3.0 ALTERNATIVES

To adhere to the CEQ regulations for complying with the NEPA (at 40 CFR Part 1502.14), the EIS must evaluate reasonable alternatives. This EIS compares the environmental impacts of the proposed action against a range of alternatives.

Each of the cooperating agencies with obligations under NEPA can use this alternatives analysis as part of their decision making process. Individual agencies would ensure consistency with their own administrative procedures prior to accepting the recommendations in this EIS.

In accordance with the NEPA and Commission policy, we have evaluated a number of alternatives to the JCE & PCGP Project to determine if any are reasonable and environmentally preferable to Jordan Cove's and Pacific Connector's proposed action. Alternatives considered, which are described in more detail below, include the No Action Alternative, system alternatives, LNG terminal alternatives, pipeline route alternatives, and aboveground facilities alternatives.

Alternatives were evaluated against the purpose and objectives of the JCE & PCGP Project, as described in section 1.3 of this EIS. Jordan Cove's primary objective is to construct and operate a West Coast terminal that can export up to 6 MMTPA of LNG to overseas markets. Pacific Connector's primary objective is to transport at least 0.9 Bcf/d of natural gas to the Jordan Cove terminal, from western Canadian and Rocky Mountain sources received at the Malin hub. In addition, Pacific Connector could service customers in southern Oregon through an interconnection with Northwest's existing Grants Pass Lateral.

The FERC's evaluation criteria for selecting alternatives include whether they:

- are technically and economically feasible, reasonable, and practical;
- offer a significant environmental advantage over the proposed action; and
- have the ability to meet the objectives of the Project.

With respect to the first criterion, it is important to recognize that not all conceivable alternatives are technically and economically feasible and practical. Some alternatives may be impracticable because they are unavailable and/or incapable of being implemented after taking into consideration costs, existing technologies, and the overall Project purpose. In assessing route alternatives, the pipeline must be buildable and safe.

For pipeline route alternatives, in most cases we used desktop data for comparisons, including USGS topographic quadrangle maps, aerial photography, NWI maps, site file searches, and literature reviews. However, in some cases, where a previously proposed route is now an alternative, Pacific Connector may have conducted on-the-ground environmental surveys. We requested additional surveys for the Blue Ridge Alternative (see section 3.4.2.2) due to comments received on the DEIS. While the raw data were collected by the applicants, the FERC staff and cooperating agencies performed the alternatives analyses, which included validation of data supplied by the applicants.

The narrative below explains why a particular alternative was found to be environmentally preferable. In conducting a reasonable analysis, we considered environmental advantages and disadvantages, and focused the assessment on those alternatives that may minimize impacts on specific resources. In general, shorter is better. One mile of a 95-foot-wide corridor would impact about 12 acres. Other elements that may influence the selection of an alternative route included the avoidance of historic properties or habitat for federally-listed threatened or

endangered species, reduction of crossings of waterbodies or wetlands, minimization of impacts to LSRs and Riparian Reserves, avoidance of geological hazards, distances from residences, and lessening of forest clearing, or impacts on agricultural land and specialty crops. In some cases, there were tradeoffs between environmental resources identified during analyses of route alternatives, as minimization of impacts on one suite of resources had to be compared to increased impacts on a different set of resources.

We considered a range of alternatives in light of the Project's objectives, feasibility, and environmental consequences. Each alternative is considered until it is clear that the alternative would not satisfy one or more of the evaluation criteria.

3.1 NO ACTION ALTERNATIVE

3.1.1 Federal Energy Regulatory Commission's No Action Alternative

If the Commission denies the application or the applicants choose to not construct the Project (the No Action Alternative), the objectives of the proposed Project would not be met and the resource impacts disclosed in this EIS would not occur. However, the selection of the No Action Alternative could result in the use or expansion of other existing or proposed LNG facilities and associated interstate natural gas pipeline systems, or the construction of new infrastructure to meet the objectives of this proposed Project (i.e., to make natural gas available for export to Asian as well as Hawaiian and Alaskan markets). In section 3.2 below, we examine natural gas and LNG system alternatives. Any expansion of existing systems or construction of new facilities would result in specific environmental impacts that could be less than, similar to, or greater than those associated with the proposed Project.

3.1.2 Federal Land Management Agencies' No Action Alternative

The BLM and Forest Service alternatives are specific to agency actions as they pertain to the FERC's proposed route and the No Action Alternative. The No Action Alternative is the same for each of the affected BLM Districts and National Forests with respect to amendment of LMPs. Under the No Action Alternative, the RMPs of the Coos Bay, Roseburg, Medford, and Klamath Falls Resource Area of the Lakeview District and the LRMPs of the Rogue River, Umpqua, and Winema National Forests would not be amended to make provision for the Project. Under the No Action Alternative, the Forest Service would not consent to the BLM to grant an easement since construction of the Project would not be consistent with the National Forest LRMPs. The BLM would not issue a Right-of-Way Grant for the Project because the Project would not be a conforming use of federal land. Under the No Action Alternative, there would be no need for Reclamation to concur with BLM with respect to issuance of a Right-of-Way Grant.

Because the application for a Right-of-Way Grant for the Project involves lands managed by two or more federal agencies, the BLM is the lead agency for issuance of the Right-of-Way Grant for occupancy of federal lands under the provisions of the FLPMA. BLM may not issue the grant until the designated federal officials administering the federal lands involved have concurred with issuance. Where concurrence is not reached, the Secretary of the Interior, after consultation with these agencies, may issue the grant, but not through lands within a federal reservation where doing so would be inconsistent with the purposes of the reservation (43 CFR 2884.26). Under the No Action Alternative, the Secretary of the Interior could issue the Right-of-Way Grant without the concurrence of the BLM, Forest Service, and Reclamation if the Secretary determined the Project was not inconsistent with the purposes of the reservations.

3.1.3 U.S. Army Corps of Engineers' No Action Alternative

There are three scenarios that the COE would consider under the No Action Alternative. The first would be that no COE permit would be necessary under the RHA and Section 404 of the CWA because no wetlands or waters of the U.S. would be crossed or affected. Under the second scenario, other alternatives would be adopted so that impacts on aquatic resources would be avoided, as in the case where the pipeline route would be entirely moved to upland locations. The third scenario would be that the Project would not be authorized or would not be built or operated.

3.1.4 Renewable Energy Alternatives

Commenters[1] have suggested that the Project could be replaced by renewable energy resources alternatives. Renewable energy resources include, but are not limited to, wind power, solar power, tidal power, and hydropower. All of these alternatives represent alternative means of producing electrical power. Because the Project's purpose is to prepare natural gas for export to overseas markets, the development or use of renewable energy technology domestically would not be a reasonable alternative to the proposed action.

3.2 SYSTEM ALTERNATIVES

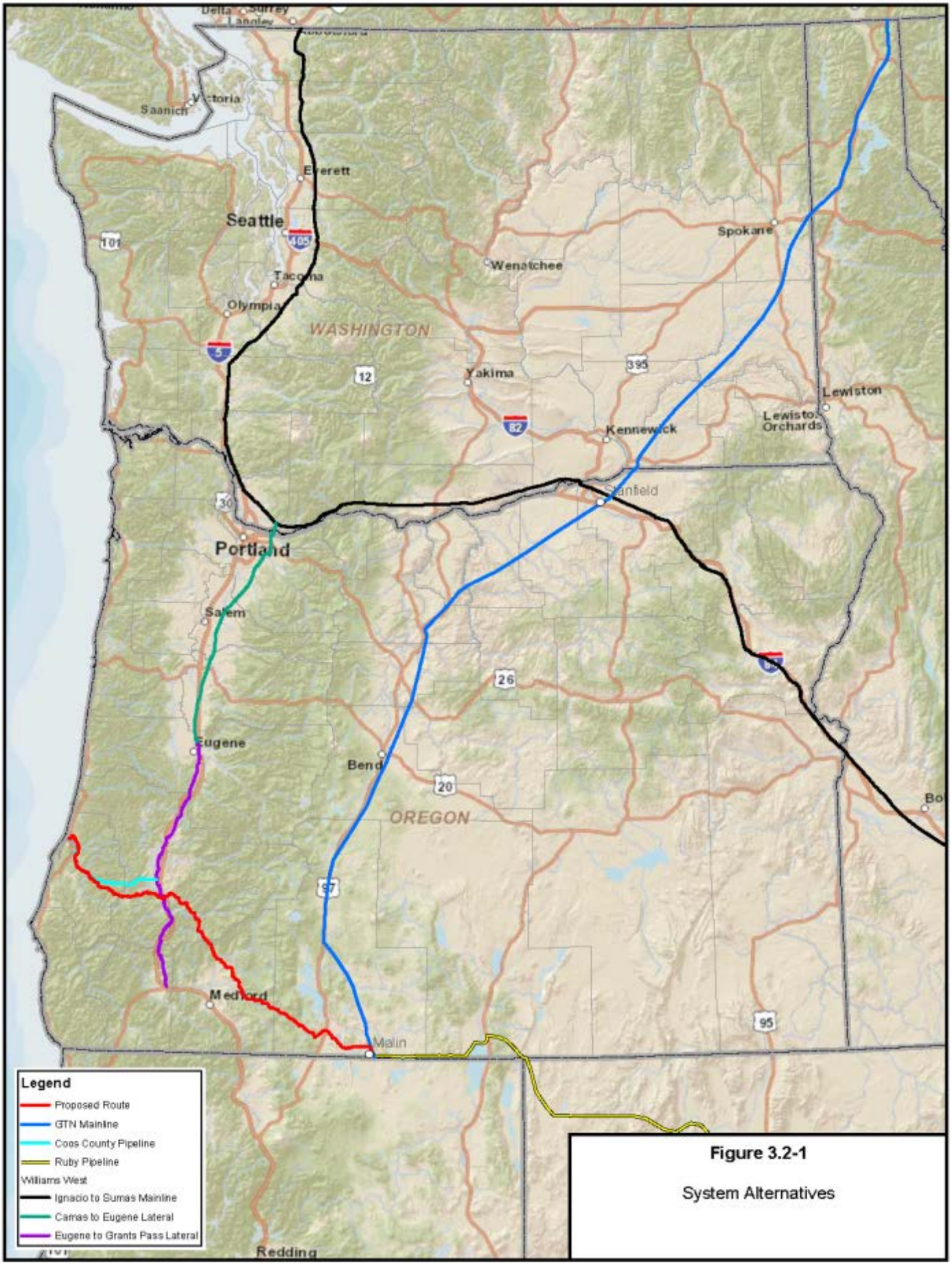
System alternatives could make use of other existing or proposed pipelines and LNG facilities to meet the objectives of the proposed Project. We reviewed system alternatives to evaluate the ability of other existing, modified, approved, planned, or proposed facilities to meet the stated objectives of the project and to determine if a system alternative exists that would have less significant adverse environmental impacts than those associated with the project.[2] The status identified for each system alternative (e.g., planned, proposed, or approved) is current as of the time this EIS is written, and is subject to change over time. Our analyses of system alternatives for the proposed pipeline and LNG facilities are presented in sections 3.2.1 and 3.2.2, respectively. By definition, implementation of a system alternative would make construction of all or some of the proposed facilities unnecessary; conversely, infrastructure additions or other modifications to the system alternative may be required to increase capacity or provide receipt and delivery capability consistent with that of the proposed facilities. Such modifications may result in environmental impacts that are less than, comparable to, or greater than those associated with construction and operation of the proposed facilities.

3.2.1 Pipeline System Alternatives

Existing pipeline system alternatives would involve the use of all or portions of other natural gas transmission systems in lieu of construction of the proposed Pacific Connector pipeline. Existing natural gas pipelines in southwestern Oregon include jurisdictional interstate transportation systems operated by Northwest, GTN, and Ruby, and the non-jurisdictional intrastate Coos County Pipeline. These existing pipelines are illustrated on figure 3.2-1, and are further discussed below. As the narrative discussion below explains, we did not find any existing pipeline systems that could replace the proposed Pacific Connector pipeline, and did not identify any existing systems that could be considered reasonable, feasible, or practicable alternatives to the proposed Project, and none that could achieve the Project objectives with significantly fewer environmental impacts.

[1] See, for example, the October 30, 2012, filing in this proceeding by Citizens Against LNG.

[2] Proposed projects are projects for which the proponent has submitted a formal application to the FERC; planned projects are projects that are either in pre-filing or have been announced, but have not been proposed.


Legend
Proposed Route
GTN Mainline
Coos County Pipeline
Ruby Pipeline
Williams West
Ignacio to Sumas Mainline
Camas to Eugene Lateral
Eugene to Grants Pass Lateral
Seattle
Everett
Spokane
Wenatchee
Tacoma
Olympia
WASHINGTON
Yakima
Kennewick
Lewiston
Portland
Salem
Eugene
Bend
OREGON
Medford
Malin
Redding
Figure 3.2-1
System Alternatives

Northwest is a 3,900-mile-long bi-directional transmission system crossing the states of Washington, Oregon, Idaho, Wyoming, Utah, and Colorado. This system provides access to British Columbia, Alberta, Rocky Mountain, and San Juan Basin natural gas supplies. The Northwest system has a peak design capacity of 3.4 Bcf/d (Williams Northwest Pipeline 2008). Northwest's Grants Pass Lateral extends from Eugene to Grants Pass, Oregon, roughly parallel to the route of I-5. The lateral includes 131 miles of 16-inch and 10-inch-diameter pipelines. Pacific Connector indicated that Northwest's Grants Pass Lateral does not have the capacity to deliver the volumes necessary to meet its Project objectives. Nor does the Grants Pass Lateral traverse from near the Malin hub, where available volumes of western Canadian and Rocky Mountain natural gas supplies could be accessed. Therefore, the Grants Pass Lateral does not have the ability to meet the objectives of the Project and we have not evaluated it any further in our analysis of pipeline system alternatives. However, we have examined the route of the Grants Pass Lateral as a partial pipeline route alternative in section 3.4.1 of this EIS.

The GTN system includes 612 miles of pipeline beginning at Kingsgate, British Columbia, traversing through northern Idaho, southeastern Washington, and central Oregon, and terminating near Malin, Oregon (where it interconnects with Tuscarora and PG&E lines). Natural gas for the GTN pipeline originates primarily from western Canadian supplies; although it can receive Rocky Mountain gas through interconnections with Northwest near Spokane and Palouse, Washington and Stanfield, Oregon. The GTN system can transport about 2.9 Bcf/d (GTN 2008).

The Ruby pipeline was constructed by the El Paso subsidiary of Kinder Morgan, Inc., extending about 680 miles from near Opal, Wyoming, to Malin, Oregon. The 42-inch-diameter pipeline, placed into service in July 2011, has a capacity of about 1.5 Bcf/d at an operating pressure of 1,440 psig. The purpose of the pipeline is to transport Rocky Mountain gas to markets in southern Oregon, northern Nevada, and northern California. At Malin, Ruby interconnects with Tuscarora and PG&E. It was reported in September 2013 that deliveries from Ruby were down to an average of 684 million cubic feet per day (MMcf/d).

Neither GTN nor Ruby can meet the proposed Pacific Connector pipeline objectives. Both GTN and Ruby terminate at Malin. The purpose of Pacific Connector is to extend a pipeline between Malin and Coos Bay to the Jordan Cove terminal. Any expansions of the GTN or Ruby pipelines to Coos Bay would have similar environmental impacts to the Pacific Connector pipeline.

There is an existing non-jurisdictional 12-inch-diameter pipeline that extends some 60 miles, over the Coast Range, from the Northwest Grants Pass lateral, near Roseburg, to Coos Bay. This pipeline was constructed by Coos County and is operated by Northwest Natural as a local distribution company (LDC). The Coos County Pipeline has a MAOP of 1,000 psig and was designed to bring gas to the communities around Coos Bay. The terminus of the Coos County Pipeline is approximately 7.7 miles south of the proposed Jordan Cove LNG terminal. Northwest Natural built a line from the terminus of the Coos County pipeline across Coos Bay to the North Spit, as part of its LDC system. LDCs are intrastate systems that are regulated by the state, and do not come under the jurisdiction of the FERC.

It is possible that the Coos County Pipeline could be converted into a jurisdictional facility, and used as a system alternative to the proposed Pacific Connector pipeline, assuming the necessary modifications were made to the Coos County Pipeline to allow gas flow to the Jordan Cove LNG

terminal from Northwest's Grants Pass Lateral. However, the maximum gas flow through the Coos County Pipeline would be a very small fraction of the capacity required for the proposed Jordan Cove LNG terminal. At a normal operating pressure of 600 psig on Northwest's Grants Pass Lateral, the maximum volume of natural gas that can be transported on the Coos County Pipeline to the city of Coos Bay and on the Northwest Natural pipeline to the North Spit is 0.018 Bcf/d at a delivery pressure of 554 psig. At an operating pressure of 800 psig on Northwest's Grants Pass Lateral, the maximum volume of natural gas that can be transported on the Coos County Pipeline to the city of Coos Bay and on Northwest Natural's pipeline to the North Spit is 0.036 Bcf/d at a delivery pressure of 680 psig. Because the diameter and available capacity of the Coos County Pipeline are too small, it could not meet the objectives of the Project.

3.2.2 LNG System Alternatives

For an LNG system alternative to be viable, it must be technically and economically feasible, as well as offer a significant environmental advantage over the proposed project. In the case of the Jordan Cove Project, it must also be compatible with Jordan Cove's contractual agreements for LNG export. Jordan Cove is proposing to export LNG to FTA and non-FTA countries. The volume of gas for FTA and non-FTA countries has already been approved by the DOE (and therefore is determined to be in the public interest). The other approved, planned, or proposed LNG export facilities have also either obtained or applied for DOE approval for the export of LNG associated with the production capacity in the respective project plans/proposals. Therefore, for Jordan Cove's customers to obtain LNG from other facilities that have DOE approval for export, those facilities would need to construct additional liquefaction facilities to meet the export capacity proposed by Jordan Cove, and as approved by the DOE authorizations. We recognize that liquefaction capacity may not be fully subscribed at all facilities based on contracts executed as of the writing of this EIS. However, because the DOE's export approval is a determination that the export is in the public interest, we will not speculate that any portion of other LNG terminals' liquefaction capacity is in "excess" or available for use by Jordan Cove to meet its project objectives.

An expansion of existing facilities would need a similar scope of pre-treatment and liquefaction facilities and possibly additional storage and marine transfer facilities, while any new facility would need a similar scope of pre-treatment, liquefaction, storage, and marine transfer facilities. These additional facilities would result in environmental impacts that are less than, equal to, or greater than the environmental impacts of the proposed facility and may not provide a significant environmental advantage over the proposed project. Each of the planned, proposed, or authorized projects described in sections 3.2.2.1 to 3.2.2.4 was considered as a potential system alternative (see section 4.13 for additional information on project locations). Our analysis was predicated on the assumption that each project has an equal chance of being constructed and would therefore be available as a potential alternative. However, future Commission review and market forces would ultimately decide which and how many of these facilities are built.

3.2.2.1 LNG Terminals on the U.S. Gulf and East Coasts

There are nine existing on-shore FERC-jurisdictional LNG import terminals on the East Coast and Gulf Coast of the United States.[3] The FERC has approved the conversion of five of the existing terminals to export LNG (Cheniere Sabine Pass [Docket No. CP11-72-000], Sabine Pass Liquefaction [in Docket No. CP13-552-000], and Cameron-Hackberry [Docket Nos. CP13-25-000 and CP13-27-000] in Louisiana; Freeport LNG Development on Quintana Island [Docket Nos. CP12-29-00 and CP12-509-000] in Texas; and Dominion Cove Point in Maryland [Docket No. CP13-113-000]), and authorized a new LNG export terminal in Corpus Christi, Texas (Cheniere in Docket No. CP12-507-000). There are four formal applications currently under review by the FERC for LNG export terminals along the Gulf Coast or East Coast (Golden Pass-Sabine Pass [Docket No. CP14-517-000] in Texas; Trunkline-Lake Charles (CP14-120-000) and Magnola-Lake Charles (CP14-347-000) in Louisiana; and Elba Island in Georgia (CP14-103-000).[4] As of April 2015, there were 10 newly proposed LNG export terminals currently under review through the FERC's pre-filing process along the Eastern and Gulf Coasts (Downeast LNG [PF14-19-000] in Maine;Eagle LNG [PF15-7-000] in Jacksonville, Florida; CE FLNG [PF13-11-000], Louisiana LNG [PF14-17-000], and Venture Global [PF15-2-000] in Louisiana; Gulf LNG [PF13-4-000] in Mississippi; and Port Arthur LNG [PF15-18-000], Texas LNG-Brownsville [PF15-14-000], Annova LNG-Brownsville [PF15-15-000], and Rio Grande LNG-Brownsville [PF15-20-000] in Texas).

As stated above, each of these planned, proposed, or authorized projects on the U.S. Gulf and East Coasts was considered as a potential system alternative. An expansion of existing facilities would need a similar scope of pre-treatment and liquefaction facilities and possibly additional storage and marine transfer facilities, while any new facility would need a similar scope of pre-treatment, liquefaction, storage, and marine transfer facilities. These additional facilities would result in environmental impacts that are less than, equal to, or greater than the environmental impacts of the proposed facility and may not provide a significant environmental advantage over the proposed project. Our analysis was predicated on the assumption that each project has an equal chance of being constructed and would therefore be available as a potential alternative. However, future Commission review and market forces would ultimately decide which and how many of these facilities are built.

3.2.2.2 Existing LNG Terminals on the West Coast of North America

Alaska

There is only one existing onshore LNG export terminal on the West Coast of North America: the plant located on the Kenai Peninsula Borough, Alaska. This facility was constructed in 1969 and lately was being operated by ConocoPhillips Natural Gas Corporation and Marathon Oil Company to export LNG primarily to Japanese markets. However, it was recently shuttered, due to declining natural gas reserves and wellhead deliverability in the Cook Inlet region.

[3] The existing LNG import terminals on the East Coast and Gulf Coast of the United States are: Everett, Massachusetts; Cove Point, Maryland; Elba Island, Georgia; Pascagoula, Mississippi; Sabine , Louisiana; Cameron, Louisiana; Lake Charles, Louisiana; Sabine Pass, Texas; and Freeport, Texas.

[4] Golden Pass-Sabine Pass, Trunkline-Lake Charles and Elba Island are existing LNG import terminals, while Excelerate-Lavaca, and Magnola-Lake Charles would be new facilities.

Because the export authorization for Kenai expired on March 31, 2013, ConocoPhillips recently submitted two applications to the DOE. One was for a blanket (two-year) authorization to export LNG to FTA nations. This was approved in DOE/FE Order No. 3392 on February 19, 2014. The second application was for a blanket (two-year) authorization to export LNG to non-FTA nations. This was approved in DOE/FE Order No. 3418 on April 14, 2014.

Mexico

There are two existing LNG import terminals on the West Coast of Mexico. One is known as Costa Azul LNG, located about 14 miles north of Ensenada, Baja Mexico. Owned by Sempra Energy, this import terminal started operations in May 2008. It has the capacity to send out about 1 Bcf/d of natural gas, intended to supply customers in northwest Mexico.

The other LNG import terminal on the West Coast of Mexico is farther south, at the port of Manzanillo. This terminal, jointly owned by Samsung C&T, Mitsui Trading, and Korea Gas, went into operation in 2012, and has the capacity to take in 3 million tons of LNG per year.

Sempra Energy has recently entered into an MOU with Pemex, the Mexican government owned oil and gas company, to develop a natural gas liquefaction project at the existing Costa Azul terminal. It may be possible to liquefy 2.5 Bcf/d at Costa Azul for export. However, the natural gas would come from Mexican sources developed by Pemex.

As stated above, each of the existing projects on the U.S. West Coast was considered as a potential system alternative. An expansion of existing facilities would need a similar scope of pre-treatment and liquefaction facilities and possibly additional storage and marine transfer facilities, and these additional facilities would result in environmental impacts that are less than, equal to, or greater than the environmental impacts of the proposed facility and may not provide a significant environmental advantage over the proposed project.

3.2.2.3 Existing LNG Storage Facilities in the Pacific Northwest

Four LNG storage facilities currently exist in the Pacific Northwest. These are peak shaving plants that liquefy natural gas, store it as LNG, and then vaporize the LNG back into natural gas for use during periods of peak demand.

In Oregon, Northwest Natural owns and operates two peak shaving LNG storage plants. One is located in Portland, and has a 28,000 m^3 tank with a storage capacity of 600 MMcf/d. The other is located in Newport and has a 48,000 m^3 tank and a storage capacity of 1.0 Bcf/d. In Washington, Northwest owns and operates a peak shaving LNG storage plant in Plymouth with a liquefaction capacity of 19.7 MMcf/d, a storage capacity of 60,000 m^3, and a vaporization capacity of 300 MMcf/d. In Gig Harbor, Washington, Puget Sound Energy (PSE) operates a small LNG peak shaving plant with a capacity of 31 Bcf, and a maximum withdrawal rate of 3 Bcf/d.

We considered the possibility of converting one of the existing peak shaving LNG storage plants into an LNG export terminal as a system alternative to the proposed Project. The Northwest Plymouth, Washington peak shaving plant is located on the Columbia River, but is upriver of several dams, and so it would not be accessible to LNG vessels. The PSE peak shaving plant at Gig Harbor, Washington is located about 1 mile from the harbor and would not be accessible to LNG vessels. While it may be feasible to construct a pipeline to transmit LNG from the harbor to the PSE peak shaving facility, such a pipeline would have additional associated environmental

impacts. The Northwest Natural Portland, Oregon peak shaving plant is located on the Willamette River and would potentially be accessible to LNG vessels. However, the waterway for LNG marine transit would be over 100 miles long and the navigation channel is obstructed by a bridge at Ross Island that only has clearances of 120 feet high and 100 feet wide. The Northwest Natural Newport, Oregon, peak shaving plant is on the coast; however, the port of Newport is relatively small, with channel depths ranging from 20 to 30 feet. The port at Newport could not accommodate LNG vessels without extensive dredging. Therefore, we conclude that converting any of the existing peak shaving LNG storage plants in the Pacific Northwest into LNG export terminals would not provide a significant environmental advantage to the proposed Project.

3.2.2.4 Proposed West Coast LNG Export Terminals

There are current proposals to construct LNG export terminals in British Columbia, Canada, and Alaska and Oregon in the United States. These other alternative LNG export proposals are in various stages of planning and review, as discussed below.

Proposed LNG Export Terminals in Oregon

There is one other proposed LNG terminal in Oregon, near Warrenton, in Clatsop County. On October 10, 2008, LNG Development Company LLC and the Oregon Pipeline Company (hereafter referred to together as Oregon LNG), filed applications with the FERC under Docket Nos. CP09-6-000 and CP09-7-000. In July 2012, Oregon LNG re-initiated the FERC's pre-filing environmental review process in Docket No. PF12-18-000, to modify its pending LNG terminal to a bi-directional facility that would also be capable of exporting LNG, with a revised pipeline route. At the same time, a companion proposal was submitted by Northwest for its Washington Expansion Project (WEP) in Docket No. PF12-20-000, to supply natural gas to the Oregon LNG terminal. On June 7, 2013, Oregon LNG filed formal applications with the FERC in Docket Nos. CP09-6-001 and CP09-7-001 for its proposed import/export terminal and its associated pipeline to connect to the Northwest system. On June 25, 2013, Northwest filed its formal application with the FERC in Docket No. CP13-507-000 for its WEP.

On May 31, 2012, Oregon LNG received DOE approval to export up to 9.6 MMTPA of LNG (equivalent of 1.3 Bcf/d of natural gas) to FTA nations in FE Docket No. 12-48-LNG. Oregon LNG received permission from DOE to export LNG to non-FTA nations on July 31, 2014, in FE Docket No. 12-77-LNG.

The Oregon LNG terminal would be located on the East Skipanon Peninsula, at about Columbia River Mile 11.5. Oregon LNG's proposed marine facilities would include a 135-acre turning basin in the Columbia River. The associated berth would be designed to handle one LNG vessel at a time, located in water now about 30 feet deep at MLLW. Oregon LNG anticipates that its terminal would be visited by about 125 LNG vessels per year. The turning basin and berth would have to be dredged to a maximum of -48 feet MLLW, requiring the removal of about 1.2 mcy of material. Oregon LNG proposes to dispose of the dredged material at the EPA Deepwater Site about 9 nautical miles southwest the mouth of the Columbia River. The berth would be connected to the onshore facilities via a 2,128-foot-long trestle, including a roadway and an LNG transfer pipeline.

Onshore, the LNG terminal facilities would occupy 74 acres within a 96-acre tract controlled by Oregon LNG. The terminal facilities would include a feed gas pretreatment plant, two liquefaction trains capable of producing 4.5 MTPY of LNG each, and two 160,000 m^3 LNG storage tanks. The terminal would also have a vaporization system consisting of shell and tube heat exchangers, with a natural gas sendout capacity of 0.5 Bcf/d.

Oregon LNG would install a new 36-inch-diameter 86.8-mile-long natural gas bidirectional pipeline to connect the LNG terminal with the Northwest system near Woodland, Washington. The proposed pipeline would have a capacity of 1.25 Bcf/d of natural gas. The route would cross through Clatsop, Tillamook, and Columbia Counties, Oregon, and Cowlitz County, Washington, with about 11 percent (9.9 miles) following existing right-of-ways for roads, railroads, and powerlines. Aboveground facilities would include a meter station at the LNG terminal, another at the interconnection with Northwest, and a single 48,000 hp electric-drive gas compressor station within a 19-acre tract at about MP 80.9.

Northwest proposes to construct and operate about 141 miles of 36-inch-diameter pipeline looping for its WEP. The loops would be divided into 10 segments, adjacent to Northwest's existing pipeline system between Sumas and Woodland, Washington, and would cross portions of Whatcom, Skagit, Snohomish, King, Pierce, Thurston, Lewis, and Cowlitz Counties. In addition, Northwest would modify five existing compressor stations (Sumas, Mt. Vernon, Snohomish, Sumner, and Chehalis) to add a total of 96,000 hp. A new meter station would be installed at the Sumas Compressor Station, and new MLVs and launchers and receivers would be put in at 35 locations. The WEP could provide about 750,000 dekatherms per day in incremental transportation capacity on Northwest's system between Sumas and Woodland.

On August 5, 2015, the FERC issued a draft EIS for the Oregon LNG Project and the Northwest WEP. It does not appear that the Oregon LNG Project and Northwest WEP would have significant environmental advantages over the JCE & PCGP Project. Construction of the Oregon LNG terminal would affect about 1,427 acres, while construction of the associated pipeline and related facilities would impact about 1,198 acres. Construction of the WEP would disturb about 2,052 acres. Like the JCE & PCGP Project, both the Oregon LNG Project and the WEP are located in the vicinity of the Cascadia Subduction Zone (CSZ), and the pipeline routes on steep slopes may be susceptible to landslides, so geological hazards would require mitigation. The Oregon LNG pipeline would cross 184 waterbodies, and 340 wetlands totaling 387 acres. The WEP would cross 271 waterbodies, and construction would affect about 177 acres of wetlands. Construction of the Oregon LNG terminal would remove about 25 acres of forest, while construction of the associated pipeline would clear about 930 acres of forest. Construction of the WEP would affect about 349 acres of forest. The Oregon LNG Project may affect 38 federally listed threatened or endangered species, including 8 marine mammals, 4 sea turtles, 16 fish species, 4 birds, 1 upland mammal, 1 upland invertebrate, and 3 upland plant species. The WEP may affect 18 federally listed threatened or endangered species, including 4 fish species, 1 amphibian, 4 birds, 2 mammals, and 4 plant species. Along the route of the Oregon LNG pipeline, 6 archaeological sites were identified, while along the WEP facilities 16 previously recorded sites and 5 newly recorded sites were identified.

Proposed LNG Export Terminals in British Columbia, Canada

Limited information is available regarding 19 LNG export projects being considered in British Columbia (table 3.2.2.4-1).

TABLE 3.2.2.4-1.

Canadian Projects Under Consideration

Project	Terminal Location	Gas Source	Permit Status	Output (Bcf/d)
Douglas Channel LNG Project	Douglas Island (barge based), near Kitimat, B.C.	Western Canada	Approved	0.95
Cedar LNG Project	Near Kitimat, B.C.	Western Canada	Under Review	1.85
LNG Canada Project	Port Edward, Prince Rupert Island, B.C.	Western Canada	Starting Process	1.54
Pacific Northwest LNG Project	Lelu Island, near Kitimat, B.C.	Western Canada	Starting Process	0.95
Kitimat LNG Project	Kitimat, B.C.	Western Canada	Approved	0.70
Prince Rupert LNG Project	Ridley Island, near Prince Rupert, B.C.	Western Canada	Under Review	2.69
WCC Ltd.	Tsimshian Peninsula, near Prince Rupert, B.C.	Western Canada	Under Review	3.84
Aurora LNG Project	Digby Island, near Prince Rupert, B.C.	Western Canada	Under Review	3.07
Woodside Energy LNG	Grassy Point, near Prince Rupert, B.C.	Western Canada	Under Review	2.56
NewTimes Energy Ltd.	Prince Rupert area, B.C.	Western Canada	Under Review	1.54
Orca LNG Project	Prince Rupert area, B.C.	Western Canada	Under Review	3.07
WesPac LNG Project	Fraser River, near Vancouver, B.C.	Western Canada	Under Review	0.38
Steelhead LNG Project	Sarita Bay, Vancouver Island, B.C.	Western Canada	Under Review	3.07
Woodfibre LNG Project	Near Squamish, B.C.	Western Canada	Under Review	0.27
Canada Stewart Energy Project	Stewart, B.C.	Western Canada	Under Review	3.84
Discovery LNG Project	Campbell River, Vancouver Island, B.C.	Western Canada	Preliminary Stage	2.56
Kitsault Energy Project	Kitsault, B.C.	Western Canada	Preliminary Stage	2.56
Triton LNG Project	Floating facility – TBD near Kitimat or Prince Rupert, B.C.	Western Canada	Preliminary Stage	0.29
Watson Island LNG	Watson Island, near Prince Rupert, B.C.	Western Canada	Unknown	Unknown

Like the Jordan Cove Project, the proposed British Columbia LNG export terminals would be located on the Pacific Coast of North America, and could potentially serve markets in Asia, as well as customers in Hawaii and Alaska. The main source of the natural gas for the British Columbia terminals would be from the Canadian province of Alberta. There are unresolved environmental, construction-related, and monetary issues regarding building new pipelines over the Canadian Rockies from the gas-producing regions in the interior to the terminals located on the coast. In addition, there are regulatory and First Nation issues that are unique to Canada. The timeframe for obtaining permits and constructing facilities so that the British Columbia LNG export terminals could operate is still unclear.

Proposed LNG Export Terminals in Alaska

Alaska LNG

On September 5, 2014, Alaska LNG filed an application with the FERC to begin the environmental and safety review needed for federal authorization to build their project (PF14-21-000). The project sponsors are North Slope producers ExxonMobil, ConocoPhillips, and BP, as well as pipeline company TransCanada and the State of Alaska. The project includes a facility to

cleanse produced gas of carbon dioxide and other impurities; an approximately 800-mile pipeline from Alaska's North Slope to the liquefaction plant; and an LNG plant, storage, and shipping terminal at Nikiski, 60 air miles southwest of Anchorage along Cook Inlet.

The 42-inch-diameter pipeline would be built to carry 3.0 to 3.5 Bcf/d of natural gas. Alaskans would use some of this gas, and running the pipeline and LNG plant would consume some. The plant would have the capacity to make up to 20 MMTPA of LNG, processing 2.5 Bcf/d of gas. The pre-front-end engineering design (FEED) is expected to be completed in late 2015 or 2016.

The Alaska LNG Project is still in FERC's pre-filing review. A formal application has not yet been filed with the FERC. Nor has the FERC produced a draft EIS for that project, so we do not know all of the environmental impacts associated with the construction and operation of that project. The Alaska pipeline would be about 570 miles longer than the Pacific Connector pipeline.

Alaska Gasline Port Authority LNG Project

In July 2012, the Alaska Gasline Port Authority (AGPA) filed for DOE approval to export approximately 2.5 Bcf/d of LNG to FTA nations. The AGPA is proposing to develop liquefaction facilities and an export terminal in Port Valdez, Alaska. The exact location of this export facility is unknown at this time; however, the AGPA's preferred site for the facility would be in Anderson Bay. The source of the gas for this export facility would be Prudhoe Bay and Point Thomson fields in Alaska's North Slope. Per an information request by the DOE, AGPA has stated that "a process was in place for construction of a pipeline to deliver gas to Port Valdez." Following AGPA's response to the DOE information request, DOE found that AGPA's FTA application was deficient and therefore was dismissed without prejudice on March 7, 2013. AGPA may re-file at a future time; however, no application has been submitted to date.

Lacking a current application, the AGPA inherently cannot meet all of the objectives of the proposed Jordan Cove LNG Project and therefore is not a reasonable alternative.

3.3 LNG TERMINAL ALTERNATIVES AT COOS BAY

The Project applicant selects the location of its facilities. The FERC then conducts an environmental review of that location, and compares the proposed facilities against other identified feasible and reasonable alternatives to determine if any alternative may be environmentally preferable.

3.3.1 Regional Review of Potential Ports on the Continental West Coast

An alternative port location along the West Coast of the continental United States could meet one of the primary goals of the Jordan Cove Project. However, that alternative terminal location must also be able to receive natural gas from Canadian and Rocky Mountain sources in order to meet one of the other goals of the Project.

Section 3.3 of the FERC's May 2009 FEIS for the import proposal in Docket No. CP07-444-000 explained how Jordan Cove selected the Coos Bay location for its LNG terminal. Jordan Cove's alternative analysis of other West Coast ports was provided in Resource Report 10 (section 10.3.4) of its May 2013 application to the FERC for its current liquefaction project in Docket No. CP13-483-000, and repeated in a filing with the FERC on May 26, 2015, addressing

questions raised by the COE in response to its Section 10 RHA and Section 404 CWA permit application. The selection process is briefly summarized below.

Jordan Cove started by examining seven ports in California, 15 in Oregon, and 17 in Washington. The company then identified ports on the continental West Coast of the United States with deep enough channels for LNG vessels. Jordan Cove indicated that it needed a minimum channel depth of -36 feet MLLW to allow vessels as large as 148,000 m^3 in capacity to reach its terminal. This reduced the potential ports to two in California (Sacramento and Humboldt), six in Oregon (Portland, St. Helens, Port Westward, Wauna, Astoria, and Coos Bay), and seven in Washington (Port Angeles, Port Townsend, Grays Harbor, Aberdeen, Skamokawa, Longview, Kalama, and Vancouver). The next set of criteria included high population densities, and transit restrictions. This brought the pool of potential ports down to five candidates (Gray Harbor, Port Westward, Wauna, Astoria, and Coos Bay).

Lastly, Jordan Cove used a scoring system that resulted in the selection of Coos Bay as the most desirable port. The scoring system included such factors as distance of transit, impacts on existing port users, availability of large enough parcel, and zoning. Port Westward is located about 54 miles up the Columbia River and Wauna is about 40 miles upriver. Another LNG project is proposed near Astoria (Oregon LNG at Warrenton, discussed above in section 3.2.2.4). The site at Gray Harbor would be less than a mile from a general aviation airport (Bowerman Field).

At Coos Bay, Oregon, Jordan Cove found a deep-water port that could accommodate the draft of LNG vessels. The transit for LNG vessels within the waterway would be relatively short: 7.5 miles along the navigation channel to the terminal. There are no obstructions along the waterway. There has been declining commercial shipping at the Port of Coos Bay over the last 20 years, so there would not be significant conflicts with other Port users, and the Port is taking an active role in encouraging the location of an LNG terminal. There are no residences within 1 mile of the proposed terminal. The Jordan Cove property is currently open land zoned for industrial development, and is large enough to accommodate all proposed facilities and the surrounding vapor hazard zone. After reviewing these data, the FERC was unable to identify any other alternative port location on the Northwest Pacific Coast that could meet the objectives of the Jordan Cove Project and that would have significant environmental advantages over Coos Bay.

3.3.2 Coos Bay Terminal Alternatives

3.3.2.1 Sites on the North Spit

Within Coos Bay, Jordan Cove originally looked at four tracts of industrial land on the North Spit as potential LNG terminal locations (figure 3.3-1). No sites were considered by Jordan Cove north of these four areas because the existing railroad bridge across Haynes Inlet would be a constraint to LNG vessels. Jordan Cove's criteria included that the tract be 200 acres in size or larger, and be zoned for industrial use. The sites considered by Jordan Cove as potential locations for its terminal include the following:

Parcel A – Southport Forest Products

This parcel, comprising less than 100 acres, was eliminated from further consideration by Jordan Cove because of its limited size.

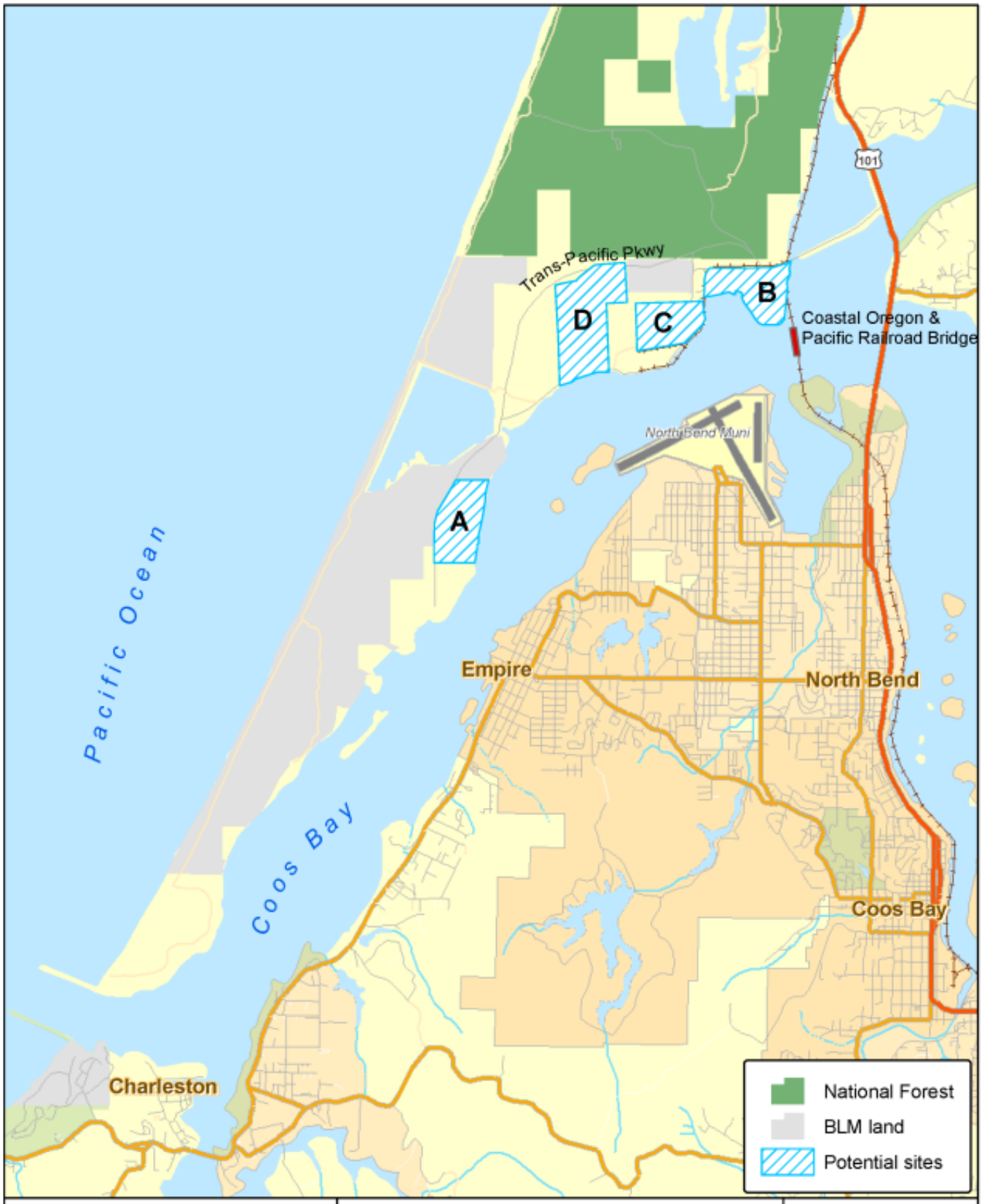


Figure 3.3-1
Potential Coos Bay
Area Project Sites

Parcel B – Former Weyerhaeuser Linerboard Mill

This parcel was once part of the historic Jordan Ranch, dating back to the 1860s. Between 1961 and 2003, it was the site of a mill operated by Menasha and then Weyerhaeuser, which has since been removed. This site is too close to the railroad bridge over Coos Bay at NCM 9 to allow for the creation of an access channel and berth to handle LNG vessels. However, Jordan Cove has acquired this parcel from Weyerhaeuser, and intends to construct and operate its non-jurisdictional South Dunes Power Plant at this location, together with associated facilities and its gas processing plant.

Parcel C – Roseburg Forest Products

The Roseburg Forest Products site is not large enough to accommodate two 160,000 m^3 full containment LNG storage tanks, while maintaining thermal and vapor exclusion zones within the site property and conforming to the property set-back requirements established under National Fire Protection Association (NFPA) 59A. Jordan Cove would locate temporary construction work areas, and a haul road, within the Roseburg tract.

Parcel D – Henderson Ranch/Ingram Yard

Parcel D is Jordan Cove's proposed terminal location. Historically, this tract was part of the Henderson Ranch dating to the 1860s, and is located immediately to the west of the Roseburg property. When this parcel was owned by Weyerhaeuser, it was known as the Ingram Yard and used to store logs for the linerboard mill. During the 1970s, the COE deposited materials dredged from the Coos Bay navigation channel at this site. This parcel was recently purchased by Jordan Cove, and was selected as the site of its liquefaction processing plant and LNG export terminal. The parcel is large enough to contain the proposed marine slip, LNG storage tanks, liquefaction trains, and any vapor released from facilities within property Jordan Cove owns or controls.

Other Coos Bay Potential Sites

D.B. Western has a manufacturing plant located on the North Spit of Coos Bay below the Southport property at NCM 5.6, about 2 miles southwest of the proposed Jordan Cove LNG terminal site. This tract is just south of Parcel A, which is shown on figure 3.3-2. D.B. Western is currently negotiating with potential clients regarding the possibility of serving as a coal depot and overseas shipping terminal. Previously, this concept was pursued by the Port, but its partners dropped out in April 2013. The idea was to transport coal from Montana and Wyoming via railroad to Coos Bay, where it would be stored and then shipped overseas to markets in Asia. D.B. Western has indicated that if it could reach an agreement with the Port and the COE to deepen and widen the Coos Bay navigation channel and build a new access channel and slip for coal ships at its North Spit plant site, it would willing to include a berth for LNG vessels.[5]

As an alternative to its current proposal, Jordan Cove could relocate its LNG export terminal to the D.B. Western property and an adjacent Port tract. The Port owns a parcel of at least 68 acres to the northeast of the D.B. Western plant that Jordan Cove originally sought to use to store materials dredged from Coos Bay during creation of the access channel for its LNG import

[5] The Port's proposed coal depot was discussed in Jeff Barnard, April 1, 2013, "Coos Bay Coal Port's Last Partner Drops Out of Proposal," *Huffington Post*. D.B. Western's plans to revive the coal depot were provided to staff by personal communication on September 20, 2013, with Dennis Beetham, CEO of D.B. Western, Inc.

terminal proposal in Docket No. CP07-444-000. The Port Commercial Sand Stockpile Site was eliminated from the currently proposed LNG export terminal in Docket No. CP13-4830-000, because now Jordan Cove intends to place materials dredged during creation of the access channel to raise the elevation at the site of its South Dunes Power Plant. The Port refers to its currently undeveloped property at NCM 5.7 on the North Spit as the North Bay Marine Industrial Park. We eliminated the D.B. Western and North Bay Marine Industrial Park from further consideration as an alternative site for the LNG terminal because even combined these two tracts are probably not large enough to contain all of Jordan Cove's proposed facilities, including a multi-user slip, storage tanks, liquefaction trains, electric plant, and gas treatment plant.

3.3.2.2 Alternative Marine Slip Design

The COE suggested that we examine the possibility of a smaller marine slip at the Jordan Cove terminal. The COE believes that the size of the marine slip could be reduced because the Coast Guard's WSA and LOR limited the size of LNG vessels calling on the Jordan Cove terminal to not larger than 148,000 m^3 in capacity. The Coast Guard determined that the 800-foot slip width would be needed in order to be able to move an LNG vessel off of the LNG berth on the east side of the slip in the event of an incident within the LNG upland facilities that might threaten the safety of the LNG vessel at berth. Having the 800-foot slip width provides the flexibility needed for tugs to move the LNG vessel away from a potential hazard at the terminal or at the LNG loading dock to the relative safety of the west side of the slip. Therefore, Jordan Cove is currently proposing a single-use slip and access channel that solely supports LNG operations (Memo from Jordan Cove dated February 23, 2015 and filed with the FERC on February 25, 2015).

3.3.2.3 LNG Storage Tank Design Alternatives

Commenters recommended that the LNG storage tanks should be reduced in height, or placed underground, for greater safety, and to reduce their visual impacts. Lower tank heights would be less of an obstruction to aircraft landing or taking off from the Southwest Oregon Regional Airport, where the end of the runways are located about 1.1 miles from the Jordan Cove terminal LNG storage tank locations.

In a filing on August 3, 2015, Jordan Cove explained why it could not lower the height of the proposed LNG storage tanks, or use three smaller tanks instead of two larger ones. The required 320,000 m^3 in total LNG storage capacity necessary for the economic viability of the Project established the tank aspect ratio (height/diameter). The tank diameter was set by the maximum acceptable radiation isopleth that can be contained within the Jordan Cove property lines. If a shorter tank were to be used, it would need to be of a greater diameter in order to hold the required 160,000 m^3 of LNG per tank. However, increasing the diameter of an LNG tank would enlarge the radiation isopleth to extend beyond the Jordan Cove property boundary. In order to meet DOT requirements, the extent of vapor modeled must be contained within land owned or controlled by Jordan Cove (see section 4.13). Increasing the number of LNG storage tanks from two to three creates the same radiation problem due to requirements for tank spacing and the limitations of real estate owned or controlled by Jordan Cove. The two 160,000 m^3 LNG storage tanks have been designed to fit within the long and narrow Ingram Yard terminal site.

While burying tanks is an established technique in many parts of the world, local soils and geologic conditions determine the feasibility of such an approach at the Jordan Cove terminal. In the case of the Ingram Yard tract, the geotechnical investigation, performed to identify surface

and subsurface soils conditions, indicated that the water table is about 10 feet below the existing ground surface. With the thickness of the tank foundation slab established at approximately 5 feet, any burying of the tank below the present design configuration would cause the foundation to be below the water table. This raises serious engineering and environmental problems. The groundwater would need to be continually pumped from the subsurface area in the vicinity of the LNG tanks to avoid the potential for contact with the underground tank heat coils, resulting in potential disruptions to groundwater flow, as well as, an additional water discharge from the Project. The high heat transfer coefficient of water would result in an excessive amount of power being used to energize the heat coils. The mobility of the water would greatly exacerbate this problem because as the water was warmed it would flow away from the coils due to the natural groundwater migration pattern in this area. The warmed water would then be replaced by cold water resulting in still greater power consumption requirements. Therefore, we do not find that burying the tanks would offer significant environmental advantage over Jordan Cove's currently proposed design.

3.3.2.4 SORSC Alternatives

The SORSC building would house the Jordan Cove Fire Station, the Jordan Cove Security Center, and the Fire Training Center. Each of the above functions is important to the daily function of the LNG complex. The COE requested an analysis of alternative locations for the SORSC in uplands, because the currently proposed location would impact about 0.6 acre of Palustrine Forested wetlands. In response to an April 10, 2105, data request from the FERC, on May 1, 2015, Jordan Cove filed information on three potential locations (A, B, C) where the SORSC could be sited. The site needs to be on the North Spit and within or near the Jordan Cove terminal for the following reasons:

- The SORSC has to be in relatively close proximity to a potential incident in order to comply with State of Oregon standards for response to industrial fire incidents. Existing emergency response facilities are all too far away with professional firefighters staffing that only the Cities of Coos Bay and North Bend fire departments provide. Jordan Cove conducted many meetings with local emergency response personnel, and it became clear that finding a location that would meet emergency response time requirements could only be achieved by siting the SORSC on the North Spit.
- The North Spit location for the SORSC also needs to be both on the west side of the existing north-south mainline of the CBRL railroad tracks and to the south of the North Spit rail spur that services the Southport Lumber mill. This requirement is necessary to ensure that access between the SORSC and the LNG terminal would not be compromised by a train blocking road crossings. The local agencies pointed out to Jordan Cove that a passing train could block access for ambulance, fire, and law enforcement personnel.
- The SORSC needed to be located so that it did not interfere with the existing Roseburg wood chip facility use of the railroad. Roseburg currently brings a number of trains into their property via a rail spur that comes off the main line, which moves north and south. If the SORSC were located elsewhere, emergency services could be blocked as with the main line.
- The site needed to be able to meet the State of Oregon fire response criteria for having equipment and personnel on scene of an incident in four minutes. The SORSC needed to

be close but not too close to the LNG facility. The criteria were established using NFPA standards for industrial facilities.

- Although local and state of Oregon emergency response personnel identified a need to have the SORSC close to the LNG terminal they deemed it essential that there be a separation of these two facilities; preferably by one of the major sand dunes. The North Spit area is partitioned by a number of north-south oriented sand dunes that are separated by deflation plains. With these tree-covered sand dunes running to an elevation of over 150 feet in many places, having a sand dune provide a buffer between the SORSC and the LNG terminal was considered to be an important characteristic.
- The SORSC site needed to be located where access to the LNG terminal would not be disrupted in the event of a tsunami. The Jordan Cove facilities are being specially prepared to meet the tsunami standards with every major area accessible even in the event of a design earthquake and resultant tsunami. This means that all areas of the SORSC, LNG terminal, and connecting corridors between the two must be at an elevation and of a structural integrity to survive a tsunami and maintain functionality.
- The SORSC building would house the Jordan Cove security system and must be located adjacent to or within the secured perimeter of the LNG terminal. This proximity allows security personnel to properly respond to any potential security breach. The primary security watch is within the SORSC building and having it within the security boundaries is critical to establishing and maintaining successful facility perimeter security.
- The location of SORSC should allow emergency personnel to access both the LNG terminal and the power plant facilities at the elevated level and clear of the tsunami inundation zone. With the site being elevated, having the Jordan Cove emergency resources elsewhere would leave them open to tsunami destruction and therefore unavailable. The selected location places them at approximately the same elevation and directly accessible to the crossroad.
- The lower land elevation in surrounding areas would have made it necessary for filling of these locations to elevate from the tsunami inundation and to allow for emergency vehicles to travel to the elevated Jordan Cove site.
- The need for an elevated site to be above tsunami inundation also enhances the interoperable communications managed from the SORSC. Jordan Cove is required to ensure interoperable communications with local emergency agencies and for communications around the facility. This would require UHF, VHF, and cellular signals. The elevated area provides the radio signals better capability to operate within the facility

Based upon the above criteria, only three potential sites for the SORSC were identified as being potentially suitable. The locations of these three potential sites are shown in figure 3.3-2. An alternatives analysis based on the criteria requested by the FERC is presented in table 3.3.2.4-1.

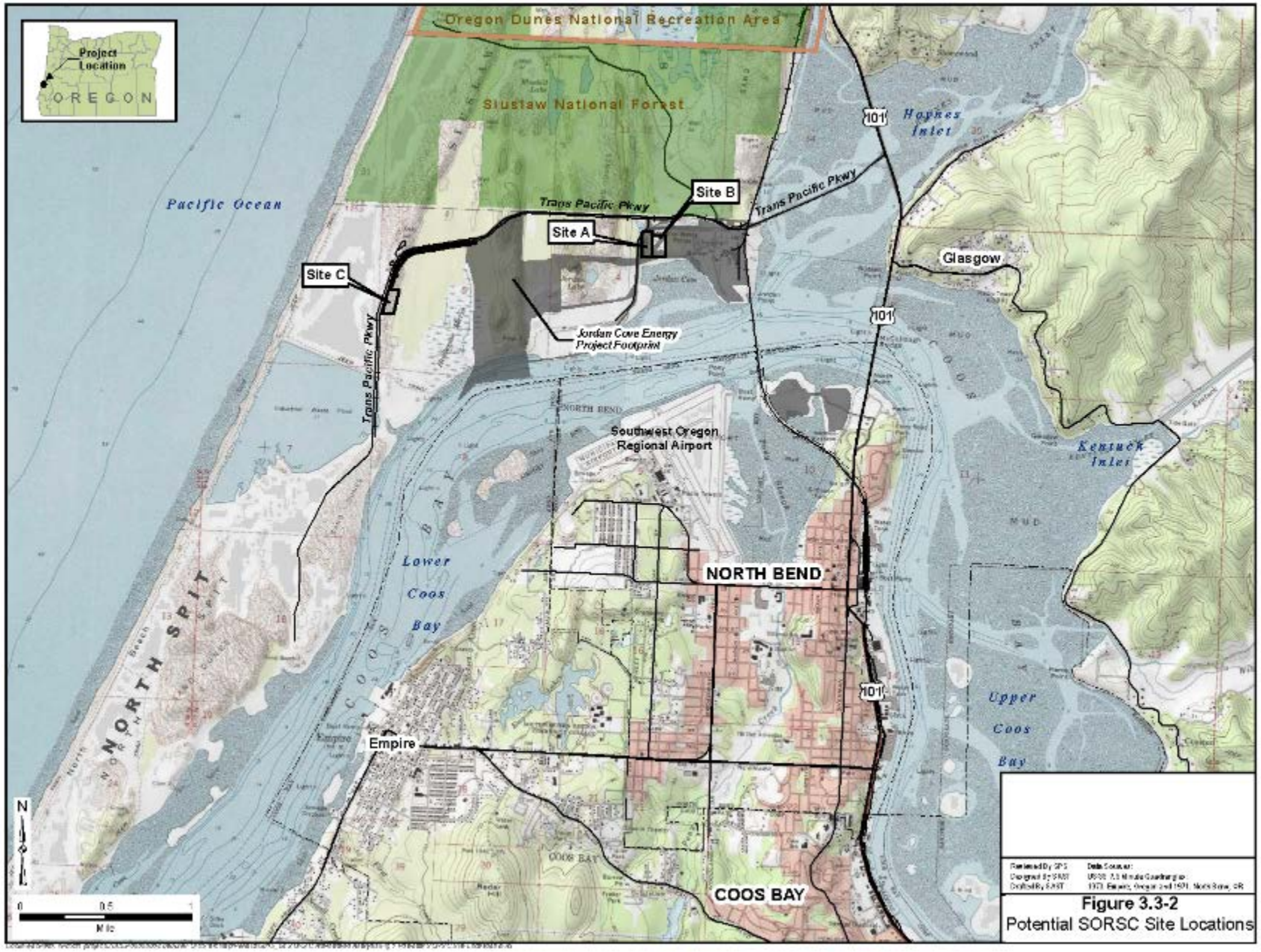


Figure 3.3-2
Potential SORSC Site Locations

TABLE 3.3.2.4-1

SORSC Alternatives Analysis

Site	Acres	# Residences within 0.25 mile	# Waterbodies Affected	Acres of Wetlands and Open Water Affected	Acres of Ag Land Affected	Acres of Forest* Cleared	Acres of Critical Habitat for T&E Species	Acres of Potential Suitable Habitat for T&E Species	# Archy Sites	Current Land Use/ Zoning
A	6.1	0	2	0.6	0	4.6	0	0.6	0	CBEMP: 6-WD, Industrial
B	6.0	0	1	3.1	0	1.8	0	2.8	0	CBEMP: 7-D, Industrial
C	14.8	0	2	2.1	0	7.5	0	2.2	0	CBEMP: 5-WD

* Forest is defined as Coastal Dune Forest (CDF)

Coos County Comprehensive Plan: Coos Bay Estuary Management Plan (CBEMP)

CBEMP: 5-WD, 6-WD:

Water-Dependent Development Shorelands (WD): areas managed for water-dependent uses and some of these areas are suited for water-dependent development. Water-related and other uses are restricted to specific instances prescribed in unit management objectives. Water-Dependent Development Shoreland areas are always located outside of urban growth boundaries, and satisfy needs that cannot be met within urban growth boundaries.

CBEMP: 7-D:

Development Shorelands (D): areas managed to maintain a mix of compatible uses, including non-dependent and non-related uses. Development areas include areas presently suitable for commercial, industrial, or recreational development. Development Shoreland areas are always located outside of urban growth boundaries and satisfy needs that cannot be met within urban growth boundaries.

Source: Attachment 6-4 of Jordan Cove's Third Supplemental Response to Environmental Information Request Dated April 10, 2015, filed May 1, 2015.

Site B is located on the South Dunes site and essentially comprises Wetland E directly to the west of the South Dunes Power Plant and Gas Conditioning unit outside of the secured battery limits of the facility. Because most of this site is wetland, it would need to be filled with excess sand removed from the Jordan Cove terminal marine slip and access channel. While Site B could function as a suitable substitute for the preferred Site A, it would result in a significant increase in the amount of jurisdictional wetlands impacted.

Site C is located on the western flank of the Henderson Marsh, on the south side of the Trans-Pacific Parkway, about 0.5 mile south of the Ingram Yard tract. This location was deemed to be potentially suitable for the SORSC facility because there is a north-south oriented sand dune on the western flank this parcel. Locating Site C any closer to the LNG terminal would create two unsatisfactory conditions. First, the SORSC would be physically located too close to facilities that store LNG and refrigerants. Additionally, siting the SORSC on the eastern portion of Henderson Marsh would violate the objective of having a sand dune provide a buffer between the SORSC and the LNG terminal. Third, placing the SORSC on the eastern portion of Henderson Marsh would require the filling of Henderson Marsh to raise the location of the SORSC out of tsunami inundation.

Site C does have the advantage of being elevated above the tsunami inundation zone without a need for fill. However, a new road would have to be built from Site C that would connect the SORSC complex to the western entrance to the LNG terminal. During a tsunami event both the Trans-Pacific Parkway and the CBRL would most likely be inundated. To ensure connectivity between the SORSC at Site C and the LNG terminal, fill would need to be placed in Henderson Marsh to create the required elevated corridor road. This is a particularly sensitive issue in that the primary direction of tsunami inundation will be from the northwest of the LNG terminal site. This location could place the SORSC directly in the path of a tsunami. Site C is nearly 1.5 miles

closer to the ocean, the source of tsunami waves, than either Sites A or B. An additional concern for this location would be the remoteness from the electric power to be supplied by the South Dune plant, in comparison to both Sites A and B. For these reasons, Site C was rejected as the preferred location for the SORSC.

Site A, the proposed location for the SORSC, is directly to the east of Jordan Cove Road and to the west of Wetland E on the South Dunes site. This site had been previously disturbed by the former owner of the property (Weyerhaeuser) and contains some minor wetlands (Wetlands A and B). Jordan Cove proposes to compensate for impacts on wetlands associated with the construction and operation of the SORSC through a combination of wetland creation and enhancement at the West Bridge Mitigation Site and the West Jordan Cove Mitigation Site. Jordan Cove's most recent wetland mitigation proposal was filed with the FERC on April 17, 2015, and is discussed in more detail in section 4.4.3.1 of this EIS.

As the table suggests, Site A would result in notably less impact on resources than Sites B or C. Site A is the environmentally preferred and the selected location. None of the other alternative locations have significant environmental advantages over the proposed location for the SORSC.

3.3.2.5 NPWHC Alternatives

In a March 23, 2015, letter to the FERC, the NMFS requested additional information about the NPWHC. In an April 10, 2015, data request, we asked Jordan Cove to explain how it selected the location for the workers camp in North Bend, and to compare that location with other alternative sites considered (see figures 3.3-3a, b, and c). In a filing on April 22, 2015, Jordan Cove explained how it had eliminated alternative sites during its selection process. Port-owned land and the D.B. Western site on the North Spit were eliminated because they may be better suited as potential yard or laydown areas, and the Port land contained wetlands. The Mill Casino Site in Coos Bay and the Myrtlewood RV site along Highway 101 near Hauser were too small for the workers camp, but were selected instead as off-site commuter parking lot locations. The former Kentuck Slough golf course, now owned by Jordan Cove, contained wetlands, and is to be used for wetland mitigation.

Lastly, the former International Paper site near Gardiner was evaluated. This site contains 200 acres which is large enough to accommodate a camp. However, it is 25 miles from the Jordan Cove terminal, resulting in longer commuting time for employees. In addition, the population of Gardiner is 248 people, while the population of Reedsport is 4,000. Jordan Cove believes that a camp of 2,100 workers would have greater socioeconomic impacts on the Gardiner-Reedsport communities, in comparison to the city of North Bend, which has a population of almost 9,600 people.

Jordan Cove selected the Al Pierce tract in North Bend for its NPWHC location because it is relatively close to the LNG terminal on the North Spit. At 50 acres, it is large enough for the camp. It is currently zoned for industrial use, and is near existing utilities. This location contains no agricultural land, no forest, no known archaeological sites, and no habitat for threatened and endangered species. None of the other alternative locations have significant environmental advantages over the proposed location for the NPWHC.

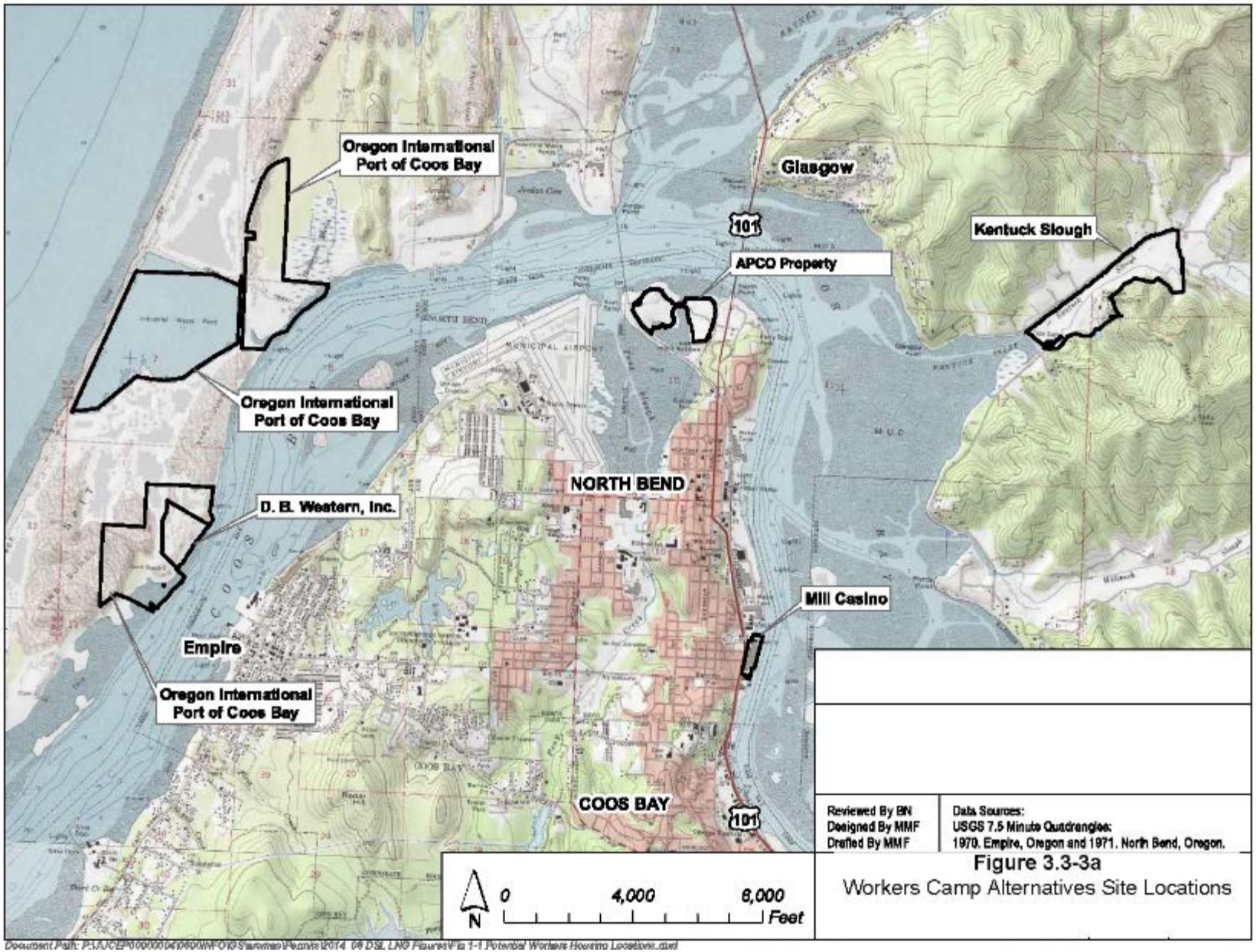


Figure 3.3-3a
Workers Camp Alternatives Site Locations

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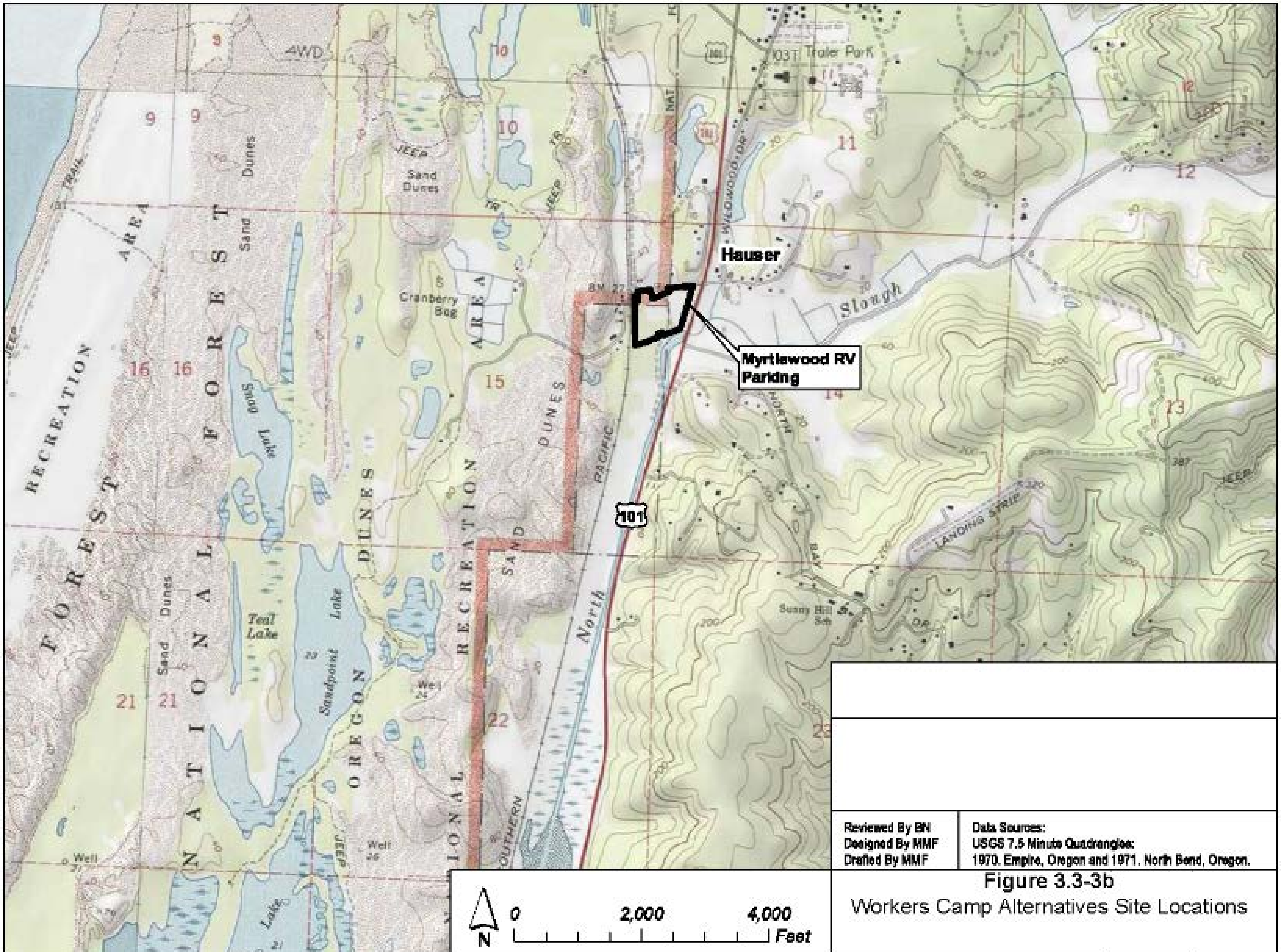

Reviewed By BN
Designed By MMF
Drafted By MMF

Data Sources:
USGS 7.5 Minute Quadrangles:
1970. Empire, Oregon and 1971. North Bend, Oregon.

Figure 3.3-3b
Workers Camp Alternatives Site Locations

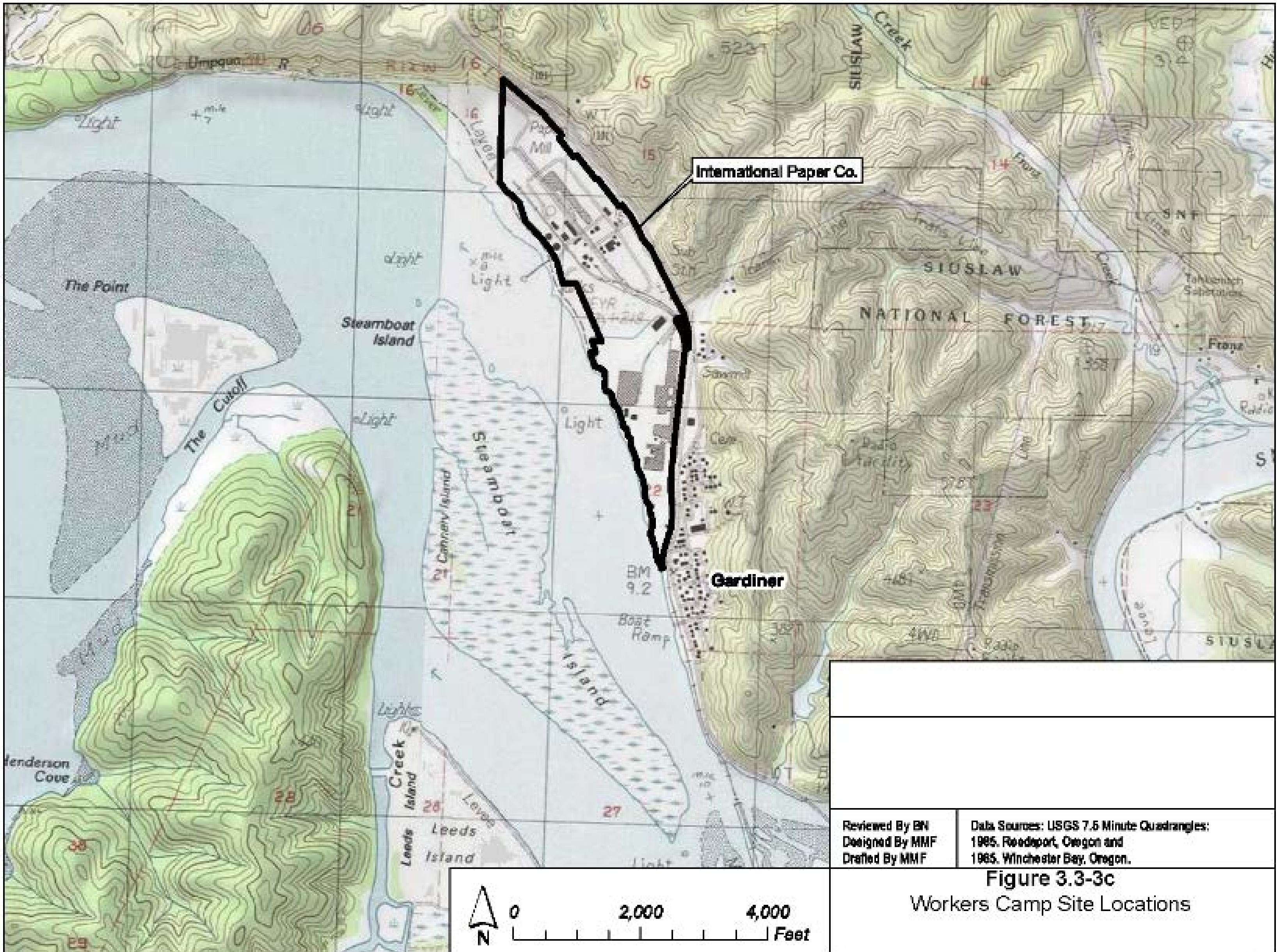

Figure 3.3-3c
Workers Camp Site Locations

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3.3.2.6 Electric Power Alternatives

The Jordan Cove LNG terminal would need electricity to power the liquefaction trains and other facilities. Jordan Cove plans to provide for its own power needs by constructing and operating the South Dunes Power Plant. Below, we discuss other alternatives for electric power.

Existing Electric Power Infrastructure

The Bonneville Power Administration (BPA) is the sole source of wholesale power to the region's various electric cooperatives. In a 1999 study, BPA noted uncertainties in terms of providing additional residential and commercial power demands. Jordan Cove's own investigation came to the conclusion that the local public utility system could not meet the power needs for the LNG export terminal if it relied solely on BPA to provide electricity. Therefore, Jordan Cove planned to construct and operate its own source of electricity through the 420-MW South Dunes Power Plant to be located adjacent to the terminal on land owned by Jordan Cove. The LNG terminal would, however, also be connected to the local distribution company, PacifiCorp, to provide power during times when the South Dunes Power Plant may be temporarily shut down. In addition, Jordan Cove could sell excess electricity generated from the South Dunes Power Plant, above what is needed for liquefaction and terminal operations, back to the grid for local consumption.

Wind Power

We considered the possibility of using wind power to replace or augment the electric power needed for the LNG terminal liquefaction process, through the currently planned South Dune Power Plant. As discussed below, we are not certain that wind energy alternatives could replace all the 420 MW needed for the Jordan Cove LNG terminal that would be generated by the planned South Dunes Power Plant. Nor do we find that wind farms would offer significant environmental advantage over Jordan Cove's currently proposed design.

Existing and Proposed Wind Farms

According to the State of Oregon 2013-15 Biennial Energy Plan, by 2012 wind energy production in Oregon made up nearly 6 percent of Oregon's total net generation and over 75 percent of the total non-hydroelectric sources of renewable energy. More than 4,000 MW of large-scale wind farms were in different phases of the ODE-EFSC process at the start of 2013. Most of the state's large-scale wind development takes place in the central and eastern Columbia River Plateau and in northeastern Oregon.

The ODE has stated that: "Wind machines generate, on average, about one third of the maximum output or capacity" (ODE 2005). If this "de-rating" is applied to the entire existing and proposed wind capacity of 4,000 MW from all of the onshore Oregon wind farms combined, they would produce about 1,320 MW of sustained output. It is unrealistic to assume that about one-third of the total electrical output from existing and proposed wind farms in Oregon would be redirected to the Jordan Cove terminal, and not serve other customers.

There are a number of problems that limit the availability of electricity generated by wind farms. First, there is no known technology for storing electric power generated by wind turbines. While the turbines are turning, electricity is generated that must be immediately conveyed to customers via transmission lines. Second, there is the limitation of existing transmission line infrastructure

between where most of the wind power is generated (eastern Oregon) and markets (population centers in western Oregon). Third, there is limited space on existing transmission lines for wind power, and there is competition for access to some lines.[6]

Wind generation suffers from what is referred to as a "clustering effect." This clustering effect means that all the machines within a specific farm tend to generate power at approximately the same time, as the wind blows. This results in spikes in supply or troughs in production that have no relationship with demand. This clustering also means that power transmission lines in the vicinity of a wind farm may experience congestion.

Wind farms are also not without environmental impacts. The turbines are known to adversely affect bird and bat populations. Wind farms have visual impacts as well.

Principal Power Proposed Off-shore Wind Project

Principal Power, under a $4 million grant from the DOE, is proposing to anchor five 6 MW semi-submerged wind turbine modules approximately 3 miles off the coast of Coos Bay, Oregon, in waters of the Pacific Ocean about 1,000 feet deep. If the Principal Power Project is funded and constructed, Jordan Cove has agreed to purchase the 30 MW of electricity produced. That would eliminate the need to have the Principal Power Project connected to the regional electric grid. The electricity produced by the Principal Power turbines would supplement the electricity generated from Jordan Cove's planned South Dunes Power Plant. However, in addition to the 30 MW that may be provided from Principal Power, Jordan Cove would still need at least 390 MW to maintain reliable LNG production. The South Dunes Power Plant would also be necessary to supply power to the Jordan Cove terminal when the wind is not blowing and the Principal Power Project is not operating. Lastly, the Principal Power Project is one of seven DOE grants and may not be selected for full funding and construction.

Solar

The bulk of solar power installations in Oregon are geared to residential or individual building use and not as a commercial base load installation. Commercial solar projects require large land areas. The largest commercial solar farm in Oregon is located in Christmas Valley, in Lake County. Known as the Outback Solar Project, it includes more than 20,000 solar panels arrayed over 40 acres, generating up to 5 MW of electricity.

The constraints related to the production of solar power on a major scale include the siting of solar farms in mostly clear and sunny geographic regions, large tracts needed for the arrays of solar panels, the location of nearby transmission lines, and access to the grid. There may not enough sunlight to generate much solar energy during the cloudy winter months along the southern Oregon Coast when there is peak demand. Data collected for the city of Seattle, which has a similar climate to much of western Oregon, showed the average annual percent sunshine for the area is about 43 percent (NCDC n.d.). Data presented by the George Washington University Solar Institute (2009) estimated that the daily average for Seattle in December is 0.7 kWh per square meter (m^2). At that rate, hundreds of acres of solar collectors would be needed to supply adequate power for the Project.

[6] In a recent case, BPA blocked wind farm generators from gaining access to its power lines, which BPA claimed were committed to carrying electricity generated by hydropower facilities.

Hydropower

Hydropower generates electricity from water stored behind dams and then run through turbines. Conventional hydropower in Oregon generates about 330,542,260 megawatt-hours (MWh), which represents about 58 percent of all the electricity produced in Oregon.

According to the Northwest Power and Conservation Council (2007), most feasible hydroelectric facilities have already been developed. New hydropower projects in the Pacific Northwest are estimated to yield 480 MW in additional electric capacity through 2025, but that new capacity would mainly replace older hydroelectric facilities that are retired.

The ODE recognizes that climate change may alter the runoff regime feeding water to the hydroelectric dams, which could result in less summer power in the future. Legal issues concerning the operation of the dams with regards to fisheries could also diminish hydropower generation (ODE 2008).

It is unlikely that new dams would be constructed in the future because of high development costs and environmental impacts. In fact, efforts are underway to remove some existing dams to restore habitat and fish passage.[7] Further, environmental scrutiny during the relicensing process for existing dams has, in some instances, resulted in increased release of water for fisheries, which has reduced their electric generation capacity. Thus, the development of additional hydropower resources is not considered to offer significant environmental benefits over the power generation portion of the proposed Project.

Tidal

Generation of electricity through conversion of ocean current, swell, wave action, tidal gradients, and thermal gradients is being successfully demonstrated around the world. Wave densities in Oregon are estimated to be capable of producing between 5 and 15 megawatts per mile of coastline. In January 2013, Oregon set the course for future wave energy development in waters of the state by adopting an amendment to the Territorial Sea Plan. This document identified four Renewable Energy Suitability Study areas.

However, the only wave energy project in Oregon state waters to begin the permitting phase was Ocean Power Technologies' (OPT) proposal about 2.5 miles off the coast of Reedsport. On August 13, 2012, OPT received a license from the FERC in P-12713 to develop this project. The proposal was to install 10 buoys in the wave park capable of generating a total of about 1.5 MW of electricity. In April 2014, OPT announced that it was dropping the project.[8] On May 30, 2014, OPT filed an application with the FERC to surrender its license.

There are now no permitted wave or tidal energy projects off the Oregon shore. Therefore, we do not consider tidal or wave energy would meet the electricity generating objectives of the Project.

[7] There are plans to remove four dams along the lower Klamath River as part of the FERC's relicensing review of PacificCorp's Klamath Hydroelectric Project in P-2082. See USDOI and CDFG (2012).
[8] Schwartz, D. 4 April 2014. "Oregon Wave Energy Project Sinks." *EarthFix*. Website: http://earthfix.opb.org/energy/article/oregon-wave-energy-project-sinks/.

3.4 PIPELINE ALTERNATIVES

We assessed whether it might be possible to significantly reduce environmental impacts associated with the construction and operation of the Pacific Connector pipeline by following alternative routes. We evaluated route alternatives raised during scoping by the public, or by federal land-managing agencies, that may avoid or minimize impacts on specific, localized resources such as mature forest habitat, waterbodies, wetlands, sensitive species, cultural resources, or residences. Lastly, we considered if there were alternative locations for aboveground facilities associated with the pipeline, such as the proposed compressor station, that would have lesser environmental impacts.

The "proposed route," discussed below in comparison to alternative routes, is the pipeline route filed by Pacific Connector in its June 2013 application to the FERC, as modified by supplemental filings thereafter up until the publication of this EIS. The proposed route is illustrated on maps contained in appendix C of this EIS.

3.4.1 Pipeline Alternative Routes Eliminated from Detailed Analyses

In the FERC May 2009 FEIS for the original sendout pipeline project in Docket No. CP07-441-000, we explained how Pacific Connector selected its route. Section 3.4.1 of that document discussed the Coos County Pipeline Alternative Route; Highway 42 Alternative Route; Powers Highway Alternative Route; Grants Pass Lateral Alternative Route; Cow Creek Alternative Route; Highway 138 Alternative Route; BPA Powerline Alternative Route; Highway 227 Alternative Route; Grants Pass to Medford Alternative Routes; Butte Falls Highway Alternative Route; Medford East Alternative Routes; and Klamath Falls East Alternative Routes. For the reasons given in the May 2009 FEIS, we eliminated those alternative routes from detailed analysis because they were unreasonable, infeasible, or unbuildable, and offered no significant environmental advantages over the proposed route. As stated in section 3.4.1 of the May 2009 FEIS, Pacific Connector reviewed more than 1,000 miles of alternative route segments, and selected its proposed route based on a number of factors, such as: minimization of the length of the pipeline; utilization of existing rights-of-way; avoidance of population centers; avoidance of known designated sensitive natural resource areas; recommendations from federal land managing agencies; avoidance of geological hazards; use of ridgelines; and construction feasibility and buildability.

Several commenters during scoping for the current Project in Docket No. CP13-492-000 proposed alternative routes that we considered but then eliminated from further analysis, as discussed below.

3.4.1.1 Straight Line Alternative Route

We received comments recommending that the pipeline route follow the shortest, most direct path, a straight line from Malin to Coos Bay.[9] This straight line alternative (figure 3.4-1) would be approximately 175 miles long compared to 232 miles for the proposed route. In theory, the shorter route would disturb approximately 650 acres less than the proposed route. However, this does not account for the additional workspaces required to cross steep terrain with unstable slopes in the Cascades and Coast Range.

[9] Comments during scoping recognized that there could be a straight line alternative that would be the optimum pipeline route for technical and economic reasons if environmental impacts and federal land use were not taken into consideration. See the letter from Ron Sadler dated October 15, 2012 and public testimony starting on page 31 of the transcript from the October 9, 2012 public scoping meeting in North Bend, Oregon.

The straight line route would require Congressional approval because it would cross the Mountain Lakes Wilderness and the Sky Lakes Wilderness. In addition the straight line route would cross directly through population centers at Altamont, Klamath Falls, and several towns, impacting many more homes and businesses than the proposed route. The straight line route would not offer significant environmental advantages over the proposed action and is not considered further in this analysis.

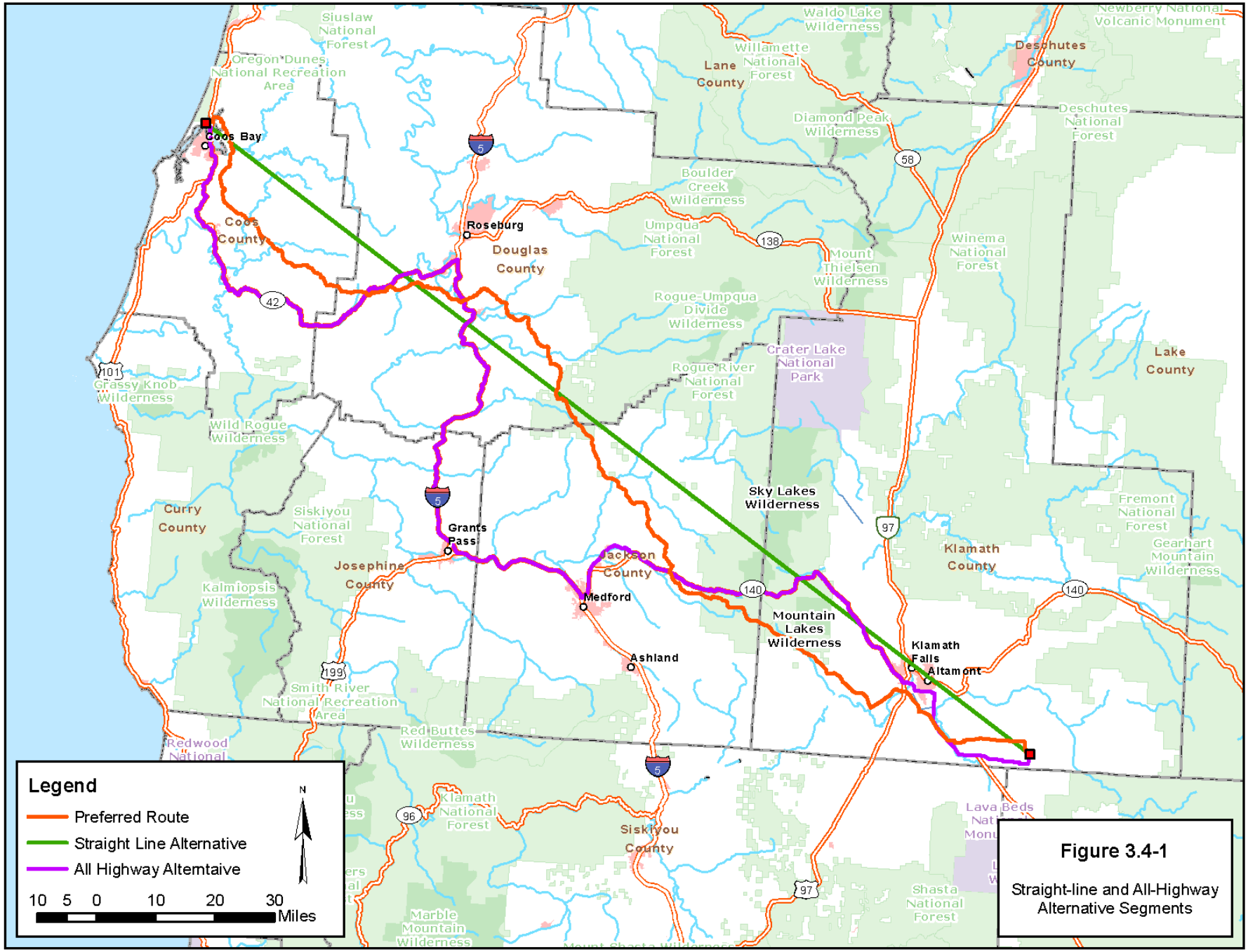
3.4.1.2 All Highway Alternative Route

During scoping, commenters made suggestions about possible route alternatives. One comment suggested the pipeline follow existing highways as much as possible.[10] This all-highway alternative would follow Highway 50 west from Malin, to Highway 39 northwest to Klamath Falls, then along Highway 140 west to Medford, then along I-5 north to Winston, then west along Highway 42, and then north along Highway 101 to Coos Bay (figure 3.4-1). This route would be approximately 281 miles long, which would be about 50 miles longer than the proposed route, resulting in approximately 600 acres of additional disturbance. Because the highways in southern Oregon cross through cities and towns, this route, and other possible routes sited along highways, would impact many more homes and businesses than the proposed route.

An all-highway route would not offer significant environmental advantages over the proposed route and is not considered further in this analysis.

In addition, the Federal Highway Administration (FHWA) historically prohibited the installation of new utility facilities within the rights-of-way of access-controlled freeways except in some extraordinary cases. This prohibition was consistent with the American Association of State Highway Transportation Officials (AASHTO) policies for longitudinal accommodation. However, with a 1988 amendment to the FHWA regulations, the FHWA's policy changed to allow each state to decide whether to permit new utility facilities within these rights-of-way, or continue to adhere to the stricter AASHTO policies (FHWA 2013). Oregon defines its policy for accommodating utilities in highway rights-of-way in Oregon Administrative Rule 734-055-0080. In general, Oregon does not allow utilities to occupy interstate rights-of-way for longitudinal uses (Caswell 2008).

[10] See letter from Bill Gow, dated October 26, 2012, filed under Docket No. PF12-17-000, and his comments during public scoping meetings for the Pacific Connector Pipeline Project.


Coos Bay
Roseburg
Grants Pass
Medford
Ashland
Klamath Falls
Altamont
Coos County
Douglas County
Curry County
Josephine County
Jackson County
Klamath County
Lake County
Lane County
Deschutes County
Siskiyou County
Siuslaw National Forest
Oregon Dunes National Recreation Area
Willamette National Forest
Waldo Lake Wilderness
Newberry National Volcanic Monument
Diamond Peak Wilderness
Deschutes National Forest
Boulder Creek Wilderness
Umpqua National Forest
Mount Thielsen Wilderness
Winema National Forest
Rogue-Umpqua Divide Wilderness
Crater Lake National Park
Rogue River National Forest
Grassy Knob Wilderness
Wild Rogue Wilderness
Siskiyou National Forest
Sky Lakes Wilderness
Fremont National Forest
Gearhart Mountain Wilderness
Kalmiopsis Wilderness
Mountain Lakes Wilderness
Smith River National Recreation Area
Red Buttes Wilderness
Redwood National
Klamath National Forest
Lava Beds
Shasta National Forest
Marble Mountain Wilderness
Legend
Preferred Route
Straight Line Alternative
All Highway Alterntaive
10 5 0 10 20 30
Miles
N
Figure 3.4-1
Straight-line and All-Highway Alternative Segments

3.4.1.3 Federal Land Route Alternative

We received a comment during scoping suggesting that the pipeline should be routed entirely on federal lands to avoid impacts on private property.[11] Given the patchwork nature of federal land holdings in southern Oregon, with federal blocks scattered between private tracts (see figure 3.4-1), we were unable to identify a route between Malin and Coos Bay that would not cross private lands. Therefore, a route that would be entirely on federal land and would avoid private property would be unrealistic and unfeasible, and is not considered further in this EIS.

3.4.1.4 Round Top Butte National Natural Landmark Route Alternative

The NPS requested that we consider an alternative route that would increase the distance between the pipeline and the Round Top Butte NNL boundary (also see the discussion in section 4.8.1.2 of this EIS). The proposed Pacific Connector pipeline route would pass within about one-quarter mile of the eastern boundary for the NNL near MP 135.3. At this location, the proposed pipeline route would be within a saddle or gap between Round Top Butte on the west and Obenchain Mountain on the east. Pacific Connector stated that to move the pipeline eastward away from the NNL boundary would put it on the steep slopes of Obenchain Mountain, which may create constructability issues. Further, the pipeline is currently routed over private lands outside of the NNL boundary that were recently harvested for timber. Relocating the pipeline to the east could affect five additional landowners, and result in the clearing of more forest. The BLM, which administers the land containing the Round Top Butte NNL, is a cooperating agency in the development of this EIS, has taken a role in the siting of the pipeline on its lands, and does not have any concerns about the proposed route in this area. Therefore, we conclude that the proposed route is environmentally preferable, and we did not do any further study of a reroute to increase the distance away from the Round Top Butte NNL.

3.4.1.5 West-wide Energy Corridor Routes (Section 368 Corridors)

Section 368 of the EPAct (42 U.S.C. 15926) directed the Secretaries of Agriculture, Commerce, Defense, and Energy to designate corridors for oil, gas, and hydrogen pipelines and electricity transmission facilities in 11 western states ("Section 368 Corridors"). The agencies prepared the *Final Programmatic Environmental Impact Statement, Designation of Energy Corridors on Federal Land in the 11 Western States* (DOE/EIS-0386) (PEIS) to evaluate the impacts of proposed Section 368 Corridors. In January of 2009, the Department of the Interior and the Department of Agriculture each issued a ROD that designated Section 368 Corridors over lands under their respective jurisdiction. The RODs contain Interagency Operating Procedures that are intended to, in part, provide practicable measures to avoid or minimize environmental harm from future development within the corridors.

On July 7, 2009, several non-profit organizations filed a lawsuit in the Northern District of California challenging the designation of the Section 368 energy corridors pursuant to the EPAct, NEPA, ESA, and the Administrative Procedure Act. The parties entered into a settlement agreement, which was approved on July 11, 2012.[12]

[11] See for example, Dave Picanso comments at the public meeting in Klamath Falls on August 29, 2012, in transcripts filed under Docket No. PF12-17-000.

[12] *Wilderness Society v. United States Department of the Interior*, No. 3:09-cv-03048-JW (D. N.D. Cal). Information about the settlement agreement can be found at the following web address: http://corridoreis.anl.gov/.

The Pacific Connector pipeline would occupy a one-mile segment crossing lands managed by BLM identified as a corridor of concern in the settlement agreement. This corridor of concern was identified as Section 368 Corridor 4-247, approximately located between pipeline MPs 80 and 81. In its role as a cooperating agency, BLM has worked closely with the proponent on route locations. The FERC, the BLM, and the Forest Service hereby meet the notification requirements of the settlement agreement through publication of this EIS, and by having informed the proponent that a small segment of the proposed route is subject to the terms of the settlement agreement.

In this EIS, we considered the proposed use of the Section 368 Corridor segment 4-247 in accordance with BLM Instruction Memorandum 2014-080 "Policy Guidance for Use of Corridors Designated Pursuant to Section 368 of the Energy Policy Act of 2005 as Required by the Settlement Agreement in *Wilderness Society v. United States Department of the Interior*, No. 3:09-cv-03048-JW (D. N.D. Cal)." Specifically, this EIS addresses issues related to critical habitat for fish and wildlife species listed under the ESA, LSRs, and Riparian Reserves and management direction provided in the BLM Roseburg District LMP. The FERC and the BLM would consider the above information in their respective decisions regarding the proposed Project.

3.4.1.6 Klamath Project Avoidance Alternative Routes

During a July 9, 2015, site visit between representatives of Pacific Connector and Reclamation, the Area Manager requested that Pacific Connector consider route alternatives that would avoid in their entirely the irrigation features associated with Reclamation's Klamath Project. In an August 7, 2015, filing with the FERC, Pacific Connector provided the results of its analysis and an explanation why route alternatives that completely avoid the Klamath Project would be impracticable and not environmentally preferable.

The Pacific Connector pipeline must begin at the proposed Klamath Compressor Station at MP 228.2, where the proposed Klamath-Eagle and Klamath-Beaver meter stations would interconnect with the existing GTN and Ruby pipelines, the source of the natural gas to be transported for the Project. The co-located Klamath-Eagle and Klamath-Beaver meter stations and Klamath Compressor Station are all located within the geographic boundaries of Reclamation's Klamath Project; therefore, the Klamath Project cannot be completely avoided. However, Pacific Connector developed two pipeline route alternatives between MPs 189.2 and 228.2 that would avoid most of the irrigation features of the Klamath Project. The Northern Route Alternative would be 9.4 miles longer than the corresponding segment of the proposed route. It would have to cross the outfall of Upper Klamath Lake using trenchless technology, follow an existing powerline, and then go across Hogback Mountain. The Southern Route Alternative would be 47.4 miles longer than the corresponding segment of the proposed route. This route is so long in order to avoid National Wildlife Refuges, the Lava Beds National Monument, and inventoried roadless areas. Trenchless technology would have to be used to cross under the Klamath River. Because of the greater distances and greater amount of disturbance, we conclude that neither route alternative to avoid the Klamath Project features would provide a significant environmental advantage to the corresponding segment of the proposed route.

3.4.2 Pipeline Alternative Routes Analyzed in Detail

We studied a number of alternative pipeline route segments that were suggested by stakeholders, including landowners and agencies, or developed by the FERC staff. Route variations were identified in an effort to avoid or minimize potential impacts on specific localized resources. Each alternative route was compared to the corresponding segment of the proposed route using desktop data (such as maps or file searches). In some cases, Pacific Connector conducted on-the-ground studies of specific alternative routes. Elements we considered during these analyses included pipeline length, use of existing rights-of-way, forest land, agricultural land, waterbody and wetland crossings, residences, known cultural resources, habitat for federally listed threatened or endangered species, and geological hazards and slope stability. After the comparison, we determined if the alternative route had significant environmental advantages over the corresponding segment of proposed route. We also took into consideration if the alternative route was technically feasible or safely buildable. These alternative route segments are discussed below.

3.4.2.1 Brunschmid Wetland Reserve Program Easement Alternative Routes

In an August 30, 2012, letter to the FERC, the NRCS indicated that it had concerns regarding the potential negative impacts the Pacific Connector Pipeline Project may have on the operation and function of the 13.4 acres enrolled in the permanent conservation easement under the Wetland Reserve Program (WRP) on the Brunschmid property. The NRCS stated that its policy is that proposed projects should avoid impacts on WRP easements. Pacific Connector's proposed route in its June 2013 application to the FERC between about MPs 9.4R and 12.4R would avoid the Brunschmid WRP easements. We evaluated Pacific Connector's June 2013 proposed pipeline route to the equivalent portion of the May 2009 FEIS Route and Pacific Connector's Brunschmid-WRP1 Route. Figure 3.4-6 illustrates the proposed route and the alternatives, and environmental elements are compared in table 3.4.2.1-1.

The May 2009 FEIS Alternative Route would directly impact the WRP easements on the Brunschmid property. The Brunschmid-WRP1 Alternative Route would avoid the WRP easements, going to the west of the easements. The Brunschmid-WRP1 Alternative Route would be slightly shorter than the proposed route; however, it would be in close proximity to an occupied bald eagle nest. While both the May 2009 FERC Alternative Route and the Brunschmid-WRP1 could use an HDD to cross under the Coos River, we are concerned about the potential for buried cultural resource deposits in the vicinity of Graveyard Point.[13]

Pacific Connector completed geotechnical borings along the proposed route in this area, which confirmed the feasibility of an HDD of the Coos River. The proposed route would avoid the WRP easements on the Brunschmid property (although it would affect other wetlands). It would also avoid the bald eagle nest along the Brunschmid-WRP-1 Alternative, Graveyard Point, and the community at the west end of Echo Valley. We conclude that the alternative routes would not offer significant environmental advantages over the proposed route.

[13] Site 35CS33 was recorded by Ron Stubbs in 1974 at Graveyard Point. Mark Tveskov (2007) wrote that the Graveyard Point Site "…documented an uninterrupted record of traditional household subsistence practices from over 1,300 years ago into the 20th century."

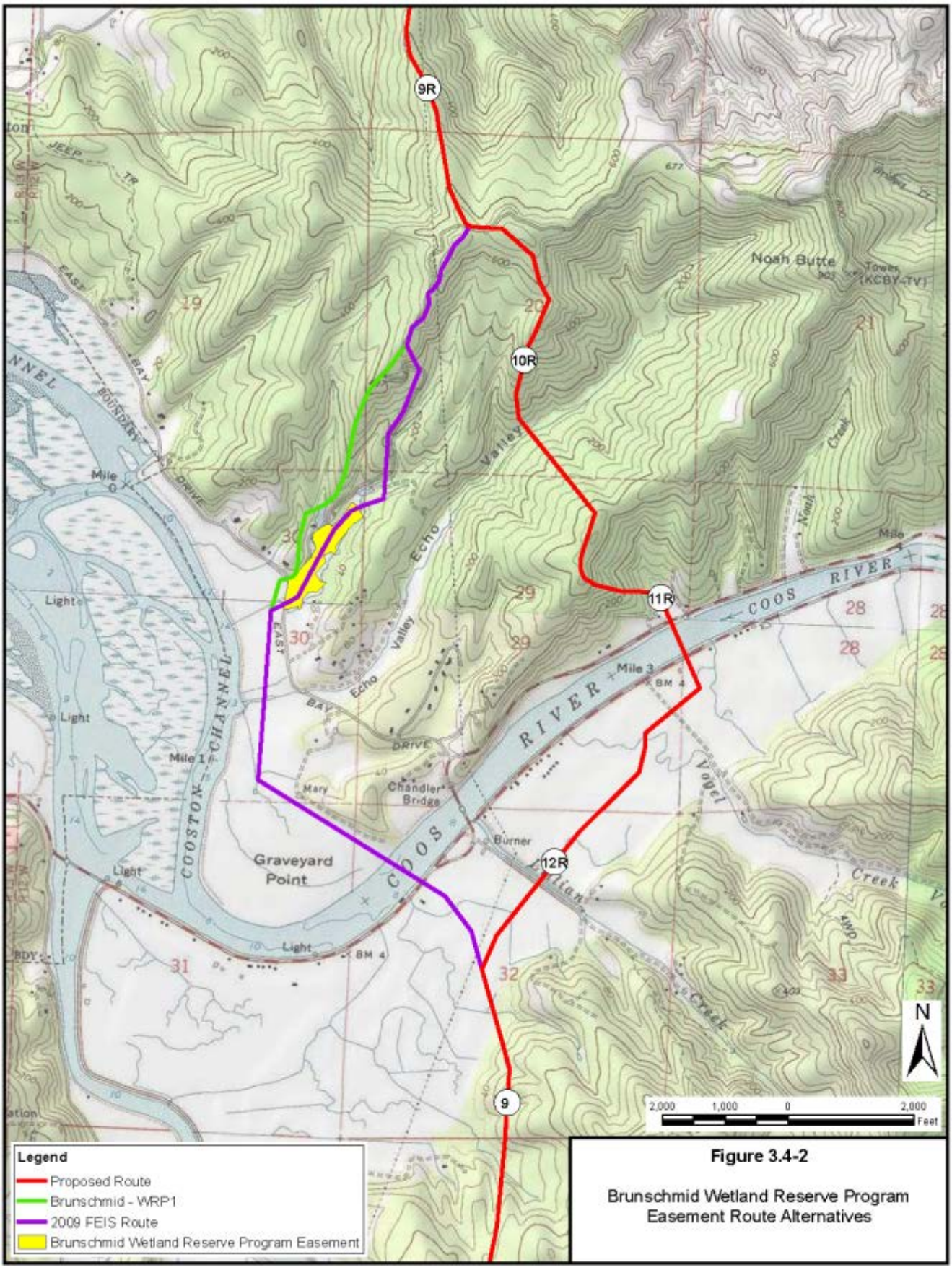


Figure 3.4-2

Brunschmid Wetland Reserve Program
Easement Route Alternatives

TABLE 3.4.2.1-1

Comparison of the Proposed Route with the 2009 FEIS Route and Brunschmid WRP Easement Avoidance Alternative 1

Alternatives Analysis	2009 FEIS Route	WRP Avoidance Alternative 1	Proposed Route
Length (miles) a/	2.9 b/	2.8	3.0
Construction Right-of-Way (acres)	31	31	33
TEWAs (acres)	23	18	19
Operational Easement (acres) c/	18	17	18
Number of Landowner Parcels Crossed (all private)	14	20	18
Number of Residences within 50 feet of Construction Right-of-Way	0	0	0
Number of Waterbodies Crossed	6 d/ Coos River and 1 ditch for HDD	7 d/ Coos River and 1 ditch for HDD	7 d/ Coos River to be HDD'd
Length of wetland crossings (feet)	9,082 e/,f/	4,417 f/	6,687 f/
Agricultural Lands Crossed (miles)	0.33 g/	0.33 g/	1.19 g/
Evergreen Forest (acres construction right-of-way)	4	8	14
Regenerating Forest clearing (acres construction right-of-way) h/	7	7	15
Habitat for threatened or endangered species	Coos River Southern DPS Green Sturgeon River – HDD	Directly affects known bald eagle nest i/ Coos River Southern DPS Green Sturgeon River – HDD	Coos River Southern DPS Green Sturgeon River – HDD
Number of Previously Recorded Cultural Resources	1	1	1
Number of Newly Identified Cultural Resources j/	0	0	0
Miles of right-of-way parallel or adjacent to existing rights-of-way (percent of alternative length)	0.8 (29.5 percent)	0.8 (27.1 percent)	0.5 (17.2 percent)
Avoids WRP Easement	No	Yes	Yes

General: All values are rounded (acres to nearest whole acre, miles to nearest tenth of a mile, feet to nearest whole foot).
a/ Route Alternative lengths cannot be accurately calculated by comparing mileposts due to shifts in the alignment.
b/ Mileage length cannot be calculated by subtracting milepost ranges because of engineering station equations included in route segments between MPs 8.59 to 9.41R.
c/ Acres of permanent easement calculated based on crossing length on private and federal timber lands. Pacific Connector proposes a 50-foot permanent easement on federal lands and a 50-foot permanent easement on private timber lands.
d/ From review of Pacific Northwest Hydrography Framework Clearinghouse data layers (http://hydro.reo.gov/)
e/ Field surveys identified 5,902 feet.
f/ Based on NWI mapping. Waterbodies/ditches not separated out of extensive wetlands.
g/ Agricultural lands are associated with the Coos River Floodplain and included wetland pastures and hayfields.
h/ Includes recent clear-cut forests.
i/ ORBIC (2012). Nest site confirmed during Pacific Connector October 2012 over-flight route investigation.
j/ Surveys incomplete.

3.4.2.2 Blue Ridge Alternative Routes

A group of landowners[14] objected to the pipeline route filed with Pacific Connector's June 2013 application to the FERC between about MPs 11.1R and 21.8, in Coos County, and suggested that the FERC consider an alternative route. Pacific Connector conferred with the landowners and developed the Modified Blue Ridge 2013 Alternative Route (Blue Ridge Alternative) that it believes is buildable. The June 2013 proposed route and the Blue Ridge Alternative are illustrated on figure 3.4-3. Figure 3.4-3 also shows a portion of the May 2009 FEIS route, and a Landowner Amended Route that was mostly incorporated into the Blue Ridge Alternative, and is therefore not analyzed as a separate alternative.

[14] See letters to the Commission filed on July 10, August 15, 16, 20, 22, and 30, September 25, October 29, and November 13, 2013, in Docket No. CP13-492-000.

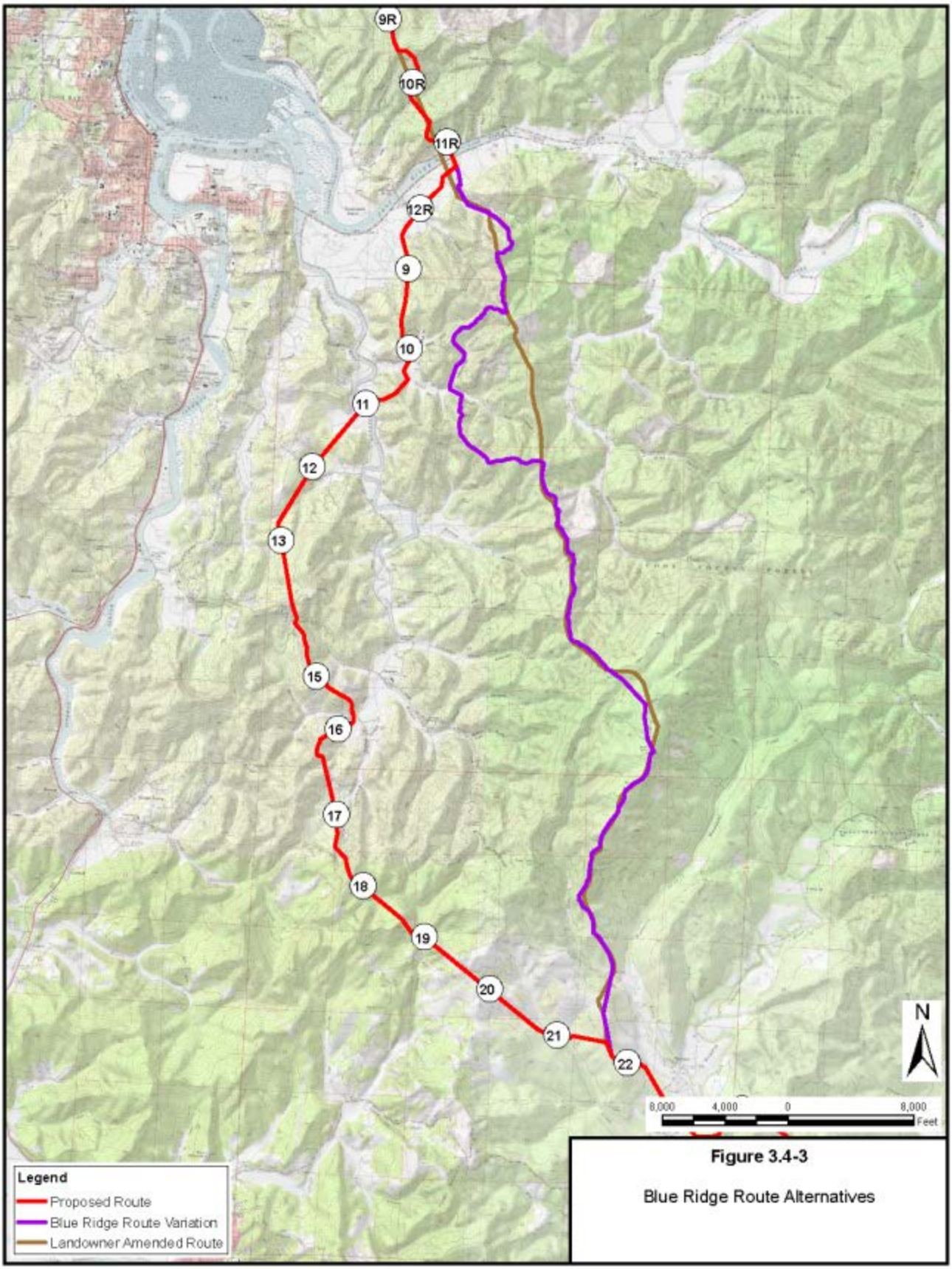


Figure 3.4-3

Blue Ridge Route Alternatives

The June 2013 proposed route would be slightly longer (14.4 miles) than the Blue Ridge Alternative (14.0 miles), and affect a greater number of landowners (table 3.4.2.2-1). Nearly 52 percent of the corresponding segment of the June 2013 proposed route would be co-located with a BPA powerline right-of-way, while 63 percent of the Blue Ridge Alternative would parallel logging roads. The Blue Ridge Alternative would shift portions of the pipeline from land owned by private individuals and timber companies to federal land managed by the Coos Bay District of the BLM. The proposed route would cross 61 privately owned parcels, while the Blue Ridge Alternative would cross 23 private parcels. The alternative route would cross about 6.5 miles of private land and 7.6 miles of federal land, while the proposed route would cross about 12.9 miles of private land and 1.5 miles of federal land. However, some landowners along the Blue Ridge Alternative object to it, believing that the alternative would affect the value of their properties, clear more forest including old growth, and impact wildlife and waterbodies, particularly Daniels Creek.[15]

In order to provide an equal comparison our DEIS used publicly available data for both the alternative and corresponding segment of proposed route, even though field data was available for a portion of the proposed route. Our DEIS found that the alternative did not provide a significant environmental advantage because additional clearing of LSOG forest and NSO and MAMU habitats along the Blue Ridge Alternative could cause long-term impacts and an irretrievable loss of suitable and occupied habitat that could not be easily mitigated. We received a number of comments on the DEIS that requested that we re-evaluate our assessment of the Blue Ridge Alternative.[16]

In response, on April 16 and May 22, 2015, we sent data requests to Pacific Connector asking for more information about the Blue Ridge Alternative in comparison to the proposed route, including data collected from on-site surveys. Pacific Connector was able to collect on-the-ground environmental information along the 7.6 miles of federal lands crossed by the alternative. The FEIS has been updated to include field data where available for the alternative, as well as field data previously collected by Pacific Connector where access was granted along the corresponding segment of proposed route. Environmental characteristics are compared in table 3.4.2.2-1, and additional details regarding the assessment for the Blue Ridge Alternative can be found in appendix Q of this EIS.

[15] See letters from Cary Norman and Karen Dohler filed with the FERC on June 24, 2914, and letters from David Schmidt, Kathi Windsor, Tom Younker, Julie Eldridge, and Christine Keenan filed July 16, 2014, in Docket No. CP13-492-000.

[16] E.g., letters from Mark Sheldon filed with FERC on January 26, 2015, James and Archina Davenport filed with FERC on February 2, 2015, Curtis and Mellissa Pallin filed with FERC on January 19, 2015, and Oregon Small Woodlands Association filed with FERC on February 13, 2015.

TABLE 3.4.2.2-1

Comparison of Pacific Connector's Proposed Route with the Blue Ridge Alternative

Impact/Issue		Proposed Route	Blue Ridge Alternative
Length (miles) a/		14.4	14.0
Construction right-of-way (acres)		166	161
Temporary extra work areas (TEWA) (acres)		62	37
Operational easement (acres) b/		87	85
Land ownership (miles)	Private	12.9	6.5
	BLM	1.4	7.5
	State	>0.1	0.0
Number of landowner parcels crossed	Private	57	24
	BLM	4	11
	State	1	1
Number of residences within 50 feet of the construction right-of-way		1	0
Water supply wells within 50 feet of the construction right-of-way c/		0	0
Number of waterbodies crossed	Field survey data	43 perennial 23 intermittent d/, e/	4 perennial 4 intermittent e/
Length of wetland crossings (miles)		2.2 f/,g/	1.2 g/
Riparian Reserves Impacted (acres)		14	17
Agricultural pastures affected (acres construction right-of-way) h/		8	8
Coniferous forest (acres construction right-of-way) i/	LSOG	9	41
	Mid-seral	50	42
	C – R	117	77
LSRs/Unmapped LSRs crossed (miles/acres)		0 miles / 0 acres	0.4 mile / 7 acres
Northern Spotted Owl (NSO) home range (1.5 mile radii)		1 NSO Home Range crossed (42310)	1 NSO Home Ranges crossed (42310)
High NRF and NRF habitat remover (acres) j/		7	66
Confirmed occupied Marbled Murrelet (MAMU) stands intersected by the alignment (based in NWFP criteria)		0	9 occupied stands (12 based on FWS criteria)
Potentially occupied MAMU stands intersected by the alignment (based in NWFP criteria)		3	1 (12 based on FWS criteria)
Marbled Murrelet suitable habitat removed		3	48
Fish-bearing streams crossed k/	Known	9	4
	Assumed	5	0
Fisheries critical habitat (streams crossed)	Coho l/	8	4
	Green Sturgeon m/	5	0
Geologic hazards (number, feet) n/	Previously mapped: SLIDO, other published	5 slides, 7,137 feet	2 slides, 3,276 feet
	LiDAR identified	2 slide, 3,257 feet	2 slides, 1,088 feet
	Total	7 slides, 10,397 feet	4 slides, 4,364 feet
Number of known cultural resources sites		0	1 o/
Number of newly identified cultural resources		0	0 o/
Miles of right-of-way parallel or adjacent to existing rights-of-way (percent of route length) p/		7.4 (52 percent)	8.3 (59 percent)

General: All values are rounded (acres to nearest whole acre, miles to nearest tenth of a mile, feet to nearest whole foot).

a/ Route Alternative lengths cannot be accurately calculated by comparing mileposts due to shifts in the alignment.

b/ Acres of permanent easement calculated based on a 50-foot permanent easement.

c/ OWRD (2013)

d/ http://hydro.reo.gov/, and field survey data

e/ Includes waterbodies not crossed by the centerline but within the right-of-way.

f/ Field surveys identified 2.0 miles.

g/ Based on NWI mapping.

h/ Only acres associated with the construction right-of-way are provided for comparison, as TEWAs have not been designed for the Modified Blue Ridge Route Variation.

i/ Evergreen Forest: LSOG (late successional/old-growth forest) = 80+ years; Mid-seral = 40 to 80 years; C-R (Clear-cut/regenerating forest) = 0 to 40 years.

j/ Nesting, Roosting, Foraging

k/ ODFW (2012a)

l/ NMFS (2008a)

m/ NMFS (2009)

n/ See GeoEngineers (2013a).

o/ Surveys incomplete.

p/ Approximately 5.6 miles (39 percent) of the proposed route is co-located/adjacent to a BPA Powerline corridor, whereas the Blue Ridge Alternative is adjacent/co-located with logging roads.

Based on field-collected data, the Blue Ridge Alternative would cross four perennial streams and four intermittent streams, all on BLM lands, while the corresponding segment of proposed route would cross 43 perennial streams and 23 intermittent streams. The Blue Ridge Alternative would cross 1.2 miles of wetlands compared to 2.2 miles crossed by the corresponding segment of the proposed route.

The DEIS identified three stands crossed by the proposed route that may be occupied by MAMU and we have no new information regarding these stands, therefore we continue to assume that the proposed route would cross three stands that may be occupied by MAMU and no stands that are confirmed as occupied. Construction of the Blue Ridge Alternative would result in removal of 48 acres of MAMU suitable habitat compared to 3 acres by the corresponding segment of proposed route.

The information that we had at the time of the DEIS indicated that there were three stands crossed by the Blue Ridge Alternative that were known to be occupied by MAMU, and seven additional stands that may be occupied by MAMU. The recently completed surveys along the Blue Ridge Alternative confirmed that six of the seven stands are occupied by MAMU (based on NWFP criteria). One additional stand crossed by the alternative route may be occupied; however, a second-year survey would be needed to confirm occupancy.

Based on our assessment, we conclude that the Blue Ridge Alternative would not offer significant environmental advantages over the proposed route. The additional clearing of LSOG forest, NSO and MAMU habitats, and Riparian Reserves along the Blue Ridge Alternative would cause long-term impacts and loss of suitable and occupied habitat that could not be easily mitigated, while impacts on waterbodies and their associated aquatic resources crossed by the proposed route would primarily be short-term occurring only during construction, and could be reduced or mitigated.

3.4.2.3 Weaver Ridge Alternative Routes

The BLM requested that Pacific Connector consider route alternatives in the vicinity of Weaver Ridge between MPs 42.7 and 49.8 to avoid MAMU and NSO critical habitat. Several alternative routes were identified: Deep Creek Variation Alternative Route, the May 2009 FEIS Alternative Route, Weaver Ridge Alternative 1 Route, Weaver Ridge Alternative 2 Route, Weaver Ridge Alternative 2a Route, Weaver Ridge Alternative 3 Route, Weaver Ridge Alternative 3a Route, and the proposed route. These routes are illustrated on figure 3.4-4 and compared in table 3.4.2.3-1.

The Weaver Ridge Alternative 1 Route would leave the proposed route around MP 46.0 crossing the logging spur road north of a reservoir and head almost due east on the north side of a tributary of Wildcat Creek over ridges, reconnecting with the proposed route at about MP 49.8. This alternative would be slightly shorter than the proposed route. However, the Weaver Ridge Alternative 1 Route would cross more miles of critical habitat for MAMU and NSO, and would cross two MAMU occupied stands (compared to one along the proposed route) and five NSO home ranges (compared to four along the proposed route).

The Weaver Ridge Alternative 2 Route would leave the Alternative 1 Route east of the proposed route at about MP 46, crossing a logging spur road, pass the Signal Tree Quarry, then follow Signal Tree Road for about 3 miles. It would head south over ridges, then join the Alternative 3 along Wildcat Creek. The Weaver Cove Alternative 2a Route would deviate from Alternative 2

just across the Coos County line along Signal Tree Road, cutting diagonally along Wildcat Creek to rejoin the Alternative 2 Route across the Douglas County line.

The Weaver Ridge Alternative 3 Route would leave the proposed route at about MP 42.6. It would follow ridges for about 3.5 miles, crossing Signal Tree Road and Upper Rock Creek. The alternative would then turn east and follow ridges for almost 4 miles, crossing Wildcat Creek before rejoining the proposed route at about MP 48.5. The Weaver Ridge Alternative 3a Route would leave Alternative 3 and follow Wildcat Creek for 1.5 miles to join the proposed route at about MP 49.0.

The Weaver Ridge Alternatives 2, 2a, 3, and 3a Routes are all longer than the proposed route and would cross more miles of MAMU and NSO critical habitat. Alternatives 3 and 3a would cross six NSO home ranges, while Alternatives 2 and 2a would cross five NSO home ranges (compared to four for the corresponding segment of proposed route). Compared to the proposed route, these alternatives would clear more LSOG and affect more acres of LSR on lands managed by the BLM. Therefore, those alternatives were eliminated from further consideration.

The May 2009 FEIS Alternative Route would leave the proposed route at about MP 46.3 and head southeast over ridges on the north side of Deep Creek, crossing the logging spur road south of the reservoir and reconnecting with the proposed route at about MP 48.0. The Deep Creek Variation Alternative Route would leave the proposed route at about MP 46.3 and follow a ridge north of Holmes Creek Spur Road and an unnamed four-wheel drive road back to the proposed route at about MP 47.0 and cross to the north side of the proposed route and parallel that route for about 1 mile before reconnecting with the proposed route near MP 48.0.

The Deep Creek Variation Alternative Route would be about 0.2 mile longer than the May 2009 FEIS Alternative Route, and cross one additional waterbody. Pacific Connector was concerned with the feasibility of this alternative. Based on a geotechnical review, the company indicated there would be a high risk of landslides and surface erosion where the Deep Creek Variation Alternative Route would cross the eastern flank of Weaver Ridge through convergent slopes above a first order stream. Pacific Connector also had concerns about the constructability of the May 2009 FEIS Alternative Route. Where that alternative would cross Weaver Ridge, it would traverse an extremely steep, narrow rock outcrop that would require blasting. So instead, the proposed route would ascend Weaver Ridge westward from a forest plantation near MP 46.5 up the slope to the north of the Deep Creek Variation Alternative Route, avoiding the rock outcrop.

The FERC staff agrees that the proposed route is environmentally preferable, because it would have the least impact on MAMU and NSO habitat, old-growth forest, and BLM LSR land allocations, and cross the fewest waterbodies, while being one of the most buildable alternatives, avoiding geological hazards and bedrock outcrops. We conclude that the alternative routes would not offer significant environmental advantage over the proposed route.

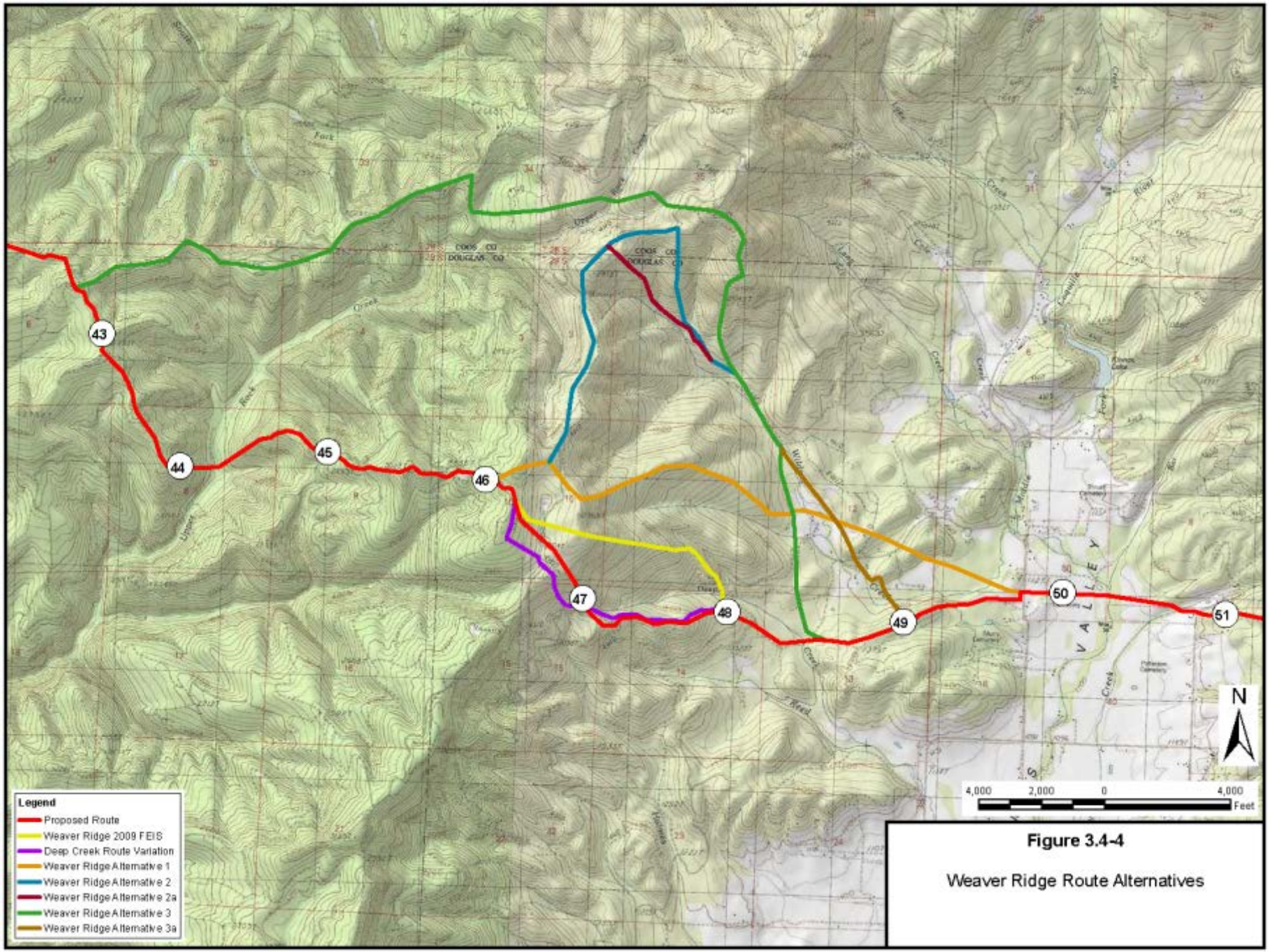


Figure 3.4-4

Weaver Ridge Route Alternatives

TABLE 3.4.2.3-1

Comparison of the Proposed Route with Weaver Ridge Alternative Routes

Alternatives Analysis		Proposed Route	Deep Creek Route Variation	2009 FEIS Route	Weaver Ridge Alternative 1	2	2a	3	3a
General									
Total length (miles) a/		7.3	7.4	7.2	7.0	9.3	9.0	8.6	8.2
Acres of construction right-of-way b/c/		84	85	82	80	107	103	99	94
Acres affected during operations (operational easement) d/		44	45	43	42	56	54	53	50
Number of Parcels Affected	BLM	4	4	4	3	5	4	4	4
	Private	12	12	11	11	15	14	12	13
	State	0	0	0	0	0	0	0	0
Land ownership (miles)	BLM	2.7	2.8	3.3	2.5	3.4	2.8	3.6	3.2
	Private	4.6	4.6	3.9	4.5	6.0	6.2	5.0	5.0
	State	0	0	0	0	0	0	0	0
Waterbodies and Wetlands									
Number of waterbodies crossed e/		5	5	5	2	7	7	11	11
Total wetland crossing length (feet) f/		0	0	0	0	0	0	0	0
Land Use									
Land Allocations (miles)	Matrix	2.1	2.1	2.1	1.1	1.4	1.4	0.7	0.4
	LSR	0.6	0.7	1.2	1.4	1.9	1.4	2.9	2.9
	Riparian Reserves	0.5	0.7	0.5	<0.1	0.5	0.3	0.6	0.5
Evergreen forest, Mixed conifer (late successional/old-growth) (miles)		0.4	0.7	0.4	1.8	2.2	1.7	1.2	1.7
Regenerating/mid-seral forest (miles)		3.7	5.4	3.9	3.4	4.5	4.5	6.3	5.2
Total forest lands affected (miles)		6.0	7.1	5.9	6.3	8.5	8.1	8.0	7.4
Other land use types (miles)		1.3	0.3	1.3	0.7	0.8	0.8	0.7	0.8
Miles of right-of-way that would be parallel or adjacent to existing rights-of-way		3.2	3.8	3.6	2.4	3.6	3.2	2.7	2.3
Number of previously identified cultural resources along the route f/		0	0	0	1	0	0	0	0
Number of newly identified cultural resources along the route f/		0	0	0	0	0	0	0	0
Endangered Species									
Miles of marbled murrelet critical habitat crossed		0.6	0.7	1.2	1.4	2.0	1.4	2.9	2.9
Number of marbled murrelet occupied stands crossed		1	1	2	2	1	1	0	0
Miles of marbled murrelet occupied stands crossed		<0.1	<0.1	0.4	1.0	<0.1	<0.1	0	0
Miles of northern spotted owl critical habitat crossed		0.9	1.0	1.0	1.1	1.7	1.3	2.5	2.5
Number of northern spotted owl home ranges crossed		4	4	4	5	5	5	6	6

TABLE 3.4.2.3-1

Comparison of the Proposed Route with Weaver Ridge Alternative Routes

Alternatives Analysis	Proposed Route	Deep Creek Route Variation	2009 FEIS Route	Weaver Ridge Alternative 1	2	2a	3	3a
Miles of northern spotted owl home ranges crossed	5.9	6.0	5.8	6.0	8.1	7.8	7.3	7.0
Number of northern spotted owl 500-acre core areas crossed	1	1	0	1	2	2	2	2
Miles of northern spotted owl core areas crossed	0.6	0.6	0	1.1	1.4	1.0	1.9	1.9
Number of 30-acre nest patches crossed	0	0	0	1	1	0	0	0
Miles of 30-acre nest patches crossed	0	0	0	0.1	0.4	0	0	0

General: All values are rounded (acres to nearest whole acre, miles to nearest tenth of a mile, feet to nearest whole foot).
a/ Route Alternative lengths cannot be accurately calculated by comparing mileposts due to shifts in the alignment.
b/ The construction right-of-way estimate for all route variations utilized 95 feet.
c/ TEWAs for all route variations have not been designed and are not included in the total acres of disturbance.
d/ The assumed operational easement is 50 feet; however, Pacific Connector will only maintain vegetation within 15 feet of the pipeline centerline for a total of 30 feet during the long term.
e/ Waterbodies from PNW Hydrography Framework Clearinghouse.
f/ NWI CONUS data.

3.4.2.4 Camas Valley Alternative Routes

The BLM requested Pacific Connector consider route alternatives in the vicinity of the Camas Valley in Douglas County, Oregon to avoid MAMU habitat. Three route variations that cross the Camas Valley were identified: the 2007 Northern Alternative (or Variation) Route, the Camas Valley East Alternative Route, and the proposed route. These routes are illustrated on figure 3.4-5 and compared in table 3.4.2.4-1.

The Northern Alternative Route would leave the proposed route at about MP 50.2 and head northeast across the Camas Valley then turn southeast over forested hills before it rejoins the proposed route near MP 53.0. This alternative route would cross habitat and one occupied stand for MAMU and habitat for NSO, and the BLM found it unacceptable.

The BLM suggested the Camas Valley East Alternative Route, which would follow the Northern Alternative for about 1 mile. It would leave the Northern Alternative Route and head southeast for about 0.4 mile. It would then turn east and follow the section line for about 1.2 miles before reconnecting with the proposed route just west of MP 53.0, east of the Camas Valley. Pacific Connector determined that the Oregon State Highway 42 crossing location along BLM's Camas Valley East Alternative Route was unacceptable for engineering design and safety reasons. The highway crossing along this alternative would be at the midpoint of a mile-long section of highway fill approximately 80 feet deep. The alternative pipeline route would also cross a tributary to Jim Bilieu Creek that flows beneath the highway in a culvert. Between Highway 42 and Quiet Mountain Road there is a rocky outcropping with numerous seeps and springs. The water appears to be collected and utilized by the nearby landowners for various uses. The severe elevation change from one side of the highway to the other, residences, water sources, powerline, and the presence of fill and rock collectively renders the alternative highway crossing virtually non-constructible.

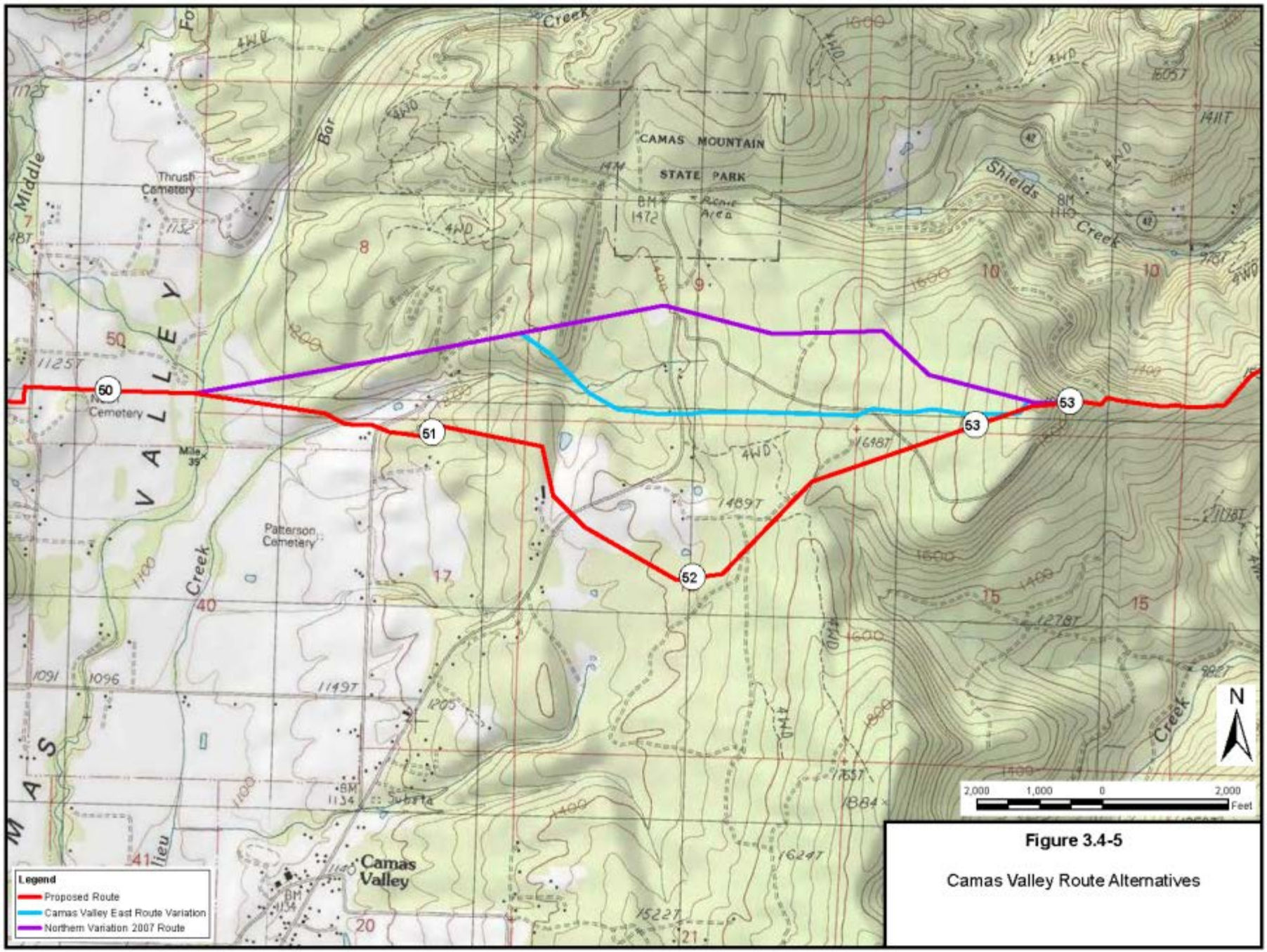


Figure 3.4-5

Camas Valley Route Alternatives

TABLE 3.4.2.4-1

Comparison of Camas Valley Alternatives with the Corresponding Segment of the Proposed Route

Alternatives Analysis			2007 Northern Alternative Route	Camas Valley East Alternative Route	Proposed Route
General					
Length (miles) a/			2.7	2.7	2.9
Construction right-of-way (acres)			31	32	33
Permanent easement (acres) b/			16	Estimated to be similar to Northern Variation	17
Land Use					
Land Ownership (miles)	Private		2.0	Similar to Northern Variation	2.3
	State		0	0	0
	Federal (BLM/NFS lands)		0.8	Similar to Northern Variation	0.6
Number of landowner parcels crossed			8	Unknown	15
Number of residences within 50 feet of construction right-of-way			0	1	0 c/
Miles of right-of-way parallel or adjacent to existing rights-of-way (percent of alternative length)			0.1	1.2	0.1
LSR - Federal land use designation (acres)			0	Unknown	5 d/
Riparian Reserves - federal land use designation (acres)			3	Unknown	1
Waterbodies and Wetlands					
Number of waterbodies crossed e/			11	3	4
Length of wetland crossings (feet) f/			0	0	0
Vegetation					
Agricultural lands affected (acres)			2	2	8
Total forest clearing (acres)			39	14	28
Acres Clearcut/Regenerating (0 to 40 years) g/			22	13	14
Acres Mid-Seral Forest (40 to 80 years)			10	Undetermined	8
Acres Late-Successional Forest (80 to 175 years)			2	Undetermined	6
Old-Growth Forest (175 +)			4	Undetermined	0
Biological Resources					
MAMU suitable habitat crossed (feet) h/			18	Unknown	5
MAMU stands	Occupied		Alignment crosses 1,043 feet of Occupied Stand R3027	Unknown	No known stands
	Presumed		Alignment crosses 350 feet of Potential MAMU Stand B12 that is not likely to be occupied based on the 2-year survey protocol.	Unknown	No known stands
MAMU critical habitat (acres)			0	Unknown	5 Pacific Connector made a minor adjusted to the Southern Route Variation to avoid crossing approximately 175 feet of the old-growth forest within this Critical Habitat Unit.)
NSO. suitable habitat crossed (acres) i/			33	Unknown	20
NSO. nest patch/cores			None	Unknown	No known nest patch/cores
NSO critical habitat crossed (feet)			0	Unknown	0
Habitat category(acres) j/	1		5	Unknown	2
	2		5	Unknown	13
	3		15	Unknown	17
	4		18	Unknown	16
	5		2	Unknown	2
	6		2	Unknown	3

TABLE 3.4.2.4-1

Comparison of Camas Valley Alternatives with the Corresponding Segment of the Proposed Route

Alternatives Analysis	2007 Northern Alternative Route	Camas Valley East Alternative Route	Proposed Route
Kincaid's lupine	Approximately 2.2 miles of potential habitat crossed; 0.8 mile surveyed of which 0.3 mile was considered suitable; no plants located in 2007.	Unknown	Approximately 1.1 miles of habitat may be suitable for Kincaid's lupine.
ESA fish species present/habitat k/	1 stream crossing known, 3 stream crossings unknown. 1 stream crossing - Oregon Coast ESU Coho, assumed.	Unknown	1 stream crossing known, 3 stream crossings unknown. 1 stream crossing - Oregon Coast ESU Coho, assumed.
StreamNet – anadromous fish distribution l/	None	None	None
Geotechnical			
Steep or difficult terrain (miles) m/	0.0	Unknown	0.0
Highly erosive soils (miles) n/	0.2	Unknown	0.2
Cultural Resources			
Number of previously recorded cultural resources	3 - Isolated finds; 2- sites	1 site	2 sites
Number of newly identified cultural resources o/	N/A	Unknown	1- isolated find

General: All values are rounded (acres to nearest whole acre, miles to nearest tenth of a mile, feet to nearest whole foot).
a/ Route Alternative lengths cannot be accurately calculated by comparing mileposts due to shifts in the alignment.
b/ Acres of operational easement calculated based on a 50-foot width.
c/ There are 2 outbuilding structures (barns/sheds) in the vicinity of the Southern Route Alternative**.** that are within 50 feet of the construction right-of-way (MP 51.4 and MP 51.9). Neither of these structures is suspected of being residences; however, during the right-of-way acquisition phase, Pacific Connector would attempt to locate the construction right-of-way 50 feet from any residences, where feasible.
d/ A total of approximately 5 acres of federal LSR would be affected, with 3 acres occurring within clear- cut/regenerating forests (0 to 40 years) and 2 acres occurring within mid-seral forest (40 to 80 years).
e/ Waterbodies from PNW Hydrography Framework Clearinghouse.
f/ NWI CONUS data.
g/ Forest Age Classes: Includes recent clearcut forests and areas of inroad construction where forest clearing would be reduced.
h/ Huff et al. (2006)
i/ Forest Service (2005a)
j/ See Section 3.4.1.4 of Pacific Connector's Resource Report 3 filed with its September 2007 application to the FERC.
k/ FWS, NMFS, and StreamNet (http://www.streamnet.org).
l/ ODFW (2000a, 2006a); StreamNet.
m/ Based on Soil Mapping Units that have slopes of 50-75 percent and have a water erosion rating of high or severe (NRCS 2004).
n/ Based on Soil Mapping Units that have a water erosion rating of high or severe (NRCS 2004).
o/ The new proposed route would avoid one site and three isolated finds on the Northern Alternative. One site would be affected regardless of the route selection. This route was not completely surveyed.

The proposed route includes a highway crossing location that Pacific Connector states is constructible, and avoids an occupied MAMU stand. Pacific Connector proposes to cross under Highway 42 along the proposed route where it is essentially level using conventional boring methods. Both sides of the highway crossing are only lightly vegetated which would minimize visual impact of the pipeline right-of-way from motorists traveling along Highway 42.

The proposed route is approximately 0.2 mile longer than the Northern Alternative Route. Based on evaluation of the Pacific Northwest Hydrography Framework Clearinghouse data layers, the proposed route would cross 4 waterbodies compared to 11 for the Northern Alternative Route, and would require the clearing of less forest. The FERC staff and BLM agree that neither the 2007 Northern Variation nor the Camas Valley East Alternative Route offer significant environmental advantage over the proposed route between MPs 50.2 and 53.0.

3.4.2.5 Interstate 5 and South Umpqua River Crossing Alternative Routes

Pacific Connector investigated various alternative routes to cross I-5 and the South Umpqua River between about MPs 67.4 and 74.8 in Douglas County, south of the city of Roseburg due to

concerns raised during scoping. The various routes are illustrated on figure 3.4-6 and are compared on table 3.4.2.5-1.

The route analyzed in the FERC's May 2009 FEIS in Docket No. CP07-441-000 (May 2009 FEIS Alternative Route) had constructability and environmental issues. Pacific Connector had proposed to use a bore to cross under I-5 along the May 2009 FEIS Alternative Route, but concerns were raised due to uncertain subsurface conditions associated with the extended crossing length (approximately 400 feet) and unknown types of fill material. Additional considerations include removal of approximately 40 feet of overburden material on the west side of I-5 to construct a bore pit, and un-useable workspace conditions due to steep side slopes on both sides of I-5 at the alternative route crossing location. Pacific Connector had originally proposed to use a diverted open cut for the western crossing of the South Umpqua River along the May 2009 FEIS Alternative Route, but concerns were raised about impacts that crossing method may have on federally listed fish species. In addition, a bald eagle nest was found near the crossing location that would have delayed construction during the breeding season, conflicting with the ODFW water crossing window.

Also along the May 2009 FEIS Alternative Route, the pipeline would be near a recently developed subdivision on property owned by Marc and Dea McConnell. Pacific Connector created the MP 69.7 Alternative Route that would go on the north side of the McConnell property from the original location of the proposed Clarks Branch Meter Station eastward to cross I-5. This alternative route would move the bore under I-5 approximately 350 feet to the northwest. However, that alternative would still cross one of the developed lots and one of the undeveloped lots, and would be within 50 feet of five residences. Although this modification would result in a slightly shorter bore under I-5, and eliminate the need to remove excessive amounts of overburden at the bore pit location, the MP 69.7 Alternative Route would involve additional affected landowners and would not address risks associated with highway fill material and steep slopes at the crossing.

The MP 69.5 Alternative Route would go south of the McConnell property to avoid the residential development. This alternative route would still be within 50 feet of one residence. It would cross I-5 in an area where Pacific Connector believed it could put in a bore. This alignment would require a relocation of the proposed Clarks Branch Meter Station. Both the MP 69.7 Alternative Route and the MP 69.5 Alternative Route would use the same diverted open cut crossing of the South Umpqua River at the location along the May 2009 FERC Alternative Route; and therefore would also be within one-quarter mile of the occupied bald eagle nest. The MP 69.5 Alternative Route would be slightly longer than either the May 2009 FERC Alternative Route and the MP 69.7 Alternative Route, and would cross land owned by the Cow Creek Tribe.

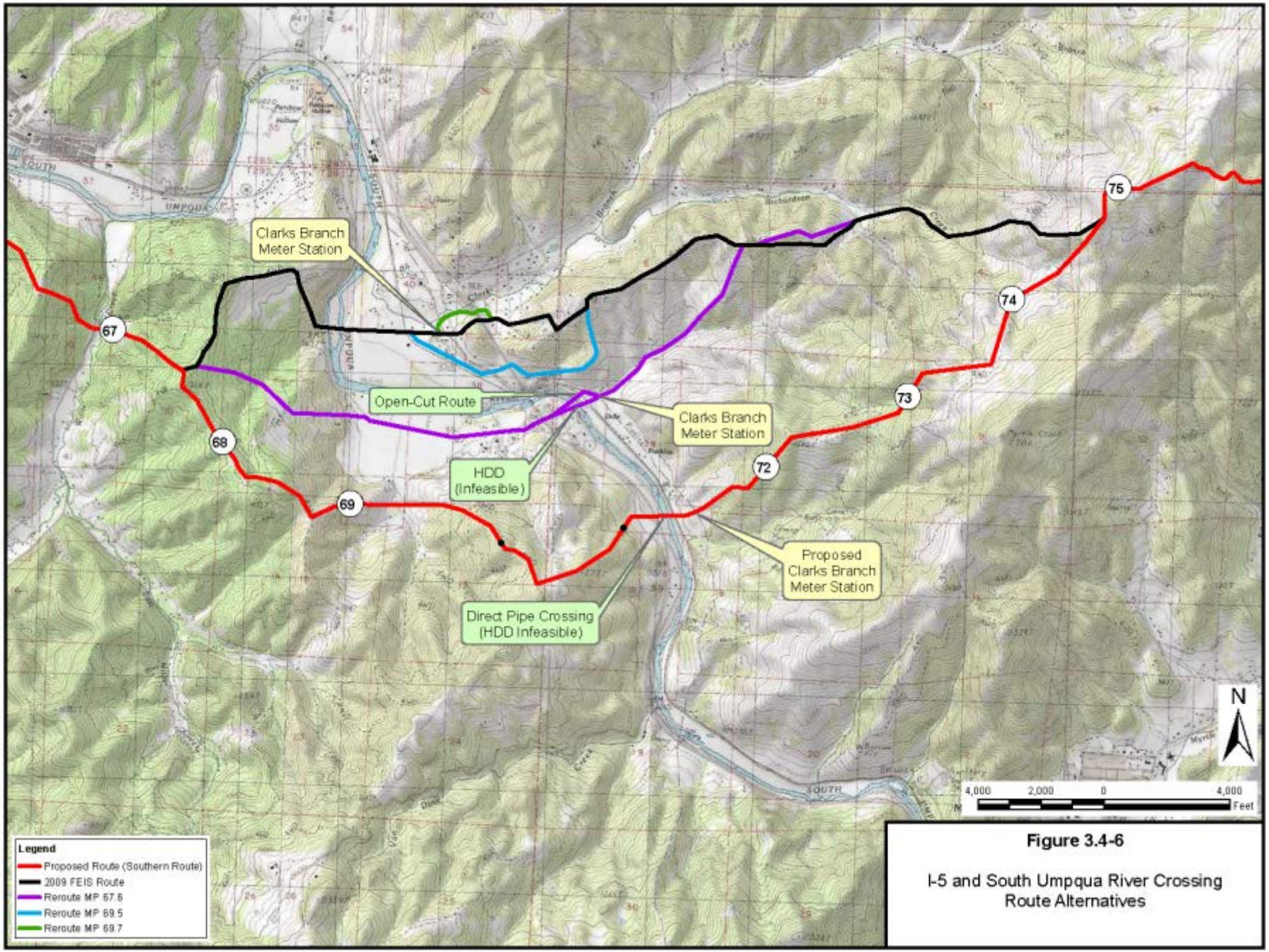


Figure 3.4-6

I-5 and South Umpqua River Crossing Route Alternatives

TABLE 3.4.2.5-1

Comparison of I-5 Alternative Routes to the Proposed Route

Alternatives Analysis		May 2009 FEIS Route Alternative	MP 69.7 Route Alternative	MP 69.5 Route Alternative	MP 67.6 Route Alternative	Proposed Route
General						
Total length (miles) a/		6.6	6.6	6.8	6.2	7.3
Acres of construction right-of-way b/		76	76	79	72	82
Total acres of construction disturbance		148	Not designed c/	Not designed c/	121	106
Acres affected during operations (operational easement) d/		40	40	41	38	44
South Umpqua River Crossing Method		Diverted open cut	Diverted open cut	Diverted open cut	Open cut	DP technology
Landowner parcels crossed e/		39	35	27	28	26
Number of residences within 50 feet of construction right-of-way		7	5	1	0	0
Land ownership (miles)	Private	5.7	5.7	4.9	4.3	7.1
	State	0.3	0.3	0.3	0.4	0.2
	Federal (BLM/NFS Lands)	0.0	0.0	0.0	0.0	0.0
	Tribal	0.6	0.6	1.6	1.5	0.0
Waterbodies and Wetlands f/						
Number of waterbodies crossed		13	13	14	19	18
Total wetland crossing length (feet)		644	0	0	741	959
Land Use						
Agricultural land (including pastures) affected (miles)		0.6	0.5	0.8	1.1	0.1
Forest lands affected (miles) g/		1.5	1.5	1.4	1.6	3.7
Miles of right-of-way that would be parallel or adjacent to existing rights-of-way		3.5	3.4	2.5	3.0	1.6
Number of previously identified cultural resources along route		0	0	0	0	0
Number of newly identified cultural resources along route h/		3	1	1	0	0
Critical Habitat						
The coho salmon – Oregon Coast ESU – including designated CHU.		Present - South Umpqua River	Present - South Umpqua River	Present - South Umpqua River	Present - South Umpqua River	Present - South Umpqua River
Bald eagle nest within 0.25-mile		Present	Present	Unknown	Unknown	Unknown

General: All values are rounded (acres to nearest whole acre, miles to nearest tenth of a mile, feet to nearest whole foot).
a/ Route Alternative lengths cannot be accurately calculated by comparing mileposts due to shifts in the alignment.
b/ The construction right-of-way for the preferred route and original proposed alignment is 95 feet.
c/ TEWAs for the various potential I-5 reroutes have not been designed and are not included in the total acres of disturbance. Pacific Connector assumes that the need for these TEWAs would be similar to the proposed route.
d/ The permanent easement for the proposed route and potential I-5 reroutes is 50 feet.
e/ Douglas County Assessor's Office (2011)
f/ Waterbodies and wetlands were obtained from the Hydrography Framework Clearinghouse and review of aerial photos. NWI mapping is not available for this area.
g/ Includes all forestland types and age classes; Mixed conifer, Deciduous forest.
h/ Surveys completed along proposed route; survey incomplete on reroutes.

It was Pacific Connector's preference to cross under both I-5 and the South Umpqua River using a single HDD, or cross I-5 with a bore where the slopes were not steep and highway fill would not be so great. Therefore, the applicant examined another crossing location along the MP 67.6 Alternative Route. The MP 67.6 Alternative Route would leave the May 2009 FEIS Alternative Route at about MP 67.6 heading southeast down a hill and then follow Old Highway 99 east for about 1 mile. It would cross I-5, the South Umpqua River, Dole Road, and a railroad before

rejoining the May FEIS Alternative Route along Richardson Ridge at about MP 72.6. Because of the immediate proximity of Dole Road along the steep abrupt east bank of the river, it would be necessary to temporarily close the road to complete the river crossing. Old Highway 99 may also have to be temporarily closed to traffic during installation of the pipeline along the MP 67.6 Alternative Route.

Pacific Connector completed geotechnical investigations along MP 67.6 Alternative Route and determined that an HDD under I-5, the river, and the railroad would not be feasible because of the unfavorable geologic conditions. An open-cut crossing of the South Umpqua River would be required along the MP 67.6 Alternative Route because a diverted open-cut crossing at that location would be problematic for the following reasons:

- narrow gravel bar in the river would limit the diversion channel;
- shallow bedrock in upstream part of the gravel bar may require blasting;
- bar may have subsurface water flows;
- upstream and downstream elevation changes may require greater excavation and larger spoil storage areas; and
- longer in-water work associated with construction of temporary diversion dams and restoration of the diversion channel.

In 2013, Pacific Connector investigated a southern route that would have a less difficult crossing of I-5 and the South Umpqua River using a different technological method, and incorporated this change into the proposed route filed with its application to the FERC in Docket No. CP13-492-000. The proposed route would leave the May 2009 FEIS Alternative Route at about MP 67.6 and head southeast over upland ridgelines, turning due east for about a mile between MPs 69.0 and 70.0, then turn northeast from Edies Land at MP 70.5 to Highway 99 at MP 71.1. Because subsurface conditions would not allow for a HDD along the proposed route, Pacific Connector would use DP technology to cross under I-5, the South Umpqua River, Dole Road, and a railroad to MP 71.4. DP technology can overcome the problematic issues associated with the HDD crossing method because it provides a continuously supported hole during the excavation process, reduces the pressure of drilling mud, and eliminates the bore hole reaming and pull back requirements of an HDD. The Clarks Branch Meter Station would be moved to a pasture on the east side of the railroad where Northwest's Grants Pass Lateral is located near MP 71.5. The proposed route would continue northeast from the meter station following upland ridges to rejoin the May 2009 FEIS Alternative Route at about MP 74.8, along a private road south of the head of Clark Branch.

The proposed route would avoid residential areas as well as the pastures and croplands crossed by the MP 67.6 Alternative Route. It offers the best crossings of I-5 and the South Umpqua River, and avoids the steep side slopes found along the May 2009 FEIS Alternative Route. The relocation of the Clarks Branch Meter Station to MP 71.5 on the proposed route would avoid the need for permanent wetland fill at the meter station location along the May 2009 FEIS Alternative Route. We conclude that none of the alternative routes would offer significant environmental advantages over the proposed route between MPs 67.4 and 74.8.

3.4.2.6 Northern Spotted Owl Nest Patch Alternative Routes

The BLM asked Pacific Connector to revise its 2009 route in order to avoid LSOG and a NSO nest patch. The pipeline route analyzed in the FERC's May 2009 FEIS for Docket No CP07-441-000 crossed an NSO nest patch between about MPs 81.2 and 82.5, east of South Myrtle

Creek in Douglas County. Pacific Connector modified its pipeline alignment to avoid the NSO nest patch in its June 2013 application to the FERC in Docket No. CP13-493-000. These two routes are compared in table 3.4.2.6-1 and illustrated in figure 3.4-7.

The proposed route would be co-located with a recently constructed logging road, and routed through recently harvested forest. The May 2009 FEIS Alternative Route would cross less private land, including agricultural land. However, the proposed route would reduce impacts on LSOG forest and avoid the NSO nest patch. Therefore, we conclude that the May 2009 FEIS Alternative Route would not offer significant environmental advantage over the proposed route between MPs 81.2 and 82.5.

TABLE 3.4.2.6-1

Comparison of the May 2009 FERC FEIS Route Alternative With the Proposed Route Between MPs 81.2 and 82.5

Impact/Issue		May 2009 FEIS Route Alternative	Proposed Route
Total length (miles) a/		1.3	1.3
Acres of construction right-of-way		15	15
Acres of TEWAs		11	9
Permanent easement (acres) b/		8	8
Number of landowner parcels crossed		4	3
Land ownership (miles):	Private	0.6	1.3
	State	0.0	0.0
	Federal (BLM/NFS lands)	0.7	0.0
Number of residences within 50 feet of construction right-of-way		0	0
Geotechnical constraints		0	0
Number of waterbodies crossed c/		1	1
Total waterbody crossing length (feet)		2	2
Number of wetlands crossed		0	0
Total wetland crossing length (feet)		0	0
Agricultural land affected (acres)		<1	<1
Forest lands cleared (miles) d/		1.1	0.7
Forest cleared LSOG (miles)		0.7	0.0
Number of NSO nest patches crossed		1	0
Number of previously identified cultural resources along route		3	0
Number of newly identified cultural resources along route		0	0
Miles of right-of-way that would be parallel or adjacent to existing rights-of-way		1.0	1.0

General: All values are rounded (acres to nearest whole acre, miles to nearest tenth of a mile, feet to nearest whole foot).

a/ Mileage length cannot be calculated by subtracting milepost ranges because of engineering station equations included in route segment between MPs 9.41R to 8.59. Route Alternative lengths also cannot be accurately calculated by comparing mileposts due to shifts in the alignment.

b/ Acres of permanent easement calculated based on crossing length on private and federal timber lands. Pacific Connector proposes a 50-foot permanent easement on both federal and private lands.

c/ From Pacific Northwest Hydrography Framework Clearinghouse data layers (http://hydro.reo.gov/) and review of aerial photography and review of NWI mapping.

d/ Includes recent clear-cut forests and areas of inroad construction where forest clearing would be reduced.

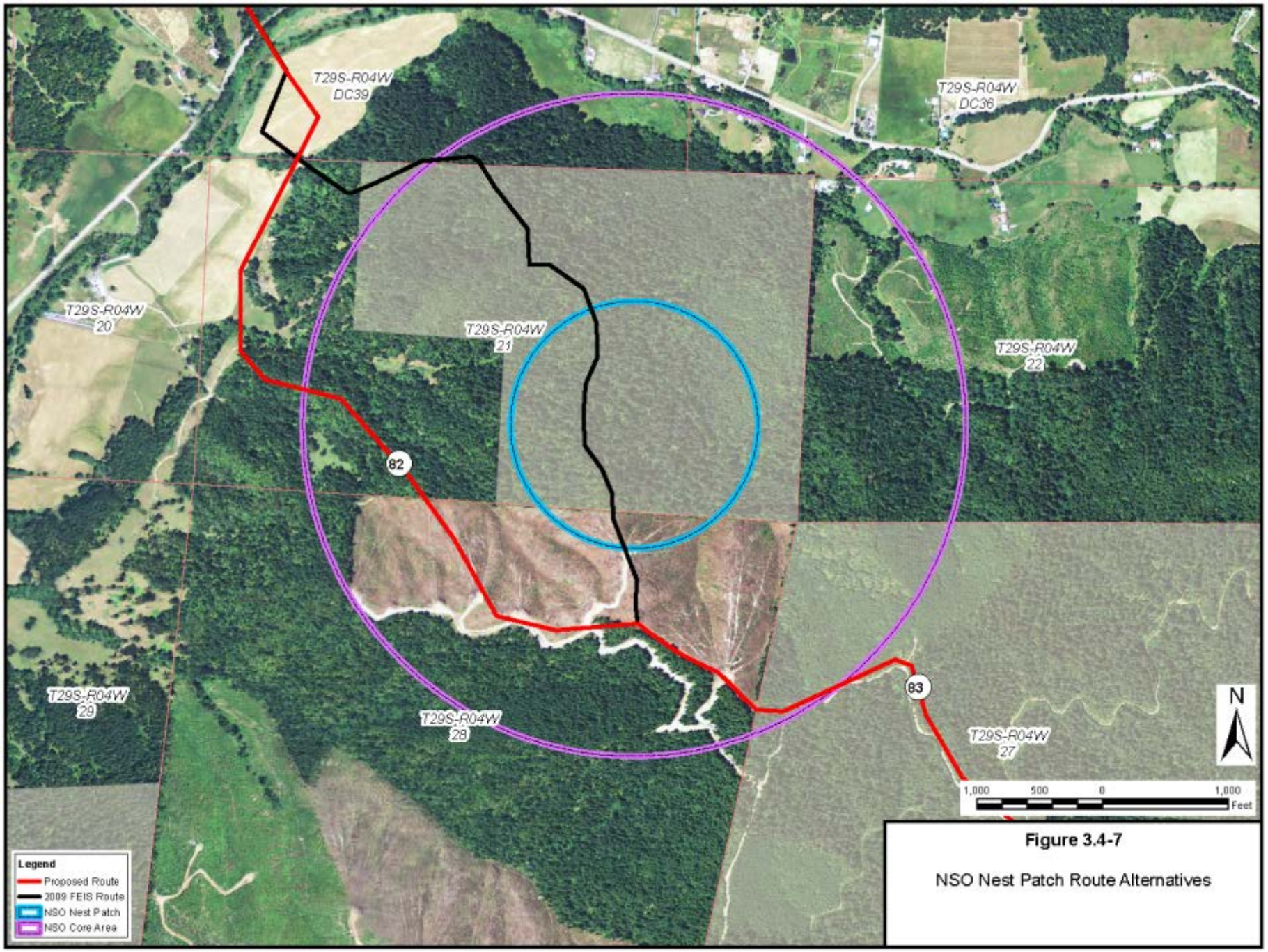


Figure 3.4-7

NSO Nest Patch Route Alternatives

3.4.2.7 Oregon Women's Land Trust Alternative Routes

In response to objections raised by the Oregon Women's Land Trust about the 2007 pipeline route across its property, Pacific Connector adjusted its proposed route between about MPs 85.4 and 87.0. Table 3.4.2.7-1 compares the 2007 Alternative Route to the proposed route; both routes are illustrated on figure 3.4-8.

The 2007 Alternative Route would be approximately 50 feet from a guest house. The proposed route avoids this house and minimizes the overall crossing of Trust-owned lands. Other environmental advantages of the proposed route include following an existing right-of-way for 0.4 mile and avoiding crossing tributaries to Wood Creek. However, the 2007 Alternative Route would be shorter, affect two fewer landowners, clear fewer acres of forest, and avoid an historic NSO activity center.

In an October 27, 2012, letter to the Commission, the Oregon Women's Land Trust stated that it found both routes objectionable. The Trust's Board believes that either route would conflict with the Trust's mission to protect the land in perpetuity. When evaluating alternatives, sometimes tradeoffs between resources have to be considered. In this situation, we are weighting impacts on natural resources against impacts on a residence. While we acknowledge that the 2007 Alternative Route would impact less forest, we conclude that the proposed route would result in the least amount of impact on the Oregon Women's Land Trust property, would avoid impacts on a residence, and would avoid crossing any waterbodies. Therefore, we found that the 2007 Alternative Route would not offer significant environmental advantages over the proposed route between MPs 85.4 and 87.0.

TABLE 3.4.2.7-1

Comparison of Alternative Routes Across the Oregon Women's Land Trust Property

Alternatives Analysis		2007 Route Alternative	Proposed Route
General			
Length (miles) a/		1.4	2.0
Construction right-of-way (acres)		16	22
Number of TEWAs		10	6
Acres of TEWAs		5	2
Operational easement (acres) b/		8	10
Land Use			
Land Ownership (miles)	Private	1.2	1.5
	State	0.0	0.0
	Federal (BLM/NFS Lands)	0.2	0.5
Number of landowner parcels crossed		6	8
Number of residences within 50 feet of construction right-of-way		1	0
Miles of right-of-way parallel or adjacent to existing rights-of-way (percent of alternative length)		0.0 (0 percent)	0.4 (21 percent)
Waterbodies and Wetlands			
Number waterbodies crossed d/		3 c/	0
Length of wetland crossings (feet) e/		0	0
Vegetation			
Total forest clearing (acres)		20	25
Acres Clearcut/Regenerating (0 to 40 years)		5	4
Acres Mid-Seral Forest (40 to 80 years)		2	<1
Acres Late-Successional Forest (80 to 175 years)		9	15
Acres Old-Growth Forest (175 +)		4	5
Biological Resources			
Northern spotted owl. suitable habitat crossed (acres) f/		19	24
Northern spotted owl nest patch/cores		1	1
Northern spotted owl critical habitat crossed (feet)		0	0

TABLE 3.4.2.7-1

Comparison of Alternative Routes Across the Oregon Women's Land Trust Property

Alternatives Analysis		2007 Route Alternative	Proposed Route
Habitat category (acres) g/	1	4	7
	2	9	13
	3	7	5
	4	0	0
	5	0	0
	6	<1	<1
ESA fish species present / habitat h/		1 stream Oregon Coast ESU Coho, assumed habitat T, CH	None
StreamNet – anadromous fish distribution i/		1 stream – assumed	None
Geotechnical			
Steep or difficult terrain (miles) j/		0.0	0.0
Highly erosive soils (miles) k/		0.9	1.4

General: All values are rounded (acres to nearest whole acre, miles to nearest tenth of a mile, feet to nearest whole foot).
a/ Route Alternative lengths cannot be accurately calculated by comparing mileposts due to shifts in the alignment.
b/ Acres of permanent easement calculated based on a 50-foot width.
c/ Field surveys identified 2 streams.
d/ Pacific Northwest Hydrography Framework Clearinghouse data layers (http://hydro.reo.gov/).
e/ From NWI mapping - access was denied on the majority of the parcels crossed by this route.
f/ Forest Service (2005a).
g/ See description in Pacific Connector's Resource Report 3 in its June 2013 application.
h/ FWS, NMFS, and StreamNet (http://www.streamnet.org).
i/ ODFW 2000a, 2006a; StreamNet.
j/ Based on Soil Mapping Units that have slopes of 50 to 75 percent and have a water erosion rating of high or severe (NRCS 2004).
k/ Based on Soil Mapping Units that have a water erosion rating of high or severe (NRCS 2004).

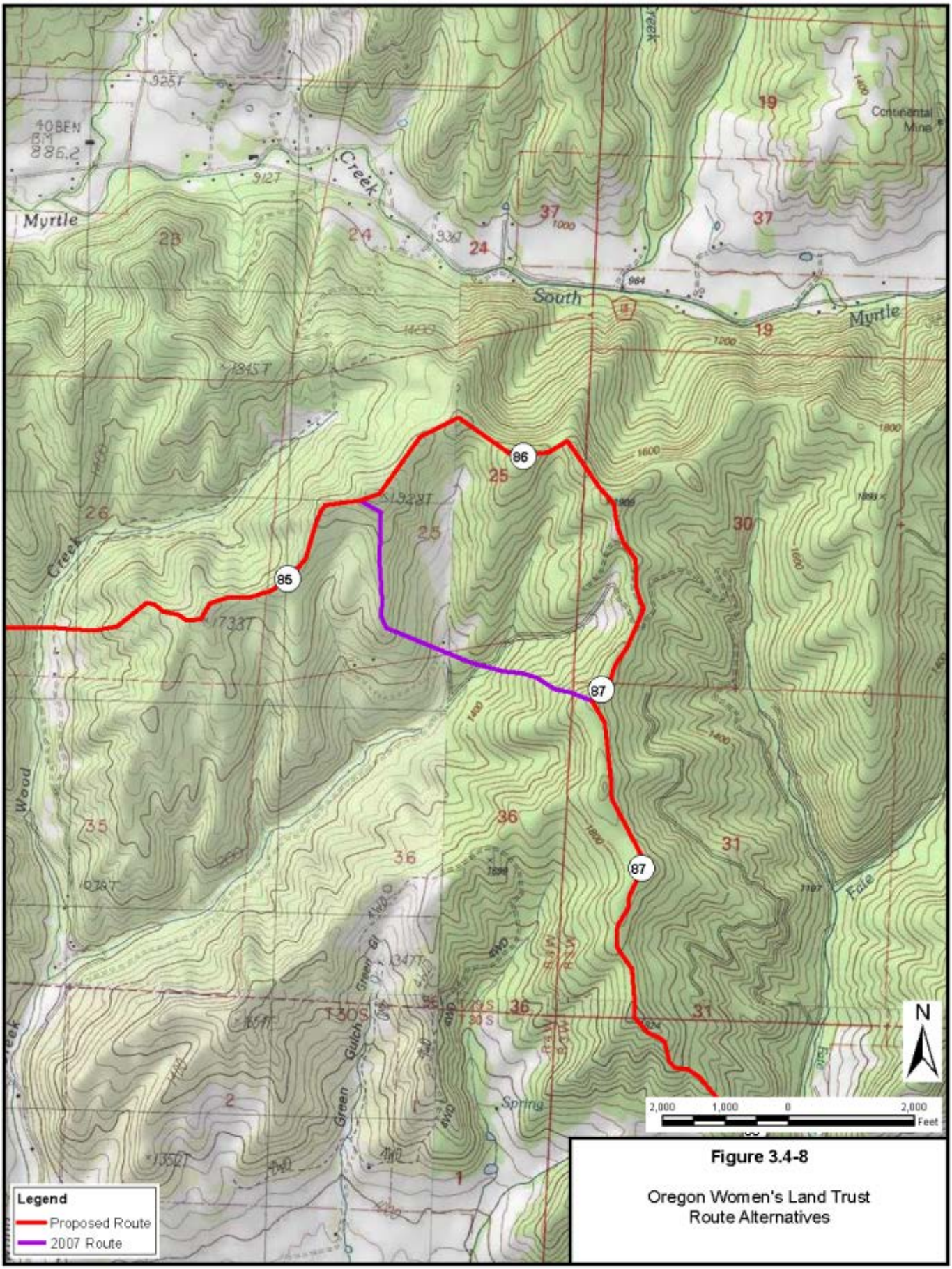


Figure 3.4-8

Oregon Women's Land Trust
Route Alternatives

3.4.2.8 Umpqua National Forest – Neuman Gap to Long Prairie Alternative Routes

The Forest Service requested the consideration of alternative routes within the Umpqua National Forest, along Wildcat Ridge between Neuman Gap near MP 105 and Long Prairie near MP 111. We compared the proposed route to three alternatives routes: the May 2006 Alternative Route (Alternative 1); the Forest Service Road 3200 Alternative Route (Alternative 2); and the Compromise Alternative Route (Alternative 3). The proposed route and alternative routes in this area are shown on figure 3.4-9, and table 3.4.2.8-1 includes a comparison of environmental variables between the alternative routes and the corresponding segment of proposed route.

The Forest Service and the Cow Creek Tribe indicated that a segment of the pipeline route originally proposed by Pacific Connector in May 2006 had the potential to impact an important traditional cultural property. The Forest Service also raised issues related to the crossing of an LSR. Based on these objections, we do not recommend use of the May 2006 Alternative Route (Alternative 1).

The Forest Service suggested a different alternative route that would follow existing Forest Service Road 3200 (Alternative 2). The rationale for this alternative was to utilize the existing cleared road corridor to minimize forest fragmentation and reduce impacts on LSRs. We also do not recommend use of the Forest Road 3200 Alternative Route Variation, because of Pacific Connector's concerns about its constructability, including:

- There is a high risk of landslide occurrence from Forest Service Road #3200, headwall swales and from constructed fill slopes that would be completed during construction;
- Earthwork necessary for a 95-foot construction corridor on side slopes exceeding 70 percent along the route is considered infeasible due to geotechnical considerations;
- Steep side slopes (greater than 50 percent) require significant excavations to construct a 95-foot construction corridor. Based on anticipated range of excavation of between 0.5:1 (horizontal:vertical) and 1:1, the cutslope would be between approximately 100 to 135 feet in height. The excavation would extend at least 50 feet upslope of the existing cutslope; and
- Up to 25,000 cubic yards of excavation material would be generated per station (100 feet) along the steep slopes. The excavated materials would need to be end-hauled to a stable, temporary stockpile site.

Subsequently, Pacific Connector developed its Compromise Alternative Route (Alternative 3). The Forest Service indicated that the Compromise Alternative Route would cross an area planned for expansion of the Peavine rock quarry, and issues were raised about the crossing of the East Fork Cow Creek. The Peavine quarry is the largest and most extensively developed quarry within the upper reaches of the watershed and is of strategic importance to the Umpqua National Forest. The Forest Service also requested that the pipeline avoid a known NSO nest patch. Based on the Forest Service objections, we do not recommend use of the Compromise Alternative Route.

Pacific Connector conducted site visits with the Forest Service and additional field studies. Based on this information, they identified the proposed route.

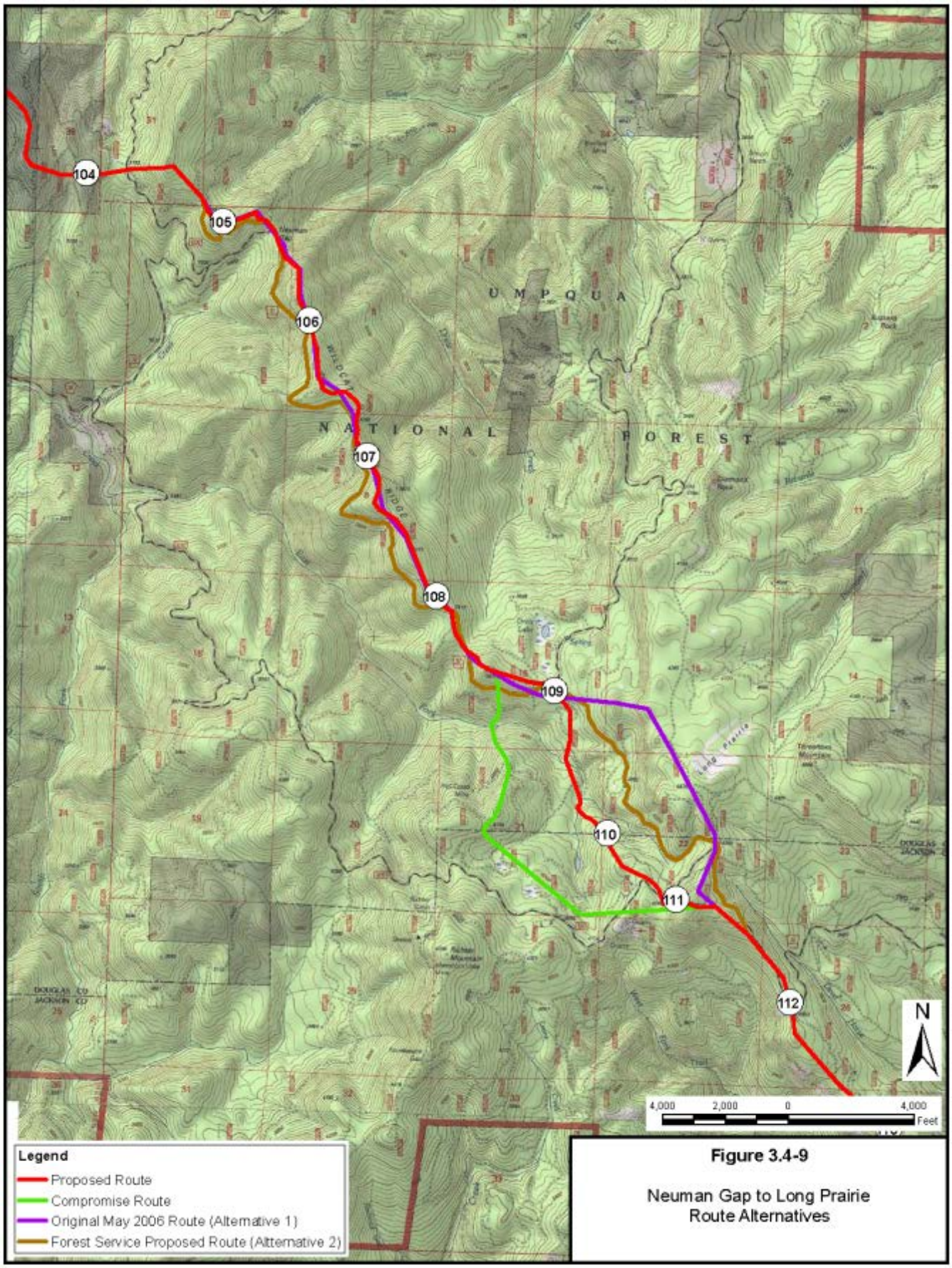


Figure 3.4-9

Neuman Gap to Long Prairie
Route Alternatives

TABLE 3.4.2.8-1

Comparison of Umpqua National Forest Alternative Routes With the Corresponding Segment of the Proposed Route Between Neuman Gap and Long Prairie – MPs 105 to 111

Impact/Issue	Proposed Route	Compromise Alternative Route (Alternative 3)	May 2006 Alternative Route (Alternative 1)	Forest Service Road 3200 Alternative Route (Alternative 2)
General				
Total length (miles) a/	6.4	6.7	6.4	7.5
Acres of construction right-of-way b/	73	77	73	86
Total acres of construction disturbance	110	117	73 c/	Pipeline integrity risks associated with steep side hill construction along the road, geologic hazards due to grading requirements (25,000 cy/100 feet).
Acres affected during operations (operational easement) d/	45	41	39	86
Land Ownership (miles)				
Forest Service	6.4	6.7	6.4	7.5
Geotechnical				
Miles of steep or difficult terrain to be crossed e/	0.2	0.4	0.1	See construction disturbance comment
Waterbodies and Wetlands				
Number of waterbodies and wetlands crossed f/	7	6	0	0
Total waterbody and wetland disturbance during construction (acres)	0.2	0.3	0	0
Land Use				
Land allocations (miles):				
Matrix	2.9	3.3	3.1	3.3
LSR	3.5	3.4	3.3	4.2
Riparian Reserves	0.5	0.2	0.0	0.3
Evergreen Forest, Mixed conifer (miles)	4.2	3.9	3.4	5.6 h/
Regeneration Forest (miles)	1.8	2.3	2.7	1.8 h/
Clearcuts (miles)	0.0	0.0	0.1	0.0 h/
Total forest lands affected (miles)	6.0	6.2	5.9	7.4 h/
Other land use types	0.4	0.5	0.4	0.1 h/
Miles parallel or adjacent to existing rights-of-way	5.6	5.1	5.4	7.3
Cultural Resources				
Number of previously identified cultural resources along route	0	1 – site 2 – isolated finds	3	0
Number of newly identified cultural resources along route	3 – site 1–isol. find	N/A	1	N/A
Critical Habitat g/				
Acres of federally listed critical habitat for NSO	52	33	34	40 (95-foot ROW only)
Miles of federally listed critical habitat for NSO crossed	6.4	6.7	6.3	7.5
NSO core area (0.5 mile buffer of nest site)	3	4	3	3

General: All values are rounded (acres to nearest whole acre, miles to nearest tenth of a mile, feet to nearest whole foot).

a/ Route Alternative lengths cannot be accurately calculated by comparing mileposts due to shifts in the alignment.

b/ The construction right-of-way for the proposed route and alternative route is 95 feet.

c/ TEWAs for the alternative route have not been designed and are not included in the total acres of disturbance. Pacific Connector estimates that the number and acres of these would be less than those required for the proposed route because the alternative route does not cross any streams or have the length of slope crossings as does the proposed route.

d/ The assumed operational easement for both the proposed route and alternative route is 50 feet; however, Pacific Connector will only maintain vegetation within 15 feet of the pipeline centerline for a total of 30 feet in the long term.

e/ Based on slopes that are greater than 50 percent (based on 10-meter digital elevation model). However, Pacific Connector has routed the alignment to ensure constructability, safety, and long-term stability by avoiding side slopes and approaching slopes with the alignment obliquely or perpendicularly to the slope.

f/ PNW Hydrography Framework Clearinghouse. Ditches were excluded.

g/ Includes acres of impact associated with the construction right-of-way and TEWAs. This analysis used the final revised critical habitat designation (2008).

h/ The proposed Forest Service route follows existing Forest Service Road 3200. Construction of the Forest Service proposed route would require extensive side-cuts; therefore, miles crossed considered habitat adjacent to the road.

The proposed route would avoid the Peavine quarry; avoid crossing the known NSO nest patch; provide better crossing locations of the East Fork Cow Creek; and avoid the Peavine Camp, a dispersed recreation site. We conclude that none of the alternative routes within the Umpqua National Forest from near Neuman Gap to near Long Prairie, between MPs 105 to 111, would offer significant environmental advantage over the proposed route

3.4.2.9 East Side of the Rogue River Access Alternatives

During the scoping period, landowners along Old Ferry Road raised concerns about the use of that road for access to the HDD drill site on the east side of the Rogue River during pipeline construction.[17] Therefore, Pacific Connector researched the possibility of finding other alternative access roads to the east side of Rogue River crossing, in the vicinity of MP 123.0.

BLM Road 34-1-23

It may be possible to use existing BLM Road 34-1-23 (Indian Creek Firebreak) as access to the east side of the Rogue River. Use of that road would require driving 2.3 miles on BLM Road 34-1-23 to about MP 125.0, then traveling about 2.2 miles along the new pipeline right-of-way westward to the HDD site. Portions of the pipeline right-of- way would exceed 65 percent grade, which would require that essentially all vehicles receive towing assistance to negotiate the grades. We conclude this may create a safety hazard. Therefore, we have not considered use of this road any further.

New Temporary Access Road

We considered the construction of a new temporary access road to the HDD drill site, on the east side of Old Ferry Road. Figure 3.4-10 shows the potential new road location. Our road design assumptions included:

- the road must be able to handle traffic for the duration of the construction window;
- the road would be reclaimed and revegetated back to its original condition and contours after construction;
- the road would need to be approximately 16 feet wide; and
- the maximum grade for the road could not exceed 12 percent.

[17] See the letter dated October 27, 2012 from Marcella and Alan Laudani and the testimony of Marcella Laudani at the August 30, 2012, public meeting in Medford, and the letter dated October 26, 2012, from Bob Barker and his testimony at the October 10, 2012, public meeting in Canyonville, under Docket No. PF12-17-000.

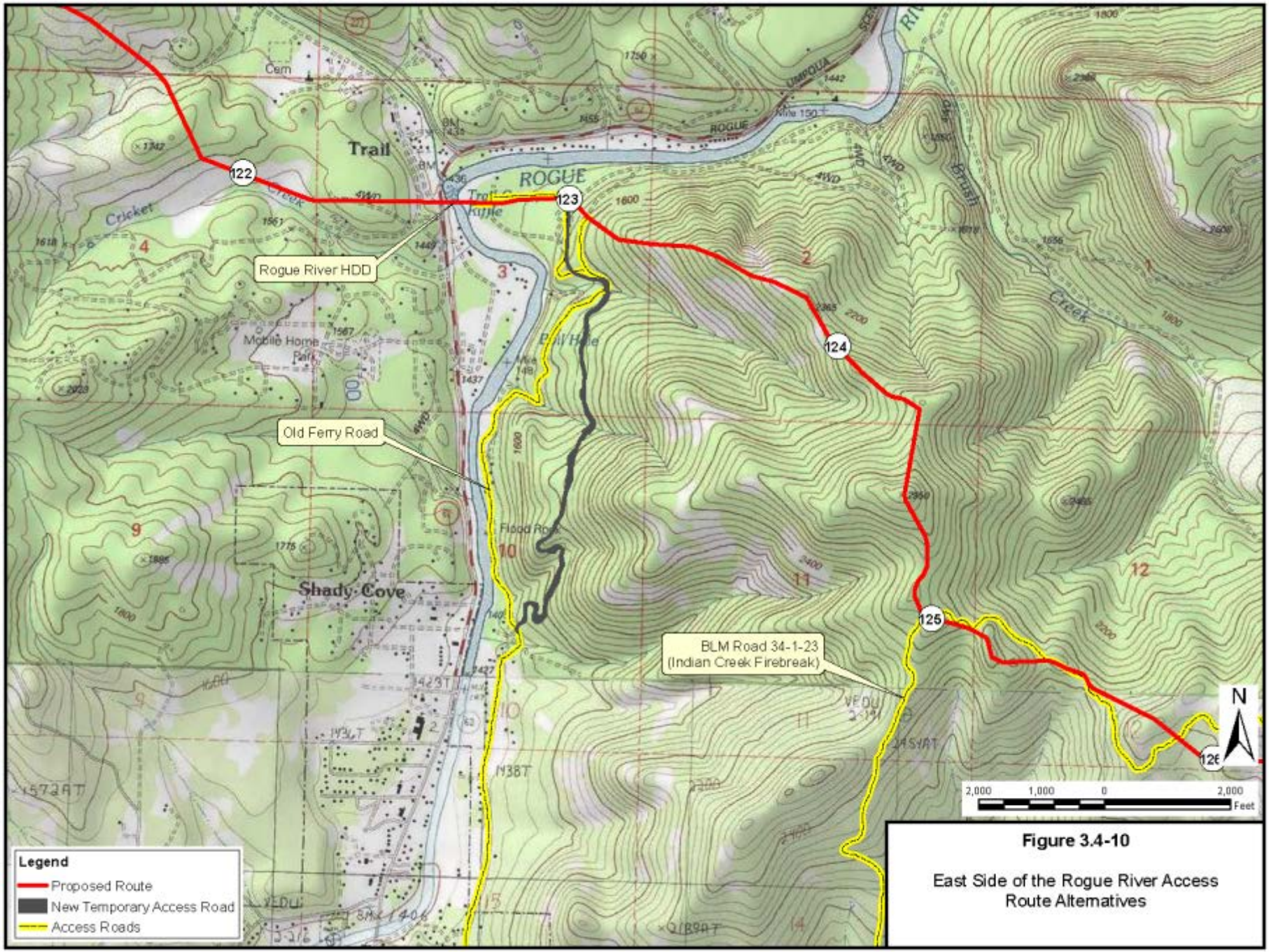


Figure 3.4-10

East Side of the Rogue River Access
Route Alternatives

Table 3.4.2.9-1 provides a comparison of the potential new access road with the existing Old Ferry Road. Construction of the new road would result in about 11 acres of disturbance. It is estimated that the combined cut and fill volumes to create a new temporary access road would be 120,000 cy of material, not including the rock to be transported in for the road base. The new TAR would cross approximately 1.4 miles of soils with limiting characteristics that would make disturbed areas difficult to reclaim because they have high erosion potential, steep slopes, large

TABLE 3.4.2.9-1

Comparison of Access Road Alternatives to Reach the East Side of Rogue River

Alternatives Analysis		Existing Old Ferry Road Improvement (Proposed)	New Temporary Access Road Alignment (Alternative)
General			
Road length (miles) a/		1.6	1.4
Road construction right-of-way (acres)		0 b/	11
Number of TEWAs c/		8	0
Acres of TEWAs		<1	0
Land Use			
Land Ownership (miles)	Private	<0.1	2.9
	State	0.0	0.0
	Federal (BLM/NFS Lands)	0.2	7.9
Number of landowner parcels crossed		22	7
Miles of right-of-way parallel or adjacent to existing rights-of-way (percent of alternative length)		1.6	0.2
BLM Visual Resource Management II (acres)		<1	8
Waterbodies and Wetlands			
Number waterbodies crossed d/		9	6 e/
Number of wetlands crossed f/		0	0
Vegetation			
Agricultural lands affected (acres)		0	0
Total forest clearing (acres) g/		<1	11
Biological Resources			
Big game winter range (acres)		<1	8
Soils			
Steep or difficult terrain (miles) h/		0.0	0.0
Highly erosive soils (miles) i/		38.0 j/ (TEWAs)	1.2
Reclamation sensitivity (miles) k/		39.0 l/ (TEWAs)	1.4

General: All values are rounded (acres to nearest whole acre, miles to nearest tenth of a mile, feet to nearest whole foot).

a/ Route Alternative lengths cannot be accurately calculated by comparing mileposts due to shifts in the alignment.

b/ The existing road prism of Old Ferry Road is estimated to be an average of approximately 12 feet in width. To utilize the road, minor brushing, grading, and graveling to fill pot holes would be required within the existing road prism.

c/ Temporary extra work areas associated with improvements required on the existing Old Ferry Road for curve widening, and turnouts (the eight TEWAs would be located in 6 areas along Old Ferry Road). No additional temporary extra work areas are associated with the "new road construction" because all necessary construction footprint requirements are included in the road construction right-of-way.

d/ From Pacific Northwest Hydrography Framework Clearinghouse data layers (http://hydro.reo.gov/). No stream widths are provided. Waterbodies are not fish bearing based on StreamNet data (http://www.streamnet.org) and BLM fish presence data (Fsh_aa_a_med_fishbearing).

e/ Four waterbodies crossed on the new road alignment would be new, previously undisturbed waterbody crossings requiring in-water work to install culverts if flowing at the time of construction.

f/ No wetlands are crossed on the proposed Old Ferry Road based on field surveys.

g/ Limited tree clearing required for Old Ferry Road improvements. The new temporary access road would disturb mixed forest typed primarily in the late successional forest age class (80-175 years) based on the BLM's Forest Inventory coverage.

h/ Based on Soil Mapping Units that have slopes of 50-75 percent and have a water erosion rating of high or severe (SCS 1993).

i/ Based on Soil Mapping Units that have a water erosion rating of high or severe (SCS 1993). Approximately 1.2 miles of soil would be crossed in Soil Mapping Unit 122E, which has a Moderate to High Erosion Hazard Potential.

j/ Three TEWAs associated with the Old Ferry Road improvements are located on Soil Mapping Unit 122E which has a Moderate to High Erosion Hazard Potential.

k/ Reclamation Sensitivity – soils having reclamation sensitivity is a combined rating for soils with high or severe erosion potential, steep slopes, large stones, shallow soils, and saline or sodic conditions and clayey soils (greater than 40 percent). This also includes soil map units with dominant amounts of rock outcrop.

l/ Seven TEWAs associated with the Old Ferry Road improvements are located on Soil Mapping Units 144G or 122E, which have a Reclamation Sensitivity Rating.

stones, or are shallow to bedrock. Of the land that would be crossed by the new access road,73 percent is public land managed by the BLM. The remaining 27 percent is owned by six private landowners. If this alternative access were to be required, Pacific Connector would not acquire permanent rights to the road, and the road could not be used for public use.

The new TAR disturbance located on BLM lands (about 8 acres) would be within an area designated as Visual Resource Management Class II (VRM II). The objective of the VRM II class is to retain the existing character of the landscape. The level of change to the landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Pacific Connector expects that the new TAR would not meet the BLM's visual quality objective and the road would be visible to many residences on the west side of the river in the communities of Shady Cove and Trail.

The new TAR would disturb about 8 acres of big game winter range within an Elk Management area on BLM lands. Almost all of the new disturbance associated with the new TAR would not be co-located with rights-of-way or other previous disturbance and would cause additional habitat fragmentation. Based on the data above, we do not recommend use of the new access road to the Rogue River HDD site.

Existing Old Ferry Road-Revised Improvements

Existing Old Ferry Road is a privately owned and maintained access road to houses located on the east side of the Rogue River opposite of the communities of Shady Cove and Trail. That road would need to be improved prior to its use by Pacific Connector for construction access. Improvements could be limited to several turn outs, curve widenings, and one staging area. Pacific Connector would maintain Old Ferry Road during the construction window. Once the HDD crossing under the Rogue River is installed, Pacific Connector would revegetate all disturbed areas and restore Old Ferry Road to its former condition, or better.

As noted in table 3.4.2.9-1, the use of the existing Old Ferry Road to access the Rogue River drill site would require installing eight small TEWAs (less than about 1 acre total) in six locations along the 1.6-mile road to accommodate turn-outs and to widen a sharp curve. These improvements would require only limited tree limb clearing. In comparison, construction of the 1.4-mile-long new temporary access road would require clearing about 11 acres of late successional mixed forest stands (80 to 175 years of age).

Although three of the TEWAs associated with the improvements for Old Ferry Road would be located within VRM II areas on an isolated BLM parcel, they would be immediately adjacent and co-located with the existing road. The largest TEWA within the VRM II area has also been located in an existing log landing area. BLM has reviewed the visual impacts of the Project in this vicinity and has determined that "the project does not meet VRM Class II objectives in the short-term (less than 5 years) at [this location], but plan amendments are not needed because the areas in question are very short, and mitigation developed in the Aesthetics Management Plan will help the areas reach VRM Class II objectives in the long term (5-10 years)" (see appendix R-8 of the EIS). Although about less than one-quarter acre of disturbance associated with the improvements to Old Ferry Road would occur within big game winter range on BLM lands, it would occur immediately adjacent to existing disturbance associated with the road.

Construction-related traffic on Old Ferry Road would be temporary and short term, lasting about 60 days total, which is the time Pacific Connector has estimated for completion of the Rogue River HDD. We conclude that improvement and use of the existing Old Ferry Road is the preferred alternative for access to the east side of the Rogue River, provided that the road would remain open to residents throughout all phases of construction. None of the other access road alternatives would offer significant advantages over the proposed improvement of Old Ferry Road.

3.4.2.10 Rogue River National Forest – Robinson Butte to Cox Butte Alternatives Routes

In response to the Forest Service's concerns over impacts to LSR and Riparian Reserves, Pacific Connector identified two route alternatives within the Rogue River National Forest in the vicinity of Robinson Butte and Cox Butte between about MPs 155.1 and 168.9. Table 3.4.2.10-1 provides a comparison of the May 2006 Alternative Route (Alternative 1), the Forest Service Roads Alternative Route (Alternative 2), and the proposed route (Compromise Route, or Alternative 3). These alternatives and the proposed route are shown on figure 3.4-11.

We refer to the route originally proposed by Pacific Connector in May 2006 as Alternative 1 (or the May 2006 Alternative Route). This alternative would deviate from the currently proposed route at about MP 155, and remain south of it on the south side of Robinson Butte near MP 159. From that point southeastwardly, Alternative 1 would closely follow the proposed route but would be straighter and cross through older forests, which provide NSO habitat. As with the proposed route, Alternative 1 would cross Big Elk Road, cross northeast of Cox Butte, and would cross Daley Prairie. The May 2006 Alternative Route would cross into Klamath County and rejoin the proposed route near MP 169. Alternative 1 would be about a mile shorter than the corresponding segment of proposed route. The route variation would cross more waterbodies and wetlands, and would affect more forest. The corresponding segment of proposed route would be adjacent to existing rights-of-way to a greater extent.

The Forest Service's suggested Roads Alternative Route, labeled Alternative 2, would leave the proposed route within the Rogue River National Forest in Jackson County, Oregon, at about MP 155, north of Grizzly Canyon, and head east along Forest Service Roads 410 and 300, around the south side of Robinson Butte along Forest Service Road 3730, south of Big Elk Guard Station along Forest Service Road 3705, across the South Fork Little Butte Creek, turn east along Forest Service Road 3720, entering Klamath County, to Forest Service Road 700, cross the Pacific Crest Trail (PCT) several miles south of Brown Mountain, then head southeast cross-county into the Winema National Forest, across Dead Indian Memorial Highway, and would rejoin the proposed route along Clover Creek Road north of Burton Butte just east of MP 169. The rationale for the Forest Service Roads Alternative Route was to reduce the amount of forest vegetation clearing by utilizing the existing cleared roadways as part of the construction corridor, thereby reducing some of the forest fragmentation and habitat loss in LSR 227. Also, this alternative would cross the PCT along an existing road, reducing potential impacts to trail users by eliminating a separate crossing. The Forest Service's suggested Roads Alternative Route would be about 3 miles longer than the original route and would require widening the existing roads, which are generally between 20 and 30 feet wide. This would require cutting mature forest in portions of the right-of-way. The Forest Service Roads Alternative Route would result in the largest construction footprint. In concept, acreage of construction impact would be reduced by the fact that most of the route (14.0 miles of the 15.7-mile route) would be along

existing forest roads. However, Pacific Connector determined the pipeline would not be constructible along portions of some roads due to the terrain and the tight radius turns.

TABLE 3.4.2.10-1

Comparison of Rogue River National Forest Alternative Routes with the Proposed Route from Robinson Butte to Cox Butte – MPs 155 to 169

Impact/Issue		May 2006 Alternative	Forest Service Alternative	Proposed Route
General				
Total Length (miles) a/		12.9	15.7	13.8
Acres of construction right-of-way b/		148	180	159
Total acres of construction disturbance		148 d/	180 e/	209
Number of UCSAs		Not designed c/	Not designed c/	45
Acres of UCSAs		Not designed c/	Not designed c/	73
Acres affected during operations (operational easement) f/		78	95	84
Land Ownership (miles)	Forest Service	11.5	14.3	12.5
	Private	0.5	0.6	0.5
	State	0.0	0.0	0.0
Waterbodies and Wetlands				
Number of waterbodies crossed g/		2	14	6
Total wetland crossing length (feet) h/		0	0	0
Land Use				
Land allocations (miles)	Matrix	0.0	0.0	0.0
	LSR	11.5	14.3	12.5
	Riparian Reserves	1.5	1.1	0.4
Evergreen Forest, Mixed Conifer		6.8	6.0	6.1
Regeneration Forest (miles)		5.9	5.4	5.6
Clearcuts (miles)		0.1	0.0	0.3
Total Forest lands affected (miles)		12.8	11.4	12.0
Other land use types (including Transportation)		0.1	4.3	1.8
Miles of right-of-way that would be parallel or adjacent to existing rights-of-way		1.6	14.0	4.4
Visual Resources				
Visual Impacts along existing Forest roads		Minimal except at existing road crossings	Existing road corridors expected to be significantly altered from 95-foot construction footprint along 13.6 miles of Forest roads.	Minimal except where parallel to existing roads (i.e., 4.4 miles)
Cultural Resources				
Number of previously identified cultural resources along route		1	0 k/	1
Habitat for Federally Listed Species				
Acres of federally listed critical habitat for the NSO l/		148	180	159
NSO activity center		2 - ½ mile buffer of site	2 - ½ mile buffer of site	2 - ½ mile buffer of site

General: All values are rounded (acres to nearest whole acre, miles to nearest tenth of a mile, feet to nearest whole foot).
a/ Route Alternative lengths cannot be accurately calculated by comparing mileposts due to shifts in the alignment.
b/ The construction right-of-way for the preferred route and original proposed alignment is 95 feet.
c/ TEWAs for the Original May 2006 Route have not been designed and are not included in the total acres of disturbance.
d/ Pacific Connector estimates that the Original May 2006 Route would likely require more TEWAs compared to the compromise route because of side slope construction between approximately MPs 149 and 152.9 and because of the increased number of stream crossings along the Original May 2006 Route.
e/ TEWAs have not been designed for this route and are not included in total construction work area requirements.
f/ The assumed operational easement for all routes is 50 feet. However, Pacific Connector will only maintain vegetation within 15 feet of the pipeline centerline for a total of 30 feet in the long term.
g/ Waterbodies from PNW Hydrography Framework Clearinghouse.
h/ Wetlands from NWI CONUS data. Surveys identified 422 feet for the May 2009 Route and 56 feet for the Proposed Route.
i/ Crossing distance based on parallel alignment with waterbody feature (i.e., intermittent stream)
j/ Based on ground survey, NWI coverages and photo interpretation.
k/ Includes acres of impact associated with the construction right-of-way and TEWAs.

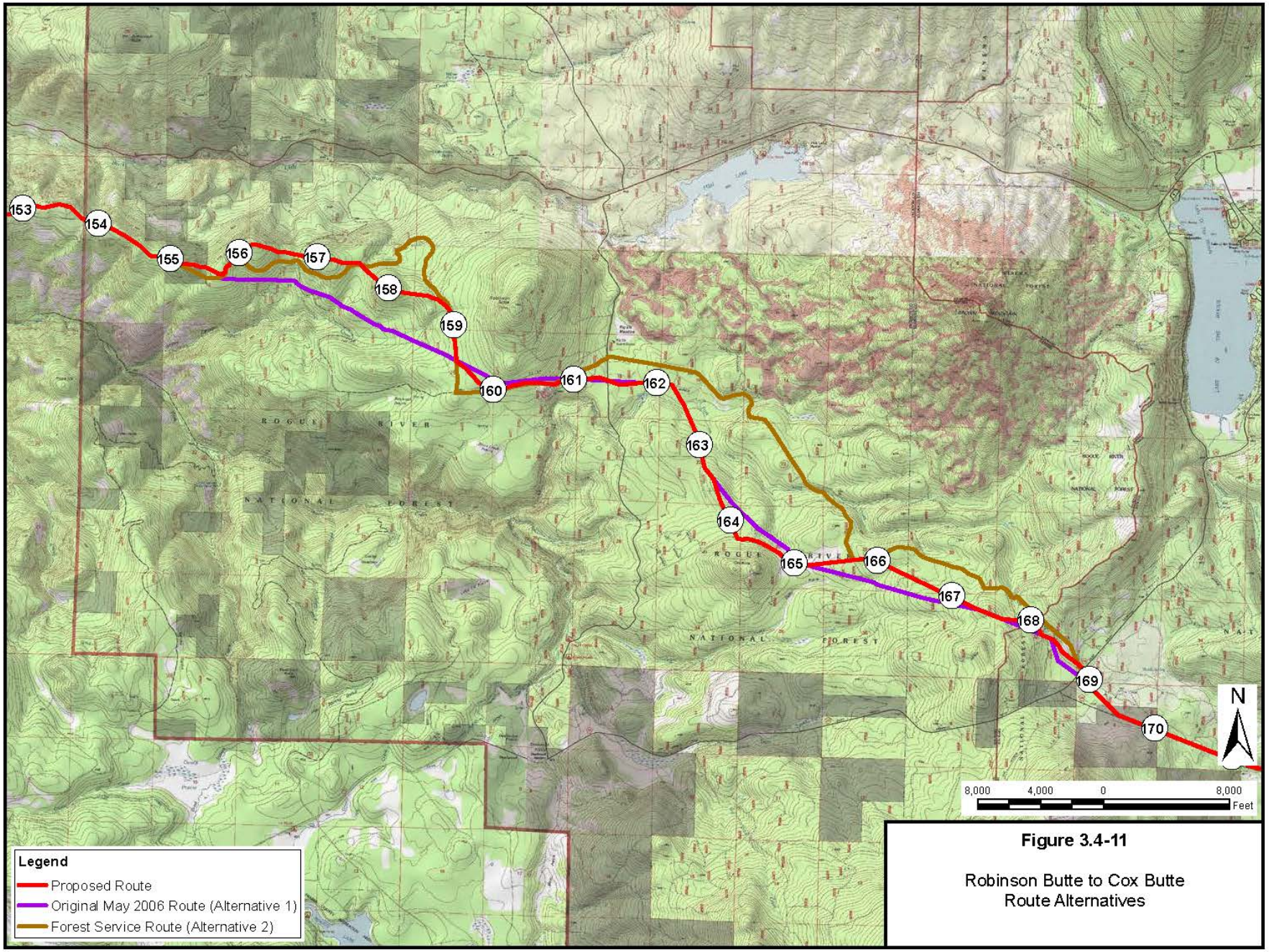


Figure 3.4-11

Robinson Butte to Cox Butte
Route Alternatives

Pacific Connector studied the Forest Service's suggested Roads Alternative Route and determined that the alignment was feasible for the most part, except where it followed tight radius road curves. As a result of consultations with the Forest Service, Pacific Connector developed its proposed route (which we refer to as Alternative 3 or the Compromise Route) and incorporated as much of the Forest Service Roads Alternative Route as was feasible. As a result, the Compromise Route incorporates recommendations of the Forest Service such as co-locating the pipeline within existing forest road corridors and within regeneration harvested areas, to minimize impacts to mature forests in LSR 227. Specifically, Pacific Connector incorporated a Forest Service recommended realignment between MPs 162.3 and 161.38 into the Compromise Route to avoid the Big Elk NSO patch, located in an NSO core area. This realignment would be about 0.5 mile south of Big Elk Meadow and Guard Station. Pacific Connector made further adjustments along the Compromise Route to minimize side slope construction and extra work area requirements, and to avoid a wetland (Riparian Reserve). This adjustment utilized an existing forest road and regenerating clear-cut area to minimize impacts on mature forest. After working with the applicant to create a modified route the Forest Service determined that neither the May 2006 route, nor the Forest Service Roads Alternative Route, would be environmentally preferable to the Compromise Route.

All three routes would cross NFS lands allocated as LSR or Riparian Reserve, with the original route crossing the least distance through LSR. We conclude that the Compromise Route would avoid or minimize environmental impacts, and neither the May 2006 Alternative Route nor the Forest Service Roads Alternative Route would offer a significant environmental advantage over the proposed route.

3.4.2.11 Pacific Crest Trail and Dead Indian Memorial Highway Alternative Routes

Due to concerns raised by the Forest Service and stakeholders who use the PCT, Pacific Connector identified two short alternative crossings of the PCT and Dead Indian Memorial Highway within the Rogue River and Winema National Forests in Klamath County, Oregon, between about MPs 167.5 and 169.1. The western segment crosses the PCT while the eastern segment crosses the Dead Indian Memorial Highway. These two alternative route segments are illustrated with the proposed route on figure 3.4-12. Table 3.4.2.11-1a compares the proposed route with the PCT Alternative Route. Table 3.4.2.11-1b compares the proposed route with the Dead Indian Memorial Highway Alternative Route.

When Pacific Connector first mapped out its pipeline route in 2007, it considered a straight line perpendicular crossing of the PCT at about MP 167.8. Stakeholders including the Forest Service and the Pacific Crest Trail Association requested that Pacific Connector and the FERC consider means of reducing impacts on the PCT and its recreational users. To reduce visual impacts, Pacific Connector's proposed route would use a right-angle 45-degree crossing of the PCT.

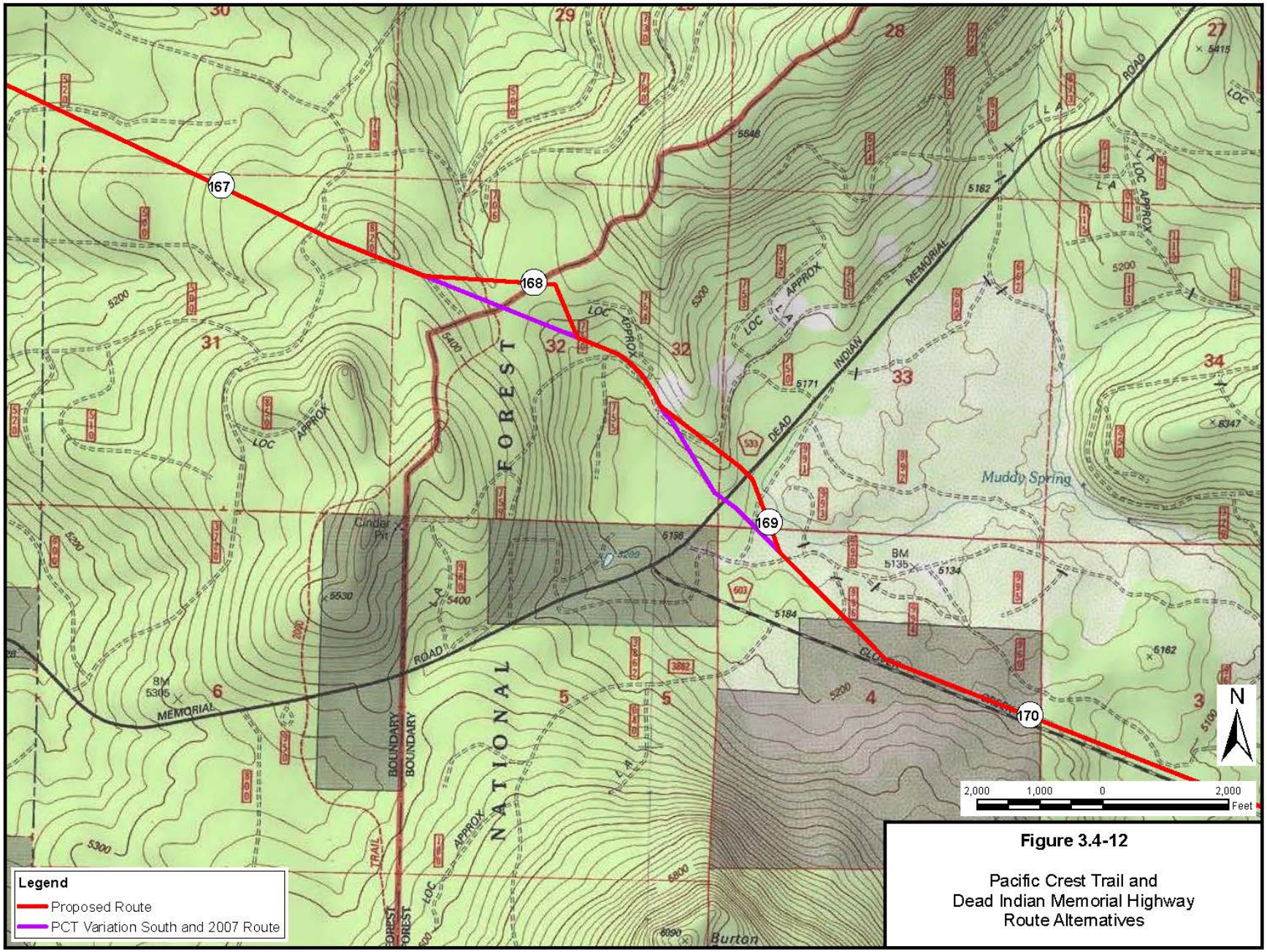


Figure 3.4-12

Pacific Crest Trail and
Dead Indian Memorial Highway
Route Alternatives

TABLE 3.4.2.11-1a

Comparison of the PCT Alternative Route with the Proposed Route

Impact/Issue		PCT Alternative Route	Proposed Route
General			
Length (miles) a/		0.5	0.6
Construction right-of-way (acres)		6	6
Number of TEWAs (acres)		0	2
Acres of TEWAs		0	<1
Operational easement (acres) b/		3	4
Land Use			
Land ownership (miles)	Private	0	0
	State	0	0
	Federal (NFS Lands)	0.5	0.6
Number of landowner parcels crossed		1	1
Number of residences within 50 feet of the construction right-of-way		0	0
Miles of right-of-way parallel or adjacent to existing rights-of-way (percent of alternative length)		0	0
LSR – Federal Land Use Designation (acres)		3	4
Riparian Reserves – Federal Land Use Designation (acres)		0	0
Waterbodies and Wetlands			
Number of waterbodies crossed c/		0	0
Length of wetland crossings (feet) c/		0	0
Vegetation			
Agricultural lands affected (acres)		0	0
Total forest clearing (acres)		6	7
Acres clear-cut/regenerating (0-40 years)		2	4
Acres mid-seral forest (40-80 years)		0	<1
Acres Late Successional Forest (80-175 years)		0	0
Old-Growth Forest (175+ years)		4	3
Biological Resources			
NSO. suitable habitat crossed (acres) d/		6	7
NSO nest patches/cores		0	0
NSO. critical habitat crossed (acres)		3	4
Habitat Category (acres)	1	3	3
	2	2	1
	3	0	3
	4	0	0
	5	0	0
	6	0	0
ESA Fish Species Present/Habitat e/		0	0
StreamNet – Anadromous Fish Distribution f/		0	0
Geotechnical			
Steep or difficult terrain (miles) g/		0	0
Highly erosive soils (miles) h/		0	0
Cultural Resources			
Number of previously recorded cultural resources		0	0
Number of newly identified cultural resources		n/a	0

General: All values are rounded (acres to nearest whole acre, miles to nearest tenth of a mile, feet to nearest whole foot).
a/ Route Alternative lengths cannot be accurately calculated by comparing mileposts due to shifts in the alignment.
b/ Acres of operational easement calculated based on a 50-foot width.
c/ Based on Pacific Connector field surveys.
d/ Forest Service (2005a)
e/ FWS, NMFS, and StreamNet (http://www.streamnet.org).
f/ ODFW (2000a, 2006a); StreamNet.
g/ Based on Soil Mapping Units that have slopes of 50-75 percent and have a water erosion rating of high or severe (Forest Service 1976).
h/ Based on Soil Mapping Units that have a water erosion rating of high or severe (Forest Service 1976).

TABLE 3.4.2.11-1b

Comparison of the Dead Indian Memorial Highway Alternative Route with the Proposed Route

Impacts/Issues		Dead Indian Memorial Highway Alternative Route	Proposed Route
General			
Length (miles)		0.6	0.6
Construction right-of-way (acres)		7	7
Number of temporary extra work areas (TEWAs)		7	7
Acres of TEWAs		3	3
Operational Easement (acres) a/		3	4
Land Use			
Land Ownership (miles)	Private	0	0
	State	0	0
	Federal (NFS Lands)	0.6	0.6
Number of landowner parcels crossed		2	2
Number of residences within 50 feet of construction right-of-way		0	0
Miles of right-of-way parallel or adjacent to existing rights-of-way (percent of alternative length)		0	0
LSR – Federal Land Use Designation (acres)		0	0
Riparian Reserves - Federal Land Use Designation (acres)		0	0
Waterbodies and Wetlands			
Number of waterbodies crossed		1	1
Length of waterbody crossings (feet)		1	1
Number of wetlands crossed		0	0
Length of wetland crossings (feet)		0	0
Vegetation			
Agricultural lands affected (acres)		0	0
Total forest clearing (acres)		10	10
Acres clear-cut/regenerating (0-40 years)		6	8
Acres mid-seral forest (40-80 years)		<1	<1
Acres Late Successional Forest (80-175 years)		2	1
Acres Old-Growth Forest (175 + years)		2	1
Biological Resources			
Northern Spotted Owl Suitable Habitat Crossed (acres) b/		4	2
Northern Spotted Owl nest patch/cores (NSO)		0	0
Northern Spotted Critical Habitat Crossed (acres)		10	10
Habitat Category(acres) c/	1	4	2
	2	6	8
	3	0	0
	4	0	0
	5	0	0
	6	0	0
ESA Fish Species Present/ Habitat d/		0	0
StreamNet – Anadromous Fish Distribution e/		0	0
Geotechnical			
Steep or difficult terrain (miles) f/		0	0
Highly erosive soils (miles) g/		0	0
Cultural Resources			
Number of previously recorded cultural resources		0	0
Number of newly identified cultural resources		0	0

General: All values are rounded (acres to nearest whole acre, miles to nearest tenth of a mile, feet to nearest whole foot).
a/ Acres of operational easement calculated based on a 50-foot width.
b/ Forest Service (2005a).
c/ See Section 3.4.1.4 (Special Habitats) in Pacific Connector's Resource Report 3 filed with its September 2007 application to the FERC.
d/ FWS, NMFS, and StreamNet (http://www.streamnet.org).
e/ ODFW 2000a, 2006b; StreamNet.
f/ Based on Soil Mapping Units that have slopes of 50-75 percent and have a water erosion rating of high or severe (Forest Service 1976).
g/ Based on Soil Mapping Units that have a water erosion rating of high or severe (Forest Service 1976).

The original straight line crossing of the PCT, which we refer to as the PCT Alternative Route, would have created an unnatural tunnel-like visual effect through the forest that would not meet Forest Service VQO of Partial Retention for this section of the PCT. We discuss a proposed amendment to the Rogue River National Forest LRMP that would allow for increased time for revegetation to meet Forest Service VQOs for the pipeline crossing of the PCT in sections 4.1.3.4 and 4.8.2.4 of this EIS. It is estimated that about 4,000 feet of cleared right-of-way would be visible from the trail/pipeline intersection along the PCT Alternative Route.

The proposed route would be slightly longer (about 0.1 mile) and construction would affect less than 1 acre more than the PCT Alternative Route. Three more pipeline bends at points-of-intersection would be required for the proposed route, resulting in the clearing of additional land for TEWAs. These TEWAs would be located within regenerating forest. However, the proposed route would impact less LSOG forest and minimize impacts within the Ichabod Quarry South NSO Home Range. Pacific Connector would reduce the width of the construction right-of-way at the PCT crossing, and would implement other measures to minimize impacts on users of this trail, as more fully discussed in section 4.8.1.2 of this EIS. The advantage of the proposed route is that it would reduce the length of permanently cleared right-of-way that would be visible from the trail to about 1,000 feet.

The FERC's May 2009 FEIS for Docket No. CP07-441-000 showed a straight line pipeline crossing of the Dead Indian Memorial Highway at about MP 168.8. Between 2010 and 2012, Pacific Connector conducted environmental surveys that found rare fungi considered to be S&M species by the Forest Service near the crossing of Dead Indian Memorial Highway. S&M species on NFS lands are more fully discussed in section 4.7 of this EIS. To avoid impacts on these sensitive species, Pacific Connector modified its proposed pipeline route between about MPs 168.5 and 169.1 to take a right-angle 45-degree turn to the east when crossing the highway.

The proposed route would reduce visual impacts on the PCT, and avoid rare fungi near the crossing of the Dead Indian Memorial Highway. We conclude that the alternative routes would not offer significant environmental advantages over the proposed route's crossings of the PCT and Dead Indian Memorial Highway between about MPs 167.5 and 169.1.

3.4.2.12 Keno Access Road and Clover Creek Road Alternative Routes

The currently proposed pipeline route follows Clover Creek Road between about MPs 169.5 and 187.4 in Klamath County, Oregon. Pacific Connector developed this proposed route after considering the Keno Access Road Alternative and the 2007 Clover Creek Road Alternative Routes. The proposed route and the alternative routes are shown on figure 3.4-13 and compared in table 3.4.2.12-1.

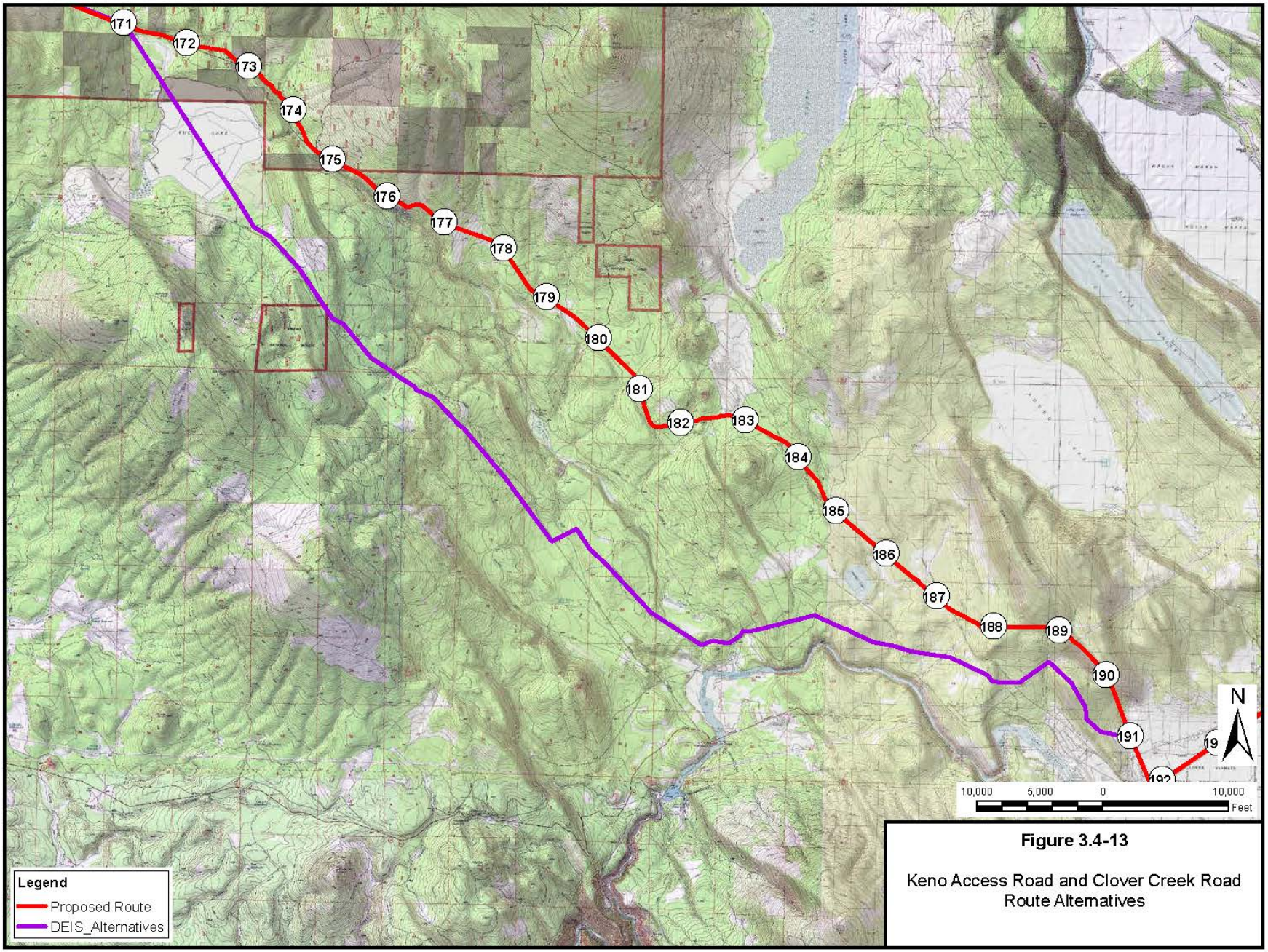


Figure 3.4-13

Keno Access Road and Clover Creek Road
Route Alternatives

TABLE 3.4.2.12-1

Comparison of the Keno Access Road and 2007 Clover Creek Road Alternative Routes With the Proposed Route

Impact/Issue		Proposed Route	Keno Access Road Alternative	2007 Clover Creek Road Alternative
General				
Total length (miles) a/		16.3	18.7	16.9
Acres of construction right-of-way b/		187	215	288
Total acres of construction disturbance		204	298	215
Acres affected during operations (operational easement)		99	140	99
Landowner parcels crossed		9	16	11
Number of residences within 50 feet of construction right-of-way		0	0	0
Land ownership (miles):	Private	11.7	15.7	11.6
	State	0.0	0.2	0.0
	Federal (BLM/NFS lands)	4.6	2.8	4.7
Geotechnical				
Miles of steep or difficult terrain to be crossed		0	0	0
Waterbodies and Wetlands				
Number of wetlands and waterbodies crossed		9	23	9
Length of wetlands and waterbodies crossed (miles)		0.2	2.1	0.2
Land Use				
Agricultural land affected (miles)		0.0	9.5	0
Forest lands affected (acres)		161	72	172
Miles of right-of-way that would be parallel or adjacent to existing rights-of-way		16.3	0	16.3
Biological Resources				
Oregon spotted frog habitat crossed c/		Avoided	Yes	Avoided
Klamath redband trout habitat crossed d/		Avoided	Yes	Avoided
NSO	Critical habitat miles crossed e/	0	1.6	0
	Critical habitat acres within 1 mile of route e/	Similar to 2007 Route	4,238	2,514
	Suitable habitat within 1 mile of route f/	Similar to 2007 Route	6,547	5,534
	Number of nest sites	Similar to 2007 Route	3 NSO within 1 mile of route (1 historical)	2 NSO within 1 mile of route (1 historical)
Bald eagle g/		Similar to 2007 Route	2 active nests within 0.3 mile of route	1 active nest within 0.6 mile of route

General: All values are rounded (acres to nearest whole acre, miles to nearest tenth of a mile, feet to nearest whole foot).

a/ Route Alternative lengths cannot be accurately calculated by comparing mileposts due to shifts in the alignment.

b/ The construction right-of-way for the proposed route and the alternative is 95 feet.

c/ Known Habitat of the Oregon spotted frog would be crossed on the proposed route between MPs 171.29 and 191.34 in Wetland AW 182. Pacific Connector would utilize conservation measures to minimize impacts to the spotted frog such as seasonal construction windows to avoid critical breeding periods and life stages. The alternative route would avoid the known Oregon spotted frog habitat.

d/ The proposed route crosses Spencer Creek above River Mile 12 in areas of known red band trout spawning habitat. Pacific Connector would use conservation measures to minimize impacts to the red band trout, including using the "dry" open cut crossing method (flume or dam and pump) within the ODFW-specified crossing window to protect the trout. The Offset Alternative crosses Spencer Creek above River Mile 12 where red band trout is not documented. Pacific Connector would also use the "dry" open cut crossing method within the ODFW-specified crossing windows to minimize impacts to aquatic species.

e/ NSO critical habitat coverage obtained from FWS Critical Habitat Portal [online: http://criticalhabitat.fws.gov/].

f/ NSO suitable habitat determined through GIS analysis using a BioMapper product created by the Forest Service Pacific Northwest Research Station and further refined based on consultation with FWS using aerial photo reconnaissance and GIS Neighborhood Analysis to determine areas with at least 30 percent suitable habitat.

g/ Bald eagle documented sites from bald eagle nest locations and history of use in Oregon and the Washington portion of the Columbia River Recovery Zone, 1971 through 2006 (Isaacs and Anthony 2007).

When Pacific Connector first mapped out its pipeline route, it wanted to follow the existing GTN Medford Lateral as much as possible and parallel a portion of the Keno Access Road between the boundary of the Winema National Forest and town of Keno. However, the Forest Service and other agencies raised concerns that this route, which we refer to as the Keno Access Road Alternative, would cross Buck Lake, an extensive emergent wetland, that provides habitat for the Oregon Spotted Frog (a federally listed candidate species) and would cross Spencer Creek at a location where redband trout are known to spawn.

After consultations with an interagency task force, in 2007 Pacific Connector suggested a new alternative route that would parallel but be offset from Clover Creek Road, to avoid impacting the species associated with the crossing of Buck Lake and Spencer Creek along the previously identified Keno Access Road Alternative Route. The Forest Service then requested that Pacific Connector move the pipeline closer to Clover Creek Road to eliminate the strip of trees left between the road and the Clover Creek Alternative Route.

The route adjacent to Clover Creek Road was filed as the proposed route in Pacific Connector's June 2013 application to the FERC. The proposed route has minor deviations from the road to avoid steep slopes or road cuts (at MPs 172.3-172.5, 173.0-173.7, 182.3, and 184.2-184.9), to avoid waterbodies and wetlands (at MPs 172.5 and 173.5-174.5), and to avoid S&M fungi species (at MPs 171.9-172.8 and 173.2-173.3).

We find the proposed route environmentally preferable to both the Keno Access Road and the 2007 Clover Creek Road Alternative Routes. First, the proposed route is shorter than either alternative resulting in less overall impact. Second, the proposed route would avoid crossing Buck Lake and Spencer Creek at locations that contain habitat for sensitive species. Lastly, moving the pipeline closer to Clover Creek Road would reduce visual impacts from forest clearing in comparison to the off-set location of the pipeline along the 2007 alternative. We conclude that the Keno Access Road Alternative and 2007 Clover Creek Road Alternative Routes would not offer significant environmental advantages over the proposed route between about MPs 169.5 and 187.4.

3.4.2.13 Shasta View Irrigation District Alternative

Reclamation and the Klamath Water Users Association have raised concerns regarding Pacific Connector's plans for crossing water conveyance facilities within the Shasta View Irrigation District (SVID) at five locations between about MPs 223 and 227. In a letter to Pacific Connector dated May 8, 2015, Reclamation, in cooperation with SVID and the Klamath Water Users Association, stated there are "significant operational, engineering, and potential socioeconomic impacts associated with the crossing locations within the SVID" and Reclamation recommends that the pipeline be rerouted to avoid crossing SVID facilities. Pacific Connector responded in a letter dated May 18, 2015, that it is committed to building the pipeline using trenchless boring technology in compliance with Reclamation's Engineering and O&M Guidelines for Crossings. In addition, in accordance with its *Klamath Project Facilities Crossing Plan*, Pacific Connector intends to conduct pipeline construction during the winter in the Klamath Basin, when most of the irrigation canals would be dry and not in use. However, Reclamation states "the Techite brand pipe used throughout the SVID distribution system is extremely fragile and has a long history of failures, many of them catastrophic." Reclamation further states that construction has the potential to disturb bedding materials surrounding these pipes, increasing the potential for failure.

Working with Reclamation and BLM, we identified a route alternative that would avoid crossing the SVID facilities. The SVID Alternative would begin at about MP 217.9 where it would turn slightly northeast from the proposed route and continue adjacent to an overhead electric transmission line for about 5.8 miles, and then turn south and southeast for about 4.9 miles, including one segment where it would share the same location as the proposed route, before rejoining the proposed route at about MP 228.0. The SVID Alternative is slightly longer than the proposed route (10.7 miles compared to 10.1 miles) but would cross fewer landowner parcels (11 compared to 17). The proposed route would parallel or be adjacent to 0.6 mile more existing rights-of-way than the alternative. The alternative would cross fewer waterbodies (9 compared to 11) but would impact slightly more wetland acres based on NWI data. The proposed route would cross 11 waterbodies while the route alternative would cross 9. The SVID Alternative and corresponding segment of proposed route are compared in table 3.4.2.13-1 and illustrated in figure 3.4-14.

Although Pacific Connector claims it could either cross the SVID facilities without damaging them or would rebuild any unstable irrigation pipes, Reclamation is concerned that this may not eliminate the risk of potential failure due to the underlying bedding material and the type of pipe used in the SVID. Therefore, Reclamation has stated that it may not be able to concur in granting a right-of-way across the SVID facilities which are part of the Klamath Project. Because of Reclamation's concerns and the fact that the alternative would avoid crossing SVID facilities and have similar or even reduced environmental impacts compared to the corresponding segment of proposed route, **we recommend that:**

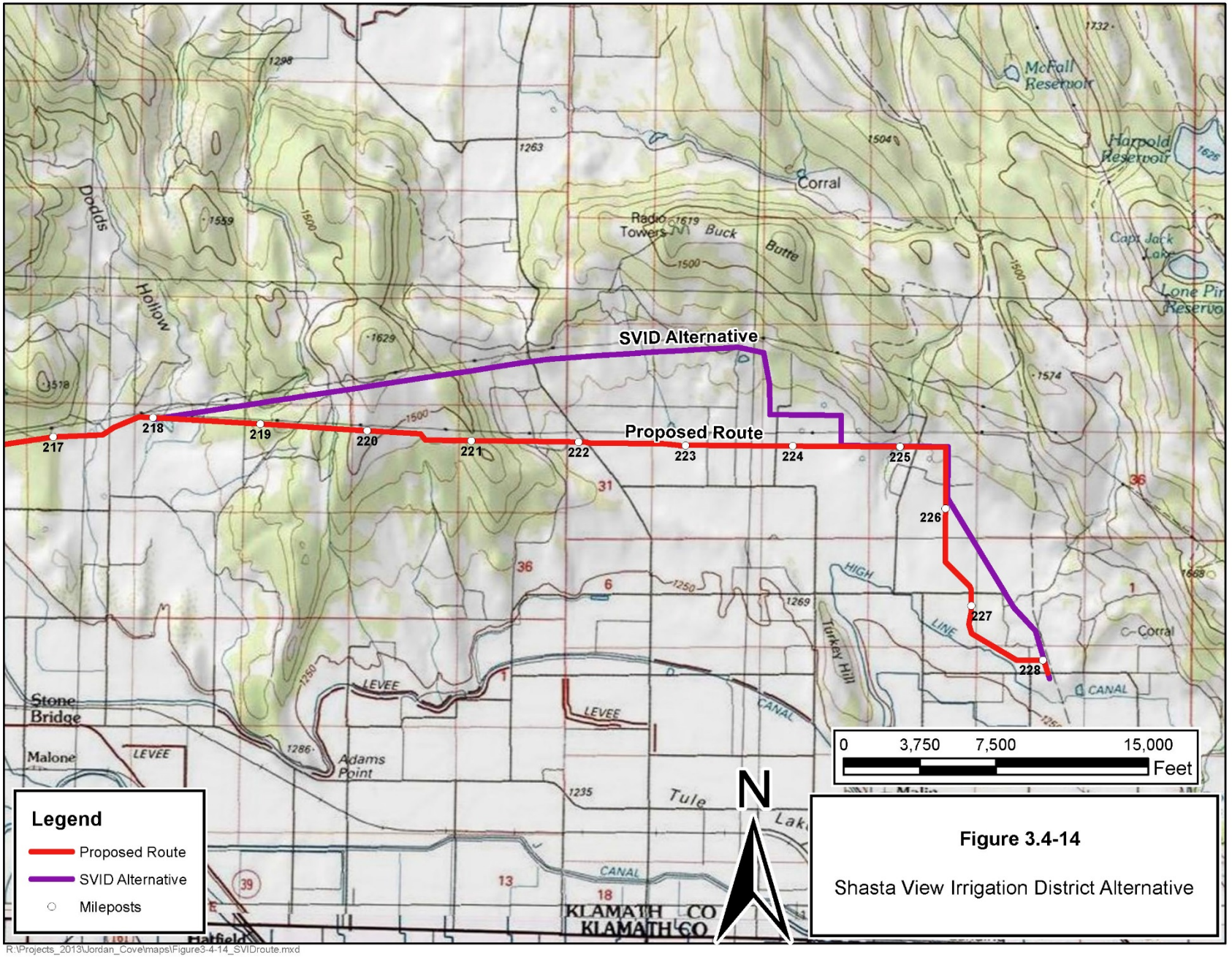
- **<u>Prior to construction</u>, Pacific Connector should incorporate the SVID Alternative into its proposed pipeline route between about MPs 218 and 228, unless its files with the Secretary a mutually agreeable plan for crossing the SVID features that addresses concerns to the satisfaction of Reclamation.**

TABLE 3.4.2.13-1

Comparison of the Shasta View Irrigation District Alternative with the Proposed Route

Alternatives Analysis	Proposed Route	Shasta View Irrigation District Alternative
General		
Length (miles) a/	10.1	10.7
Construction right-of-way (acres)	116	123
Number of TEWAs (acres)	34.4	Not Designed
Operational Easement (acres) b/	61	65
Land Use		
Number of landowner parcels crossed	17	11
Land Ownership		
Land Owner: private (miles)	10.1	10.7
Land Owner: State (miles)	0.0	0.0
Land Owner: Fed/BLM/NFS (miles)	0.0	0.0
Number of Residences within 50 feet of Construction Right-of-Way c/	0	0
Miles of right-of-way parallel or adjacent to existing rights-of-way c/	7.3	6.7
Waterbodies and Wetlands		
Riparian Reserves (acres) d/	0	0
Wetlands Crossed e/	0	2
Wetland Crossings (acres) e/	0.0	0.3
Waterbody crossings f/	11	9
Vegetation		
Number of tree orchards crossed g/	0	3
Agricultural Vegetation impacted (acres) h/	28	14
Forest & Woodland impacted (acres) h/	8	18
Semi-Desert impacted (acres) h/	21	26
Shrubland & Grassland impacted (acres) h/	2	7
Biological Resources		
ESA Fish Species/Habitat Present (streams crossed)	5	3

General: All values are rounded (acres to nearest whole acre, miles to nearest tenth of a mile, feet to nearest whole foot).
a/ Route Alternative lengths cannot be accurately calculated by comparing mileposts due to shifts in the alignment.
b/ The construction right-of-way for the proposed route and the alternative is 95 feet.
c/ Based on aerial imagery.
d/ From Riparian-Reserves_2012
e/ NWI data
f/ NHD Stream data
g/ Based on aerial image, may include tree farms
h/ GAP data


SVID Alternative
Proposed Route
217
218
219
220
221
222
223
224
225
226
227
228
Legend
Proposed Route
SVID Alternative
Mileposts
0
3,750
7,500
15,000
Feet
N
Figure 3.4-14
Shasta View Irrigation District Alternative
R:\Projects_2013\Jordan_Cove\maps\Figure3-4-14_SVIDroute.mxd

3.4.3 Pipeline Alternatives Over Federal Lands

Several of the pipeline alternative routes discussed above cross federal lands. Specifically, the Weaver Ridge Alternatives between MPs 42.7 and 49.8, the Camas Valley Alternatives between MPs 50.2 and 53.0, and the NSO Nest Patch Alternative between MPs 81.2 and 82.5 would cross BLM lands. The Neuman Gap to Long Prairie Alternatives between MPs 104.8 and 111.5, the Robinson Butte to Cox Butte Alternatives between MPs 155.1 and 168.9, the PCT Alternative between MPs 167.7 and 168.4, and the Dead Indian Memorial Highway Alternative Route between MPs 168.6 and 169.1 would be on NFS lands. In these cases, the BLM and the Forest Service conducted an analysis of the alternatives and found the proposed route environmentally preferable. The FERC staff concurs.

However, the Forest Service and BLM also considered if there were alternatives that would avoid or minimize impacts on specific land management allocations, such as LSRs and Riparian Reserves. In 1994, the Secretaries of Agriculture and Interior signed the *Record of Decision for Amendments to the Forest Service and Bureau of Land Management Planning Documents with the Range of the Northern Spotted Owl* (NSO ROD). The NSO ROD amended LRMPs for all BLM Districts and National Forests within the range of the NSO in California, Oregon, and Washington states, and created new land use allocations known as LSRs and Riparian Reserves. The NSO ROD indicated that LSRs are to be managed to protect and enhance old-growth forest conditions.

All of the NFS lands on the Rogue River National Forest lie within the Dead Indian LSR RO227, while about half of the proposed pipeline route across the Umpqua National Forest would be within the South Umpqua River/Galesville LSR RO223. There are no designated LSRs where the pipeline would be located within the Winema National Forest.

The ROD stipulates that non-silvicultural activities in LSR, such as the installation of a pipeline or other utilities, would only be allowed where those activities could be demonstrated to be neutral, or may have benefits for the creation and maintenance of late-successional habitat. New developments, such as a pipeline, may be allowed if it would have a public benefit and if adverse effects on the LSR could be minimized or mitigated. In designing its pipeline project, Pacific Connector followed the principles outlined in the Regional Interagency Executive Committee memorandum dated January 3, 2001, regarding New Developments in LSRs.

The BLM and Forest Service indicated that amendments to their LMPs may be necessary to allow the Pacific Connector pipeline to cross federal lands. These amendments are described as part of the proposed action in sections 2.1.3 and 4.1.3.4 of this EIS.

3.4.3.1 Public Need

The Commission will consider the need and public benefit of this Project when making its decision on whether or not to authorize it, as documented in the Project Order. The cooperating agencies will consider public benefit within the context of each agency's respective authorities. Each cooperating agency will document its decision in the applicable permit, approval, concurrence, or determination.

3.4.3.2 Avoidance of Late Successional Reserves

We did consider an all-highway route that would potentially avoid or only minimally affect LSR, but determined that such an alternative would not provide a significant environmental advantage over the proposed route (see section 3.4.1.2). Because the proposed Pacific Connector pipeline is a linear, large-diameter, high-pressure natural gas pipeline that must be routed to ensure safety, stability, and integrity, it is unreasonable, impractical, and infeasible to entirely avoid all designated LSRs for the following reasons:

- the overall extent of the designated LSR land allocation in the area crossed by the pipeline on BLM and NFS lands makes it unrealistic to completely avoid LSRs;
- long re-routes around LSRs would be impractical because of other determining factors, such as topography, the overall length and direction of the pipeline, and the large size of individual LSRs within contiguous tracts of NFS lands; and
- safety and constructability requirements for installation of the pipeline, in areas with limited geological hazards to ensure the long-term integrity of the pipeline and stability of the right-of-way makes it infeasible and unreasonable to avoid LSRs by aligning the pipeline on steep side slopes or other potentially unstable areas.

3.4.3.3 Project Design Measures to Minimize Adverse Impacts on Late Successional Reserves and Riparian Reserves

To comply with the Principles of the 2001 Regional Interagency Executive Committee memorandum regarding new developments in LSRs and Riparian Reserves, this alternative analysis discusses how the proposed Pacific Connector pipeline and associated facilities have been designed to have the least possible adverse impacts on these resources. In summary, this alternative analysis will discuss: (1) the project design measures that were implemented to avoid LSRs and Riparian Reserves, where feasible; (2) the project design procedures that minimize impacts to LSRs and Riparian Reserves; (3) the measures that would be implemented to rectify project-related impacts to LSRs and riparian reserves; (4) the project design measures that would be applied to reduce impacts over time by maintenance operations during the life of the action; and (5) the compensatory mitigation that Pacific Connector proposes to mitigate for unavoidable impacts to LSRs and Riparian Reserves.

Pacific Connector worked closely with the BLM and Forest Service to minimize impacts to LSRs and Riparian Reserves during the proposed pipeline route selection and construction footprint design process through the following steps.

- Performing routing and geotechnical evaluations to ensure the most stable pipeline alignment for long-term stability. These efforts minimize the potential need to conduct future maintenance activities, which could require additional impacts to suitable NSO habitat, LSRs, and Riparian Reserves.
- Where feasible, the alignment was co-located with existing roads to minimize disturbance impacts.
- Areas of side slopes were avoided to the extent possible to minimize the need for additional TEWAs to accommodate the necessary cuts and fill to safely construct the pipeline.

- The number and size of the TEWAs in LSRs and Riparian Reserves were minimized to those critical for safe pipeline construction.
- Where feasible, TEWAs were located in previously disturbed areas (recently logged) or in young regenerating forest stands.
- Existing roads would be used to access the construction right-of-way during construction and the right-of-way would be used as the primary travel-way to move equipment and materials up and down the right-of-way to remove the need for additional roads within LSRs and riparian reserves. The existing roads would also be used during operations to avoid the need for new access routes.

To help rectify pipeline-related impacts to LSRs, Pacific Connector would replant all disturbed areas of the construction footprint as described in its ECRP. Pacific Connector would replant or allow trees to naturally regenerate to within 15 feet of the pipeline centerline within the operational pipeline easement to minimize potential long-term effects of the pipeline easement. Vegetation within the remaining area of the pipeline easement would be maintained as necessary to allow for DOT-required visual aerial survey requirements, and to prevent the root systems of trees from damaging pipe coatings and pushing on the pipeline.

Additionally, Pacific Connector understands that unavoidable impacts on LSRs would require mitigation measures that in the long run would make the Project impacts neutral or beneficial. Pacific Connector has agreed to fund a suite of Forest Service- and BLM-recommended measures that are described in chapter 2 of this EIS to mitigate Project-related impacts to LSRs and Riparian Reserves in a manner that would ensure that the Project is neutral or beneficial to the creation and maintenance of late-successional habitat (see appendix F). Example mitigation projects would include decommissioning existing disturbance areas within LSRs such as roads that are no longer required, and non-economic thinning or other management projects to accelerate old growth characteristics within young or dense forest stands. Additionally, the Forest Service and BLM would re-allocate Matrix land to LSR, where feasible.

3.4.4 Minor Route Variations Incorporated into the Proposed Pipeline Route

During the course of refining the route alignment for the currently proposed route, Pacific Connector incorporated a number of minor route variations to address agency concerns and landowner requests, constructability issues or constraints, to avoid cultural resources or geological hazards, or reduce impacts on special status, threatened, or endangered species. These minor route variations are listed in table 3.4.4-1. Several variations that were recommended in the DEIS have been incorporated in the table. These included variations recommended by the BLM between MPs 119.5 and 119.8, at MP 126.0, and at MP 131.5, and between MPs 183.9 and 187, and recommended by the Forest Service between MPs 154.7 and 155.1, MPs 157.1 and 158.7, and MPs 171.2 and 173.0. In all the cases listed on the table below, we find the minor route changes to be environmentally preferable and acceptable. These minor route variations were incorporated into the proposed route that is analyzed in section 4 of this EIS. We did not identify any alternative routes that would be environmentally preferable to these minor route variations.

TABLE 3.4.4-1

Minor Deviations Incorporated into the Proposed Pipeline Route

Deviation Name/MPs	County	Rationale for Route Realignment
Powerline Structure MPs 6.0R-6.1R	Coos	Added two PIs to the west to avoid power line structure guy wires and facilitate power line crossing.
Snelgrove MPs 6.1R-6.2R	Coos	Landowner recommended modification to avoid a water source. The alignment modification follows a ridgeline to minimize sidehill construction, grading, and cut/fill grading requirements.
Sweet MPs 7.5R – 8.4R	Coos	Landowner recommended modification to avoid a potential future home site. Realignment follows a stable ridgeline alignment which was evaluated onsite by GeoEngineers. The modification avoids crossing a tributary to Willanch Slough.
Powerline alignment MPs 8.4R-8.8R	Coos	Minor route modification facilitates parallel power line alignment along ridgeline; minimizes cut/fill/grading and TEWA requirements; and avoids wetland/stream GSI-031. Alignment modification also avoids parcel (Edwards - APN 273401).
Stock Slough MPs 9.7–10.3	Coos	The proposed route has been slightly modified between MPs 9.7 and 10.3 from the FERC May 2009 FEIS route. The route modification avoids crossing Stock Slough Road (County Road 54) in a steep road cut as the alignment descends a steep ridge slope. Further, the route modification avoids two crossings of Stock Slough in the tight meandering bends which were crossed immediately below Stock Slough Road and immediately adjacent to a residence.
Muenchrath/Wilson MPs 12.1–12.8	Coos	During an on-site meeting with Mr. Muenchrath, an agreement was reached to route the pipeline farther east, away from the Muenchrath and Wilson residences. Although a potential geological hazard was identified along this route, Pacific Connector determined that the new proposed reroute to the east could be built and maintained over the long term if certain site-specific construction, backfill, and restoration techniques were adhered to.
Boone Creek MPs 15.3–16.0	Coos	The alignment in this area was adjusted based on geological hazard evaluations. The proposed route now minimizes sidehill and steep slope construction requirements.
BPA Adjustments MPs 20.9–22.3	Coos	The alignment between MPs 20.9 and 22.3 was adjusted based on Pacific Connector's meeting with the Bonneville Power Administration (BPA). BPA requested that the pipeline easement more closely abut the powerline corridor in these areas to minimize the strip of trees between the two easements. Abutting the easements would minimize the potential for tree wind throw hazards and subsequent maintenance requirements.
Coos Wagon Road MPs 24.0 – 24.3	Coos	Minor route modification facilitates Coos Wagon Road crossing (removes PI from road prism); minimizes sidehill construction and cut/fill grading requirements. TEWAs have been located based on topographic conditions.
Lone Rock Timberlands Development MPs 29.0–29.5	Coos	The alignment between MPs 29.0 and 29.5 was modified to minimize impacts on Lone Rock Timberland's planned subdivision. The reroute would avoid impacts to a number of lots within the subdivision.
East Fork Coquille River MPs 29.8–39.1	Coos	New proposed route segment between MPs 29.8 and 39.1 avoids marbled murrelet (MAMU) habitat and MAMU Stands G46 and G47.
MAMU Stand G50 MPs 30.3–30.7	Coos	New proposed route segment between MPs 30.3 and 30.7 reduces impacts on MAMU Stand G50.
MAMU Stand C3088 MPs 31.7–32.3	Coos	New proposed route segment between MPs 31.7 and 32.3 reduces impacts on MAMU Stand C3088.
Hardwood Study Plot MPs 31.4–32.2	Coos	The alignment between MPs 31.4 to 32.2 was rerouted to avoid a long-term Hardwood Study Plot on BLM lands that is being studied by Oregon State University. The new proposed route was coordinated with the BLM.
SF Elk Creek MPs 34.4.34.7	Coos	Added PI to the north to avoid stream meander and improve stream crossing alignment at MP 34.46, South Fork Elk Creek (CSP-5).
Elk Creek Road MPs 35.5-35.7	Coos	Removed PI to better align/co-locate with Elk Creek Rd (28-11-29) and to minimize cutslope/grading disturbance and MAMU stand effects.
MAMU Stand B07 MPs 36.0–36.3	Coos	New proposed route segment between MPs 36.1 and 36.3 reduces impacts on MAMU Stand B07.
Road Crossing MPs 36.6-36.8	Coos	Removed PI to better align pipeline with road cutslope to minimize additional cut/fill/grading requirements.
Big Creek MPs 37.1-37.4	Coos	Realignment to fit topography and improve stream crossing at two tributaries of Big Creek (ESI-19 and ESP-20) by minimizing side slope construction, grading, cut/fill requirements.
Tri W Group LP MPs 39.9-41.7	Coos	Landowner recommended modification to move the alignment to a recent clear-cut to minimize timber impacts (Tri W Group – APN 811900 & 8118000). Realignment avoids two road crossings and an in-road lay segment (MPs 40.3 - 40.4) and incorporates other minor alignment refinements to follow topographic conditions to minimize sidehill construction and cut/fill/ grading requirements.
Road Crossing MPs 42.1-42.8	Coos	Adjusted alignment to follow topography; removed PIs to avoid two road crossings which also shortened the alignment length. Realignment also occurs within a recent clear-cut to minimize timber impacts

TABLE 3.4.4-1

Minor Deviations Incorporated into the Proposed Pipeline Route

Deviation Name/MPs	County	Rationale for Route Realignment
Road Crossing MPs 43.3-44.5	Coos	Adjusted route to better align with parallel road alignment, existing log landing, and topography to minimize road crossings/inroad lays, sidehill construction, and cut/fill/grading requirements.
MAMU Stand C3070 MPs 45.2–45.7	Coos	New proposed route segment between MPs 45.2 and 45.7 reduces impacts on MAMU Stand C3070.
Rust Parcel Subdivision MPs 49.3–49.8	Douglas	The alignment between MPs 49.5 and 49.8 was adjusted to minimize impacts on the landowner's planned parcel subdivision. The pipeline route and block valve locations were realigned to the edge of the parcel.
Brian and Darla Standley MPs 51.5–52.5	Douglas	Pacific Connector incorporated a minor route deviation between approximately MPs 51.5 and 52.5, east of Highway 42, to accommodate a landowner request/concern.
Brian and Darla Standley MPs 51.6–52.3	Douglas	Landowner subsequently requested to revert back to Pacific Connector's 2009 FERC Certificated Route. Pacific Connector included a minor modification in the 2009 Certificated Route to avoid a residential parcel owned by the Standleys (APN R123564) near MP 51.6.
Kincaid's lupine MPs 57.8–57.9	Douglas	New proposed route segment between MPs 57.8 and 57.9 avoids population of Kincaid's lupine.
Willis Creek and Road MPs 66.9-67.0	Douglas	Added PIs to provide perpendicular crossing of Trib. to Willis Creek (BSI-169) and Willis Creek Road. Also improves crossing of Willis Creek (BSI-169).
Stream Crossing MPs 77.7-78.0	Douglas	Adjusted PI locations to improve alignment based on topography and stream crossing/offset. Realignment balances grading and cut/fill requirements.
Transmission Tower MPs 79.2–79.7	Douglas	The alignment between MPs 79.2 and 79.7 was modified to avoid a transmission tower. The route of the minor deviation was dictated by topographic conditions and the presence of three transmission line crossings in this area.
St. Johns Creek Reroute MPs 88.1–90.0	Douglas	Pacific Connector's proposed reroute alignment crosses the creek in an area where the creek is not steeply incised and there is a minor floodplain on either side of the stream to facilitate the crossing.
NSO Nest Patch 094-8 MPs 95.1–95.6	Douglas	New proposed route between MPs 95.1 and 95.6 reduces impacts on old-growth forest and northern spotted owl (NSO) Nest Patch 094-8.
Landslide Hazards Nos. 34-35 MPs 108.5–109.0	Douglas	Route realigned to avoid landslide hazards.
Civil Survey Corrections MPs 109.7-109.8	Douglas	Civil survey correction to move alignment to previously surveyed/staked PIs.
Civil Survey Corrections MPs 110.8–111.1	Jackson	The alignment in this area was trued-up with actual civil survey data which ensured that the alignment approached the slope perpendicularly or head-on to the contours to minimize right-of-way grading requirements.
Umpqua National Forest Stream / Road MPs 110.4-111.8	Jackson	Alignment adjustment and construction right-of-way modification to minimize grading and cut/fill requirements based on topography to minimize stream effects (RDI-68 / FS-HF-N). Also facilitates co-location with Forest Service Road FS 3232000 and facilitates crossing and co-location with Forest Service Road FS-3200RD.
Umpqua National Forest MPs 113.6-113.8	Jackson	Relocated Block Valve # 9 moved from MP 112.10 to MP 113.70 based on Forest Service request to be on private land outside the Forest Service's 1.5-mile peregrine falcon buffer zone. To accommodate the aboveground facility, the alignment was slightly realigned to the east based on topographic conditions to minimize grading requirements.
Gagnon MPs 118.7–119.1	Jackson	The alignment in this area (MPs 118.7 to 123.3) was adjusted based on landowner concerns/recommendations to move the alignment to the edge of the parcel/pasture.
Medford BLM – Riparian Reserve MPs 119.5-120.3	Jackson	BLM recommended alignment modification to avoid a crossing and parallel alignment along a 1-2 feet wide unnamed intermittent tributary to Trail Creek and potential effects to the tributary's associated Riparian Reserve. The modified alignment would avoid crossing one landowner parcel Adam (APN 10215722).
Laudani MPs 123.1–123.3	Jackson	The alignment between MPs 123.1 and 123.3 was adjusted based on landowner concerns. In this area the alignment was moved upslope and away from residence as much as possible. Further, the TEWAs in this area were reduced in size and extent to minimize overall disturbance on the slope which was a concern of the landowner.
Medford BLM – Riparian Reserves MPs 126.3 – 126.8	Jackson	BLM recommended alignment modification to avoid a crossing of an unnamed intermittent tributary to Indian Creek (1-2 feet wide) and minimize crossings and potential effects to the tributary's associated Riparian Reserve. The construction right-of-way modifications also incorporated a neckdown to 75 feet across the two remaining intermittent waterbodies to minimize effects to these waterbodies and their associated Riparian Reserves.
Mitchell Ranch Deviations MPs 127.4–127.8	Jackson	Minor reroute to avoid home site development.

TABLE 3.4.4-1

Minor Deviations Incorporated into the Proposed Pipeline Route

Deviation Name/MPs	County	Rationale for Route Realignment
Mucky Flats Reroute MPs 128.4–130.6	Jackson	Reroute to address landowner concerns with shallow groundwater, irrigation pastures. Landowner also proposed to extend private runway airstrip in Mucky Flats, which would have crossed the proposed pipeline route.
Powerline MPs 129.9-130.0	Jackson	Adjusted route to provide a more perpendicular power line crossing.
Gibson MPs 130.0-130.5	Jackson	Minor modification incorporated to avoid a private quarry on Gibson (APN 10536777). The alignment modification avoids two parcels: BLM - APN 10536710 and Gibson - APN 10536777.
Obenchain Mountain MPs 130.0–132.1	Jackson	Reroute to address landowner concern and impacts to spring and seep water sources and developed pasture.
NSO Reroute MPs 127.4–128.6	Jackson	New proposed route segment between MPs 127.4 and 128.6 to avoid impacts on NSOs.
Medford BLM – Riparian Reserves MPs 131.4 – 132.1	Jackson	BLM recommended alignment modification to avoid a parallel alignment along an intermittent drainage to Neil Creek as well as two crossings of unnamed intermittent tributaries to Neil Creek (1-3 feet wide) to minimize potential effects to these tributaries and their associated Riparian Reserves.
Schott MPs 131.9-132.7	Jackson	Landowner recommended modification to minimize impacts to hayfields and relocates Block Valve #11 out of important cattle winter loafing area. Modification minimizes crossing of emergent wetlands (hayfields) and shortens the length of the permanent access road (PAR) to BV#11. Shortening the PAR also avoids the road crossing of the reservoir impoundment dam. The modified route would decrease the wetland crossing length and acres of wetland affected by approximately 1,838.5 feet and 3.2 acres, respectively.
Stream MPs 141.4-141.5	Jackson	Realignment on BLM lands to remove approximately 460 feet of the parallel alignment of the Tributary to Salt Creek (ASI188), an intermittent waterbody, from the construction right-of-way. This minor realignment also adjusts the construction right-of-way to the topography to minimize cut and fill requirements, disturbance, and soil/spoil handling.
C-2 Ranch MPs 143.71–147.54	Jackson	Between MPs 143.71 and 147.54, the alignment crosses the C-2 Ranch, on which there are numerous irregularly-shaped conservation easements held by the Southern Oregon Land Conservancy (Conservancy). Pacific Connector met with the Conservancy and received GIS data showing the locations of the conservation easements. Pacific Connector adjusted the alignment to minimize the impacts on conservation easements, irrigated pastures, and irrigation facilities (canals/ditches). Mainline valve (MLV) #11 was also relocated to MP 145.2 adjacent to Gardner/Salt Creek Road and out of the view of Highway 140.
Heppsie Mountain Quarry MP 150.4–150.7	Jackson	Minor realignment (MPs 150.4 to 150.7) to avoid the Heppsie Mountain Rock Quarry on BLM lands.
Rogue River National Forest – Civil Survey Correction M Ps 151.4-155.5	Jackson	Civil survey coordinate correction.
Rogue River National Forest – S&M Species MPs 154.7–154.9	Jackson	To avoid Survey and Manage (S&M) fungus species *Gymnomyces abietis* (GYAB), identified during surveys on the Rogue River National Forest, a minor route deviation was incorporated into the pipeline alignment to create an adequate S&M protective buffer on this fungi species as directed by the Forest Service.
Rogue River National Forest – S&M Species MPs 158.1-158.2	Jackson	To avoid S&M fungus species *Sedecula pulvinata* (SEPU), identified during surveys on the Rogue River National Forest, a minor route deviation was incorporated into the pipeline alignment to create an adequate S&M protective buffer on this fungi species as directed by the Forest Service.
Rogue River National Forest - Road Crossing 158.7-159.4	Jackson	Alignment adjustment extends co-location with existing road and improves parallel alignment along FS Road 3707500.
Rogue River National Forest – SF Little Butte Creek 162.45	Jackson	Alignment adjustment to provide better stream crossing and right-of-way and TEWA setbacks from South Fork Little Butte Creek (ASP-165).
Rogue River National Forest – S&M Species MPs 162.5–162.8	Jackson	To avoid a cluster of S&M species, including *Albatrellus ellisii*, *Boletus pulcherrimus, Cortinarius olympianus*, *Gomphus kauffmanii*, and *Albatrellus dispansus,* a Forest Service strategic species.
Rogue River National Forest - S&M Species MPs 164.2–164.3	Jackson	To avoid a S&M fungus species *Hygrophorus caeruleus,* identified during surveys in 2009 on the Rogue River National Forest, a minor route deviation was incorporated into the pipeline alignment between MPs 164.2 and 164.3. The deviation moved the alignment and construction right-of-way to the south side of Forest Service Road 37200000.

TABLE 3.4.4-1

Minor Deviations Incorporated into the Proposed Pipeline Route

Deviation Name/MPs	County	Rationale for Route Realignment
Winema National Forest - S&M Species MPs 168.6–169.1	Klamath	To avoid S&M fungus species *Hygrophorus caeruleus* identified during surveys in 2009 on the Winema National Forest, a minor route deviation was incorporated into the pipeline alignment between MPs 168.6 and 169.1. The deviation moved the alignment approximately 500 feet to the north so that the construction right-of-way would avoid the species by approximately 100 feet at the crossing of Dead Indian Memorial Road.
Winema National Forest – S&M Species MPs 171.9–173.0	Klamath	To avoid S&M fungus species *Choiromyces alveolatus* (CHAL), identified during surveys in 2009 on the Winema National Forest, a minor route deviation was incorporated into the pipeline alignment to create an adequate S&M protective buffer on this fungi species as directed by the Forest Service.
Winema National Forest – S&M Species MPs 173.2–173.3	Klamath	To avoid S&M fungus species *Arcangeliella crassa*, identified during surveys in 2009 on the Winema National Forest, a minor route deviation was incorporated into the pipeline alignment between MPs 173.2 and 173.3. The deviation moved the alignment to the north so that the construction right-of-way would avoid the species by 125 feet or more.
Clover Creek Road MPs 175.7-176.4	Klamath	Alignment adjusted to ensure the pipeline's permanent easement does not encroach onto the permanent easement of Clover Creek Road (CR 603).
McLaughlin Lane and Big Buck Lane MPs 187.3–191.8	Klamath	To avoid potential habitat for Applegate's milk-vetch and to avoid the houses in a residential neighborhood along McLaughlin Lane and Big Buck Lane.
Powerline MPs 187.3-187.8	Klamath	Adjusted PIs to avoid power line structure and facilitate power line crossing.
Powerline MPs 189.3-189.4	Klamath	Adjusted alignment to avoid power line structure.
Johnston Subdivision MPs 190.2-192.3	Klamath	Route modification minimizes effects to a planned subdivision (Palomino Pines). The modified alignment skirts around the edge of the planned subdivision along the back lot lines vs. bisecting the middle of the subdivision. The route modification would also avoid crossing two parcels: Johnson - APN R579859 and Lilly - APN R619281.
Applegate's milk-vetch MPs 195.5–196.5	Klamath	New proposed route segment between MPs 195.5 and 196.5 avoids population of Applegate's milk-vetch.
Pipe Rack MPs 198.4-198.5	Klamath	Adjusted alignment to facilitate construction under overhead pipe rack.
Pipeline MPs 199.7-200.0	Klamath	Adjusted alignment to ensure the pipeline's permanent easement avoided encroaching onto the permanent easement of the GTN pipeline.
Canal MPs 200.3-200.7	Klamath	Alignment adjusted to ensure the pipeline's permanent easement avoided encroaching onto the permanent easement of BOR lateral C-4 (ADX-293) and potential construction effects to the canal. Also avoids one parcel (S. Suburban Sanitary District - APN R581016).
Powerline Reroute MPs 202.3– 202.6	Klamath	The alignment in this area was shifted to minimize impacts to hayfields by realigning the pipeline adjacent to the powerline corridor.
Highway 39 Reroute MPs 210.3–211.6	Klamath	The alignment would more closely parallel State Highway 39 to minimize land encumbrances and to minimize pipeline traversing the middle of the fields in this area.
Powerline Reroute MPs 215.3–217.5	Klamath	The alignment was shifted upslope to parallel the powerline corridor more closely in this area, and to avoid a center pivot irrigation feature.
Powerline Reroute MPs 217.5-219.2	Klamath	Alignment modification avoids encroachment of the pipeline's permanent easement onto the permanent easement of the power line. The modification would also avoid one parcel (Alford - APN R103863).
Powerline Reroute MPs 220.5-221.1	Klamath	Alignment modification avoids encroachment of the pipeline's permanent easement onto the permanent easement of the power line. Also avoids four parcels: Johnson - APN R890029 and R104087, Calvin - APN R627851, and Four H Organics - APNR627842.
Lyons Center Pivot MPs 225.5–228.2	Klamath	The alignment in this area was rerouted to avoid impacts to the center pivot irrigated hayfield. Additionally, the reroute avoids an area that is expected to require blasting due to shallow and hard bedrock. The reroute was aligned along property line boundaries where feasible to minimize potential encumbrances.
Topographic modifications MPs - various	Coos, Douglas & Jackson	Fifty (50) minor alignment modifications to ensure that the centerline and construction right-of-way, based on detailed civil survey, maximize ridgeline alignment to minimize sidehill construction, grading and cut/fill requirements, disturbance, and soil/spoil handling. These alignment modifications where described in Pacific Connector's January and March 2015 supplemental information filings to FERC.

TABLE 3.4.4-1

Minor Deviations Incorporated into the Proposed Pipeline Route

Deviation Name/MPs	County	Rationale for Route Realignment
Various Minor MPs – various	Coos, Douglas, Jackson & Klamath	Twenty one (21) minor route modifications were incorporated into the Proposed Route, which have a deviation of less than 20 feet from Pacific Connector's 2013 FERC Certificate Application route; the average deviation is approximately 9.5 feet with a range between 1.4 and 18.5 feet. Generally, these minor alignment modifications were incorporated to avoid encroaching on the permanent easement of Clover Creek Road (CR 603), correcting minor survey errors, ensuring the alignment follows ridgelines to minimize grading requirements, and avoiding existing powerline structures.

3.4.5 Compressor Station Alternatives

Pacific Connector's selection criteria for siting its proposed compressor station were:

- located near the eastern terminus based on pipeline hydraulics and expected fuel usage;
- proximity to interconnecting pipeline facilities;
- need for a relatively flat area, approximately 30 acres in size to accommodate planned facilities and provide a buffer from local development;
- proximity to a paved or all-weather access road, electrical power, and telephone connectivity;
- remote or sparsely populated area to minimize potential noise and visual effects;
- compatibility with existing land uses; and
- minimization of environmental impacts, such as avoidance of wetlands and sensitive habitat.

Besides the proposed location of the Klamath Compressor Station at MP 228.1, Pacific Connector identified two alternative locations: at MP 225.4 about 2 miles north of the proposed Klamath Compressor Station, and at MP 230.9 about 1.7 miles south (figure 3.4-15). In addition, Pacific Connector considered the design alternative of using electric-driven units at the proposed compressor station instead of natural gas burning units. Electric units would produce less noise and less air pollution than gas-burning units.

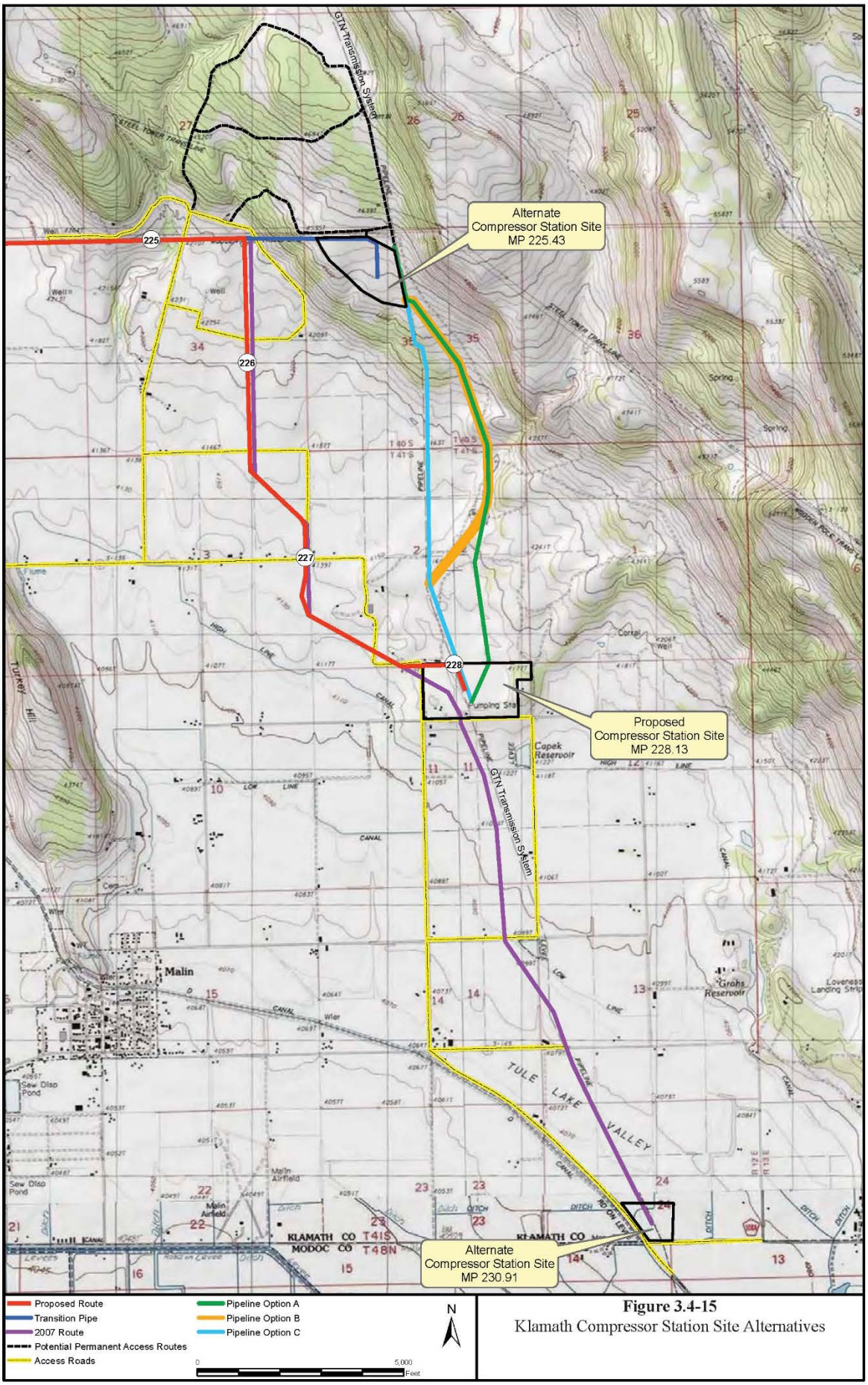


Figure 3.4-15
Klamath Compressor Station Site Alternatives

3.4.5.1 Northern Alternative Compressor Station Location

Pacific Connector evaluated an alternate compressor station site at MP 225.4, about 2.0 miles north of the proposed Klamath Compressor Station, in Section 35, T.40S., R.12E., Klamath County, Oregon, approximately 3.2 miles northeast of Malin. This alternate site is located on a bench adjacent to the GTN natural gas pipeline and a PacifiCorp electric line. The tract is on a hill, east of and topographically about 200 feet above the valley floor. It consists of rangelands with a few scattered juniper trees. Pacific Connector has identified an approximately 48-acre area suitable for siting a compressor station. The closest residence from the center of the site is approximately 0.7 mile to the northwest. This residence is about 150 feet in elevation below the alternative compressor station site, and is topographically screened from view from the site. Noise surveys and modeling have not been completed for this site. However, preliminary evaluations indicate that this alternative site may meet Oregon noise standards.

The additional facilities noted below would be required if this alternate site were selected.

- Upgrading between approximately 1.0 and 1.5 miles of existing dirt road for permanent all-weather access. Pacific Connector is evaluating three potential permanent access routes that are shown on figure 3.4-21 and utilize an existing all-weather road to a Pacific Power substation facility.
- An interconnect with the Ruby pipeline system near MP 228.1. The connection may require installation of pipe larger than 36-inches-in-diameter. Pacific Connector has identified three potential route options for the interconnecting pipeline, that are described below:
    1. Interconnect Pipeline Option-A is approximately 2.0 miles long and proceeds southerly to Ruby Pipeline's existing meter station at MP 228.1. This route deviates from the GTN pipeline to avoid irrigated croplands by crossing primarily rangeland vegetation and land use types.
    2. Interconnect Pipeline Option-B is also approximately 2.0 miles long and is similar to Option-A in that it proceeds southerly avoiding most irrigated cropland. The alignment avoids an irrigated center pivot field then converges with the GTN pipeline for approximately 0.6 mile of the alignment. Approximately 0.2 mile of the southern portion of this route would cross an irrigated field.
    3. Interconnect Pipeline Option-C is approximately 1.9 miles long and proceeds to the south, co-located entirely with the GTN pipeline. This alignment would cross two irrigated fields for approximately 0.8 mile. Pacific Connector has discussed this alignment with the landowner of the center pivot irrigated field, and he is adamantly opposed to this route.

Selection of the alternate compressor station site at MP 225.4 would eliminate the need to construct the proposed Pacific Connector pipeline between MPs 225.4 and 228.1 (2.7 miles), which crosses through primarily irrigated croplands.

3.4.5.2 Southern Alternate Compressor Station Location

Pacific Connector evaluated a potential alternate compressor station site at MP 230.9. The Southern Alternative Compressor Station site would be adjacent to the Oregon/California state line and approximately 2.7 miles southeast of Malin, in Section 24, T.41S., R.12E., in Klamath

County, Oregon. The parcel is an alfalfa field immediately north of County Road 108A. This site is the same as the formerly proposed Tule Lake, Russell Canyon, and Buck Butte meter stations in Klamath County, Oregon previously analyzed in the FERC's May 2009 FEIS for Docket No. CP07-441-000. The Tule Lake, Russell Canyon, and Buck Butte meter stations are not part of the current proposal under Docket No. CP13-492-000, and would be replaced by the Klamath-Beaver and Klamath-Eagle meter stations to be located within the proposed Klamath Compressor station at MP 228.1.

The Southern Alternative Compressor Station site was eliminated from further consideration for the following reasons:

- it was recently encumbered by construction of the Ruby Pipeline aboveground facilities, reducing available space;
- it would require construction of 2.5 more miles of pipeline, affecting 11 additional landowner parcels; and
- it would permanently remove agricultural land on prime farmland soils from crop production.

3.4.5.3 Electric Motor–Driven Compressor Units Alternative

As an alternative to the proposed natural gas driven compressors, Pacific Connector has worked with the local electric distribution company to determine feasibility and cost of power for electric motor–driven (EMD) compressors. Sufficient power is available in the area but transmission line(s) and a substation would have to be constructed to the compressor station. Three motors (13,200 hp each) would be required, one for each compressor. Only two would be in service at any time. For the EMD alternative, dedicated 230-kV transmission lines would have been identified to provide the total load and voltage needs for the Klamath Compressor Station. The total load would be 27.6 MW. The demand would be for two motors with the assumed power demand for the start of the first motor at 15 megavolt ampere (MVA), with a 0.85 power factor followed by a start of the second motor with the first motor operating normally at a total of 30 MVA at a 0.85 power factor.

The provision of the required power for operating EMD compressors would require that an approximately 2-mile-long 230-kV line be constructed to the compressor station from Pacific Power's line 70 that traverses between the Klamath Falls and Malin substations, as well as the installation of an approximately 500-foot by 500-foot (approximately 6-acre) substation. The substation would contain a 230-kV circuit breaker, two 30 MVA transformers, and 12,740-volt metered delivery from each transformer to the compressor station.

Comparatively, for the proposed natural gas–driven turbine, power would be obtained from a multi-customer distribution line, probably in the 25-kV class. Pacific Connector has not made a formal request for service, but Pacific Connector believes (subject of informal discussions with the utility) that the required power could be supplied from existing lines. The power required for the natural gas–driven turbines would be less than 1 MVA, compared to 26 MVA for the EMD option.

3.4.5.4 Conclusions about Compressor Station Alternatives

Oregon has a noise standard (OAR 340-035-0035(1)(f)) for new sources located at previously unused sites. Pacific Connector completed noise surveys and modeling at the proposed Klamath Compressor Station that indicate that the Oregon noise standard would not be achievable at this

location, even after the application of advanced acoustical mitigation measures. However, Pacific Connector stated that the standard only applies to "industrial and commercial noise sources," and should not be applicable to a commodity conveyance utility such as a pipeline. Further, in 1991, the Oregon legislature terminated funding for the ODEQ's administration of the state noise regulation. Since the state can no longer provide site-specific variances or exemption procedures, Pacific Connector believes that the Oregon noise regulation would be unenforceable and would pose an unreasonable impediment to the Project. Therefore, only the FERC noise standards should be applied to the Project.[18] The FERC staff agrees that, in this situation, the FERC noise standards would take precedence over the Oregon regulations. As discussed in section 4.12.2.4 of this EIS, we calculated that noise from the Klamath Compressor Station would average between a day-night sound level (L_{dn}) of 56.1 and 47.5 A-weighted decibels (dBA) at the five closest residences. The FERC standard of an L_{dn} of 55 dBA at noise sensitive areas (NSA) would be met at the proposed Klamath Compressor Station, with the exception of NSA 1. However, Pacific Connector has reached an agreement with the landowners to purchase the property at NSA 1.

We conclude that the use of the EMD alternative may not offer significant environmental advantages over the use of gas-burning compressors at the proposed Klamath Compressor Station. While there are no direct air emissions from EMD compressors, there are indirect emissions associated with generating power at the electric power plant. Depending on its fuel source, the indirect emissions from the power plant may or may not be higher than the direct emissions from the gas-fired compressors at Klamath Compressor Station. The natural gas–driven turbine system would require less electric power and avoid the construction of a new powerline and substation required by the EMD alternative.

The Southern Alternative Compressor Station location would not be environmentally preferable because it would require the additional construction of 2.5 more miles of pipeline; would convert prime farmland to industrial purposes; and the proposed Pacific Connector facilities may conflict with the existing Ruby facilities at the site. While the Northern Compressor Station location could possibly meet the Oregon noise standards, use of that site would require about 2 miles of additional 42-inch-diameter piping, and another new access road. The proposed Klamath Compressor Station would be in compliance with the FERC noise standards. Noise and visual impacts on nearby NSAs would be reduced by measures implemented by Pacific Connector, including slatted fence and vegetative screening, as further discussed in sections 4.8.2.2 and 4.12.2. The proposed Klamath Compressor Station would offer direct access to the GTN and Ruby systems. It would be located on a relatively flat hayfield. We conclude that the alternative compressor station locations do not offer any significant environmental advantages over the proposed site of the Klamath Compressor Station.

[18] Oregon noise standards are discussed in sections 4.12.2.2 and 4.12.2.4 of this EIS; these standards limit increases to 10 dBA above the ambient background L_{10} and L_{50} noise levels at nearby NSAs. Pacific Connector contends that if the Oregon standards were applied to its Project, the company would have to purchase nine residences closest to the Klamath Compressor Station. In Section 10.5.4 of Resource Report 10 in its June 2013 application to the FERC, and in its September 16, 2013, response to the FERC's August 16, 2013, data request, question 84, Pacific Connector explained its position that the Oregon noise regulations should not be applicable to its Project, and that the FERC noise standards should take precedence. This stance was not refuted by ODEQ in its comments on the FERC's November 2014 DEIS for the Project filed on February 12, 2015.