentation plan would ensure that ample spawning gravels persist downstream of Merwin Dam, providing long-term benefits to Chinook, coho and chum salmon, and steelhead populations.

LWD Enhancement

Under existing conditions, Swift Creek Reservoir, Yale Lake, and Lake Merwin intercept virtually all LWD generated in upstream areas. By providing a LWD collection and funding program to supplement LWD in the lower Lewis River, Alternative D would enhance fish habitat and would enhance habitat-forming processes throughout the life of the Licenses. This measure is expected to enhance juvenile fish survival, benefiting Lower Columbia River Chinook salmon, steelhead, and coho salmon populations that spawn in the Lewis River and its tributaries.

Other Aquatic Habitat Measures

Under Alternative D, several other aquatic habitat measures would be implemented to protect and enhance aquatic habitat and water quality. Bull trout conservation covenants would be maintained in perpetuity; a bull trout limiting factors analysis would be conducted for all three project reservoirs; a predation study would be conducted in Lake Merwin; and several funds would be set up to support stream and riparian habitat protection and enhancement projects in the Lewis River basin. In addition, monitoring plans would be developed to determine compliance with 401 water quality criteria.

The Aquatic Habitat Enhancement Fund provided by PacifiCorp and Cowlitz PUD (totaling $5.7 million) would be used for aquatic habitat protection, restoration, and enhancement through acquisition, easements, or restoration projects. Representative

[2] Under existing conditions, ample spawning gravels remain in the reach below Merwin Dam and appear to have been stable over the long term (McIsaac 1990).

projects may include but are not limited to repairing the highest priority culvert passage problems on Ross, Johnson, Colvin, Cedar, Beaver, John, and Brush creeks; restoring and enhancing Johnson Creek to eliminate passage problems; reconnecting and enhancing off-channel and floodplain habitats along the lower reaches of the mainstem Lewis River; enhancing floodplain and side channel habitat around Eagle Island; restoring degraded riparian conditions along the tributaries to the lower Lewis River; increasing functional LWD structures, or similar natural structures, in appropriate stream reaches; and restoring and enhancing wetlands, springs, and seeps in the sub basin. These or similar projects should benefit all aquatic species in the basin. However, since no specific projects or plans have been reported, the actual effects of this fund are unknown, but are expected to be beneficial.

If the USFWS and NOAA Fisheries determine that introduction of anadromous salmonids into Yale or Merwin reservoirs is not desirable based on additional study results, PacifiCorp would establish the "In Lieu Fund" to support aquatic enhancement measures. PacifiCorp would contribute up to a total of $30 million. Funds would be spent on projects in consultation with the ACC and approved by the USFWS and NOAA Fisheries, and PacifiCorp would submit annual reports reviewing project actions, implementation, and monitoring. As described in the Settlement Agreement, the In Lieu Fund would be used for USFWS and NOAA Fisheries-approved mitigation measures that collectively contribute to meeting the objective of achieving equivalent or greater benefits to anadromous fish populations as would have occurred if passage through Yale Lake and/or Lake Merwin had been provided. Like the Aquatic Habitat Enhancement Fund, the In Lieu Fund would be used for fisheries habitat protection, restoration, and enhancement through acquisition, easements, or restoration projects. These types of projects would benefit all aquatic species in the basin; however, like the Aquatic Habitat Enhancement Fund described above, the actual effects of this fund are unknown, but are expected to be beneficial.

Within two years of the issuance of new licenses, PacifiCorp would also conduct a limiting factors analysis for bull trout occurring in Lake Merwin and Swift Creek Reservoir tributary streams. Based on the results of this analysis, the ACC may implement enhancement measures through the use of the Aquatic Enhancement Fund if warranted by the study results. Bull trout enhancement measures (if deemed necessary) would likely improve bull trout spawning and rearing habitat and provide long-term protection of critical habitat for bull trout in the Lewis River basin.

The survival of juvenile Chinook, coho and steelhead migrating through Lake Merwin might be severely reduced due to the presence of tiger musky and large numbers of northern pikeminnow. Northern pikeminnow are known to prey heavily upon resident and anadromous salmonids. Northern pikeminnow predation was believed to be the major cause of very low coho salmon survival in Lake Merwin the late 1950s and early 1960s (Hamilton et al. 1970). The impacts of northern pikeminnow predation on reintroduced anadromous fish are currently unknown. To address this uncertainty, PacifiCorp would conduct a one-time study of whether predation in Lake Merwin is likely to be a limiting factor to the success of the anadromous salmonid reintroduction program. If warranted by study results, PacifiCorp may identify steps that could be

undertaken to control predation. The objective of this program will be to increase the survival rate of juvenile salmonids within the project area. Reducing predator abundance would likely increase the survival of anadromous fish migrating through or rearing in Lake Merwin.

None of the habitat measures described above are being implemented under existing conditions. Their implementation would improve bull trout and anadromous fish spawning and rearing habitat and provide for the long-term protection of critical habitat.

Measures that would affect habitat in specific Lewis River reaches are further analyzed below.

3.4.3.3 Flow

Lewis River Bypass Reach

As discussed in Section 3.4.2.2 of the April 2004 PDEAs (PacifiCorp 2004 and Cowlitz PUD 2004), the 3.3-mile-long Lewis River bypass reach (North Fork Lewis River) has no minimum instream flow requirement. Flows in the bypass reach are normally limited to inflow from groundwater/seepage and tributary contributions (except during Swift No. 1 spill events when large quantities of water are released into the reach)[3]. During the summer low flow period, surface flow at the downstream end of the Lewis River bypass reach is estimated to be about 21 cfs. Under existing conditions, median summer water temperatures in the Lewis River bypass reach approach the upper end of preferred ranges for most salmonids (PacifiCorp and Cowlitz PUD 2004: WAQ 1). Maximum summer water temperatures exceed the preferred ranges for all salmonid species except rainbow trout. Although the bypass reach supports populations of cutthroat trout, rainbow trout, mountain whitefish, largescale sucker, and other resident fish species (including occasional bull trout), the quality and quantity of habitat in this reach is limited by the lack of flow, summer water temperatures, and the periodic spill events.

Under Alternative D, minimum instream flows would be released into the Lewis River bypass reach from two points, a water release structure located 2,000 feet downstream of Swift Dam (upper release point) and a canal drain located approximately one mile downstream of Swift Dam (lower release point). Flow releases would vary by season and would range from 60 to 100 cfs. The lower release point would contribute up to 47 cfs (the maximum capacity of the canal drain) into an "improved habitat channel" located between the lower release point and Yale Lake. Conceptual design of this approximately 1,200-foot-long channel incorporates placement of LWD and boulders to increase habitat complexity in the channel. It is expected that the improved habitat in this off-channel area would not be adversely affected by periodic spill events in the main bypass reach, providing a long term benefit to aquatic resources. The remaining flow would be

[3] Spill events occur sporadically, but in general, spills of several thousand cfs or greater occur every few years.

released into the upper bypass reach (via the upper release point) to maintain some level of habitat connectivity between several large pools that exist in this reach.

As discussed in Section 3.4.3.2, the Alternative D flow regime would improve aquatic habitat connectivity and increase the amount of spawning and rearing habitat for Chinook, coho, steelhead (once fish passage is implemented), cutthroat trout, rainbow trout, kokanee, brook trout, and mountain whitefish (PacifiCorp and Cowlitz PUD 2003 and 2004: AQU 2). Large-scale sucker, northern pikeminnow, threespine stickleback, and sculpin are native to the North Fork Lewis River basin and these species would also benefit from the increase in flow. The Alternative D flow regime would create additional foraging habitat for bull trout during the winter and spring; however, summer and fall water temperatures in excess of 9°C would likely preclude successful bull trout spawning in this reach. According to Pratt (2003), water temperatures above 9°C would delay or abort bull trout spawning, as appropriate spawning temperature (<9°C) would not occur until late November or December (Figure 3.3-1). If bull trout spawned before mid-November, egg mortality would be complete (Pratt 2003). It should be noted that fall water temperatures in the bypass reach would exceed 9°C at all flow releases (Figure 3.3-1). As a result, augmenting the flows in the bypass reach would not provide additional spawning habitat for bull trout residing in Yale Lake.

Under Alternative D, spring and fall water temperatures in the Lewis River bypass reach would likely be within the preferred range for spawning cutthroat trout, rainbow trout and mountain whitefish (Figure 3.3-1) (PacifiCorp and Cowlitz PUD 2004). These water temperatures would also be ideal for brook trout, a species that is known to hybridize and compete with bull trout (USFWS 2002). Hybridization with brook trout is one of the major factors contributing to the decline and lack of recovery of bull trout throughout its range (USFWS 2002). It is not known if Chinook and steelhead would successfully spawn and rear in this reach.

If a trap-and-transport facility is eventually installed at Swift No. 2, the increased flows in the Lewis River bypass reach may also attract migrating anadromous fish that are bound for higher quality habitat above Swift Dam. Any such delay in reaching the trap-and-transport facility entrance at Swift No. 2 could decrease the survival of these upstream migrants. If the trap-and-transport facility is eventually installed at the base of Swift Dam, the 60 to 100 cfs flow release would facilitate anadromous fish migration to this facility.

There would be little change to stream morphology in the bypass reach associated with the Alternative D flow regime, as flows would not be large enough to change channel form. The wetted channel, however, would be somewhat wider, deeper and more persistent throughout the year. While instream habitat area would increase substantially compared to Alternative A, periodic spill events would continue to transport wood and gravel particles from the reach, limiting the amount of spawning gravel and instream cover (i.e., habitat quality would be limited by physical factors in addition to instream flow). The same very large spills would also scour redds and wash out encroaching riparian brush and shrubs from within the high water channel (PacifiCorp and Cowlitz PUD 2003 and 2004: AQU 2).The constructed habitat channel would be less affected by

these events, especially in the upper section where it is separate from the main bypass reach. Overall, there would be a net benefit to fish and other aquatic species in the reach.

Lewis River Below Merwin Dam

Flows in the Lewis River downstream of Merwin Dam are affected by the coordinated operation of the three project reservoirs. Flows are highest during the winter, decrease gradually in the spring, and are lowest during summer months. This flow regime has resulted in more wetted habitat area in the Lewis River downstream from Merwin Dam during the summer and early fall months than prior to construction of the projects, inundating more potential aquatic habitat and likely more side channel habitat. Operation of the projects has reduced the frequency of flows in the 10,000-20,000 cfs range and changed the shape of mid-range flow fluctuations. A reduction in magnitude of peak flows likely has resulted in a more stable channel with less scour of redds and less fine sediment transport than prior to project operation, while ample spawning gravels remain and appear to be stable over the long term (McIsaac 1990).

Minimum Flows – The existing minimum instream flow regime below Merwin Dam was developed in the early 1980s and adopted by FERC in September 1995. This was purposefully developed by WDFW and PacifiCorp to maintain and enhance native fall Chinook salmon spawning and rearing in the mainstem Lewis River (WDF 1991). Fall Chinook rearing habitat studies and population estimates conducted on the Lewis River between 1977 and 1990 (McIsaac 1980, 1990; NESC 1984; Norman et al. 1987; and WDF 1991) found that higher flows in the spring and early summer produce more wild fall Chinook smolts, and that flows in the 3,000 to 5,000 cfs range represent optimum rearing conditions for pre-smolt wild fall Chinook. The basis for the flow regime was to protect wild fall Chinook and was arranged in periods to reflect the most critical life stages. Although these minimum flows have been established to enhance native fall Chinook and protect other aquatic resource in the lower Lewis River, actual flow releases from Merwin Dam exceed these minimum flow requirements during much of the year (Figure 3.4-1).

Under Alternative D, minimum flows below Merwin Dam in the winter would be 2,000 cfs; minimum flows in the spring would range from 2,200 to 2,700 cfs; summer minimum flows would range from 1,200 to 2,700 cfs; fall low flows would be 1,200 cfs; late fall minimum flows would range from 2,500 to 4,200 cfs (Table 3.4-4).

A flow of 4,200 cfs from November 1 through December 15 was determined by WDFW to provide the "maximum amount of spawning area" for bright fall Chinook during their peak spawning period (November and early December). Under Alternative D, the existing 5,400 cfs minimum flow in December would be reduced to 4,200 cfs to reduce the difference between the highest sustained flow during the peak spawning period and the lowest flow during egg incubation, while maintaining ample spawning habitat for Chinook, coho, and chum. By minimizing the difference between spawning flows and incubation flows, redd dewatering would be minimized, increasing Chinook, coho, and chum egg and alevin survival. Fish survival and abundance should improve by avoiding higher fall discharge rates that are of a sufficient duration to encourage Chinook and

chum salmon spawning in channel areas that would be difficult to keep watered throughout the incubation and emergence period during low flow years (Connor and Pflug 2004).

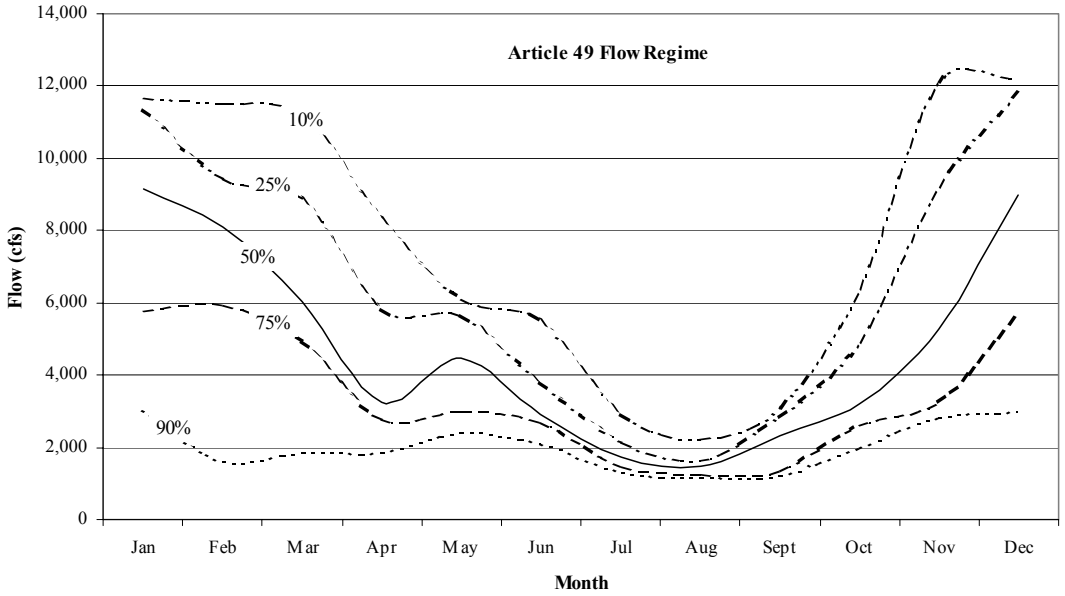

Figure 3.4-1. Daily flow exceedence curve for observed Lewis River flows at Ariel since 1995.

Table 3.4-4. Minimum flow provisions downstream of Merwin proposed under Alternative D.

Time Period	Alternative D Flow Minimum Flow Requirement
November 1 through December 15	4,200 cfs
December 16 through March 1	2,000 cfs
March 2 through March 15	2,200 cfs
March 16 through March 30	2,500 cfs
March 31 through June 30	2,700 cfs
July 1 through July 10	2,300 cfs
July 11 through July 20	1,900 cfs
July 21 through July 30	1,500 cfs
July 31 through October 15	1,200 cfs
October 16 through October 31	2,500 cfs

To minimize the redd dewatering risk, minimum flows in January and February would increase from 1,500 cfs under existing conditions to 2,000 cfs, and in March from 2,000

cfs to 2,500 cfs. Minimum flows in July would slowly decrease to mimic a similar reduction in natural flows. These flows would be slightly higher than under existing conditions to reduce potential adverse effects on emerging steelhead fry. Flows in September and October would be similar to existing conditions, increasing the amount of rearing habitat compared to pre-project conditions. It was determined by the WDF in 1981 that flows less than 1,500 cfs would be acceptable for August and September because natural conditions are usually less in that period. Therefore, 1,200 cfs was established as a minimum flow for that time period up to October 15.

Compared to existing conditions, the Alternative D flow regime would reduce the difference between the Chinook, coho, and chum spawning and incubation flows, and would slightly increase minimum flows in July to protect emerging steelhead fry. Therefore, Alternative D would result in decreased redd dewatering and increased Chinook, coho, chum, and steelhead survival.

Plateau Operations – Under Alternative D, PacifiCorp would restrict daily flow fluctuations below Merwin during the period of February 16 through August 15 of each year by maintaining flow plateaus (periods of near-steady discharge). Once a flow plateau is established, it would be maintained for as long a duration as practicable, but flow plateaus may be altered to a new level as a result of changes in natural flow or operational demands on the Lewis River power system. Changes in level would be subject to the limitations of the ramping restrictions and the number of allowable plateau changes.

Plateau operations have been designed to limit flow fluctuations on a daily to weekly basis, as opposed to ramping rate restrictions that have been designed to limit flow fluctuations on an hourly basis (discussed below). Daily to monthly flow fluctuations have been shown to reduce benthic macroinvertebrate diversity and total biomass and can change invertebrate species composition. A study on the Skagit River, Washington found that flow fluctuations have a greater adverse effect on the aquatic invertebrate community than does a substantial reduction in average flow (Gislason 1985). Alterations in the annual hydrograph of rivers may also contribute to disruptions in aquatic food webs, as documented in several northern California river systems (Power et. al 1996). Shifts in the composition of benthic fauna to more predator resistant taxa have been found to occur in regulated river systems, which potentially decreases the energy transfer from algae to fish (Power et. al 1996).

A reduction in the aquatic invertebrate forage base can negatively affect fish production potential. Flow fluctuations can affect aquatic invertebrates through stranding (similar to fish stranding), increasing drift response, and reducing aquatic invertebrate forage. It is anticipated that by implementing plateau operations, impacts to macroinvertebrates caused by flow fluctuations would be reduced. Therefore, Alternative D may increase, or at a minimum, stabilize macroinvertebrate production in the Lewis River downstream of Merwin Dam. This would represent an increase in the fish forage base, benefiting resident and anadromous fish species.

Ramping Rates – Since 1993, PacifiCorp has implemented a voluntary two-inch per hour down-ramping rate at all release levels to protect aquatic resources below Merwin Dam and to reduce juvenile fish stranding. In their Biological Opinion for the Interim Operation of the Lewis River Hydroelectric Projects (USFWS and NMFS 2002), the USFWS, NOAA Fisheries and PacifiCorp agreed to alter their Article 49 ramping rates to meet a limit of (1) 0.5 feet per three-hour period; (2) 2 inches per hour for down-ramping; and (3) 1.5 feet per hour for up-ramping (note: up-ramping limitations focus on public safety for those using the river below the project).

Ramping rate restrictions included in Alternative D would be similar to those recommended by the USFWS and NOAA Fisheries in their 2002 Interim Operations Biological Opinion, except that no down-ramping would be allowed from February 16 through June 15, between one hour before and after sunset and one hour before and after sunrise each day. A critical ramping flow would be set at 8,000 cfs (measured at the Ariel gage). Ramping criteria would be imposed at flows less than the critical flow, and no ramping restrictions would be required when flows were equal to or greater than the critical flow. Study AQU 3 (PacifiCorp and Cowlitz PUD 2004) determined that a flow greater than or equal to 8,000 cfs substantially wetted gravel bars that have a high potential for juvenile fish stranding. Implementing these restrictions would limit the potential for entrapment and stranding of juvenile Chinook, coho, steelhead, chum, and other aquatic organisms. Alternative D would provide a substantial reduction in fish stranding compared to the existing License Article 49 and would provide additional stranding protection over the Interim Operations Biological Opinion ramping requirements. In addition, a study would be conducted to evaluate fish stranding potential under Alternative D.

In addition to the above measures, PacifiCorp has finished mechanical upgrades at Merwin to provide back-up power and additional alarms to prevent future losses of anadromous salmonid from mechanical failures. Past emergency shutdowns have de-watered the adult fish trap and downstream channels. A series of alarms and a video system have been installed, enabling the operators to observe the tailrace area during shutdowns. The operators also perform a daily calculation to determine how much of a spillgate opening would be needed to maintain flow and river stage if the Merwin units were to shut down. In addition, secondary and tertiary power back-up systems have been installed to allow automatic gate openings to maintain river flows.

3.4.3.4 Fish Passage

The only fish passage facility in the Lewis River basin is the upstream fish collection facility at the base of Merwin Dam. This is a trap-and-haul system that is operated year-round. The system consists of a fish entrance located on the right bank below the dam, a fish elevator, and truck transport loading facility. Collected fish are loaded into tanker trucks and transported to hatchery facilities, or released in the lower Lewis River to support harvest by anglers. This facility has not been used to transport anadromous fish upstream of Merwin Dam since 1957, because a lack of downstream passage facilities at all three dams has made this measure biologically impractical.

While no Lewis River project structures are equipped with downstream fish passage facilities, juvenile and adult migrants can pass downstream of each dam through the project turbines and spillways. Both turbine and spillway entrainment have the potential to injure or kill downstream migrating fish, although survival rates are currently unknown. Fisheries literature indicates that juvenile survival through Francis turbines ranges from 65 to 97 percent (Eicher and Associates 1987). Forty-eight hour survival rates for hatchery coho and steelhead smolts passing through two Francis turbines at Mayfield Dam on the Cowlitz River ranged from 83 to 97 percent. The survival rates differed between the two turbines (two different designs) but not between species within each turbine (Normandeau Associates, Inc, and Skalski 2003).

Under Alternative D, both upstream (trap and transport) and downstream (surface collector) fish passage facilities would be installed and/or upgraded at Merwin, Yale, and Swift dams (unless otherwise directed by the USFWS and NOAA Fisheries). As described below, installation of these facilities would follow a phased approach. PacifiCorp would also construct improvements to the Yale spillway by the fourth anniversary of the new licenses to improve fish survival over the spillway during spill events.

Upstream Fish Passage

Within 6 months after the fourth anniversary of the new Merwin license, PacifiCorp would construct and begin operating an upgraded upstream fish passage facility at Merwin Dam that would collect, sort and transport upstream-migrating adult Chinook, coho, steelhead, sea-run cutthroat trout, and bull trout. Initially, adult Chinook, coho, and steelhead collected at Merwin Dam would be transported and released above Swift Dam. Any bull trout collected below Merwin Dam would be transported to Yale Lake unless otherwise directed by USFWS. By the 13th anniversary of the new licenses, unless otherwise directed by NOAA Fisheries and the USFWS, PacifiCorp would construct and begin operating adult trap and transport facilities at the base of Yale Dam. By the 17th anniversary, PacifiCorp and Cowlitz PUD would construct and begin operating adult trap and transport facilities at the single best site located above Yale Lake.[4]

The adult handling protocols (by species at each facility) would depend on the fish management objectives of the resource agencies. In general, adult anadromous hatchery fish (identified by fin clips) would be transported to the hatchery to meet broodstock needs or released back to the river for harvest. Naturally-produced anadromous fish would be transported and released into the upper end of Swift Creek Reservoir, Yale Lake, or Lake Merwin (once all passage facilities were complete). Resident fish (i.e., bull trout) would either be returned to the lower river or transported and released above Merwin, Yale or Swift Dams, depending on agency fish management policies. The target for adult collection and transport survival would be 99.5 percent.

[4] The location for an adult trap and transport facility at the upstream end of Yale Lake is undetermined, but will be based on biological and hydrological factors.

The probability of attaining the 99.5 percent adult upstream passage survival target is very high, based on the best available technology and survival noted at other facilities in the Pacific Northwest. Preliminary data from the first four years of anadromous salmonid introduction efforts in the Upper Cowlitz River basin indicate that trap and haul methodology has been successful at reestablishing some level of anadromous salmonid production, especially for coho salmon (Dammers et al. 2002 as cited in NOAA Fisheries 2003). The Pelton Round Butte trap and haul facility has been operating nearly continuously since 1956, with many thousands of fish captured, sorted, and transported. Mortality rates at this facility have been less than one percent (PGE 2004). Adult anadromous salmonid monitoring studies (i.e. fish tagging) also have the potential to affect individual fish as a result of tagging injury or mortality, but would provide long-term benefits with the assurance that fish passage is meeting program goals and objectives.

Downstream Fish Passage

Under Alternative D, PacifiCorp and Cowlitz PUD would construct and operate a downstream fish passage facility at Swift Dam within 6 months of the fourth anniversary of the Swift licenses to collect, sort, and transport downstream migrating Chinook, coho, steelhead, and sea-run cutthroat trout. PacifiCorp and Cowlitz PUD would transport these fish below Merwin Dam to a release pond before release into the lower Lewis River. Unless otherwise directed by the USFWS, bull trout collected in the Swift downstream collection facility would be transported to Yale Lake, except that bull trout with a smolt-like appearance would be transported below Merwin Dam. All salmonids would be passed downstream using trap and truck transport methods, unless the USFWS, NOAA Fisheries and the ACC believe there may be benefits from downstream transport of migrating juvenile salmonids via a bypass facility such as a pipe or flume to the next downstream waterbody.

On or before the 13th anniversary of the new licenses (unless otherwise directed by the USFWS and NOAA Fisheries), PacifiCorp would construct and begin operating a downstream fish passage facility at Yale Dam. On or before the 17th anniversary of the new licenses (unless otherwise directed by the USFWS and NOAA Fisheries), PacifiCorp would construct and begin operating a downstream passage facility at Merwin Dam. PacifiCorp would transport downstream migrating Chinook, coho, and steelhead and sea-run cutthroat from both Yale Lake and Lake Merwin to the release pond below Merwin Dam.

Mortalities are expected among some downstream migrating salmon and steelhead smolts (and potential adult fallbacks) as they move through the projects and downstream fish passage facilities. Passage survival performance standards have been set by the USFWS and NOAA Fisheries at levels that are expected to allow for sustainable populations above the dam, and the fish passage facilities would be designed to meet these targets. The overall downstream survival (ODS) target[5] at Swift Dam is 80 percent until

[5] The percentage of juvenile anadromous fish for each designated species that enters the reservoirs from natal streams and that survive to enter the Lewis River below

downstream passage is implemented at Yale, at which point the ODS goal at Swift and Yale is 75 percent. The probability of attaining 75 to 80 percent ODS is unknown, but facilities would be designed to meet this target with the overall goal of producing self-sustaining anadromous fish populations upstream of Merwin Dam. If monitoring indicates that performance standards are not being met, PacifiCorp and Cowlitz PUD would make modifications to the facilities to achieve the targets. Studies performed by PacifiCorp and Cowlitz PUD indicate that survival of anadromous fish migrating downstream through Swift Creek Reservoir was approximately 90 percent (PacifiCorp and Cowlitz PUD 2004: AQU 14A and AQU 14B).

Although the collection efficiency of the downstream passage facilities would not be known until constructed, the efficiency of the Baker River gulper system, upon which the proposed downstream fish passage facility systems would be based, has been estimated at between 53 and 70 percent (pers. comm. Cary Feldman, Puget Sound Energy, 2003, as cited in PacifiCorp 2004). Because the Swift, Yale, and Merwin floating surface collectors would be significantly larger (more attraction flow) than the existing Baker system, it is anticipated that their collection efficiencies would exceed the high end of the Baker gulper efficiency range. In addition, Baker River data show that approximately 98 percent of the juveniles survive the collection and transport process (pers. comm. Cary Feldman, Puget Sound Energy, 2003). Given these efficiency and survival targets, floating surface collectors at Swift, Yale and Merwin dams would reduce project entrainment through turbines and spillways, increase passage survival, and thus facilitate fish movement through the project area. Modifications to the Yale spillway under Alternative D would also provide greater protection for any bull trout or other fish species that attempt to migrate downstream during the spill season.

All juvenile anadromous salmonids collected at the downstream fish passage facilities would be transported to a release pond near Pekins Ferry near the mouth of the Lewis River. After acclimating in the pond, they would be released to the lower river to continue their journey to the ocean. Survival data (48 hour) on juvenile anadromous salmonids transported from Cowlitz Falls Project fish collection facility release ponds at the Cowlitz Salmon Hatchery in 1998 show that survival was higher than 98 percent over the entire migration season (Tacoma Power 1999).

Construction of the proposed fish passage facilities has the potential to cause short-term adverse effects, such as increased turbidity. Although water quality may be affected temporarily during construction through increased erosion and sedimentation, these effects can be minimized and avoided by implementing best management practices (e.g., installing silt fencing and other sediment trapping devices on land and silt curtains in water) and covering exposed soil until permanently stabilized. PacifiCorp and Cowlitz PUD would develop sediment and erosion control plans as part of the construction process. Chemical spills could also occur during construction, but development of a pollution prevention plan in accordance with appropriate federal, state, and county

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Merwin Dam by collection, transport and release via the juvenile fish passage system, passage via turbines, or some combination thereof.

requirements would minimize the effects of such an occurrence. Typically, a pollution prevention plan would specify areas for equipment maintenance and refueling, spill prevention and emergency response strategies, and establish requirements for keeping emergency response spill containment kits onsite and for having specially trained personnel. PacifiCorp and Cowlitz PUD currently have Spill Prevention and Containment Control programs in place.

Through the construction permitting process, plans would be developed to minimize and avoid temporary construction-related effects to the extent feasible using best management practices. No long-term negative effects on aquatic resources are anticipated from construction of new fish passage facilities. Overall, it is anticipated that construction of new fish passage facilities would benefit aquatic species.

3.4.3.5 Hatcheries

Under Alternative D, PacifiCorp and Cowlitz PUD would undertake a hatchery and supplementation program. The goals of the program are to support (i) self-sustaining, naturally-producing, harvestable native anadromous salmonid species above Merwin Dam, and (ii) the continued harvest of resident and native anadromous fish species. The supplementation portion of the program would be linked to the anadromous salmonid introduction program and would be limited to spring Chinook, winter steelhead and late coho (Type N).

To ensure that this program is meeting the established goals, PacifiCorp and Cowlitz PUD would develop and implement a hatchery and supplementation plan to adaptively manage and guide the program. The plan would be designed to achieve the adult hatchery fish targets presented in Table 3.4-5, taking into account harvest and escapement. PacifiCorp and Cowlitz PUD would use the existing Lewis River, Merwin, and Speelyai hatchery facilities to meet production obligations. Initial juvenile production goals under Alternative D are 1.35 million spring Chinook, 1.8 million coho and 275,000 steelhead. Production obligations would include juveniles for the supplementation program and for harvest opportunities; however, at some point in the future, a smaller number of hatchery juveniles may be needed to achieve the same number of returning adults.

Table 3.4-5. Initial Lewis River Hatchery Complex targets.

	Spring Chinook	Steelhead	Coho	Total
Initial Hatchery Target (adult pre-harvest ocean recruits)	12,800	13,200	60,000	86,000

Anadromous fish stocks used in the introduction program would include a mixture of indigenous and hatchery stocks (Table 3.4-6).

Table 3.4-6. Broodstock sources used for supplementation above and below Merwin Dam.

Program	Stock Source		
	Spring Chinook	**Steelhead**	**Coho**
Juveniles for Supplementation (release above Merwin)	Lewis River Hatchery stock with Cowlitz River Hatchery stock as contingency	Lewis River wild winter stock with Kalama Hatchery stock as contingency	Lewis River Hatchery early (type S) stock
Juveniles for Harvest (release below Merwin)	Same as for supplementation	Same as for supplementation and existing Lewis River Hatchery summer and winter stock	Same as for supplementation and Lewis River Hatchery late (type N) stock

When the number of natural returning pre-harvest ocean recruits of any species exceeds the natural production threshold specified in Table 3.4-7, PacifiCorp and Cowlitz PUD would decrease the hatchery target(s) identified in Table 3.4-5 on a fish for fish (1:1) basis; however, PacifiCorp and Cowlitz PUD would not decrease the hatchery targets below the hatchery target floor specified in Table 3.4-7. If PacifiCorp and Cowlitz PUD reduce hatchery targets based on the number of returning natural pre-harvest ocean recruits, but the number of returning pre-harvest ocean recruits subsequently decline, they would increase the hatchery targets on a fish for fish (1:1) basis provided that they not exceed the initial hatchery targets in Table 3.4-5.

Table 3.4-7. Numbers governing modifications to hatchery targets.

	Spring Chinook	**Steelhead**	**Coho**	**Total**
Natural Production Threshold for Hatchery Reduction	2,977	3,070	13,953	20,000
Hatchery Target Floor	2,679	2,763	12,558	18,000

Under Alternative D, juvenile spring Chinook and steelhead would be transported from the hatcheries to locations above Swift, Yale and Merwin dams for 10 years, commencing upon completion of the Swift, Yale, and Merwin downstream fish collection facilities. Coho would be transported above Swift, Yale and Merwin dams for 6 years. At the end of these periods, the ACC would assess on a year-by-year basis whether to extend the transportation of juvenile salmonids.

In addition to the above anadromous species, PacifiCorp and Cowlitz PUD would continue to produce up to 20,000 pounds of resident rainbow trout (800,000 juveniles with an estimated weight of 40 juvenile fish per pound) per year and stock these in Swift Creek Reservoir. PacifiCorp would also produce up to 12,500 pounds of resident kokanee (93,000 juveniles) to be planted in Lake Merwin. These production levels are the same as those in Alternative A.

The effects of the hatchery supplementation program under Alternative D would be similar to those discussed for Alternative B; however, the hatcheries would not

necessarily be retired after natural production targets are met, although operations may be consolidated. Instead, these facilities would continue to maintain hatchery "reserve" populations (hatchery target floor) of Chinook, coho, and steelhead for use if the natural populations suffer a catastrophic loss. Because initial hatchery production under Alternative D would be reduced on a fish for fish (1:1) basis as natural populations are restored, adverse hatchery effects such as increased predation, disease, and competition would be a concern only in the short term, and would be similar to that of Alternative A (in the short term, Alternatives A and D have similar juvenile production levels). However, in Alternative D, these effects would be greatly reduced as wild production replaces hatchery production. The genetic risks associated with hatchery fish spawning in the wild or interbreeding with wild fish would be reduced, as would predation and competition. The risk of hatchery fish transmitting diseases to wild fish would continue to be a concern as long as hatchery fish are being produced in the basin; however, lower production levels and lower rearing densities under Alternative D may reduce the incidence of disease outbreaks. Under Alternative C, large-scale hatchery production would continue as a tool to support sport harvest in the basin for the term of the new licenses. Therefore, hatchery effects such as increased predation, disease, and competition would continue to be a concern in Alternative C, but would be reduced or eliminated in Alternatives B and D after an estimated 10-20 years.

Under Alternative D, it is assumed that the wider geographic distribution of anadromous fish would increase life history diversity, gene flow, and genetic fitness of introduced stocks. These naturally produced fish would be better adapted to the Lewis River and its tributaries and theoretically, exhibit higher smolt to adult survival rates than their hatchery counterparts. This action would also increase system productivity and the available prey base for bull trout in all three introduction reaches. It is assumed that this action would help increase bull trout abundance, especially in stream reaches where resident hatchery fish are not planted.

Under Alternative D hatchery rainbow trout and kokanee would continue to be stocked at the same level as occurs under existing conditions. Presumably, the ACC would recommend rainbow trout and kokanee supplementation programs that would incorporate current scientific information in order to reduce or eliminate hatchery impacts on wild fish populations to the extent practicable.

Recreational fishing associated with the release of hatchery rainbow trout in Swift Creek Reservoir would likely result in fishing pressure on native fish stocks, such as cutthroat. Non-native kokanee could compete with native fish stocks and inhibit production of native fish. Studies have found that adverse species interactions are more likely with fish that were not historically present in an area compared with the introduction of fish that were once native (Hearn 1987).

Although, hatchery rainbow and kokanee may compete with juvenile cutthroat trout for food and habitat resources, these species would provide forage for adfluvial cutthroat trout in Swift Creek Reservoir and Lake Merwin. Hatchery rainbow trout would also move into Yale Lake during spill events and would have a similar effect on cutthroat trout in Yale Lake as described above.

3.4.3.6 Threatened or Endangered Species

The effects of measures designed to protect and enhance threatened or endangered fish species under Alternative D are described below. Effects not addressed by these measures would be the same as those described under Alternative A.

- Anadromous fish would be introduced into the upper Lewis River basin above Swift Dam, and potentially into Yale Lake and Lake Merwin, allowing access to up to 174 miles of potential spawning and rearing habitat. This action would expand the current range and natural production potential for listed Lower Columbia River Chinook and steelhead, and proposed Lower Columbia coho. Monitoring associated with the anadromous salmonid introduction program would ensure that any potential negative effects on bull trout are minimized or avoided. Anadromous fish introduction would also increase primary productivity through increased marine derived nutrients in the upper basin and increase the bull trout forage base.

- Upstream and downstream fish passage facilities would allow anadromous salmonids to be transported to and from additional upstream habitat. This action would also minimize the potential for entrainment. Passage survival performance standards have been set by the USFWS and NOAA Fisheries at levels that are expected to allow for sustainable Chinook, coho, and steelhead populations above the dam, and the fish passage facilities would be designed to meet these targets.

- Reducing hatchery production on a 1:1 basis as natural anadromous fish runs become established in the upper basin would reduce the potential for hatchery-related impacts on naturally spawning anadromous species (i.e., competition, predation, hatchery operations, and disease). Maintaining the hatchery target floor for Chinook, coho and steelhead would continue to maintain a "reserve" of locally adapted brood stock for use if the natural population suffers a catastrophic loss.

- Modifying the Yale Dam spillway would improve downstream resident fish survival (including bull trout) during spill events. Testing alternatives to limit bull trout entrainment and implementing a preferred alternative also would minimize adverse effects associated with entrainment.

- Monitoring bull trout population dynamics and determining limiting factors would allow adaptive management decisions to be made to ensure the long-term persistence of bull trout in the Lewis River basin.

- Implementing additional down-ramping restrictions, modifying minimum flows, and flow plateau operations below Merwin Dam would protect Chinook, steelhead, chum, and bull trout and in the lower Lewis River.

- Releasing flows ranging from 60 to 100 cfs to the Lewis River bypass reach and constructing an improved habitat channel would increase the amount of riverine rearing habitat for Chinook and steelhead, and bull trout residing in Yale Lake. It is highly unlikely that successful bull trout spawning would occur in this reach (due to

summer and fall water temperatures greater than 9ºC). Aquatic habitat conditions would also be ideal for brook trout, a species known to hybridize and compete with bull trout (USFWS 2002). Hybridization with brook trout is one of the major factors contributing to the decline and lack of recovery of bull trout throughout its range. It is not known if Chinook and steelhead would successfully spawn and rear in this reach.

- Monitoring plans that address TDG and other state water quality standards would help ensure adequate water quality conditions for listed fish in the Project area.

- Installing signs and distributing flyers to inform the public about bull trout in the project area would help protect existing bull trout populations from illegal harvest and harassment.

- Managing existing conservation covenants would protect Project area bull trout spawning and rearing habitat in perpetuity and may also benefit introduced anadromous species.

- Establishing the $5.7 million habitat enhancement fund, LWD transport program and LWD fund, and the gravel monitoring and augmentation plan would ensure improved habitat conditions for listed fish species in the Lewis River basin.

- Establishing the $30 million In Lieu Fund (if passage is not provided into Yale Lake or Lake Merwin) for fisheries habitat protection, restoration, and enhancement through acquisition, easements, or restoration projects that would collectively contribute to meeting the objective of achieving equivalent or greater benefits to anadromous fish populations as would have occurred if passage through Yale Lake and/or Lake Merwin had been provided. These types of projects would benefit Chinook, steelhead, and bull trout in the Lewis River basin.

3.4.4 Conclusion

Alternative D would greatly improve anadromous fish distribution and abundance when compared to Alternative A, providing access to all potential habitat above Merwin, Yale and Swift dams. Alternative D would also result in more robust anadromous fish production and a more successful introduction program than in Alternatives B and C. Alternative B would allow access to 117 miles of potential habitat upstream of Swift Dam. Alternative D would provide access to the full 174 miles of potential habitat and theoretically produce the same number of juvenile anadromous fish as Alternative C; however, reservoir-related mortality would be substantially higher under Alternative C, as fish migrating from the upper basin would have to pass through all three Project reservoirs. Alternative D minimizes juvenile fish passage mortality by collecting and directly transporting fish to a release pond below Merwin Dam. As a result, Alternative D would produce (on average) substantially more adult anadromous fish than Alternatives B and C (Table 3.4-3). Prior to the construction and operation of downstream fish passage facilities at Yale and Merwin dams (years 13 and 17 of the new licenses), adult production under Alternative D would be similar to that of Alternative B.

If some or all of these passage facilities are not constructed, at the direction of the USFWS or NOAA Fisheries, the In Lieu Fund would be created and used to enhance fish habitat.

The hatchery program under Alternative D would be similar to Alternative B; however, the hatcheries would not be retired after natural production targets are met, although production may be consolidated. Instead, these facilities would continue to produce a "hatchery target floor" of locally adapted brood stock for use if the natural population suffers a catastrophic loss. Because initial hatchery production under Alternative D would be reduced on a fish for fish (1:1) basis as natural populations are restored in the upper basin, adverse hatchery effects such as increased predation, disease, and competition would be a concern only in the short term, and would be similar to those in Alternative A (in the short term, Alternative A and Alternative D have similar juvenile production levels). However, in Alternative D, these effects would be greatly reduced as wild production replaces hatchery production. Reducing hatchery production as natural production increases would reduce the genetic risks associated with hatchery fish spawning in the wild, or interbreeding with wild fish. Under Alternative D, the Swift Creek Reservoir rainbow trout program and Lake Merwin kokanee program would continue at the same level as Alternatives A and B, and would have the same effects (as described above). However, under Alternative C, the potential impacts from resident fish stocking would be eliminated.

The overall benefit to aquatic resources in the bypass reach under Alternative D would be greater than that realized under Alternatives A and B and similar to that that realized under Alternative C[6]. The slightly lower flow releases in Alternative D (60 to 100 cfs) compared to Alternative C (100 to 400 cfs) may also minimize the potential to attract migrating anadromous fish that are bound for higher quality habitat located above Swift Dam. Under all four alternatives, periodic spill events would continue to transport wood and gravel from the reach, limiting the amount of spawning habitat and instream cover; however, the habitat channel would be unaffected.

Alternative D includes ramping rate restrictions that would provide added benefits over those ramping rates included in Alternatives A, B, and C. Alternative D would also improve minimum flow conditions below Merwin Dam by reducing the difference between spawning to incubation flows, thereby reducing redd dewatering and improving egg and alevin survival when compared to all other alternatives.

Alternative D would provide greater benefits to bull trout when compared to all other alternatives by investigating and implementing strategies to reduce entrainment; facilitating upstream and downstream migration at all Project dams; conducting a limiting factors study and predation study; and monitoring bull trout populations over the long term. In addition, the anadromous fish introduction program under Alternative D would

[6] While Alternative C has higher minimum flow releases, it does not include the construction of a habitat channel.

provide increased forage for bull trout when compared to Alternatives A and B, but would be similar to Alternative C.

Alternative D would also provide substantially more habitat enhancement and protection opportunities than all other alternatives by funding habitat enhancement; transporting LWD and funding LWD projects; and implementing the gravel monitoring and augmentation program.

Overall, Alternative D, provides greater benefits and less risk to aquatic species by introducing Chinook, coho, and steelhead to all accessible habitat upstream of Merwin Dam; providing state-of-the-art upstream and downstream passage facilities designed to meet high collection and survival targets; reconnecting isolated bull trout spawning populations; providing long-term monitoring and evaluations of implemented measures and to provide information that can be used to make adaptive management decisions; and funding habitat enhancement and preservation. As a result, the measures under Alternative D provide more benefit to aquatic resources than Alternatives A, B, or C. Additional information comparing Alternatives A, B and C is presented in Section 3.4.4 of PacifiCorp 2004 and Cowlitz 2004.

3.5 BOTANICAL RESOURCES

3.5.1 Resource Issues

Botanical resource issues identified during the NEPA scoping process included the following concerns:

- Effects of the projects on botanical resources
- Establishment and control of noxious weeds
- Effects of projects on state and federally listed or rare plants.

3.5.2 Affected Environment

Existing botanical resource conditions are described in Section 3.5 of the April 2004 PDEAs submitted by PacifiCorp and Cowlitz PUD (PacifiCorp 2004 and Cowlitz PUD 2004).

3.5.3 Effects of Alternative D

Alternative D includes the same measures for flood management as Alternative B. Measures for recreation would be similar to Alternative B, but with a few minor differences. Like Alternative C, Alternative D introduces anadromous fish to all three reservoirs and the upper Lewis River using trap-and-transport methods. Alternative D also includes a variable flow regime for the Lewis River bypass reach. Land management practices under Alternative D are identical to Alternative C except that the amount of land managed for wildlife would be substantially greater. Alternative D introduces some significant improvements to fish habitat in the bypass reach and provides

funding to acquire and protect additional land in the Lewis River basin. Effects of Alternative D on botanical resources are described below.

3.5.3.1 Fish Passage

Alternative D would introduce salmon to all three Project reservoirs and their tributaries, with similar effects on the productivity of associated riparian conifer forests, as described under Alternative C.

Trap-and-transport facilities at Merwin Dam would be located in the same areas as described under Alternative B; downstream surface collection facilities for all three reservoirs would be as described for Alternative C. The location of the new upstream fish passage facilities proposed under Alternative D for the Swift No. 1 and Swift No. 2 projects is presumed to be near the Swift No. 2 tailrace, in an area that is already relatively disturbed. Thus, there are few effects on botanical resources expected from trap-and-transport and fish collection facilities under Alternative D.

Effects on botanical resources from additional fish passage facilities proposed under Alternative D would be associated with: (1) the new release pond proposed downstream of Merwin Dam; (2) temporary net pens for acclimation of juvenile hatchery fish in tributaries to Yale and Merwin, and juvenile salmonid acclimation sites above Swift Creek Reservoir; and (3) the seasonal spring Chinook satellite collection facility (modular screw trap) to be positioned upstream of Swift Creek Reservoir. The new release pond potentially would be constructed on WDFW land at Pekins Ferry, which is downstream of the I-5 bridge and just upstream of the confluence of the East Fork Lewis River. Construction of this pond would result in the loss of about one acre of vegetation of unknown type, possibly riparian. The net pens and spring Chinook satellite collection facility would be installed periodically on a temporary basis. Juvenile salmonid acclimation facilities above Swift would be more permanently constructed, although without concrete-lined ponds or waterways. Although the exact locations of these facilities are unknown, it is likely that some upland and riparian vegetation would be removed or disturbed for site access and equipment installation. The amount and specific types of vegetation are unknown.

3.5.3.2 Land Management Practices

Like Alternative C, a WHMP would be developed and implemented on PacifiCorp lands. In addition, under Alternative D, Cowlitz PUD's property within the Swift No. 2 Project boundary and its 283 acres of land on the Devil's Backbone would also be included within and benefit from a WHMP. These management plans would guide decisions about vegetation and land uses to improve conditions for targeted wildlife species. Land use practices on project lands are not expected to change significantly, as much of the current management focus is to benefit wildlife.

3.5.3.3 Acquisition of Interests in Land

Unlike any of the other alternatives, Alternative D includes funds to acquire interests in additional lands in the vicinity of the Swift and Yale projects, as well as elsewhere in the Lewis River basin. Alternative D would provide an additional $12.2 million to protect and manage land for wildlife, and would thus have a substantial beneficial effect on botanical resources in the Lewis River basin. Effects are likely to include an increased amount of mature and old-growth forest, greater plant species diversity, and decreased disturbance of vegetation.

3.5.3.4 Flow Management

Under Alternative D, continuous flows in the Lewis River bypass reach would range from 60 cfs to 100 cfs. At all release levels, up to 47 cfs would be provided from the existing Swift No. 2 canal drain, which is located about one mile downstream of Swift Dam. The remaining 13-53 cfs would be provided by a new release structure from the Swift No. 2 canal, which would be constructed about 2,000 feet downstream of Swift Dam. This area does not appear to support wetlands, but construction would probably require the permanent removal of an acre of riparian deciduous forest and shrubland. A similar amount of vegetation may be temporarily affected by construction activity; BMPs should ensure that disturbed areas are not colonized by invasive weed species.

Increased flows in the bypass reach would inundate between about 5 and 8 acres of riparian vegetation. Higher flows would also increase the extent of the wetted channel and floodplain hyporheic zone and raise associated soil moisture in riparian areas, potentially changing plant species composition. Some adjacent uplands would be affected by higher surface or groundwater levels, resulting in changes that make these areas conducive to plant species more tolerant of wetter conditions.

3.5.3.5 Fish Habitat Improvements

Unlike the other action alternatives, Alternative D includes a number of measures designed to improve fish habitat throughout the basin and in a section of the Lewis River bypass reach just below the Swift No. 2 canal drain. Potential enhancements include the addition of LWD, boulders, and gravel to create pools, measures to reduce sedimentation and stabilize the channel. Construction associated with the planned aquatic habitat and channel enhancements is likely to result in temporary disturbance to riparian vegetation. BMPs should ensure that disturbed areas are not colonized by invasive weed species and that native vegetation reestablishes.

3.5.3.6 Reservoir Water Level Management

Reservoir water level management would be the same as under Alternative B, with similar effects on vegetation communities along the shorelines.

3.5.3.7 Flood Management

Flood management under Alternative D would be the same as Alternatives B and C, with similar effects on botanical resources along the lower Lewis River and in the Lewis River bypass reach.

3.5.3.8 Project-related Recreation

Recreational facilities proposed under Alternative D are identical to Alternatives B and C with one exception. Cowlitz PUD would maintain its bank fishing facility at the Swift No. 2 canal and would seasonally install a portable toilet at the site. The presence of this facility is not expected to negatively affect vegetation on the disturbed margin of the canal.

3.5.4 Conclusion

Alternatives B, C, and D would benefit botanical resources more than Alternative A by managing recreation growth. Alternative D has substantial beneficial effects on botanical resources. In addition to providing most of the measures included in Alternative C, Alternative D would greatly increase the amount of protected land in the Lewis River basin. The acquisition of additional interests in land would reduce the effects of large-scale timber harvest and development on vegetation communities, ultimately increasing the amount of old-growth and mature forest in the basin and perhaps improving plant species diversity in some areas. Overall, Alternative D provides considerably more opportunities to protect and improve botanical resources compared to baseline conditions than Alternatives B or C.

3.6 WILDLIFE RESOURCES

3.6.1 Resource Issues

The NEPA scoping process for the Lewis River projects identified three primary issues related to wildlife resources:

- Effects of project operations and maintenance activities on wildlife and wildlife habitat, including: (1) big game winter range, reproductive habitat, and forage availability; (2) riparian, shoreline, and wetland habitat structure, function, and composition; (3) available snags/dead wood habitat for cavity-nesting species; and (4) habitat connectivity.

- Effects of project-related recreation use and facilities on wildlife and wildlife habitat.

- Impacts to wildlife from an absence of anadromous fish in the upper basin.

3.6.2 Affected Environment

Existing wildlife resource conditions are described in Section 3.6 of the April 2004 PDEAs submitted by PacifiCorp and Cowlitz PUD (PacifiCorp 2004 and Cowlitz PUD 2004).

3.6.3 Effects of Alternative D

Land management practices under Alternative D are identical to Alternative C except that the amount of land managed for wildlife would be substantially greater. Alternative D introduces some significant improvements to fish habitat in the Lewis River bypass reach, provides funding for aquatic habitat enhancement projects throughout the basin, and provides funding to acquire interests in and protection of additional land in the basin. Like Alternative C, Alternative D introduces anadromous fish to all three reservoirs and the upper Lewis River. Alternative D also includes a variable flow regime for the Lewis River bypass reach, but the range of flows is less compared to Alternative C. Alternative D includes the same measures for flood management as Alternative B. Measures for recreation would be similar to Alternative B, with the addition of a bank fishing facility at Swift No. 2. Effects of Alternative D on wildlife resources are described below.

3.6.3.1 Fish Passage

Alternative D potentially would introduce salmon to all three reservoirs and their tributaries. The additional forage provided by salmon carcasses would be expected to increase populations of black bear, bald eagle, common merganser, and other species with a strong link to salmon.

Under Alternative D, upstream trap-and-transport facilities at Merwin Dam would be located in the same areas as analyzed in Alternative B; downstream surface collection facilities for all three reservoirs would be as described in Alternative C. The location of the new upstream fish passage facilities proposed under Alternative D for the Swift projects are expected to be located near Swift No. 2 tailrace, in an already relatively disturbed area. Thus, no effects are expected from trap-and-transport and fish collection facilities on wildlife in the vicinity of the projects.

Effects on wildlife from additional fish passage facilities proposed under Alternative D would be associated with: (1) the new release pond proposed downstream of Merwin Dam at Pekins Ferry; (2) temporary net pens for acclimation of juvenile hatchery fish in tributaries to Yale and Merwin and acclimation facilities at Swift; and (3) the seasonal spring Chinook satellite collection facility (modular screw trap) upstream of Swift Creek Reservoir. Construction of the new release pond at Pekins Ferry would result in the loss of about one acre of habitat of unknown type, possibly riparian. Some wildlife habitat in riparian areas is likely to be disturbed from site access and equipment installation associated with the periodic and temporary installation of net pens and the spring Chinook satellite collection facility. The net pens could also affect wildlife species that use riparian areas and streams as movement corridors.

3.6.3.2 Land Management Practices

A WHMP would be developed and implemented on PacifiCorp lands. In addition, under Alternative D, Cowlitz PUD's property within the Swift No. 2 Project boundary and its 283 acres of land on the Devil's Backbone would also be covered by and benefit from a WHMP. These land management practices would benefit wildlife by implementing vegetation management practices that increase habitat values for targeted species.

3.6.3.3 Acquisition of Interests in Land

Unlike any of the other alternatives, Alternative D includes funds to acquire additional interests in lands in the vicinity of the Swift and Yale projects, as well as elsewhere in the Lewis River basin. Alternative D would provide an additional $12.2 million to protect and manage land for wildlife, and would thus have a substantial beneficial effect on wildlife resources in the Lewis River basin. Long-term effects are likely to include an increased amount of mature and old-growth forest habitat, improved habitat connectivity, and decreased disturbance to wildlife and associated habitats.

3.6.3.4 Flow Management

The new water release structure from the Swift No. 2 canal proposed under Alternative D would probably require the permanent removal of about an acre of riparian habitat. Nearby wildlife and a similar amount of habitat may be temporarily affected by construction activity. The effects of increased flows in the bypass reach on wildlife would be similar to those described for Alternative C.

3.6.3.5 Fish Habitat Improvements

Alternative D includes measures that would improve fish habitat throughout the Lewis River basin. Construction associated with these measures would temporarily disturb some riparian habitat and wildlife; however, the benefits expected from the addition of LWD, boulders, and gravel may enhance habitat for some aquatic dependent wildlife, such as beaver and mink. In addition, improvements to aquatic habitat that result in increased fish production could benefit wildlife that forage on fish, including bald eagles, great blue heron, and osprey.

3.6.3.6 Reservoir Water Level Management

Reservoir water level management under Alternative D would be the same as under Alternative B, with similar effects on wildlife.

3.6.3.7 Project-related Recreation

Impacts to wildlife from recreation under Alternative D would be the similar to those described in Alternatives B and C.

3.6.4 Conclusion

Alternative D has substantial beneficial effects on wildlife resources. In addition to providing most of the measures included in Alternative C, Alternative D would greatly increase the amount of protected land in the Lewis River basin. The acquisition of additional interests in land would increase the amount of land protected and managed for wildlife, ultimately increasing the amount of old-growth and mature forest habitat in the basin, decreasing disturbance, and perhaps increasing habitat connectivity in some areas. Overall, Alternative D provides considerably more opportunities to protect and improve wildlife compared to baseline conditions than Alternatives B or C.

3.7 CULTURAL RESOURCES

3.7.1 Resource Issues

Cultural resources include prehistoric and historic-period archaeological sites, historical buildings and structures, and traditional cultural properties (TCPs). Three related cultural resource issues were identified during NEPA scoping.

- Effects of the Lewis River Projects on traditional cultural properties and resources
- Effects on historic buildings and structures
- Effects on archaeological sites.

During relicensing studies, the Applicants conducted professional evaluations of cultural resources to assess the effects of potential project changes on these resources.

Measures proposed to enhance other resource values under the action alternatives could also impact the TCPs and traditional cultural resources (TCRs), both directly and indirectly. For example, an increase in the number of recreational visitors can negatively affect TCPs and TCRs through an increase in human traffic, with the accompanying destruction and encroachment upon native habitat.

3.7.2 Affected Environment

Existing cultural resource conditions are described in Section 3.7 of the April 2004 PDEAs submitted by PacifiCorp and Cowlitz PUD (PacifiCorp 2004 and Cowlitz PUD 2004).

3.7.3 Effects of Alternative D

3.7.3.1 Archaeological Sites

Project operations under Alternative D could affect archaeological sites in the project area in the same manner as described under Alternative A. Measures are proposed that would increase protection for archaeological sites in the project area. Artifacts collected

as part of project-related investigations would be curated in a secure location in the project vicinity. PacifiCorp would develop an HPMP that would provide specific guidance for reducing the impacts of project actions on archaeological sites. Management measures would include consultation with a professional archaeologist to avoid affecting sites, prevention of vehicle access to reservoir drawdown areas, public education about resource values, patrols to reduce unauthorized artifact collection, engineered erosion protection as feasible, and data recovery as needed.

Several archaeological sites occur in areas likely to be affected by construction activities, facility upgrades, or recreation activities under Alternative D. Specifically, site 45CW121 along Lake Merwin near the dam could be affected by future modifications or construction. Also along Lake Merwin, sites 45CW114 and 45CW100 lie close to Speelyai Bay Park, and could be affected through increased human traffic associated with site improvements such as the restroom or the boat ramp modifications. Sites 45CW110, 45CW118, and 45CW119 are located near the Cresap Bay Campground, which could be affected by increased recreation use. Around Yale Lake, site 45CW103 is located between the Town of Cougar and Cougar Park, and potentially could be impacted by trail development. The management measures discussed in the previous paragraph would avoid or reduce impacts on the sites.

3.7.3.2 Historic Structures and Buildings

The cultural resource management measures for Alternative D would be provided for the two historic districts within the project area. Changes to the buildings and structures within these districts would be limited and carefully designed to retain the historic value. The implementation of an HPMP would help guide changes within the districts, ensuring the retention of historic value while sustaining the industrial use for which the facilities were intended. This includes the construction of floating surface collectors, trap-and-transport systems, or other construction within the districts. Alternative D would likely have little direct effect on the historic structures. Upkeep of the roads used to transport fish between Merwin and Swift dams would not likely affect the historic districts, although an increase in truck traffic may affect their setting.

3.7.3.3 Traditional Cultural Properties and Resources

Cultural resource protection measures proposed under Alternative D treat TCPs and TCRs in a similar manner. This alternative allows tribal access to project lands to continue traditional practices. The development and implementation of an HPMP by PacifiCorp should also aid the preservation of any TCPs that may be identified on their project lands in the future.

Trap-and-transport facilities would introduce fish to Lake Merwin and Yale Lake, as well as to the watershed above Swift Dam. This addresses a goal of the tribes.

Alternative D provides funding for terrestrial habitat enhancement and protection, along with implementation of the WHMPs and protection of sensitive habitats from timber operations and construction disturbances. Lands managed to benefit wildlife would be

substantially greater under Alternative D. These measures would help sustain traditional cultural values by protecting a variety of native plant and animal resources.

Proposed measures such as increasing and/or upgrading camping facilities, and the addition of new or improved fishing and boating access spots, could negatively affect TCPs and TCRs. Alternative D expands and/or enhances recreational facilities and increases the diversity of recreational opportunities, which could reduce the habitat for native plants and animals. Preparation of an interpretation and education program could educate recreation users to help protect these habitat values.

3.7.4 Conclusion

Alternatives B, C and D would enhance anadromous fish runs, a goal important to tribal groups. Terrestrial habitat protection would be supported by Alternative C and expanded significantly under Alternative D, benefiting a variety of native plant and animal populations important to traditional cultural practices. National Register eligible historic districts would be least affected by Alternatives B, C and D, because PacifiCorp's HPMP developed under these alternatives would provide greater protection to facilities than the existing conditions. Alternative B, C and D would specifically include archaeological site protection in PacifiCorp's HPMP. For the Swift No. 2 Project, no archaeological sites were recorded during surveys, no traditional cultural properties have been identified, and there are no buildings or structures eligible for listing on the National Register of Historic Places. Nonetheless, Cowlitz PUD has prepared an Unanticipated Discovery Plan for archaeological resources in the event they may be encountered. The plan describes how Cowlitz PUD proposes to identify and treat archaeological resources and human remains that may be found during ground-disturbing activities and specifies communication with the Tribes and OAHP.

Alternatives B and C include partial funding for the construction of a curation and interpretation center for artifacts found in the project area, while under Alternative D, artifacts may be curated at the Visitor Center or another location in the basin. Alternatives B, C and D represent moderate beneficial improvements over Alternative A.

3.8 RECREATION

3.8.1 Resource Issues

During the NEPA scoping process, the Recreation Resource Group identified four primary issues related to recreation and public use.

- Adequacy of the supply and quality of project recreation facilities, use areas, and services to accommodate existing and future user demand in the project area
- Effect of project area recreation visitation on the local economy, resources, and residents
- Compatibility of existing and potential increased recreational use on project area and basin ecosystems

- Effects of Monument and GPNF-induced recreation on project lands and facilities

3.8.2 Affected Environment

Existing recreation uses and facilities in the Project area are described in Section 3.8 of the April 2004 PDEAs prepared by PacifiCorp and Cowlitz PUD (PacifiCorp 2004 and Cowlitz PUD 2004).

3.8.3 Effects of Alternative D

All of the recreation actions described under Alternative B also would be implemented under Alternative D. Project-related effects would be similar, with the exception of fish passage, and these effects on recreation would be minimal.

Fish passage facilities proposed under Alternative D would be extensive; however, generally they would not affect existing or potential new recreation facilities. Downstream fish collection facilities at each reservoir are not anticipated to limit surface water boating because they would be located within restricted surface water areas near the dams. Surface collector operations also would not likely result in significant pool elevation changes in July and August at Lake Merwin and Yale Lake, and would therefore not significantly affect reservoir recreation use.

Swift Creek Reservoir levels may be affected by flood management measures and variable releases of between 60 and 100 cfs to the Lewis River bypass reach. The additional flows in this reach may attract some dispersed use; however, increased enforcement and gating would help limit access within this unauthorized use area. Flow modeling assumed these releases would maintain Swift Creek Reservoir levels (at the expense of power generation). There would be slight fluctuations from current conditions, with winter and spring levels approximately four feet lower than existing conditions, so the Swift Campground boat ramp would continue to be accessible.

3.8.4 Conclusion

The reasonably expected impacts to recreational resources associated with actions under Alternative A are likely to be moderately adverse, while the impacts associated with Alternatives B through D are likely to be moderately beneficial. Alternative D, like Alternatives B and C, would generally improve and enhance recreation opportunities in the project area through the term of the new licenses. Alternatives B, C and D would help reduce concerns about existing and future capacity and displacement, although with slight impacts to terrestrial resources due to the increased area of disturbance. As a result of improved recreation facilities, these alternatives may require some expanded law enforcement, and other emergency services, along with more operations and maintenance staff during the peak summer season. Swift Creek Reservoir recreational facilities would be retained in a less developed condition than the other reservoirs but some recreation facilities would be provided to partially meet anticipated needs during the license terms. The proposed recreation measures under Alternatives B, C and D would have no impact on the generation capacity of the projects. Overall, compared to the baseline (Alternative

A), the improvements and enhancements under Alternatives B, C and D would likely result in moderately beneficial impacts on recreation resources in the project area.

3.9 LAND MANAGEMENT AND USE

3.9.1 Resource Issues

Continued operation of the four Lewis River Projects would influence land uses throughout the basin in slightly different ways under the alternatives being considered. The consistency of these alternatives with federal, state, and local comprehensive plans was targeted for evaluation during the NEPA scoping process.

3.9.2 Affected Environment

Current management and use of lands in the Project area are described in Section 3.9 of the April 2004 PDEAs prepared by PacifiCorp and Cowlitz PUD (PacifiCorp 2004 and Cowlitz PUD 2004).

3.9.3 Effects of Alternative D

3.9.3.1 Consistency with Comprehensive Plans

Measures proposed in Alternative D would be similar to those described in Alternative B Section 3.9.3.2 of the April 2004 Lewis River PDEAs (PacifiCorp 2004 and Cowlitz PUD 2004). Consistency with comprehensive plans would be as described for Alternative B and in Section 5.1.

3.9.3.2 Compatibility with Proposed Measures

Several measures proposed in Alternative D have the potential to affect land uses in the basin. Specific measures proposed to enhance wildlife habitat, fish passage, and recreation could alter current land uses, as summarized below.

Measures proposed as part of Alternative D to protect and enhance wildlife habitat on project lands include replacing some damaged or undersized culverts on PacifiCorp lands, restricting dispersed camping in some shoreline and riparian areas, and closing some roads to vehicles. In addition to benefiting amphibians and aquatic species, culvert replacement would reduce potential land use impacts associated with erosion and overflow that can occur with undersized or damaged culverts. Dispersed camping would be precluded in some currently used areas, a measure that would benefit wildlife and vegetation while forcing the relocation of some campers. Road closures on project lands to benefit wildlife would not be expected to significantly change current uses, as these are private roads. None of these measures would have a significant effect on land uses.

Recreation development proposed as part of Alternative D would be consistent with current patterns of use. Use would increase in the town of Cougar if full funding is obtained for construction of a Visitor Information Center. This facility would focus

traffic in an already developed area, which could attract commercial development over time.

Several trail segments would be developed or improved in the vicinity of Yale Lake, meeting a demand for safer, off-road pedestrian and bicycle corridors. Measures would include the conversion of the Yale/IP Road to a non-motorized public corridor. Unauthorized use of this road along the shoreline of Yale Lake currently occurs, so while this measure would be a formal use change, it would provide a more managed approach to current, although somewhat limited use patterns.

Development of new fish passage facilities in Swift Reservoir and at Yale and Merwin dams would complement current land uses at the project sites and would occur entirely within the existing FERC boundaries. Construction would introduce short-term increases in traffic in the vicinity of Swift Dam, at Yale Dam, and just below Merwin Dam. Work in the Yale and Merwin areas would be spatially contained and conducted within areas generally not accessible to the public. Conversely, construction activities just upstream of Swift Dam would affect visitors to this more remote area. Temporary land use modifications would occur in this vicinity as heavy equipment and supplies are present. When these facilities become operational, truck traffic on area roads between Merwin Dam and Swift Creek Reservoir, and between Yale Dam and Swift Creek Reservoir would increase somewhat as fish are transported into and out of the upper basin.

3.9.4 Conclusion

Land uses would not be altered by the continuing measures under Alternative A nor would significant alterations occur under Alternatives B, C or D. Some uses would intensify, with associated land use effects. Development and visitor pressure on the Lewis River basin can be expected to increase over the term of the new FERC licenses because of its proximity to major metropolitan areas, the regional attractions of the Mount St. Helens National Volcanic Monument and the project reservoirs, and a good transportation network. Under Alternative A, these pressures are expected to have a moderate adverse impact on project lands over the terms of the new licenses because demand for the recreation facilities would exceed capacity and no new management controls would be implemented. This effect also would be experienced on USFS lands in the basin and on private land adjacent to the projects.

Expansion of PacifiCorp's recreation facilities under Alternatives B, C and D would reduce encroachment on adjacent federal, state, and private lands by meeting a portion of the expected demand for water-based recreation. This represents a moderate land management improvement over existing conditions.

Although construction of trap-and-transport facilities for upstream fish passage and floating surface collectors for downstream fish passage under Alternative D would not introduce new land uses, it would increase construction-related traffic. Depending on the facility development schedules, this effect could have from moderate to major short-term effects on transportation networks adjacent to the construction activity. Construction of downstream passage facilities under Alternatives B and D would have a major short-term

effect on FR 90 in the vicinity of Swift Dam and a moderate effect on road use in the Merwin Dam vicinity. Identical effects would occur under Alternative C and D, and would include construction of a downstream passage facility at Yale Dam, contributing heavy vehicle traffic for a short duration to these area roads.

3.10 AESTHETIC/VISUAL RESOURCES

3.10.1 Resource Issues

Project operations, facilities, and land management practices, among other factors, currently affect the aesthetic quality of the project area. During the NEPA scoping process, one aesthetics-related issue was identified. Some stakeholders expressed concern about the effect of the Swift No. 2 canal and powerhouse on the aesthetic experience of visitors traveling on FR 90. The powerhouse and canal are adjacent to SR 503 Spur and FR 90. Both were extensively damaged in 2002 and will be reconstructed by mid-2005. The canal and powerhouse will be reconstructed within the existing footprint. The powerhouse has been re-sided in a two-tone color scheme approved by the USFS.

3.10.2 Affected Environment

Existing aesthetic and visual resource conditions in the Project area are described in Section 3.10 of the April 2004 PDEAs prepared by PacifiCorp and Cowlitz PUD (PacifiCorp 2004 and Cowlitz PUD 2004).

3.10.3 Effects of Alternative D

There are no aesthetic or visual resource measures associated with Alternative D; however, other resource actions may affect aesthetic conditions in the Project area.

Upstream fish passage facilities would be constructed at Merwin Dam, Yale Dam, and potentially adjacent to the Swift No. 2 tailrace under Alternative D. At Merwin, the existing fish collection facilities would be modified and reconfigured. This collection facility is largely out of sight of recreation visitors, so is not expected to have an adverse effect on the aesthetic experience of visitors. A trap, transport and sorting facility would be constructed at the base of Yale Dam in a steep canyon inaccessible to the public. Visitors would be aware only of the increased traffic associated with the construction process; permanent installation is not expected to be apparent to area visitors. A similar upstream collection facility would be constructed somewhere between the upper end of Yale Lake and Swift Dam. For analysis purposes, it is assumed that facilities would be located adjacent to the Swift No. 2 powerhouse and tailrace. These features would be visible from FR 90 and from the surface of upper Yale Lake, introducing new industrial structures to the landscape. If trap-and-transport facilities were chosen, they would be visually compatible with the adjacent powerhouse, switchyard and tailrace. Should trap-and-tram methods be selected to transport fish, the visual effects would be as described for Alternative C. With either type of structure, their presence would have an overall adverse effect on area aesthetic values.

Downstream fish collection facilities would be constructed in each project reservoir. At Swift Creek Reservoir, a modular surface collector would be installed. This complex would include a 400-foot-long guide wall paralleling the south shore of the lake, and a fish sorting/sampling facility. These facilities would be the same as analyzed under Alternative B and would have an overall adverse effect on the aesthetics of this area. A modular surface collector would be added seasonally at Yale Dam. This structure would be less complex, using a system of nets to direct the fish rather than concrete guide walls. The visual effects would therefore be less severe, although still adverse overall due to the more intensive recreation use that occurs on Yale Lake. At Merwin Dam, the floating surface collector similar to that proposed at Yale would be installed seasonally. It would have an adverse visual effect for boaters near the dam. Prior to construction of the collectors at Yale and Merwin, barrier nets would be positioned to reduce fish entrainment in the turbines and spillways of each dam. These features would have little visual impact as the nets would be below the water surface and anchored by a system of cables with limited visibility.

Under Alternative D, a release pond would be constructed near the mouth of the Lewis River, near Pekins Ferry. As described in Section 3.4.3.4, three concrete raceways would be constructed below grade, surrounded by security fencing and bird netting, with supporting infrastructure. The physical condition of this site has not been inspected, so the potential visual effects have not been assessed.

3.10.4 Conclusion

There are no specific aesthetic-related actions proposed under any of the alternatives. Fish passage facilities under Alternatives B, C and D would have an effect on the aesthetic/visual quality of the project area. The actions proposed under Alternative A would have no new aesthetic/visual impacts. New fish passage facilities proposed under Alternatives B and D would have moderate impacts on aesthetic quality. Under Alternative C and possibly D, the new fish trap-and-tram facilities would have a moderately high impact on the aesthetic/visual quality of the area, especially on the aesthetic/visual experience of motorists and bikers traveling along FR 90.

3.11 SOCIOECONOMICS

3.11.1 Resource Issues

Five socioeconomic issues were identified by relicensing participants:

- Effects of potential enhancement measures on project economics, utility rates and local economic conditions
- Impacts on local economic conditions
- Effects of project-generated recreation on local government infrastructure, tax assessments, emergency services, and local residents
- Effects of projects on the local residents' quality of life

- Effects of project operations on downstream flood management

3.11.2 Affected Environment

Existing socioeconomic conditions are described in Section 3.11 of the April 2004 PDEAs submitted by PacifiCorp and Cowlitz PUD (PacifiCorp 2004 and Cowlitz PUD 2004).

3.11.3 Effects of Alternative D

3.11.3.1 Project Economics

Enhancement measures are proposed to address many of the environmental issues in the alternatives, as described in Section 2. These measures not only incur direct costs for PacifiCorp and Cowlitz PUD, but also they affect the costs of operation and maintenance activities and, in some cases, the amount of power that can be produced. This analysis considers these costs in terms of the economic viability of the projects, based on the Developmental Analysis presented in Section 4.

Under Alternative D, the most significant costs are for fish, recreation, and terrestrial resources. Costs for fish habitat, fish passage and improvements to the fish hatchery are estimated at $228.7 million in capital costs and about $5.2 million in annual operations and maintenance (O&M) and lost generation costs. Costs for recreation improvements are the same as Alternative B and are estimated at $15 million with $598,500 in annual O&M. Enhancements for terrestrial resources are estimated at $13.4 million in capital costs and $251,000 in annual O&M costs. Annual generation would be reduced by changes in operations and flow regimes. The net result of the increased costs and reduced generation is a Levelized Annual Net Benefit of the projects of $22 million for PacifiCorp, a reduction from existing levels of 39 percent levelized over 30 years. When calculated over 50 years, the Levelized Annual Net Benefit for Cowlitz PUD is $6.6 million for an average water year and $4.1 million for a low water year, a reduction from existing levels of 24 percent and 33 percent respectively. Over a 30-year period, Cowlitz PUD's Levelized Annual Net Benefit would be $2.8 million for an average water year and $966,000 for a low water year, a reduction from existing levels of 42 and 68 percent, respectively. Based on first year costs, the annual net benefit of Swift No. 2 under Alternative D in average water year conditions would be $0.3 million (a reduction of 83 percent) and in low water conditions would be a negative $0.9 million.

3.11.3.2 Utility Rates

Alternative D involves higher total costs for enhancement measures, particularly fish passage, flows, and terrestrial resources, than Alternatives A and B, although less than C. While the precise effects of these costs on utility rates are not available at this time, rate increases are likely to be substantially greater than Alternatives A and B and less than Alternative C.

For PacifiCorp customers, the increased costs of operating the projects and providing environmental measures may substantially increase the costs of getting power out of the Lewis River Projects. However, these costs are only one of many factors in determining consumer utility rates. Costs to PacifiCorp customers over their six-state service area are likely to increase as a result of relicensing under Alternative D. Since these costs are distributed over such a large customer base, the level of impact is expected to be minor and would be substantially lower than alternative sources of power. The effect on the local or regional economy would not be significant.

For Cowlitz PUD customers, the increased costs of operating Swift No. 2 and providing environmental measures significantly increases the costs of getting power from this facility. Further, the Swift No. 2 Project represents about 20 to 30 percent of the power needed for their residential, commercial, and light industrial customers. As a public utility district, any increases in costs are passed to the consumer. Costs to Cowlitz PUD customers are likely to increase as a result of relicensing under Alternative D. It is difficult to predict the increase in rates because many factors affecting rates are undecided or unknown at this time. The effect on the general local economy cannot be predicted without further data on increases in customer rates. However, any future utility rate increase will have a negative impact on Cowlitz County, given the county's weak economy combined with Cowlitz PUD's 97 percent rate increase over the last three years in response to market conditions.

3.11.3.3 Local Economic Conditions

Alternative D would involve the construction of a sorting facility and an improved entrance to the existing trap at Merwin Dam for upstream passage of adult fish. A floating surface collector at Swift Dam, along with facilities for holding and trucking the fish, plus spillway modifications at Yale, barrier nets at Yale and Merwin, a seasonal screw trap upstream of Swift Creek Reservoir, and a release pond would be provided for downstream passage of juvenile fish. These facilities are scheduled to be constructed following the fourth anniversary of the new licenses. Their estimated cost is approximately $14.2 million for the upstream improvements and $63.3 million for the downstream facilities. The equipment to be installed would require custom steel fabrication that most likely would be completed outside of the immediate area, possibly in Longview or, more likely, the Portland area. Thus, the labor related to fabrication would not support the Lewis River valley, but would support either Cowlitz County or the broader regional economy. On-site construction labor is estimated to average approximately 34 construction workers per month for a 24-month period for these facilities. Since the construction work force would involve a number of different trades, an individual laborer is unlikely to be employed for the entire duration of construction. Given the limited duration of the construction period and the availability of construction workers within the adjacent three-county area, many of these workers are likely to commute to the site and/or stay in temporary housing such as campsites or RV parks for all or portions of their on-site work. Thus, the economic benefit of the additional employment and demand for housing, goods, and services would be dispersed among the three-county region.

Over the life of the new licenses, the trap-and-transport facilities proposed under Alternatives B and D would require crews to handle both upstream and downstream operations. A typical crew for the trap-and-transport facility would be two operators and one truck driver working 40-hours/week for the full year. A typical crew for the surface collection facility would be two full-time workers. Thus, a total of 15 employees would be needed for the three upstream and three downstream facilities. When the salmon are running at their peak returns (approximately three months of the year), temporary employees may be added. The regular workers are likely to be PacifiCorp employees, while the temporary employees may be hired locally. This would add a total of six PacifiCorp employees (five full-time and one seasonal) and a variable number of temporary employees to the local economy. This would increase PacifiCorp's on-site full time employees from 25 to 40 and seasonal employees from 42 to 45. The estimated payroll of $780,000 for the 15 full-time staff and $90,000 for the seasonal workers would have a multiplier effect on the local economy through expenditures on housing, goods, and services.

Based on the Settlement Agreement, Alternative D also includes additional fish passage improvements in future years. Downstream passage facilities would be added to Yale Dam by the 13th anniversary of the new license and to Merwin Dam by the 17th license anniversary. Upstream passage facilities would be added at both Yale and the Swift projects by the 17th anniversary as well. The costs for these additions to the system are estimated at $119.2 million. The total cost for the combined system of fish passage facilities is greater than either Alternative B or C, at a total of approximately $182 million, including the facilities to be built after the fourth anniversary of the licenses.

As in Alternative B, the facilities would be fabricated off site, benefiting the larger region but not the immediate project area. Since the downstream facilities at Yale would be constructed in Year 13 and the remaining upstream and downstream facilities would be constructed in Year 17, there would be two construction periods. The Yale downstream construction period would require approximately 22 workers for 18 to 24 months. The remaining construction would require approximately 18 to 24 months and would average 40 workers per day. These labor forces would include a variety of different skills such that most workers would be needed for only a limited portion of this time. Given the short duration of the construction period for individual skills and the availability of construction workers within the adjacent three-county area, these workers are likely to commute to the site and/or stay in temporary housing such as campsites or RV parks.

The total number of workers over these two-year construction periods would have some economic effect on the local area – both positive and negative. The positive economic benefit would be the additional employment opportunities in the area and the associated demand for housing, goods, and services. This estimated labor force would require an average payroll of approximately $1.2 million for the construction period. This payroll has a multiplier effect in terms of benefiting the local and regional economy through expenditures on housing, goods, and services. The potential negative effect of this economic boost is two-fold: (1) if local RV parks and campgrounds that typically cater to tourists are filled by construction workers for two to three recreation seasons, the tourists may develop interest in other locations and not return to the Lewis River basin;

and (2) at the end of the construction period, the loss of construction workers may cause new or expanded businesses serving that labor force to lay off staff or to close.

Under Alternative D, recreation measures would be the same as described for Alternatives B and C, with the additional detail that the level of funding by the Applicants for the Visitor Information Center at Cougar is a one-time contribution of $75,000 or ongoing maintenance costs, at the choice of the parties participating in facility development. Effects on the local economy would be the same as described for Alternatives B and C.

3.11.3.4 Emergency Services

Under Alternative D, new recreation facilities would be developed and existing facilities expanded, as described for Alternatives B and C. Costs and projected revenues also would be the same, as would the effects on the local economy.

The various new facilities would encourage higher use levels within the project – estimated at an approximately 20 to 25 percent increase over current levels, or approximately 120,000 to 150,000 additional recreation days. The increase in number of visitors could likely increase the need for public services, including law enforcement, fire protection, and emergency services, which are provided by the Cowlitz County Sheriff's Office, four Fire Protection Districts, and the North County Emergency Medical Services. PacifiCorp would provide $20,000 per year to the Cowlitz-Skamania Fire Protection District to compensate for increased emergency services due to project-related recreation use. This alternative also expands existing marine patrols and land-based law enforcement, specifically providing funding for two full-time equivalent law enforcement officers (marine and land-based). Support would also be provided for an additional fish and wildlife officer to patrol the basin. Alternative D also includes continuation of contributions to the Pine Creek Work Center communication link. The increased valuation of the project due to recreation and fish passage facilities, as well as other improvements, would increase property tax revenues that accrue to the counties. The increased revenues may offset the increased costs of service providers. Alternative D is not expected to have a significant impact on public services and emergency services.

3.11.3.5 Local Residents' Quality of Life

Under Alternative D, recreation facility expansion and associated use levels would be the same as in Alternatives B and C. The adverse effects of additional visitors would be regulated by additional marine patrols, a fish and wildlife enforcement officer, and additional land-based law enforcement. Specifically, this alternative includes funding for two full-time equivalent positions for marine and land-based law enforcement. Additionally, funding would be provided for maintenance of Forest Road 90, including a one-time payment of $10,000 for bridge repair and annual payments of $25,000. Overall, Alternative D is expected to enhance local resident's quality of life.

3.11.3.6 Flood Management

Under Alternative D, PacifiCorp would contribute to the same package of measures to improve flood notification systems and procedures as described for Alternatives B and C. Alternative D also includes two additional items: 1) funding for the County-developed installation and maintenance of an emergency phone system for flood notification, and 2) funding for a NOAA weather radio transmitter installation.

Project operations and high runoff procedures would also be identical to Alternative B and C, with the amount of dependable flood control storage maintained at the existing 70,000 acre-feet (17 feet of hole) and with project operations and high runoff procedures modified to take advantage of improved flow forecasts.

3.11.4 Conclusion

Alternative A would not have the beneficial effects of new employment and added recreation visitors as shown in Alternatives B through D. Alternative A would adversely affect local fire and emergency service providers over the length of the licenses, as gradually increasing needs for fire and emergency services for recreation visitors are not covered by the gradually decreasing revenues distributed by the state, due to the declining valuation of the PacifiCorp projects.

Alternatives B through D would not have significant adverse effects on overall social and economic conditions, although electricity rate increases in Cowlitz County would adversely affect local residential, commercial, and light industrial customers. Alternatives B through D each include measures to enhance the local economy by expanding recreation opportunities that would attract visitors and by constructing fish passage and recreation facilities that would provide additional construction and operations employment to the area. Local fire and emergency services would be supported through increased tax revenues related to project improvements. Both Alternatives C and D would provide the most long-term employment of operations personnel at the three fish passage facilities.

3.12 CUMULATIVELY AFFECTED RESOURCES

3.12.1 Geology and Soils

Under Alternative D, cumulative effects on geology and soils would be the same as those described in the PDEAs (PacifiCorp 2004 and Cowlitz PUD 2004).

3.12.2 Water Quality

Under Alternative D, cumulative effects on water quality would be the same as those described in the PDEAs (PacifiCorp 2004 and Cowlitz PUD 2004).

3.12.3 Aquatic Resources

The cumulative effects of Alternative D measures on aquatic resources would be the same as those described for Alternatives B and C in the PDEAs (PacifiCorp 2004 and Cowlitz PUD 2004).

3.12.4 Wildlife Resources

The cumulative effects of Alternative D on terrestrial resources would be similar to those described in the PDEAs (PacifiCorp 2004 and Cowlitz PUD 2004). All four alternatives provide some moderate beneficial effects that offset otherwise adverse cumulative impacts on wildlife resources from timber harvest, rural land development, recreation, and proposed new roads. Benefits from Alternative D are likely to be greatest since this alternative provides the most protection to wildlife habitat on project lands and includes the protection of additional lands in the basin. Alternative C provides less protection, yet would be greater than Alternatives A or B.

3.12.5 Botanical Resources

There are two potential sources of cumulative effects related to botanical resources: timber harvest and floodplain habitat modification. All four alternatives provide some moderate beneficial effects that offset otherwise adverse cumulative impacts on botanical resources from timber harvest. Benefits from Alternative D are significantly greater since this alternative provides the most protection to habitat on basin lands. Alternative D would make large woody debris available for use in habitat improvement projects in the Lewis River basin, reducing the contribution of the Projects to this cumulative effect. Other cumulative effects on botanical resources, including the presence of dikes and floodplain development, would be the same under all action alternatives.

3.12.6 Cultural Resources

Under Alternative D, cumulative effects on cultural resources would be the same as described for the action alternatives in the PDEAs (PacifiCorp 2004 and Cowlitz PUD 2004).

3.12.7 Recreation Resources

Under Alternative D, cumulative effects on recreation resources would be the same as described in the PDEAs (PacifiCorp 2004 and Cowlitz PUD 2004).

3.12.8 Aesthetic/Visual Resources

Cumulative effects on aesthetics and visual resources under Alternative D would be the same as those described for the action alternatives in the PDEA.

3.12.9 Socioeconomics

Cumulative effects on socioeconomics under Alternative D would be similar to those described for the action alternatives in the PDEA (PacifiCorp 2004 and Cowlitz PUD 2004).

3.13 UNAVOIDABLE ADVERSE IMPACTS

3.13.1 Geology and Soils

Under all alternatives, there would be continued slow erosion of parts of the reservoir shorelines. Under Alternatives B, C, and D there would be minor erosion during construction of new project facilities, but these effects could be minimized by the implementation of erosion control measures.

3.13.2 Water Quantity

The Lewis River Projects would continue to control flows in the Lewis River downstream of project facilities under all alternatives considered in this assessment. Thus, to varying degrees, operational and flow related impacts to sediment transport and aquatic habitat would continue in the project reservoirs, the Lewis River bypass reach, and in Speelyai Creek.

3.13.3 Water Quality

Operational impacts to TDG in the Swift No. 1 and Yale tailraces, flow related impacts to water temperature in the Lewis River bypass reach and Speelyai Creek, and loss of marine-derived nutrients would continue under Alternative A. Effects on MDN would be offset by introduction of anadromous fish under Alternatives B, C, and D. Monitoring of these and other parameters under the Water Quality Management Plans would document compliance with State standards under Alternatives B through D.

3.13.4 Aquatic Resources

Operation of the Lewis River Projects under all alternatives would trap most sediment and woody debris in the three project reservoirs and alter flow regimes in the Lewis River bypass reach, lower Speelyai Creek, and the Lewis River downstream from Merwin Dam. As a result, aquatic and riparian habitat in the Lewis River bypass reach would be limited under all alternatives. Aquatic and riparian conditions in lower Speelyai Creek would be stable under all alternatives. In the Lewis River downstream from Merwin Dam, aquatic and riparian habitat conditions would be stable, with little channel shifting or active aquatic or riparian conditions under all alternatives.

The upstream and downstream fish passage facilities associated with Alternatives B, C and D could delay, injure, or kill fish migrating past the project dams. Gill netting and transporting bull trout below Yale Dam and in the Swift No. 2 tailrace has the potential to injure or kill individual bull trout, although these actions would be beneficial to the species as a whole. Under Alternative D, other collection methods would be tested,

which ultimately would reduce these negative effects. The relatively slow-moving reservoir habitat in Lake Merwin would continue to support northern pikeminnow. Operation of the Lewis River hatcheries may convey fish disease in the basin and contribute to competition between hatchery and wild fish. Both effects may alter the abundance and fitness of wild fish populations. Recreational fishing associated with the project reservoirs and hatcheries would result in fishing pressure on native stocks, including endangered species.

3.13.5 Botanical and Wildlife Resources

To protect botanical and wildlife resources, Alternatives B, C and D close additional roads and install gates, actions that would reduce vehicle access to some utility-owned lands and may curtail some current recreation use. In addition, the alternatives would permanently reduce the number of sites available for dispersed camping along the reservoirs. Construction associated with installation of new culverts and gates under Alternatives B, C and D would disturb wildlife over a few days. Timber harvest activities under all alternatives would alter wildlife habitat and vegetation communities, and may affect nearby recreation use, as well as aesthetics.

3.13.6 Cultural Resources

All alternatives would affect traditional cultural resources. Facility modifications and new construction would alter some historic structures. Some archaeological sites would be affected by reservoir erosion and possibly by fish passage facilities that cannot be re-sited. These effects would add to the cumulative loss of traditional cultural resources, historic structures, and archaeological sites over time in the upper Lewis River valley.

3.13.7 Recreation

Some of the proposed recreation resource enhancements would entail ground-disturbing activities, including construction of new and improved recreation sites. These activities could result in short-term temporary displacement of wildlife and recreationists during construction. Additionally, some vegetation removal would also occur, which could result in longer-term loss of habitat. The potential effects of recreation facility construction activities would be the same under Alternatives B, C and D, and least extensive under Alternative A (No Action). The proposed recreation enhancements would attract new visitors to the project area. In the long term, these additional visitors would have minor effects on wildlife and vegetation.

3.13.8 Socioeconomics

The projects provide a recreation benefit that supports the local economy and attracts new residents. While the various alternatives differ in the period of time and the extent to which they support additional benefits, none have unavoidable adverse effects on the local economy. The current operations (Alternative A) have adverse effects on the demand for fire and emergency services that are not fully covered by tax revenues, due to two factors: 1) the existing tax distribution system does not reflect the realities of access

to the project; and 2) the expectation that future recreational use will not be matched by growth in revenues as the projects age. In Alternatives B, C and D, these effects would be addressed by increased project value, resulting in increased revenues.

3.14 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Continued operation of the projects under each alternative analyzed would continue to commit the lands and water that have been developed for energy production to this purpose. This commitment of resources would not necessarily be irreversible or irretrievable because removal of project facilities and restoration of disturbed areas could ultimately return the area to a condition approximating pre-project. Given the substantial costs and loss of energy, flood management, recreation, and socioeconomic benefits, however, removal of the projects is unlikely in the reasonably foreseeable future.

The electrical generation lost as a result of the proposed minimum flow releases to the Lewis River bypass reach under Alternatives B, C and D would be irretrievable.

3.15 RELATIONSHIP BETWEEN SHORT-TERM AND LONG-TERM PRODUCTIVITY

Under all three alternatives, the projects would continue to generate power for the customers of Cowlitz PUD and PacifiCorp and provide recreation and socioeconomic benefits for the duration of the new licenses (30 to 50 years). Each action alternative (B, C and D) would provide significant long-term protection and enhancement of biological, cultural, and recreational resources, while decreasing the ability of the projects to meet energy and economic needs.

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4.0 DEVELOPMENTAL ANALYSIS

This section analyzes the use of the Lewis River's water resources by the Swift No. 1, Yale and Merwin projects to generate hydropower, estimates the economic benefits of the projects, and estimates the cost of various environmental measures and the effects of those measures on project operations.

4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECTS

The power and economic benefits analysis is presented in this section of the PDEA for the Merwin, Yale and Swift No. 1 projects. It considers the combined net benefits of the Swift No. 1, Yale and Merwin projects because they are operated together to meet the needs of PacifiCorp's customers.

The environmental measures proposed under Alternative D compared to those that make –up baseline conditions (Alternative A) would decrease the annual generation at the Swift No. 1 and Swift No. 2 projects by approximately 5,235 MWh. PacifiCorp's share of this generation reduction would be approximately 3,874 MWh. Under this alternative, annualized costs would increase by about $14,255,000. The Levelized Net Benefit of the project would decrease by $8.36/MWh.

4.2 COST OF ENVIRONMENTAL MEASURES

Most of the measures included as part of the Alternative D would affect project economics by requiring capital outlays for construction, equipment and studies, as well as annual operation and maintenance (O & M) costs. In addition, releasing flow to the Lewis River bypass reach would result in loss of generation at Swift No. 1 and Swift No. 2. In this section, capital costs and O & M expenditures are presented in 2003 dollars for the environmental measures described in Chapters 2 and 3. Where O & M costs would be invested other than on an annual basis, the likely schedule is identified. It is important to note that the costs presented in the following tables for Alternative D are additive to the Alternative A costs, unless otherwise noted.

4.2.1 Geology and Soils Measures

Erosion control plans would be developed for all new project facilities to minimize erosion during their construction and operation.

Geology and Soils Measures	**Capital Cost (in 2003 $)**	**Annual O&M Cost (in 2003 $)**
Alternative D Measures		
▪ Develop Erosion Control Plans (erosion control measures are included in construction cost)	$0	$40,000
Alternative D Total Cost	**$0**	**$40,000**

4.2.2 Water Quantity Measures

Costs for flood management under Alternative D involve on-going costs similar to Alternative A plus additional costs for development and implementation of forecast-based high runoff operating procedures, and financial contributions to local authorities for improved flood notification systems and procedures.

The estimated cost to develop and implement a forecast-based high runoff procedure for Alternatives B, C and D assumes the following: (1) procure flow forecasts at an annual cost of $72,000; (2) PacifiCorp provides three person-months per year of staff for forecast-based operations, including archiving forecasts and periodic assessments of forecast accuracy; (3) acquire, operate and maintain one additional weather station and one additional stream flow station to provide data in support of forecast-based operations; and (4) fund initial development and testing of forecast-based high runoff procedures, including obtaining regulatory approval for such procedures. The total initial investment for implementation of forecast-based high runoff procedures is estimated at $150,000 with a recurring annual cost of $112,000.

The estimated cost to support improved notification systems and procedures under Alternative D assumes the following: (1) contribution to local emergency management authorities of $42,000 to fund acquisition and first year maintenance of a new emergency telephone notification system; (2) annual payment of $4,500, estimated to be half the annual maintenance cost of the system after the first year of operation; (3) annual payment of $9,000 for mechanical operation and maintenance of a new weather radio transmitter; and (4) fund one person-month per year to coordinate with other parties having flood management interests and responsibilities. The initial contribution for improved flood notification is estimated at $42,000, compared with $25,000 for Alternatives B and C. Total recurring annual cost is estimated to be $22,000.

Under Alternative D, a new release mechanism would be constructed from Swift No. 2 canal that would continuously release flow to the Lewis River bypass reach. Flows also would be released from the existing Swift No. 2 canal drain to an enhanced side channel.

Generation losses under Alternative D are primarily a result of the increased flows directed to the Lewis River bypass reach, as discussed above. Compared to Alternative A, under Alternative D, there would be a reduction in annual generation from the combined Swift No. 1 and Swift No. 2 generation of about 5,235 MWh. Approximately 57 percent of this reduction in operation would be on-peak hours. Further analysis of generation losses is provided in Section 4.3.

Water Quantity Measures	**Capital Cost (in 2003 $)**	**Annual O&M Cost (in 2003 $)**
Alternative D Measures		
▪ All measures described under Alternative A would continue		
▪ Develop and implement forecast-based high runoff procedure	$150,000	$112,000

Water Quantity Measures	Capital Cost (in 2003 $)	Annual O&M Cost (in 2003 $)
▪ Improve flood notification systems and procedures	$42,000	$22,000
▪ Construct outlet from Swift No. 2 canal to continuously supply flow to the bypass reach[a]	$1,800,000	$30,000
Alternative D Incremental Cost	**$1,992,000**	**$164,000**

[a] Additional economic cost for this measure is reflected in Table 4.3-2 as lost generation to be replaced from other sources.

4.2.3 Water Quality Measures

Costs associated with water quality monitoring assume the implementation of monitoring stations at all three project tailraces, as well as implementation of automated controls to reduce the risk of exceedances of the TDG standard at Merwin and Swift No. 1. Costs for an automated TDG control system at Yale are included under Alternative A because this system has been installed and is in the testing and evaluation phase. In addition to TDG, monitored parameters would include temperature, dissolved oxygen, and pH.

Capital costs assume $10,000 per station and replacement at 10-year intervals (initial installation and three replacements over a 30-year period). Annual O&M for Alternative D include data management, reporting, and maintenance of equipment at the three projects ($20,000 for Merwin, Yale, and Swift No. 1).

Water Quality Measures	Capital Cost (in 2003 $)	Annual O&M Cost (in 2003 $)
Alternative D Measures		
▪ Water Quality Management Plan, with monitoring as in Alternative A.	$120,000	$20,000
Alternative D Incremental Cost	**$120,000**	**$20,000**

4.2.4 Fish Habitat Measures and Population Monitoring

Under Alternative D, PacifiCorp would fund aquatic habitat protection and enhancement; habitat monitoring and evaluation (gravel and LWD); and provide for monitoring and evaluation of several fish species, such as Chinook and bull trout.

Fish Habitat Measures	Capital Cost (in 2003 $)	Annual O&M Cost (in 2003 $)
Alternative D Measures		
▪ Enhance side channel in Lewis River bypass reach	$818,000	$15,000
▪ Establish aquatic habitat enhancement fund	$5.2 million	

Fish Habitat Measures	Capital Cost (in 2003 $)	Annual O&M Cost (in 2003 $)
▪ Establish "in lieu" fund if some combination of upstream passage facilities at Yale and Swift and downstream passage facilities at Yale and Merwin are not constructed.	up to $30 million[1]	
▪ Provide a public information program including signage and flyers for bull trout identification and protection	(included as a recreation cost)	
▪ Store large woody debris from Swift Creek Reservoir	$0	$7,000
▪ Monitoring and Evaluation Plan		$60,000
▪ Conduct a large woody debris study downstream of Merwin Dam		$60,000 one time cost
▪ Conduct a spawning gravel augmentation study downstream of Merwin Dam		$80,000 one time cost
▪ Conduct predation study on anadromous fish released above Merwin Dam.		$80,000 one time cost
▪ Conduct annual monitoring of wild fall Chinook and chum downstream of Merwin Dam	$0	$75,000
▪ Conduct anadromous fish adult migration and spawning assessment upstream of Merwin Dam	$0	$100,000 one time cost
▪ Conduct resident fish assessment	$0	$60,000 one time cost
▪ Conduct annual monitoring of bull trout and sea-run cutthroat	$0	$50,000
▪ Conduct bull trout limiting factors analysis in Swift Creek Reservoir and Lake Merwin	$0	$60,000 one time cost
▪ Conduct anadromous fish stranding and habitat study downstream of Merwin Dam	$0	$300,000 one time cost
▪ Aquatics Coordination Committee		$50,000
Alternative D Total Cost	**$6,018,000**	**$997,000**

[1] Not added into total; this fund would be provided only if introduction of anadromous species to Lake Merwin and Yale Lake was deemed unnecessary by the Services.

4.2.5 Downstream Fish Passage Measures

Capital cost estimates for proposed downstream fish passage measures are based on designs developed in the Engineering Feasibility Study for Fish Passage Facilities - Phase 2 (PacifiCorp and Cowlitz PUD 2003 and 2004: AQU 5, Appendix 1), a comparison of existing projects of similar scope, and the 2001 Means estimating manual. The estimates include a 30 percent line item based on the conceptual level construction cost subtotal to cover unforeseen items and to address issues not yet analyzed in detail, and a 25 percent fee on the total estimated construction cost to address engineering, permitting, construction management and administrative costs. In addition, costs assume upgrades to

the fish passage approximately every 10 years throughout their life cycle. Costs listed in this section were escalated to 2003 dollars from the 2001 Phase 2 Report estimates using the Engineering News Records (ENR) construction cost index, which equated to a 6 percent adjustment. Additionally, costs presented in the 2001 Phase 2 report for the floating surface collector alternatives were updated based on updated design cost estimates of similar fish collection facilities.

The cost of the Alternative D downstream modular floating surface collector at Swift Dam has increased from the $60,340,000 estimated for Alternative B in the April 2004 Preliminary Draft EA (PacifiCorp 2004 and Cowlitz PUD 2004). This $4,860,000 increase results from updated costs estimates based on other projects in the region, updated budgets for system upgrades planned throughout the Lewis River project durations, and the addition of PacifiCorp administrative costs to implement these measures. The $65,200,000 value should also be applied to Alternative B, as these systems are intended to be identical.

Similarly, the cost of modular floating surface collectors at Yale and Merwin dams under Alternative C has increased from $19,910,000 and $18,980,000 respectively, to $41,100,000 at each facility under Alternative D. These increases include the addition of fish sorting and truck transport facilities, budget for anticipated facility upgrades every 10 years, plus PacifiCorp administrative costs to implement these measures.

Operation and maintenance costs were developed assuming a Full Time Equivalent (FTE) rate of $60/hour during the fish migration season. The period of juvenile downstream migration used for the estimates extends from mid-March to mid-October. Costs were generally based on knowledge of operations and maintenance activities of similar facilities currently under operation. Off-season docking facilities for the floating surface collectors in Alternative D was based on the use of a tug and mobile crane.

Downstream Fish Passage Measures	**Capital Cost (in 2003 $)**	**Annual O&M Cost (in 2003 $)**
Alternative D Measures		
▪ Downstream modular floating surface collector at Swift with guidewall, guide nets, sorting and transport facilities.	$65,200,000	$322,500 beginning in Year 4
▪ Seasonally install spring Chinook modular screw trap upstream of Swift Creek Reservoir.	$50,000	$2,000
▪ Modify Yale spillway to improve downstream resident fish survival during spill events.	$2,298,000	$0
▪ Install barrier nets in Yale and Merwin forebays to reduce fish entrainment up to and until the modular surface collector is installed.	Included in downstream passage costs	$50,000
▪ Install modular floating surface collector, sorting and truck transport facilities at Yale Dam by Year 13. [1,2]	$41,100,000	$322,500 beginning in Year 13

Downstream Fish Passage Measures	Capital Cost (in 2003 $)	Annual O&M Cost (in 2003 $)
▪ Install modular floating surface collector, sorting and truck transport facilities at Merwin Dam by Year 17. [1,2]	$41,100,000	$322,500 beginning in Year 17
▪ Develop stress release pond downstream of Merwin Dam near Pekins Ferry by Year 4.	$4,222,779	$50,000 beginning in Year 4
▪ Monitor and evaluate fish passage.	$0	$140,000 beginning in Year 4
▪ Conduct entrainment reduction study for bull trout at Yale and Merwin dams	$100,000	
Alternative D Total Cost	**$154,070,779**	**$1,209,500**

[1] Alternatively, In Lieu Fund may be established.

[2] Alternatives to upstream truck transport will be evaluated. One prerequisite to implementation of an alternative transport method is that it not be significantly more expensive than truck transport. Therefore, cost estimates are based on truck transport.

4.2.6 Upstream Fish Passage Measures

Under Alternative D, anadromous fish initially would be introduced into the North Fork Lewis River basin above Swift Dam. This would be accomplished using a trap-and-transport system below Merwin Dam and relocating fish via tanker trucks to a release site in upper Swift Creek Reservoir. Lake Merwin, Yale Lake, and much of Swift Creek Reservoir initially would be bypassed to expedite movement of adult migratory fish to the spawning and rearing habitat in the upper river tributaries. In addition, as needed, bull trout in the Yale and Swift No. 2 tailrace would be netted and hauled to a location determined by the USFWS. Alternative collection methods will be examined and tested in an effort to identify a more safe and effective means of collecting bull trout, with results reported annually. In Year 17 of the new licenses, Alternative D provides upstream passage for anadromous salmonids and bull trout into all three Lewis River reservoirs.

Capital cost estimates for upstream fish passage facilities were developed in the same manner as the downstream fish passage facilities described in Section 4.2.5. Similarly, O&M costs were also developed as described in Section 4.2.5, except the period of adult upstream migration used for the estimates runs year round.

The $14,180,000 cost for the Alternative D upstream trap-and-transport system from the Merwin tailrace has increased from the $6,000,000 published under Alternative B in the April 2004 Preliminary Draft EA (PacifiCorp 2004). This $8,180,000 increase is a result of updating the costs of the fish trap, new budgeting for multiple facility upgrades planned throughout the project duration, and the addition of PacifiCorp's administrative costs to implement these measures. The $14,180,000 value should be applied to Alternative B, as these systems are intended to be identical.

Similarly, costs shown below for the potential trap-and-transport systems at Yale and Swift No. 2 have increased from the amounts shown under Alternative C in the April 2004 Preliminary Draft EA (PacifiCorp 2004) to reflect updated cost estimates and

PacifiCorp administrative overhead. The cost for the Yale facility has been increased by $562,000, for an updated total of $18,482,000, and the cost for the Swift No. 2 facility has been increased by $1,432,000, for an updated total of $18,482,000.

Upstream Fish Passage Measures	**Capital Cost (in 2003 $)**	**Annual O&M Cost (in 2003 $)**
Alternative D Measures		
▪ Trap & transport, from Merwin tailrace to Swift Creek Reservoir (Chinook, coho & steelhead), and to Yale Lake or as directed by USFWS (bull trout) with improved trap entrance and new sorting/truck loading facility.	$14,180,000	$356,000 beginning in Year 4
▪ Periodically net bull trout from Yale tailrace.	$0	$15,000
▪ Evaluate alternative trapping and collection methods for bull trout passage	$100,000	
▪ Construction trap & transport and sorting/truck loading facility at Yale in Year 17. [1]	$18,482,000	$288,000 beginning in Year 17
▪ Construct trap & transport and sorting/ truck loading facility at Swift in Year 17. [1]	$18,482,000	$288,000 beginning in Year 17
▪ Monitor and evaluate fish passage.	$0	$148,000
Alternative D Total Initial Cost	**$51,244,000**	**$1,095,000**

[1] Alternatively, In Lieu Fund may be established.

4.2.7 Fish Hatchery Measures

Costs for fish hatchery measures are summarized in the table below, including both capital and associated operations and maintenance costs for Alternative D. Measures would include annual kokanee and rainbow trout production for the recreational fishery; and Chinook, coho and steelhead for the introduction program upstream of Merwin Dam and recreational, commercial, and tribal harvest downstream of Merwin Dam. Monitoring and evaluations would be conducted to assess impacts of hatchery fish on naturally produced fish and to determine whether or not introduction goals are being attained.

Fish Hatchery Measures	**Capital Cost (in 2003 $)**	**Annual O&M Cost (in 2003 $)**
Alternative D Measures		
▪ Develop the hatchery supplementation plan	$0	$75,000 one time cost
▪ Fund operations and maintenance of Lewis River Hatcheries including fish production, marking and evaluation, transport and release, and reporting	$0	$1,800,000

Fish Hatchery Measures	Capital Cost (in 2003 $)	Annual O&M Cost (in 2003 $)
▪ Provide juvenile fish acclimation release structures at Swift, Yale, and Merwin	$3,000,000	$75,000
▪ Hatchery Upgrades	$14,400,000	$0
Alternative D Total Cost	**$17,400,000**	**$1,950,000**

4.2.8 Terrestrial Habitat Measures

Capital costs for terrestrial resource measures range from $695,000 for Alternative A to about $13.4 million for Alternative D. Annual O&M costs vary from $231,000 for Alternative D to $356,000 and $556,000 for Alternatives B and C, respectively.

A Wildlife Habitat Management Plan (WHMP) would be developed for all PacifiCorp lands under Alternatives C and D. Capital costs associated with developing and implementing this plan are estimated at $450,000 for Alternative D. Since the plan will be applied across all PacifiCorp owned lands and will probably include a wide variety of habitat improvement measures, annual O&M is estimated at $200,000. This amount also covers the monitoring program for the WHMP, which would include re-application of the Habitat Evaluation Procedure about halfway through the next license period to evaluate the success of the plan.

All of the alternatives include measures to incorporate spatial and/or temporal buffers, close roads, reduce barriers to movement along stream corridors, and manage roads to reduce erosion. Alternatives B, C and D however, provide more measures to improve aquatic and riparian habitat connectivity than Alternative A. Costs for these measures were estimated using information provided by PacifiCorp and from several web sites. Under Alternative D, these measures are expected to require a capital investment of about $675,000. Estimated annual O&M costs range from $10,000 for Alternative A to $30,000 for Alternative D. For Alternative D, this O&M cost is included as part of the O&M for the WHMP.

Alternatives B and C also propose to reduce the number of dispersed campsites along project reservoirs. Closure and rehabilitation of 30 sites is assumed to require about $100,000 over the first five years of the new licenses. O&M associated with monitoring the closures (e.g., reinstalling signs, repairing barriers) is estimated at $1,000 annually. The primary difference between Alternatives C and D is the establishment of several funds to acquire land to protect and improve wildlife habitat in the vicinity of the Lewis River Projects. PacifiCorp would establish a fund of $2.5 million to acquire lands in the vicinity of the Yale Project and a separate fund of $2.2 million to acquire other lands in the Lewis River basin. In addition, PacifiCorp would contribute $7.5 million to a fund to acquire land near the Swift No. 1 and Swift No. 2 projects.

Terrestrial Habitat Measures	Capital Cost (in 2003 $)	Annual O&M Cost (in 2003 $)
Alternative D Measures		
▪ All measures described under Alternative A would continue, except where noted.		
▪ Develop and implement a WHMP on all suitable project lands and a monitoring program that includes application of the HEP to evaluate plan success. (The WHMP includes improvements to the Merwin Wildlife Habitat Management Program in Alt. A.)	$450,000	$200,000 (includes $100,000 to re-apply the HEP mid-way through the next license)
▪ Reduce the number of dispersed campsites through improved management	$100,000 ($20,000/yr in years 1-5)	$1,000
▪ Develop a culvert replacement plan and schedule to improve aquatic, terrestrial and riparian habitat connectivity at select streams.	$675,000	Included in the WHMP
▪ Utilities commit $2.5 million to fund habitat acquisition in the Yale Project area.	$2,500,000	
▪ Establish $7.5 million habitat acquisition and protection fund for Swift No. 1 and Swift No. 2.	$7,500,000	
▪ PacifiCorp establishes a $2.2 million habitat acquisition and enhancement fund for the Lewis River Basin area.	$2,200,000	
▪ Terrestrial Coordination Committee		$50,000
Alternative D Incremental Cost	**$13,425,000**	**$251,000**

4.2.9 Cultural Resources Measures

PacifiCorp's costs under Alterative A would include an estimated average of $5,000 per year (in 2003 dollars) for cultural resource surveys of project operation and maintenance actions. Curating artifacts and documentation resulting from the relicensing studies would amount to about $10,000 initially, followed by about $2,000 per year.

The costs of measures that are part of Alternatives B, C and D have been refined and reallocated since submittal of the April 2004 PDEA (PacifiCorp 2004). Capital costs have been reclassified as O&M and reduced. Under all three alternatives, PacifiCorp would expend an estimated $59,000 annually for monitoring and protection measures, artifact curation, staff training and agency and tribal coordination.

Cultural Resource Measures	Capital Cost (in 2003 $)	Annual O&M Cost (in 2003 $)
Alternative D Measures		
▪ All measures described under Alternative A would continue.		

Cultural Resource Measures	Capital Cost (in 2003 $)	Annual O&M Cost (in 2003 $)
▪ All measures proposed under Alternative D would be the same as those under Alternative B. All associated costs would be the same.	$0	$59,000
Alternative D Incremental Cost	**$0**	**$59,000**

4.2.10 Recreational Resource Measures

PacifiCorp's ongoing capital and O&M expenditures for recreation resources total approximately $463,000 annually for all project recreation facilities at the three reservoirs and five river access sites below Merwin Dam. Alternatives B through D are identical and would include higher levels of recreation capital development and associated annual O&M costs than Alternative A. These costs have been refined since submittal of the April 2004 Preliminary Draft EA (PacifiCorp 2004) and those presented below should be applied to all action alternatives (B, C and D). The precise timing and implementation of several measures are unknown at this time (dependent on the monitoring of use levels to demonstrate a sustained need for new facilities); however, the total capital development cost is expected to be approximately $15,000,000 for Alternative D (including the cost of continuing measures described under Alternative A). Estimated O&M costs are expected to be approximately $568,613 annually (including continuing measures under Alternative A), an increase over Alternative A of approximately 22.8 percent.

Recreational Enhancement Measure	Capital Cost (in 2003 $)	Annual O&M Cost (in 2003 $)
Alternative D Measures		
▪ All measured proposed under Alternative D are the same as those under Alternative B and C. All associated costs would be the same.	Same as Alternatives B and C $15,398,500	Same as Alternatives B and C $105,613
Alternative D Incremental Cost	**$15,398,500**	**$105,613**

4.2.11 Aesthetic Resource Measures

There are no proposed aesthetic/visual resource measures in any of the alternatives.

4.2.12 Socioeconomic Measures

Many of the enhancement measures that benefit other resources also provide a social or economic benefit to the local community. These include measures such as additional employment related to construction or operation of fish passage facilities or recreation facilities. The capital and operating costs of these other measures are defined in their respective resource sections. Measures that directly benefit socioeconomics are summarized briefly and listed below.

Under Alternative A, PacifiCorp currently pays $75,000 in annual operating costs to provide marine patrols and land based law enforcement and to support a telephone link at Pine Creek for emergencies. Alternatives B and C would continue those measures. Alternative D increases this commitment to $220,000 to support additional marine patrols and a wildlife enforcement officer. Alternative D also includes annual support to local fire districts in the amount of $20,000.

Socioeconomic Measures	**Capital Cost (in 2003 $)**	**Annual O&M Cost (in 2003 $)**
Alternative D Measures		
▪ Continue to fund marine patrols and land-based law enforcement		$220,000
▪ Support Pine Creek phone link	$10,000	
▪ Contribute to maintenance of Forest Road 90	$10,000	$25,000
▪ Local Fire Support		$20,000
Alternative D Total Cost	**$20,000**	**$265,000**

4.3 COMPARISON OF ALTERNATIVES

Table 4.3-1 presents a comparison of the annual net benefits for Alternatives A through D for the Merwin, Yale and Swift No. 1 projects levelized over 30 years. Alternative B would decrease annual net benefits by $6,598,000 from the No Action Alternative (Alternative A). Alternative C reduces annual net benefits by $14,728,000 from Alternative A. Alternative D would reduce annual net benefits by $14,255,000 in comparison to Alternative A. Annual generation changes according to the amount of flow routed through the Lewis River bypass reach specified in each alternative.

Table 4.3-1. Summary of the levelized annual net benefits for Alternatives A through D for Swift No. 1, Yale and Merwin.

	Alternative A[a]	Alternative B	Alternative C	Alternative D
Installed capacity (mW)	510	510	510	510
Annual generation (MWh)	1,715,406	1,712,806[b]	1,668,606[b]	1,711,532
Levelized Annual Power Benefit ($/MWh)	$65,254,000 $38.04[c]	$65,156,000 $38.04[c]	$63,461,000 $38.03[c d]	$65,110,000 $38.04
Levelized Annual Cost of PM&E Measures ($/MWh)	$0	$6,598,000 $3.85	$14,728,000[e] $8.82	$14,255,000 $8.33
Levelized Annual Cost of Operations ($/MWh)	$28,693,000 $16.73	$28,693,000 $16.75	$28,693,000 $17.20	$28,693,000 $16.76
Levelized Net Benefit ($/MWh)	$36,561,000 $21.31	$29,865,000 $17.44	$20,040,000 $12.01	$22,162,000 $12.95

[a] Includes cost of existing environmental measures and O&M.

[b] Average annual generation less the impact of lost generation from PM&E measures.

[c] Based on Mid-Columbia prices for On-Peak hours ($40.25/MWh) and Off-Peak hours ($33.74/ MWh) for 12 months ending March 31, 2004 per Bloomberg.

[d] $/MWh are less than under Alternatives A and B because the mix of Peak and Off-peak production is different.

[e] The capital cots for trams under Alternative C presented in the April 2004 PDEA should be updated to reflect increased engineering costs based on additional analysis, facility upgrades over the life of the license, and PacifiCorp's overhead and administrative costs. The capital costs for trams should be $70,074,000. Since Alternative C is not proposed, the levelized Annual Costs and Benefits presented here have not been updated.

Table 4.3-2. Summary of the annual lost generation and replacement power cost for Alternatives A through D for Swift No. 1, Yale and Merwin.

	Alternative A	Alternative B	Alternative C	Alternative D
Lost generation to be replaced from other sources (MWh)	0	2,600	46,800	3,874
Annual Cost of Replacement Power ($/MWh)	$0	$101,000 $38.90 [a]	$1,821,000 $38.90 [a]	$145,000 $37.43[a]

[a] Based on Mid-Columbia prices for On-Peak hours ($40.25/MWh) and Off-Peak hours ($33.74/ MWh) for 12 months ending March 31, 2004 per Bloomberg.

4.4 POLLUTION ABATEMENT

By producing hydroelectricity, PacifiCorp's three Lewis River Projects displace the need for other power plants, primarily fossil-fueled facilities, thereby avoiding some power plant emissions. If the 1,715,406 megawatt hours of electricity generated annually by these projects were replaced with fossil fuel-powered facilities, greenhouse gas emissions could potentially increase in the amounts shown in Table 4.4-1.

Table 4.4-1. Equivalent amount of pollutants emitted annually (tons) if the Lewis River projects were replaced by fossil fuel generated energy.

	Merwin	Yale	Swift No. 1
SO_2	1.2	1.3	1.5
NO_X	27.8	30.2	36.0
CO_2	216,627.6	235,700.9	281,136.7
CO	9.8	10.6	12.7
Particulates	4.3	4.7	5.6
VOC	3.1	3.4	4.1
Total (tons)	**216,673.8**	**235,751.1**	**281,196.7**

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5.0 COMPREHENSIVE DEVELOPMENT ANALYSIS

5.1 CONSISTENCY WITH COMPREHENSIVE PLANS

Analysis of the consistency of the Lewis River Projects with various comprehensive plans and the relationship of the licensing process to environmental laws and policies is presented in Section 5.1 of the April 2004 PDEAs. This analysis has been expanded and is supplemented with the information presented below.

1. *Northwest Conservation and Electric Power Plan.* Northwest Power Planning Council. 1998. Portland, Oregon.

   The Northwest Power Act of 1980 mandated that Idaho, Montana, Oregon and Washington prepare and adopt a "regional conservation and electric power plan." The states established the Northwest Power Planning Council to implement this Act by helping to plan for the future of the power system and involving citizens of the region in the planning process. This plan is to be updated at least every five years. The Council's first plan was adopted in 1991 and updated in 1998. A draft update, the Fifth Pacific Northwest Electric Power and Conservation Plan, was released for public comment on September 22, 2004 and comments were received through November 19, 2004.

   The goal of the 1998 plan is to provide guidance in moving toward a more competitive Northwest electricity industry. It recognizes the importance of hydropower to the Pacific Northwest, noting that fish and wildlife protections have reduced the firm energy capability of the regional hydropower system by about 850 average megawatts and that potential further constraints to protect fish and wildlife create uncertainty. The objective of this plan is to secure low-cost, reliable energy for the Pacific Northwest. The Lewis River Projects provide firm, reliable, renewable energy consistent with this plan.

   The draft update to this plan focuses on strategies to increase the available power supply in the Pacific Northwest. Inherent in the update is the need to maintain existing resources. Alternative D would help achieve this goal of the draft Fifth Pacific Northwest Electric Power and Conservation Plan.

2. *Columbia River Basin Fish and Wildlife Program*. Northwest Power Planning Council. 2000. Portland, Oregon.

   In accordance with the Northwest Power Act of 1980, the Northwest Power Planning Council prepared this plan to protect, mitigate and enhance fish and wildlife in the Columbia River Basin while ensuring an "adequate, efficient, economical and reliable power supply." It establishes a basin-wide vision for fish and wildlife, along with biological objectives and action strategies to implement that vision. The plan is implemented through a series of sub-basin plans. One of

the major focuses of this plan is to mitigate the impact of hydropower projects on fish and wildlife in the basin through enhancement and protection programs.

The fish passage and introduction measures of Alternative D are consistent with the goals of this plan. The goal of Alternative D to achieve genetically viable, self-sustaining naturally reproducing, harvestable anadromous fish populations above Merwin Dam at greater than minimum viable populations fulfills the overall vision of the Plan for an ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife. Alternative D also includes aquatic habitat enhancement consistent with this plan.

3. *1987 Strategies for Washington's Wildlife*. Washington State Department of Game. 1986. Olympia, Washington.

   This strategic plan sets goals, identifies problems, recommends solutions, and establishes priorities for wildlife and fish in the State of Washington. Individual wildlife programs describe goals and objectives for big game species, upland game species, waterfowl, furbearers, and nongame wildlife. Individual fisheries programs describe goals and objectives for steelhead, cutthroat and Dolly Varden; lowland lakes trout, alpine lakes, warmwater fisheries; and resident streams and beaver ponds. The goal statements in this plan were written in 1986 and were intended to apply until roughly 1998-2001.

   Some of the species addressed in this plan are present in the vicinity of the Lewis River Project. Terrestrial species will be addressed in the Wildlife Habitat Management Plan included in Alternative D. Alternative D's aquatic measures designed to achieve genetically viable, self-sustaining naturally reproducing, harvestable anadromous fish populations above Merwin Dam at greater than minimum viable populations are consistent with the goals of this plan.

4. *Hydroelectric Project Assessment Guidelines*. Washington State Department of Fisheries. 1987. Olympia, Washington.

   These 1987 guidelines, updated in 1995, provide instructions for conducting studies to gather the information necessary to assess the potential impacts of a proposed project on salmon and their habitat. The guidelines call for cooperation with all involved agencies to identify anadromous and resident fish and wildlife issues related to a specific project and steps needed to protect and enhance species of concern. PacifiCorp and Cowlitz PUD worked with state and federal agencies, tribes, and stakeholders throughout the relicensing study process and in settlement negotiations to address fish and wildlife issues consistent with these guidelines.

5. *Hydroelectric Project Assessment Guidelines*. Washington State Department of Fisheries. 1995. Olympia, Washington.

The 1995 guidelines are an update to guidelines issued by WDF in 1987, discussed above. Alternative D is consistent with these guidelines as described above.

6. *A Resource Protection Planning Process Identification of Prehistoric Archaeological Resources in the Lower Columbia Study Unit*. Washington State Department of Community Development, Office of Archaeology and Historic Preservation. 1987. Olympia, Washington.

   This document is one of a series of Resource Protection Planning Process studies designed to organize the available archaeological data into a consistent thematic account to support development of resource-based planning in the State of Washington.

   Alternative D provides for recognition of and the proper treatment of cultural resources in the Lewis River Project vicinity. It includes development by PacifiCorp of a Historic Properties Management Plan to address impacts to cultural resources from project activities and provides for cultural resources to be curated within the Lewis River basin. The Yakama Indian Nation and Cowlitz Tribe have participated in the relicensing studies and settlement negotiations to protect their cultural interests in the project area. Alternative D is consistent with this plan.

7. *Resource Protection Planning Process Study Unit—Transportation.* Washington State Department of Community Development, Office of Archaeology and Historic Preservation. 1989.

   The Transportation Study Unit is one of 18 historic resource study units established to better identify, evaluate, and protect heritage resources throughout the state. This plan identifies transportation resources that are eligible for listing or have been listed on either the State or National Register of Historic Places. The Yale bridge, approximately 2 miles downstream of Yale Dam, is included on the National Register. The continued operation of the dams in the Lewis River Project will not affect the Yale bridge. Alternative D is consistent with this plan.

8. *Washington State Trails Plan: Policy and Action Document*. Washington State Interagency Committee for Outdoor Recreation. 1991. Tumwater, Washington.

   This plan is an element of the Statewide Comprehensive Outdoor Recreation Plan (SCORP) that seeks to identify issues surrounding trail-based recreation and proposes solutions in the form of action plans. These action plans are presented as management objectives rather than specific development mandates. The State Trails Plan does not show any existing trails in the vicinity of the Lewis River Project, nor does it propose any new trails in this area. The plan does not include any trails on private property. Although not required by this plan, Alternative D proposes enhancements to existing trails and the creation of additional trails in the

Lewis River Project vicinity. These actions are consistent with the goals and strategies of the State Trails Plan.

9. *State of Washington Natural Heritage Plan.* Washington State Department of Natural Resources. 2003. Olympia, Washington.

The 2003 plan is the update to the 2001 plan, which is included on the Commission's list of comprehensive plans. This plan provides the framework for the state's natural areas program. A natural area is defined as "any tract of land or water which supports high quality examples of terrestrial or aquatic ecosystems, habitats and populations of rare or endangered plant or animal species, or unique geologic features, and is managed specifically to protect those examples."

No portion of the Lewis River Project is within a designated natural area and it is not anticipated that Alternative D will have any affect on a natural area. The Lewis River Projects are consistent with this comprehensive plan.

10. *Washington Outdoors: Assessment and Policy Plan, 1995-2001.* Washington State Interagency Committee for Outdoor Recreation. 1995. Tumwater, Washington.

This plan is a component of the SCORP program. It provides an inventory of lands and facilities operated for public recreational use and analyzes how well recreation providers are keeping up with demands for recreation resources and opportunities. The plan is used by public land managers in their attempts to supply outdoor recreation diversity in the state. The plan is updated every 5 years. In this update, the Interagency Committee for Outdoor Recreation conducted no new surveys because it was determined that data and participation projections from the prior plan remained valid.

The 1990-1995 report forecasted regional demand for specific recreational opportunities between 1987-2000. It indicated that, at that time, the geographic region that includes the Lewis River Projects was the destination for more recreation demand than any other region, with the exception of camping.

The plan outlines a state policy that encourages the "private sector to contribute needed recreation opportunities." Alternative D includes provisions to accommodate and manage increased recreational use in the vicinity of the Lewis River Projects, which is consistent with the objectives of this plan. Alternative D also provides for enhancements to existing trails, campgrounds and water recreational resources, as well as increased access to existing facilities.

11. *Application of Shoreline Management to Hydroelectric Developments.* Washington State Department of Ecology, Shorelands and Coastal Zone Management Program. 1986. Olympia, Washington.

This document indicates that many actions entailing ground disturbance within 200 feet of a waterway should comply with the shoreline management regulations from the appropriate county government. The Applicants will work with the counties in implementing measures under new FERC license orders. Therefore, actions implemented under Alternative D would be consistent with this comprehensive plan.

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